MESSRS.:

Date: 15.Apr.2019

PACKAGE

GCM X7R ≧1μF Series

Addition of MLCC Factory

(Philippines Manufacturing Co. of Murata, Inc.)

1. Design Records of Saleable Product
2. Engineering Change Documents
3. Design FMEA
4. Process Flow Diagrams
5. Process FMEA
6. Dimensional Results
7. Material, Performance Test Results
8. Initial Process Study
9. Measurement System Analysis Studies
10. Qualified Laboratory Documentation
11. Control Plan

muRata
INNOVATOR IN ELECTRONICS

MURATA MFG. CO., LTD

1. Design Records of Saleable Product

Murata Standard Specification.

muRata

Messrs.

Specification No. : JEMCG2-026346

Product Specification for Reference

Issued Date : 9 APR. 2019

Part Description : Chip Multilayer Ceramic Capacitors for Automotive

Customer Part No. :

MURATA Part No. : GCM X7R ≧1μF Series

Technical Dept.

Prepared by

Product Engineering Department
Capacitor Division
Fukui Murata MFG. Co., Ltd.

Yoshinori Sugihara
Representative

Norio Shiroiwa

【CONTENTS】

CHIP MULTILAYER CERAMIC CAPACITORS FOR AUTOMOTIVE

1. Scope

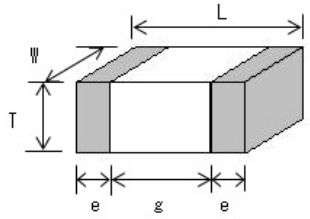
This product specification is applied to Chip Multilayer Ceramic Capacitors used for Automotive Electronic equipment.

2. MURATA Part No. System

(Ex.)

GCM	18	8	R7	1E	105	K	A64	D
	(1)L/W Dimensions	(2)T Dimensions	(3)Temperature Characteristics	(4)Rated Voltage	(5)Nominal Capacitance	(6)Capacitance Tolerance	(7)Murata's Control Code	(8)Packaging Code

3. Type & Dimensions



(Unit:mm)

Type	T Code	(1)-1 L	(1)-2 W	(2) T	e	g
GCM18	8	1.6±0.1	0.8±0.1	0.8±0.1	0.2 to 0.5	0.5 min.
GCM21	B	2.0±0.15	1.25±0.15	1.25±0.15	0.2 to 0.7	0.7 min.
GCM31	C	3.2±0.2	1.6±0.2	1.6±0.2	0.3 to 0.8	1.5 min.
GCM32	E	3.2±0.3	2.5±0.2	2.5±0.2	0.3 min.	1.0 min.

4. Rated value

4.1. Temperature Characteristics

High Dielectric Constant Type

(3) TC Code	Cap. Change	Temp. Range	Ref.Temp.	Operating Temp. Range
R7	-15 to 15 %	-55 to 125 °C	25 °C	-55 to 125 °C

4.2. Rated Voltage

(4) Code	Rated Voltage
0J	DC 6.3 V
1C	DC 16 V
1E	DC 25 V

4.3. Nominal Capacitance

Nominal Capacitance shall be expressed by three digits. The first two digits represents significant figures. The last specifies the number of zero to follow. The letter R is used as the decimal point.

(Ex.)

(5) Cap Code	Capacitance
R50	0.5 pF
5R0	5 pF
220	22 pF
221	220 pF

4.4. Capacitance Tolerance

(6) Cap.Tol Code	Capacitance Tolerance
K	±10 %
M	±20 %

5. Package

(8) Package Code	Packaging
D	ϕ180mm Reel PAPER
L	ϕ180mm Reel EMBOSSED

6. Parts No. List

(Ex.)	GCM	18	8	R7	1E	105	K	A64	D
		(1)L/W Dimensions	(2)T Dimensions	(3)Temperature Characteristics	(4)Rated Voltage	(5)Nominal Capacitance	(6)Capacitance Tolerance	(7)Murata's Control Code	(8)Packaging Code

(1) LxW : 1.6x0.8mm
(3) Temperature Characteristics : R7(-15 to 15%)

Customer PART NO.	MURATA PART NO.	(2) T (mm)	(4)Rated Voltage	(5) Nominal Capacitance	(6) Capacitance Tolerance	φ180mm Reel (pcs./Reel)	Specifications and Test Methods
	GCM188R71E105KA64D	0.8±0.1	DC 25 V	1 uF	±10 %	4000	7.1
	GCM188R71E105MA64D	0.8±0.1	DC 25 V	1 uF	±20 %	4000	7.1
	GCM188R71C105KA64D	0.8±0.1	DC 16 V	1 uF	±10 %	4000	7.2
	GCM188R71C105MA64D	0.8±0.1	DC 16 V	1 uF	±20 %	4000	7.2

(1) LxW : 2.0x1.25mm
(3) Temperature Characteristics : R7(-15 to 15%)

Customer PART NO.	MURATA PART NO.	(2) T (mm)	(4)Rated Voltage	(5) Nominal Capacitance	(6) Capacitance Tolerance	φ180mm Reel (pcs./Reel)	Specifications and Test Methods
	GCM21BR71C475KA73L	1.25±0.15	DC 16 V	4.7 uF	±10 %	3000	7.3
	GCM21BR71C475MA73L	1.25±0.15	DC 16 V	4.7 uF	±20 %	3000	7.3
	GCM21BR70J106KE22L	1.25±0.15	DC 6.3 V	10 uF	±10 %	3000	7.3
	GCM21BR70J106ME22L	1.25±0.15	DC 6.3 V	10 uF	±20 %	3000	7.3

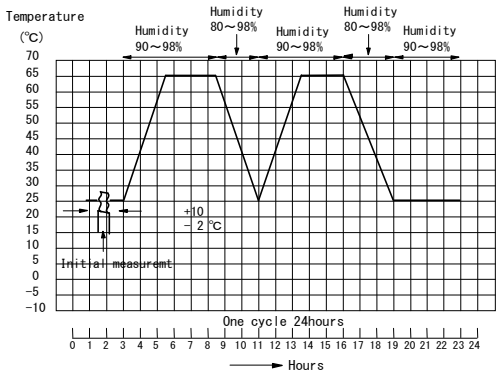
(1) LxW : 3.2x1.6mm
(3) Temperature Characteristics : R7(-15 to 15%)

Customer PART NO.	MURATA PART NO.	(2) T (mm)	(4)Rated Voltage	(5) Nominal Capacitance	(6) Capacitance Tolerance	φ180mm Reel (pcs./Reel)	Specifications and Test Methods
	GCM31CR70J226KE23L	1.6±0.2	DC 6.3 V	22 uF	±10 %	2000	7.3
	GCM31CR70J226ME23L	1.6±0.2	DC 6.3 V	22 uF	±20 %	2000	7.3

(1) LxW : 3.2x2.5mm
(3) Temperature Characteristics : R7(-15 to 15%)

Customer PART NO.	MURATA PART NO.	(2) T (mm)	(4)Rated Voltage	(5) Nominal Capacitance	(6) Capacitance Tolerance	φ180mm Reel (pcs./Reel)	Specifications and Test Methods
	GCM32ER71C226KE19L	2.5±0.2	DC 16 V	22 uF	±10 %	1000	7.3
	GCM32ER71C226ME19L	2.5±0.2	DC 16 V	22 uF	±20 %	1000	7.3
	GCM32ER70J476KE19L	2.5±0.2	DC 6.3 V	47 uF	±10 %	1000	7.3
	GCM32ER70J476ME19L	2.5±0.2	DC 6.3 V	47 uF	±20 %	1000	7.3

<table>
<tr><th>No</th><th colspan="2">AEC-Q200 Test Item</th><th>Specification.</th><th>AEC-Q200 Test Method</th></tr>
<tr><td>1</td><td colspan="2">Pre-and Post-Stress Electrical Test</td><td colspan="2">-</td></tr>
<tr><td rowspan="5">2</td><td colspan="2">High Temperature Exposure (Storage)</td><td>The measured and observed characteristics should satisfy the specifications in the following table.</td><td rowspan="5">Solder the capacitor on the test substrate(glass epoxy board).
Set the capacitor for 1000+/-12h at 150+/-3℃.
Set for 24+/-2h at room temperature, then measure.

・Initial measurement
Perform a heat treatment at 150+0/-10 ℃for 1h and then sit for 24+/-2h at room temperature.Perform the initial measurement.</td></tr>
<tr><td>Appearance</td><td>No marking defects</td></tr>
<tr><td>Capacitance Change</td><td>Within +/-12.5%</td></tr>
<tr><td>D.F.</td><td>Within the specified initial value.</td></tr>
<tr><td>I.R.
25℃</td><td>Within the specified initial value.</td></tr>
<tr><td rowspan="5">3</td><td colspan="2">Temperature Cycling</td><td>The measured and observed characteristics should satisfy the specifications in the following table.</td><td rowspan="5">Solder the capacitor on the test substrate(glass epoxy board).
Perform cycle test according to the four heat treatments listed in the following table.
Set for 24+/-2h at room temperature, then measure.
<table><tr><th rowspan="2">Step</th><th rowspan="2">Time(min)</th><th>Cycles</th></tr><tr><th>1000(for R7/C7)</th></tr><tr><td>1</td><td>15+/-3</td><td>-55℃+0/-3</td></tr><tr><td>2</td><td>1</td><td>Room</td></tr><tr><td>3</td><td>15+/-3</td><td>125℃+3/-0</td></tr><tr><td>4</td><td>1</td><td>Room</td></tr></table>
・Initial measurement
Perform a heat treatment at 150+0/-10 ℃for 1h and then sit for 24+/-2h at room temperature.Perform the initial measurement.</td></tr>
<tr><td>Appearance</td><td>No marking defects</td></tr>
<tr><td>Capacitance Change</td><td>Within +/-10.0%</td></tr>
<tr><td>D.F.</td><td>Within the specified initial value.</td></tr>
<tr><td>I.R.
25℃</td><td>Within the specified initial value.</td></tr>
<tr><td>4</td><td colspan="2">Destructive Physical Analysis</td><td>No defects or abnormalities</td><td>Per EIA-469.</td></tr>
<tr><td rowspan="5">5</td><td colspan="2">Moisture Resistance</td><td>The measured and observed characteristics should satisfy the specifications in the following table.</td><td rowspan="5">Solder the capacitor on the test substrate(glass epoxy board).
Apply the 24h heat (25℃ to 65℃) and humidity (80%RH to 98%RH) treatment shown below, 10 consecutive times.
 

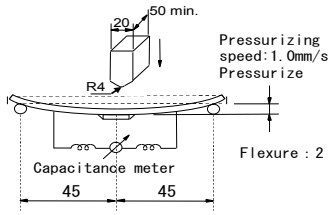
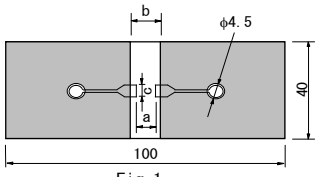
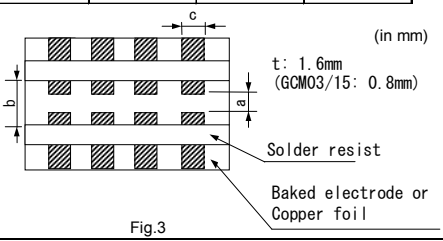
・Initial measurement
Perform a heat treatment at 150+0/-10 ℃for 1h and then sit for 24+/-2h at room temperature.Perform the initial measurement.
・Measurement after test
Perform a heat treatment at 150+0/-10 ℃for 1h and then sit for 24+/-2h at room temperature.Perform the initial measurement.</td></tr>
<tr><td>Appearance</td><td>No marking defects</td></tr>
<tr><td>Capacitance Change</td><td>Within +/-12.5%</td></tr>
<tr><td>D.F.</td><td>0.2 max.</td></tr>
<tr><td>I.R.
25℃</td><td>Within the specified initial value.</td></tr>
<tr><td rowspan="5">6</td><td colspan="2">Biased Humidity</td><td>The measured and observed characteristics should satisfy the specifications in the following table.</td><td rowspan="5">Solder the capacitor on the test substrate(glass epoxy board).
Apply the rated voltage and 1.3+0.2/-0vdc (add 6.8kΩ resister) at 85+/-3℃ and 80%RH to 85%RH humidity for 1000+/-12h.
The charge/discharge current is less than 50mA.

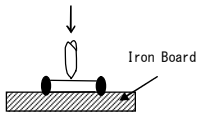
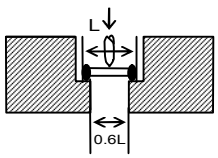
・Initial measurement
Perform a heat treatment at 150+0/-10 ℃for 1h and then sit for 24+/-2h at room temperature.Perform the initial measurement.
・Measurement after test
Perform a heat treatment at 150+0/-10 ℃for 1h and then sit for 24+/-2h at room temperature.Perform the initial measurement.</td></tr>
<tr><td>Appearance</td><td>No marking defects</td></tr>
<tr><td>Capacitance Change</td><td>Within +/-12.5%</td></tr>
<tr><td>D.F.</td><td>0.2 max.</td></tr>
<tr><td>I.R.
25℃</td><td>More than 200MΩ or 5Ω・F
(Whichever is smaller)</td></tr>
</table>

No	AEC-Q200 Test Item		Specification.	AEC-Q200 Test Method
7	Operational Life		The measured and observed characteristics should satisfy the specifications in the following table.	Solder the capacitor on the test substrate(glass epoxy board). Apply 150% of the rated voltage for 1000+/-12h at 125+/-3℃ (for R7/C7). The charge/discharge current is less than 50mA. Set for 24+/-2h at room temperature, then measure. · Initial measurement Apply the test voltage at the max. operating temp. +/-3°C for 1h and then let sit for 24+/-2h at room temperature,then measure.
		Appearance	No marking defects	
		Capacitance Change	Within +/-12.5%	
		D.F.	0.2 max.	
		I.R. 25℃	More than 200MΩ or 5Ω･F (Whichever is smaller)	
8	External Visual		No defects or abnormalities	Visual inspection
9	Physical Dimension		Within the specified dimensions	Using Measuring instrument of dimension.
10	Resistance to Solvents	Appearance	No marking defects	Per MIL-STD-202 Method 215 Solvent 1 : 1 part (by volume) of isopropyl alcohol 3 parts (by volume) of mineral spirits Solvent 2 : Terpene defluxer Solvent 3 : 42 parts (by volume) of water 1 part (by volume) of propylene glycol monomethyl ether 1 part (by volume) of monoethanolamine
		Capacitance	Within the specified initial value.	
		D.F.	Within the specified initial value.	
		I.R. 25℃	Within the specified initial value.	
11	Mechanical Shock	Appearance	No marking defects	Solder the capacitor on the test substrate(glass epoxy board). Three shocks in each direction should be applied along 3 mutually perpendicular axes of the test specimen (18 shocks). The specified test pulse should be Half-sine and should have a duration :0.5ms, peak value:1500g and velocity change: 4.7m/s.
		Capacitance	Within the specified initial value.	
		D.F.	Within the specified initial value.	
		I.R. 25℃	Within the specified initial value.	
12	Vibration	Appearance	No defects or abnormalities	Solder the capacitor on the test substrate(glass epoxy board). The capacitor should be subjected to a simple harmonic motion having a total amplitude of 1.5mm, the frequency being varied uniformly between the approximate limits of 10 and 2000Hz. The frequency range, from 10 to 2000Hz and return to 10Hz, should be traversed in approximately 20 minutes. This motion should be applied for 12 items in each 3 mutually perpendicular directions (total of 36 times).
		Capacitance	Within the specified initial value.	
		D.F.	Within the specified initial value.	
		I.R. 25℃	Within the specified initial value.	
13	Resistance to Soldering Heat		The measured and observed characteristics should satisfy the specifications in the following table.	Immerse the capacitor in Sn-3.0Ag-0.5Cu solder solution or an eutectic solder solution at 260±5℃ for 10±1s. Set at room temperature for 24+/-2h, then measure. · Initial measurement Perform a heat treatment at 150+0/-10 ℃ for 1h and then set for 24+/-2h at room temperature. Perform the initial measurement.
		Appearance	No marking defects	
		Capacitance	Within the specified initial value.	
		D.F.	Within the specified initial value.	
		I.R. 25℃	Within the specified initial value.	

<table>
<tr><th>No</th><th colspan="2">AEC-Q200 Test Item</th><th>Specification.</th><th>AEC-Q200 Test Method</th></tr>
<tr><td rowspan="5">14</td><td rowspan="5">Thermal Shock</td><td></td><td>The measured and observed characteristics should satisfy the specifications in the following table.</td><td rowspan="5">Solder the capacitor on the test substrate(glass epoxy board).
Perform the 300 cycles according to the two heat treatments listed in the following table(Maximum transfer time is 20s).
Set for 24+/-2h at room temperature, then measure.

<table><tr><td>Step</td><td>1</td><td>2</td></tr><tr><td>Temp. (℃)</td><td>-55+0/-3</td><td>125+3/-0</td></tr><tr><td>Time (min)</td><td>15+/-3</td><td>15+/-3</td></tr></table>
· Initial measurement
Perform a heat treatment at 150+0/-10 ℃ for 1h and then set for 24+/-2h at room temperature.
Perform the initial measurement.</td></tr>
<tr><td>Appearance</td><td>No marking defects</td></tr>
<tr><td>Capacitance Change</td><td>Within +/-10.0%</td></tr>
<tr><td>D.F.</td><td>Within the specified initial value.</td></tr>
<tr><td>I.R.
25℃</td><td>Within the specified initial value.</td></tr>
<tr><td rowspan="4">15</td><td rowspan="4">ESD</td><td>Appearance</td><td>No marking defects</td><td rowspan="4">Per AEC-Q200-002</td></tr>
<tr><td>Capacitance</td><td>Within the specified initial value.</td></tr>
<tr><td>D.F.</td><td>Within the specified initial value.</td></tr>
<tr><td>I.R.
25℃</td><td>Within the specified initial value.</td></tr>
<tr><td rowspan="3">16</td><td colspan="2" rowspan="3">Solderability</td><td rowspan="3">95% of the terminations is to be soldered evenly and continuously.</td><td>(a) Preheat at 155℃ for 4h. After preheating, immerse the capacitor in a solution of rosin ethanol 25(mass)%.
Immerse in Sn-3.0Ag-0.5Cu solder solution at 245+/-5℃ or an eutectic solder solution at 235+/-5℃ for 5+0/-0.5s.</td></tr>
<tr><td>(b) should be placed into steam aging for 8h+/-15min.
After preheating, immerse the capacitor in a solution of rosin ethanol 25(mass)%.
Immerse in Sn-3.0Ag-0.5Cu solder solution at 245+/-5℃ or an eutectic solder solution at 235+/-5℃ for 5+0/-0.5s.</td></tr>
<tr><td>(c) should be placed into steam aging for 8h+/-15min.
After preheating, immerse the capacitor in a solution of rosin ethanol 25(mass)%.
Immerse in Sn-3.0Ag-0.5Cu solder solution or an eutectic solder solution for 120+/-5s at 260+/-5℃.</td></tr>
<tr><td rowspan="6">17</td><td rowspan="6">Electrical Chatacteri-zation</td><td>Appearance</td><td>No defects or abnormalities</td><td>Visual inspection.</td></tr>
<tr><td>Capacitance</td><td>Shown in Rated value.</td><td rowspan="2">The capacitance/D.F. should be measured at 25℃ at the frequency and voltage shown in the table.
<table><tr><td>Char.
Item</td><td>R7,C7
(C≦10μF)</td></tr><tr><td>Frequency</td><td>1.0+/-0.1kHz</td></tr><tr><td>Voltage</td><td>1.0+/-0.2Vrms</td></tr></table></td></tr>
<tr><td>D.F.</td><td>0.1 max.</td></tr>
<tr><td>I.R. 25℃</td><td>More than 2000MΩ or 50Ω･F
(Whichever is smaller)</td><td rowspan="2">The insulation resistance should be measured with a DC voltage not exceeding the rated voltage at 25℃ and 125℃(for R7/C7) within 2 minutes of charging.</td></tr>
<tr><td>I.R. 125℃</td><td>More than 200MΩ or 5Ω･F
(Whichever is smaller)</td></tr>
<tr><td>Dielectric Strength</td><td>No failure</td><td>No failure should be observed when 250% of the rated voltage is applied between the terminations for 1 to 5s, provided the charge/discharge current is less than 50mA.</td></tr>
</table>

<table>
<tr><th>No</th><th colspan="2">AEC-Q200 Test Item</th><th>Specification.</th><th>AEC-Q200 Test Method</th></tr>
<tr><td rowspan="5">18</td><td rowspan="5">Board Flex</td><td>Appearance</td><td>No marking defects</td><td rowspan="5">Solder the capacitor on the test substrate(glass epoxy board) shown in Fig1.
Then apply a force in the direction shown in Fig 2 for 60s.
The soldering should be done by the reflow method and should be conducted with care so that the soldering is uniform and free of defects such as heat shock.
<table><tr><th>Type</th><th>a</th><th>b</th><th>c</th></tr><tr><td>GCM03</td><td>0.3</td><td>0.9</td><td>0.3</td></tr><tr><td>GCM15</td><td>0.5</td><td>1.5</td><td>0.6</td></tr><tr><td>GCM18</td><td>0.6</td><td>2.2</td><td>0.9</td></tr><tr><td>GCM21</td><td>0.8</td><td>3.0</td><td>1.3</td></tr><tr><td>GCM31</td><td>2.0</td><td>4.4</td><td>1.7</td></tr><tr><td>GCM32</td><td>2.0</td><td>4.4</td><td>2.6</td></tr></table>(in mm)
  Fig. 2</td></tr>
<tr><td>Capacitance Change</td><td>Within +/-10.0%</td></tr>
<tr><td>D.F.</td><td>Within the specified initial value.</td></tr>
<tr><td>I.R.
25℃</td><td>Within the specified initial value.</td></tr>
<tr><td></td><td>  Fig. 1
t : 1.6mm
(GCM03/15:0.8mm)</td></tr>
<tr><td rowspan="5">19</td><td rowspan="5">Terminal Strength</td><td>Appearance</td><td>No marking defects</td><td rowspan="5">Solder the capacitor on the test substrate(glass epoxy board) shown in Fig3.
Then apply 18N* force in parallel with the test jig for 60s.
The soldering should be done either with an iron or using the reflow method and should be conducted with care so that the soldering is uniform and free of defects such as heat shock
*2N(GCM03/15)
<table><tr><th>Type</th><th>a</th><th>b</th><th>c</th></tr><tr><td>GCM03</td><td>0.3</td><td>0.9</td><td>0.3</td></tr><tr><td>GCM15</td><td>0.4</td><td>1.5</td><td>0.5</td></tr><tr><td>GCM18</td><td>1.0</td><td>3.0</td><td>1.2</td></tr><tr><td>GCM21</td><td>1.2</td><td>4.0</td><td>1.65</td></tr><tr><td>GCM31</td><td>2.2</td><td>5.0</td><td>2.0</td></tr><tr><td>GCM32</td><td>2.2</td><td>5.0</td><td>2.9</td></tr></table>  Fig.3</td></tr>
<tr><td>Capacitance</td><td>Within the specified initial value.</td></tr>
<tr><td>D.F.</td><td>Within the specified initial value.</td></tr>
<tr><td>I.R.
25℃</td><td>Within the specified initial value.</td></tr>
<tr><td></td><td></td></tr>
<tr><td>20</td><td colspan="2">Beam Load Test</td><td>Destruction value should be exceed following one.
< Chip L dimension : 2.5mm max. >
Chip thickness > 0.5mm rank : 20N
Chip thickness = 0.5mm rank : 8N
Chip thickness = 0.3mm rank : 5N
Chip thickness < 0.3mm rank : 2.5N

< Chip L dimension : 3.2mm min. >
Chip thickness < 1.25mm rank : 15N
Chip thickness ≧1.25mm rank : 54.5N</td><td>Place the capacitor in the beam load fixture as Fig 4.
Apply a force.
< Chip Length : 2.5mm max. >
 
< Chip Length : 3.2mm min. >
  Fig.4

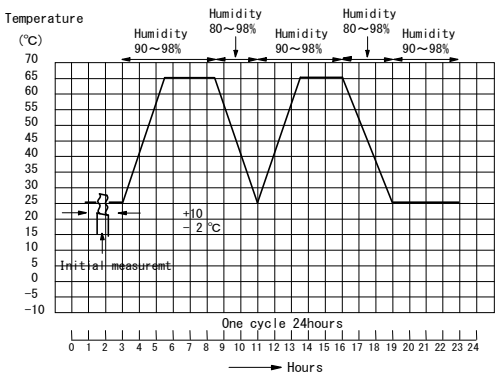
Speed supplied the Stress Load : *0.5mm/s
*GCM03: 0.1mm/s</td></tr>
</table>

<table>
<tr><th>No</th><th>AEC-Q200 Test Item</th><th>Specification.</th><th>AEC-Q200 Test Method</th></tr>
<tr><td>21</td><td>Capacitance Temperature Characteristics</td><td>R7 : Within +/-15%
(-55℃ to +125℃)
C7 : Within +/-22%
(-55℃ to +125℃)</td><td>The capacitance change should be measured after 5 minutes at each specified temp. stage.
Capacitance value as a reference is the value in step 3.

<table><tr><th>Step</th><th>Temperature(°C)</th></tr><tr><td>1</td><td>Reference Temp.+/-2</td></tr><tr><td>2</td><td>Min. Operating Temp.+/-3</td></tr><tr><td>3</td><td>Reference Temp.+/-2</td></tr><tr><td>4</td><td>Max. Operating Temp.+/-3</td></tr><tr><td>5</td><td>Reference Temp.+/-2</td></tr></table>
· Initial measurement
Perform a heat treatment at 150+0/-10°C for 1h and then let sit for 24+/-2h at room temperature,then measure.</td></tr>
</table>

No	AEC-Q200 Test Item		Specification.	AEC-Q200 Test Method
1	Pre-and Post-Stress Electrical Test		-	
2	High Temperature Exposure (Storage)		The measured and observed characteristics should satisfy the specifications in the following table.	Solder the capacitor on the test substrate(glass epoxy board). Set the capacitor for 1000+/-12h at 150+/-3℃. Set for 24+/-2h at room temperature, then measure. ・ Initial measurement for high dielectric constant type Perform a heat treatment at 150+0/-10 ℃for 1h and then sit for 24+/-2h at room temperature.Perform the initial measurement.
		Appearance	No marking defects	
		Capacitance Change	Within +/-10.0%	
		D.F.	Within the specified initial value.	
		I.R. 25℃	Within the specified initial value.	
3	Temperature Cycling		The measured and observed characteristics should satisfy the specifications in the following table.	Solder the capacitor on the test substrate(glass epoxy board). Perform cycle test according to the four heat treatments listed in the following table. Set for 24+/-2h at room temperature, then measure. ・ Initial measurement for high dielectric constant type Perform a heat treatment at 150+0/-10 ℃for 1h and then sit for 24+/-2h at room temperature.Perform the initial measurement.
		Appearance	No marking defects	
		Capacitance Change	Within +/-10.0%	
		D.F.	Within the specified initial value.	
		I.R. 25℃	Within the specified initial value.	
4	Destructive Physical Analysis		No defects or abnormalities	Per EIA-469.
5	Moisture Resistance		The measured and observed characteristics should satisfy the specifications in the following table.	Solder the capacitor on the test substrate(glass epoxy board). Apply the 24h heat (25℃ to 65℃) and humidity (80%RH to 98%RH) treatment shown below, 10 consecutive times. Set for 24+/-2h at room temperature, then measure. ・ Initial measurement for high dielectric constant type Perform a heat treatment at 150+0/-10 ℃for 1h and then sit for 24+/-2h at room temperature.Perform the initial measurement.
		Appearance	No marking defects	
		Capacitance Change	Within +/-12.5%	
		D.F.	Within the specified initial value.	
		I.R. 25℃	Within the specified initial value.	
6	Biased Humidity		The measured and observed characteristics should satisfy the specifications in the following table.	Solder the capacitor on the test substrate(glass epoxy board). Apply the rated voltage and 1.3+0.2/-0vdc (add 6.8kΩ resister) at 85+/-3℃ and 80%RH to 85%RH humidity for 1000+/-12h. The charge/discharge current is less than 50mA. Remove and set for 24+/-2h at room temperature, then measure. ・ Initial measurement for high dielectric constant type Perform a heat treatment at 150+0/-10 ℃for 1h and then sit for 24+/-2h at room temperature.Perform the initial measurement.
		Appearance	No marking defects	
		Capacitance Change	Within +/-12.5%	
		D.F.	Within the specified initial value.	
		I.R. 25℃	More than 1,000MΩ or 50Ω・F (Whichever is smaller)	

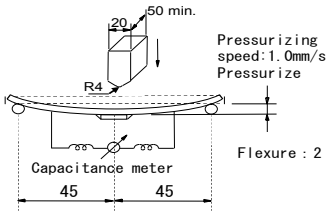
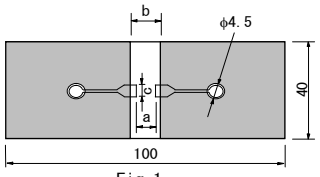
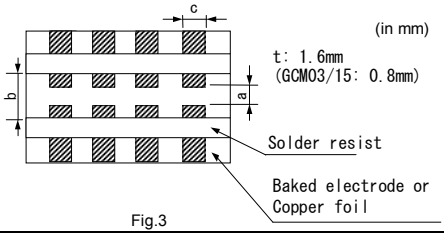
Step	Time(min)	Cycles
		1000(for R7/C7)
1	15+/-3	-55℃+0/-3
2	1	Room
3	15+/-3	125℃+3/-0
4	1	Room

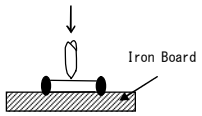
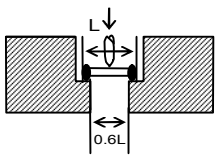


No	AEC-Q200 Test Item		Specification.	AEC-Q200 Test Method
7	Operational Life		The measured and observed characteristics should satisfy the specifications in the following table.	Solder the capacitor on the test substrate(glass epoxy board). Apply 150% of the rated voltage for 1000+/-12h at 125+/-3℃ (for R7/C7). The charge/discharge current is less than 50mA. Set for 24+/-2h at room temperature, then measure. ・Initial measurement for high dielectric constant type. Apply the test voltage at the max. operating temp. +/-3°C for 1h and then let sit for 24+/-2h at room temperature,then measure.
		Appearance	No marking defects	
		Capacitance Change	Within +/-12.5%	
		D.F.	Within the specified initial value.	
		I.R. 25℃	More than 1,000MΩ or 50Ω・F (Whichever is smaller)	
8	External Visual		No defects or abnormalities	Visual inspection
9	Physical Dimension		Within the specified dimensions	Using Measuring instrument of dimension.
10	Resistance to Solvents	Appearance	No marking defects	Per MIL-STD-202 Method 215 Solvent 1 : 1 part (by volume) of isopropyl alcohol 3 parts (by volume) of mineral spirits Solvent 2 : Terpene defluxer Solvent 3 : 42 parts (by volume) of water 1 part (by volume) of propylene glycol monomethyl ether 1 part (by volume) of monoethanolamine
		Capacitance	Within the specified initial value.	
		D.F.	Within the specified initial value.	
		I.R. 25℃	Within the specified initial value.	
11	Mechanical Shock	Appearance	No marking defects	Solder the capacitor on the test substrate(glass epoxy board). Three shocks in each direction should be applied along 3 mutually perpendicular axes of the test specimen (18 shocks). The specified test pulse should be Half-sine and should have a duration :0.5ms, peak value:1500g and velocity change: 4.7m/s.
		Capacitance	Within the specified initial value.	
		D.F.	Within the specified initial value.	
		I.R. 25℃	Within the specified initial value.	
12	Vibration	Appearance	No defects or abnormalities	Solder the capacitor on the test substrate(glass epoxy board). The capacitor should be subjected to a simple harmonic motion having a total amplitude of 1.5mm, the frequency being varied uniformly between the approximate limits of 10 and 2000Hz. The frequency range, from 10 to 2000Hz and return to 10Hz, should be traversed in approximately 20 minutes. This motion should be applied for 12 items in each 3 mutually perpendicular directions (total of 36 times).
		Capacitance	Within the specified initial value.	
		D.F.	Within the specified initial value.	
		I.R. 25℃	Within the specified initial value.	
13	Resistance to Soldering Heat		The measured and observed characteristics should satisfy the specifications in the following table.	Immerse the capacitor in Sn-3.0Ag-0.5Cu solder solution or an eutectic solder solution at 260±5℃ for 10±1s. Set at room temperature for 24+/-2h, then measure. ・Initial measurement for high dielectric constant type Perform a heat treatment at 150+0/-10 ℃ for 1h and then set for 24+/-2h at room temperature. Perform the initial measurement.
		Appearance	No marking defects	
		Capacitance	Within the specified initial value.	
		D.F.	Within the specified initial value.	
		I.R. 25℃	Within the specified initial value.	

<table>
<tr><th>No</th><th colspan="2">AEC-Q200 Test Item</th><th>Specification.</th><th>AEC-Q200 Test Method</th></tr>
<tr><td rowspan="5">14</td><td rowspan="5">Thermal Shock</td><td></td><td>The measured and observed characteristics should satisfy the specifications in the following table.</td><td rowspan="5">Solder the capacitor on the test substrate(glass epoxy board).
Perform the 300 cycles according to the two heat treatments listed in the following table(Maximum transfer time is 20s).
Set for 24+/-2h at room temperature, then measure.

<table><tr><th>Step</th><th>1</th><th>2</th></tr><tr><td>Temp. (℃)</td><td>-55+0/-3</td><td>125+3/-0</td></tr><tr><td>Time (min)</td><td>15+/-3</td><td>15+/-3</td></tr></table>
・Initial measurement for high dielectric constant type
Perform a heat treatment at 150+0/-10 ℃ for 1h and then set for 24+/-2h at room temperature.
Perform the initial measurement.</td></tr>
<tr><td>Appearance</td><td>No marking defects</td></tr>
<tr><td>Capacitance Change</td><td>Within +/-10.0%</td></tr>
<tr><td>D.F.</td><td>Within the specified initial value.</td></tr>
<tr><td>I.R.
25℃</td><td>Within the specified initial value.</td></tr>
<tr><td rowspan="4">15</td><td rowspan="4">ESD</td><td>Appearance</td><td>No marking defects</td><td rowspan="4">Per AEC-Q200-002</td></tr>
<tr><td>Capacitance</td><td>Within the specified initial value.</td></tr>
<tr><td>D.F.</td><td>Within the specified initial value.</td></tr>
<tr><td>I.R.
25℃</td><td>Within the specified initial value.</td></tr>
<tr><td rowspan="3">16</td><td colspan="2" rowspan="3">Solderability</td><td rowspan="3">95% of the terminations is to be soldered evenly and continuously.</td><td>(a) Preheat at 155℃ for 4h. After preheating, immerse the capacitor in a solution of rosin ethanol 25(mass)%.
Immerse in Sn-3.0Ag-0.5Cu solder solution at 245+/-5℃ or an eutectic solder solution at 235+/-5℃ for 5+0/-0.5s.</td></tr>
<tr><td>(b) should be placed into steam aging for 8h+/-15min.
After preheating, immerse the capacitor in a solution of rosin ethanol 25(mass)%.
Immerse in Sn-3.0Ag-0.5Cu solder solution at 245+/-5℃ or an eutectic solder solution at 235+/-5℃ for 5+0/-0.5s.</td></tr>
<tr><td>(c) should be placed into steam aging for 8h+/-15min.
After preheating, immerse the capacitor in a solution of rosin ethanol 25(mass)%.
Immerse in Sn-3.0Ag-0.5Cu solder solution or an eutectic solder solution for 120+/-5s at 260+/-5℃.</td></tr>
<tr><td rowspan="6">17</td><td rowspan="6">Electrical Chatacteri-zation</td><td>Appearance</td><td>No defects or abnormalities</td><td>Visual inspection.</td></tr>
<tr><td>Capacitance</td><td>Shown in Rated value.</td><td rowspan="2">The capacitance/D.F. should be measured at 25℃ at the frequency and voltage shown in the table.
<table><tr><th>Char.
Item</th><th>R7,C7
(C≦10μF)</th></tr><tr><td>Frequency</td><td>1.0+/-0.1kHz</td></tr><tr><td>Voltage</td><td>1.0+/-0.2Vrms</td></tr></table></td></tr>
<tr><td>D.F.</td><td>0.1 max.</td></tr>
<tr><td>I.R. 25℃</td><td>More than 10,000MΩ or 500Ω・F
(Whichever is smaller)</td><td rowspan="2">The insulation resistance should be measured with a DC voltage not exceeding the rated voltage at 25℃ and 125℃(for R7/C7) within 2 minutes of charging.</td></tr>
<tr><td>I.R. 125℃</td><td>More than 1,000MΩ or 10Ω・F
(Whichever is smaller)</td></tr>
<tr><td>Dielectric Strength</td><td>No failure</td><td>No failure should be observed when 250% of the rated voltage is applied between the terminations for 1 to 5s, provided the charge/discharge current is less than 50mA.</td></tr>
</table>

<table>
<tr><th>No</th><th colspan="2">AEC-Q200 Test Item</th><th>Specification.</th><th>AEC-Q200 Test Method</th></tr>
<tr><td rowspan="5">18</td><td rowspan="5">Board Flex</td><td>Appearance</td><td>No marking defects</td><td rowspan="5">Solder the capacitor on the test substrate(glass epoxy board) shown in Fig1.
Then apply a force in the direction shown in Fig 2 for 60s.
The soldering should be done by the reflow method and should be conducted with care so that the soldering is uniform and free of defects such as heat shock.
<table><tr><th>Type</th><th>a</th><th>b</th><th>c</th></tr><tr><td>GCM03</td><td>0.3</td><td>0.9</td><td>0.3</td></tr><tr><td>GCM15</td><td>0.5</td><td>1.5</td><td>0.6</td></tr><tr><td>GCM18</td><td>0.6</td><td>2.2</td><td>0.9</td></tr><tr><td>GCM21</td><td>0.8</td><td>3.0</td><td>1.3</td></tr><tr><td>GCM31</td><td>2.0</td><td>4.4</td><td>1.7</td></tr><tr><td>GCM32</td><td>2.0</td><td>4.4</td><td>2.6</td></tr></table>(in mm)
  Fig. 2</td></tr>
<tr><td>Capacitance Change</td><td>Within +/-10.0%</td></tr>
<tr><td>D.F.</td><td>Within the specified initial value.</td></tr>
<tr><td>I.R.
25℃</td><td>Within the specified initial value.</td></tr>
<tr><td></td><td>  Fig. 1
t : 1.6mm
(GCM03/15:0.8mm)</td></tr>
<tr><td rowspan="4">19</td><td rowspan="4">Terminal Strength</td><td>Appearance</td><td>No marking defects</td><td rowspan="4">Solder the capacitor on the test substrate(glass epoxy board) shown in Fig3.
Then apply 18N* force in parallel with the test jig for 60s.
The soldering should be done either with an iron or using the reflow method and should be conducted with care so that the soldering is uniform and free of defects such as heat shock
*2N(GCM03/15)
<table><tr><th>Type</th><th>a</th><th>b</th><th>c</th></tr><tr><td>GCM03</td><td>0.3</td><td>0.9</td><td>0.3</td></tr><tr><td>GCM15</td><td>0.4</td><td>1.5</td><td>0.5</td></tr><tr><td>GCM18</td><td>1.0</td><td>3.0</td><td>1.2</td></tr><tr><td>GCM21</td><td>1.2</td><td>4.0</td><td>1.65</td></tr><tr><td>GCM31</td><td>2.2</td><td>5.0</td><td>2.0</td></tr><tr><td>GCM32</td><td>2.2</td><td>5.0</td><td>2.9</td></tr></table>  Fig.3</td></tr>
<tr><td>Capacitance</td><td>Within the specified initial value.</td></tr>
<tr><td>D.F.</td><td>Within the specified initial value.</td></tr>
<tr><td>I.R.
25℃</td><td>Within the specified initial value.</td></tr>
<tr><td>20</td><td colspan="2">Beam Load Test</td><td>Destruction value should be exceed following one.
< Chip L dimension : 2.5mm max. >
Chip thickness > 0.5mm rank : 20N
Chip thickness = 0.5mm rank : 8N
Chip thickness = 0.3mm rank : 5N
Chip thickness < 0.3mm rank : 2.5N

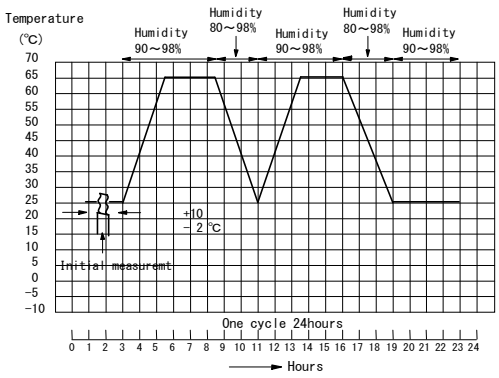
< Chip L dimension : 3.2mm min. >
Chip thickness < 1.25mm rank : 15N
Chip thickness ≧1.25mm rank : 54.5N</td><td>Place the capacitor in the beam load fixture as Fig 4.
Apply a force.
< Chip Length : 2.5mm max. >
 
< Chip Length : 3.2mm min. >
  Fig.4

Speed supplied the Stress Load : *0.5mm/s
*GCM03: 0.1mm/s</td></tr>
</table>

<table>
<tr><th>No</th><th>AEC-Q200 Test Item</th><th>Specification.</th><th>AEC-Q200 Test Method</th></tr>
<tr><td>21</td><td>Capacitance Temperature Characteristics</td><td>R7 : Within +/-15%
(-55℃ to +125℃)
C7 : Within +/-22%
(-55℃ to +125℃)</td><td>The capacitance change should be measured after 5 minutes at each specified temp. stage.
Capacitance value as a reference is the value in step 3.
<table><tr><th>Step</th><th>Temperature(°C)</th></tr><tr><td>1</td><td>Reference Temp.+/-2</td></tr><tr><td>2</td><td>Min. Operating Temp.+/-3</td></tr><tr><td>3</td><td>Reference Temp.+/-2</td></tr><tr><td>4</td><td>Max. Operating Temp.+/-3</td></tr><tr><td>5</td><td>Reference Temp.+/-2</td></tr></table>· Initial measurement for high dielectric constant type
Perform a heat treatment at 150+0/-10°C for 1h and then let sit for 24+/-2h at room temperature,then measure.</td></tr>
</table>

No	AEC-Q200 Test Item		Specification.	AEC-Q200 Test Method
1	Pre-and Post-Stress Electrical Test		-	
2	High Temperature Exposure (Storage)		The measured and observed characteristics should satisfy the specifications in the following table.	Solder the capacitor on the test substrate(glass epoxy board). Set the capacitor for 1000+/-12h at 150+/-3℃. Set for 24+/-2h at room temperature, then measure.
		Appearance	No marking defects	
		Capacitance Change	Within +/-10%	・ Initial measurement Perform a heat treatment at 150+0/-10 ℃for 1h and then sit for 24+/-2h at room temperature. Perform the initial measurement.
		D.F.	0.2max	
		Insulation Resistance 25℃	Within the specified initial value.	
3	Temperature Cycling		The measured and observed characteristics should satisfy the specifications in the following table.	Solder the capacitor on the test substrate(glass epoxy board). Perform the 1000 cycles test according to the four heat treatments listed in the following table. Set for 24+/-2h at room temperature, then measure.
		Appearance	No marking defects	
		Capacitance Change	Within +/-7.5%	
		D.F.	0.2max	・Initial measurement Perform a heat treatment at 150+0/-10 ℃for 1h and then sit for 24+/-2h at room temperature. Perform the initial measurement.
		Insulation Resistance 25℃	Within the specified initial value.	
4	Destructive Physical Analysis		No defects or abnormalities	Per EIA-469
5	Moisture Resistance		The measured and observed characteristics should satisfy the specifications in the following table.	Solder the capacitor on the test substrate(glass epoxy board). Apply the 24h heat (25℃ to 65℃) and humidity (80%RH to 98%RH) treatment shown below, 10 consecutive times.
		Appearance	No marking defects	
		Capacitance Change	Within +/-10%	
		D.F.	0.2max	
		Insulation Resistance 25℃	Within the specified initial value.	・ Initial measurement Perform a heat treatment at 150+0/-10 ℃for 1h and then sit for 24+/-2h at room temperature. Perform the initial measurement. ・Measurement after test Perform a heat treatment at 150+0/–10°C for 1h and then let sit for 24+/-2h at room temperature, then measure.
6	Biased Humidity		The measured and observed characteristics should satisfy the specifications in the following table.	Solder the capacitor on the test substrate(glass epoxy board). Apply the rated voltage and 1.3+0.2/-0Vdc (add 6.8kΩ resister) at 85+/-3℃ and 80%RH to 85%RH humidity for 1000+/-12h. The charge/discharge current is less than 50mA.
		Appearance	No marking defects	
		Capacitance Change	Within +/-10%	・ Initial measurement Perform a heat treatment at 150+0/-10 ℃for 1h and then sit for 24+/-2h at room temperature. Perform the initial measurement. ・Measurement after test Perform a heat treatment at 150+0/–10°C for 1h and then let sit for 24+/-2h at room temperature, then measure.
		D.F.	0.2 max	
		Insulation Resistance 25℃	More than 200MΩ or 5Ω･F (Whichever is smaller)	

Step	1	2	3	4
Temp. (℃)	Min.Operating Temp.+0/-3	Room Temp.	Max.Operating Temp. +3/-0	Room Temp.
Time (min)	15+/-3	1	15+/-3	1



No	AEC-Q200 Test Item		Specification.	AEC-Q200 Test Method
7	Operational Life		The measured and observed characteristics should satisfy the specifications in the following table.	Solder the capacitor on the test substrate(glass epoxy board). Apply 150% of the rated voltage for 1000+/-12h at 125+/-3℃. The charge/discharge current is less than 50mA. ・ Initial measurement Perform a heat treatment at 150+0/-10 ℃for 1h and then sit for 24+/-2h at room temperature. Perform the initial measurement. ・Measurement after test Perform a heat treatment at 150+0/–10°C for 1h and then let sit for 24+/-2h at room temperature, then measure.
		Appearance	No marking defects	
		Capacitance Change	Within +/-12.5%	
		D.F.	0.2max	
		Insulation Resistance 25℃	More than 200MΩ or 5Ω･F (Whichever is smaller)	
8	External Visual		No defects or abnormalities	Visual inspection
9	Physical Dimension		Within the specified dimensions	Using Measuring instrument of dimension.
10	Resistance to Solvents	Appearance	No marking defects	Per MIL-STD-202 Method 215 Solvent 1 : 1 part (by volume) of isopropyl alcohol 3 parts (by volume) of mineral spirits Solvent 2 : Terpene defluxer Solvent 3 : 42 parts (by volume) of water 1part (by volume) of propylene glycol monomethyl ether 1 part (by volume) of monoethanolamine
		Capacitance	Within the specified initial value.	
		D.F.	Within the specified initial value.	
		Insulation Resistance 25℃	Within the specified initial value.	
11	Mechanical Shock	Appearance	No marking defects	Solder the capacitor on the test substrate(glass epoxy board). Three shocks in each direction should be applied along 3 mutually perpendicular axes of the test specimen (18 shocks). The specified test pulse should be Half-sine and should have a duration :0.5ms, peak value:1500g and velocity change: 4.7m/s.
		Capacitance	Within the specified initial value.	
		D.F.	Within the specified initial value.	
		Insulation Resistance 25℃	Within the specified initial value.	
12	Vibration	Appearance	No defects or abnormalities	Solder the capacitor on the test substrate(glass epoxy board). The capacitor should be subjected to a simple harmonic motion having a total amplitude of 1.5mm, the frequency being varied uniformly between the approximate limits of 10 and 2000Hz. The frequency range, from 10 to 2000Hz and return to 10Hz, should be traversed in approximately 20 minutes. This motion should be applied for 12 items in each 3 mutually perpendicular directions (total of 36 times).
		Capacitance	Within the specified initial value.	
		D.F.	Within the specified initial value.	
		Insulation Resistance 25℃	Within the specified initial value.	
13	Resistance to Soldering Heat		The measured and observed characteristics should satisfy the specifications in the following table.	Immerse the capacitor in Sn-3.0Ag-0.5Cu solder solution or an eutectic solder solution at 260+/-5℃ for 10+/-1s. Set at room temperature for 24+/-2h, then measure. ・ Initial measurement Perform a heat treatment at 150+0/-10 ℃for 1h and then sit for 24+/-2h at room temperature. Perform the initial measurement.
		Appearance	No marking defects	
		Capacitance	Within the specified initial value.	
		D.F.	Within the specified initial value.	
		Insulation Resistance 25℃	Within the specified initial value.	

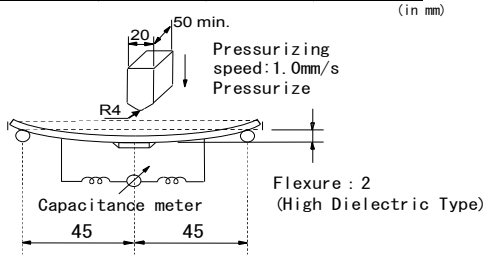
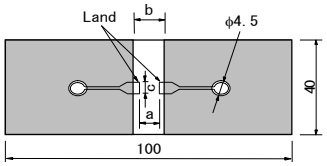
<table>
<tr><th>No</th><th colspan="2">AEC-Q200 Test Item</th><th>Specification.</th><th>AEC-Q200 Test Method</th></tr>
<tr><td rowspan="5">14</td><td rowspan="5">Thermal Shock</td><td></td><td>The measured and observed characteristics shall satisfy the specifications in the following table.</td><td rowspan="5">Solder the capacitor on the test substrate(glass epoxy board).
Perform the 300 cycles according to the two heat treatments listed in the following table(Maximum transfer time is 20s).
Set for 24+/-2h at room temperature, then measure.
<table><tr><td>Step</td><td>1</td><td>2</td></tr><tr><td>Temp.(℃)</td><td>Min.Operating Temp.+0/-3</td><td>Max.Operating Temp.+3/-0</td></tr><tr><td>Time (min)</td><td>15+/-3</td><td>15+/-3</td></tr></table>・ Initial measurement
Perform a heat treatment at 150+0/-10 ℃for 1h and then sit for 24+/-2h at room temperature.</td></tr>
<tr><td>Appearance</td><td>No marking defects</td></tr>
<tr><td>Capacitance Change</td><td>Within +/-10.0%</td></tr>
<tr><td>D.F.</td><td>Within the specified initial value.</td></tr>
<tr><td>Insulation Resistance 25℃</td><td>Within the specified initial value.</td></tr>
<tr><td rowspan="4">15</td><td rowspan="4">ESD</td><td>Appearance</td><td>No marking defects</td><td rowspan="4">Per AEC-Q200-002</td></tr>
<tr><td>Capacitance</td><td>Within the specified initial value.</td></tr>
<tr><td>D.F.</td><td>Within the specified initial value.</td></tr>
<tr><td>Insulation Resistance 25℃</td><td>Within the specified initial value.</td></tr>
<tr><td>16</td><td colspan="2">Solderability</td><td>95% of the terminations is to be soldered evenly and continuously.</td><td>(a) Preheat at 155℃ for 4h. After preheating, immerse the capacitor in a solution of rosin ethanol 25(mass)%.
Immerse in Sn-3.0Ag-0.5Cu solder solution at 245+/-5℃ or an eutectic solder solution at 235+/-5℃ for 5+0/-0.5s.

(b) should be placed into steam aging for 8h+/-15min.
After preheating, immerse the capacitor in a solution of rosin ethanol 25(mass)%.
Immerse in Sn-3.0Ag-0.5Cu solder solution at 245+/-5℃ or an eutectic solder solution at 235+/-5℃ for 5+0/-0.5s.

(c) should be placed into steam aging for 8h+/-15min.
After preheating, immerse the capacitor in a solution of rosin ethanol 25(mass)%.
Immerse in Sn-3.0Ag-0.5Cu solder solution or an eutectic solder solution for 120+/-5s at 260+/-5℃.</td></tr>
<tr><td rowspan="5">17</td><td rowspan="5">Electrical Chatacteri-zation</td><td>Appearance</td><td>No defects or abnormalities</td><td>Visual inspection.</td></tr>
<tr><td>Capacitance</td><td>Shown in Rated value.</td><td rowspan="2">The capacitance/D.F. should be measured at 25℃ at the frequency and voltage shown in the table.
<table><tr><td rowspan="2">Char
Item.</td><td colspan="2">C ≦10μF</td><td rowspan="2">10μF < C</td></tr><tr><td>6.3V max.</td><td>10V min.</td></tr><tr><td>Frequency</td><td>1.0+/-0.1kHz</td><td>1.0+/-0.1kHz</td><td>120+/-24Hz</td></tr><tr><td>Voltage</td><td>0.5+/-0.1Vrms</td><td>1.0+/-0.2Vrms</td><td>0.5+/-0.1Vrms</td></tr></table></td></tr>
<tr><td>D.F.</td><td>0.1 max</td></tr>
<tr><td>Insulation Resistance 25 ℃</td><td>More than 2,000MΩ or 50Ω･F (Whichever is smaller)</td><td rowspan="2">The insulation resistance should be measured with a DC voltage not exceeding the rated voltage at 25℃ and 125℃ within 1min of charging.</td></tr>
<tr><td>Insulation Resistance 125℃</td><td>More than 200MΩ or 5Ω･F (Whichever is smaller)</td></tr>
<tr><td>Dielectric Strength</td><td>No failure</td><td>No failure should be observed when 250% of the rated voltage is applied between the terminations for 1 to 5s, provided the charge/ discharge current is less than 50mA.</td></tr>
</table>

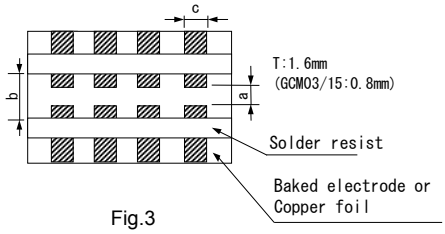
<table>
<tr><th>No</th><th colspan="2">AEC-Q200 Test Item</th><th>Specification.</th><th>AEC-Q200 Test Method</th></tr>
<tr><td rowspan="5">18</td><td rowspan="5">Board Flex</td><td>Appearance</td><td>No marking defects</td><td rowspan="5">Solder the capacitor on the test substrate(glass epoxy board) shown in Fig1.
Then apply a force in the direction shown in Fig 2 for 60s.
The soldering should be done by the reflow method and should be conducted with care so that the soldering is uniform and free of defects such as heat shock.

Type | a | b | c
GCM03 | 0.3 | 0.9 | 0.3
GCM15 | 0.5 | 1.5 | 0.6
GCM18 | 0.6 | 2.2 | 0.9
GCM21 | 0.8 | 3.0 | 1.3
GCM31 | 2.0 | 4.4 | 1.7
GCM32 | 2.0 | 4.4 | 2.6
(in mm)

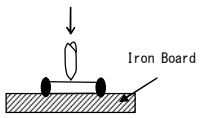
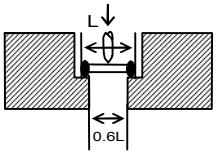
 
Fig.2</td></tr>
<tr><td>Capacitance Change</td><td>Within +/-10.0%</td></tr>
<tr><td>D.F.</td><td>Within the specified initial value.</td></tr>
<tr><td>Insulation Resistance 25℃</td><td>Within the specified initial value.</td></tr>
<tr><td></td><td> 
Fig.1
t : 1.6mm
(GCM03/15:0.8mm)</td></tr>
<tr><td rowspan="4">19</td><td rowspan="4">Terminal Strength</td><td>Appearance</td><td>No marking defects</td><td rowspan="4">Solder the capacitor on the test substrate(glass epoxy board) shown in Fig3.
Then apply 18N* force in parallel with the test jig for 60s.
The soldering should be done either with an iron or using the reflow method and should be conducted with care so that the soldering is uniform and free of defects such as heat shock

*2N(GCM03/15)

Type | a | b | c
GCM03 | 0.3 | 0.9 | 0.3
GCM15 | 0.4 | 1.5 | 0.5
GCM18 | 1.0 | 3.0 | 1.2
GCM21 | 1.2 | 4.0 | 1.65
GCM31 | 2.2 | 5.0 | 2.0
GCM32 | 2.2 | 5.0 | 2.9
(in mm)

 
Fig.3</td></tr>
<tr><td>Capacitance</td><td>Within the specified initial value.</td></tr>
<tr><td>D.F.</td><td>Within the specified initial value.</td></tr>
<tr><td>Insulation Resistance 25℃</td><td>Within the specified initial value.</td></tr>
<tr><td>20</td><td colspan="2">Beam Load Test</td><td>Destruction value should be exceed following one.

< Chip L dimension : 2.5mm max. >
Chip thickness > 0.5mm rank : 20N
Chip thickness = 0.5mm rank : 8N
Chip thickness = 0.3mm rank : 5N
Chip thickness < 0.3mm rank : 2.5N

< Chip L dimension : 3.2mm max. >
Chip thickness < 1.25mm rank : 15N
Chip thickness ≧1.25mm rank : 54.5N</td><td>Place the capacitor in the beam load fixture as Fig 4.
Apply a force.
< Chip Length : 2.5mm max. >
 
< Chip Length : 3.2mm min. >
 
Fig.4
Speed supplied the Stress Load : *0.5mm/s
*GCM03: 0.1mm/s</td></tr>
</table>

<table>
<tr><th>No</th><th>AEC-Q200 Test Item</th><th>Specification.</th><th>AEC-Q200 Test Method</th></tr>
<tr><td>21</td><td>Capacitance Temperature Characteristics</td><td>R7 : Within +/-15%
(-55℃ to +125℃)
C7 : Within +/-22%
(-55℃ to +125℃)</td><td>The capacitance change should be measured after 5 minutes at each specified temperature stage.
Capacitance value as a reference is the value in step 3.
<table><tr><th>Step</th><th>Temperature(℃)</th></tr><tr><td>1</td><td>Reference Temp.+/-2</td></tr><tr><td>2</td><td>Min. Operating Temp.+/-3</td></tr><tr><td>3</td><td>Reference Temp.+/-2</td></tr><tr><td>4</td><td>Max. Operating Temp.+/-3</td></tr><tr><td>5</td><td>Reference Temp.+/-2</td></tr></table>・ Initial measurement
Perform a heat treatment at 150+0/-10 ℃for 1h and then sit for 24+/-2h at room temperature.
Perform the initial measurement.</td></tr>
</table>

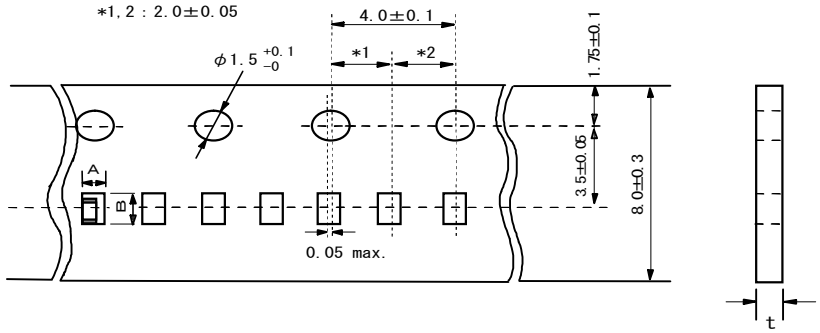
1.Tape Carrier Packaging(Packaging Code:D/E/W/F/L/J/K)

1.1 Minimum Quantity(pcs./reel)

Type		φ180mm reel			φ330mm reel	
		Paper Tape		Plastic Tape	Paper Tape	Plastic Tape
		Code:D/E	Code:W	Code:L	Code:J/ F	Code:K
GCM03		15000(W8P2)	30000(W8P1)		50000(W8P2)	
GCM15	5 (Dimensions Tolerance:±0.05)	10000(W8P2)	20000(W8P1)		50000(W8P2)	
	5 (Dimensions Tolerance:±0.1min.)	10000(W8P2)			40000(W8P2)	
GCM18		4000			10000	
GCM21	6	4000			10000	
	9	4000			10000	
	B			3000		10000
GCM31	9	4000			10000	
	M			3000		10000
	C			2000		6000
GCM32	9	4000			10000	
	M			3000		10000
	N			2000		8000
	R/D/E			1000		4000
GCM43	M			1000		5000
	N/R			1000		4000
	E			500		2000
GCM55	M			1000		5000
	N/R			1000		4000

1.2 Dimensions of Tape

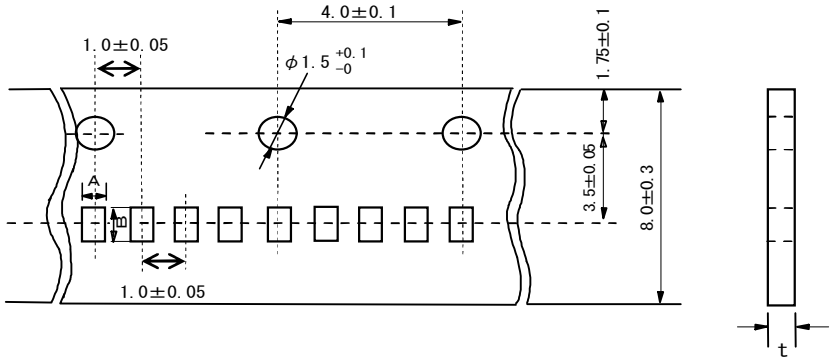
(1)GCM03/15 <Paper Tape W8P2 CODE:D/E/J/F> (in mm)



Type		Dimensions(Chip)			A *3	B *3	t
		L	W	T			
GCM03	3	0.6±0.03	0.3±0.03	0.3±0.03	0.37	0.67	0.5 max.
GCM15	5	1.0±0.05	0.5±0.05	0.5±0.05	0.65	1.15	0.8 max.
		1.0±0.1	0.5±0.1	0.5±0.1	0.7	1.2	
		1.0±0.2	0.5±0.2	0.5±0.2	0.75	1.35	

*3 Nominal

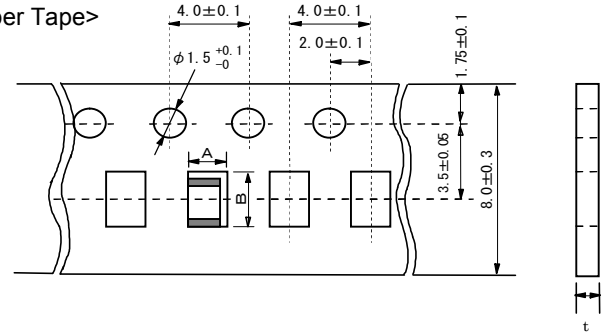
(2)GCM03/15 <Paper Tape W8P1 CODE:W> (in mm)



Type		Dimensions(Chip)			A *	B *	t
		L	W	T			
GCM03	3	0.6±0.03	0.3±0.03	0.3±0.03	0.37	0.67	0.5 max.
GCM15	5	1.0±0.05	0.5±0.05	0.5±0.05	0.65	1.15	0.8 max.

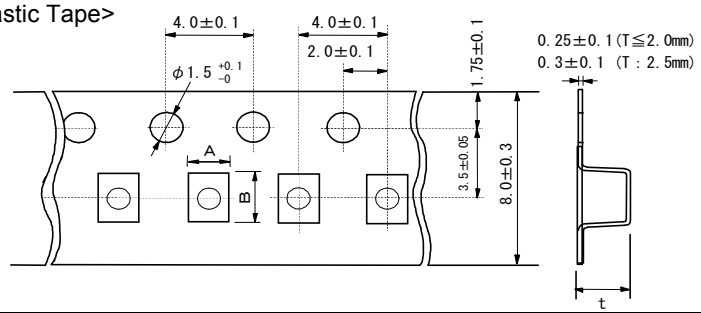
* Nominal value

(3)GCM18/21/31/32 <Paper Tape> (in mm)



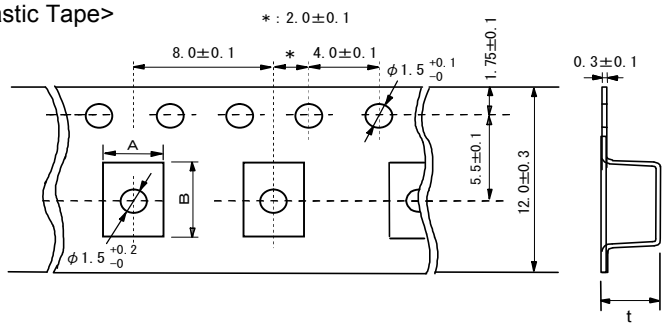
Type		Dimensions(Chip)			A	B	t
		L	W	T			
GCM18	8	1.6±0.1	0.8±0.1	0.8±0.1	1.05±0.10	1.85±0.10	1.1 max.
		1.6±0.2	0.8±0.2	0.8±0.2	1.10±0.10	2.00±0.10	
GCM21	6	2.0±0.15	1.25±0.15	0.6±0.1	1.55±0.15	2.30±0.15	
	9			0.85±0.1			
GCM31		3.2±0.15	1.6±0.15		2.00±0.20	3.60±0.20	
GCM32		3.2±0.3	2.5±0.2	0.85 +0.15/-0.05	2.80±0.20	3.60±0.20	

(4)GCM21/31/32 <Plastic Tape> (in mm)



Type		Dimensions(Chip)			A	B	t
		L	W	T			
GCM21	B	2.0±0.15	1.25±0.15	1.25±0.15	1.45±0.20	2.25±0.20	2.0 max.
		2.0±0.2	1.25±0.2	1.25±0.2	1.50±0.20	2.30±0.20	
GCM31	M	3.2±0.15	1.6±0.15	1.15±0.1	1.90±0.20	3.50±0.20	1.7 max.
		3.2±0.2	1.6±0.2	1.15±0.15			
	C			1.6±0.2			2.5 max.
		3.2±0.3	1.6±0.3	1.6±0.3	2.10±0.20	3.60±0.20	
GCM32	M	3.2±0.3	2.5±0.2	1.15±0.1	2.80±0.20	3.50±0.20	1.7 max.
	N			1.35±0.15			2.5 max.
	R			1.8±0.2			3.0 max.
	D			2.0±0.2			
	E			2.5±0.2			3.7 max.
		3.2 +0.35/-0.3	2.5 +0.35/-0.2	2.5 +0.35/-0.2	3.10±0.20	3.80±0.20	4.0 max.

(5)GCM43/55 <Plastic Tape> (in mm)



Type		Dimensions(Chip)			A*1	B*1	t
		L	W	T			
GCM43	M	4.5±0.4	3.2±0.3	1.15±0.1	3.6	4.9	2.5 max.
	N			1.35 +0.15/-0.05			
	R			1.8±0.2			
	E			2.5±0.2			3.7 max.
GCM55	M	5.7±0.4	5.0±0.4	1.15±0.1	5.2	6.1	2.5 max.
	N			1.35±0.15			
	R			1.8±0.2			

*1 Nominal value

Fig.1 Package Chips (in mm)

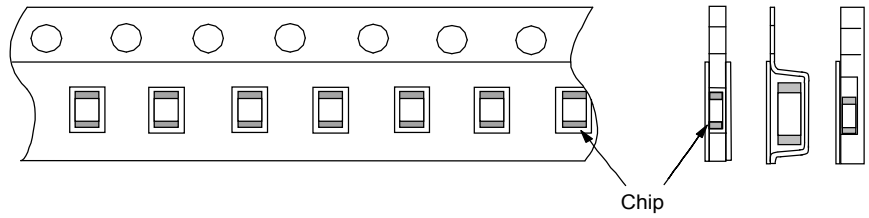
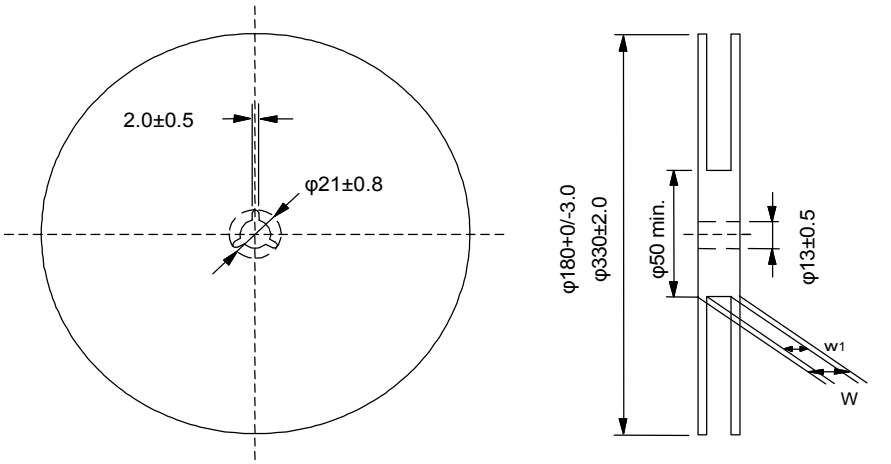
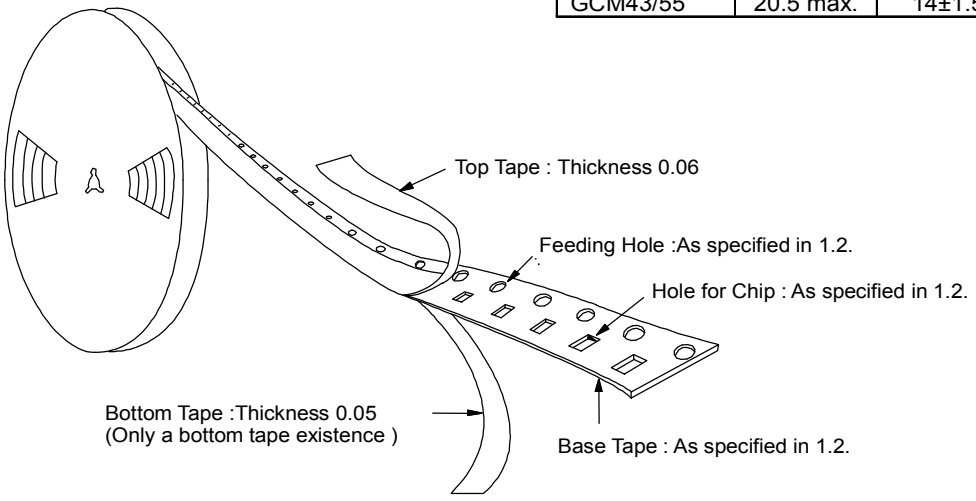


Fig.2 Dimensions of Reel



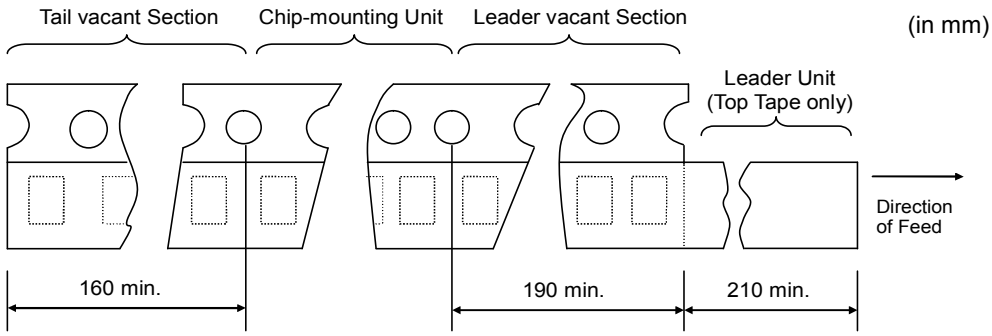
	W	W_1
GCM32 max.	16.5 max.	10±1.5
GCM43/55	20.5 max.	14±1.5

Fig.3 Taping Diagram



1.3 Tapes for capacitors are wound clockwise shown in Fig.3.
(The sprocket holes are to the right as the tape is pulled toward the user.)

1.4 Part of the leader and part of the vacant section are attached as follows.



1.5 Accumulate tolerance of sprocket holes pitch = ±0.3mm / 10 pitch

1.6 Chip in the tape is enclosed by top tape and bottom tape as shown in Fig.1.

1.7 The top tape and base tape are not attached at the end of the tape for a minimum of 5 pitches.

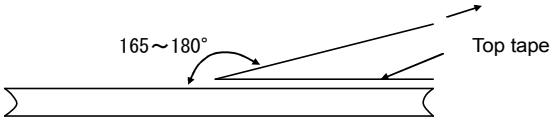
1.8 There are no jointing for top tape and bottom tape.

1.9 There are no fuzz in the cavity.

1.10 Break down force of top tape : 5N min.
Break down force of bottom tape : 5N min. (Only a bottom tape existence)

1.11 Reel is made by resin and appearance and dimension is shown in Fig 2.
There are possibly to change the material and dimension due to some impairment.

1.12 Peeling off force : 0.1N to 0.6N* in the direction as shown below.
* GCM03:0.05N to 0.5N



1.13 Label that show the customer parts number, our parts number, our company name, inspection number and quantity, will be put in outside of reel.

■Limitation of Applications

Please contact us before using our products for the applications listed below which require especially high reliability for the prevention of defects which might directly cause damage to the third party's life, body or property.

①Aircraft equipment ②Aerospace equipment ③Undersea equipment ④Power plant control equipment
⑤Medical equipment ⑥Transportation equipment(vehicles,trains,ships,etc.) ⑦Traffic signal equipment
⑧Disaster prevention / crime prevention equipment ⑨Data-processing equipment
⑩Application of similar complexity and/or reliability requirements to the applications listed in the above.

■Storage and Operation condition

1. The performance of chip multilayer ceramic capacitors (henceforth just "capacitors") may be affected by the storage conditions. Please use them promptly after delivery.

1-1. Maintain appropriate storage for the capacitors using the following conditions:
Room Temperature of +5℃ to +40℃ and a Relative Humidity of 20% to 70%.

High temperature and humidity conditions and/or prolonged storage may cause deterioration of the packaging materials. If more than six months have elapsed since delivery, check packaging, mounting, etc. before use. In addition, this may cause oxidation of the electrodes. If more than one year has elapsed since delivery, also check the solderability before use.

1-2. Corrosive gas can react with the termination (external) electrodes or lead wires of capacitors, and result in poor solderability. Do not store the capacitors in an atmosphere consisting of corrosive gas (e.g.,hydrogen sulfide, sulfur dioxide, chlorine, ammonia gas etc.).

1-3. Due to moisture condensation caused by rapid humidity changes, or the photochemical change caused by direct sunlight on the terminal electrodes and/or the resin/epoxy coatings, the solderability and electrical performance may deteriorate. Do not store capacitors under direct sunlight or in high huimidity conditions

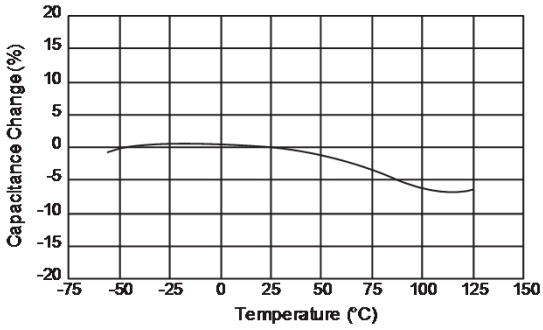
■Rating

1.Temperature Dependent Characteristics

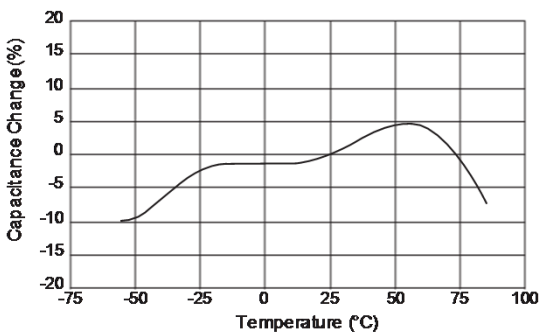
1. The electrical characteristics of the capacitor can change with temperature.

1-1. For capacitors having larger temperature dependency, the capacitance may change with temperature changes. The following actions are recommended in order to ensure suitable capacitance values.
(1) Select a suitable capacitance for the operating temperature range.
(2) The capacitance may change within the rated temperature.
When you use a high dielectric constant type capacitor in a circuit that needs a tight (narrow) capacitance tolerance (e.g., a time-constant circuit), please carefully consider the temperature characteristics, and carefully confirm the various characteristics in actual use conditions and the actual system.

[Example of Temperature Caracteristics X7R(R7)]
Sample: 0.1μF, Rated Voltage 50VDC



[Example of Temperature Characteristics X5R(R6)]
Sample: 22μF, Rated Voltage 4VDC



2.Measurement of Capacitance

1. Measure capacitance with the voltage and frequency specified in the product specifications.

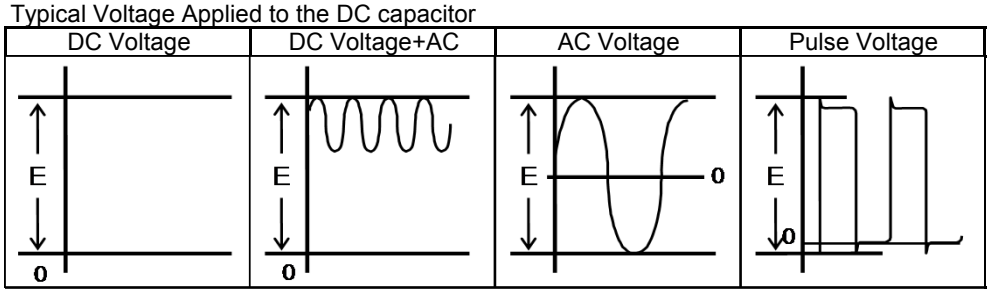
1-1. The output voltage of the measuring equipment may decrease occasionally when capacitance is high.
Please confirm whether a prescribed measured voltage is impressed to the capacitor.
1-2. The capacitance values of high dielectric constant type capacitors change depending on the AC voltage applied.
Please consider the AC voltage characteristics when selecting a capacitor to be used in a AC circuit.

3.Applied Voltage

1. Do not apply a voltage to the capacitor that exceeds the rated voltage as called out in the specifications.

1-1. Applied voltage between the terminals of a capacitor shall be less than or equal to the rated voltage.
(1) When AC voltage is superimposed on DC voltage, the zero-to-peak voltage shall not exceed the rated DC voltage.
When AC voltage or pulse voltage is applied, the peak-to-peak voltage shall not exceed the rated DC voltage.
(2) Abnormal voltages (surge voltage, static electricity, pulse voltage, etc.) shall not exceed the rated DC voltage.

Typical Voltage Applied to the DC capacitor



(E : Maximum possible applied voltage.)

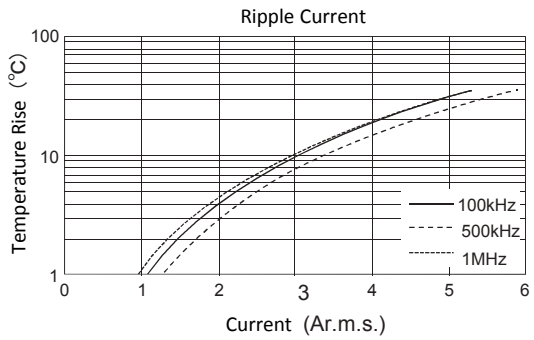
1-2. Influence of over voltage
Over voltage that is applied to the capacitor may result in an electrical short circuit caused by the breakdown of the internal dielectric layers .
The time duration until breakdown depends on the applied voltage and the ambient temperature.

4.Type of Applied Voltage and Self-heating Temperature

1.Confirm the operating conditions to make sure that no large current is flowing into the capacitor due to the continuous application of an AC voltage or pulse voltage.
When a DC rated voltage product is used in an AC voltage circuit or a pulse voltage circuit, the AC current or pulse current will flow into the capacitor; therefore check the self-heating condition.
Please confirm the surface temperature of the capacitor so that the temperature remains within the upper limits of the operating temperature, including the rise in temperature due to self-heating. When the capacitor is used with a high-frequency voltage or pulse voltage, heat may be generated by dielectric loss.

<Applicable to Rated Voltage of less than 100VDC>
The load should be contained so that the self-heating of the capacitor body remains below 20°C ,
when measuring at an ambient temperature of 25°C.

[Example of Temperature Rise (Heat Generation) in Chip Multilayer Ceramic Capacitors in Contrast to Ripple Current]
Sample: R(R1) characteristics 10μF, Rated voltage: DC10V



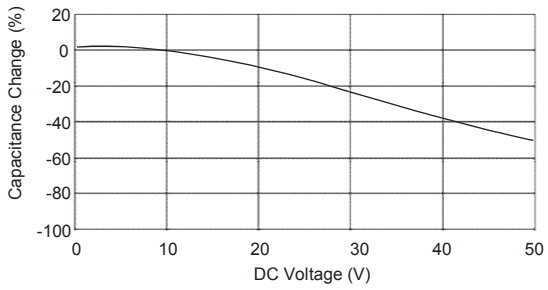
5. DC Voltage and AC Voltage Characteristic

1. The capacitance value of a high dielectric constant type capacitor changes depending on the DC voltage applied. Please consider the DC voltage characteristics when a capacitor is selected for use in a DC circuit.

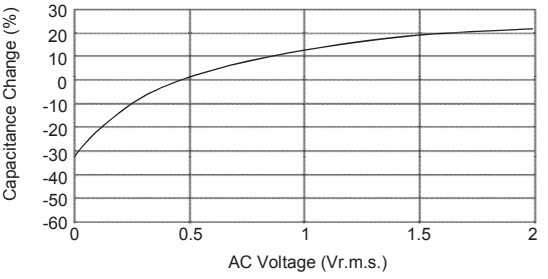
1-1. The capacitance of ceramic capacitors may change sharply depending on the applied voltage. (See figure) Please confirm the following in order to secure the capacitance.
(1) Determine whether the capacitance change caused by the applied voltage is within the allowed range .
(2) In the DC voltage characteristics, the rate of capacitance change becomes larger as voltage increases, even if the applied voltage is below the rated voltage. When a high dielectric constant type capacitor is used in a circuit that requires a tight (narrow) capacitance tolerance (e.g., a time constant circuit), please carefully consider the voltage characteristics, and confirm the various characteristics in the actual operating conditions of the system.

2. The capacitance values of high dielectric constant type capacitors changes depending on the AC voltage applied. Please consider the AC voltage characteristics when selecting a capacitor to be used in a AC circuit.

[Example of DC Voltage Characteristics]
Sample: R(R1) Characteristics 0.1μF, Rated Voltage 50VDC



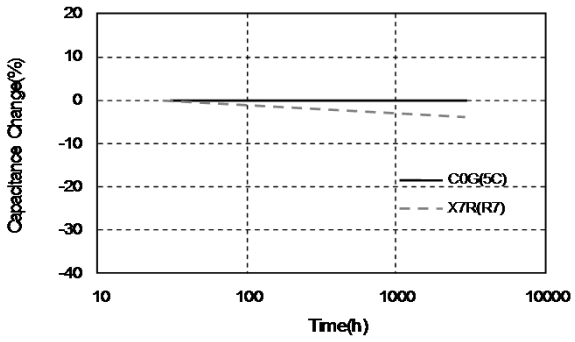
[Example of AC Voltage Characteristics]
Sample: X7R(R7) Characteristics 10μF, Rated Voltage 6.3VDC



6. Capacitance Aging

1. The high dielectric constant type capacitors have an Aging characteristic in which the capacitance value decreases with the passage of time. When you use a high dielectric constant type capacitors in a circuit that needs a tight (narrow) capacitance tolerance (e.g., a time-constant circuit), please carefully consider the characteristics of these capacitors, such as their aging, voltage, and temperature characteristics. In addition, check capacitors using your actual appliances at the intended environment and operating conditions.

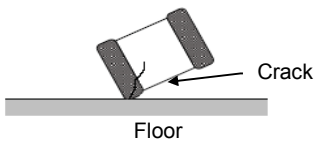
[Example of Change Over Time (Aging characteristics)]



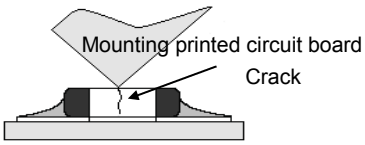
7.Vibration and Shock

1. Please confirm the kind of vibration and/or shock, its condition, and any generation of resonance. Please mount the capacitor so as not to generate resonance, and do not allow any impact on the terminals.

2. Mechanical shock due to being dropped may cause damage or a crack in the dielectric material of the capacitor. Do not use a dropped capacitor because the quality and reliability may be deteriorated.



3. When printed circuit boards are piled up or handled, the corner of another printed circuit board should not be allowed to hit the capacitor in order to avoid a crack or other damage to the capacitor.

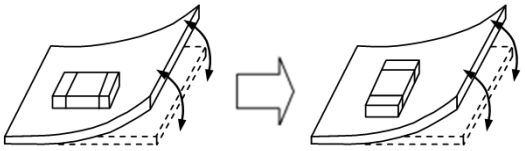


■Soldering and Mounting

1.Mounting Position

1. Confirm the best mounting position and direction that minimizes the stress imposed on the capacitor during flexing or bending the printed circuit board.

1-1.Choose a mounting position that minimizes the stress imposed on the chip during flexing or bending of the board.
[Component Direction]

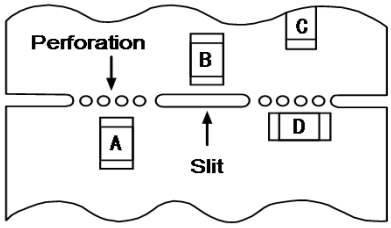


(Bad Example) (Good Example)

Locate chip horizontal to the direction in which stress acts.

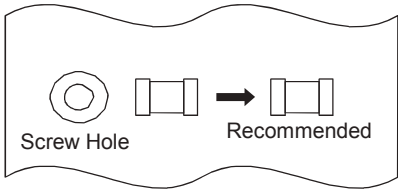
[Chip Mounting Close to Board Separation Point]
It is effective to implement the following measures, to reduce stress in separating the board.
It is best to implement all of the following three measures; however, implement as many measures as possible to reduce stress.

Contents of Measures	Stress Level
(1) Turn the mounting direction of the component parallel to the board separation surface.	A > D *1
(2) Add slits in the board separation part.	A > B
(3) Keep the mounting position of the component away from the board separation surface.	A > C



*1 A > D is valid when stress is added vertically to the perforation as with Hand Separation.
If a Cutting Disc is used, stress will be diagonal to the PCB, therefore A > D is invalid.

[Mounting Capacitors Near Screw Holes]
When a capacitor is mounted near a screw hole, it may be affected by the board deflection that occurs during the tightening of the screw. Mount the capacitor in a position as far away from the screw holes as possible.



2.Information before Mounting

1. Do not re-use capacitors that were removed from the equipment.

2. Confirm capacitance characteristics under actual applied voltage.

3. Confirm the mechanical stress under actual process and equipment use.

4. Confirm the rated capacitance, rated voltage and other electrical characteristics before assembly.

5. Prior to use, confirm the solderability of capacitors that were in long-term storage.

6. Prior to measuring capacitance, carry out a heat treatment for capacitors that were in long-term storage.

7.The use of Sn-Zn based solder will deteriorate the reliability of the MLCC.
Please contact our sales representative or product engineers on the use of Sn-Zn based solder in advance.

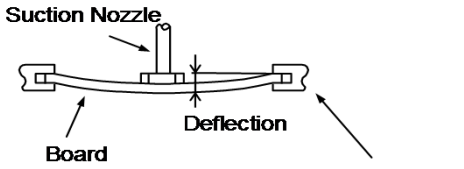
3.Maintenance of the Mounting (pick and place) Machine

1. Make sure that the following excessive forces are not applied to the capacitors.
Check the mounting in the actual device under actual use conditions ahead of time.

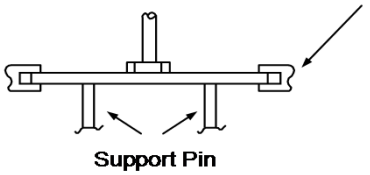
1-1. In mounting the capacitors on the printed circuit board, any bending force against them shall be kept to a minimum to prevent them from any damage or cracking. Please take into account the following precautions and recommendations for use in your process.

(1) Adjust the lowest position of the pickup nozzle so as not to bend the printed circuit board.

[Incorrect]



[Correct]



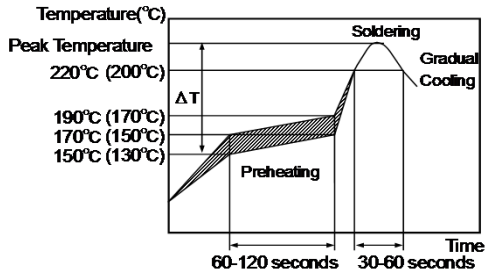
2.Dirt particles and dust accumulated in the suction nozzle and suction mechanism prevent the nozzle from moving smoothly. This creates excessive force on the capacitor during mounting, causing cracked chips.
Also, the locating claw, when worn out, imposes uneven forces on the chip when positioning, causing cracked chips.
The suction nozzle and the locating claw must be maintained, checked and replaced periodically.

4-1.Reflow Soldering

1. When sudden heat is applied to the components, the mechanical strength of the components will decrease because a sudden temperature change causes deformation inside the components. In order to prevent mechanical damage to the components, preheating is required for both the components and the PCB. Preheating conditions are shown in table 1. It is required to keep the temperature differential between the solder and the components surface (ΔT) as small as possible.

2. When components are immersed in solvent after mounting, be sure to maintain the temperature difference (ΔT) between the component and the solvent within the range shown in the table 1.

[Standard Conditions for Reflow Soldering]



Temperature
Incase of Lead Free Solder
( ): In case of Pb-Sn Solder

Table 1

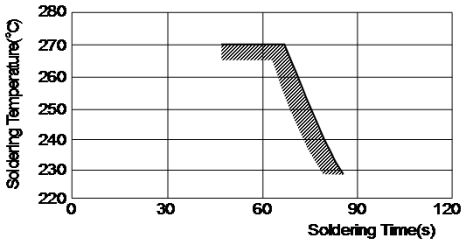
Series	Chip Dimension(L/W) Code	Temperature Differential
GC□	03/15/18/21/31	ΔT≦190℃
GC□	32	ΔT≦130℃

Recommended Conditions

	Pb-Sn Solder	Lead Free Solder
Peak Temperature	230 to 250℃	240 to 260℃
Atmosphere	Air	Air or N_2

Pb-Sn Solder: Sn-37Pb
Lead Free Solder: Sn-3.0Ag-0.5Cu

[Allowable Reflow Soldering Temperature and Time]



In the case of repeated soldering, the accumulated soldering time must be within the range shown above.

3. When a capacitor is mounted at a temperature lower than the peak reflow temperature recommended by the solder manufacturer, the following quality problems can occur. Consider factors such as the placement of peripheral components and the reflow temperature setting to prevent the capacitor's reflow temperature from dropping below the peak temperature specified. Be sure to evaluate the mounting situation beforehand and verify that none of the following problems occur.
- ·Drop in solder wettability
- ·Solder voids
- ·Possible occurrence of whiskering
- ·Drop in bonding strength
- ·Drop in self-alignment properties
- ·Possible occurrence of tombstones and/or shifting on the land patterns of the circuit board

4. Optimum Solder Amount for Reflow Soldering

4-1. Overly thick application of solder paste results in a excessive solder fillet height.
This makes the chip more susceptible to mechanical and thermal stress on the board and may cause the chips to crack.

4-2. Too little solder paste results in a lack of adhesive strength on the termination, which may result in chips breaking loose from the PCB.

4-3. Please confirm that solder has been applied smoothly to the termination.

Inverting the PCB

Make sure not to impose any abnormal mechanical shocks to the PCB.

4-2.Flow Soldering

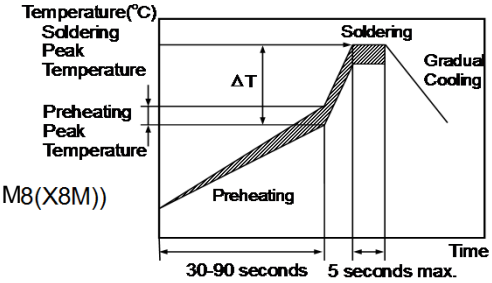
1. Do not apply flow soldering to chips not listed in Table 2.

Table 2

Series	Chip Dimension (L/W) Code	Temperature Differential
GC□	18/21/31	ΔT≦150℃

(Except for Temperature Characteristics:0C(CHA),5G(X8G),R9(X8R),L8(X8L),M8(X8M))

[Standard Conditions for Flow Soldering]

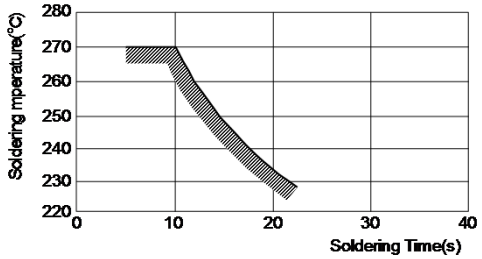


2. When sudden heat is applied to the components, the mechanical strength of the components will decrease because a sudden temperature change causes deformation inside the components. In order to prevent mechanical damage to the components, preheating is required for both of the components and the PCB. Preheating conditions are shown in table 2. It is required to keep the temperature differential between the solder and the components surface (ΔT) as low as possible.

3. Excessively long soldering time or high soldering temperature can result in leaching of the terminations, causing poor adhesion or a reduction in capacitance value due to loss of contact between the inner electrodes and terminations.

4. When components are immersed in solvent after mounting, be sure to maintain the temperature differential (ΔT) between the component and solvent within the range shown in the table 2.

[Allowable Flow Soldering Temperature and Time]



In the case of repeated soldering, the accumulated soldering time must be within the range shown above.

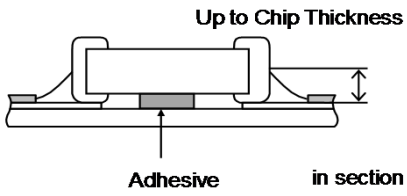
Recommended Conditions

	Pb-Sn Solder	Lead Free Solder
Preheating Peak Temperature	90 to 110℃	100 to 120℃
Soldering Peak Temperature	240 to 250℃	250 to 260℃
Atmosphere	Air	Air or N2

Pb-Sn Solder: Sn-37Pb
Lead Free Solder: Sn-3.0Ag-0.5Cu

5. Optimum Solder Amount for Flow Soldering

5-1. The top of the solder fillet should be lower than the thickness of the components. If the solder amount is excessive, the risk of cracking is higher during board bending or any other stressful condition.



4-3.Correction of Soldered Portion

When sudden heat is applied to the capacitor, distortion caused by the large temperature difference occurs internally, and can be the cause of cracks. Capacitors also tend to be affected by mechanical and thermal stress depending on the board preheating temperature or the soldering fillet shape, and can be the cause of cracks.
Please refer to "1. PCB Design" or "3. Optimum solder amount" for the solder amount and the fillet shapes.

1. Correction with a Soldering Iron
1-1. In order to reduce damage to the capacitor, be sure to preheat the capacitor and the mounting board. Preheat to the temperature range shown in Table 3. A hot plate, hot air type preheater, etc. can be used for preheating.
1-2. After soldering, do not allow the component/PCB to cool down rapidly.
1-3. Perform the corrections with a soldering iron as quickly as possible. If the soldering iron is applied too long, there is a possibility of causing solder leaching on the terminal electrodes, which will cause deterioration of the adhesive strength and other problems.

Table 3

Series	Chip Dimension (L/W) Code	Temperature of Soldering Iron tip	Preheating Temperature	Temperature Differential(ΔT)	Atmosphere
GC☐	03/15/18/21/31	350℃ max.	150℃ min.	ΔT≦190℃	Air
GC☐	32	280℃ max.	150℃ min.	ΔT≦130℃	Air

*Applicable for both Pb-Sn and Lead Free Sold Pb-Sn Solder: Sn-37Pb
Lead Free Solder: Sn-3.0Ag-0.5Cu
* Please manage Δ T in the temperature of soldering iron and the preheating temperature.

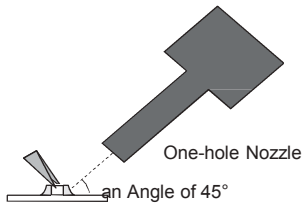
2. Correction with Spot Heater
Compared to local heating with a soldering iron, hot air heating by a spot heater heats the overall component and board, therefore, it tends to lessen the thermal shock. In the case of a high density mounted board, a spot heater can also prevent concerns of the soldering iron making direct contact with the component.
2-1. If the distance from the hot air outlet of the spot heater to the component is too close, cracks may occur due to thermal shock. To prevent this problem, follow the conditions shown in Table 4.
2-2. In order to create an appropriate solder fillet shape, it is recommended that hot air be applied at the angle shown in Figure 1.

Table 4

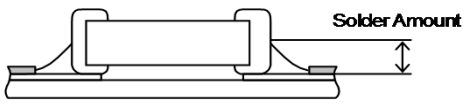
Distance	5mm or more
Hot Air Application angle	45° *Figure 1
Hot Air Temperature Nozzle Outlet	400°C max.
Application Time	Less than 10 seconds (3216M / 1206 size or smaller)
	Less than 30 seconds (3225M / 1210 size or larger)

(3216M , 3225M : Metric size code)

[Figure 1]



3. Optimum solder amount when re-working with a soldering iron
3-1. If the solder amount is excessive, the risk of cracking is higher during board bending or any other stressful condition.
Too little solder amount results in a lack of adhesive strength on the outer electrode termination, which may result in chips breaking loose from the PCB.
Please confirm that solder has been applied smoothly is and rising to the end surface of the chip.



in section

3-2. A soldering iron with a tip of ø3mm or smaller should be used. It is also necessary to keep the soldering iron from touching the components during the re-work.
3-3. Solder wire with ø0.5mm or smaller is required for soldering.

5.Washing

Excessive ultrasonic oscillation during cleaning can cause the PCBs to resonate, resulting in cracked chips or broken solder joints. Before starting your production process, test your cleaning equipment / process to insure it does not degrade the capacitors.

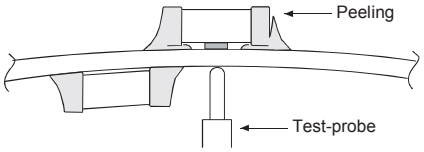
6.Electrical Test on Printed Circuit Board

1. Confirm position of the support pin or specific jig, when inspecting the electrical performance of a capacitor after mounting on the printed circuit board.

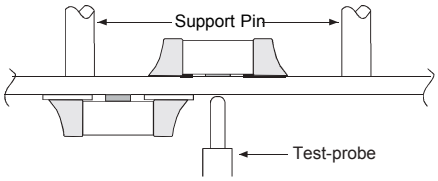
1-1. Avoid bending the printed circuit board by the pressure of a test-probe, etc.
The thrusting force of the test probe can flex the PCB, resulting in cracked chips or open solder joints. Provide support pins on the back side of the PCB to prevent warping or flexing.
Install support pins as close to the test-probe as possible.

1-2. Avoid vibration of the board by shock when a test -probe contacts a printed circuit board.

[Not Recommended]



[Recommended]

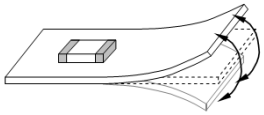


7.Printed Circuit Board Cropping

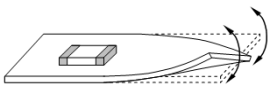
1. After mounting a capacitor on a printed circuit board, do not apply any stress to the capacitor that caused bending or twisting the board.

1-1. In cropping the board, the stress as shown may cause the capacitor to crack.
Cracked capacitors may cause deterioration of the insulation resistance, and result in a short.
Avoid this type of stress to a capacitor.

[Bending]



[Twisting]



2. Check the cropping method for the printed circuit board in advance.

2-1. Printed circuit board cropping shall be carried out by using a jig or an apparatus (Disc separator, router type separator, etc.) to prevent the mechanical stress that can occur to the board.

Board Separation Method	Hand Separation Nipper Separation	(1) Board Separation Jig	Board Separation Apparatus	
			2) Disc Separator	3) Router Type Separator
Level of stress on board	High	Medium	Medium	Low
Recommended	×	△*	△*	○
Notes	Hand and nipper separation apply a high level of stress. Use another method.	· Board handling · Board bending direction · Layout of capacitors	· Board handling · Layout of slits · Design of V groove · Arrangement of blades · Controlling blade life	Board handling

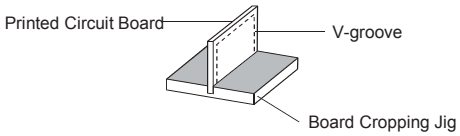
* When a board separation jig or disc separator is used, if the following precautions are not observed, a large board deflection stress will occur and the capacitors may crack.
Use router type separator if at all possible.

(1) Example of a suitable jig

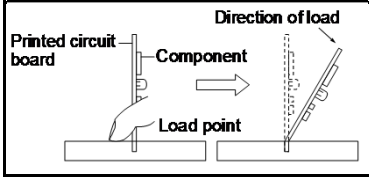
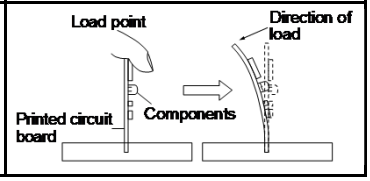
[In the case of Single-side Mounting]

An outline of the board separation jig is shown as follows.
Recommended example: Stress on the component mounting position can be minimized by holding the portion close to the jig, and bend in the direction towards the side where the capacitors are mounted.
Not recommended example: The risk of cracks occurring in the capacitors increases due to large stress being applied to the component mounting position, if the portion away from the jig is held and bent in the direction opposite the side where the capacitors are mounted.

[Outline of jig]



[Hand Separation]

Recommended	Not recommended
	

[In the case of Double-sided Mounting]

Since components are mounted on both sides of the board, the risk of cracks occurring can not be avoided with the above method. Therefore, implement the following measures to prevent stress from being applied to the components.
(Measures)

(1) Consider introducing a router type separator.
If it is difficult to introduce a router type separator, implement the following measures.
(Refer to item 1. Mounting Position)
(2) Mount the components parallel to the board separation surface.
(3) When mounting components near the board separation point, add slits in the separation position near the component.
(4) Keep the mounting position of the components away from the board separation point.

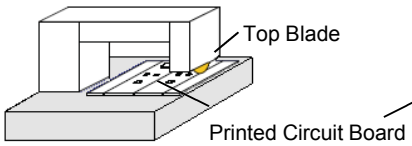
(2) Example of a Disc Separator

An outline of a disc separator is shown as follows. As shown in the Principle of Operation, the top blade and bottom blade are aligned with the V-grooves on the printed circuit board to separate the board.
In the following case, board deflection stress will be applied and cause cracks in the capacitors.

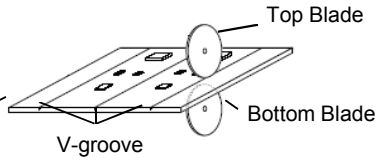
(1) When the adjustment of the top and bottom blades are misaligned, such as deviating in the top-bottom, left-right or front-rear directions
(2) The angle of the V groove is too low, depth of the V groove is too shallow, or the V groove is misaligned top-bottom

IF V groove is too deep, it is possible to brake when you handle and carry it. Carefully design depth of the V groove with consideration about strength of material of the printed circuit board.

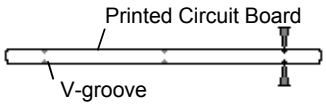
[Outline of Machine]



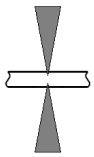
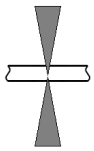
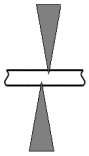
[Principle of Operation]



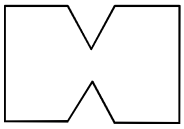
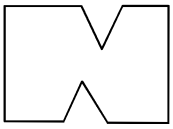
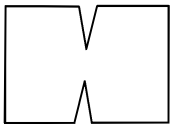
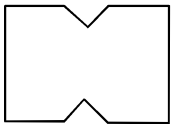
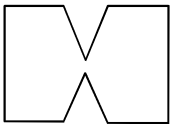
[Cross-section Diagram]



[Disc Separator]

Recommended	Not recommended		
	Top-bottom Misalignment	Left-right Misalignment	Front-rear Misalignment
			

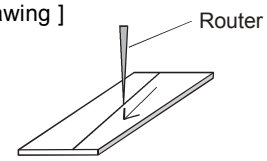
[V-groove Design]

Example of Recommended V-groove Design	Not Recommended			
	Left-right Misalignment	Low-Angle	Depth too Shallow	Depth too Deep
				

(3) Example of Router Type Separator

The router type separator performs cutting by a router rotating at a high speed. Since the board does not bend in the cutting process, stress on the board can be suppressed during board separation.
When attaching or removing boards to/from the router type separator, carefully handle the boards to prevent bending.

[Outline Drawing]



8. Assembly

1. Handling

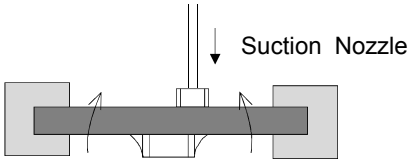
If a board mounted with capacitors is held with one hand, the board may bend.
Firmly hold the edges of the board with both hands when handling.
If a board mounted with capacitors is dropped, cracks may occur in the capacitors.
Do not use dropped boards, as there is a possibility that the quality of the capacitors may be impaired.

2. Attachment of Other Components

2-1. Mounting of Other Components

Pay attention to the following items, when mounting other components on the back side of the board after capacitors have been mounted on the opposite side.
When the bottom dead point of the suction nozzle is set too low, board deflection stress may be applied to the capacitors on the back side (bottom side), and cracks may occur in the capacitors.

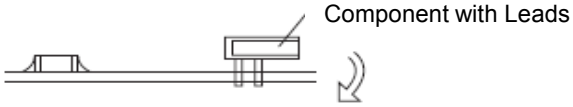
· After the board is straightened, set the bottom dead point of the nozzle on the upper surface of the board.
· Periodically check and adjust the bottom dead point.



2-2. Inserting Components with Leads into Boards

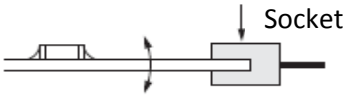
When inserting components (transformers, IC, etc.) into boards, bending the board may cause cracks in the capacitors or cracks in the solder. Pay attention to the following.

· Increase the size of the holes to insert the leads, to reduce the stress on the board during insertion.
· Fix the board with support pins or a dedicated jig before insertion.
· Support below the board so that the board does not bend. When using support pins on the board, periodically confirm that there is no difference in the height of each support pin.



2-3. Attaching/Removing Sockets and/or Connectors

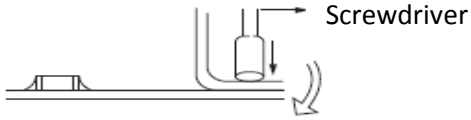
Insertion and removal of sockets and connectors, etc., might cause the board to bend.
Please insure that the board does not warp during insertion and removal of sockets and connectors, etc., or the bending may damage mounted components on the board.



2-4. Tightening Screws

The board may be bent, when tightening screws, etc. during the attachment of the board to a shield or chassis. Pay attention to the following items before performing the work.

· Plan the work to prevent the board from bending.
· Use a torque screwdriver, to prevent over-tightening of the screws.
· The board may bend after mounting by reflow soldering, etc. Please note, as stress may be applied to the chips by forcibly flattening the board when tightening the screws.



■ Others

1. Under Operation of Equipment

1-1. Do not touch a capacitor directly with bare hands during operation in order to avoid the danger of an electric shock.

1-2. Do not allow the terminals of a capacitor to come in contact with any conductive objects (short-circuit).
Do not expose a capacitor to a conductive liquid, inducing any acid or alkali solutions.

1-3. Confirm the environment in which the equipment will operate is under the specified conditions.
Do not use the equipment under the following environments.
(1) Being spattered with water or oil.
(2) Being exposed to direct sunlight.
(3) Being exposed to ozone, ultraviolet rays, or radiation.
(4) Being exposed to toxic gas (e.g., hydrogen sulfide, sulfur dioxide, chlorine, ammonia gas etc.)
(5) Any vibrations or mechanical shocks exceeding the specified limits.
(6) Moisture condensing environments.

1-4. Use damp proof countermeasures if using under any conditions that can cause condensation.

2. Others

2-1. In an Emergency
(1) If the equipment should generate smoke, fire, or smell, immediately turn off or unplug the equipment.
If the equipment is not turned off or unplugged, the hazards may be worsened by supplying continuous power.
(2) In this type of situation, do not allow face and hands to come in contact with the capacitor or burns may be caused by the capacitor's high temperature.

2-2. Disposal of waste
When capacitors are disposed of, they must be burned or buried by an industrial waste vendor with the appropriate licenses.

2-3. Circuit Design
(1) Addition of Fail Safe Function
Capacitors that are cracked by dropping or bending of the board may cause deterioration of the insulation resistance, and result in a short. If the circuit being used may cause an electrical shock, smoke or fire when a capacitor is shorted, be sure to install fail-safe functions, such as a fuse, to prevent secondary accidents.
(2) This series are not safety standard certified products.

2-4. Remarks
Failure to follow the cautions may result, worst case, in a short circuit and smoking when the product is used.
The above notices are for standard applications and conditions. Contact us when the products are used in special mounting conditions.
Select optimum conditions for operation as they determine the reliability of the product after assembly.
The data herein are given in typical values, not guaranteed ratings.

■ Rating

1.Operating Temperature

1. The operating temperature limit depends on the capacitor.

1-1. Do not apply temperatures exceeding the maximum operating temperature.
It is necessary to select a capacitor with a suitable rated temperature that will cover the operating temperature range. It is also necessary to consider the temperature distribution in equipment and the seasonal temperature variable factor.

1-2. Consider the self-heating factor of the capacitor
The surface temperature of the capacitor shall not exceed the maximum operating temperature including self-heating.

2.Atmosphere Surroundings (gaseous and liquid)

1. Restriction on the operating environment of capacitors.

1-1. Capacitors, when used in the above, unsuitable, operating environments may deteriorate due to the corrosion of the terminations and the penetration of moisture into the capacitor.

1-2. The same phenomenon as the above may occur when the electrodes or terminals of the capacitor are subject to moisture condensation.

1-3. The deterioration of characteristics and insulation resistance due to the oxidization or corrosion of terminal electrodes may result in breakdown when the capacitor is exposed to corrosive or volatile gases or solvents for long periods of time.

3.Piezo-electric Phenomenon

1. When using high dielectric constant type capacitors in AC or pulse circuits, the capacitor itself vibrates at specific frequencies and noise may be generated.
Moreover, when the mechanical vibration or shock is added to capacitor, noise may occur.

■Soldering and Mounting

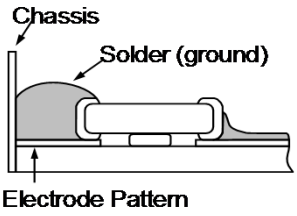
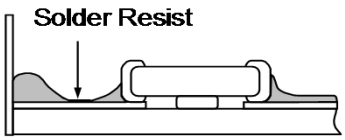
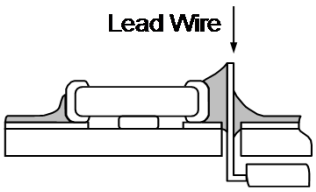
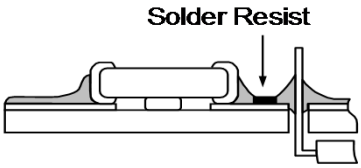
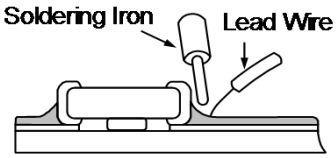
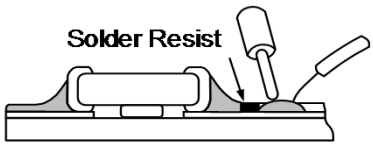
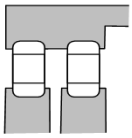
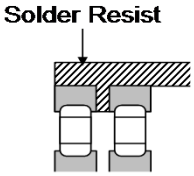
1.PCB Design

1. Notice for Pattern Forms

1-1. Unlike leaded components, chip components are susceptible to flexing stresses since they are mounted directly on the substrate.
They are also more sensitive to mechanical and thermal stresses than leaded components.
Excess solder fillet height can multiply these stresses and cause chip cracking.
When designing substrates, take land patterns and dimensions into consideration to eliminate the possibility of excess solder fillet height.

1-2. There is a possibility of chip cracking caused by PCB expansion/contraction with heat, because stress on a chip is different depending on PCB material and structure.When the thermal expansion coefficient greatly differs between the board used for mounting and the chip,it will cause cracking of the chip due to the thermal expansion and contraction. When capacitors are mounted on a fluorine resin printed circuit board or on a single-layered glass epoxy board, it may also cause cracking of the chip for the same reason.

Pattern Forms

	Prohibited	Correct
Placing Close to Chassis		
Placing of Chip Components and Leaded Components		
Placing of Leaded Components after Chip Component		
Lateral Mounting		

2. Land Dimensions

Please confirm the suitable land dimension by evaluating of the actual SET / PCB.

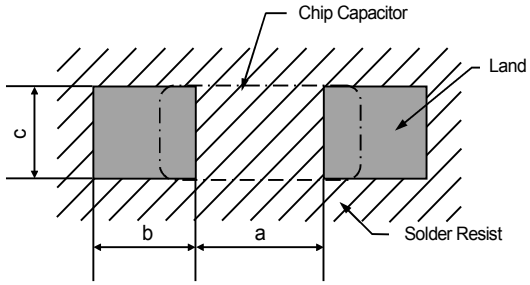


Table 1 Flow Soldering Method

Series	Chip Dimension (L/W) Code	Chip(L×W)	a	b	c
GC☐	18	1.6×0.8	0.6 to 1.0	0.8 to 0.9	0.6 to 0.8
GC☐	21	2.0×1.25	1.0 to 1.2	0.9 to 1.0	0.8 to 1.1
GC☐	31	3.2×1.6	2.2 to 2.6	1.0 to 1.1	1.0 to 1.4

Flow soldering can only be used for products with a chip size of 1.6x0.8mm to 3.2x1.6mm. (in mm)
Resistance to PCB bending stress may be improved by designing the “a” dimension with solder resist.

Table 2 Reflow Soldering Method

Series	Chip Dimension (L/W) Code	Chip(L×W) (Dimensions Tolerance)	a	b	c
GC☐	03	0.6×0.3 (±0.03)	0.2 to 0.25	0.2 to 0.3	0.25 to 0.35
GC☐	15	1.0×0.5 (within ±0.10)	0.3 to 0.5	0.35 to 0.45	0.4 to 0.6
		1.0×0.5 (±0.20)	0.4 to 0.6	0.4 to 0.5	0.5 to 0.7
GC☐	18	1.6×0.8 (±0.10)	0.6 to 0.8	0.6 to 0.7	0.6 to 0.8
		1.6×0.8 (±0.20)	0.7 to 0.9	0.7 to 0.8	0.8 to 1.0
GC☐	21	2.0×1.25 (±0.15)	1.2	0.6 to 0.8	1.2 to 1.4
		2.0×1.25 (±0.20)	1.0 to 1.4	0.6 to 0.8	1.2 to 1.4
GC☐	31	3.2×1.6 (within±0.20)	1.8 to 2.0	0.9 to 1.2	1.5 to 1.7
		3.2×1.6 (±0.30)	1.9 to 2.1	1.0 to 1.3	1.7 to 1.9
GC☐	32	3.2×2.5	2.0 to 2.4	1.0 to 1.2	1.8 to 2.3

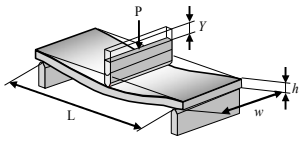
(in mm)

3. Board Design

When designing the board, keep in mind that the amount of strain which occurs will increase depending on the sizeand material of the board.

Relationship with amount of strain to the board thickness, length, width, etc.]

$$\varepsilon = \frac{3PL}{2Ewh^2}$$ Relationship between load and strain



ε : Strain on center of board (μst)
L : Distance between supporting points (mm)
w : Board width (mm)
h : Board thickness (mm)
E : Elastic modulus of board (N/m^2=Pa)
Y : Deflection (mm)
P : Load (N)

When the load is constant, the following relationship can be established.
· As the distance between the supporting points (L) increases,the amount of strain also increases.
→Reduce the distance between the supporting points.
· As the elastic modulus (E) decreases, the amount of strain increases.
→Increase the elastic modulus.
· As the board width (w) decreases, the amount of strain increases.
→Increase the width of the board.
· As the board thickness (h) decreases, the amount of strain increases.
→Increase the thickness of the board.
Since the board thickness is squared, the effect on the amount of strain becomes even greater.

2.Item to be confirmed for Flow sordering

If you want to temporarily attach the capacitor to the board using an adhesive agent before soldering the capacitor, first be sure that the conditions are appropriate for affixing the capacitor. If the dimensions of the land, the type of adhesive,the amount of coating, the contact surface area, the curing temperature, or other conditions are inappropriate, the characteristics of the capacitor may deteriorate.

1. Selection of Adhesive

1-1. Depending on the type of adhesive, there may be a decrease in insulation resistance. In addition, there is a chance that the capacitor might crack from contractile stress due to the difference in the contraction rate of the capacitor and the adhesive.

1-2. If there is not enough adhesive, the contact surface area is too small, or the curing temperature or curing time are inadequate, the adhesive strength will be insufficient and the capacitor may loosen or become disconnected during transportation or soldering. If there is too much adhesive, for example if it overflows onto the land, the result could be soldering defects, loss of electrical connection, insufficient curing, or slippage after the capacitor is mounted. Furthermore, if the curing temperature is too high or the curing time is too long, not only will the adhesive strength be reduced, but solderability may also suffer due to the effects of oxidation on the terminations (outer electrodes) of the capacitor and the land surface on the board.

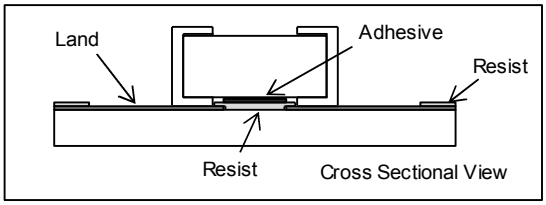
(1) Selection of Adhesive

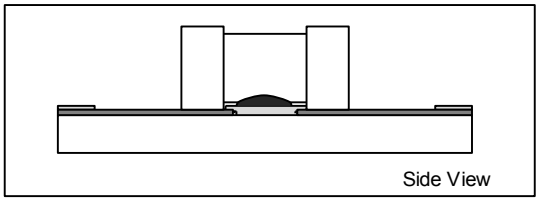
Epoxy resins are a typical class of adhesive. To select the proper adhesive, consider the following points.

1) There must be enough adhesive strength to prevent the component from loosening or slipping during the mounting process.
2) The adhesive strength must not decrease when exposed to moisture during soldering.
3) The adhesive must have good coatability and shape retention properties.
4) The adhesive must have a long pot life.
5) The curing time must be short.
6) The adhesive must not be corrosive to the exterior of the capacitor or the board.
7) The adhesive must have good insulation properties.
8) The adhesive must not emit toxic gases or otherwise be harmful to health.
9) The adhesive must be free of halogenated compounds.

(2) Use the following illustration as a guide to the amount of adhesive to apply.

Chip Dimension (L/W) Code:18/21/31





2.Flux

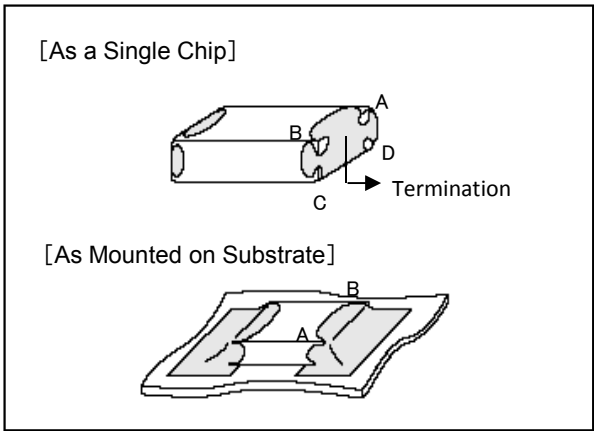
2-1. An excessive amount of flux generates a large quantity of flux gas, which can cause a deterioration of solderability, so apply flux thinly and evenly throughout. (A foaming system is generally used for flow solderring.)

2-2. Flux containing too high a percentage of halide may cause corrosion of the terminations unless there is sufficient cleaning. Use flux with a halide content of 0.1% max.

2-3. Strong acidic flux can corrode the capacitor and degrade its performance.
Please check the quality of capacitor after mounting.

3.Leaching of the terminations

Set temperature and time to ensure that leaching of the terminations does not exceed 25% of the chip end area as a single chip (full length of the edge A-B-C-D shown at right) and 25% of the length A-B shown as mounted on substrate.



3.Reflow soldering

The flux in the solder paste contains halogen-based substances and organic acids as activators.
Strong acidic flux can corrode the capacitor and degrade its performance.
Please check the quality of capacitor after mounting.

4.Washing

1. Please evaluate the capacitor using actual cleaning equipment and conditions to confirm the quality, and select the solvent for cleaning.

2. Unsuitable cleaning may leave residual flux or other foreign substances, causing deterioration of electrical characteristics and the reliability of the capacitors.

5.Coating

1. A crack may be caused in the capacitor due to the stress of the thermal contraction of the resin during curing process. The stress is affected by the amount of resin and curing contraction. Select a resin with low curing contraction. The difference in the thermal expansion coefficient between a coating resin or a molding resin and the capacitor may cause the destruction and deterioration of the capacitor such as a crack or peeling, and lead to the deterioration of insulation resistance or dielectric breakdown.
Select a resin for which the thermal expansion coefficient is as close to that of the capacitor as possible.
A silicone resin can be used as an under-coating to buffer against the stress.

2. Select a resin that is less hygroscopic.
Using hygroscopic resins under high humidity conditions may cause the deterioration of the insulation resistance of a capacitor. An epoxy resin can be used as a less hygroscopic resin.

3. The halogen system substance and organic acid are included in coating material, and a chip corrodes by the kind of Coating material. Do not use strong acid type.

■ Others

1.Transportation

1. The performance of a capacitor may be affected by the conditions during transportation.

1-1. The capacitors shall be protected against excessive temperature, humidity and mechanical force during transportation.

(1) Climatic condition
- low air temperature : -40℃
- change of temperature air/air : -25℃/+25℃
- low air pressure : 30 kPa
- change of air pressure : 6 kPa/min.

(2) Mechanical condition
Transportation shall be done in such a way that the boxes are not deformed and forces are not directly passed on to the inner packaging.

1-2. Do not apply excessive vibration, shock, or pressure to the capacitor.

(1) When excessive mechanical shock or pressure is applied to a capacitor, chipping or cracking may occur in the ceramic body of the capacitor.

(2) When the sharp edge of an air driver, a soldering iron, tweezers, a chassis, etc. impacts strongly on the surface of the capacitor, the capacitor may crack and short-circuit.

1-3. Do not use a capacitor to which excessive shock was applied by dropping etc.
A capacitor dropped accidentally during processing may be damaged.

2.Characteristics Evaluation in the Actual System

1. Evaluate the capacitor in the actual system,to confirm that there is no problem with the performance and specification values in a finished product before using.

2. Since a voltage dependency and temperature dependency exists in the capacitance of high dielectric type ceramic capacitors, the capacitance may change depending on the operating conditions in the actual system. Therefore,be sure to evaluate the various characteristics, such as the leakage current and noise absorptivity, which will affect the capacitance value of the capacitor.

3. In addition,voltages exceeding the predetermined surge may be applied to the capacitor by the inductance in the actual system. Evaluate the surge resistance in the actual system as required.

⚠NOTE

1.Please make sure that your product has been evaluated in view of your specifications with our product being mounted to your product.

2.Your are requested not to use our product deviating from this product specification.

3.We consider it not appropriate to include any terms and conditions with regard to the business transaction in the product specifications, drawings or other technical documents. Therefore, if your technical documents as above include such terms and conditions such as warranty clause, product liability clause, or intellectual property infringement liability clause, they will be deemed to be invalid.

2. Engineering Change Documents

N/A

3. Design FMEA

Design FMEA

Product series : GCM/GCD/GRT/GRM/GJM/GCQ Series	Process FMEA No. : -----	Doc. # : LEMC6604-DF001O
Product name : Chip Multilayer Ceramic Capacitors	Core team : Product Development, Process Engineering, Material Development Product Eng.	Date(Orig) : 12,Feb.,2004 / Date(Rev) : 7, Aug, 2018 Issued by : Quality Assurance Dept 1, 2. Capacitor Division

SPE : Use symbol [◎] for special characteristics, or write the unique symbol that customer specified.

No	ITEM (MATERIAL)	FUNCTION	POTENTIAL FAILURE MODE	EFFECT(S) OF FAILURE	SEV	SPE	POTENTIAL CAUSE(S) OF FAILURE	OCC	CURRENT DESIGN CONTROL		DET	RPN	RECOMMENDED ACTIONS AND CONTROL METHODS	RESP. & TARGET COMPLETION DATE	ACTION RESULTS				
									PREVENTION	DETECTION					ACTION TAKEN	SEV	OCC	DET	RPN
1	Dielectric substance element	To satisfy electric char.	Improper dielectric thickness	- Electric char. defect - Reliability defect - Out of dimension spec.	8		Dielectric thickness isn't optimized	2	Optimization of dielectric thickness based on electrical char. / reliability test	Measurement of - green sheet thickness, - cap., - temp. char., - BDV, - DC / AC voltage char., - dimension, - ESD Test of - high temp. loading, - high temp. storage, - humidity loading	4	64	None						
							Variation of dielectric thickness by temperature / pressure of press	2	Optimizing minimum dielectric thickness considering pressing deformation	Check of dimension after pressing Measurement of - dimension after firing, - cap., - temp. char., - DC / AC voltage char., - BDV, - ESD Test of - high temp. loading, - high temp. storage	4	64	None						
							Variation of dielectric thickness by temperature / pressure of press	2	Optimization of electrical characteristics and shrinkage factor at firing process and optimization of dielectric thickness	Measurement of - cap., - DC / AC voltage char., - BDV, - ESD Test of - High temp. loading, - High temp. storage, - Humidity loading	4	64	None						

Design FMEA

Product series : GCM/GCD/GRT/GRM/GJM/GCQ Series	Process FMEA No. : -----	Doc. # : LEMC6604-DF001O
Product name : Chip Multilayer Ceramic Capacitors	Core team : Product Development, Process Engineering, Material Development Product Eng.	Date(Orig) : 12,Feb.,2004 / Date(Rev) : 7, Aug, 2018 Issued by : Quality Assurance Dept 1, 2. Capacitor Division

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No	ITEM (MATERIAL)	FUNCTION	POTENTIAL FAILURE MODE	EFFECT(S) OF FAILURE	SEV	SPE	POTENTIAL CAUSE(S) OF FAILURE	OCC	CURRENT DESIGN CONTROL		DET	RPN	RECOMMENDED ACTIONS AND CONTROL METHODS	RESP. & TARGET COMPLETION DATE	ACTION RESULTS				
									PREVENTION	DETECTION					ACTION TAKEN	SEV	OCC	DET	RPN
			Nonconformance of sintering	- Electric char. defect (IR, Flash) - Reliability defect	8		Material char. / spec. isn't optimized	2	Making a control limit of material char. (Such as particle size of ceramic, SSA , molecular rate)	Measurement of - material char.(S50/SSA), - cap., - temp. char., - IR, - other electric char., - DC / AC voltage char. Test of - high temp. loading, - humidity loading	4	64	None						
							Firing temp. / atmosphere isn't optimized for ceramic	2	Optimization of electrical characteristics and shrinkage factor at firing process	Measurement of - cap., - temp. char. Test of - High temp. loading - Humidity loading	4	64	None						
		To ensure mechanical strength	Insufficient mechanical strength	Cracking or chipping at mounting	6		Firing temp. / atmosphere isn't optimized for ceramic	2	Optimization of electrical characteristics and shrinkage factor at firing process	Test of - breakdown, - flex, - mechanical shock Appearance check	4	48	None						
							Design of material of ceramic isn't optimized	2	Optimization of material design and making a control limit of material char.(Such molecular rate) as particle size of ceramic, SSA , particle size of ceramic, SSA , molecular rate)	Measurement of material char.(S50/SSA) Test of - breakdown, - flex, - mechanical shock Appearance check	4	48	None						
2	Dummy (Top and Bottom)	To protect capacitor element from outer environment	Insufficient dummy thickness	Decrease of reliability influenced from outer environment	8		Improper dummy thickness design	2	Optimization of dummy thickness design	DPA Test of - high temp. loading, - humidity loading Measurement of dimension	4	64	None						
			Insufficient mechanical strength	- Appearance defect(chip, crack) - Crack at mounting	6		Firing-temp. / atmosphere for ceramic aren't optimized	2	Optimization of electrical characteristics and shrinkage factor at firing process	Test of - breakdown, - flex, - mechanical shock Appearance check	4	48	None						

Design FMEA

Product series : GCM/GCD/GRT/GRM/GJM/GCQ Series	Process FMEA No. : -----	Doc. # : LEMC6604-DF001O
Product name : Chip Multilayer Ceramic Capacitors	Core team : Product Development, Process Engineering, Material Development Product Eng.	Date(Orig) : 12,Feb.,2004 / Date(Rev) : 7, Aug, 2018 Issued by : Quality Assurance Dept 1, 2. Capacitor Division

SPE : Use symbol [◎] for special characteristics, or write the unique symbol that customer specified.

No	ITEM (MATERIAL)	FUNCTION	POTENTIAL FAILURE MODE	EFFECT(S) OF FAILURE	SEV	SPE	POTENTIAL CAUSE(S) OF FAILURE	OCC	CURRENT DESIGN CONTROL		DET	RPN	RECOMMENDED ACTIONS AND CONTROL METHODS	RESP. & TARGET COMPLETION DATE	ACTION RESULTS				
									PREVENTION	DETECTION					ACTION TAKEN	SEV	OCC	DET	RPN
							Design of ceramic material isn't optimized	2	Optimization of material design and making a control limit of material char.(Such as particle size of ceramic, SSA , molecular rate)	Measurement of material char.(S50/SSA) Test of - breakdown, - flex, - mechanical shock Appearance check	4	48	None						
							Edge radius of chip is small	3	Optimization of edge radius design	Measurement of edge radius	3	54	None						
3	Side gap	To protect capacitor element from outer environment	Narrow side gap	Decrease of reliability influenced from outer environment	8		Improper side gap design	2	Optimization of side gap design	Measurement of - side gap, - dimension Test of - high temp. loading, - humidity loading, DPA	4	64	None						
							Stacking shift / Cutting shift	2	Introduction of optimized process design to prevent shifted electrode	Measurement of side margin	4	64	None						
			Peeled-off caused by insufficient lamination	Decrease of reliability due to peeled-off	8		Insufficient lamination at green chip	2	Optimization of green stick shrinkage at pressing	Measurement of lamination strength for green chip Appearance check Test of - high temp. loading, - humidity loading	4	64	None						
4	Inner electrode	To get electric char.	Decrease of inner electrode coverage	Contact defect	7		Inner electrode thickness isn't optimized	2	Optimization of inner electrode thickness design	Measurement of - laydown thickness, - cap., - ESR, - other electric char. DPA	4	56	None						
							Improper firing condition to get optimized multilayer capacitor	2	Optimization of electrical characteristics and shrinkage factor at firing process	Measurement of - cap., - ESR, - other electric char. Test of - high temp. loading, - humidity loading DPA	4	56	None						
							Material char.of inner electrode isn't optimized	2	Making a control limit of material char.(Such as Particle size of metal)	Measurement of - material char., - cap. Thermal shock test	4	56	None						

Design FMEA

Product series : GCM/GCD/GRT/GRM/GJM/GCQ Series	Process FMEA No. : -----	Doc. # : LEMC6604-DF001O
Product name : Chip Multilayer Ceramic Capacitors	Core team : Product Development, Process Engineering, Material Development Product Eng.	Date(Orig) : 12,Feb.,2004 / Date(Rev) : 7, Aug, 2018 Issued by : Quality Assurance Dept 1, 2. Capacitor Division

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No	ITEM (MATERIAL)	FUNCTION	POTENTIAL FAILURE MODE	EFFECT(S) OF FAILURE	SEV	SPE	POTENTIAL CAUSE(S) OF FAILURE	OCC	CURRENT DESIGN CONTROL		DET	RPN	RECOMMENDED ACTIONS AND CONTROL METHODS	RESP. & TARGET COMPLETION DATE	ACTION RESULTS				
									PREVENTION	DETECTION					ACTION TAKEN	SEV	OCC	DET	RPN
			Nonconformance of printing inner electrode thickness	- Crack caused by poor solder leaching at mounting - Delamination	7		Inner electrode thickness isn't optimized	2	Optimization of inner electrode thickness design	Measurement of - laydown thickness, - cap., - dimension Thermal shock test	4	56	None						
			Oxidation of inner electrode	Contact-defect with termination	7		Improper firing condition to get optimized multilayer capacitor	2	Optimization of electrical characteristics and shrinkage factor at firing process	Measurement of - cap., - ESR, - V-I char., - other electric char. Electrode strength test DPA	4	56	None						
5	Termination	To protect capacitor element from outer environment	Nonconformance of termination sintering	- Decrease of reliability or IR caused by outer environment such as humidity loading - Crack by termination stress	8		Improper firing condition to get good termination char.	2	Optimizing thermal, mechnical and cntact characteristics at termination firing	Test of - mechanical shock, - solder splash, - thermal shock, - high temp. loading, - humidity loading, - humidity loading with low voltage, - electrode strength, - solderability DPA	4	64	None						
							Termination material char. isn't optimized	2	Making a control limit of material char.(Such as particle size of metal)	Measurement of material char. Test of - solder splash, - humidity loading, - humidity loading with low voltage	4	64	None						
			Nonconformance of termination thickness	- Decrease of reliability or IR caused by outer environment such as humidity loading - Crack by termination stress	8		Termination thickness isn't optimized	2	Making a control limit of termination thickness	Measurement of termination thickness DPA Test of - high temp. loading, - humidity loading, - humidity loading with low voltage	4	64	None						

Design FMEA

Product series : GCM/GCD/GRT/GRM/GJM/GCQ Series	Process FMEA No. : -----	Doc. # : LEMC6604-DF001O
Product name : Chip Multilayer Ceramic Capacitors	Core team : Product Development, Process Engineering, Material Development Product Eng.	Date(Orig) : 12,Feb.,2004 / Date(Rev) : 7, Aug, 2018
		Issued by : Quality Assurance Dept 1, 2. Capacitor Division

SPE : Use symbol [◎] for special characteristics, or write the unique symbol that customer specified.

No	ITEM (MATERIAL)	FUNCTION	POTENTIAL FAILURE MODE	EFFECT(S) OF FAILURE	SEV	SPE	POTENTIAL CAUSE(S) OF FAILURE	OCC	CURRENT DESIGN CONTROL		DET	RPN	RECOMMENDED ACTIONS AND CONTROL METHODS	RESP. & TARGET COMPLETION DATE	ACTION RESULTS				
									PREVENTION	DETECTION					ACTION TAKEN	SEV	OCC	DET	RPN
			Pin hole and nonconforming shape of termination	- Solder splash defect at mounting - Mount defect	5		Termination paste condition isn't optimized	2	Optimization of paste design(Viscosity / Specific gravity etc) to optimize the terminated shape	DPA Appearance check Test of - solder splash, - self alignment	5	50	None						
							Rheology char. Of termination paste isn't optimized	2	Making a control limit of paste viscosity for terminating	Measurement of - paste viscosity, - bonding strength after paste drying	5	50	None						
		To get good contact with plating layer and inner electrode	Nonconformance of termination sintering	- Cap. defect / ESR defect - Poor solder wettability	6		Improper firing condition to get good termination char.	2	Optimizing thermal, mechnical and cntact characteristics at termination firing	Measurement of - cap., - ESR, - plating thickness Test of - solder wettability, - temp. cycle	4	48	None						
		To ensure mechanical strength	Nonconformance of termination sintering	- Appearance defect such as termination peeled-off - Decrease of pull or flex-strength	7		Improper firing condition to get good termination char.	2	Optimizing thermal, mechnical and cntact characteristics at termination firing	Test of - sticking tendency, - flex, - mechanical shock	4	56	None						
6	Ni Plating (Nickel)	To ensure solder heat resistance	Nonconformance of Ni plating thickness	- Electric char. defect caused by poor solder leaching at mounting - Decrease of flex strength	7		Ni plating thickness isn't optimized	2	Optimization of Ni plating thickness	Measurement of - Ni plating thickness, - dimension Test of - thermal shock, - solder leaching, - flex DPA	4	56	None						
		To make contact with tin plating	Oxidation of Ni surface	Insufficient contact resistance between Ni and Sn plating	4		Improper Ni plating condition	2	Optimization of Ni plating thickness	Measurement of - cap., - ESR Solder leaching test DPA	4	32	None						
7	Sn Plating (Tin)	To ensure solderability	Nonconformance of Sn plating thickness	- Mount defect by poor solder wettability - Solder splash defect at mounting	5	◎	Sn plating thickness isn't optimized	2	Optimization of Sn plating thickness	Measurement of Sn plating thickness Test of - solder wettability, - solder splash	5	50	None						
			Oxidization of Sn surface	Mount defect by poor solder wettability	5		Improper Sn plating condition	2	Optimization of Sn plating thickness	Measurement of Sn plating thickness Solder wettability test	5	50	None						

4. Process Flow Diagrams

This is included in Control Plan.

5. Process FMEA

Process FMEA

Product series : GCM/GRT Series	Control Plan No. : -----	Doc. # : LEMC6604-PF024E
Product name : Chip Multilayer Ceramic Capacitors	Core team : Process Eng., Factory QC, Mechanical Eng., Production, Production Control, Group QA	Date(Orig) : 30, Nov, 2017 / Date(Rev) : 24, July, 2018
		Issued by : Quality Assurance Dept 2. Capacitor Division

SPE : Use symbol [◎] for special characteristics, or write the unique symbol that customer specified.

No	PROCESS FUNCTION	PROCESS PURPOSE	POTENTIAL FAILURE MODE	EFFECT(S) OF FAILURE	SEV	SPE	POTENTIAL CAUSE(S) OF FAILURE	OCC	CURRENT PROCESS CONTROL		DET	RPN	RECOMMENDED ACTIONS AND CONTROL METHODS	RESP. & TARGET COMPLETION DATE	ACTION RESULTS				
									PREVENTION	DETECTION					ACTION TAKEN	SEV	OCC	DET	RPN
1	CERAMICS MATERIAL INCOMING INSPECTION	Inspecting of ceramics material	Mis-judgement	・Characteristic failure	6		・Mis-inspection	2	-	・Double check by other person	5	60	None						
2	MIXING	Making uniformity of slurry by mixing of ceramic powder, solvent and binder.	Excess resin ingredients	・Delamination	7		・Wrong input by the abnormal measuring instrument	2	・Regular calibration of the weighing instrument	・Measurement of ignition Loss ・Check of slurry viscosity	6	84	None						
			Lack of resin ingredients	・Delamination	7		・Wrong input by the abnormal measuring instrument	2	・Regular calibration of the weighing instrument	・Measurement of ignition Loss ・Check of slurry viscosity	6	84	None						
			The particle size is small	・Out of spec. for TC ・Flash/IR failure	6		・Wrong setting of mixing condition	2	・Double check of work order sheet	・Check of sheet particle size	6	72	None						
							・Wrong filling of media	2	・Control of media amount	・Check of sheet particle size	6	72	None						
			The particle size is large	・Characteristic failure ・Flash/IR failure	6		・Wrong setting of mixing condition	2	・Double check of work order sheet	・Check of sheet particle size	6	72	None						
							・Wrong filling of media	2	・Control of media amount	・Check of sheet particle size	6	72	None						
			Foreign material mixing	・Flash/IR failure	6		・Mixing of different material	2	・Cleansing of the mixing machine after using	・ Visual check	7	84	None						
							・The contamination by wear	2	・Periodic exchange	・Daily check	5	60	None						
3	DE-AIRING	Deairing of slurry by vacuum suck.	Excess de-airing	・Filter clogging ・Slurry cannot be pumped	6		・Wrong setting of de-airing time	3	・Check of work order sheet	・Check of slurry viscosity	5	90	None						
							・High vacuum degree	3	・Check of vacuum degree	・Check of slurry viscosity	5	90	None						
			Insufficient de-airing	・Sheet defect ・Flash/IR failure	6		・Wrong setting of de-airing time	2	・Check of work order sheet	・Check of slurry viscosity	5	60	None						
							・Low vacuum degree	4	・Check of vacuum degree	・Check of slurry viscosity	5	120	None						
			Foreign material mixing	・Flash/IR failure	6		・The contamination by wear	2	・Periodic exchange	・Daily check	5	60	None						
4	CASTING	Making the dielectric sheet with uniform thickness.	Non-conformance of sheet thickness	・Capacitance failure ・Dimension failure ・Flash/IR failure	6		・Non-conformance of slurry viscosity	3	・Control of slurry viscosity	・Check of slurry viscosity ・Measurement of X-ray thickness	3	54	None						

No	PROCESS FUNCTION	PROCESS PURPOSE	POTENTIAL FAILURE MODE	EFFECT(S) OF FAILURE	SEV	SPE	POTENTIAL CAUSE(S) OF FAILURE	OCC	CURRENT PROCESS CONTROL		DET	RPN	RECOMMENDED ACTIONS AND CONTROL METHODS	RESP. & TARGET COMPLETION DATE	ACTION RESULTS				
									PREVENTION	DETECTION					ACTION TAKEN	SEV	OCC	DET	RPN
							・Non-Conformance of the X-ray thickness meter	2	・Check of calibration curve	・Measurement of sheet weight	6	72	None						
							・Non-Conformance of pumping machine	2	・Check of pumping pressure	・Measurement of X-ray thickness	3	36	None						
							・Wrong setting of machine condition	3	・Check of work order sheet before work	・Measurement of X-ray thickness	3	54	None						
			Pin-hole Unpenetrated spot	・Flash/IR failure	6		・Scratch of roll	2	・Check of the roll	・Appearance check of the sheet ・Automatic visual inspection machine	3	36	None						
							・Foreign material adhesion to the roll	3	・Cleaning of the roll	・Appearance check of the sheet ・Automatic visual inspection machine	3	54	None						
							・Wrong setting of drying condition	2	・Check before work	・Appearance check of the sheet ・Automatic visual inspection machine	3	36	None						
			Scratch of sheet	・Flash/IR failure	6		・Scratch of roll	2	・Check of the roll	・Appearance check of the sheet ・Automatic visual inspection machine	3	36	None						
							・Foreign material adhesion to the roll	3	・Cleaning of the roll	・Appearance check of the sheet ・Automatic visual inspection machine	3	54	None						
			Sheet crumbs	・Flash/IR failure	6		・Wrong setting of slit blade	2	・Exchange record of slit blade	・Visual check	7	84	None						
							・Decrease of slit blade function	2	・Exchange record of slit blade	・Visual check	7	84	None						
			Foreign material mixing	・Flash/IR failure	6		・Mixing of PET crumbs from slit	3	・Cleaning of the slit , periodic exchange	・Measurement of clean degree	5	90	None						
							・Mixing of green sheet crumbs from dryer	2	・Cleaning inside of dryer	・Appearance check of the sheet ・Automatic visual inspection machine	3	36	None						
5	TRANSPORTING	Transport to the Philippines plant from Japan and Singapore.	Damage of cargo	Sheet defect	7		Setting miss	2	-	Check at the incoming	4	56	None						
6	INCOMING INSPECTION (CERAMICS SHEET)	Inspecting of sheet	Mis-judgement	Electrical characteristics defect	7		Mis-inspection of inspector	2	-	Double check by other person	5	70	None						
7	INNER ELECTRODE INCOMING INSPECTION	Inspecting of the inner electrode paste.	Mis-judgement	・Capacitance failure	6		・Mis-inspection	2	-	・Double check by other person	5	60	None						

No	PROCESS FUNCTION	PROCESS PURPOSE	POTENTIAL FAILURE MODE	EFFECT(S) OF FAILURE	SEV	SPE	POTENTIAL CAUSE(S) OF FAILURE	OCC	CURRENT PROCESS CONTROL		DET	RPN	RECOMMENDED ACTIONS AND CONTROL METHODS	RESP. & TARGET COMPLETION DATE	ACTION RESULTS				
									PREVENTION	DETECTION					ACTION TAKEN	SEV	OCC	DET	RPN
8	PRINTING AND STACKING	Printing internal electrode on green sheet, and dry, and stacking correctly to get target capacitance.	Thick laydown	・ Delamination ・Crack ・Large capacitance ・Dimension failure	7		・Printing condition is not appropriate	3	・Check of printing condition ・Optimization of printing condition	・Periodical measurement of inner electrode thickness	5	105	None						
							・Non-conformance of paste viscosity / specific gravity	4	・Inner electrode incoming inspection	・Periodical measurement of inner electrode thickness	5	140	None						
							・Non-conformance of X-ray strength	3	-	・Daily check of standard foil	5	105	None						
							・Wear-out of the screen plate	5	・Life control of printing plate	・Periodical measurement of inner electrode thickness	5	175	None						
							・Insufficient of paste stirring	2	・Check of stirring time	・Periodical measurement of inner electrode thickness	5	70	None						
			Thin laydown	・Small capacitance ・ ESR failure ・Dimension failure	6		・Printing condition is not appropriate	3	・Check of printing condition ・Optimization of printing condition	・Periodical measurement of inner electrode thickness	5	90	None						
							・Non-conformance of paste viscosity / specific gravity	4	・Inner electrode incoming inspection	・Periodical measurement of inner electrode thickness	5	120	None						
							・Non-conformance of X-ray strength	3	-	・Daily check of X-ray fluorescence measuring instrument	5	90	None						
							・Wear-out of the screen plate	5	・Life control of printing plate	・Periodical measurement of inner electrode thickness	5	150	None						
							・Insufficient of paste stirring	2	・Check of stirring time	・Periodical measurement of inner electrode thickness	5	60	None						
			Variation of electrode area	・Variation of capacitance	6		・Printing condition is not appropriate	3	・Check of printing condition ・Optimization of printing condition	・Periodical measurement of inner electrode thickness	5	90	None						
							・Non-conformance of paste viscosity / specific gravity	4	・Inner electrode incoming inspection	・Periodical measurement of inner electrode thickness	5	120	None						
			Nonconformance of a sensing mark	・Capacitance failure ・Flash/IR failure	6		・Printing condition is not appropriate	3	・Check of printing condition ・Optimization of printing condition	・Periodical check by visual or pattern matching	5	90	None						

No	PROCESS FUNCTION	PROCESS PURPOSE	POTENTIAL FAILURE MODE	EFFECT(S) OF FAILURE	SEV	SPE	POTENTIAL CAUSE(S) OF FAILURE	OCC	CURRENT PROCESS CONTROL		DET	RPN	RECOMMENDED ACTIONS AND CONTROL METHODS	RESP. & TARGET COMPLETION DATE	ACTION RESULTS				
									PREVENTION	DETECTION					ACTION TAKEN	SEV	OCC	DET	RPN
							・Non-conformance of slurry viscosity / specific gravity	4	・Inner electrode incoming inspection	・Periodical measurement of inner electrode thickness	5	120	None						
							・Wear-out of the screen plate	5	・Life control of printing plate	・Check of stretch of screen mesh	5	150	None						
			Foreign material mixing	・Flash/IR failure	6		・Mixing of aggregates	4	・Inner electrode incoming inspection	・Inner electrode incoming inspection	5	120	None						
							・Wear-out of cutting blade	2	・Periodical exchange of cutting blade	・Check of punching state	7	84	None						
			Insufficient drying	・Delamination ・Peeling defect	7		・Abnormality of thermostat	2	・Daily check	・The alarm of abnormal detection	2	28	None						
							・Non-conformance of air blow at dryer	2	・Daily check	・Periodical check of Machine	5	70	None						
			Sheet folding/wrinkles	・Flash/IR failure ・Appearance failure	6		・The suction hole clogging	4	・Standardization of the cleaning method	・Periodical check	5	120	None						
							・Variation of holding pressure	4	Check of uniformity of pressure to sheet	・Periodical check	5	120	None						
9	PRESSING	Pressing the stacked sheets and making the block of multilayer.	Insufficient deairing	・Delamination	7		・Degradation of seal point	2	・Check of vacuum pack	・Visual check after press	8	112	None						
							・Degradation of vacuum pump	2	・Check of vacuum degree	・Visual check after press	8	112	None						
			Large T dimension of green block	・Large T dimension ・Capacitance failure	6		・Non-conformance of press condition	4	・Periodical check	・Measurement of T dimension of block	6	144	None						
			Small T dimension of green block	・Small T dimension ・Capacitance failure	6		・Non-conformance of press condition	4	・Periodical check	・Measurement of T dimension of block	6	144	None						
			Appearance failure of block	・Appearance failure	2		・Foreign material adhesion to metal mold	4	・Cleaning of metal mold	・Appearance check after press	8	64	None						
			Insufficient adhesion force	・Delamination	7		・Non-conformance of press condition	4	・Periodical check	・Daily check ・Check of machine setting condition	5	140	None						
10	CUTTING	Cutting the block and making the chip of MLCC.	Shifting cut	・Small gap ・Flash/IR failure ・Appearance failure	6		・Non-conformance of suction force	4	・Daily check	・Appearance check after cutting	8	192	None						
							・Sensing operation error	4	・Daily check	・Appearance check after cutting	8	192	None						
							・Low stripper pressure	4	・Daily check	・Appearance check after cutting	8	192	None						
			Bias cut	・Flash/IR failure ・Appearance failure ・Dimension failure	6		・Non-conformance of pre-heating temperature	4	・Daily check	・Appearance check after cutting	8	192	None						
							・Nonconformance of suction pressure	4	・Daily check	・Appearance check after cutting	8	192	None						

No	PROCESS FUNCTION	PROCESS PURPOSE	POTENTIAL FAILURE MODE	EFFECT(S) OF FAILURE	SEV	SPE	POTENTIAL CAUSE(S) OF FAILURE	OCC	CURRENT PROCESS CONTROL		DET	RPN	RECOMMENDED ACTIONS AND CONTROL METHODS	RESP. & TARGET COMPLETION DATE	ACTION RESULTS				
									PREVENTION	DETECTION					ACTION TAKEN	SEV	OCC	DET	RPN
							・Low stripper pressure	4	・Daily check	・Appearance check after cutting	8	192	None						
			Imperfect cutting	・Flash/IR failure ・Appearance failure	6		Non-conformance of pre-heating temperature	4	・Daily check	・Appearance check after cutting	8	192	None						
							・Under limit of cut blade is high	1	・Daily check	・Appearance check after cutting	8	48	None						
			Cross section defect	・Appearance failure	2		・Non-conformance of pre-heating temperature	4	・Daily check	・Appearance check after cutting	8	64	None						
							・ Non-conformance of pre-heating time	4	・Daily check	・Appearance check after cutting	8	64	None						
11	CUTTING (Dicing saw)	Cutting the block and making the chip of MLCC.	Shifting cut	・Small gap ・Flash/IR failure ・Appearance failure	6		・Wear of the cutting blade	2	・Periodic exchange of cut blade	・Appearance check after cutting	8	96	None						
							・Sensing operation error	4	・Daily check	・Appearance check after cutting	8	192	None						
			Bias cut	・Flash/IR failure ・Appearance failure ・Dimension failure	6		・Wear of the cutting blade	2	・Periodic exchange of cut blade	・Appearance check after cutting	8	96	None						
			Cross section defect	・Appearance failure	2		・Wear of the cutting blade	2	・Periodic exchange of cut blade	・Appearance check after cutting	8	32	None						
			Adhesion of cut scrap	・Appearance failure	2		Insufficient drainer	2	・Control of dry time	・Appearance check after cutting	8	32	None						
							・Wear of the cutting blade	2	・Periodic exchange of cut blade	・Appearance check after cutting	8	32	None						
12	RAW UNIT GRINDING	Grinding a edge of chip	Peeled edge	・Nonconformance of heatproof strength ・Flash/IR failure	7		・Fast barrel rotational speed	2	・Daily check ・Work standards	・Check of rotation speed	5	70	None						
							・Long grinding time	2	・Work standards	・Check of barrel time	5	70	None						
							・Variation of charge quantity	4	・Work standards	・Check of chip loading quantity	5	140	None						
							・Wrong media	4	・Work standards	・Check of media species & quantity	5	140	None						
			Crack or chipping of chip	・Appearance failure	6		・Fast barrel rotational speed	2	・Daily check ・Work standards	・Check of rotation speed	5	60	None						
							・Long grinding time	2	・Work standards	・Check of barrel time	5	60	None						
							・Variation of charge quantity	4	・Work standards	・Check of chip loading quantity	5	120	None						
							・Wrong media	4	・Work standards	・Check of media species & quantity	5	120	None						

No	PROCESS FUNCTION	PROCESS PURPOSE	POTENTIAL FAILURE MODE	EFFECT(S) OF FAILURE	SEV	SPE	POTENTIAL CAUSE(S) OF FAILURE	OCC	CURRENT PROCESS CONTROL		DET	RPN	RECOMMENDED ACTIONS AND CONTROL METHODS	RESP. & TARGET COMPLETION DATE	ACTION RESULTS				
									PREVENTION	DETECTION					ACTION TAKEN	SEV	OCC	DET	RPN
			Insufficient edge radius	・Peeled termination at corner	6		・Slow barrel rotational speed	2	・Daily check ・Work standards	・Check of rotation speed	5	60	None						
							・Short grinding time	2	・Work standards	・Check of barrel time	5	60	None						
							・Variation of charge quantity	4	・Work standards	・Check of chip loading quantity	5	120	None						
			Excess edge radius	・Flash/IR failure ・Appearance failure	6		・Fast barrel rotational speed	2	・Daily check ・Work standards	・Check of rotation speed	5	60	None						
							・Long grinding time	2	・Work standards	・Check of barrel time	5	60	None						
							・Variation of charge quantity	4	・Work standards	・Check of chip loading quantity	5	120	None						
			Inner electrode underexposure	・Capacitance failure	6		・Slow barrel rotational speed	2	・Daily check ・Work standards	・Check of rotation speed	5	60	None						
							・Short grinding time	2	・Work standards	・Check of barrel time	5	60	None						
							・Variation of charge quantity	4	・Work standards	・Check of chip loading quantity	5	120	None						
13	FIRING	Baking and sintering inner electrode and ceramic after each green chip cutting.	Crack or chipping, at the time of loading	・Appearance failure	6		・ Excess shock at the time of loading	2	・Limit of the chip drop height	・Appearance check	8	96	None						
			Insufficient decarbonization	・Delaminaton ・Flash/IR failure	7		・Wrong profile	2	・Check of profile No	・Check of temperature & gas flow amount	5	70	None						
							・Nonconformance of gas flow rate	2	・Daily check	・Check of gas flow amount	5	70	None						
							・The temperature drop due to heater degradation	2	・Thermocouple calibration	・Detection of heater degradation	2	28	None						
							・Nonconformance of inner pressure at firing	2	・Daily check	・Check of inner pressure	5	70	None						
			Excess decarbonization	・Delaminaton ・Flash/IR failure	7		・Wrong profile	2	・Check of profile No	・Check of temperature & gas flow amount	5	70	None						
							・Nonconformance of gas flow rate	2	・Daily check	・Check of gas flow amount	5	70	None						
							・Nonconformance of inner pressure at firing	2	・Daily check	・Check of inner pressure	5	70	None						
			Excess sintering	・Flash/IR failure ・Capacitance failure ・Out of spec. for TC ・Decrease of solder heatproof	7		・Wrong profile	2	・Check of profile No	・Check of temperature & gas flow amount	5	70	None						
							・Nonconformance of gas flow rate	2	・Daily check	・Check of gas flow amount	5	70	None						

No	PROCESS FUNCTION	PROCESS PURPOSE	POTENTIAL FAILURE MODE	EFFECT(S) OF FAILURE	SEV	SPE	POTENTIAL CAUSE(S) OF FAILURE	OCC	CURRENT PROCESS CONTROL		DET	RPN	RECOMMENDED ACTIONS AND CONTROL METHODS	RESP. & TARGET COMPLETION DATE	ACTION RESULTS				
									PREVENTION	DETECTION					ACTION TAKEN	SEV	OCC	DET	RPN
							・Nonconformance of inner pressure at firing	2	・Daily check	・Check of inner pressure	5	70	None						
							・Thermocouple breakdown	2	・Daily check & replacement	・Constant monitoring of temperature	3	42	None						
							・Oxygen sensor breakdown	2	・Daily check & replacement	・Constant monitoring of the electromotive force	2	28	None						
			Insufficient sintering	・Flash/IR failure ・Capacitance failure ・Out of spec. for TC	6		・Wrong profile	2	・Check of profile No	・Check of temperature & gas flow amount	5	60	None						
							・Nonconformance of gas flow rate	2	・Daily check	・Check of gas flow amount	5	60	None						
							・The temperature drop due to heater degradation	2	・Thermocouple calibration	・Detection of heater degradation	2	24	None						
							・Nonconformance of inner pressure at firing	2	・Daily check	・Check of inner pressure	5	60	None						
							・Thermocouple breakdown	2	・Daily check & replacement	・Constant monitoring of temperature	3	36	None						
							・Oxygen sensor breakdown	2	・Daily check & replacement	・Constant monitoring of the electromotive force	2	24	None						
			Coverage decrease of inner electrode	・Capacitance failure ・ESR failure	6		・Wrong profile	2	・Check of profile No	・Check of temperature & gas flow amount	5	60	None						
							・Nonconformance of gas flow rate	2	・Daily check	・Check of gas flow amount	5	60	None						
							・Nonconformance of temperature	2	・Daily check	・Check of temperature	5	60	None						
							・Nonconformance of inner pressure at firing	2	・Daily check	・Check of inner pressure	5	60	None						
							・Thermocouple breakdown	2	・Daily check	・Constant monitoring of temperature	3	36	None						
							・Oxygen sensor breakdown	2	・Daily check & replacement	・Constant monitoring of the electromotive force	2	24	None						
			Reaction failure/Pin hole on ceramic	・Appearance failure	6		・Reaction between chip & foreign material	2	- Periodical cleaning of sagger	・Appearance check	8	96	None						
			Crack or chipping, at the time of unloading	・Appearance failure	6		・Excess shock at unloading	2	・Limit of the chip drop height ・Use of shock absorber	・Appearance check	8	96	None						

No	PROCESS FUNCTION	PROCESS PURPOSE	POTENTIAL FAILURE MODE	EFFECT(S) OF FAILURE	SEV	SPE	POTENTIAL CAUSE(S) OF FAILURE	OCC	CURRENT PROCESS CONTROL		DET	RPN	RECOMMENDED ACTIONS AND CONTROL METHODS	RESP. & TARGET COMPLETION DATE	ACTION RESULTS				
									PREVENTION	DETECTION					ACTION TAKEN	SEV	OCC	DET	RPN
14	GRINDING	Making round corner and outline of the chip by grinding. Then exposing inner electrode to keep contact with termination.	Insufficient edge radius	・Peeled termination at corner ・Decrease of solder heatproof	7		・Slow barrel rotational speed	2	・Daily check ・Work standards	・Check of rotation speed	5	70	None						
							・Short grinding time	2	・Work standards	・Check of barrel time	5	70	None						
							・Variation of charge quantity	4	・Work standards	・Check of chip loading quantity	5	140	None						
			Excess edge radius	・Appearance failure ・Mount mistake ・Tombstone at mounting	6		・Fast barrel rotational speed	2	・Daily check ・Work standards	・Check of rotational speed	5	60	None						
							・Long grinding time	2	・Work standards	・Check of barrel time	5	60	None						
							・Variation of charge quantity	4	・Work standards	・Check of chip loading quantity	5	120	None						
			Inner electrode underexposure	・Insufficient capacitance	6		・Slow barrel rotational speed	2	・Daily check ・Work standards	・Check of rotational speed	5	60	None						
							・Short grinding time	2	・Work standards	・Check of barrel time	5	60	None						
							・Variation of charge quantity	4	・Work standards	・Check of chip loading quantity	5	120	None						
			Crack or chipping of chip	・Appearance failure ・Flash/IR failure	6		・Slow barrel rotational speed	2	・Daily check ・Work standards	・Check of rotational speed	5	60	None						
							・Short grinding time	2	・Work standards	・Check of barrel time	5	60	None						
							・Variation of charge quantity	4	・Work standards	・Check of chip loading quantity	5	120	None						
			Adhesion of grinding rubbish	・Appearance failure ・Capacitance failure	6		・Insufficient washing time	2	・Work standards	・Check of washing time	5	60	None						
							・Variation of charge quantity	4	・Work standards	・Check of chip loading quantity	5	120	None						
							・Insufficient washing water	2	・Work standards	・Check of water amount	5	60	None						
			Insufficient drying	・Appearance failure	6		・Decrease of drying temperature	2	・Work standards	・Check of dry temperature	5	60	None						
							・Insufficient drying time	2	・Work standards	・Check of drying time	5	60	None						
							・Decrease of air quantity	4	・Work standards	・Check of air quantity	5	120	None						
15	APPEARANCE CHECK	Confirmation of appearance quality after firing of chip.	Outflow of failure	・Appearance failure	6		・Judgment error	2	・Distribution of limit standard ・Use of loupe	-	10	120	None						
16	TERMINATION MATERIAL INCOMING INSPECTION	Inspecting of termination paste.	Mis-judgement	Characteristic failure	6		Mis-inspection	2	-	・Double check by other person	5	60	None						

No	PROCESS FUNCTION	PROCESS PURPOSE	POTENTIAL FAILURE MODE	EFFECT(S) OF FAILURE	SEV	SPE	POTENTIAL CAUSE(S) OF FAILURE	OCC	CURRENT PROCESS CONTROL		DET	RPN	RECOMMENDED ACTIONS AND CONTROL METHODS	RESP. & TARGET COMPLETION DATE	ACTION RESULTS				
									PREVENTION	DETECTION					ACTION TAKEN	SEV	OCC	DET	RPN
17	TERMINATION	Dipping termination to chip ends	Crack or chipping of chip	・Appearance failure	6		・Nonconformance of loading quantity of shaker	3	・Control of chip loading quantity	・check at the time of input	7	126	None						
			Thick termination	・Appearance failure ・Large dimension	6		・High specific gravity of paste	3	・Check of specific gravity	・Dimension check after termination	6	108	None						
							・Excess chip height at pressing on paste coating	3	・Check of chip height at pressing	・Dimension check after termination	6	108	None						
			Thin termination	・Appearance failure ・Small dimension	3		・Low specific gravity of paste	3	・Check of specific gravity	・Dimension check after termination	6	54	None						
							・Low chip height at pressing on paste coating	3	・Check of chip height at pressing	・Dimension check after termination	6	54	None						
			Large bandwidth small gap dimension	・Appearance failure ・Dimension failure	3		・Nonconformance of specific gravity of paste	3	・Check of specific gravity	・Dimension check after termination	6	54	None						
							・Excess chip height at pressing on paste coating	3	・Check of chip height at pressing	・Dimension check after termination	6	54	None						
			Small bandwidth Large gap dimension	・Appearance failure ・Dimension failure	3		・Nonconformance of specific gravity of paste	3	・Check of specific gravity	・Dimension check after termination	6	54	None						
							・Low chip height at pressing on paste coating	3	・Check of chip height at pressing	・Dimension check after termination	6	54	None						
18	TERMINATION FIRING	Sintering the external electrode to get the contact with the internal electrodes so that chip will grant the electrical characteristics.	Insufficient sintering	・Capacitance failure ・Flash/IR failure ・ESR defect	6		・Nonconformance of oxygen concentration	2	・Check of oxygen concentration	・The automatic monitoring of oxygen concentration	3	36	None						
							・Fast belt speed	2	・Check of belt speed	・Detection of belt slip	3	36	None						
							・Low firing temp.	2	・Check of temperature	・The automatic monitoring of temperature	3	36	None						
							・Wrong gas setting	2	・Check of gas setting	・Check of gas flow	5	60	None						
			Excess sintering	・Capacitance defect ・Poor solderability ・Flash/IR failure	6		・Nonconformance of oxygen concentration	2	・Check of oxygen concentration	・The automatic monitoring of oxygen concentration	3	36	None						
							・Low belt speed	2	・Check of belt speed	・Detection of belt slip	2	24	None						
							・High firing temp.	2	・Check of temperature	・The automatic monitoring of temperature	3	36	None						
							・Wrong gas setting	2	・Check of gas setting	・Check of gas flow	5	60	None						

No	PROCESS FUNCTION	PROCESS PURPOSE	POTENTIAL FAILURE MODE	EFFECT(S) OF FAILURE	SEV	SPE	POTENTIAL CAUSE(S) OF FAILURE	OCC	CURRENT PROCESS CONTROL		DET	RPN	RECOMMENDED ACTIONS AND CONTROL METHODS	RESP. & TARGET COMPLETION DATE	ACTION RESULTS				
									PREVENTION	DETECTION					ACTION TAKEN	SEV	OCC	DET	RPN
			Chip sticking	・Poor solderability ・Appearance failure	6		・Nonconformance of oxygen concentration	2	・Check of oxygen concentration	・The automatic monitoring of oxygen concentration	3	36	None						
							・Low belt speed	2	・Check of belt speed	・Detection of belt slip	2	24	None						
							・High firing temp.	2	・Check of temperature	・The automatic monitoring of temperature	3	36	None						
							・Wrong gas setting	2	・Check of gas setting	・Check of gas flow	5	60	None						
			Termination peel off	・Appearance failure	6		・Chip rubbing at the time of loading	3	・Automatical loading ・Regulate drop height of chip	・Appearance check	8	144	None						
			Crack or chipping of chip	・Appearance defect ・Flash/IR failure	6		・Excess shock at the time of loading	2	・Automatical loading ・Regulate drop height of chip	・Appearance check	8	96	None						
			Termination blister	・Appearance failure ・Dimension failure	6		・Nonconformance of oxygen concentration	2	・Check of oxygen concentration	・The automatic monitoring of oxygen concentration	3	36	None						
							・Lack of combustion gas emissions	2	・Check of exhaust gas temperature	・The automatic monitoring of temperature	3	36	None						
							・Over-sintering	2	・Check of temperature	・The automatic monitoring of temperature	3	36	None						
19	TERMINATION PLATING	Ni and Sn plating on termination electrodes to get solder heat resistance & good solderability	Nonconformance of Ni plating thickness	・Decrease of solder heat resistance ・Decrease of flex strength ・Appearance failure	7		・Nonconformance of plating temperature	2	・Automatic control of bath temperature	・The alarm in the case of abnormal	2	28	None						
							・Nonconformance of current density	2	・Automatic calculation of current value	・Constant monitoring of current value	2	28	None						
							・Nonconformance of plating time	2	・Control of plating time	・Check of plating thickness	6	84	None						
							・Nonconformance of loading Q'ty to barrel	2	・Control of chip loading quantity	・Check of plating thickness	6	84	None						
							・Nonconformance of media diameter	2	・Checking diameter of media	・Check of plating thickness	6	84	None						
							・Nonconformance of loading quantity of media	2	・Control of media loading quantity	・Check of plating thickness	6	84	None						
							・Nonconformance of plating bath concentration	2	・Control plating bath concentration	・Check of plating thickness	6	84	None						
							・Nonconformance of pH	2	・Check of PH	・Check of plating thickness	6	84	None						

No	PROCESS FUNCTION	PROCESS PURPOSE	POTENTIAL FAILURE MODE	EFFECT(S) OF FAILURE	SEV	SPE	POTENTIAL CAUSE(S) OF FAILURE	OCC	CURRENT PROCESS CONTROL		DET	RPN	RECOMMENDED ACTIONS AND CONTROL METHODS	RESP. & TARGET COMPLETION DATE	ACTION RESULTS				
									PREVENTION	DETECTION					ACTION TAKEN	SEV	OCC	DET	RPN
							・Insufficient contact to cathode	2	–	・Check of plating thickness	6	84	None						
			Nonconformance of Sn plating thickness	・Poor solderability ・Appearance failure	6	◎	・Nonconformance of plating temperature	2	・Automatic control of bath temperature	・The alarm in the case of abnormal	2	24	None						
							・Nonconformance of current density	2	・Automatic calculation of current value	・Constant monitoring of current value	2	24	None						
							・Nonconformance of plating time	2	・Control of plating time	・Check of plating thickness	6	72	None						
							・Nonconformance of loading Q'ty to barrel	2	・Control of chip loading quantity	・Check of plating thickness	6	72	None						
							・Nonconformance of media diameter	2	・Checking diameter of media	・Check of plating thickness	6	72	None						
							・Nonconformance of loading quantity of steel media	2	・Control of media loading quantity	・Check of plating thickness	6	72	None						
							・Nonconformance of plating bath concentration	2	・Control plating bath concentration	・Check of plating thickness	6	72	None						
							・Nonconformance of pH	2	・Check of PH	・Check of plating thickness	6	72	None						
							・Insufficient contact to cathode	2	-	・Check of plating thickness	6	72	None						
			Twin chips	・Appearance failure ・Poor solderability	6		・Nonconformance of plating bath concentration	2	・Control plating bath concentration	・Analysis of bath concentration	5	60	None						
			Growth of plate	・Appearance failure ・Dimension failure ・Flash/IR failure	6		・Nonconformance of media diameter	2	・Checking diameter of media	・Measurement of media diameter	5	60	None						
							・Nonconformance of loading quantity of steel media	2	・Control of chip loading quantity	・Measurement of media weight	5	60	None						
							・Nonconformance of current density	2	・Automatic calculation of current value	・Constant monitoring of current value	2	24	None						
							・Nonconformance of plating bath concentration	2	・Control plating bath concentration	・Analysis of bath concentration	5	60	None						
			Insufficient cleansing	・Flash/IR failure ・Appearance failure	6		・Impure deionizer water	4	・Control of conductivity	・Measurement of conductivity	5	120	None						
			Insufficient drying condition	・Flash/IR failure ・Appearance failure	6		・Control device breakdown	2	・Control of temperature	・Temperature alarm	3	36	None						

No	PROCESS FUNCTION	PROCESS PURPOSE	POTENTIAL FAILURE MODE	EFFECT(S) OF FAILURE	SEV	SPE	POTENTIAL CAUSE(S) OF FAILURE	OCC	CURRENT PROCESS CONTROL		DET	RPN	RECOMMENDED ACTIONS AND CONTROL METHODS	RESP. & TARGET COMPLETION DATE	ACTION RESULTS				
									PREVENTION	DETECTION					ACTION TAKEN	SEV	OCC	DET	RPN
							・Decrease of drying temperature	2	・Control of temperature	・Temperature alarm	3	36	None						
							・Insufficient drying time	2	・Control of drying time	・visual check when taking out	8	96	None						
			Crack or chipping of chip	・Appearance failure	6		・Shock when discharging the chip	2	・Limit of the chip drop height	・visual check when taking out	8	96	None						
20	OUTGOING INSPECTION	-	-	-			-		-	-			-						
20-1	ELECTRICAL INSPECTION	Inspect electrical characteristics automatically & remove defect chip	Outflow of capacitance failure	・Capacitance failure	7		・Nonconformance of measuring voltage	2	・Daily & periodical check ・Regular calibration	・Check by dedicated work	5	70	None						
							・Abrasion or uncleanness of measurement terminals	2	・Periodical check	・Visual check, regular cleaning	7	98	None						
							・Nonconformance of room temperature	2	・Control of room temperature/humidity	・Check of room temperature/humidity	5	70	None						
							・Nonconformance of measurement condition	2	・Check of sorting condition	Automatic setting	2	28	None						
			Outflow of DF failure	・DF failure	7		・Nonconformance of measuring voltage	2	・Daily & periodical check ・Regular calibration	・Check by dedicated work	5	70	None						
							・Abrasion or uncleanness of measurement terminals	2	・Periodical check	・Visual check, regular cleaning	7	98	None						
							・Nonconformance of room temperature	2	・Control of room temperature/humidity	・Check of room temperature/humidity	5	70	None						
							・Nonconformance of measurement condition	2	・Check of sorting condition	Automatic setting	2	28	None						
			Outflow of Flash/IR failure	・Flash/IR failure	8		・Nonconformance of IR meter	2	・Daily & periodical check ・Regular calibration	・Check by dedicated work	6	96	None						
							・Abrasion or uncleanness of measurement terminals	2	・Periodical check	・Visual check, regular cleaning	7	112	None						
							・Nonconformance of measurement condition	2	・Check of sorting condition	Automatic setting	2	32	None						
			Crack or chipping of chip	・Appearance failure	6		・High pressure of measurement terminal	3	・Periodical check	・Regular appearance check	7	126	None						
							・Position error on conveyance	3	・Periodical check	・Regular appearance check	7	126	None						
							・Shock when discharging the chip	2	・Limit of the chip drop height	・Regular appearance check	7	84	None						

No	PROCESS FUNCTION	PROCESS PURPOSE	POTENTIAL FAILURE MODE	EFFECT(S) OF FAILURE	SEV	SPE	POTENTIAL CAUSE(S) OF FAILURE	OCC	CURRENT PROCESS CONTROL		DET	RPN	RECOMMENDED ACTIONS AND CONTROL METHODS	RESP. & TARGET COMPLETION DATE	ACTION RESULTS				
									PREVENTION	DETECTION					ACTION TAKEN	SEV	OCC	DET	RPN
			Rubbing	・Appearance failure ・poor solderability	6		・Abrasion or uncleanness of measurement terminals	2	・Periodical check	・Visual check, regular cleaning	7	84	None						
							・Uncleanness of conveying equipment	2	・Periodical check	・Visual check, regular cleaning	7	84	None						
							・Excess charge quantity	3	・Control of charge quantity	・Regular appearance check	7	126	None						
20-2	APPEARANCE INSPECTION	Inspect appearance & remove defect chip	Outflow of defect	・Appearance failure	6		・Judgment error	2	・Distribution of limit standard ・Use of loupe ・Periodical check	-	10	120	None						
20-3	DIMENSION INSPECTION	Inspect dimension	Outflow of defect	・Dimension defect	6		・Non-conformance of Measuring instrument	2	・Caliblation of Measuring instrument	-	10	120	None						
20-4	FINAL INSPECTION	Check of inspection resilt , lot history	Mis-judgement	・Characteristic failure ・Appearance failure	8		・Mis-inspection	2	・Qualification system of inspectors	Verification of inspection items (System)	3	48	None						
21	TAPING MATERIAL INCOMING INSPECTION	Inspecting of taping material.	Mis-judgement	・Taping machine breakdown ・Conveyance trouble at mounting	5		・Mis-inspection	2	-	・Double check by other person	5	50	None						
22	TAPING	Processing specific taping style according to customer demand. (Spec.)	Nonconformance of peeling-off strength of top film	・Defect regarding mounting	5		・Nonconformance of heat-sealer temperature & pressure	3	・Daily check	・Checking peeling-off strength	5	75	None						
			Lot mixture	・Characteristic failure	6		・Chip mixing of before lot	3	・Cleaning at the time of lot exchange	・Check of all chips capacitance value	4	72	None						
			Chipping	・Appearance failure	6		・Unsuitable position of terminals for electrical sorting & conveyance system	2	・Daily check	・Appearance sorting	4	48	None						
			Crack	・Flash/IR failure	6		・Impact on the chip by the air cylinder separation pin	1	・Daily check	・Appearance sorting	4	24	None						
23	TAPING INSPECTION	Check of taping appearance defect after wrapping.	Lot mixture	・Characteristic failure	6		・Remained reel on the desk causes mixing to the next lot	2	・Thoroughness of confirmation above desk at lot exchange	・Collation of work order sheet, product name, label ・One-work / one-desk ・Collation of lot No., ticket	2	24	None						
							・Several lot on the desk causes lot mixing	2	・Thoroughness of one-lot one-desk	・Collation of work order sheet, product name, label ・One-work / one-desk ・Collation of lot No., ticket	2	24	None						

No	PROCESS FUNCTION	PROCESS PURPOSE	POTENTIAL FAILURE MODE	EFFECT(S) OF FAILURE	SEV	SPE	POTENTIAL CAUSE(S) OF FAILURE	OCC	CURRENT PROCESS CONTROL		DET	RPN	RECOMMENDED ACTIONS AND CONTROL METHODS	RESP. & TARGET COMPLETION DATE	ACTION RESULTS				
									PREVENTION	DETECTION					ACTION TAKEN	SEV	OCC	DET	RPN
			Outflow of appearance defect	・Appearance failure	6		・Operator's mis-recognition of limit standard	2	・Accuracy confirmation by periodic training program for operator	・Double check by other person	5	60	None						
24	PACKING	Packing according to each specification.	Wrong label	・Wrong products	7		・Human error	2	・Operator education	Barcode check	2	28	None						
			Label removed from reel	・No label	3		・Low adhesive strength	2	・Adhesive strength up	Label appearance check	6	36	None						
25	PICKING	Retrieve the products with the shipping instruction from the storage cabinet.	Damage of reel	・Trouble at mounting process	5		・Drop the reel erroneously at delivery	3	・Training of handling	・Check of reel	7	105	None						
			Wrong parts No.	・Wrong product shipping in LBL process	6		・The picking person put into wrong bucket which differ from instruction	3	・Matching between the collective bucket and the products by barcode	・Check of all reels (Match between the shipping instruction and the inspection No.)	4	72	None						
26	PASTE THE REEL LABEL	Sticking C3 label to specific position of the products.	Drity label	Apperance defect of label	5		・Abnormal of printing head	2	・Daily check of printer	・Visual check	7	70	None						
			Barcode is faint	Reading error in customer	5		・Operation failure of thermal head	2	・ Daily check	・Visual check by operator	7	70	None						
			Peeling label	Reading error in customer	5		[Hand sticking] ・Pressing force to label is weak	2	・Standanization of sticking operation	・Appearance check	7	70	None						
					5		[LBL] ・Set of pressing force to label is weak	2	・Check of press force power by periodical inspection	・Visual check	7	70	None						
27	PACKING TO OUTER PACKAGE BOX	Put the products into outer package box or collective bucket.	Nonconformance of reel quantity in outer package box	Delivery shortage to customer	5		・Insufficient check of quantity in outer package box	2	・Operator education	[LBL] ・Detection of transport number	3	30	None						
					5		・Insufficient check of quantity in outer package box	2	・Operator education	・Check by operator	7	70	None						
			Damage of reel	Trouble at mounting process	5		・Use of outer package box differ size from instruction	2	・Operator education	・Check of outer package box	7	70	None						
			Wrong parts No.	Operation failure at customer	6		・Operating differ from individual instruction	2	・Operator education	・Check of individual instruction	7	84	None						
28	PASTE THE PACKING LABEL	Sticking D/G label to specific position of outer package box.	Label tear	Apperance defect of label	5		・Abnormal of label printer	2	・Cleaning and periodical inspection of printer	・Visual check of label apperance all items	7	70	None						

No	PROCESS FUNCTION	PROCESS PURPOSE	POTENTIAL FAILURE MODE	EFFECT(S) OF FAILURE	SEV	SPE	POTENTIAL CAUSE(S) OF FAILURE	OCC	CURRENT PROCESS CONTROL		DET	RPN	RECOMMENDED ACTIONS AND CONTROL METHODS	RESP. & TARGET COMPLETION DATE	ACTION RESULTS				
									PREVENTION	DETECTION					ACTION TAKEN	SEV	OCC	DET	RPN
			Drity label	Apperance defect of label	5		・Abnormal of thermal head	2	・Cleaning and periodical inspection of printer	・Visual check	7	70	None						
			Peeling label	Reading error in customer	5		[Hand sticking] ・Pressing force to label is weak	2	・Standanization of sticking operation	・Appearance check	7	70	None						
					5		[LBL] ・Set of pressing force to label is weak	2	・Check of press force power by periodical inspection	・Visual check	7	70	None						
29	COLLECTIVE PACKING	Attached the statement of delivery follows instruction from customer, and shipping with collective package.	Nonconformance of quantity	Nonconformance of quantity to customer	5		・Miss counting by operator	2	・Operator education	・Barcode check	2	20	None						
			Mistake product	Wrong product shippment to customer	5		・Not kept 1 desk-1 work condition	2	・Operator education	None	10	100	None						
30	SHIPPING	Transferring to deliverer the collective package product.	Damage of product	Impossible to mounting due to damage of product in customer process	5		・Drop product	2	・Operator education	・Check the products	7	70	None						
31	LOADING	Loading product to truck.	Damaged to product by drop	Degradation or damage of product (clack etc.)	6		・Drop product by hand lift when transporting	3	・Educational implementation	・Check the products when dropped	7	126	None						
32	DELIVERY	Delivered products on time without damage.	Cargo shift	Degradation or damage of product (clack etc.)	6		・Slide the cushion by vibration during transport, less fixing, excess clearance	3	・Educational implementation	・Check the products when unloading or transship	7	126	None						
			Late arrival	Delivery delay	4		・Vehicle trouble	3	・Vehicle inspection	・Vehicle inspection	5	60	None						
		Unloading to the delivery place.	Drop product	Degradation or damage of product (clack etc.)	6		・Impatience, unusual position	3	・Educational implementation	・Check the products when dropped	7	126	None						

6. Dimensional Results

7. Material, Performance Test Results

This data is typical of X7R of this size.

AEC Q200 Summary of Test Results

Supplier: Murata

Submission Date: July / 2018

Part Name:

GCM188R71E105KA64

Series description:

GCM / 0603 / X7R / 25V Series

muRata
INNOVATOR IN ELECTRONICS

Murata P/N: GCM188R71E105KA64

Part Series GCM / 0603 / X7R / 25V Series

Operating Temperature: -55℃ ~ +125℃

Test Item	Test Conditions	No of Lots	Qty per Lot	No of Failure
#3 - High Temperature Exposure	Test conditions : 1000hr , 150deg C	1	77	0
#4 - Temperature Cycling	Test conditions : 1000cycles , -55deg C to 125deg C	1	77	0
#5 - Destructive Physical Analysis		1	10	0
#6 - Moisture Resistance	Test conditions : 10cycles(1cycle : 24hr) , 25deg C / 80% RH to 65deg C / 98% RH	1	77	0
#7 - Biased Humidity (I)	Test Conditions : 1000hr , 85deg C / 85% RH , 1WV	1	77	0
#7 - Biased Humidity (II)	Test Conditions : 1000hr , 85deg C / 85% RH , 1.3V	1	77	0
#8 - Operational Life	Test conditions : 1000hr ,125deg C , 1.5WV	1	77	0
#9 - External Visual Examination		all qualification parts		0
#10 - Physical Dimensions		1	30	0
#12 Resistance to solvents	Test conditions A : 1 part (by volume) of isopropyl alcohol and 3 parts (by volume) of mineral sperits , 25deg C 3min immersion test conditions B : terpene defluxer, 25deg C 3min immersion test conditions C : 42 parts(by volume) of water and 1 part (by volume) of propylene glycol monomethylether and 1 part (by volume) of monoethanolamine, 63-70deg C 3min immersion	1	5	0
#13 - Mechanical Shock	Test conditions : shock pulse : 1500g's, 0.5ms, 4.7m/s, 3 times each of 6 orientations	1	30	0
#14 - Vibration	Test conditions : 5g's for 20min, 12 cycles each of 3 orientations, test frequency 10 - 2000Hz	1	30	0
#15 - Resistance to Soldering Heat	Test Conditions : soldering , 260C 10sec immersion	1	30	0
#16 - Thermal Shock	Test conditions : 300Cycles (-55deg C to 125deg C) , Maximum transfer time 20sec , keeping time 15min	1	15	0
#17 - ESD Test	Test conditions : charge capacitor 150pF, discharge resistor 2000ohm	1	30	0
#18 - Solderability	Test conditions : 1.soldering 235C 5sec immersion, 2.soldering 235C 5sec immersion, 3.soldering 260C 120sec immersion	1	15	0
#19 - Electrical Characterization	Test conditions : 1+/-0.1KHz, 1+/-0.2Vrms	1	30	0
#21 - Board Flex	Test conditions : bend board at 2mm for 5sec pass/fail criteria : cap change within +/-10%	1	30	0
#22 - Terminal Strength (SMD)	Test conditions : Force of 1.8kg for 60sec	1	30	0
#23 - Beam Load	Test conditions : Apply a force until the part brakes pass/fail criteria: 0805 size or smaller: 20N over (t>0.5mm), 8N over (t<=0.5mm) 1206 size or bigger: 15N over (t<1.25mm), 54.5N over (t>=1.25mm)	1	30	0

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM188R71E105KA64
Manufacturung Location: Philippine	Lot No: A
Date before test:2018/03/13	Date after test:2018/04/24

#3 - High Temperature Exposure

Test conditions : 1000hr , 150deg C

No. of samples:	77	Initial readings			Final readings			
No. of lots:	1	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
Spec limits	lower	0.90		5.0E+01			5.0E+01	-12.50
	upper	1.10	10.00			10.00		12.50
Measurement Statistics	minimum	0.98	9.25	2.6E+03	0.91	8.42	2.4E+03	-7.26
	maximum	1.04	9.46	3.2E+03	0.97	8.60	3.4E+03	-6.39
	mean	1.01	9.36	2.9E+03	0.94	8.52	2.9E+03	-6.90
	standard deviation	0.01	0.05	1.4E+02	0.01	0.04	2.1E+02	0.19
Presence of Failures		in spec	in spec	in spec	in spec	in spec	in spec	in spec

Test Data

Lot #	Sample	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
A	1	1.01	9.33	2.9E+03	0.94	8.53	2.9E+03	-7.02
	2	1.01	9.38	2.8E+03	0.94	8.44	3.3E+03	-7.12
	3	1.00	9.38	2.9E+03	0.93	8.55	2.9E+03	-7.26
	4	0.98	9.35	2.8E+03	0.91	8.53	3.1E+03	-7.25
	5	0.99	9.35	2.9E+03	0.93	8.51	2.9E+03	-6.39
	6	1.01	9.31	2.9E+03	0.94	8.52	3.1E+03	-6.92
	7	1.02	9.36	2.7E+03	0.95	8.51	2.5E+03	-7.01
	8	1.00	9.35	2.9E+03	0.93	8.54	2.9E+03	-6.91
	9	1.00	9.37	3.2E+03	0.93	8.42	3.3E+03	-6.89
	10	1.01	9.39	2.8E+03	0.94	8.49	3.0E+03	-6.75
	11	1.02	9.37	2.9E+03	0.95	8.51	2.9E+03	-6.84
	12	1.02	9.37	2.9E+03	0.95	8.54	3.2E+03	-6.98
	13	0.99	9.35	2.8E+03	0.92	8.50	3.4E+03	-7.03
	14	1.01	9.30	2.8E+03	0.94	8.55	3.0E+03	-6.95
	15	1.02	9.36	2.9E+03	0.95	8.50	3.1E+03	-6.96
	16	0.99	9.42	3.0E+03	0.93	8.56	2.8E+03	-6.77
	17	1.01	9.37	2.8E+03	0.94	8.52	2.9E+03	-7.01
	18	1.00	9.25	2.9E+03	0.94	8.54	2.9E+03	-6.57
	19	1.02	9.35	3.0E+03	0.94	8.54	2.8E+03	-7.23
	20	0.99	9.43	2.9E+03	0.93	8.49	3.0E+03	-6.66
	21	1.01	9.34	2.8E+03	0.95	8.49	2.5E+03	-6.68
	22	1.03	9.46	2.9E+03	0.96	8.55	2.8E+03	-7.01
	23	1.02	9.32	3.0E+03	0.95	8.53	3.0E+03	-7.00
	24	1.01	9.31	2.8E+03	0.94	8.49	2.9E+03	-7.05
	25	1.01	9.39	3.1E+03	0.95	8.54	2.6E+03	-6.70
	26	1.01	9.36	2.6E+03	0.94	8.57	3.4E+03	-6.80
	27	1.03	9.41	2.9E+03	0.96	8.55	2.8E+03	-6.82
	28	1.01	9.37	2.6E+03	0.94	8.56	2.8E+03	-6.88
	29	0.99	9.37	3.0E+03	0.93	8.57	3.0E+03	-6.94
	30	1.00	9.44	2.9E+03	0.93	8.54	2.9E+03	-6.69
	31	1.04	9.29	2.9E+03	0.96	8.51	2.9E+03	-6.84
	32	0.98	9.39	2.9E+03	0.92	8.48	3.1E+03	-6.54
	33	1.01	9.36	3.1E+03	0.94	8.44	3.1E+03	-6.92
	34	1.01	9.36	2.9E+03	0.94	8.52	2.8E+03	-7.01
	35	0.99	9.38	3.1E+03	0.92	8.46	2.7E+03	-7.01
	36	1.02	9.39	3.1E+03	0.95	8.53	2.9E+03	-6.49
	37	1.01	9.37	2.6E+03	0.94	8.57	3.0E+03	-6.97
	38	1.01	9.46	2.9E+03	0.95	8.52	2.9E+03	-6.80
	39	1.02	9.32	2.7E+03	0.95	8.53	2.6E+03	-7.10
	40	1.00	9.46	3.0E+03	0.93	8.57	3.1E+03	-6.97
	41	1.04	9.42	2.7E+03	0.97	8.46	2.4E+03	-6.71
	42	1.01	9.28	2.9E+03	0.94	8.60	2.8E+03	-7.05
	43	1.02	9.36	2.8E+03	0.95	8.53	2.7E+03	-6.65
	44	0.98	9.44	2.8E+03	0.92	8.58	2.8E+03	-6.79
	45	1.01	9.38	2.9E+03	0.94	8.56	3.2E+03	-6.89
	46	1.01	9.36	2.8E+03	0.93	8.54	2.7E+03	-7.21
	47	1.01	9.37	3.0E+03	0.94	8.43	2.7E+03	-6.57
	48	0.99	9.37	2.8E+03	0.92	8.52	2.8E+03	-6.96
	49	0.98	9.25	2.6E+03	0.92	8.50	2.9E+03	-6.77
	50	1.00	9.29	2.9E+03	0.93	8.58	2.9E+03	-7.14

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM188R71E105KA64
Manufacturung Location: Philippine	Lot No: A
Date before test:2018/03/13	Date after test:2018/04/24

#3 - High Temperature Exposure

Test conditions : 1000hr , 150deg C

	51	1.02	9.33	2.8E+03	0.95	8.58	3.1E+03	-7.04
	52	1.03	9.37	2.9E+03	0.96	8.56	3.2E+03	-6.93
	53	1.01	9.31	2.9E+03	0.94	8.54	2.8E+03	-7.11
	54	1.02	9.38	2.7E+03	0.94	8.55	3.0E+03	-7.22
	55	1.01	9.42	2.8E+03	0.94	8.50	2.8E+03	-6.83
	56	1.02	9.26	2.8E+03	0.95	8.44	2.8E+03	-6.79
	57	1.03	9.44	2.8E+03	0.96	8.52	2.8E+03	-7.09
	58	1.00	9.34	2.8E+03	0.93	8.51	2.8E+03	-7.04
	59	1.01	9.37	2.8E+03	0.94	8.55	3.4E+03	-7.17
	60	1.02	9.42	2.8E+03	0.94	8.43	2.8E+03	-7.03
	61	1.02	9.33	3.0E+03	0.95	8.51	3.2E+03	-6.98
	62	0.99	9.39	2.7E+03	0.92	8.53	3.2E+03	-6.73
	63	0.99	9.34	3.1E+03	0.92	8.60	2.9E+03	-6.76
A	64	1.00	9.31	2.7E+03	0.93	8.53	2.7E+03	-7.04
	65	1.01	9.40	2.7E+03	0.94	8.53	2.7E+03	-6.87
	66	0.99	9.39	3.0E+03	0.92	8.52	2.5E+03	-7.15
	67	1.03	9.37	2.8E+03	0.96	8.49	2.8E+03	-6.96
	68	1.01	9.42	3.1E+03	0.94	8.56	2.7E+03	-6.59
	69	1.00	9.40	2.8E+03	0.93	8.59	3.2E+03	-6.86
	70	1.01	9.34	2.7E+03	0.94	8.45	2.7E+03	-6.73
	71	1.02	9.33	3.1E+03	0.95	8.50	3.1E+03	-7.17
	72	1.01	9.28	3.0E+03	0.94	8.49	3.0E+03	-6.89
	73	1.01	9.41	2.8E+03	0.94	8.56	2.9E+03	-6.98
	74	1.04	9.30	2.6E+03	0.96	8.59	3.3E+03	-7.06
	75	1.01	9.28	3.0E+03	0.94	8.46	2.7E+03	-6.70
	76	1.00	9.32	2.9E+03	0.93	8.54	2.8E+03	-6.78
	77	1.00	9.41	3.1E+03	0.93	8.49	3.1E+03	-6.60

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM188R71E105KA64
Manufacturung Location: Philippine	Lot No: A
Date before test:2018/03/20	Date after test:2018/05/22

#4 - Temperature Cycling

Test conditions : 1000cycles , -55deg C to 125deg C

No. of samples:	77	Initial readings			Final readings			
No. of lots:	1	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
Spec limits	lower	0.90		5.0E+01			5.0E+01	-10.00
	upper	1.10	10.00			10.00		10.00
Measurement Statistics	minimum	0.97	9.25	7.4E+02	0.97	8.95	6.9E+02	-1.04
	maximum	1.04	9.59	1.4E+03	1.04	9.22	1.4E+03	-0.34
	mean	1.00	9.36	1.1E+03	1.00	9.07	1.1E+03	-0.71
	standard deviation	0.01	0.06	1.6E+02	0.02	0.07	2.0E+02	0.17
Presence of Failures		in spec	in spec	in spec	in spec	in spec	in spec	in spec

Test Data

Lot #	Sample	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
A	1	1.00	9.42	7.8E+02	0.99	9.11	1.0E+03	-0.94
	2	0.99	9.38	1.3E+03	0.98	9.07	1.3E+03	-0.71
	3	1.00	9.33	1.1E+03	0.99	9.08	1.1E+03	-0.49
	4	0.99	9.36	9.2E+02	0.99	9.11	1.0E+03	-0.39
	5	1.00	9.33	1.3E+03	1.00	9.07	1.2E+03	-0.56
	6	1.00	9.38	8.5E+02	0.99	9.14	1.4E+03	-0.47
	7	1.01	9.26	1.3E+03	1.01	8.97	1.1E+03	-0.72
	8	1.01	9.33	1.1E+03	1.01	9.02	1.3E+03	-0.49
	9	1.00	9.33	9.6E+02	1.00	9.18	7.0E+02	-0.42
	10	1.00	9.35	1.2E+03	0.99	9.05	9.5E+02	-0.74
	11	1.00	9.32	9.2E+02	1.00	9.22	1.3E+03	-0.34
	12	1.02	9.35	9.4E+02	1.01	9.02	1.0E+03	-0.87
	13	1.04	9.31	1.0E+03	1.03	9.13	7.2E+02	-0.97
	14	1.00	9.33	7.4E+02	1.00	9.14	1.3E+03	-0.60
	15	0.98	9.41	1.0E+03	0.97	9.05	1.0E+03	-0.81
	16	0.99	9.41	1.3E+03	0.98	9.19	1.4E+03	-0.78
	17	1.00	9.38	9.9E+02	0.99	9.10	1.3E+03	-0.73
	18	0.99	9.31	9.9E+02	0.98	9.07	1.1E+03	-0.93
	19	1.02	9.32	7.6E+02	1.01	9.13	9.3E+02	-0.47
	20	1.02	9.33	1.3E+03	1.01	9.09	1.0E+03	-0.51
	21	1.00	9.36	1.1E+03	1.00	9.07	9.2E+02	-0.66
	22	1.02	9.35	1.3E+03	1.01	9.05	1.4E+03	-0.57
	23	0.99	9.34	9.9E+02	0.99	9.07	1.3E+03	-0.56
	24	1.01	9.43	1.1E+03	1.00	8.97	1.3E+03	-0.67
	25	0.99	9.33	1.1E+03	0.98	9.00	1.2E+03	-0.89
	26	1.01	9.37	1.2E+03	1.00	9.05	1.4E+03	-0.82
	27	1.00	9.29	1.1E+03	0.99	9.07	1.3E+03	-0.75
	28	0.99	9.28	1.0E+03	0.98	9.06	1.4E+03	-0.88
	29	0.98	9.45	1.1E+03	0.98	9.06	1.1E+03	-0.73
	30	1.02	9.35	1.0E+03	1.01	9.18	1.2E+03	-0.75
	31	0.99	9.33	1.3E+03	0.98	8.96	1.4E+03	-0.93
	32	0.99	9.32	1.2E+03	0.98	9.04	9.7E+02	-0.98
	33	1.01	9.35	9.5E+02	1.00	9.07	1.1E+03	-0.79
	34	0.97	9.50	1.2E+03	0.97	9.06	1.1E+03	-0.68
	35	1.01	9.35	8.4E+02	1.00	9.04	8.9E+02	-0.58
	36	1.00	9.35	1.1E+03	0.99	9.07	1.1E+03	-0.68
	37	1.00	9.35	9.8E+02	0.99	9.08	1.4E+03	-0.82
	38	1.01	9.36	1.2E+03	1.00	9.06	1.2E+03	-0.59
	39	1.01	9.44	1.1E+03	1.01	8.95	1.0E+03	-0.75
	40	0.99	9.37	1.1E+03	0.99	8.99	1.1E+03	-0.77
	41	1.03	9.32	8.1E+02	1.03	9.09	7.1E+02	-0.55
	42	0.98	9.59	9.1E+02	0.98	9.15	1.3E+03	-0.68
	43	1.03	9.29	1.2E+03	1.02	9.19	7.1E+02	-0.53
	44	0.99	9.36	1.0E+03	0.98	9.05	7.3E+02	-1.04
	45	0.98	9.35	1.2E+03	0.97	8.98	9.0E+02	-0.85
	46	1.01	9.32	1.2E+03	1.00	9.05	1.4E+03	-0.84
	47	1.01	9.41	8.6E+02	1.00	9.07	1.2E+03	-0.80
	48	1.02	9.36	1.3E+03	1.01	9.21	1.0E+03	-0.82
	49	1.02	9.37	8.2E+02	1.01	9.11	1.4E+03	-0.58
	50	0.99	9.33	1.0E+03	0.98	9.06	1.1E+03	-0.98

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM188R71E105KA64
Manufacturung Location: Philippine	Lot No: A
Date before test:2018/03/20	Date after test:2018/05/22

#4 - Temperature Cycling

Test conditions : 1000cycles , -55deg C to 125deg C

	51	1.01	9.52	1.2E+03	1.00	9.04	1.2E+03	-0.81
	52	0.99	9.48	1.3E+03	0.99	9.16	8.7E+02	-0.53
	53	1.01	9.40	1.1E+03	1.00	8.97	1.4E+03	-0.52
	54	1.02	9.31	1.1E+03	1.02	9.08	1.1E+03	-0.70
	55	1.01	9.32	1.0E+03	1.00	9.00	9.8E+02	-0.53
	56	0.98	9.42	1.1E+03	0.97	9.02	1.3E+03	-0.75
	57	1.01	9.39	8.4E+02	1.00	9.03	1.0E+03	-0.93
	58	1.03	9.33	1.0E+03	1.02	9.07	1.3E+03	-0.43
	59	0.99	9.35	1.3E+03	0.98	9.03	1.1E+03	-0.84
	60	1.01	9.38	8.9E+02	1.00	9.07	1.1E+03	-0.75
	61	1.02	9.39	1.2E+03	1.02	9.10	1.3E+03	-0.70
	62	1.02	9.26	1.0E+03	1.01	8.95	9.3E+02	-0.72
	63	1.01	9.43	1.3E+03	1.00	9.00	1.3E+03	-0.83
A	64	1.00	9.38	9.8E+02	0.99	9.05	1.0E+03	-0.97
	65	1.03	9.32	1.1E+03	1.02	9.14	1.2E+03	-0.80
	66	1.00	9.38	1.1E+03	1.00	9.08	1.3E+03	-0.53
	67	1.03	9.45	1.2E+03	1.02	9.15	6.9E+02	-0.96
	68	0.98	9.41	9.6E+02	0.97	9.15	8.3E+02	-1.04
	69	1.02	9.46	1.4E+03	1.02	8.96	7.7E+02	-0.54
	70	1.01	9.27	8.1E+02	1.00	9.12	9.4E+02	-0.90
	71	1.02	9.29	1.2E+03	1.01	9.20	1.2E+03	-0.58
	72	1.00	9.25	7.9E+02	0.99	9.15	1.1E+03	-0.68
	73	0.99	9.40	9.4E+02	0.98	9.02	8.6E+02	-0.85
	74	1.03	9.36	9.1E+02	1.02	9.05	1.1E+03	-0.67
	75	1.00	9.32	1.1E+03	0.99	9.14	1.4E+03	-0.72
	76	1.01	9.44	9.5E+02	1.00	8.96	1.0E+03	-0.49
	77	0.98	9.37	8.5E+02	0.97	9.16	1.2E+03	-0.65

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM188R71E105KA64
Manufacturung Location: Philippine	Lot No: A
Date before test:2018/03/15	

#5 - Destructive Physical Analysis

Number of Samples: 10 Number of Lots: 1	Number of failures: 0

Lot #	Sample	Result (pass/fail)
A	1	pass
	2	pass
	3	pass
	4	pass
	5	pass
	6	pass
	7	pass
	8	pass
	9	pass
	10	pass

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM188R71E105KA64
Manufacturung Location: Philippine	Lot No: A
Date before test:2018/03/27	Date after test:2018/04/24

#6 - Moisture Resistance

Test conditions : 10cycles(1cycle : 24hr) , 25deg C / 80% RH to 65deg C / 98% RH

No. of samples:	77	Initial readings			Final readings			
No. of lots:	1	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
Spec limits	lower	0.90		5.0E+01			5.0E+01	-10.00
	upper	1.10	10.00			20.00		10.00
Measurement Statistics	minimum	0.97	9.23	7.4E+02	0.97	9.16	8.9E+02	-0.48
	maximum	1.03	9.59	1.3E+03	1.03	9.39	1.6E+03	0.32
	mean	1.01	9.40	1.0E+03	1.01	9.26	1.3E+03	-0.05
	standard deviation	0.01	0.08	1.3E+02	0.01	0.05	1.7E+02	0.22
Presence of Failures		in spec	in spec	in spec	in spec	in spec	in spec	in spec

Test Data

Lot #	Sample	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
A	1	1.01	9.43	1.0E+03	1.01	9.19	9.6E+02	-0.33
	2	1.01	9.30	1.0E+03	1.01	9.32	1.4E+03	-0.10
	3	1.01	9.42	1.1E+03	1.01	9.20	1.4E+03	0.12
	4	1.03	9.39	1.2E+03	1.03	9.25	9.8E+02	-0.09
	5	1.01	9.42	1.2E+03	1.00	9.28	1.2E+03	-0.09
	6	1.01	9.31	9.3E+02	1.01	9.31	1.1E+03	0.04
	7	0.99	9.38	1.2E+03	0.99	9.34	1.2E+03	0.11
	8	1.01	9.42	9.1E+02	1.00	9.27	1.2E+03	-0.30
	9	1.02	9.38	8.4E+02	1.02	9.32	1.1E+03	-0.02
	10	1.01	9.46	1.2E+03	1.01	9.23	1.1E+03	-0.42
	11	1.00	9.48	8.7E+02	1.00	9.22	1.2E+03	-0.09
	12	1.03	9.37	1.1E+03	1.03	9.28	1.2E+03	-0.08
	13	1.00	9.49	1.0E+03	1.01	9.18	1.2E+03	0.29
	14	1.02	9.40	9.2E+02	1.02	9.26	1.3E+03	-0.05
	15	1.02	9.40	1.2E+03	1.01	9.29	1.2E+03	-0.43
	16	0.99	9.36	8.4E+02	0.99	9.24	1.4E+03	0.03
	17	1.01	9.41	1.1E+03	1.01	9.39	1.1E+03	0.08
	18	1.01	9.39	9.5E+02	1.01	9.28	1.3E+03	-0.34
	19	1.02	9.48	7.9E+02	1.01	9.26	1.1E+03	-0.32
	20	1.01	9.43	9.4E+02	1.01	9.24	1.5E+03	-0.34
	21	1.02	9.47	1.1E+03	1.02	9.29	1.3E+03	-0.27
	22	1.02	9.29	8.2E+02	1.01	9.25	1.3E+03	-0.38
	23	1.00	9.52	1.1E+03	1.00	9.28	1.4E+03	-0.07
	24	1.00	9.30	9.3E+02	1.01	9.22	1.2E+03	0.13
	25	1.01	9.29	1.3E+03	1.01	9.28	1.1E+03	0.01
	26	1.00	9.52	9.8E+02	1.00	9.32	1.4E+03	0.22
	27	1.00	9.44	9.8E+02	1.00	9.28	1.2E+03	0.16
	28	1.02	9.50	1.0E+03	1.02	9.26	1.1E+03	0.16
	29	1.00	9.31	8.2E+02	1.00	9.22	1.5E+03	0.09
	30	0.99	9.41	1.0E+03	0.99	9.22	1.2E+03	-0.06
	31	1.01	9.39	9.6E+02	1.00	9.35	1.5E+03	-0.33
	32	0.99	9.47	7.4E+02	1.00	9.26	1.1E+03	0.28
	33	1.01	9.33	1.2E+03	1.02	9.27	1.4E+03	0.06
	34	1.01	9.36	1.1E+03	1.01	9.25	1.1E+03	-0.31
	35	0.98	9.43	9.2E+02	0.98	9.28	1.3E+03	-0.29
	36	1.00	9.35	1.1E+03	1.00	9.30	1.4E+03	0.15
	37	1.00	9.43	1.2E+03	1.00	9.24	1.1E+03	-0.22
	38	1.01	9.39	1.2E+03	1.01	9.35	1.5E+03	-0.25
	39	1.00	9.27	9.2E+02	1.00	9.26	1.4E+03	0.01
	40	1.00	9.27	9.5E+02	1.00	9.24	1.6E+03	-0.14
	41	1.02	9.47	9.5E+02	1.02	9.28	1.3E+03	-0.05
	42	1.01	9.27	1.2E+03	1.01	9.23	1.6E+03	-0.39
	43	1.00	9.53	9.2E+02	0.99	9.23	1.2E+03	-0.48
	44	1.00	9.48	1.2E+03	1.00	9.31	9.8E+02	0.18
	45	1.02	9.38	1.1E+03	1.02	9.29	1.2E+03	-0.14
	46	1.01	9.28	1.1E+03	1.01	9.23	1.3E+03	0.14
	47	1.01	9.42	1.0E+03	1.01	9.34	1.3E+03	-0.33
	48	1.01	9.47	1.1E+03	1.01	9.16	1.5E+03	0.18
	49	0.99	9.47	1.0E+03	0.99	9.26	9.7E+02	0.28
	50	1.00	9.43	1.2E+03	1.00	9.27	1.5E+03	0.27

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM188R71E105KA64
Manufacturung Location: Philippine	Lot No: A
Date before test:2018/03/27	Date after test:2018/04/24

#6 - Moisture Resistance

Test conditions : 10cycles(1cycle : 24hr) , 25deg C / 80% RH to 65deg C / 98% RH

	51	1.01	9.27	8.8E+02	1.01	9.17	1.4E+03	0.18
	52	1.01	9.38	1.0E+03	1.01	9.22	1.3E+03	0.10
	53	1.01	9.51	1.2E+03	1.01	9.35	1.2E+03	-0.17
	54	1.00	9.40	1.0E+03	1.00	9.27	1.4E+03	-0.02
	55	0.98	9.30	1.0E+03	0.99	9.21	1.3E+03	0.04
	56	1.00	9.28	1.2E+03	1.00	9.34	1.3E+03	0.17
	57	1.00	9.40	7.7E+02	1.00	9.26	1.1E+03	0.23
	58	1.00	9.36	9.9E+02	1.00	9.28	1.1E+03	-0.07
	59	1.02	9.29	9.4E+02	1.02	9.27	1.2E+03	-0.03
	60	1.02	9.58	1.1E+03	1.02	9.31	1.5E+03	-0.44
	61	0.99	9.35	9.1E+02	0.99	9.17	1.2E+03	-0.34
	62	1.00	9.23	1.0E+03	1.00	9.30	1.6E+03	-0.02
	63	1.02	9.40	8.9E+02	1.03	9.28	1.6E+03	0.23
A	64	1.01	9.39	1.1E+03	1.01	9.21	1.5E+03	-0.04
	65	0.99	9.48	9.9E+02	0.99	9.18	1.5E+03	0.16
	66	0.97	9.37	8.5E+02	0.97	9.28	1.2E+03	-0.37
	67	1.00	9.40	8.0E+02	1.01	9.21	1.3E+03	0.06
	68	0.98	9.33	1.1E+03	0.98	9.27	1.1E+03	-0.21
	69	1.01	9.45	8.6E+02	1.00	9.20	1.1E+03	-0.26
	70	1.01	9.38	1.0E+03	1.01	9.32	1.3E+03	0.10
	71	0.99	9.30	1.2E+03	0.99	9.18	8.9E+02	-0.04
	72	1.01	9.42	9.4E+02	1.02	9.26	1.2E+03	0.26
	73	1.00	9.59	1.2E+03	1.00	9.21	9.8E+02	0.24
	74	1.01	9.38	8.4E+02	1.02	9.25	1.3E+03	0.01
	75	1.01	9.49	9.1E+02	1.01	9.39	1.1E+03	0.32
	76	0.99	9.38	8.5E+02	0.99	9.29	1.5E+03	0.09
	77	1.00	9.40	1.1E+03	1.00	9.34	1.2E+03	-0.28

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM188R71E105KA64
Manufacturung Location: Philippine	Lot No: A
Date before test:2018/03/29	Date after test:2018/05/24

#7 - Biased Humidity

Test Conditions : 1000hr , 85deg C / 85% RH , 1WV

No. of samples:	77	Initial readings			Final readings			
No. of lots:	1	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
Spec limits	lower	0.90		5.0E+01			5.0E+00	-12.50
	upper	1.10	10.00			20.00		12.50
Measurement Statistics	minimum	0.98	9.27	2.2E+03	0.96	8.92	4.3E+03	-2.10
	maximum	1.03	9.52	3.7E+03	1.01	9.09	6.0E+03	-1.82
	mean	1.01	9.36	3.1E+03	0.99	9.00	5.2E+03	-1.95
	standard deviation	0.01	0.06	3.6E+02	0.01	0.05	3.9E+02	0.06
Presence of Failures		in spec	in spec	in spec	in spec	in spec	in spec	in spec

Test Data

Lot #	Sample	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
A	1	1.03	9.48	2.7E+03	1.01	8.98	4.8E+03	-2.01
	2	1.00	9.32	2.9E+03	0.98	8.95	5.2E+03	-1.95
	3	1.00	9.38	3.4E+03	0.98	9.00	4.7E+03	-1.92
	4	1.00	9.40	3.4E+03	0.98	9.04	5.8E+03	-2.00
	5	1.02	9.38	3.0E+03	1.00	9.01	5.8E+03	-2.07
	6	0.99	9.28	2.9E+03	0.97	8.98	5.6E+03	-2.03
	7	1.02	9.40	3.6E+03	1.00	9.07	5.7E+03	-1.89
	8	1.03	9.34	3.5E+03	1.01	8.97	4.8E+03	-2.04
	9	1.03	9.42	2.8E+03	1.01	8.96	5.3E+03	-1.93
	10	0.99	9.39	3.3E+03	0.97	8.99	5.1E+03	-2.01
	11	1.01	9.38	3.4E+03	0.99	8.97	5.6E+03	-1.87
	12	1.01	9.28	2.4E+03	0.99	9.02	5.3E+03	-1.98
	13	0.99	9.42	3.3E+03	0.97	9.07	5.3E+03	-1.94
	14	1.03	9.37	3.2E+03	1.01	9.08	5.7E+03	-1.92
	15	1.02	9.39	3.6E+03	1.00	9.03	4.8E+03	-1.99
	16	1.02	9.45	3.2E+03	1.00	9.01	5.0E+03	-2.03
	17	1.01	9.29	2.8E+03	0.99	8.99	5.5E+03	-1.96
	18	1.02	9.39	3.5E+03	1.00	8.95	5.1E+03	-1.95
	19	1.00	9.32	2.8E+03	0.98	8.95	5.2E+03	-1.86
	20	1.00	9.36	2.7E+03	0.98	9.01	5.8E+03	-1.88
	21	1.00	9.32	3.2E+03	0.98	9.01	4.9E+03	-2.00
	22	0.98	9.44	2.9E+03	0.96	8.96	4.8E+03	-1.87
	23	1.01	9.34	3.1E+03	0.99	9.00	5.3E+03	-2.10
	24	0.99	9.27	3.4E+03	0.97	8.98	4.4E+03	-1.96
	25	1.01	9.37	3.3E+03	0.99	9.00	5.1E+03	-2.00
	26	1.01	9.47	3.4E+03	0.99	9.03	5.0E+03	-1.88
	27	1.01	9.42	3.6E+03	0.99	8.94	5.3E+03	-1.88
	28	1.00	9.52	3.6E+03	0.98	9.08	4.8E+03	-2.04
	29	1.01	9.38	2.8E+03	0.99	8.96	5.2E+03	-1.94
	30	0.99	9.31	2.8E+03	0.97	9.05	5.2E+03	-2.01
	31	1.02	9.31	3.7E+03	1.00	9.00	5.3E+03	-1.94
	32	1.01	9.47	3.3E+03	0.99	8.94	5.5E+03	-2.02
	33	1.00	9.32	3.1E+03	0.98	8.92	5.3E+03	-1.99
	34	1.01	9.33	3.5E+03	0.99	8.97	4.8E+03	-1.89
	35	1.00	9.36	3.3E+03	0.98	8.97	5.0E+03	-1.92
	36	1.02	9.37	3.0E+03	1.00	9.07	6.0E+03	-2.00
	37	1.00	9.34	2.6E+03	0.98	8.96	5.3E+03	-1.98
	38	1.02	9.32	2.7E+03	1.00	8.99	5.2E+03	-1.98
	39	0.99	9.34	2.6E+03	0.97	9.03	5.3E+03	-1.97
	40	1.03	9.40	2.4E+03	1.01	8.92	5.2E+03	-1.93
	41	1.01	9.33	2.7E+03	0.99	9.03	4.3E+03	-2.03
	42	0.99	9.30	3.1E+03	0.97	8.95	5.2E+03	-1.95
	43	1.02	9.34	3.6E+03	1.00	8.99	4.6E+03	-1.90
	44	1.01	9.33	3.3E+03	0.99	9.02	4.4E+03	-2.00
	45	1.00	9.27	2.6E+03	0.98	9.05	5.2E+03	-1.91
	46	0.99	9.41	3.2E+03	0.97	8.94	5.1E+03	-1.95
	47	1.01	9.36	3.6E+03	0.99	8.97	6.0E+03	-1.87
	48	0.99	9.39	3.6E+03	0.97	8.93	5.2E+03	-1.93
	49	1.00	9.38	3.1E+03	0.98	9.04	5.2E+03	-1.91
	50	1.02	9.49	3.3E+03	1.00	9.00	5.2E+03	-1.96

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM188R71E105KA64
Manufacturung Location: Philippine	Lot No: A
Date before test:2018/03/29	Date after test:2018/05/24

#7 - Biased Humidity

Test Conditions : 1000hr , 85deg C / 85% RH , 1WV

	51	1.00	9.29	3.0E+03	0.98	9.09	5.5E+03	-1.85
	52	1.01	9.38	2.7E+03	1.00	8.94	4.9E+03	-1.82
	53	1.01	9.32	2.4E+03	0.99	8.99	5.2E+03	-1.94
	54	1.01	9.28	3.1E+03	0.99	8.93	5.2E+03	-1.95
	55	1.00	9.41	3.1E+03	0.98	8.99	4.7E+03	-1.95
	56	0.99	9.40	3.3E+03	0.97	8.94	4.6E+03	-2.01
	57	1.00	9.28	3.0E+03	0.98	8.93	4.7E+03	-2.04
	58	1.03	9.28	3.4E+03	1.01	8.92	5.1E+03	-2.04
	59	1.00	9.31	2.8E+03	0.98	8.98	4.4E+03	-1.89
	60	1.00	9.32	3.2E+03	0.98	9.08	4.8E+03	-1.95
	61	1.00	9.39	3.5E+03	0.98	9.01	5.4E+03	-1.98
	62	1.00	9.33	2.7E+03	0.98	9.04	4.8E+03	-1.87
	63	1.03	9.37	3.2E+03	1.01	9.02	5.4E+03	-1.89
A	64	1.03	9.39	3.4E+03	1.01	8.96	5.4E+03	-1.94
	65	1.03	9.28	3.5E+03	1.01	8.92	5.2E+03	-1.88
	66	1.03	9.39	3.1E+03	1.01	8.95	4.8E+03	-1.86
	67	1.03	9.32	3.6E+03	1.01	9.00	5.6E+03	-2.02
	68	1.01	9.32	3.5E+03	0.99	9.05	5.6E+03	-1.95
	69	0.98	9.34	2.5E+03	0.96	9.09	4.8E+03	-2.07
	70	1.03	9.35	3.3E+03	1.01	9.01	5.5E+03	-2.00
	71	1.00	9.42	2.6E+03	0.98	9.00	4.9E+03	-1.97
	72	1.03	9.30	2.2E+03	1.01	9.02	4.5E+03	-1.97
	73	1.02	9.36	3.2E+03	1.00	8.96	5.5E+03	-1.82
	74	1.03	9.36	3.4E+03	1.01	9.04	5.5E+03	-1.97
	75	1.01	9.41	3.7E+03	0.99	9.03	5.7E+03	-2.01
	76	1.01	9.39	3.2E+03	0.99	9.06	5.6E+03	-2.07
	77	1.02	9.52	3.3E+03	1.00	8.98	4.4E+03	-1.84

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM188R71E105KA64
Manufacturung Location: Philippine	Lot No: A
Date before test:2018/03/29	Date after test:2018/05/24

#7 - Biased Humidity

Test Conditions : 1000hr , 85deg C / 85% RH , 1.3V

No. of samples:	77	Initial readings			Final readings			
No. of lots:	1	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
Spec limits	lower	0.90		5.0E+01			5.0E+00	-12.50
	upper	1.10	10.00			20.00		12.50
Measurement Statistics	minimum	0.98	9.29	9.1E+02	0.96	8.88	1.8E+03	-2.65
	maximum	1.04	9.49	1.4E+03	1.03	9.15	2.8E+03	-0.96
	mean	1.01	9.36	1.2E+03	0.99	9.01	2.2E+03	-1.88
	standard deviation	0.01	0.04	1.1E+02	0.01	0.07	2.0E+02	0.44
Presence of Failures		in spec	in spec	in spec	in spec	in spec	in spec	in spec

Test Data

Lot #	Sample	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
A	1	0.99	9.41	9.5E+02	0.97	9.05	2.1E+03	-1.99
	2	1.00	9.33	1.3E+03	0.99	9.09	2.3E+03	-1.04
	3	1.01	9.37	1.3E+03	0.99	9.00	2.1E+03	-1.76
	4	1.03	9.34	1.1E+03	1.01	9.06	1.9E+03	-1.59
	5	1.01	9.35	1.2E+03	0.99	9.00	2.1E+03	-1.75
	6	1.01	9.29	1.3E+03	0.99	9.03	2.4E+03	-2.26
	7	1.00	9.47	1.3E+03	0.99	9.04	2.4E+03	-1.39
	8	1.02	9.32	1.2E+03	1.00	9.03	1.8E+03	-2.17
	9	1.01	9.30	1.2E+03	0.99	9.02	2.3E+03	-2.45
	10	1.02	9.40	1.3E+03	1.01	9.00	2.5E+03	-1.13
	11	1.00	9.41	1.2E+03	0.98	9.10	2.1E+03	-2.58
	12	1.02	9.39	9.9E+02	1.01	9.04	2.5E+03	-1.24
	13	1.00	9.30	1.1E+03	0.99	9.03	2.1E+03	-1.78
	14	1.01	9.32	1.3E+03	0.99	9.01	2.3E+03	-2.36
	15	1.00	9.33	1.1E+03	0.98	8.94	2.7E+03	-2.16
	16	1.04	9.37	1.2E+03	1.01	9.15	2.2E+03	-2.35
	17	1.00	9.34	1.2E+03	0.99	8.99	2.4E+03	-1.30
	18	1.01	9.35	9.4E+02	0.99	8.91	2.1E+03	-2.46
	19	0.99	9.33	1.1E+03	0.97	8.99	2.2E+03	-1.73
	20	1.04	9.31	1.2E+03	1.02	8.93	2.1E+03	-1.72
	21	1.01	9.33	1.2E+03	0.99	9.07	2.1E+03	-2.58
	22	0.99	9.38	1.3E+03	0.96	8.94	2.4E+03	-2.30
	23	1.01	9.39	1.2E+03	1.00	8.96	2.3E+03	-1.39
	24	1.02	9.38	1.3E+03	1.00	9.01	2.2E+03	-1.88
	25	1.00	9.36	1.1E+03	0.98	9.00	2.0E+03	-1.54
	26	1.00	9.42	1.3E+03	0.99	9.08	2.2E+03	-1.04
	27	0.98	9.36	1.3E+03	0.97	9.02	1.9E+03	-1.64
	28	1.01	9.39	1.4E+03	0.99	9.02	2.1E+03	-2.64
	29	1.02	9.33	1.4E+03	1.01	8.99	2.4E+03	-1.81
	30	1.01	9.37	1.0E+03	0.99	8.90	2.1E+03	-1.72
	31	0.99	9.39	1.3E+03	0.98	8.94	2.1E+03	-1.29
	32	1.01	9.37	1.0E+03	1.00	9.14	2.0E+03	-1.43
	33	1.03	9.29	1.3E+03	1.01	9.02	2.4E+03	-1.69
	34	1.00	9.40	1.2E+03	0.99	9.06	2.4E+03	-1.71
	35	1.02	9.31	1.2E+03	1.00	8.98	2.3E+03	-1.36
	36	1.01	9.34	9.1E+02	0.99	9.00	2.2E+03	-1.86
	37	1.03	9.39	1.1E+03	1.01	8.93	2.4E+03	-1.82
	38	0.99	9.38	1.1E+03	0.97	9.01	2.2E+03	-2.01
	39	1.03	9.39	1.1E+03	1.00	9.02	2.2E+03	-2.24
	40	1.00	9.31	1.2E+03	0.98	9.00	2.1E+03	-2.09
	41	1.02	9.30	1.1E+03	0.99	8.93	2.3E+03	-2.54
	42	1.00	9.35	1.2E+03	0.98	8.91	2.1E+03	-2.40
	43	1.01	9.37	1.0E+03	0.99	9.08	2.3E+03	-2.65
	44	1.01	9.34	1.3E+03	1.00	9.01	1.9E+03	-1.67
	45	1.02	9.34	1.2E+03	1.00	8.96	2.3E+03	-1.65
	46	1.00	9.37	1.2E+03	0.97	9.09	2.0E+03	-2.54
	47	1.01	9.35	1.2E+03	0.99	8.93	2.2E+03	-2.02
	48	0.99	9.36	1.2E+03	0.97	9.04	2.3E+03	-1.32
	49	1.00	9.29	1.2E+03	0.99	8.98	2.3E+03	-1.89
	50	1.01	9.49	1.2E+03	0.98	9.09	2.2E+03	-2.23

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM188R71E105KA64
Manufacturung Location: Philippine	Lot No: A
Date before test:2018/03/29	Date after test:2018/05/24

#7 - Biased Humidity

Test Conditions : 1000hr , 85deg C / 85% RH , 1.3V

	51	1.02	9.32	1.1E+03	1.00	9.15	2.4E+03	-2.06
	52	1.00	9.43	1.1E+03	0.99	8.91	2.3E+03	-1.60
	53	1.03	9.40	1.0E+03	1.01	8.93	2.4E+03	-2.10
	54	1.01	9.35	1.1E+03	1.00	8.94	2.2E+03	-1.47
	55	1.02	9.32	1.4E+03	1.00	8.97	2.3E+03	-1.93
	56	1.04	9.37	1.0E+03	1.02	8.92	2.8E+03	-2.04
	57	1.01	9.32	1.1E+03	1.00	8.93	2.2E+03	-1.62
	58	1.04	9.34	1.2E+03	1.02	8.92	1.9E+03	-1.59
	59	0.99	9.31	1.3E+03	0.97	9.00	2.1E+03	-2.11
	60	0.99	9.39	1.1E+03	0.97	9.07	2.2E+03	-1.94
	61	1.02	9.40	1.3E+03	1.00	9.00	2.4E+03	-2.52
	62	1.00	9.40	1.2E+03	0.99	9.12	2.5E+03	-1.09
	63	1.01	9.39	1.2E+03	1.00	9.01	2.1E+03	-1.80
A	64	0.98	9.31	1.2E+03	0.96	9.06	2.1E+03	-2.22
	65	1.01	9.38	9.9E+02	0.99	8.88	1.8E+03	-2.26
	66	1.00	9.35	1.2E+03	0.98	9.08	1.8E+03	-1.91
	67	1.03	9.34	1.3E+03	1.01	9.10	2.4E+03	-2.03
	68	1.02	9.31	1.1E+03	1.00	8.91	1.9E+03	-1.48
	69	1.04	9.37	9.4E+02	1.03	8.93	2.3E+03	-0.96
	70	1.01	9.44	1.1E+03	0.99	8.91	2.5E+03	-1.70
	71	0.99	9.40	1.2E+03	0.98	9.07	2.2E+03	-1.48
	72	1.02	9.42	1.3E+03	1.01	9.02	2.2E+03	-1.28
	73	1.02	9.36	1.3E+03	1.00	9.03	2.3E+03	-2.41
	74	1.00	9.41	1.2E+03	0.97	9.00	2.3E+03	-2.58
	75	0.98	9.38	1.3E+03	0.96	9.07	2.4E+03	-2.17
	76	1.02	9.35	1.1E+03	1.00	9.11	2.6E+03	-2.01
	77	1.01	9.34	1.1E+03	0.99	9.02	2.4E+03	-2.29

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM188R71E105KA64
Manufacturung Location: Philippine	Lot No: A
Date before test:2018/03/30	Date after test:2018/05/25

#8 - Operational Life

Test conditions : 1000hr ,125deg C , 1.5WV

No. of samples:	77	Initial readings			Final readings			
No. of lots:	1	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
Spec limits	lower	0.90		5.0E+01			5.0E+00	-12.50
	upper	1.10	10.00			20.00		12.50
Measurement Statistics	minimum	0.90	8.88	4.0E+03	0.87	7.99	3.0E+03	-3.60
	maximum	0.95	9.00	5.5E+03	0.94	8.25	4.2E+03	-1.08
	mean	0.92	8.94	4.9E+03	0.90	8.12	3.6E+03	-2.39
	standard deviation	0.01	0.03	3.2E+02	0.01	0.06	3.1E+02	0.60
Presence of Failures		in spec	in spec	in spec	in spec	in spec	in spec	in spec

Test Data

Lot #	Sample	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
A	1	0.92	8.96	5.0E+03	0.91	8.10	3.4E+03	-1.67
	2	0.92	8.96	4.3E+03	0.89	8.11	4.0E+03	-3.24
	3	0.92	8.88	5.3E+03	0.90	8.05	3.8E+03	-2.21
	4	0.94	8.95	4.6E+03	0.92	8.06	3.1E+03	-1.69
	5	0.94	8.93	4.8E+03	0.92	8.17	3.5E+03	-2.30
	6	0.91	8.91	5.1E+03	0.89	8.02	3.4E+03	-2.28
	7	0.94	8.91	4.9E+03	0.92	8.05	3.5E+03	-2.05
	8	0.92	8.95	4.5E+03	0.90	8.12	3.5E+03	-2.35
	9	0.91	8.97	4.5E+03	0.89	8.07	3.4E+03	-2.35
	10	0.92	8.88	5.2E+03	0.89	8.22	3.8E+03	-2.60
	11	0.92	8.89	4.5E+03	0.90	8.16	3.7E+03	-2.22
	12	0.95	8.94	4.9E+03	0.91	8.07	4.1E+03	-3.43
	13	0.93	8.93	4.8E+03	0.91	8.13	3.7E+03	-2.16
	14	0.93	8.91	4.7E+03	0.91	8.07	3.8E+03	-2.67
	15	0.91	8.92	4.8E+03	0.90	8.14	3.7E+03	-1.34
	16	0.91	8.97	5.0E+03	0.89	7.99	3.3E+03	-2.33
	17	0.94	8.98	4.6E+03	0.92	8.07	3.6E+03	-2.11
	18	0.93	8.92	5.5E+03	0.90	8.12	3.2E+03	-2.55
	19	0.90	8.89	5.2E+03	0.87	8.22	3.2E+03	-3.60
	20	0.91	8.91	4.7E+03	0.89	8.25	4.0E+03	-2.58
	21	0.93	8.93	4.8E+03	0.90	8.15	3.8E+03	-2.95
	22	0.91	8.95	5.1E+03	0.90	8.25	3.6E+03	-1.83
	23	0.90	8.95	5.0E+03	0.87	8.14	3.5E+03	-3.40
	24	0.92	8.94	5.2E+03	0.90	8.07	3.5E+03	-2.61
	25	0.91	8.93	4.8E+03	0.89	8.07	3.7E+03	-2.13
	26	0.93	8.99	4.6E+03	0.92	8.10	3.9E+03	-1.69
	27	0.92	8.94	4.8E+03	0.90	8.13	3.2E+03	-2.37
	28	0.92	8.92	5.3E+03	0.91	8.09	3.4E+03	-1.19
	29	0.92	8.98	4.5E+03	0.90	8.02	4.1E+03	-2.04
	30	0.92	8.94	5.2E+03	0.90	8.17	3.8E+03	-2.46
	31	0.92	8.92	4.8E+03	0.90	8.10	3.5E+03	-1.91
	32	0.92	8.93	4.8E+03	0.91	8.03	4.2E+03	-1.16
	33	0.92	8.97	5.1E+03	0.90	8.06	3.3E+03	-2.88
	34	0.91	8.98	5.2E+03	0.90	8.10	3.9E+03	-1.16
	35	0.91	8.91	5.1E+03	0.88	8.05	3.5E+03	-2.98
	36	0.93	8.94	4.8E+03	0.90	8.16	3.2E+03	-3.43
	37	0.92	8.93	5.0E+03	0.89	8.10	3.5E+03	-3.48
	38	0.92	8.91	4.0E+03	0.91	8.12	3.6E+03	-1.26
	39	0.92	8.93	5.0E+03	0.89	8.19	3.5E+03	-2.85
	40	0.94	8.94	5.3E+03	0.91	8.12	3.8E+03	-2.84
	41	0.92	8.97	4.5E+03	0.90	8.19	4.0E+03	-2.11
	42	0.93	9.00	5.4E+03	0.90	8.22	3.4E+03	-2.40
	43	0.93	8.92	4.9E+03	0.90	8.09	3.6E+03	-2.59
	44	0.91	8.95	4.9E+03	0.89	8.15	3.8E+03	-2.34
	45	0.91	8.90	5.3E+03	0.89	8.17	4.0E+03	-2.54
	46	0.91	8.92	5.3E+03	0.89	8.06	3.7E+03	-2.13
	47	0.93	8.90	4.4E+03	0.91	8.10	3.8E+03	-2.35
	48	0.92	8.90	5.3E+03	0.90	8.05	4.2E+03	-2.62
	49	0.92	8.93	5.0E+03	0.90	8.04	3.7E+03	-2.36
	50	0.93	8.94	4.4E+03	0.91	8.18	3.0E+03	-2.20

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM188R71E105KA64
Manufacturung Location: Philippine	Lot No: A
Date before test:2018/03/30	Date after test:2018/05/25

#8 - Operational Life

Test conditions : 1000hr ,125deg C , 1.5WV

	51	0.93	8.97	4.2E+03	0.91	8.16	3.8E+03	-2.09
	52	0.90	8.94	4.8E+03	0.88	8.07	3.9E+03	-2.49
	53	0.91	8.93	4.6E+03	0.89	8.08	3.7E+03	-2.96
	54	0.92	8.94	5.5E+03	0.89	8.12	3.1E+03	-2.59
	55	0.93	8.89	5.1E+03	0.91	8.06	3.2E+03	-2.14
	56	0.92	8.90	4.9E+03	0.89	8.16	3.1E+03	-2.90
	57	0.92	8.92	4.7E+03	0.91	8.10	3.4E+03	-1.49
	58	0.92	8.99	4.8E+03	0.90	8.17	3.0E+03	-2.02
	59	0.92	8.92	4.5E+03	0.91	8.15	3.7E+03	-1.08
	60	0.93	8.98	4.8E+03	0.91	8.20	3.9E+03	-2.03
	61	0.94	8.95	5.2E+03	0.92	8.08	3.4E+03	-1.95
	62	0.92	8.94	5.1E+03	0.90	8.20	3.7E+03	-1.82
	63	0.94	8.95	5.1E+03	0.93	8.06	3.3E+03	-1.85
A	64	0.92	9.00	4.1E+03	0.89	8.09	3.0E+03	-2.63
	65	0.90	8.91	5.1E+03	0.88	8.06	3.6E+03	-2.84
	66	0.92	8.90	5.2E+03	0.90	8.23	3.0E+03	-2.16
	67	0.90	8.98	4.8E+03	0.88	8.10	3.3E+03	-2.49
	68	0.92	8.96	4.5E+03	0.89	8.19	3.1E+03	-3.38
	69	0.92	8.90	4.7E+03	0.89	8.13	4.2E+03	-3.22
	70	0.92	8.93	4.7E+03	0.89	8.14	3.2E+03	-2.73
	71	0.93	8.95	4.6E+03	0.90	8.15	3.9E+03	-3.28
	72	0.93	8.91	4.8E+03	0.90	8.18	3.2E+03	-3.06
	73	0.92	8.96	4.6E+03	0.90	8.11	3.7E+03	-1.70
	74	0.92	8.92	4.9E+03	0.90	8.11	3.5E+03	-2.47
	75	0.92	8.95	4.7E+03	0.89	8.15	3.8E+03	-2.49
	76	0.92	9.00	5.1E+03	0.89	8.16	3.4E+03	-3.47
	77	0.94	8.94	5.0E+03	0.91	8.08	3.6E+03	-2.90

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM188R71E105KA64
Manufacturung Location: Philippine	Lot No: A

#9 - External Visual Examination

Number of Samples: 812 Number of Lots: 1	Number of failures: 0

Lot #	Test No.	Result (pass/fail)
A	3	pass
	4	pass
	5	pass
	6	pass
	7-1	pass
	7-2	pass
	8	pass
	10	pass
	12-1	pass
	12-2	pass
	12-3	pass
	13	pass
	14	pass
	15	pass
	16	pass
	17	pass
	18	pass
	18	pass
	18	pass
	19	pass
	21	pass
	22	pass
	23	pass

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM188R71E105KA64
Manufacturung Location: Philippine	Lot No: A
Date before test:2018/04/17	

#10 - Physical Dimensions

Number of Samples: 30 Number of Lots: 1		Readings at Room Temp: 25C					
		L [mm]	W [mm]	T [mm]	e1 [mm]	e2 [mm]	g [mm]
Spec limits	lower	1.50	0.70	0.70	0.20	0.20	0.50
	upper	1.70	0.90	0.90	0.50	0.50	
Measurement Statistics	minimum	1.65	0.86	0.85	0.32	0.29	0.95
	maximum	1.69	0.87	0.86	0.37	0.37	1.01
	mean	1.67	0.87	0.86	0.34	0.34	0.97
	standard deviation	0.01	0.00	0.00	0.01	0.02	0.02
Presence of failures		in spec	in spec	in spec	in spec	in spec	in spec
Measurements	Sample	L [mm]	W [mm]	T [mm]	e1 [mm]	e2 [mm]	g [mm]
	1	1.67	0.87	0.86	0.33	0.36	1.00
	2	1.66	0.87	0.86	0.34	0.33	0.98
	3	1.67	0.87	0.86	0.34	0.36	0.99
	4	1.68	0.87	0.86	0.34	0.34	0.96
	5	1.68	0.87	0.86	0.35	0.35	0.96
	6	1.67	0.87	0.86	0.32	0.34	0.95
	7	1.68	0.87	0.86	0.33	0.29	0.98
	8	1.67	0.87	0.86	0.35	0.33	0.98
	9	1.68	0.87	0.86	0.36	0.36	0.97
	10	1.67	0.87	0.86	0.37	0.33	0.96
	11	1.68	0.87	0.86	0.34	0.36	0.95
	12	1.68	0.87	0.86	0.35	0.36	0.96
	13	1.67	0.87	0.86	0.32	0.32	0.99
	14	1.67	0.87	0.86	0.32	0.36	0.97
	15	1.66	0.86	0.86	0.36	0.35	0.99
	16	1.68	0.87	0.86	0.33	0.35	0.96
	17	1.67	0.87	0.86	0.34	0.35	0.99
	18	1.67	0.87	0.86	0.36	0.32	0.97
	19	1.68	0.87	0.86	0.36	0.33	0.99
	20	1.67	0.86	0.86	0.34	0.32	0.96
	21	1.67	0.87	0.86	0.35	0.35	0.98
	22	1.67	0.87	0.86	0.35	0.34	0.97
	23	1.65	0.87	0.86	0.34	0.35	0.99
	24	1.67	0.87	0.86	0.32	0.35	0.98
	25	1.68	0.87	0.85	0.36	0.35	0.97
	26	1.68	0.87	0.86	0.35	0.35	1.01
	27	1.67	0.87	0.86	0.35	0.33	0.97
	28	1.67	0.87	0.85	0.33	0.37	1.00
	29	1.69	0.87	0.85	0.35	0.36	0.98
	30	1.68	0.87	0.86	0.34	0.35	0.96

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM188R71E105KA64
Manufacturung Location: Philippine	Lot No: A
Date before test:2018/03/27	Date after test:2018/04/03

#12 Resistance to solvents

Number of Samples: 5 Number of Lots: 1	*Test conditions* A : 1 part (by volume) of isopropyl alcohol and 3 parts (by volume) of mineral sperits , 25deg C 3min immersion test conditions B : terpene defluxer, 25deg C 3min immersion test conditions C : 42 parts(by volume) of water and 1 part (by volume) of propylene glycol monomethylether and 1 part (by volume) of monoethanolamine, 63-70deg C 3min immersion

Number of Samples: 5 Number of Lots: 1	Number of failures: 0	
A	1	No Failure
	2	No Failure
	3	No Failure
	4	No Failure
	5	No Failure

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM188R71E105KA64
Manufacturung Location: Philippine	Lot No: A
Date before test:2018/03/21	Date after test:2018/04/09

#13 - Mechanical Shock

Test conditions : shock pulse : 1500g's, 0.5ms, 4.7m/s, 3 times each of 6 orientations

No. of samples:	30	Initial readings			Final readings			
No. of lots:	1	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
Spec limits	lower	0.90		5.0E+01	0.90		5.0E+01	
	upper	1.10	10.00		1.10	10.00		
Measurement Statistics	minimum	0.98	9.17	2.6E+03	0.94	8.57	3.8E+03	-5.10
	maximum	1.02	9.31	3.5E+03	0.98	8.76	4.7E+03	-4.50
	mean	1.00	9.24	3.1E+03	0.95	8.67	4.3E+03	-4.94
	standard deviation	0.01	0.04	2.4E+02	0.01	0.05	2.8E+02	0.17
Presence of Failures		in spec	in spec	in spec	in spec	in spec	in spec	in spec

Test Data

Lot #	Sample	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
A	1	1.00	9.22	3.4E+03	0.95	8.65	4.6E+03	-5.05
	2	1.01	9.19	3.0E+03	0.96	8.64	4.2E+03	-5.05
	3	1.00	9.27	2.6E+03	0.95	8.70	4.3E+03	-4.99
	4	0.99	9.25	3.0E+03	0.94	8.68	4.0E+03	-5.07
	5	1.02	9.25	3.0E+03	0.97	8.66	4.1E+03	-4.90
	6	1.01	9.23	3.5E+03	0.96	8.63	4.2E+03	-5.05
	7	1.00	9.22	2.8E+03	0.95	8.68	4.3E+03	-4.92
	8	1.00	9.19	3.4E+03	0.95	8.65	4.1E+03	-4.91
	9	1.00	9.22	2.8E+03	0.95	8.57	4.2E+03	-4.75
	10	1.00	9.30	3.1E+03	0.95	8.60	4.5E+03	-5.08
	11	1.01	9.22	2.8E+03	0.96	8.59	4.6E+03	-4.96
	12	1.00	9.25	3.3E+03	0.95	8.65	4.6E+03	-4.98
	13	1.00	9.28	3.3E+03	0.95	8.76	4.3E+03	-4.70
	14	1.00	9.19	3.0E+03	0.95	8.69	3.8E+03	-5.10
	15	0.98	9.19	3.1E+03	0.94	8.72	4.7E+03	-4.68
	16	1.00	9.26	3.2E+03	0.95	8.65	3.9E+03	-5.10
	17	1.01	9.24	3.1E+03	0.96	8.65	4.5E+03	-5.01
	18	0.99	9.24	3.4E+03	0.94	8.69	3.9E+03	-5.01
	19	1.00	9.27	2.9E+03	0.95	8.65	4.1E+03	-5.10
	20	0.99	9.30	3.0E+03	0.94	8.71	4.5E+03	-4.86
	21	1.00	9.17	3.2E+03	0.95	8.65	3.8E+03	-5.09
	22	1.02	9.21	3.1E+03	0.97	8.69	4.5E+03	-4.50
	23	1.00	9.21	3.0E+03	0.95	8.74	3.9E+03	-5.08
	24	0.99	9.25	3.1E+03	0.95	8.67	3.9E+03	-4.68
	25	1.00	9.28	3.4E+03	0.95	8.64	4.3E+03	-5.04
	26	1.01	9.31	3.1E+03	0.96	8.71	4.5E+03	-4.54
	27	1.02	9.29	3.5E+03	0.97	8.68	4.6E+03	-5.04
	28	1.02	9.27	3.1E+03	0.97	8.73	4.6E+03	-5.05
	29	1.01	9.27	3.3E+03	0.96	8.69	4.0E+03	-4.81
	30	1.00	9.22	2.7E+03	0.95	8.76	4.1E+03	-5.03

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM188R71E105KA64
Manufacturung Location: Philippine	Lot No: A
Date before test:2018/03/15	Date after test:2018/03/29

#14 - Vibration

Test conditions : 5g's for 20min, 12 cycles each of 3 orientations, test frequency 10 - 2000Hz

No. of samples:	30	Initial readings			Final readings			
No. of lots:	1	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
Spec limits	lower	0.90		5.0E+01	0.90		5.0E+01	
	upper	1.10	10.00		1.10	10.00		
Measurement Statistics	minimum	1.00	9.16	2.7E+03	0.99	8.66	3.7E+03	-1.11
	maximum	1.04	9.38	3.0E+03	1.03	8.79	4.5E+03	-0.99
	mean	1.02	9.27	2.9E+03	1.00	8.73	4.1E+03	-1.07
	standard deviation	0.01	0.05	7.6E+01	0.01	0.03	2.4E+02	0.04
Presence of Failures		in spec	in spec	in spec	in spec	in spec	in spec	in spec

Test Data

Lot #	Sample	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
A	1	1.02	9.25	2.8E+03	1.01	8.78	4.5E+03	-1.07
	2	1.01	9.25	2.8E+03	1.00	8.70	3.8E+03	-1.10
	3	1.01	9.38	2.9E+03	1.00	8.71	4.4E+03	-1.06
	4	1.03	9.28	2.7E+03	1.01	8.71	4.0E+03	-1.10
	5	1.00	9.28	3.0E+03	0.99	8.72	3.8E+03	-1.11
	6	1.01	9.34	2.8E+03	1.00	8.71	4.3E+03	-0.99
	7	1.02	9.26	2.9E+03	1.01	8.70	4.2E+03	-1.07
	8	1.03	9.25	3.0E+03	1.02	8.73	4.2E+03	-1.09
	9	1.02	9.28	2.9E+03	1.01	8.75	3.9E+03	-1.08
	10	1.01	9.25	2.9E+03	1.00	8.76	4.2E+03	-1.09
	11	1.04	9.23	2.9E+03	1.03	8.76	4.0E+03	-1.10
	12	1.01	9.24	3.0E+03	1.00	8.68	4.4E+03	-1.00
	13	1.03	9.30	3.0E+03	1.02	8.79	4.2E+03	-1.10
	14	1.03	9.36	2.8E+03	1.02	8.75	4.2E+03	-1.10
	15	1.00	9.25	2.9E+03	0.99	8.68	3.8E+03	-0.99
	16	1.00	9.25	2.8E+03	0.99	8.66	4.1E+03	-1.01
	17	1.00	9.30	2.9E+03	0.99	8.74	4.0E+03	-1.07
	18	1.00	9.30	2.9E+03	0.99	8.70	4.5E+03	-1.06
	19	1.02	9.29	2.7E+03	1.01	8.78	3.9E+03	-1.02
	20	1.03	9.24	2.8E+03	1.02	8.71	4.1E+03	-1.10
	21	1.02	9.27	2.8E+03	1.01	8.74	3.9E+03	-1.08
	22	1.02	9.22	2.9E+03	1.01	8.72	4.5E+03	-1.05
	23	1.01	9.26	3.0E+03	1.00	8.67	3.8E+03	-1.00
	24	1.01	9.27	2.8E+03	1.00	8.71	3.8E+03	-1.02
	25	1.01	9.29	2.8E+03	1.00	8.68	4.4E+03	-1.07
	26	1.01	9.29	2.8E+03	1.00	8.75	4.1E+03	-1.08
	27	1.00	9.16	3.0E+03	0.99	8.76	3.8E+03	-1.10
	28	1.01	9.16	2.9E+03	1.00	8.70	3.7E+03	-1.10
	29	1.03	9.36	2.9E+03	1.02	8.78	4.5E+03	-1.07
	30	1.01	9.26	3.0E+03	1.00	8.72	3.9E+03	-1.11

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM188R71E105KA64
Manufacturung Location: Philippine	Lot No: A
Date before test:2018/03/29	Date after test:2018/04/19

#15 - Resistance to Soldering Heat

Test Conditions : soldering , 260C 10sec immersion

Number of Samples: 30 Number of Lots: 1	Number of failures: 0

Lot #	Sample	Result
A	1	No failure
	2	No failure
	3	No failure
	4	No failure
	5	No failure
	6	No failure
	7	No failure
	8	No failure
	9	No failure
	10	No failure
	11	No failure
	12	No failure
	13	No failure
	14	No failure
	15	No failure
	16	No failure
	17	No failure
	18	No failure
	19	No failure
	20	No failure
	21	No failure
	22	No failure
	23	No failure
	24	No failure
	25	No failure
	26	No failure
	27	No failure
	28	No failure
	29	No failure
	30	No failure

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM188R71E105KA64
Manufacturung Location: Philippine	Lot No: A
Date before test:2018/03/23	Date after test:2018/04/27

#16 - Thermal Shock

Test conditions : 300Cycles (-55deg C to 125deg C) , Maximum transfer time 20sec , keeping time 15min

No. of samples:	30	Initial readings			Final readings			
No. of lots:	1	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
Spec limits	lower	0.90		5.0E+01			5.0E+01	-10.00
	upper	1.10	10.00			10.00		10.00
Measurement Statistics	minimum	0.99	9.16	2.9E+03	0.96	9.11	2.7E+03	-2.92
	maximum	1.04	9.35	3.5E+03	1.01	9.24	3.2E+03	-2.68
	mean	1.01	9.25	3.1E+03	0.98	9.17	3.0E+03	-2.79
	standard deviation	0.01	0.05	1.5E+02	0.01	0.03	1.3E+02	0.06
Presence of Failures		in spec	in spec	in spec	in spec	in spec	in spec	in spec

Test Data

Lot #	Sample	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
A	1	1.00	9.18	3.1E+03	0.97	9.15	2.9E+03	-2.71
	2	1.02	9.35	3.0E+03	0.99	9.18	2.7E+03	-2.77
	3	0.99	9.20	3.2E+03	0.96	9.16	3.1E+03	-2.76
	4	1.01	9.24	2.9E+03	0.98	9.12	2.9E+03	-2.78
	5	1.01	9.24	3.3E+03	0.98	9.21	2.9E+03	-2.78
	6	1.01	9.21	3.3E+03	0.98	9.15	2.9E+03	-2.86
	7	1.01	9.31	3.2E+03	0.98	9.18	2.8E+03	-2.74
	8	0.99	9.22	3.0E+03	0.97	9.16	3.2E+03	-2.83
	9	1.01	9.18	3.3E+03	0.99	9.18	3.0E+03	-2.79
	10	1.01	9.22	3.3E+03	0.98	9.11	2.9E+03	-2.86
	11	0.99	9.29	3.0E+03	0.96	9.17	2.9E+03	-2.73
	12	1.00	9.29	3.3E+03	0.97	9.16	2.9E+03	-2.81
	13	1.03	9.25	3.0E+03	1.01	9.21	2.8E+03	-2.68
	14	1.00	9.31	3.0E+03	0.97	9.21	2.8E+03	-2.77
	15	1.03	9.21	3.3E+03	1.00	9.14	2.9E+03	-2.77
	16	1.03	9.34	2.9E+03	1.00	9.19	3.1E+03	-2.83
	17	1.02	9.33	3.2E+03	0.99	9.16	2.8E+03	-2.84
	18	1.00	9.17	3.4E+03	0.97	9.16	3.2E+03	-2.69
	19	1.00	9.21	3.2E+03	0.97	9.11	2.9E+03	-2.79
	20	1.03	9.24	3.3E+03	1.00	9.14	2.8E+03	-2.80
	21	1.02	9.21	3.2E+03	0.99	9.17	3.1E+03	-2.76
	22	1.00	9.16	3.1E+03	0.97	9.17	2.9E+03	-2.82
	23	0.99	9.19	3.1E+03	0.96	9.21	2.8E+03	-2.74
	24	1.04	9.28	3.5E+03	1.01	9.17	3.1E+03	-2.73
	25	1.01	9.27	2.9E+03	0.98	9.14	3.1E+03	-2.72
	26	1.02	9.27	3.1E+03	0.99	9.24	3.0E+03	-2.81
	27	1.01	9.21	3.0E+03	0.98	9.14	3.2E+03	-2.77
	28	1.02	9.30	3.3E+03	0.99	9.21	3.0E+03	-2.84
	29	1.00	9.28	3.1E+03	0.97	9.24	2.9E+03	-2.89
	30	1.01	9.23	2.9E+03	0.98	9.20	3.1E+03	-2.92

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM188R71E105KA64
Manufacturung Location: Philippine	Lot No: A
Date before test:2018/04/06	Date after test:2018/04/10

#17 - ESD Test

Test conditions : charge capacitor 150pF, discharge resistor 2000ohm

Number of Samples: 15 Number of Lots: 1		Greatest Breakdown Voltage with no failures
Breakdown Voltage	Sample	Result (pass/fail)
min 1kV D.C.	1	pass
	2	pass
	3	pass
	4	pass
	5	pass
	6	pass
	7	pass
	8	pass
	9	pass
	10	pass
	11	pass
	12	pass
	13	pass
	14	pass
	15	pass

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM188R71E105KA64
Manufacturung Location: Philippine	Lot No: A
Date before test:2018/03/21	

#18 - Solderability

Test conditions : 1.soldering 235C 5sec immersion, 2.soldering 235C 5sec immersion, 3.soldering 260C 120sec immersion

Number of Samples: 45 Number of Lots: 1	Number of failures: 0

Test No.	Sample	Result (pass/fail)
1	1	pass
	2	pass
	3	pass
	4	pass
	5	pass
	6	pass
	7	pass
	8	pass
	9	pass
	10	pass
	11	pass
	12	pass
	13	pass
	14	pass
	15	pass
2	1	pass
	2	pass
	3	pass
	4	pass
	5	pass
	6	pass
	7	pass
	8	pass
	9	pass
	10	pass
	11	pass
	12	pass
	13	pass
	14	pass
	15	pass
3	1	pass
	2	pass
	3	pass
	4	pass
	5	pass
	6	pass
	7	pass
	8	pass
	9	pass
	10	pass
	11	pass
	12	pass
	13	pass
	14	pass
	15	pass

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM188R71E105KA64
Manufacturung Location: Philippine	Lot No: A
Date before test:2018/03/27	

#19 - Electrical Characterization

Test conditions : 1+/-0.1KHz, 1+/-0.2Vrms

Number of Samples: 30 Number of Lots: 1		Readings at Room Temp: 25C			at Min Operating Temperature: -55C			at Max Operating Temperature: 125C			
		Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	Change in capacitance %	Capacitance uF	Dissipation Factor %	IR 125C Mohm	Change in capacitance %
Spec limits	lower	0.90		5.0E+01			-15.00			5.0E+00	-15.00
	upper	1.10	10.00				15.00				15.00
Measurement Statistics	minimum	1.02	9.55	2.4E+03	0.96	17.66	-6.26	0.88	1.58	3.0E+01	-14.44
	maximum	1.09	9.76	2.5E+03	1.04	18.35	-4.39	0.96	1.93	4.2E+01	-11.16
	mean	1.06	9.66	2.4E+03	1.00	18.02	-5.30	0.92	1.78	3.6E+01	-12.91
	standard deviation	0.02	0.05	3.5E+01	0.02	0.19	0.50	0.02	0.08	3.0E+00	0.85
Presence of failures		in spec	in spec	in spec	in spec	in spec	in spec	in spec	in spec	in spec	in spec

Measurements	Sample	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	Change in capacitance %	Capacitance uF	Dissipation Factor %	IR 125C Mohm	Change in capacitance %
A	1	1.06	9.61	2.4E+03	1.01	17.87	-5.42	0.93	1.79	3.1E+01	-12.33
	2	1.05	9.62	2.5E+03	0.99	17.85	-5.72	0.91	1.75	3.6E+01	-12.98
	3	1.08	9.58	2.4E+03	1.03	17.95	-4.70	0.94	1.74	3.7E+01	-12.97
	4	1.08	9.67	2.4E+03	1.02	18.02	-5.66	0.95	1.82	3.9E+01	-12.43
	5	1.06	9.69	2.4E+03	1.01	17.94	-4.64	0.93	1.58	3.8E+01	-12.57
	6	1.03	9.74	2.5E+03	0.97	18.31	-5.30	0.90	1.78	4.0E+01	-12.58
	7	1.08	9.69	2.4E+03	1.02	17.97	-5.27	0.95	1.72	3.3E+01	-11.99
	8	1.02	9.71	2.4E+03	0.97	18.01	-5.38	0.90	1.86	4.2E+01	-12.05
	9	1.05	9.61	2.5E+03	1.00	17.84	-4.86	0.92	1.79	4.1E+01	-12.34
	10	1.03	9.62	2.4E+03	0.96	18.14	-6.26	0.89	1.93	3.5E+01	-13.77
	11	1.09	9.66	2.5E+03	1.03	17.86	-4.78	0.94	1.88	3.8E+01	-13.66
	12	1.06	9.59	2.4E+03	1.01	18.17	-4.39	0.92	1.66	3.5E+01	-12.81
	13	1.08	9.68	2.5E+03	1.03	18.08	-5.39	0.95	1.90	3.3E+01	-12.27
	14	1.04	9.66	2.4E+03	0.99	17.83	-5.15	0.90	1.79	3.5E+01	-13.68
	15	1.03	9.63	2.5E+03	0.98	17.69	-5.10	0.90	1.76	3.7E+01	-12.42
	16	1.04	9.71	2.4E+03	0.99	18.26	-5.11	0.91	1.72	3.6E+01	-13.15
	17	1.03	9.66	2.5E+03	0.98	17.96	-4.76	0.90	1.70	3.8E+01	-12.71
	18	1.09	9.63	2.5E+03	1.04	18.29	-4.97	0.94	1.77	3.5E+01	-14.24
	19	1.08	9.72	2.4E+03	1.02	17.99	-5.72	0.94	1.84	3.4E+01	-12.58
	20	1.06	9.62	2.4E+03	1.00	18.35	-5.66	0.92	1.92	3.3E+01	-13.30
	21	1.06	9.74	2.4E+03	1.00	18.31	-6.02	0.93	1.72	3.2E+01	-12.75
	22	1.09	9.66	2.4E+03	1.02	17.84	-5.78	0.96	1.77	3.3E+01	-11.16
	23	1.02	9.62	2.5E+03	0.97	18.03	-4.78	0.88	1.68	3.8E+01	-14.08
	24	1.09	9.75	2.4E+03	1.04	18.00	-4.74	0.94	1.71	3.3E+01	-13.75
	25	1.09	9.68	2.4E+03	1.03	17.66	-5.52	0.96	1.84	3.4E+01	-11.77
	26	1.08	9.63	2.5E+03	1.03	17.93	-4.75	0.94	1.88	3.1E+01	-13.00
	27	1.04	9.76	2.5E+03	0.98	18.29	-5.38	0.92	1.67	3.0E+01	-11.48
	28	1.05	9.55	2.4E+03	0.99	17.97	-6.07	0.90	1.87	4.0E+01	-14.44
	29	1.07	9.64	2.4E+03	1.01	18.23	-5.61	0.92	1.74	3.7E+01	-14.11
	30	1.06	9.65	2.4E+03	1.00	18.11	-6.13	0.91	1.78	3.7E+01	-14.01

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM188R71E105KA64
Manufacturung Location: Philippine	Lot No: A
Date before test:2018/03/29	Date after test:2018/03/30

#21 - Board Flex

Test conditions : bend board at 2mm for 60sec
pass/fail criteria : cap change within +/-10%

Test Data

Number of Samples: 30 Number of Lots: 1	Number of failures: 0

Lot #	Sample	Result (pass/fail)
A	1	pass
	2	pass
	3	pass
	4	pass
	5	pass
	6	pass
	7	pass
	8	pass
	9	pass
	10	pass
	11	pass
	12	pass
	13	pass
	14	pass
	15	pass
	16	pass
	17	pass
	18	pass
	19	pass
	20	pass
	21	pass
	22	pass
	23	pass
	24	pass
	25	pass
	26	pass
	27	pass
	28	pass
	29	pass
	30	pass

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM188R71E105KA64
Manufacturung Location: Philippine	Lot No: A
Date before test:2018/03/22	Date after test:2018/03/22

#22 - Terminal Strength (SMD)

Test conditions : Force of 1.8kg for 60sec

Number of Samples: 30 Number of Lots: 1	Number of failures: 0

Lot #	Sample	Result (pass/fail)
A	1	pass
	2	pass
	3	pass
	4	pass
	5	pass
	6	pass
	7	pass
	8	pass
	9	pass
	10	pass
	11	pass
	12	pass
	13	pass
	14	pass
	15	pass
	16	pass
	17	pass
	18	pass
	19	pass
	20	pass
	21	pass
	22	pass
	23	pass
	24	pass
	25	pass
	26	pass
	27	pass
	28	pass
	29	pass
	30	pass

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM188R71E105KA64
Manufacturung Location: Philippine	Lot No: A
Date before test:2018/03/22	

#23 - Beam Load

Test conditions : Apply a force until the part brakes
pass/fail criteria : 0805 size or smaller: 20N over (t>0.5mm), 8N over (t<=0.5mm)
1206 size or bigger: 15N over (t<1.25mm), 54.5N over (t>=1.25mm)

Number of Samples: 30 Number of Lots: 1	Number of failures: 0

Lot #	Sample	Result (pass/fail)
A	1	pass
	2	pass
	3	pass
	4	pass
	5	pass
	6	pass
	7	pass
	8	pass
	9	pass
	10	pass
	11	pass
	12	pass
	13	pass
	14	pass
	15	pass
	16	pass
	17	pass
	18	pass
	19	pass
	20	pass
	21	pass
	22	pass
	23	pass
	24	pass
	25	pass
	26	pass
	27	pass
	28	pass
	29	pass
	30	pass

AEC Q200 Summary of Test Results

Supplier: Murata

Submission Date: July / 2018

Part Name:

GCM21BR70J106KE22

Series description:

GCM / 0805 / X7R / 6.3V Series

muRata
INNOVATOR IN ELECTRONICS

Murata P/N: GCM21BR70J106KE22

Part Series GCM / 0805 / X7R / 6.3V Series

Operating Temperature: -55℃ ~ +125℃

Test Item	Test Conditions	No of Lots	Qty per Lot	No of Failure
#3 - High Temperature Exposure	Test conditions : 1000hr , 150deg C	1	77	0
#4 - Temperature Cycling	Test conditions : 1000cycles , -55deg C to 125deg C	1	77	0
#5 - Destructive Physical Analysis		1	10	0
#6 - Moisture Resistance	Test conditions : 10cycles(1cycle : 24hr) , 25deg C / 80% RH to 65deg C / 98% RH	1	77	0
#7 - Biased Humidity (I)	Test Conditions : 1000hr , 85deg C / 85% RH , 1WV	1	77	0
#7 - Biased Humidity (II)	Test Conditions : 1000hr , 85deg C / 85% RH , 1.3V	1	77	0
#8 - Operational Life	Test conditions : 1000hr ,125deg C , 1.5WV	1	77	0
#9 - External Visual Examination		all qualification parts		0
#10 - Physical Dimensions		1	30	0
#12 Resistance to solvents	Test conditions A : 1 part (by volume) of isopropyl alcohol and 3 parts (by volume) of mineral sperits , 25deg C 3min immersion test conditions B : terpene defluxer, 25deg C 3min immersion test conditions C : 42 parts(by volume) of water and 1 part (by volume) of propylene glycol monomethylether and 1 part (by volume) of monoethanolamine, 63-70deg C 3min immersion	1	5	0
#13 - Mechanical Shock	Test conditions : shock pulse : 1500g's, 0.5ms, 4.7m/s, 3 times each of 6 orientations	1	30	0
#14 - Vibration	Test conditions : 5g's for 20min, 12 cycles each of 3 orientations, test frequency 10 - 2000Hz	1	30	0
#15 - Resistance to Soldering Heat	Test Conditions : soldering , 260C 10sec immersion	1	30	0
#16 - Thermal Shock	Test conditions : 300Cycles (-55deg C to 125deg C) , Maximum transfer time 20sec , keeping time 15min	1	15	0
#17 - ESD Test	Test conditions : charge capacitor 150pF, discharge resistor 2000ohm	1	30	0
#18 - Solderability	Test conditions : 1.soldering 235C 5sec immersion, 2.soldering 235C 5sec immersion, 3.soldering 260C 120sec immersion	1	15	0
#19 - Electrical Characterization	Test conditions : 1+/-0.1KHz, 0.5+/-0.1Vrms	1	30	0
#21 - Board Flex	Test conditions : bend board at 2mm for 60sec pass/fail criteria : cap change within +/-10%	1	30	0
#22 - Terminal Strength (SMD)	Test conditions : Force of 1.8kg for 60sec	1	30	0
#23 - Beam Load	Test conditions : Apply a force until the part brakes pass/fail criteria: 0805 size or smaller: 20N over (t>0.5mm), 8N over (t<=0.5mm) 1206 size or bigger: 15N over (t<1.25mm), 54.5N over (t>=1.25mm)	1	30	0

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM21BR70J106KE22
Manufacturung Location: Phillipine	Lot No: A
Date before test:2018/03/30	Date after test:2018/05/11

#3 - High Temperature Exposure

Test conditions : 1000hr , 150deg C

No. of samples:	77	Initial readings			Final readings			
No. of lots:	1	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
Spec limits	lower	9.00		5.0E+00			5.0E+00	-10.00
	upper	11.00	10.00			20.00		10.00
Measurement Statistics	minimum	9.98	8.13	1.1E+02	9.41	7.32	1.5E+02	-7.29
	maximum	10.51	9.41	1.7E+02	10.00	8.53	2.5E+02	-3.97
	mean	10.25	8.61	1.4E+02	9.67	7.85	2.1E+02	-5.59
	standard deviation	0.11	0.34	1.4E+01	0.13	0.32	2.6E+01	0.61
Presence of Failures		in spec	in spec	in spec	in spec	in spec	in spec	in spec

Test Data

Lot #	Sample	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
A	1	10.29	8.49	1.6E+02	9.54	7.92	2.0E+02	-7.27
	2	10.05	9.19	1.5E+02	9.49	8.51	2.3E+02	-5.55
	3	10.35	8.17	1.3E+02	9.74	7.48	2.0E+02	-5.94
	4	9.98	9.05	1.5E+02	9.46	8.32	1.7E+02	-5.25
	5	10.19	8.14	1.4E+02	9.64	7.42	2.5E+02	-5.35
	6	10.35	8.59	1.3E+02	9.86	7.80	2.0E+02	-4.76
	7	10.21	8.33	1.4E+02	9.69	7.51	2.3E+02	-5.07
	8	10.41	8.80	1.3E+02	9.83	7.99	2.2E+02	-5.54
	9	10.15	8.80	1.3E+02	9.57	8.12	2.4E+02	-5.70
	10	10.19	9.16	1.6E+02	9.65	8.29	1.8E+02	-5.31
	11	10.05	8.69	1.5E+02	9.41	7.87	2.5E+02	-6.40
	12	10.18	8.73	1.5E+02	9.62	7.96	2.1E+02	-5.51
	13	10.47	8.40	1.3E+02	9.88	7.61	2.4E+02	-5.57
	14	10.19	8.94	1.3E+02	9.58	8.11	2.1E+02	-5.94
	15	10.14	8.84	1.3E+02	9.57	8.14	1.7E+02	-5.64
	16	10.23	8.83	1.4E+02	9.67	8.02	2.2E+02	-5.45
	17	10.27	8.30	1.5E+02	9.62	7.53	2.0E+02	-6.39
	18	10.22	8.16	1.4E+02	9.70	7.61	1.8E+02	-5.06
	19	10.38	8.31	1.6E+02	9.89	7.64	2.5E+02	-4.74
	20	10.39	8.72	1.2E+02	9.90	7.87	2.3E+02	-4.76
	21	10.28	8.34	1.4E+02	9.69	7.68	2.3E+02	-5.69
	22	10.27	8.17	1.3E+02	9.71	7.54	1.9E+02	-5.52
	23	10.23	8.38	1.3E+02	9.62	7.74	2.1E+02	-5.95
	24	10.42	8.21	1.3E+02	9.76	7.50	1.9E+02	-6.28
	25	10.26	9.21	1.2E+02	9.70	8.37	2.2E+02	-5.47
	26	10.32	8.46	1.5E+02	9.73	7.73	1.8E+02	-5.72
	27	10.45	8.59	1.5E+02	9.73	7.99	2.0E+02	-6.91
	28	10.11	8.65	1.4E+02	9.49	7.77	1.9E+02	-6.11
	29	10.21	8.15	1.3E+02	9.57	7.34	1.6E+02	-6.34
	30	10.06	8.19	1.4E+02	9.54	7.51	1.9E+02	-5.19
	31	10.12	9.03	1.4E+02	9.53	8.12	2.4E+02	-5.86
	32	10.23	8.46	1.2E+02	9.61	7.62	2.5E+02	-6.04
	33	10.24	8.22	1.2E+02	9.71	7.57	2.4E+02	-5.19
	34	10.23	8.95	1.4E+02	9.64	8.04	1.8E+02	-5.83
	35	10.36	8.19	1.1E+02	9.76	7.44	2.5E+02	-5.75
	36	10.06	8.22	1.4E+02	9.48	7.34	2.0E+02	-5.71
	37	10.28	8.21	1.5E+02	9.74	7.53	1.5E+02	-5.26
	38	10.28	8.97	1.4E+02	9.71	7.98	1.8E+02	-5.57
	39	10.30	8.63	1.1E+02	9.62	7.81	2.3E+02	-6.61
	40	10.15	8.72	1.2E+02	9.57	8.05	1.9E+02	-5.76
	41	10.39	8.13	1.4E+02	9.83	7.34	2.4E+02	-5.35
	42	10.18	8.24	1.4E+02	9.59	7.56	1.8E+02	-5.85
	43	10.20	8.60	1.5E+02	9.62	7.87	2.3E+02	-5.60
	44	10.32	9.09	1.3E+02	9.80	8.39	2.0E+02	-4.96
	45	10.28	8.32	1.4E+02	9.72	7.73	1.6E+02	-5.49
	46	10.19	8.60	1.7E+02	9.62	7.71	2.3E+02	-5.57
	47	10.32	8.74	1.4E+02	9.71	8.11	1.8E+02	-5.90
	48	10.24	8.74	1.5E+02	9.70	8.06	2.2E+02	-5.26
	49	10.30	8.78	1.2E+02	9.82	8.09	2.0E+02	-4.67
	50	10.03	8.22	1.4E+02	9.47	7.45	2.1E+02	-5.53

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM21BR70J106KE22
Manufacturung Location: Phillipine	Lot No: A
Date before test:2018/03/30	Date after test:2018/05/11

#3 - High Temperature Exposure

Test conditions : 1000hr , 150deg C

A	51	10.29	8.79	1.3E+02	9.61	8.10	2.3E+02	-6.55
	52	10.22	8.25	1.2E+02	9.47	7.59	2.2E+02	-7.29
	53	10.26	8.65	1.3E+02	9.75	8.01	2.4E+02	-4.97
	54	10.13	8.68	1.3E+02	9.57	8.02	2.0E+02	-5.55
	55	10.38	8.41	1.2E+02	9.89	7.71	2.0E+02	-4.70
	56	10.36	8.74	1.2E+02	9.81	7.82	1.7E+02	-5.38
	57	10.49	8.60	1.7E+02	9.88	7.67	2.3E+02	-5.77
	58	10.21	8.54	1.4E+02	9.67	7.90	2.1E+02	-5.26
	59	10.00	8.74	1.4E+02	9.47	8.06	2.0E+02	-5.32
	60	10.37	9.28	1.4E+02	9.72	8.35	1.9E+02	-6.28
	61	10.15	9.16	1.3E+02	9.62	8.31	1.5E+02	-5.19
	62	10.38	8.53	1.4E+02	9.83	7.73	2.4E+02	-5.36
	63	10.19	9.41	1.6E+02	9.54	8.52	1.7E+02	-6.35
	64	10.14	8.13	1.4E+02	9.57	7.32	2.2E+02	-5.67
	65	10.26	8.62	1.3E+02	9.72	7.61	1.7E+02	-5.25
	66	10.30	9.11	1.2E+02	9.81	8.36	1.9E+02	-4.74
	67	10.36	9.26	1.3E+02	9.80	8.53	2.3E+02	-5.37
	68	10.14	8.47	1.5E+02	9.46	7.83	1.9E+02	-6.69
	69	10.23	9.13	1.5E+02	9.69	8.31	1.9E+02	-5.24
	70	10.19	8.39	1.3E+02	9.79	7.70	1.6E+02	-3.97
	71	10.51	8.45	1.3E+02	10.00	7.52	1.9E+02	-4.83
	72	10.39	8.78	1.4E+02	9.73	7.82	2.2E+02	-6.39
	73	10.27	8.87	1.5E+02	9.72	8.25	2.4E+02	-5.38
	74	10.22	8.99	1.7E+02	9.73	8.06	2.0E+02	-4.74
	75	10.23	8.16	1.7E+02	9.66	7.33	2.1E+02	-5.64
	76	10.27	8.43	1.2E+02	9.77	7.74	1.9E+02	-4.87
	77	10.12	8.61	1.3E+02	9.52	7.72	1.9E+02	-5.91

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM21BR70J106KE22
Manufacturung Location: Phillipine	Lot No: A
Date before test:2018/04/06	Date after test:2018/06/08

#4 - Temperature Cycling

Test conditions : 1000cycles , -55deg C to 125deg C

No. of samples:	77	Initial readings			Final readings			
No. of lots:	1	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
Spec limits	lower	9.00		5.0E+00			5.0E+00	-7.50
	upper	11.00	10.00			20.00		7.50
Measurement Statistics	minimum	9.88	9.70	1.2E+02	9.79	9.67	1.2E+02	-1.65
	maximum	10.45	9.99	2.2E+02	10.35	9.96	2.1E+02	-0.44
	mean	10.17	9.88	1.8E+02	10.06	9.83	1.6E+02	-1.05
	standard deviation	0.13	0.07	2.2E+01	0.13	0.07	2.2E+01	0.27
Presence of Failures		in spec	in spec	in spec	in spec	in spec	in spec	in spec

Test Data

Lot #	Sample	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
A	1	10.15	9.99	2.1E+02	10.03	9.76	1.6E+02	-1.12
	2	10.40	9.72	1.9E+02	10.31	9.87	1.7E+02	-0.81
	3	10.16	9.91	2.1E+02	10.06	9.87	1.3E+02	-0.99
	4	10.16	9.88	1.4E+02	10.06	9.82	1.7E+02	-0.93
	5	9.88	9.84	1.9E+02	9.79	9.89	1.3E+02	-0.98
	6	9.94	9.72	1.7E+02	9.80	9.73	1.6E+02	-1.40
	7	10.08	9.85	2.0E+02	9.98	9.94	1.4E+02	-0.99
	8	10.01	9.88	1.7E+02	9.93	9.75	1.5E+02	-0.78
	9	10.33	9.90	1.8E+02	10.23	9.82	1.5E+02	-1.04
	10	10.25	9.85	2.1E+02	10.11	9.83	2.0E+02	-1.36
	11	10.39	9.86	1.7E+02	10.29	9.83	1.8E+02	-0.92
	12	10.25	9.86	1.6E+02	10.12	9.80	1.5E+02	-1.27
	13	10.07	9.92	1.9E+02	10.02	9.85	1.4E+02	-0.49
	14	10.35	9.89	1.9E+02	10.23	9.92	1.7E+02	-1.10
	15	10.11	9.96	1.9E+02	10.07	9.81	1.6E+02	-0.47
	16	10.26	9.90	1.6E+02	10.15	9.80	1.9E+02	-1.07
	17	10.29	9.98	1.9E+02	10.18	9.87	1.9E+02	-1.12
	18	10.00	9.89	1.5E+02	9.91	9.77	1.6E+02	-0.88
	19	10.33	9.90	1.5E+02	10.24	9.70	1.6E+02	-0.84
	20	10.32	9.90	1.7E+02	10.22	9.85	1.8E+02	-1.02
	21	10.38	9.91	2.0E+02	10.25	9.86	1.6E+02	-1.30
	22	10.25	9.98	1.9E+02	10.17	9.94	1.8E+02	-0.77
	23	9.97	9.90	2.1E+02	9.86	9.89	1.8E+02	-1.08
	24	10.26	9.89	1.5E+02	10.13	9.90	1.8E+02	-1.23
	25	9.96	9.85	2.0E+02	9.85	9.86	1.5E+02	-1.09
	26	10.15	9.91	1.8E+02	10.09	9.83	1.5E+02	-0.66
	27	10.16	9.82	2.1E+02	9.99	9.89	1.7E+02	-1.62
	28	10.05	9.85	1.2E+02	9.93	9.87	1.3E+02	-1.22
	29	10.03	9.88	1.8E+02	9.93	9.85	1.6E+02	-1.02
	30	10.20	9.88	1.5E+02	10.11	9.74	1.5E+02	-0.93
	31	10.21	9.83	1.8E+02	10.08	9.88	1.8E+02	-1.24
	32	10.00	9.86	1.8E+02	9.92	9.92	1.4E+02	-0.81
	33	10.10	9.86	1.6E+02	9.93	9.76	1.8E+02	-1.65
	34	10.45	9.76	1.7E+02	10.34	9.81	1.9E+02	-1.06
	35	9.96	9.88	2.2E+02	9.84	9.88	1.4E+02	-1.19
	36	10.11	9.98	1.8E+02	9.99	9.86	1.8E+02	-1.13
	37	10.43	9.86	2.1E+02	10.31	9.91	1.4E+02	-1.17
	38	10.21	9.89	1.7E+02	10.10	9.77	1.7E+02	-1.08
	39	10.21	9.88	2.0E+02	10.06	9.80	1.2E+02	-1.48
	40	10.19	9.89	2.0E+02	10.09	9.88	2.0E+02	-1.01
	41	10.13	9.85	1.6E+02	10.04	9.85	1.6E+02	-0.93
	42	10.38	9.81	2.0E+02	10.28	9.94	1.6E+02	-0.98
	43	10.11	9.94	1.6E+02	10.01	9.86	1.4E+02	-0.93
	44	9.98	9.94	1.6E+02	9.83	9.77	1.9E+02	-1.49
	45	10.20	9.93	1.7E+02	10.09	9.82	2.0E+02	-1.05
	46	10.10	9.80	1.7E+02	10.04	9.85	1.5E+02	-0.57
	47	10.29	9.97	2.2E+02	10.24	9.78	1.3E+02	-0.44
	48	10.31	9.70	1.6E+02	10.23	9.74	1.7E+02	-0.77
	49	10.12	9.93	1.7E+02	9.95	9.89	1.3E+02	-1.64
	50	10.01	9.90	1.9E+02	9.91	9.75	1.8E+02	-1.03

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM21BR70J106KE22
Manufacturung Location: Phillipine	Lot No: A
Date before test:2018/04/06	Date after test:2018/06/08

#4 - Temperature Cycling

Test conditions : 1000cycles , -55deg C to 125deg C

	51	10.03	9.98	1.8E+02	9.92	9.72	1.3E+02	-1.12
	52	10.06	9.97	1.9E+02	9.95	9.81	1.9E+02	-1.08
	53	10.07	9.83	1.6E+02	9.97	9.68	1.7E+02	-1.05
	54	10.19	9.88	1.4E+02	10.08	9.70	1.7E+02	-1.03
	55	10.12	9.89	1.9E+02	10.00	9.83	1.5E+02	-1.23
	56	10.26	9.79	1.3E+02	10.17	9.77	1.9E+02	-0.87
	57	10.03	9.89	1.9E+02	9.87	9.85	1.9E+02	-1.54
	58	10.04	9.82	1.7E+02	9.93	9.93	1.7E+02	-1.10
	59	10.12	9.86	1.5E+02	10.02	9.89	1.5E+02	-0.99
	60	10.39	9.94	1.7E+02	10.29	9.84	1.9E+02	-0.96
	61	10.18	9.79	2.2E+02	10.06	9.92	1.4E+02	-1.22
	62	10.20	9.84	1.7E+02	10.07	9.82	1.5E+02	-1.26
	63	10.11	9.85	1.7E+02	9.98	9.89	1.6E+02	-1.27
A	64	10.19	9.97	1.9E+02	10.11	9.81	1.3E+02	-0.81
	65	10.05	9.93	1.9E+02	9.97	9.87	2.1E+02	-0.76
	66	10.26	9.87	1.9E+02	10.17	9.67	1.5E+02	-0.89
	67	10.17	9.97	1.7E+02	10.12	9.73	1.9E+02	-0.52
	68	10.41	9.74	1.6E+02	10.27	9.86	1.6E+02	-1.37
	69	10.13	9.97	1.8E+02	10.03	9.79	1.3E+02	-0.97
	70	10.06	9.86	2.0E+02	9.93	9.80	1.9E+02	-1.27
	71	10.12	9.77	2.1E+02	10.00	9.83	2.0E+02	-1.20
	72	10.16	9.84	1.9E+02	10.08	9.80	1.4E+02	-0.80
	73	10.19	9.82	1.9E+02	10.07	9.87	1.3E+02	-1.15
	74	10.08	9.76	1.7E+02	9.92	9.81	1.5E+02	-1.59
	75	10.23	9.86	1.4E+02	10.15	9.67	1.3E+02	-0.71
	76	10.13	9.90	1.4E+02	10.05	9.77	1.7E+02	-0.81
	77	10.18	9.91	2.2E+02	10.05	9.96	1.6E+02	-1.20

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM21BR70J106KE22
Manufacturung Location: Phillipine	Lot No: A
Date before test:2018/04/03	

#5 - Destructive Physical Analysis

Number of Samples: 10 Number of Lots: 1	Number of failures: 0

Lot #	Sample	Result (pass/fail)
A	1	pass
	2	pass
	3	pass
	4	pass
	5	pass
	6	pass
	7	pass
	8	pass
	9	pass
	10	pass

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM21BR70J106KE22
Manufacturung Location: Phillipine	Lot No: A
Date before test:2018/04/13	Date after test:2018/05/11

#6 - Moisture Resistance

Test conditions : 10cycles(1cycle : 24hr) , 25deg C / 80% RH to 65deg C / 98% RH

No. of samples:	77	Initial readings			Final readings			
No. of lots:	1	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
Spec limits	lower	9.00		5.0E+00			5.0E+00	-10.00
	upper	11.00	10.00			20.00		10.00
Measurement Statistics	minimum	9.90	8.14	1.2E+02	9.87	8.88	1.4E+02	-0.59
	maximum	10.30	9.24	2.1E+02	10.31	11.28	1.9E+02	0.31
	mean	10.10	8.59	1.7E+02	10.09	9.96	1.7E+02	-0.14
	standard deviation	0.11	0.32	2.0E+01	0.11	0.55	1.3E+01	0.20
Presence of Failures		in spec	in spec	in spec	in spec	in spec	in spec	in spec

Test Data

Lot #	Sample	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
A	1	9.90	8.54	1.5E+02	9.87	9.42	1.8E+02	-0.30
	2	10.27	8.59	1.7E+02	10.26	9.95	1.4E+02	-0.09
	3	10.19	8.57	1.5E+02	10.18	9.81	1.6E+02	-0.08
	4	10.16	8.62	1.8E+02	10.18	9.93	1.7E+02	0.12
	5	9.95	8.74	1.5E+02	9.94	9.74	1.9E+02	-0.15
	6	10.26	8.50	1.7E+02	10.27	9.74	1.6E+02	0.07
	7	10.03	8.22	1.2E+02	10.04	8.94	1.7E+02	0.04
	8	10.30	8.16	1.3E+02	10.28	10.11	1.9E+02	-0.26
	9	10.04	9.21	1.8E+02	10.01	11.28	1.8E+02	-0.30
	10	10.23	9.05	1.6E+02	10.22	10.91	1.5E+02	-0.16
	11	10.24	8.26	1.9E+02	10.22	9.55	1.5E+02	-0.19
	12	10.06	8.98	1.6E+02	10.03	10.22	1.8E+02	-0.29
	13	10.05	8.62	1.3E+02	10.02	10.15	1.5E+02	-0.28
	14	9.97	8.47	1.8E+02	9.96	9.22	1.6E+02	-0.09
	15	9.98	9.24	1.6E+02	9.97	10.97	1.7E+02	-0.10
	16	9.99	8.95	1.8E+02	9.98	10.59	1.7E+02	-0.10
	17	9.93	8.98	1.8E+02	9.94	11.09	1.9E+02	0.07
	18	10.06	8.15	1.7E+02	10.00	9.22	1.7E+02	-0.59
	19	10.10	8.30	1.7E+02	10.06	9.54	1.7E+02	-0.46
	20	10.14	8.52	1.6E+02	10.14	10.15	1.7E+02	0.00
	21	10.26	8.21	1.8E+02	10.23	9.27	1.7E+02	-0.26
	22	10.21	8.36	1.7E+02	10.20	9.37	1.6E+02	-0.13
	23	10.14	8.44	1.7E+02	10.11	9.82	1.8E+02	-0.24
	24	10.18	8.38	1.9E+02	10.18	9.66	1.7E+02	0.02
	25	10.20	8.50	1.9E+02	10.21	10.43	1.5E+02	0.06
	26	10.22	8.78	1.5E+02	10.20	9.70	1.8E+02	-0.23
	27	9.98	8.20	1.6E+02	9.96	9.81	1.5E+02	-0.21
	28	10.07	8.20	2.0E+02	10.08	10.16	1.8E+02	0.12
	29	10.11	8.71	1.3E+02	10.14	10.61	1.7E+02	0.31
	30	10.13	8.57	1.7E+02	10.13	9.62	1.6E+02	-0.06
	31	10.24	8.14	1.6E+02	10.21	9.91	1.4E+02	-0.36
	32	9.99	8.54	1.6E+02	9.95	9.66	1.8E+02	-0.44
	33	10.24	8.29	1.7E+02	10.22	9.14	1.6E+02	-0.25
	34	10.06	8.98	1.4E+02	10.02	10.42	1.7E+02	-0.37
	35	10.00	8.67	1.9E+02	10.02	10.66	1.8E+02	0.13
	36	10.13	8.18	1.6E+02	10.12	9.33	1.6E+02	-0.09
	37	10.25	8.62	2.1E+02	10.24	10.60	1.8E+02	-0.07
	38	10.05	8.81	1.9E+02	10.04	9.85	1.6E+02	-0.17
	39	9.99	8.32	1.5E+02	9.97	9.89	1.6E+02	-0.17
	40	10.25	8.31	1.4E+02	10.28	9.62	1.9E+02	0.29
	41	10.04	8.45	1.7E+02	10.03	9.19	1.5E+02	-0.13
	42	10.02	8.28	2.0E+02	10.01	9.68	1.8E+02	-0.15
	43	10.11	8.45	1.6E+02	10.13	10.47	1.7E+02	0.17
	44	10.29	8.38	2.1E+02	10.27	9.98	1.9E+02	-0.16
	45	10.04	8.90	1.5E+02	10.01	10.22	1.8E+02	-0.34
	46	10.10	8.64	1.8E+02	10.08	10.25	1.9E+02	-0.23
	47	10.29	9.09	1.5E+02	10.26	10.30	1.6E+02	-0.31
	48	9.92	8.35	2.0E+02	9.91	10.25	1.5E+02	-0.11
	49	10.14	9.07	1.3E+02	10.15	11.04	1.9E+02	0.19
	50	10.18	9.19	1.7E+02	10.16	10.16	1.6E+02	-0.25

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM21BR70J106KE22
Manufacturung Location: Phillipine	Lot No: A
Date before test:2018/04/13	Date after test:2018/05/11

#6 - Moisture Resistance

Test conditions : 10cycles(1cycle : 24hr) , 25deg C / 80% RH to 65deg C / 98% RH

	51	10.17	8.47	1.8E+02	10.14	9.36	1.6E+02	-0.30
	52	10.22	8.54	1.6E+02	10.20	9.46	1.6E+02	-0.23
	53	10.05	9.16	1.8E+02	10.04	10.24	1.6E+02	-0.09
	54	10.27	8.55	1.9E+02	10.24	9.68	1.5E+02	-0.30
	55	9.94	9.06	1.6E+02	9.91	11.20	1.7E+02	-0.26
	56	10.01	8.68	2.0E+02	10.00	10.15	1.7E+02	-0.08
	57	10.05	8.22	1.5E+02	10.04	8.88	1.6E+02	-0.09
	58	10.06	8.22	1.6E+02	10.02	10.00	1.6E+02	-0.43
	59	10.14	8.28	1.7E+02	10.08	8.88	1.6E+02	-0.57
	60	9.99	8.25	1.4E+02	10.00	10.04	1.8E+02	0.09
	61	10.12	9.19	1.5E+02	10.12	10.06	1.5E+02	-0.06
	62	9.98	8.20	1.5E+02	9.99	9.59	1.7E+02	0.06
	63	10.14	8.30	1.6E+02	10.15	9.21	1.5E+02	0.11
A	64	10.29	9.08	1.6E+02	10.23	10.70	1.7E+02	-0.56
	65	10.07	8.63	1.5E+02	10.05	10.50	1.5E+02	-0.17
	66	10.02	8.18	2.0E+02	9.99	9.47	1.5E+02	-0.30
	67	10.16	8.70	1.7E+02	10.18	10.12	1.6E+02	0.15
	68	9.95	9.22	2.1E+02	9.91	10.82	1.5E+02	-0.47
	69	9.97	8.80	1.9E+02	9.93	9.96	1.6E+02	-0.36
	70	10.14	8.32	1.7E+02	10.14	9.98	1.7E+02	0.01
	71	10.03	8.36	1.7E+02	9.98	9.87	1.6E+02	-0.44
	72	10.02	8.53	1.7E+02	10.02	9.50	1.6E+02	0.00
	73	10.19	8.62	1.8E+02	10.21	9.72	1.8E+02	0.18
	74	10.16	8.57	1.4E+02	10.15	9.88	1.8E+02	-0.06
	75	10.05	8.52	1.8E+02	10.06	9.81	1.5E+02	0.16
	76	9.99	8.77	1.6E+02	9.98	9.91	1.6E+02	-0.17
	77	10.05	8.99	1.7E+02	10.02	10.68	1.6E+02	-0.29

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM21BR70J106KE22
Manufacturung Location: Phillipine	Lot No: A
Date before test:2018/04/17	Date after test:2018/06/12

#7 - Biased Humidity

Test Conditions : 1000hr , 85deg C / 85% RH , 1WV

No. of samples:	77	Initial readings			Final readings			
No. of lots:	1	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
Spec limits	lower	9.00		5.0E+00			5.0E-01	-10.00
	upper	11.00	10.00			20.00		10.00
Measurement Statistics	minimum	10.30	8.13	1.2E+02	10.09	8.06	3.5E+02	-2.66
	maximum	10.39	9.37	2.4E+02	10.51	9.41	4.9E+02	1.12
	mean	10.34	8.57	1.9E+02	10.34	8.59	4.3E+02	-0.06
	standard deviation	0.02	0.31	3.0E+01	0.08	0.32	3.2E+01	0.78
Presence of Failures		in spec	in spec	in spec	in spec	in spec	in spec	in spec

Test Data

Lot #	Sample	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
A	1	10.36	8.85	1.7E+02	10.43	8.89	4.5E+02	0.70
	2	10.31	8.15	2.1E+02	10.11	8.11	4.8E+02	-1.94
	3	10.36	8.45	2.2E+02	10.44	8.53	3.5E+02	0.81
	4	10.34	8.51	2.2E+02	10.35	8.39	4.3E+02	0.16
	5	10.36	8.66	1.8E+02	10.38	8.64	3.6E+02	0.24
	6	10.39	8.18	1.5E+02	10.39	8.07	3.8E+02	0.01
	7	10.32	8.58	2.1E+02	10.36	8.63	3.8E+02	0.40
	8	10.36	8.59	2.1E+02	10.27	8.55	4.6E+02	-0.86
	9	10.32	8.79	2.1E+02	10.35	8.73	4.3E+02	0.29
	10	10.35	9.27	2.2E+02	10.42	9.24	4.6E+02	0.64
	11	10.37	8.77	2.3E+02	10.09	8.72	4.7E+02	-2.66
	12	10.34	8.60	1.8E+02	10.30	8.52	4.7E+02	-0.40
	13	10.37	9.37	1.8E+02	10.41	9.28	4.2E+02	0.40
	14	10.37	8.68	1.7E+02	10.32	8.59	4.5E+02	-0.40
	15	10.33	8.82	2.1E+02	10.30	8.71	4.3E+02	-0.31
	16	10.36	8.60	2.1E+02	10.45	8.68	4.5E+02	0.92
	17	10.35	8.62	1.7E+02	10.42	8.71	4.5E+02	0.68
	18	10.35	8.73	1.9E+02	10.38	8.81	4.4E+02	0.31
	19	10.35	8.20	2.1E+02	10.33	8.36	4.3E+02	-0.25
	20	10.33	8.60	1.9E+02	10.38	8.67	4.0E+02	0.53
	21	10.30	8.25	1.5E+02	10.31	8.32	4.7E+02	0.15
	22	10.36	8.59	2.3E+02	10.35	8.67	4.6E+02	-0.03
	23	10.33	8.23	1.8E+02	10.28	8.24	4.3E+02	-0.46
	24	10.33	8.41	1.7E+02	10.36	8.29	4.2E+02	0.30
	25	10.36	8.75	2.3E+02	10.41	8.84	4.6E+02	0.49
	26	10.34	8.33	1.8E+02	10.40	8.30	4.3E+02	0.59
	27	10.34	8.45	1.6E+02	10.37	8.34	4.4E+02	0.31
	28	10.34	8.59	1.7E+02	10.41	8.66	4.0E+02	0.66
	29	10.38	8.33	1.7E+02	10.45	8.23	4.5E+02	0.75
	30	10.36	8.77	2.0E+02	10.34	8.82	3.7E+02	-0.20
	31	10.34	8.63	2.4E+02	10.36	8.72	3.8E+02	0.18
	32	10.35	9.08	2.1E+02	10.26	8.96	4.4E+02	-0.87
	33	10.35	8.14	2.0E+02	10.22	8.14	4.5E+02	-1.17
	34	10.32	9.15	1.9E+02	10.40	9.12	3.7E+02	0.73
	35	10.33	8.21	1.8E+02	10.31	8.14	4.8E+02	-0.17
	36	10.36	8.69	2.2E+02	10.35	8.91	4.5E+02	-0.11
	37	10.36	8.18	2.1E+02	10.37	8.27	4.6E+02	0.10
	38	10.35	8.67	1.7E+02	10.25	8.72	4.5E+02	-0.97
	39	10.36	8.41	1.5E+02	10.23	8.40	3.7E+02	-1.22
	40	10.34	9.16	2.0E+02	10.38	9.26	4.4E+02	0.40
	41	10.34	8.21	2.0E+02	10.36	8.27	4.5E+02	0.19
	42	10.34	8.74	1.9E+02	10.30	8.71	4.0E+02	-0.32
	43	10.33	8.72	1.4E+02	10.41	8.79	4.1E+02	0.77
	44	10.32	8.93	1.8E+02	10.23	8.95	4.7E+02	-0.90
	45	10.35	8.72	1.7E+02	10.39	8.91	4.1E+02	0.33
	46	10.36	8.28	2.3E+02	10.36	8.14	4.6E+02	-0.07
	47	10.34	9.26	1.6E+02	10.32	9.41	4.0E+02	-0.23
	48	10.35	8.59	1.4E+02	10.33	8.55	4.3E+02	-0.23
	49	10.37	8.16	1.6E+02	10.42	8.25	4.0E+02	0.46
	50	10.30	8.72	2.0E+02	10.23	8.78	4.2E+02	-0.69

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM21BR70J106KE22
Manufacturung Location: Phillipine	Lot No: A
Date before test:2018/04/17	Date after test:2018/06/12

#7 - Biased Humidity

Test Conditions : 1000hr , 85deg C / 85% RH , 1WV

	51	10.35	8.83	1.7E+02	10.46	8.99	3.9E+02	1.11
	52	10.32	8.21	2.1E+02	10.36	8.11	4.2E+02	0.38
	53	10.36	8.59	1.4E+02	10.18	8.67	4.4E+02	-1.82
	54	10.35	9.16	1.5E+02	10.38	9.17	4.7E+02	0.33
	55	10.37	8.53	2.3E+02	10.15	8.51	4.7E+02	-2.15
	56	10.33	8.21	1.4E+02	10.30	8.35	4.9E+02	-0.22
	57	10.35	9.05	2.0E+02	10.27	9.08	4.4E+02	-0.78
	58	10.34	8.28	2.2E+02	10.30	8.38	4.7E+02	-0.41
	59	10.34	8.58	1.7E+02	10.27	8.64	4.3E+02	-0.63
	60	10.34	8.42	2.4E+02	10.42	8.52	4.7E+02	0.80
	61	10.32	8.35	1.8E+02	10.37	8.40	4.6E+02	0.48
	62	10.34	8.25	1.9E+02	10.42	8.22	4.0E+02	0.75
	63	10.35	8.48	2.3E+02	10.22	8.52	4.1E+02	-1.21
A	64	10.33	8.52	1.5E+02	10.45	8.44	4.0E+02	1.12
	65	10.33	8.89	2.3E+02	10.27	8.95	4.3E+02	-0.63
	66	10.32	8.46	1.8E+02	10.35	8.53	4.0E+02	0.35
	67	10.35	9.09	1.4E+02	10.41	9.14	4.0E+02	0.57
	68	10.38	8.33	2.4E+02	10.43	8.42	4.2E+02	0.49
	69	10.33	8.56	1.4E+02	10.38	8.66	4.3E+02	0.44
	70	10.35	8.51	2.1E+02	10.38	8.40	4.5E+02	0.28
	71	10.31	8.95	1.9E+02	10.22	8.86	4.4E+02	-0.81
	72	10.38	8.51	1.5E+02	10.49	8.61	4.6E+02	1.06
	73	10.39	8.20	1.9E+02	10.29	8.18	4.8E+02	-0.88
	74	10.34	8.37	2.0E+02	10.37	8.53	4.0E+02	0.34
	75	10.35	8.13	1.3E+02	10.28	8.06	4.2E+02	-0.69
	76	10.37	8.17	1.2E+02	10.26	8.23	4.6E+02	-1.03
	77	10.33	8.13	2.2E+02	10.35	8.19	4.0E+02	0.25

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM21BR70J106KE22
Manufacturung Location: Phillipine	Lot No: A
Date before test:2018/04/17	Date after test:2018/06/12

#7 - Biased Humidity

Test Conditions : 1000hr , 85deg C / 85% RH , 1.3V

No. of samples:	77	Initial readings			Final readings			
No. of lots:	1	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
Spec limits	lower	9.00		5.0E+00			5.0E-01	-10.00
	upper	11.00	10.00			20.00		10.00
Measurement Statistics	minimum	9.98	8.13	8.5E+01	9.95	7.52	1.8E+02	-0.93
	maximum	10.47	9.27	1.4E+02	10.47	8.94	2.8E+02	0.12
	mean	10.23	8.60	1.1E+02	10.19	8.15	2.3E+02	-0.40
	standard deviation	0.12	0.27	1.3E+01	0.12	0.26	2.3E+01	0.23
Presence of Failures		in spec	in spec	in spec	in spec	in spec	in spec	in spec

Test Data

Lot #	Sample	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
A	1	10.47	8.67	1.2E+02	10.47	8.20	2.2E+02	-0.05
	2	10.24	8.43	1.1E+02	10.23	7.87	2.4E+02	-0.08
	3	10.18	8.37	1.1E+02	10.12	7.98	1.9E+02	-0.52
	4	10.42	8.51	1.3E+02	10.36	7.97	2.6E+02	-0.65
	5	10.27	8.39	1.2E+02	10.21	7.99	2.8E+02	-0.58
	6	10.17	8.99	1.1E+02	10.12	8.36	1.8E+02	-0.50
	7	10.32	8.14	1.1E+02	10.27	7.67	2.0E+02	-0.44
	8	10.12	8.44	1.2E+02	10.09	8.07	2.0E+02	-0.34
	9	10.23	8.26	8.9E+01	10.22	7.98	2.1E+02	-0.12
	10	10.26	8.26	1.0E+02	10.22	7.99	2.6E+02	-0.38
	11	10.25	8.53	1.1E+02	10.26	8.12	2.6E+02	0.08
	12	10.12	8.62	1.1E+02	10.05	8.31	2.4E+02	-0.70
	13	10.19	8.16	1.1E+02	10.17	7.73	2.1E+02	-0.22
	14	10.36	8.82	8.5E+01	10.32	8.29	2.1E+02	-0.36
	15	10.21	8.77	1.2E+02	10.21	8.02	2.1E+02	-0.05
	16	10.07	8.71	1.2E+02	10.02	8.15	2.2E+02	-0.43
	17	10.30	8.74	9.8E+01	10.25	8.31	2.3E+02	-0.41
	18	10.23	8.55	1.4E+02	10.20	8.00	2.2E+02	-0.27
	19	10.30	8.40	1.1E+02	10.24	7.99	2.0E+02	-0.54
	20	10.02	8.34	1.0E+02	9.97	7.68	2.0E+02	-0.44
	21	10.31	8.19	1.1E+02	10.24	7.65	2.4E+02	-0.60
	22	10.22	8.79	1.1E+02	10.19	8.31	1.9E+02	-0.36
	23	10.17	8.60	1.1E+02	10.10	8.08	2.3E+02	-0.65
	24	10.13	8.25	1.0E+02	10.08	7.98	2.1E+02	-0.57
	25	10.07	8.56	1.1E+02	10.06	8.15	2.1E+02	-0.10
	26	10.16	8.36	1.1E+02	10.11	8.05	2.6E+02	-0.46
	27	10.15	8.63	9.5E+01	10.11	8.04	2.4E+02	-0.47
	28	10.27	8.42	1.0E+02	10.22	7.99	2.0E+02	-0.51
	29	10.30	8.31	9.3E+01	10.23	8.01	2.2E+02	-0.67
	30	10.11	9.20	1.2E+02	10.04	8.77	2.4E+02	-0.63
	31	10.21	8.80	1.1E+02	10.16	8.40	2.5E+02	-0.45
	32	10.14	8.48	9.1E+01	10.08	7.91	2.0E+02	-0.62
	33	10.46	8.74	9.9E+01	10.45	8.36	2.4E+02	-0.08
	34	10.09	8.45	1.1E+02	10.08	8.02	2.5E+02	-0.12
	35	10.27	8.26	1.1E+02	10.23	7.94	2.1E+02	-0.38
	36	10.44	8.95	1.3E+02	10.39	8.45	2.0E+02	-0.56
	37	10.19	8.90	9.4E+01	10.17	8.38	2.4E+02	-0.25
	38	10.26	9.00	1.2E+02	10.23	8.51	2.2E+02	-0.28
	39	10.28	8.64	1.3E+02	10.21	8.18	2.3E+02	-0.67
	40	10.15	8.15	8.7E+01	10.12	7.82	2.1E+02	-0.25
	41	10.00	8.13	1.2E+02	9.98	7.70	2.2E+02	-0.20
	42	10.39	8.59	1.4E+02	10.33	8.22	2.5E+02	-0.64
	43	10.27	8.94	1.4E+02	10.24	8.37	2.4E+02	-0.30
	44	10.39	8.51	9.6E+01	10.39	8.00	2.4E+02	-0.05
	45	10.40	8.66	1.1E+02	10.33	8.25	2.2E+02	-0.64
	46	10.30	8.26	1.2E+02	10.21	7.76	2.3E+02	-0.93
	47	10.13	8.63	1.2E+02	10.08	8.21	2.3E+02	-0.41
	48	10.04	8.97	1.2E+02	10.00	8.47	2.2E+02	-0.45
	49	10.22	8.90	1.2E+02	10.20	8.42	2.2E+02	-0.18
	50	9.98	8.63	1.3E+02	9.95	8.22	2.5E+02	-0.30

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM21BR70J106KE22
Manufacturung Location: Phillipine	Lot No: A
Date before test:2018/04/17	Date after test:2018/06/12

#7 - Biased Humidity

Test Conditions : 1000hr , 85deg C / 85% RH , 1.3V

	51	10.18	8.53	1.3E+02	10.12	8.15	2.2E+02	-0.63
	52	10.41	8.91	1.0E+02	10.32	8.33	2.3E+02	-0.82
	53	10.15	8.86	1.3E+02	10.13	8.26	2.5E+02	-0.13
	54	10.34	8.55	9.8E+01	10.34	8.03	2.2E+02	0.01
	55	10.06	8.75	1.2E+02	10.02	8.37	1.9E+02	-0.34
	56	10.07	8.47	1.1E+02	10.01	8.12	2.5E+02	-0.54
	57	10.32	8.69	1.2E+02	10.27	8.25	2.4E+02	-0.50
	58	10.31	8.89	1.4E+02	10.25	8.46	2.7E+02	-0.58
	59	10.20	8.85	1.1E+02	10.15	8.54	2.3E+02	-0.48
	60	10.42	8.46	1.1E+02	10.35	8.14	2.5E+02	-0.67
	61	10.36	8.47	1.2E+02	10.34	8.12	2.3E+02	-0.13
	62	10.26	8.45	1.2E+02	10.19	7.89	2.2E+02	-0.74
	63	10.38	9.27	1.0E+02	10.30	8.94	2.2E+02	-0.73
A	64	10.21	8.57	1.3E+02	10.22	8.12	2.3E+02	0.12
	65	10.10	8.80	1.3E+02	10.02	8.37	2.5E+02	-0.72
	66	10.24	8.87	1.2E+02	10.19	8.37	2.6E+02	-0.51
	67	10.33	9.07	1.2E+02	10.30	8.54	2.6E+02	-0.29
	68	10.17	8.94	1.4E+02	10.16	8.41	2.3E+02	-0.10
	69	10.04	8.83	1.2E+02	9.97	8.31	2.1E+02	-0.69
	70	10.35	8.68	1.1E+02	10.33	8.38	2.3E+02	-0.23
	71	10.19	8.22	1.3E+02	10.15	7.72	2.0E+02	-0.42
	72	10.02	8.68	1.0E+02	9.96	8.38	2.4E+02	-0.60
	73	10.28	8.47	1.3E+02	10.23	8.13	2.0E+02	-0.46
	74	10.22	8.53	1.3E+02	10.21	8.17	1.9E+02	-0.03
	75	10.38	8.88	1.2E+02	10.37	8.38	2.8E+02	-0.08
	76	10.25	8.16	1.0E+02	10.21	7.52	2.4E+02	-0.33
	77	10.22	8.56	1.3E+02	10.17	8.12	2.2E+02	-0.45

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM21BR70J106KE22
Manufacturung Location: Phillipine	Lot No: A
Date before test:2018/04/18	Date after test:2018/06/13

#8 - Operational Life

Test conditions : 1000hr ,125deg C , 1.5WV

No. of samples:	77	Initial readings			Final readings			
No. of lots:	1	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
Spec limits	lower	9.00		5.0E+00			5.0E-01	-12.50
	upper	11.00	10.00			20.00		12.50
Measurement Statistics	minimum	9.93	8.14	1.2E+02	9.55	7.76	1.6E+02	-4.93
	maximum	10.55	9.19	1.7E+02	10.17	8.83	1.7E+02	-2.83
	mean	10.23	8.60	1.5E+02	9.84	8.27	1.6E+02	-3.81
	standard deviation	0.13	0.31	1.3E+01	0.12	0.29	2.4E+00	0.42
Presence of Failures		in spec	in spec	in spec	in spec	in spec	in spec	in spec

Test Data

Lot #	Sample	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
A	1	10.19	8.47	1.6E+02	9.79	8.19	1.6E+02	-3.99
	2	10.31	8.36	1.3E+02	9.97	8.02	1.6E+02	-3.34
	3	10.26	8.38	1.5E+02	9.85	8.10	1.7E+02	-3.99
	4	10.21	9.17	1.4E+02	9.87	8.80	1.6E+02	-3.30
	5	10.20	9.09	1.4E+02	9.81	8.63	1.7E+02	-3.84
	6	10.20	8.37	1.4E+02	9.78	7.99	1.6E+02	-4.09
	7	10.12	8.31	1.4E+02	9.77	7.94	1.6E+02	-3.44
	8	10.13	8.77	1.4E+02	9.79	8.45	1.6E+02	-3.30
	9	10.39	8.58	1.7E+02	10.04	8.23	1.6E+02	-3.33
	10	10.16	9.13	1.3E+02	9.74	8.69	1.6E+02	-4.12
	11	9.93	8.60	1.4E+02	9.55	8.23	1.6E+02	-3.80
	12	10.25	8.32	1.5E+02	9.81	7.94	1.7E+02	-4.25
	13	10.00	8.67	1.5E+02	9.68	8.37	1.6E+02	-3.23
	14	10.17	8.51	1.4E+02	9.85	8.13	1.7E+02	-3.11
	15	10.27	8.40	1.3E+02	9.80	8.10	1.7E+02	-4.57
	16	10.13	8.15	1.5E+02	9.73	7.84	1.7E+02	-3.98
	17	10.06	8.71	1.7E+02	9.61	8.37	1.7E+02	-4.48
	18	10.25	8.97	1.5E+02	9.83	8.69	1.6E+02	-4.07
	19	10.24	8.76	1.6E+02	9.91	8.50	1.6E+02	-3.19
	20	10.25	9.05	1.5E+02	9.84	8.65	1.6E+02	-4.05
	21	10.40	8.46	1.4E+02	10.00	8.17	1.7E+02	-3.79
	22	10.15	8.14	1.3E+02	9.76	7.91	1.7E+02	-3.89
	23	10.14	8.41	1.4E+02	9.76	8.16	1.7E+02	-3.73
	24	10.34	8.17	1.3E+02	9.85	7.76	1.6E+02	-4.69
	25	10.19	8.31	1.2E+02	9.73	8.00	1.7E+02	-4.43
	26	10.16	8.29	1.3E+02	9.78	7.99	1.6E+02	-3.68
	27	10.13	8.71	1.7E+02	9.79	8.39	1.6E+02	-3.33
	28	10.29	8.45	1.5E+02	9.83	8.14	1.6E+02	-4.46
	29	10.20	8.87	1.5E+02	9.82	8.52	1.7E+02	-3.74
	30	10.19	8.41	1.6E+02	9.79	8.11	1.6E+02	-3.88
	31	10.22	8.50	1.3E+02	9.79	8.22	1.7E+02	-4.19
	32	10.20	8.16	1.6E+02	9.79	7.77	1.6E+02	-3.94
	33	10.29	8.80	1.5E+02	9.88	8.41	1.6E+02	-3.90
	34	10.18	8.54	1.5E+02	9.75	8.23	1.7E+02	-4.25
	35	10.09	8.26	1.5E+02	9.71	7.92	1.7E+02	-3.80
	36	10.31	8.32	1.6E+02	9.96	8.05	1.7E+02	-3.41
	37	10.21	8.29	1.4E+02	9.85	7.88	1.6E+02	-3.50
	38	10.25	8.14	1.3E+02	9.89	7.82	1.7E+02	-3.54
	39	10.23	9.01	1.4E+02	9.84	8.77	1.6E+02	-3.80
	40	10.38	8.31	1.5E+02	9.87	7.97	1.7E+02	-4.93
	41	10.17	8.78	1.6E+02	9.76	8.47	1.6E+02	-4.01
	42	10.05	9.08	1.6E+02	9.64	8.72	1.6E+02	-4.13
	43	10.15	9.10	1.4E+02	9.78	8.71	1.7E+02	-3.67
	44	10.31	8.78	1.2E+02	9.92	8.52	1.7E+02	-3.78
	45	10.31	8.14	1.5E+02	9.91	7.83	1.6E+02	-3.84
	46	10.38	8.36	1.4E+02	9.98	8.04	1.6E+02	-3.89
	47	10.32	8.26	1.3E+02	9.93	8.05	1.7E+02	-3.78
	48	10.17	8.42	1.5E+02	9.78	8.07	1.7E+02	-3.88
	49	10.26	8.61	1.7E+02	9.91	8.26	1.6E+02	-3.44
	50	10.35	9.19	1.6E+02	9.90	8.83	1.7E+02	-4.29

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM21BR70J106KE22
Manufacturung Location: Phillipine	Lot No: A
Date before test:2018/04/18	Date after test:2018/06/13

#8 - Operational Life

Test conditions : 1000hr ,125deg C , 1.5WV

	51	10.55	8.41	1.5E+02	10.17	7.92	1.6E+02	-3.66
	52	10.52	9.15	1.3E+02	10.07	8.69	1.7E+02	-4.24
	53	10.28	8.74	1.7E+02	9.98	8.43	1.7E+02	-2.92
	54	9.96	8.40	1.4E+02	9.58	8.16	1.7E+02	-3.82
	55	10.20	8.32	1.5E+02	9.86	8.05	1.6E+02	-3.27
	56	10.19	8.81	1.5E+02	9.90	8.50	1.7E+02	-2.83
	57	10.31	8.51	1.3E+02	9.88	8.25	1.6E+02	-4.17
	58	9.98	9.19	1.3E+02	9.61	8.81	1.6E+02	-3.72
	59	10.31	8.42	1.6E+02	9.87	8.05	1.6E+02	-4.22
	60	10.40	8.87	1.5E+02	10.00	8.53	1.6E+02	-3.86
	61	10.17	8.26	1.6E+02	9.81	8.01	1.6E+02	-3.54
	62	10.47	8.77	1.4E+02	10.10	8.45	1.6E+02	-3.58
	63	9.99	8.28	1.6E+02	9.58	7.97	1.6E+02	-4.11
A	64	10.19	8.94	1.5E+02	9.76	8.61	1.7E+02	-4.21
	65	10.03	9.02	1.4E+02	9.63	8.70	1.6E+02	-3.99
	66	10.22	8.52	1.5E+02	9.85	8.20	1.6E+02	-3.68
	67	10.39	8.56	1.4E+02	9.93	8.22	1.6E+02	-4.44
	68	10.36	8.51	1.6E+02	9.95	8.18	1.6E+02	-3.98
	69	10.42	8.46	1.6E+02	10.04	8.16	1.6E+02	-3.57
	70	10.23	8.77	1.5E+02	9.85	8.38	1.7E+02	-3.69
	71	10.19	8.56	1.2E+02	9.77	8.24	1.7E+02	-4.15
	72	10.16	9.14	1.6E+02	9.82	8.73	1.7E+02	-3.27
	73	10.21	8.43	1.6E+02	9.86	8.16	1.6E+02	-3.40
	74	10.41	9.00	1.5E+02	10.01	8.59	1.7E+02	-3.85
	75	10.39	8.79	1.3E+02	10.07	8.45	1.7E+02	-3.14
	76	10.07	8.87	1.6E+02	9.75	8.41	1.7E+02	-3.16
	77	10.31	8.33	1.6E+02	9.94	8.13	1.6E+02	-3.67

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM21BR70J106KE22
Manufacturung Location: Phillipine	Lot No: A

#9 - External Visual Examination

Number of Samples: 812 Number of Lots: 1	Number of failures: 0

Lot #	Test No.	Result (pass/fail)
A	3	pass
	4	pass
	5	pass
	6	pass
	7-1	pass
	7-2	pass
	8	pass
	10	pass
	12-1	pass
	12-2	pass
	12-3	pass
	13	pass
	14	pass
	15	pass
	16	pass
	17	pass
	18	pass
	18	pass
	18	pass
	19	pass
	21	pass
	22	pass
	23	pass

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM21BR70J106KE22
Manufacturung Location: Phillipine	Lot No: A
Date before test:2018/05/04	

#10 - Physical Dimensions

Number of Samples: 30 Number of Lots: 1		Readings at Room Temp: 25C					
		L [mm]	W [mm]	T [mm]	e1 [mm]	e2 [mm]	g [mm]
Spec limits	lower	1.85	1.10	1.10	0.20	0.20	0.70
	upper	2.15	1.40	1.40	0.70	0.70	
Measurement Statistics	minimum	2.07	1.35	1.35	0.55	0.54	0.89
	maximum	2.11	1.37	1.37	0.60	0.60	0.95
	mean	2.09	1.36	1.36	0.57	0.57	0.92
	standard deviation	0.01	0.00	0.01	0.02	0.02	0.02
Presence of failures		in spec	in spec	in spec	in spec	in spec	in spec
Measurements	Sample	L [mm]	W [mm]	T [mm]	e1 [mm]	e2 [mm]	g [mm]
	1	2.10	1.36	1.35	0.60	0.59	0.91
	2	2.10	1.36	1.36	0.58	0.57	0.90
	3	2.09	1.36	1.37	0.58	0.57	0.92
	4	2.11	1.36	1.37	0.56	0.54	0.93
	5	2.08	1.36	1.35	0.57	0.57	0.91
	6	2.10	1.36	1.37	0.55	0.57	0.93
	7	2.10	1.36	1.36	0.55	0.55	0.94
	8	2.08	1.36	1.36	0.56	0.54	0.94
	9	2.09	1.36	1.36	0.55	0.56	0.95
	10	2.10	1.36	1.36	0.59	0.59	0.92
	11	2.08	1.36	1.35	0.58	0.58	0.89
	12	2.07	1.36	1.36	0.55	0.57	0.90
	13	2.09	1.36	1.36	0.57	0.57	0.92
	14	2.09	1.36	1.36	0.59	0.58	0.90
	15	2.10	1.36	1.37	0.59	0.57	0.91
	16	2.10	1.36	1.36	0.57	0.57	0.94
	17	2.10	1.36	1.35	0.56	0.59	0.89
	18	2.11	1.36	1.36	0.56	0.55	0.93
	19	2.11	1.36	1.36	0.55	0.57	0.94
	20	2.10	1.36	1.35	0.55	0.60	0.89
	21	2.09	1.35	1.36	0.59	0.57	0.93
	22	2.07	1.36	1.36	0.58	0.59	0.92
	23	2.09	1.36	1.36	0.56	0.58	0.92
	24	2.10	1.37	1.36	0.59	0.56	0.91
	25	2.09	1.35	1.36	0.59	0.54	0.91
	26	2.09	1.35	1.35	0.56	0.55	0.95
	27	2.09	1.37	1.36	0.56	0.59	0.91
	28	2.09	1.35	1.36	0.57	0.56	0.93
	29	2.10	1.36	1.36	0.58	0.59	0.93
	30	2.11	1.36	1.36	0.57	0.58	0.93

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM21BR70J106KE22
Manufacturung Location: Phillipine	Lot No: A
Date before test:2018/04/13	Date after test:2018/04/20

#12 Resistance to solvents

Number of Samples: 5 Number of Lots: 1	*Test conditions* A : 1 part (by volume) of isopropyl alcohol and 3 parts (by volume) of mineral sperits , 25deg C 3min immersion test conditions B : terpene defluxer, 25deg C 3min immersion test conditions C : 42 parts(by volume) of water and 1 part (by volume) of propylene glycol monomethylether and 1 part (by volume) of monoethanolamine, 63-70deg C 3min immersion

Number of Samples: 5 Number of Lots: 1	Number of failures: 0	
A	1	No Failure
	2	No Failure
	3	No Failure
	4	No Failure
	5	No Failure

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM21BR70J106KE22
Manufacturung Location: Phillipine	Lot No: A
Date before test:2018/04/09	Date after test:2018/04/26

#13 - Mechanical Shock

Test conditions : shock pulse : 1500g's, 0.5ms, 4.7m/s, 3 times each of 6 orientations

No. of samples:	30	Initial readings			Final readings			
No. of lots:	1	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
Spec limits	lower	9.00		5.0E+00	9.00		5.0E+00	
	upper	11.00	10.00		11.00	10.00		
Measurement Statistics	minimum	10.18	8.13	1.0E+02	9.16	7.50	1.5E+02	-10.53
	maximum	10.43	8.95	1.1E+02	9.49	8.43	1.6E+02	-9.55
	mean	10.31	8.55	1.1E+02	9.28	7.92	1.5E+02	-9.97
	standard deviation	0.08	0.23	2.1E+00	0.08	0.28	2.5E+00	0.30
Presence of Failures		in spec	in spec	in spec	in spec	in spec	in spec	in spec

Test Data

Lot #	Sample	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
A	1	10.21	8.87	1.1E+02	9.16	8.40	1.5E+02	-10.30
	2	10.27	8.51	1.1E+02	9.23	7.81	1.6E+02	-10.09
	3	10.23	8.83	1.0E+02	9.20	8.00	1.5E+02	-10.10
	4	10.43	8.49	1.1E+02	9.39	8.13	1.5E+02	-10.01
	5	10.19	8.90	1.1E+02	9.20	7.99	1.6E+02	-9.73
	6	10.38	8.39	1.0E+02	9.38	7.50	1.6E+02	-9.62
	7	10.22	8.13	1.1E+02	9.18	7.58	1.5E+02	-10.15
	8	10.21	8.47	1.1E+02	9.18	7.52	1.6E+02	-10.13
	9	10.28	8.43	1.1E+02	9.22	7.96	1.6E+02	-10.34
	10	10.31	8.71	1.1E+02	9.28	8.04	1.5E+02	-10.00
	11	10.23	8.32	1.1E+02	9.23	7.50	1.6E+02	-9.77
	12	10.41	8.75	1.0E+02	9.33	8.31	1.6E+02	-10.41
	13	10.22	8.89	1.1E+02	9.24	8.26	1.6E+02	-9.59
	14	10.39	8.65	1.1E+02	9.39	8.10	1.6E+02	-9.61
	15	10.40	8.54	1.1E+02	9.34	8.00	1.5E+02	-10.21
	16	10.41	8.58	1.1E+02	9.40	8.08	1.5E+02	-9.70
	17	10.26	8.87	1.1E+02	9.22	7.90	1.5E+02	-10.06
	18	10.36	8.49	1.1E+02	9.34	7.85	1.6E+02	-9.87
	19	10.34	8.61	1.0E+02	9.25	8.43	1.5E+02	-10.53
	20	10.32	8.51	1.1E+02	9.24	7.90	1.5E+02	-10.44
	21	10.40	8.32	1.0E+02	9.37	7.71	1.5E+02	-9.87
	22	10.29	8.49	1.0E+02	9.23	7.87	1.5E+02	-10.34
	23	10.18	8.26	1.1E+02	9.20	7.61	1.6E+02	-9.67
	24	10.22	8.60	1.1E+02	9.24	8.24	1.6E+02	-9.64
	25	10.25	8.53	1.1E+02	9.22	7.64	1.5E+02	-9.98
	26	10.38	8.95	1.1E+02	9.38	8.26	1.5E+02	-9.65
	27	10.34	8.54	1.0E+02	9.36	8.08	1.6E+02	-9.55
	28	10.23	8.21	1.0E+02	9.23	7.51	1.6E+02	-9.78
	29	10.43	8.13	1.1E+02	9.34	7.60	1.5E+02	-10.41
	30	10.41	8.46	1.0E+02	9.41	7.81	1.5E+02	-9.63

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM21BR70J106KE22
Manufacturung Location: Phillipine	Lot No: A
Date before test:2018/04/03	Date after test:2018/04/17

#14 - Vibration

Test conditions : 5g's for 20min, 12 cycles each of 3 orientations, test frequency 10 - 2000Hz

No. of samples:	30	Initial readings			Final readings			
No. of lots:	1	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
Spec limits	lower	9.00		5.0E+00	9.00		5.0E+00	
	upper	11.00	10.00		11.00	10.00		
Measurement Statistics	minimum	10.06	8.17	1.0E+02	9.04	7.49	1.8E+02	-10.79
	maximum	10.40	9.45	1.1E+02	9.33	8.72	2.5E+02	-9.27
	mean	10.21	8.62	1.1E+02	9.18	7.92	2.2E+02	-10.17
	standard deviation	0.09	0.37	1.6E+00	0.09	0.36	1.8E+01	0.34
Presence of Failures		in spec	in spec	in spec	in spec	in spec	in spec	in spec

Test Data

Lot #	Sample	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
A	1	10.20	8.36	1.1E+02	9.10	7.61	1.8E+02	-10.79
	2	10.27	8.67	1.1E+02	9.22	7.91	2.4E+02	-10.23
	3	10.23	9.32	1.1E+02	9.20	8.54	2.1E+02	-10.05
	4	10.08	8.19	1.1E+02	9.05	7.53	1.9E+02	-10.14
	5	10.40	8.53	1.1E+02	9.33	7.85	2.0E+02	-10.31
	6	10.11	8.75	1.1E+02	9.05	8.09	2.2E+02	-10.49
	7	10.21	8.76	1.1E+02	9.22	8.12	2.4E+02	-9.67
	8	10.23	8.55	1.1E+02	9.22	7.86	2.1E+02	-9.89
	9	10.24	8.56	1.1E+02	9.15	7.91	2.3E+02	-10.66
	10	10.11	8.85	1.1E+02	9.07	8.15	1.9E+02	-10.27
	11	10.24	8.17	1.1E+02	9.19	7.49	2.1E+02	-10.24
	12	10.08	8.29	1.1E+02	9.05	7.53	1.9E+02	-10.21
	13	10.37	8.58	1.0E+02	9.29	7.90	2.2E+02	-10.43
	14	10.17	9.08	1.1E+02	9.13	8.39	2.2E+02	-10.22
	15	10.36	8.73	1.1E+02	9.33	7.99	2.2E+02	-9.98
	16	10.17	8.54	1.1E+02	9.16	7.78	2.2E+02	-9.87
	17	10.19	8.88	1.1E+02	9.18	8.09	2.2E+02	-9.88
	18	10.32	9.41	1.1E+02	9.29	8.69	2.3E+02	-9.97
	19	10.34	8.19	1.1E+02	9.29	7.53	2.0E+02	-10.17
	20	10.21	9.45	1.1E+02	9.26	8.72	2.1E+02	-9.27
	21	10.30	8.46	1.1E+02	9.24	7.74	2.5E+02	-10.37
	22	10.23	8.25	1.1E+02	9.23	7.61	2.3E+02	-9.83
	23	10.21	8.94	1.0E+02	9.12	8.29	2.3E+02	-10.76
	24	10.28	8.29	1.1E+02	9.24	7.61	2.4E+02	-10.17
	25	10.17	8.36	1.1E+02	9.12	7.73	2.0E+02	-10.29
	26	10.31	9.11	1.1E+02	9.26	8.41	2.4E+02	-10.23
	27	10.08	8.24	1.1E+02	9.11	7.53	2.1E+02	-9.62
	28	10.27	8.33	1.1E+02	9.19	7.67	2.3E+02	-10.53
	29	10.06	8.43	1.1E+02	9.04	7.67	2.0E+02	-10.17
	30	10.15	8.40	1.1E+02	9.09	7.80	2.0E+02	-10.48

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM21BR70J106KE22
Manufacturung Location: Phillipine	Lot No: A
Date before test:2018/04/17	Date after test:2018/05/08

#15 - Resistance to Soldering Heat

Test Conditions : soldering , 260C 10sec immersion

Number of Samples: 30 Number of Lots: 1	Number of failures: 0

Lot #	Sample	Result
A	1	No failure
	2	No failure
	3	No failure
	4	No failure
	5	No failure
	6	No failure
	7	No failure
	8	No failure
	9	No failure
	10	No failure
	11	No failure
	12	No failure
	13	No failure
	14	No failure
	15	No failure
	16	No failure
	17	No failure
	18	No failure
	19	No failure
	20	No failure
	21	No failure
	22	No failure
	23	No failure
	24	No failure
	25	No failure
	26	No failure
	27	No failure
	28	No failure
	29	No failure
	30	No failure

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM21BR70J106KE22
Manufacturung Location: Phillipine	Lot No: A
Date before test:2018/04/11	Date after test:2018/05/16

#16 - Thermal Shock

Test conditions : 300Cycles (-55deg C to 125deg C) , Maximum transfer time 20sec , keeping time 15min

No. of samples:	30	Initial readings			Final readings			
No. of lots:	1	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
Spec limits	lower	9.00		5.0E+00			5.0E+00	-10.00
	upper	11.00	10.00			10.00		10.00
Measurement Statistics	minimum	10.12	8.15	1.1E+02	9.89	8.05	1.0E+02	-2.58
	maximum	10.57	9.22	1.6E+02	10.33	9.24	1.1E+02	-1.87
	mean	10.32	8.61	1.3E+02	10.10	8.56	1.1E+02	-2.16
	standard deviation	0.13	0.27	1.1E+01	0.13	0.29	2.3E+00	0.19
Presence of Failures		in spec	in spec	in spec	in spec	in spec	in spec	in spec

Test Data

Lot #	Sample	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
A	1	10.21	8.53	1.3E+02	10.00	8.46	1.1E+02	-2.09
	2	10.41	8.66	1.4E+02	10.21	8.75	1.1E+02	-1.87
	3	10.57	8.75	1.4E+02	10.33	8.74	1.0E+02	-2.25
	4	10.39	8.90	1.3E+02	10.16	8.67	1.0E+02	-2.18
	5	10.29	8.15	1.2E+02	10.05	8.14	1.0E+02	-2.32
	6	10.12	8.35	1.4E+02	9.90	8.26	1.0E+02	-2.21
	7	10.30	8.18	1.3E+02	10.06	8.09	1.0E+02	-2.27
	8	10.29	8.72	1.3E+02	10.09	8.72	1.1E+02	-1.92
	9	10.34	8.69	1.4E+02	10.13	8.66	1.0E+02	-1.99
	10	10.31	8.53	1.2E+02	10.11	8.58	1.1E+02	-1.95
	11	10.16	8.46	1.3E+02	9.94	8.44	1.1E+02	-2.09
	12	10.20	8.43	1.3E+02	10.00	8.47	1.0E+02	-1.97
	13	10.29	8.52	1.4E+02	10.04	8.39	1.1E+02	-2.42
	14	10.36	9.22	1.4E+02	10.11	9.22	1.1E+02	-2.35
	15	10.16	8.78	1.4E+02	9.94	8.73	1.0E+02	-2.17
	16	10.15	8.78	1.2E+02	9.95	8.72	1.0E+02	-1.91
	17	10.50	8.45	1.2E+02	10.28	8.45	1.1E+02	-2.04
	18	10.55	9.05	1.4E+02	10.33	8.91	1.0E+02	-2.10
	19	10.44	8.30	1.4E+02	10.22	8.30	1.1E+02	-2.04
	20	10.14	8.72	1.6E+02	9.89	8.73	1.1E+02	-2.44
	21	10.44	8.55	1.2E+02	10.21	8.41	1.1E+02	-2.23
	22	10.36	8.63	1.4E+02	10.14	8.56	1.0E+02	-2.11
	23	10.53	8.27	1.4E+02	10.33	8.05	1.1E+02	-1.95
	24	10.39	8.58	1.2E+02	10.17	8.64	1.0E+02	-2.07
	25	10.43	8.66	1.1E+02	10.16	8.45	1.1E+02	-2.58
	26	10.21	8.34	1.3E+02	9.96	8.08	1.0E+02	-2.47
	27	10.26	9.21	1.3E+02	10.04	9.24	1.1E+02	-2.08
	28	10.37	8.48	1.1E+02	10.12	8.40	1.1E+02	-2.41
	29	10.43	8.80	1.2E+02	10.19	8.84	1.1E+02	-2.26
	30	10.14	8.75	1.4E+02	9.94	8.70	1.1E+02	-2.05

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM21BR70J106KE22
Manufacturung Location: Phillipine	Lot No: A
Date before test:2018/04/25	Date after test:2018/04/27

#17 - ESD Test

Test conditions : charge capacitor 150pF, discharge resistor 2000ohm

Number of Samples: 15 Number of Lots: 1		Greatest Breakdown Voltage with no failures
Breakdown Voltage	Sample	Result (pass/fail)
min 1kV D.C.	1	pass
	2	pass
	3	pass
	4	pass
	5	pass
	6	pass
	7	pass
	8	pass
	9	pass
	10	pass
	11	pass
	12	pass
	13	pass
	14	pass
	15	pass

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM21BR70J106KE22
Manufacturung Location: Phillipine	Lot No: A
Date before test:2018/04/09	

#18 - Solderability

Test conditions : 1.soldering 235C 5sec immersion, 2.soldering 235C 5sec immersion, 3.soldering 260C 120sec immersion

Number of Samples: 45 Number of Lots: 1	Number of failures: 0

Test No.	Sample	Result (pass/fail)
1	1	pass
	2	pass
	3	pass
	4	pass
	5	pass
	6	pass
	7	pass
	8	pass
	9	pass
	10	pass
	11	pass
	12	pass
	13	pass
	14	pass
	15	pass
2	1	pass
	2	pass
	3	pass
	4	pass
	5	pass
	6	pass
	7	pass
	8	pass
	9	pass
	10	pass
	11	pass
	12	pass
	13	pass
	14	pass
	15	pass
3	1	pass
	2	pass
	3	pass
	4	pass
	5	pass
	6	pass
	7	pass
	8	pass
	9	pass
	10	pass
	11	pass
	12	pass
	13	pass
	14	pass
	15	pass

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM21BR70J106KE22
Manufacturung Location: Phillipine	Lot No: A
Date before test:2018/04/13	

#19 - Electrical Characterization

Test conditions : 1+/-0.1KHz, 0.5+/-0.1Vrms

Number of Samples: 30 Number of Lots: 1		Readings at Room Temp: 25C			at Min Operating Temperature: -55C			at Max Operating Temperature: 125C			
		Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	Change in capacitance %	Capacitance uF	Dissipation Factor %	IR 125C Mohm	Change in capacitance %
Spec limits	lower	9.00		5.0E+00			-15.00			5.0E-01	-15.00
	upper	11.00	10.00				15.00				15.00
Measurement Statistics	minimum	10.13	8.87	1.5E+02	9.26	17.01	-8.58	9.23	1.10	9.4E+00	-9.15
	maximum	10.80	9.32	1.6E+02	9.89	17.91	-8.36	9.86	2.25	1.1E+01	-8.25
	mean	10.47	9.07	1.5E+02	9.58	17.46	-8.46	9.56	1.61	9.9E+00	-8.69
	standard deviation	0.15	0.11	1.8E+00	0.14	0.21	0.05	0.13	0.26	2.5E-01	0.24
Presence of failures		in spec	in spec	in spec	in spec	in spec	in spec	in spec	in spec	in spec	in spec

Measurements	Sample	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	Change in capacitance %	Capacitance uF	Dissipation Factor %	IR 125C Mohm	Change in capacitance %
A	1	10.36	9.12	1.6E+02	9.49	17.27	-8.43	9.43	1.34	9.7E+00	-9.02
	2	10.39	9.23	1.6E+02	9.51	17.91	-8.49	9.49	1.79	9.5E+00	-8.67
	3	10.61	8.97	1.5E+02	9.71	17.01	-8.49	9.67	1.66	1.0E+01	-8.85
	4	10.58	8.98	1.5E+02	9.67	17.43	-8.52	9.69	1.56	9.7E+00	-8.40
	5	10.48	9.17	1.6E+02	9.59	17.35	-8.53	9.55	1.72	9.9E+00	-8.89
	6	10.58	9.32	1.5E+02	9.69	17.19	-8.42	9.70	1.63	9.4E+00	-8.31
	7	10.26	8.87	1.6E+02	9.39	17.66	-8.48	9.37	1.66	9.8E+00	-8.70
	8	10.52	9.06	1.6E+02	9.63	17.68	-8.42	9.59	1.10	9.7E+00	-8.77
	9	10.33	8.96	1.5E+02	9.46	17.56	-8.47	9.43	2.25	1.0E+01	-8.71
	10	10.49	9.26	1.5E+02	9.60	17.68	-8.42	9.61	1.49	9.7E+00	-8.33
	11	10.13	9.09	1.6E+02	9.26	17.46	-8.55	9.23	1.50	9.6E+00	-8.88
	12	10.80	9.09	1.5E+02	9.89	17.23	-8.36	9.86	1.55	1.0E+01	-8.62
	13	10.72	9.22	1.6E+02	9.82	17.70	-8.40	9.76	1.19	1.0E+01	-8.94
	14	10.37	8.94	1.5E+02	9.49	17.78	-8.50	9.47	1.61	1.0E+01	-8.66
	15	10.40	9.10	1.6E+02	9.52	17.62	-8.44	9.47	1.45	9.9E+00	-8.93
	16	10.31	9.05	1.6E+02	9.44	17.48	-8.43	9.43	1.65	9.8E+00	-8.53
	17	10.46	8.94	1.5E+02	9.58	17.53	-8.43	9.54	1.60	9.8E+00	-8.80
	18	10.51	8.87	1.6E+02	9.62	17.52	-8.43	9.55	1.40	1.0E+01	-9.15
	19	10.41	9.22	1.5E+02	9.53	17.17	-8.46	9.48	1.74	1.0E+01	-8.86
	20	10.56	9.08	1.6E+02	9.67	17.56	-8.47	9.64	1.23	1.0E+01	-8.68
	21	10.32	9.19	1.6E+02	9.45	17.67	-8.40	9.43	1.54	1.0E+01	-8.65
	22	10.65	9.14	1.5E+02	9.75	17.20	-8.45	9.75	1.83	9.6E+00	-8.48
	23	10.52	9.08	1.5E+02	9.63	17.29	-8.47	9.59	1.71	9.7E+00	-8.79
	24	10.38	8.97	1.5E+02	9.50	17.57	-8.47	9.52	2.15	9.9E+00	-8.25
	25	10.65	9.06	1.5E+02	9.74	17.46	-8.51	9.71	1.65	9.7E+00	-8.84
	26	10.52	8.99	1.6E+02	9.64	17.58	-8.42	9.64	1.76	1.1E+01	-8.39
	27	10.41	9.09	1.5E+02	9.53	17.22	-8.49	9.55	1.89	9.9E+00	-8.29
	28	10.35	9.15	1.6E+02	9.46	17.17	-8.58	9.46	1.85	9.7E+00	-8.53
	29	10.64	9.02	1.5E+02	9.74	17.47	-8.45	9.68	1.59	9.8E+00	-9.02
	30	10.44	9.00	1.5E+02	9.55	17.53	-8.45	9.53	1.15	9.6E+00	-8.69

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM21BR70J106KE22
Manufacturung Location: Phillipine	Lot No: A
Date before test:2018/04/17	Date after test:2018/04/18

#21 - Board Flex

Test conditions : bend board at 2mm for 60sec
pass/fail criteria : cap change within +/-10%

Test Data

Number of Samples: 30 Number of Lots: 1	Number of failures: 0

Lot #	Sample	Result (pass/fail)
A	1	pass
	2	pass
	3	pass
	4	pass
	5	pass
	6	pass
	7	pass
	8	pass
	9	pass
	10	pass
	11	pass
	12	pass
	13	pass
	14	pass
	15	pass
	16	pass
	17	pass
	18	pass
	19	pass
	20	pass
	21	pass
	22	pass
	23	pass
	24	pass
	25	pass
	26	pass
	27	pass
	28	pass
	29	pass
	30	pass

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM21BR70J106KE22
Manufacturung Location: Phillipine	Lot No: A
Date before test:2018/04/10	Date after test:2018/04/10

#22 - Terminal Strength (SMD)

Test conditions : Force of 1.8kg for 60sec

Number of Samples: 30 Number of Lots: 1	Number of failures: 0

Lot #	Sample	Result (pass/fail)
A	1	pass
	2	pass
	3	pass
	4	pass
	5	pass
	6	pass
	7	pass
	8	pass
	9	pass
	10	pass
	11	pass
	12	pass
	13	pass
	14	pass
	15	pass
	16	pass
	17	pass
	18	pass
	19	pass
	20	pass
	21	pass
	22	pass
	23	pass
	24	pass
	25	pass
	26	pass
	27	pass
	28	pass
	29	pass
	30	pass

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM21BR70J106KE22
Manufacturung Location: Phillipine	Lot No: A
Date before test:2018/04/10	

#23 - Beam Load

Test conditions : Apply a force until the part brakes
pass/fail criteria : 0805 size or smaller: 20N over (t>0.5mm), 8N over (t<=0.5mm)
1206 size or bigger: 15N over (t<1.25mm), 54.5N over (t>=1.25mm)

Number of Samples: 30 Number of Lots: 1	Number of failures: 0

Lot #	Sample	Result (pass/fail)
A	1	pass
	2	pass
	3	pass
	4	pass
	5	pass
	6	pass
	7	pass
	8	pass
	9	pass
	10	pass
	11	pass
	12	pass
	13	pass
	14	pass
	15	pass
	16	pass
	17	pass
	18	pass
	19	pass
	20	pass
	21	pass
	22	pass
	23	pass
	24	pass
	25	pass
	26	pass
	27	pass
	28	pass
	29	pass
	30	pass

AEC Q200 Summary of Test Results

Supplier: Murata

Submission Date: July / 2018

Part Name:

GCM31CR70J226KE23

Series description:

GCM / 1206 / X7R / 6.3V Series

muRata
INNOVATOR IN ELECTRONICS

Murata P/N: GCM31CR70J226KE23

Part Series GCM / 1206 / X7R / 6.3V Series

Operating Temperature: -55℃ ~ +125℃

Test Item	Test Conditions	No of Lots	Qty per Lot	No of Failure
#3 - High Temperature Exposure	Test conditions : 1000hr , 150deg C	1	77	0
#4 - Temperature Cycling	Test conditions : 1000cycles , -55deg C to 125deg C	1	77	0
#5 - Destructive Physical Analysis		1	10	0
#6 - Moisture Resistance	Test conditions : 10cycles(1cycle : 24hr) , 25deg C / 80% RH to 65deg C / 98% RH	1	77	0
#7 - Biased Humidity (I)	Test Conditions : 1000hr , 85deg C / 85% RH , 1WV	1	77	0
#7 - Biased Humidity (II)	Test Conditions : 1000hr , 85deg C / 85% RH , 1.3V	1	77	0
#8 - Operational Life	Test conditions : 1000hr ,125deg C , 1.5WV	1	77	0
#9 - External Visual Examination		all qualification parts		0
#10 - Physical Dimensions		1	30	0
#12 Resistance to solvents	Test conditions A : 1 part (by volume) of isopropyl alcohol and 3 parts (by volume) of mineral sperits , 25deg C 3min immersion test conditions B : terpene defluxer, 25deg C 3min immersion test conditions C : 42 parts(by volume) of water and 1 part (by volume) of propylene glycol monomethylether and 1 part (by volume) of monoethanolamine, 63-70deg C 3min immersion	1	5	0
#13 - Mechanical Shock	Test conditions : shock pulse : 1500g's, 0.5ms, 4.7m/s, 3 times each of 6 orientations	1	30	0
#14 - Vibration	Test conditions : 5g's for 20min, 12 cycles each of 3 orientations, test frequency 10 - 2000Hz	1	30	0
#15 - Resistance to Soldering Heat	Test Conditions : soldering , 260C 10sec immersion	1	30	0
#16 - Thermal Shock	Test conditions : 300Cycles (-55deg C to 125deg C) , Maximum transfer time 20sec , keeping time 15min	1	15	0
#17 - ESD Test	Test conditions : charge capacitor 150pF, discharge resistor 2000ohm	1	30	0
#18 - Solderability	Test conditions : 1.soldering 235C 5sec immersion, 2.soldering 235C 5sec immersion, 3.soldering 260C 120sec immersion	1	15	0
#19 - Electrical Characterization	Test conditions : 120+/-24Hz, 0.5+/-0.1Vrms	1	30	0
#21 - Board Flex	Test conditions : bend board at 2mm for 5sec pass/fail criteria : cap change within +/-10%	1	30	0
#22 - Terminal Strength (SMD)	Test conditions : Force of 18N for 60sec	1	30	0
#23 - Beam Load	Test conditions : Apply a force until the part brakes pass/fail criteria: 0805 size or smaller: 20N over (t>0.5mm), 8N over (t<=0.5mm) 1206 size or bigger: 15N over (t<1.25mm), 54.5N over (t>=1.25mm)	1	30	0

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM31CR70J226KE23
Manufacturung Location: Phillipine	Lot No: A
Date before test:2018/04/05	Date after test:2018/05/17

#3 - High Temperature Exposure

Test conditions : 1000hr , 150deg C

No. of samples:	77	Initial readings			Final readings			
No. of lots:	1	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
Spec limits	lower	19.80		2.3E+00			2.3E+00	-10.00
	upper	24.20	10.00			20.00		10.00
Measurement Statistics	minimum	23.13	8.43	4.0E+01	22.18	8.05	3.6E+01	-4.51
	maximum	23.61	8.53	7.6E+01	22.71	8.21	5.5E+01	-3.44
	mean	23.36	8.47	5.9E+01	22.39	8.10	4.6E+01	-4.15
	standard deviation	0.11	0.02	9.6E+00	0.11	0.03	4.6E+00	0.22
Presence of Failures		in spec	in spec	in spec	in spec	in spec	in spec	in spec

Test Data

Lot #	Sample	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
A	1	23.22	8.48	5.9E+01	22.20	8.11	5.1E+01	-4.42
	2	23.37	8.43	4.6E+01	22.41	8.10	4.4E+01	-4.10
	3	23.38	8.44	5.1E+01	22.38	8.06	4.7E+01	-4.29
	4	23.45	8.48	4.6E+01	22.54	8.11	5.0E+01	-3.88
	5	23.37	8.43	6.9E+01	22.40	8.12	3.7E+01	-4.16
	6	23.13	8.44	5.7E+01	22.18	8.15	3.6E+01	-4.11
	7	23.36	8.46	5.4E+01	22.37	8.10	4.3E+01	-4.22
	8	23.19	8.48	4.3E+01	22.23	8.14	4.2E+01	-4.13
	9	23.49	8.50	5.5E+01	22.62	8.05	4.9E+01	-3.71
	10	23.38	8.48	6.2E+01	22.43	8.09	4.9E+01	-4.03
	11	23.42	8.49	6.1E+01	22.44	8.10	4.5E+01	-4.18
	12	23.53	8.48	7.4E+01	22.53	8.06	4.6E+01	-4.25
	13	23.28	8.45	4.0E+01	22.30	8.11	4.2E+01	-4.21
	14	23.27	8.49	7.1E+01	22.27	8.05	4.4E+01	-4.32
	15	23.34	8.51	4.5E+01	22.31	8.07	4.6E+01	-4.42
	16	23.44	8.49	4.1E+01	22.45	8.11	4.8E+01	-4.21
	17	23.27	8.49	6.7E+01	22.34	8.07	5.3E+01	-4.01
	18	23.24	8.46	4.5E+01	22.19	8.06	4.8E+01	-4.50
	19	23.23	8.45	4.5E+01	22.24	8.10	5.0E+01	-4.27
	20	23.38	8.47	6.4E+01	22.45	8.08	3.7E+01	-3.99
	21	23.43	8.47	6.6E+01	22.45	8.13	4.9E+01	-4.19
	22	23.24	8.47	4.7E+01	22.31	8.11	4.9E+01	-3.99
	23	23.35	8.49	7.1E+01	22.32	8.11	5.2E+01	-4.42
	24	23.39	8.48	6.8E+01	22.41	8.10	4.0E+01	-4.22
	25	23.21	8.44	6.6E+01	22.34	8.12	5.3E+01	-3.76
	26	23.43	8.46	4.3E+01	22.39	8.14	4.3E+01	-4.41
	27	23.23	8.50	7.3E+01	22.27	8.10	3.7E+01	-4.14
	28	23.40	8.46	7.1E+01	22.51	8.11	5.1E+01	-3.80
	29	23.57	8.46	5.9E+01	22.55	8.05	4.7E+01	-4.31
	30	23.30	8.44	5.5E+01	22.27	8.14	4.4E+01	-4.43
	31	23.24	8.46	7.5E+01	22.33	8.12	3.8E+01	-3.90
	32	23.45	8.45	5.2E+01	22.41	8.07	5.5E+01	-4.46
	33	23.37	8.44	6.7E+01	22.43	8.07	5.1E+01	-4.02
	34	23.27	8.48	5.0E+01	22.25	8.08	5.3E+01	-4.38
	35	23.18	8.48	5.4E+01	22.24	8.09	4.4E+01	-4.08
	36	23.55	8.44	5.7E+01	22.64	8.21	4.6E+01	-3.89
	37	23.42	8.46	7.0E+01	22.43	8.09	4.6E+01	-4.26
	38	23.35	8.50	6.6E+01	22.33	8.07	4.5E+01	-4.38
	39	23.55	8.45	5.1E+01	22.54	8.14	4.7E+01	-4.26
	40	23.30	8.45	6.8E+01	22.41	8.07	4.8E+01	-3.81
	41	23.26	8.47	6.3E+01	22.31	8.10	3.9E+01	-4.06
	42	23.47	8.45	5.5E+01	22.51	8.07	4.7E+01	-4.10
	43	23.34	8.45	6.4E+01	22.34	8.09	5.1E+01	-4.30
	44	23.28	8.46	5.8E+01	22.26	8.11	4.9E+01	-4.39
	45	23.24	8.51	6.6E+01	22.34	8.07	4.8E+01	-3.88
	46	23.54	8.47	6.6E+01	22.54	8.11	5.0E+01	-4.23
	47	23.22	8.45	5.8E+01	22.27	8.08	5.0E+01	-4.09
	48	23.37	8.48	5.3E+01	22.38	8.09	4.9E+01	-4.25
	49	23.54	8.45	6.6E+01	22.63	8.12	4.6E+01	-3.86
	50	23.29	8.49	5.9E+01	22.49	8.05	4.8E+01	-3.44

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM31CR70J226KE23
Manufacturung Location: Phillipine	Lot No: A
Date before test:2018/04/05	Date after test:2018/05/17

#3 - High Temperature Exposure

Test conditions : 1000hr , 150deg C

	51	23.20	8.44	7.6E+01	22.23	8.07	5.4E+01	-4.17
	52	23.44	8.43	6.2E+01	22.48	8.07	3.7E+01	-4.11
	53	23.38	8.48	7.0E+01	22.37	8.13	4.6E+01	-4.32
	54	23.22	8.44	7.3E+01	22.22	8.06	5.1E+01	-4.32
	55	23.42	8.48	5.7E+01	22.46	8.10	4.5E+01	-4.11
	56	23.30	8.46	7.2E+01	22.29	8.10	5.2E+01	-4.32
	57	23.50	8.48	6.6E+01	22.49	8.14	4.8E+01	-4.33
	58	23.33	8.46	7.4E+01	22.38	8.11	5.1E+01	-4.11
	59	23.31	8.47	6.4E+01	22.40	8.13	4.2E+01	-3.91
	60	23.37	8.44	5.8E+01	22.46	8.09	4.4E+01	-3.90
	61	23.48	8.48	6.0E+01	22.59	8.17	4.3E+01	-3.81
	62	23.47	8.47	7.2E+01	22.45	8.11	4.7E+01	-4.33
	63	23.36	8.45	5.4E+01	22.34	8.11	4.0E+01	-4.36
A	64	23.32	8.45	6.1E+01	22.37	8.12	5.1E+01	-4.06
	65	23.27	8.45	5.2E+01	22.29	8.10	4.0E+01	-4.24
	66	23.50	8.45	5.0E+01	22.54	8.11	4.2E+01	-4.10
	67	23.41	8.47	6.6E+01	22.38	8.13	4.3E+01	-4.41
	68	23.36	8.49	5.8E+01	22.31	8.06	4.4E+01	-4.51
	69	23.43	8.49	5.2E+01	22.47	8.07	4.6E+01	-4.10
	70	23.55	8.53	4.9E+01	22.54	8.08	5.2E+01	-4.30
	71	23.25	8.45	5.8E+01	22.42	8.11	4.6E+01	-3.55
	72	23.41	8.46	6.4E+01	22.40	8.12	4.7E+01	-4.30
	73	23.30	8.51	4.8E+01	22.38	8.13	5.0E+01	-3.91
	74	23.35	8.45	7.0E+01	22.41	8.09	5.5E+01	-4.03
	75	23.61	8.44	7.1E+01	22.64	8.14	4.4E+01	-4.10
	76	23.23	8.48	4.8E+01	22.21	8.12	3.9E+01	-4.38
	77	23.25	8.46	4.5E+01	22.33	8.08	4.1E+01	-3.94

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM31CR70J226KE23
Manufacturung Location: Phillipine	Lot No: A
Date before test:2018/04/12	Date after test:2018/06/14

#4 - Temperature Cycling

Test conditions : 1000cycles , -55deg C to 125deg C

No. of samples:	77	Initial readings			Final readings			
No. of lots:	1	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
Spec limits	lower	19.80		2.3E+00			2.3E+00	-7.50
	upper	24.20	10.00			20.00		7.50
Measurement Statistics	minimum	23.21	8.97	4.0E+01	22.76	8.92	4.1E+01	-2.39
	maximum	23.87	9.05	7.5E+01	23.59	9.03	6.0E+01	-1.41
	mean	23.57	9.00	5.9E+01	23.15	8.98	5.1E+01	-1.79
	standard deviation	0.15	0.02	8.7E+00	0.15	0.02	4.6E+00	0.23
Presence of Failures		in spec	in spec	in spec	in spec	in spec	in spec	in spec

Test Data

Lot #	Sample	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
A	1	23.70	9.02	6.2E+01	23.36	8.99	5.7E+01	-1.44
	2	23.80	9.00	6.5E+01	23.32	9.00	5.7E+01	-2.02
	3	23.80	9.00	7.3E+01	23.37	8.95	5.8E+01	-1.82
	4	23.33	9.03	5.9E+01	22.92	9.00	4.6E+01	-1.76
	5	23.62	9.00	5.6E+01	23.26	9.00	5.4E+01	-1.56
	6	23.52	9.00	5.7E+01	23.11	9.00	4.3E+01	-1.77
	7	23.63	9.00	6.0E+01	23.14	8.96	4.5E+01	-2.09
	8	23.46	9.02	5.7E+01	23.01	8.96	4.7E+01	-1.90
	9	23.80	8.97	6.1E+01	23.32	9.03	4.8E+01	-2.00
	10	23.46	9.00	6.4E+01	22.99	8.97	4.3E+01	-2.03
	11	23.35	9.01	5.2E+01	22.88	8.97	5.2E+01	-1.99
	12	23.55	9.01	6.6E+01	23.18	9.00	5.7E+01	-1.57
	13	23.52	9.03	6.3E+01	23.11	8.99	5.0E+01	-1.74
	14	23.63	8.98	7.1E+01	23.28	8.99	4.8E+01	-1.47
	15	23.64	9.00	6.2E+01	23.08	9.00	5.9E+01	-2.39
	16	23.22	9.00	5.6E+01	22.76	8.96	5.1E+01	-2.01
	17	23.71	8.99	5.7E+01	23.19	8.94	5.7E+01	-2.19
	18	23.26	8.99	5.0E+01	22.84	9.00	5.1E+01	-1.82
	19	23.62	8.99	6.4E+01	23.25	9.00	4.9E+01	-1.60
	20	23.61	8.99	4.5E+01	23.21	8.92	5.5E+01	-1.69
	21	23.65	8.98	6.7E+01	23.26	8.98	4.2E+01	-1.62
	22	23.54	9.00	7.3E+01	23.16	8.96	4.2E+01	-1.65
	23	23.64	8.99	6.4E+01	23.10	9.01	4.5E+01	-2.28
	24	23.84	8.99	6.6E+01	23.36	8.97	5.8E+01	-2.03
	25	23.61	8.98	5.9E+01	23.23	8.97	5.1E+01	-1.61
	26	23.39	9.01	6.1E+01	22.97	9.01	5.5E+01	-1.83
	27	23.49	8.98	4.4E+01	23.16	8.93	5.4E+01	-1.41
	28	23.41	8.98	7.0E+01	23.00	8.97	5.3E+01	-1.77
	29	23.63	9.01	6.8E+01	23.16	8.93	5.2E+01	-1.98
	30	23.55	8.97	6.2E+01	23.13	8.99	4.3E+01	-1.78
	31	23.53	9.01	4.4E+01	23.10	9.00	5.3E+01	-1.82
	32	23.67	9.02	5.6E+01	23.25	8.98	4.9E+01	-1.79
	33	23.61	8.99	4.9E+01	23.13	8.97	5.7E+01	-2.02
	34	23.75	8.99	6.6E+01	23.37	8.97	5.4E+01	-1.57
	35	23.73	9.03	7.2E+01	23.28	8.97	5.2E+01	-1.90
	36	23.68	8.97	5.1E+01	23.15	9.01	5.4E+01	-2.22
	37	23.50	9.00	5.1E+01	23.12	8.99	5.0E+01	-1.63
	38	23.69	8.98	6.6E+01	23.24	8.95	5.5E+01	-1.91
	39	23.57	9.02	5.5E+01	23.23	8.97	6.0E+01	-1.46
	40	23.49	9.00	7.5E+01	23.08	8.98	5.0E+01	-1.76
	41	23.67	8.99	6.5E+01	23.26	8.97	5.0E+01	-1.72
	42	23.51	8.97	6.0E+01	23.04	8.94	5.0E+01	-1.99
	43	23.40	9.03	5.8E+01	22.98	8.94	5.2E+01	-1.80
	44	23.65	8.97	4.6E+01	23.17	8.97	5.2E+01	-1.99
	45	23.57	8.99	6.2E+01	23.17	9.01	4.2E+01	-1.69
	46	23.59	9.03	4.0E+01	23.10	8.98	5.2E+01	-2.08
	47	23.57	9.02	5.3E+01	23.07	8.99	4.9E+01	-2.14
	48	23.60	9.00	7.4E+01	23.25	8.96	4.1E+01	-1.47
	49	23.64	9.00	5.8E+01	23.30	8.93	5.0E+01	-1.44
	50	23.21	9.00	5.7E+01	22.82	8.97	5.9E+01	-1.69

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM31CR70J226KE23
Manufacturung Location: Phillipine	Lot No: A
Date before test:2018/04/12	Date after test:2018/06/14

#4 - Temperature Cycling

Test conditions : 1000cycles , -55deg C to 125deg C

	51	23.53	9.03	7.1E+01	23.07	8.99	5.2E+01	-1.94
	52	23.84	9.03	5.3E+01	23.41	8.98	4.9E+01	-1.83
	53	23.73	8.97	4.8E+01	23.33	8.99	5.0E+01	-1.70
	54	23.37	9.05	6.3E+01	22.93	9.01	5.2E+01	-1.88
	55	23.53	8.98	6.1E+01	23.17	8.95	4.1E+01	-1.53
	56	23.70	8.99	4.4E+01	23.29	8.99	4.8E+01	-1.73
	57	23.77	9.00	5.3E+01	23.39	8.93	5.5E+01	-1.60
	58	23.49	9.04	4.4E+01	23.10	8.97	4.8E+01	-1.63
	59	23.47	8.98	4.6E+01	23.14	9.02	5.2E+01	-1.43
	60	23.39	9.02	6.1E+01	22.95	8.97	4.8E+01	-1.90
	61	23.46	9.00	6.8E+01	23.00	8.99	5.0E+01	-1.97
	62	23.50	9.00	5.2E+01	23.02	8.98	5.4E+01	-2.05
	63	23.61	9.00	5.1E+01	23.14	8.95	4.6E+01	-2.01
A	64	23.60	9.04	5.4E+01	23.13	9.00	5.3E+01	-2.01
	65	23.29	8.99	6.2E+01	22.94	8.96	5.4E+01	-1.50
	66	23.73	8.98	7.0E+01	23.35	8.98	5.5E+01	-1.61
	67	23.27	9.02	5.6E+01	22.89	8.96	4.9E+01	-1.65
	68	23.87	9.01	4.9E+01	23.52	9.01	5.4E+01	-1.46
	69	23.43	8.97	7.5E+01	22.96	9.00	5.4E+01	-1.97
	70	23.37	9.01	5.6E+01	22.99	8.92	5.4E+01	-1.60
	71	23.59	9.01	5.0E+01	23.12	9.00	5.6E+01	-1.97
	72	23.73	8.98	6.6E+01	23.28	9.01	4.8E+01	-1.91
	73	23.53	9.00	4.6E+01	23.16	8.98	5.3E+01	-1.59
	74	23.53	9.00	4.7E+01	23.15	8.94	5.4E+01	-1.58
	75	23.56	8.97	6.1E+01	23.20	8.98	4.9E+01	-1.53
	76	23.54	8.98	5.7E+01	23.21	8.96	5.4E+01	-1.42
	77	23.59	9.00	6.6E+01	23.14	8.98	5.7E+01	-1.90

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM31CR70J226KE23
Manufacturung Location: Phillipine	Lot No: A
Date before test:2018/04/09	

#5 - Destructive Physical Analysis

Number of Samples: 10 Number of Lots: 1	Number of failures: 0

Lot #	Sample	Result (pass/fail)
A	1	pass
	2	pass
	3	pass
	4	pass
	5	pass
	6	pass
	7	pass
	8	pass
	9	pass
	10	pass

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM31CR70J226KE23
Manufacturung Location: Phillipine	Lot No: A
Date before test:2018/04/19	Date after test:2018/05/17

#6 - Moisture Resistance

Test conditions : 10cycles(1cycle : 24hr) , 25deg C / 80% RH to 65deg C / 98% RH

No. of samples:	77	Initial readings			Final readings			
No. of lots:	1	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
Spec limits	lower	19.80		2.3E+00			2.3E+00	-10.00
	upper	24.20	10.00			20.00		10.00
Measurement Statistics	minimum	20.75	8.39	3.9E+01	20.68	9.42	5.3E+01	-1.45
	maximum	21.51	8.52	5.7E+01	21.68	9.55	9.9E+01	1.29
	mean	21.14	8.45	4.9E+01	21.11	9.48	7.7E+01	-0.12
	standard deviation	0.16	0.03	4.1E+00	0.20	0.03	1.2E+01	0.52
Presence of Failures		in spec	in spec	in spec	in spec	in spec	in spec	in spec

Test Data

Lot #	Sample	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
A	1	21.10	8.45	4.9E+01	21.11	9.50	7.5E+01	0.08
	2	21.04	8.46	4.9E+01	21.04	9.45	6.0E+01	0.00
	3	21.01	8.44	4.5E+01	20.99	9.46	5.8E+01	-0.08
	4	21.14	8.46	5.5E+01	20.94	9.52	9.1E+01	-0.96
	5	21.07	8.40	5.2E+01	21.02	9.48	8.5E+01	-0.23
	6	21.05	8.41	5.0E+01	21.14	9.45	8.3E+01	0.42
	7	21.32	8.45	5.3E+01	21.34	9.52	5.9E+01	0.07
	8	21.19	8.44	5.2E+01	21.27	9.47	6.1E+01	0.34
	9	21.27	8.46	4.8E+01	21.23	9.52	6.8E+01	-0.16
	10	20.89	8.50	5.3E+01	20.82	9.45	8.3E+01	-0.34
	11	21.19	8.46	5.0E+01	21.15	9.49	8.8E+01	-0.18
	12	21.20	8.48	4.2E+01	21.13	9.50	6.7E+01	-0.33
	13	21.21	8.46	5.1E+01	21.23	9.48	6.4E+01	0.12
	14	21.31	8.40	4.8E+01	21.32	9.42	8.2E+01	0.06
	15	21.05	8.46	4.5E+01	21.07	9.48	9.8E+01	0.09
	16	21.33	8.45	5.4E+01	21.29	9.45	7.8E+01	-0.19
	17	21.23	8.44	4.2E+01	21.07	9.46	9.1E+01	-0.74
	18	21.30	8.45	4.8E+01	21.36	9.45	9.9E+01	0.29
	19	21.45	8.41	5.5E+01	21.35	9.43	7.7E+01	-0.47
	20	21.19	8.42	4.2E+01	21.01	9.46	5.6E+01	-0.84
	21	21.29	8.43	4.9E+01	21.41	9.50	8.0E+01	0.56
	22	21.14	8.43	5.6E+01	21.28	9.51	6.1E+01	0.66
	23	21.51	8.46	4.6E+01	21.51	9.50	8.2E+01	-0.01
	24	20.99	8.47	4.6E+01	20.83	9.50	7.0E+01	-0.74
	25	21.03	8.47	4.8E+01	20.79	9.48	9.1E+01	-1.15
	26	21.09	8.46	4.8E+01	21.15	9.55	7.6E+01	0.29
	27	21.01	8.46	5.0E+01	21.15	9.47	8.5E+01	0.69
	28	21.19	8.49	4.5E+01	21.23	9.52	9.5E+01	0.19
	29	21.13	8.51	5.3E+01	21.00	9.51	6.6E+01	-0.58
	30	21.00	8.42	4.9E+01	21.05	9.44	6.5E+01	0.24
	31	21.05	8.52	3.9E+01	21.09	9.47	6.2E+01	0.19
	32	21.02	8.41	5.0E+01	20.94	9.45	6.6E+01	-0.38
	33	21.26	8.45	5.4E+01	21.27	9.44	8.4E+01	0.06
	34	21.05	8.45	4.8E+01	20.91	9.43	8.6E+01	-0.70
	35	21.17	8.43	5.2E+01	21.24	9.49	7.8E+01	0.33
	36	21.36	8.41	5.3E+01	21.05	9.49	6.2E+01	-1.44
	37	21.05	8.44	5.2E+01	21.01	9.51	6.8E+01	-0.18
	38	20.85	8.44	5.1E+01	20.69	9.49	9.1E+01	-0.81
	39	21.20	8.44	4.8E+01	21.15	9.47	9.6E+01	-0.25
	40	21.16	8.46	4.8E+01	21.15	9.48	7.4E+01	-0.06
	41	20.95	8.44	4.0E+01	20.82	9.42	8.0E+01	-0.62
	42	20.92	8.45	4.7E+01	21.13	9.50	7.7E+01	1.02
	43	21.17	8.49	4.4E+01	21.18	9.50	8.9E+01	0.06
	44	21.00	8.42	4.9E+01	20.96	9.53	9.7E+01	-0.19
	45	21.06	8.39	4.5E+01	20.99	9.47	5.5E+01	-0.33
	46	20.91	8.42	5.2E+01	20.81	9.44	8.5E+01	-0.46
	47	21.00	8.45	4.7E+01	20.93	9.50	6.2E+01	-0.33
	48	21.14	8.44	4.7E+01	21.20	9.52	8.2E+01	0.29
	49	21.03	8.43	5.0E+01	20.82	9.48	6.8E+01	-0.99
	50	21.09	8.42	5.4E+01	21.13	9.47	6.9E+01	0.16

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM31CR70J226KE23
Manufacturung Location: Phillipine	Lot No: A
Date before test:2018/04/19	Date after test:2018/05/17

#6 - Moisture Resistance

Test conditions : 10cycles(1cycle : 24hr) , 25deg C / 80% RH to 65deg C / 98% RH

	51	21.51	8.47	4.9E+01	21.43	9.51	8.8E+01	-0.36
	52	21.14	8.44	4.8E+01	21.12	9.50	8.1E+01	-0.10
	53	21.23	8.42	4.7E+01	21.30	9.49	9.5E+01	0.34
	54	21.31	8.46	4.5E+01	21.29	9.52	8.0E+01	-0.12
	55	20.77	8.42	5.6E+01	20.74	9.52	5.3E+01	-0.16
	56	21.03	8.45	5.2E+01	20.90	9.47	7.1E+01	-0.61
	57	21.24	8.43	5.0E+01	21.17	9.48	8.0E+01	-0.32
	58	21.24	8.43	4.9E+01	21.15	9.51	8.2E+01	-0.40
	59	21.04	8.49	5.0E+01	21.31	9.44	6.8E+01	1.29
	60	20.75	8.42	5.7E+01	20.68	9.46	9.3E+01	-0.36
	61	21.31	8.47	5.6E+01	21.22	9.48	9.9E+01	-0.41
	62	21.21	8.48	4.9E+01	20.90	9.45	6.5E+01	-1.45
	63	21.32	8.41	5.4E+01	21.34	9.45	6.0E+01	0.09
A	64	20.87	8.43	4.6E+01	20.85	9.43	8.3E+01	-0.11
	65	21.44	8.42	4.7E+01	21.49	9.49	7.7E+01	0.23
	66	21.25	8.48	4.5E+01	21.43	9.43	8.1E+01	0.85
	67	20.81	8.42	4.8E+01	20.81	9.47	7.6E+01	0.02
	68	21.21	8.43	4.9E+01	21.36	9.55	6.9E+01	0.71
	69	21.26	8.51	5.2E+01	21.12	9.44	8.7E+01	-0.65
	70	20.92	8.44	5.5E+01	20.85	9.45	8.7E+01	-0.33
	71	21.35	8.48	3.9E+01	21.31	9.45	9.1E+01	-0.20
	72	21.20	8.42	4.4E+01	21.19	9.49	6.3E+01	-0.01
	73	21.00	8.45	5.3E+01	20.94	9.50	7.9E+01	-0.28
	74	21.02	8.47	5.3E+01	21.07	9.53	8.4E+01	0.24
	75	21.21	8.46	4.9E+01	21.11	9.44	8.6E+01	-0.45
	76	21.39	8.41	5.6E+01	21.59	9.45	5.6E+01	0.93
	77	21.24	8.48	5.2E+01	21.24	9.49	6.3E+01	-0.04

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM31CR70J226KE23
Manufacturung Location: Phillipine	Lot No: A
Date before test:2018/04/23	Date after test:2018/06/18

#7 - Biased Humidity

Test Conditions : 1000hr , 85deg C / 85% RH , 1WV

No. of samples:	77	Initial readings			Final readings			
No. of lots:	1	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
Spec limits	lower	19.80		2.3E+00			2.3E-01	-10.00
	upper	24.20	10.00			20.00		10.00
Measurement Statistics	minimum	22.37	8.85	4.1E+01	22.48	8.84	1.1E+02	-0.02
	maximum	22.98	8.99	7.8E+01	23.16	8.97	1.6E+02	0.81
	mean	22.69	8.92	6.2E+01	22.79	8.91	1.4E+02	0.46
	standard deviation	0.15	0.03	9.1E+00	0.16	0.03	1.3E+01	0.17
Presence of Failures		in spec	in spec	in spec	in spec	in spec	in spec	in spec

Test Data

Lot #	Sample	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
A	1	22.85	8.98	6.0E+01	23.02	8.97	1.4E+02	0.74
	2	22.71	8.92	6.9E+01	22.83	8.95	1.3E+02	0.52
	3	22.84	8.96	6.6E+01	22.94	8.94	1.4E+02	0.46
	4	22.59	8.91	7.8E+01	22.69	8.94	1.4E+02	0.45
	5	22.77	8.89	5.9E+01	22.84	8.92	1.4E+02	0.29
	6	22.62	8.86	6.7E+01	22.77	8.90	1.5E+02	0.64
	7	22.58	8.92	7.3E+01	22.70	8.94	1.2E+02	0.51
	8	22.62	8.91	6.3E+01	22.75	8.91	1.2E+02	0.59
	9	22.58	8.91	5.7E+01	22.62	8.88	1.2E+02	0.17
	10	22.97	8.92	7.4E+01	23.05	8.90	1.5E+02	0.33
	11	22.79	8.92	7.5E+01	22.91	8.90	1.2E+02	0.52
	12	22.80	8.91	4.9E+01	22.91	8.87	1.6E+02	0.47
	13	22.93	8.92	7.2E+01	22.93	8.92	1.2E+02	-0.02
	14	22.56	8.91	5.4E+01	22.65	8.92	1.5E+02	0.41
	15	22.64	8.94	6.4E+01	22.72	8.92	1.5E+02	0.35
	16	22.48	8.92	7.2E+01	22.55	8.90	1.6E+02	0.31
	17	22.70	8.91	5.4E+01	22.83	8.94	1.5E+02	0.58
	18	22.75	8.87	4.5E+01	22.89	8.90	1.3E+02	0.62
	19	22.85	8.88	7.7E+01	22.96	8.91	1.6E+02	0.47
	20	22.68	8.90	7.2E+01	22.84	8.95	1.5E+02	0.71
	21	22.80	8.94	6.9E+01	22.87	8.90	1.2E+02	0.32
	22	22.62	8.93	7.3E+01	22.74	8.87	1.4E+02	0.54
	23	22.87	8.90	7.3E+01	22.99	8.92	1.2E+02	0.52
	24	22.95	8.88	5.3E+01	23.09	8.92	1.5E+02	0.62
	25	22.63	8.91	7.2E+01	22.77	8.94	1.4E+02	0.60
	26	22.54	8.85	4.9E+01	22.62	8.91	1.3E+02	0.36
	27	22.79	8.90	4.6E+01	22.95	8.90	1.5E+02	0.70
	28	22.83	8.90	6.7E+01	22.94	8.91	1.3E+02	0.50
	29	22.78	8.99	6.9E+01	22.88	8.95	1.6E+02	0.48
	30	22.41	8.96	6.8E+01	22.48	8.92	1.4E+02	0.31
	31	22.48	8.91	4.1E+01	22.58	8.93	1.5E+02	0.44
	32	22.56	8.93	5.8E+01	22.64	8.95	1.2E+02	0.34
	33	22.60	8.92	5.5E+01	22.65	8.92	1.5E+02	0.24
	34	22.75	8.86	7.2E+01	22.94	8.93	1.3E+02	0.80
	35	22.73	8.94	5.8E+01	22.88	8.93	1.5E+02	0.65
	36	22.49	8.92	5.2E+01	22.56	8.92	1.4E+02	0.34
	37	22.56	8.97	5.4E+01	22.62	8.94	1.5E+02	0.28
	38	22.90	8.97	6.4E+01	23.08	8.90	1.2E+02	0.81
	39	22.70	8.88	6.4E+01	22.83	8.92	1.5E+02	0.58
	40	22.74	8.94	6.2E+01	22.84	8.93	1.3E+02	0.43
	41	22.57	8.92	5.9E+01	22.65	8.89	1.6E+02	0.35
	42	22.37	8.93	5.7E+01	22.49	8.92	1.1E+02	0.55
	43	22.75	8.96	6.7E+01	22.84	8.91	1.4E+02	0.38
	44	22.46	8.95	6.4E+01	22.49	8.90	1.4E+02	0.14
	45	22.54	8.92	6.1E+01	22.65	8.93	1.3E+02	0.50
	46	22.75	8.93	5.8E+01	22.78	8.90	1.5E+02	0.10
	47	22.78	8.97	6.2E+01	22.79	8.88	1.6E+02	0.07
	48	22.50	8.91	5.5E+01	22.62	8.90	1.5E+02	0.54
	49	22.72	8.93	6.0E+01	22.84	8.86	1.6E+02	0.51
	50	22.39	8.92	5.2E+01	22.50	8.94	1.3E+02	0.49

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM31CR70J226KE23
Manufacturung Location: Phillipine	Lot No: A
Date before test:2018/04/23	Date after test:2018/06/18

#7 - Biased Humidity

Test Conditions : 1000hr , 85deg C / 85% RH , 1WV

A	51	22.68	8.94	6.0E+01	22.80	8.93	1.6E+02	0.52
	52	22.56	8.94	5.0E+01	22.67	8.88	1.2E+02	0.47
	53	22.70	8.95	5.4E+01	22.79	8.84	1.6E+02	0.37
	54	22.72	8.91	5.5E+01	22.84	8.91	1.3E+02	0.54
	55	22.91	8.90	6.5E+01	23.06	8.89	1.4E+02	0.65
	56	22.66	8.88	6.0E+01	22.76	8.92	1.5E+02	0.46
	57	22.85	8.93	6.6E+01	22.93	8.92	1.3E+02	0.33
	58	22.98	8.90	5.9E+01	23.15	8.95	1.6E+02	0.73
	59	22.91	8.88	7.7E+01	23.01	8.93	1.3E+02	0.45
	60	22.97	8.95	7.2E+01	23.04	8.93	1.2E+02	0.32
	61	22.57	8.95	6.2E+01	22.65	8.94	1.5E+02	0.36
	62	22.66	8.85	4.8E+01	22.72	8.93	1.2E+02	0.27
	63	22.77	8.88	6.6E+01	22.91	8.95	1.3E+02	0.62
	64	22.58	8.94	6.7E+01	22.73	8.86	1.3E+02	0.63
	65	22.66	8.87	7.1E+01	22.74	8.91	1.2E+02	0.37
	66	22.56	8.85	5.8E+01	22.66	8.84	1.4E+02	0.46
	67	22.76	8.97	5.8E+01	22.88	8.86	1.5E+02	0.52
	68	22.67	8.91	5.5E+01	22.68	8.92	1.5E+02	0.03
	69	22.60	8.90	7.0E+01	22.71	8.88	1.3E+02	0.47
	70	22.88	8.94	6.2E+01	23.02	8.90	1.2E+02	0.65
	71	22.84	8.88	7.1E+01	22.93	8.90	1.6E+02	0.41
	72	22.80	8.96	7.4E+01	22.92	8.95	1.3E+02	0.54
	73	22.59	8.91	7.4E+01	22.70	8.94	1.5E+02	0.50
	74	22.71	8.96	5.3E+01	22.84	8.92	1.4E+02	0.58
	75	22.88	8.93	5.2E+01	22.93	8.92	1.4E+02	0.23
	76	22.37	8.93	4.3E+01	22.48	8.96	1.4E+02	0.51
	77	22.44	8.87	4.5E+01	22.57	8.89	1.4E+02	0.58

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM31CR70J226KE23
Manufacturung Location: Phillipine	Lot No: A
Date before test:2018/04/23	Date after test:2018/06/18

#7 - Biased Humidity

Test Conditions : 1000hr , 85deg C / 85% RH , 1.3V

No. of samples:	77	Initial readings			Final readings			
No. of lots:	1	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
Spec limits	lower	19.80		2.3E+00			2.3E-01	-10.00
	upper	24.20	10.00			20.00		10.00
Measurement Statistics	minimum	23.18	8.42	3.0E+01	23.19	8.54	7.8E+01	-0.15
	maximum	23.69	8.50	4.3E+01	23.77	8.68	1.2E+02	0.88
	mean	23.37	8.45	3.6E+01	23.43	8.60	1.0E+02	0.27
	standard deviation	0.10	0.02	3.1E+00	0.12	0.03	1.1E+01	0.26
Presence of Failures		in spec	in spec	in spec	in spec	in spec	in spec	in spec

Test Data

Lot #	Sample	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
A	1	23.50	8.46	3.6E+01	23.56	8.59	8.2E+01	0.24
	2	23.29	8.44	4.2E+01	23.48	8.57	1.0E+02	0.80
	3	23.26	8.48	3.5E+01	23.38	8.61	1.2E+02	0.54
	4	23.42	8.45	3.5E+01	23.50	8.58	1.2E+02	0.30
	5	23.41	8.48	3.8E+01	23.61	8.61	1.2E+02	0.88
	6	23.38	8.44	3.6E+01	23.51	8.63	1.0E+02	0.56
	7	23.42	8.45	3.3E+01	23.49	8.61	1.1E+02	0.31
	8	23.22	8.48	3.5E+01	23.22	8.59	7.8E+01	0.01
	9	23.41	8.46	3.5E+01	23.39	8.55	9.8E+01	-0.10
	10	23.49	8.48	4.0E+01	23.52	8.64	1.1E+02	0.13
	11	23.46	8.46	4.1E+01	23.46	8.63	1.2E+02	0.00
	12	23.25	8.45	3.0E+01	23.34	8.57	9.2E+01	0.41
	13	23.28	8.46	4.1E+01	23.34	8.60	8.1E+01	0.26
	14	23.38	8.46	3.3E+01	23.42	8.60	9.0E+01	0.17
	15	23.29	8.43	3.6E+01	23.31	8.57	9.7E+01	0.10
	16	23.38	8.46	4.3E+01	23.36	8.67	8.0E+01	-0.09
	17	23.18	8.48	3.3E+01	23.19	8.65	1.1E+02	0.04
	18	23.38	8.47	3.5E+01	23.46	8.60	1.1E+02	0.33
	19	23.32	8.43	3.4E+01	23.42	8.58	9.7E+01	0.46
	20	23.30	8.47	3.3E+01	23.42	8.60	1.1E+02	0.53
	21	23.69	8.45	4.0E+01	23.77	8.63	9.3E+01	0.36
	22	23.51	8.45	3.4E+01	23.61	8.59	1.0E+02	0.44
	23	23.25	8.44	3.6E+01	23.33	8.56	8.5E+01	0.32
	24	23.64	8.45	3.1E+01	23.67	8.58	1.0E+02	0.13
	25	23.24	8.43	3.6E+01	23.38	8.60	1.1E+02	0.59
	26	23.40	8.43	3.5E+01	23.40	8.59	1.0E+02	-0.01
	27	23.48	8.45	3.6E+01	23.58	8.60	1.1E+02	0.39
	28	23.39	8.43	3.8E+01	23.47	8.65	9.8E+01	0.34
	29	23.38	8.42	4.0E+01	23.45	8.59	7.8E+01	0.30
	30	23.37	8.48	3.7E+01	23.54	8.59	1.1E+02	0.73
	31	23.56	8.46	3.9E+01	23.63	8.65	1.1E+02	0.31
	32	23.55	8.46	3.1E+01	23.67	8.63	1.0E+02	0.51
	33	23.50	8.46	3.9E+01	23.54	8.63	1.1E+02	0.18
	34	23.38	8.42	3.4E+01	23.49	8.60	8.6E+01	0.50
	35	23.26	8.47	3.1E+01	23.39	8.58	1.1E+02	0.56
	36	23.28	8.43	3.3E+01	23.33	8.63	1.1E+02	0.20
	37	23.26	8.46	4.3E+01	23.30	8.60	1.0E+02	0.17
	38	23.24	8.46	3.6E+01	23.26	8.65	1.1E+02	0.12
	39	23.29	8.46	3.8E+01	23.26	8.55	1.2E+02	-0.15
	40	23.25	8.42	3.6E+01	23.30	8.61	1.2E+02	0.21
	41	23.50	8.45	3.7E+01	23.70	8.61	8.4E+01	0.87
	42	23.34	8.47	3.1E+01	23.36	8.61	9.7E+01	0.09
	43	23.42	8.47	3.5E+01	23.42	8.55	7.9E+01	0.03
	44	23.34	8.42	3.9E+01	23.40	8.59	1.0E+02	0.28
	45	23.32	8.44	3.6E+01	23.42	8.54	1.0E+02	0.42
	46	23.35	8.44	3.9E+01	23.34	8.58	1.1E+02	-0.08
	47	23.22	8.50	3.6E+01	23.41	8.60	9.8E+01	0.83
	48	23.38	8.49	3.5E+01	23.53	8.55	1.0E+02	0.65
	49	23.30	8.42	3.6E+01	23.29	8.60	1.1E+02	-0.03
	50	23.34	8.46	4.3E+01	23.35	8.59	9.5E+01	0.05

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM31CR70J226KE23
Manufacturung Location: Phillipine	Lot No: A
Date before test:2018/04/23	Date after test:2018/06/18

#7 - Biased Humidity

Test Conditions : 1000hr , 85deg C / 85% RH , 1.3V

	51	23.34	8.46	3.7E+01	23.34	8.61	1.1E+02	0.01
	52	23.45	8.46	3.2E+01	23.65	8.60	7.9E+01	0.85
	53	23.32	8.43	3.7E+01	23.41	8.62	9.4E+01	0.35
	54	23.32	8.43	3.3E+01	23.48	8.65	8.8E+01	0.68
	55	23.23	8.43	3.6E+01	23.32	8.56	9.8E+01	0.40
	56	23.46	8.42	3.4E+01	23.46	8.61	9.3E+01	0.00
	57	23.43	8.47	3.7E+01	23.53	8.62	1.1E+02	0.42
	58	23.36	8.42	3.6E+01	23.34	8.61	1.1E+02	-0.09
	59	23.29	8.47	3.9E+01	23.36	8.59	1.2E+02	0.31
	60	23.48	8.47	3.6E+01	23.53	8.58	8.8E+01	0.19
	61	23.32	8.46	3.4E+01	23.36	8.64	1.0E+02	0.18
	62	23.45	8.48	3.3E+01	23.45	8.63	1.1E+02	0.00
	63	23.39	8.47	3.4E+01	23.42	8.59	8.7E+01	0.13
A	64	23.43	8.46	3.6E+01	23.50	8.68	1.0E+02	0.29
	65	23.38	8.44	3.2E+01	23.47	8.64	9.2E+01	0.39
	66	23.44	8.47	3.1E+01	23.42	8.57	1.1E+02	-0.05
	67	23.21	8.45	3.3E+01	23.19	8.56	9.2E+01	-0.09
	68	23.45	8.47	3.7E+01	23.54	8.61	1.2E+02	0.38
	69	23.35	8.47	3.5E+01	23.36	8.61	1.0E+02	0.01
	70	23.42	8.42	3.3E+01	23.43	8.63	1.1E+02	0.07
	71	23.48	8.46	3.8E+01	23.46	8.58	1.0E+02	-0.08
	72	23.27	8.48	3.7E+01	23.34	8.63	9.9E+01	0.34
	73	23.46	8.48	3.3E+01	23.48	8.60	9.1E+01	0.09
	74	23.30	8.46	3.1E+01	23.31	8.62	9.7E+01	0.06
	75	23.23	8.49	3.5E+01	23.29	8.61	1.1E+02	0.26
	76	23.42	8.42	3.5E+01	23.58	8.59	1.2E+02	0.66
	77	23.39	8.44	3.0E+01	23.37	8.60	8.7E+01	-0.07

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM31CR70J226KE23
Manufacturung Location: Phillipine	Lot No: A
Date before test:2018/04/24	Date after test:2018/06/19

#8 - Operational Life

Test conditions : 1000hr ,125deg C , 1.5WV

No. of samples:	77	Initial readings			Final readings			
No. of lots:	1	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
Spec limits	lower	19.80		2.3E+00			2.3E-01	-12.50
	upper	24.20	10.00			20.00		12.50
Measurement Statistics	minimum	23.13	8.42	4.0E+01	22.41	8.22	4.5E+01	-3.54
	maximum	23.65	8.50	8.1E+01	22.98	8.33	6.8E+01	-2.35
	mean	23.38	8.46	6.6E+01	22.66	8.28	5.5E+01	-3.08
	standard deviation	0.12	0.02	9.0E+00	0.13	0.03	5.3E+00	0.25
Presence of Failures		in spec	in spec	in spec	in spec	in spec	in spec	in spec

Test Data

Lot #	Sample	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
A	1	23.20	8.49	6.5E+01	22.42	8.27	6.0E+01	-3.36
	2	23.31	8.45	7.2E+01	22.62	8.24	6.1E+01	-2.96
	3	23.36	8.46	6.8E+01	22.55	8.28	5.3E+01	-3.49
	4	23.59	8.49	8.1E+01	22.85	8.32	4.8E+01	-3.14
	5	23.31	8.48	6.5E+01	22.65	8.33	5.1E+01	-2.85
	6	23.34	8.47	5.2E+01	22.70	8.31	5.8E+01	-2.74
	7	23.43	8.47	5.6E+01	22.72	8.29	5.4E+01	-3.04
	8	23.53	8.45	7.2E+01	22.85	8.29	5.8E+01	-2.87
	9	23.33	8.47	5.1E+01	22.56	8.24	5.7E+01	-3.29
	10	23.30	8.50	6.8E+01	22.55	8.30	5.0E+01	-3.25
	11	23.63	8.44	4.6E+01	22.90	8.30	5.8E+01	-3.07
	12	23.48	8.47	6.4E+01	22.79	8.28	5.1E+01	-2.94
	13	23.13	8.48	7.0E+01	22.48	8.27	6.4E+01	-2.79
	14	23.37	8.44	7.3E+01	22.61	8.27	5.3E+01	-3.26
	15	23.32	8.45	5.8E+01	22.59	8.24	5.0E+01	-3.17
	16	23.43	8.46	6.2E+01	22.70	8.28	5.5E+01	-3.10
	17	23.41	8.46	6.7E+01	22.71	8.24	5.5E+01	-3.00
	18	23.16	8.46	7.5E+01	22.49	8.30	6.5E+01	-2.88
	19	23.29	8.43	7.7E+01	22.60	8.26	5.2E+01	-2.96
	20	23.38	8.44	7.3E+01	22.65	8.28	4.6E+01	-3.15
	21	23.35	8.46	6.4E+01	22.66	8.33	5.3E+01	-2.96
	22	23.21	8.46	7.4E+01	22.43	8.29	5.3E+01	-3.36
	23	23.24	8.45	7.2E+01	22.50	8.27	5.2E+01	-3.17
	24	23.18	8.48	7.3E+01	22.44	8.28	4.7E+01	-3.19
	25	23.44	8.48	7.6E+01	22.79	8.25	4.9E+01	-2.78
	26	23.35	8.45	5.9E+01	22.55	8.27	5.3E+01	-3.44
	27	23.46	8.47	6.6E+01	22.91	8.28	6.3E+01	-2.35
	28	23.28	8.44	7.1E+01	22.61	8.29	5.1E+01	-2.88
	29	23.50	8.44	6.1E+01	22.72	8.31	5.5E+01	-3.31
	30	23.40	8.46	7.2E+01	22.59	8.26	5.1E+01	-3.46
	31	23.52	8.46	4.4E+01	22.73	8.23	6.2E+01	-3.34
	32	23.31	8.45	5.0E+01	22.62	8.26	6.0E+01	-2.94
	33	23.31	8.49	5.5E+01	22.55	8.28	5.6E+01	-3.30
	34	23.27	8.49	5.9E+01	22.55	8.33	5.1E+01	-3.11
	35	23.37	8.47	6.3E+01	22.67	8.26	5.7E+01	-3.02
	36	23.65	8.43	6.9E+01	22.86	8.28	5.4E+01	-3.35
	37	23.39	8.47	7.0E+01	22.72	8.28	5.8E+01	-2.86
	38	23.44	8.47	6.1E+01	22.74	8.27	4.6E+01	-2.99
	39	23.17	8.44	7.4E+01	22.41	8.30	5.8E+01	-3.29
	40	23.22	8.45	6.1E+01	22.44	8.28	4.8E+01	-3.34
	41	23.35	8.48	7.1E+01	22.61	8.30	6.1E+01	-3.16
	42	23.31	8.46	7.3E+01	22.60	8.26	5.3E+01	-3.07
	43	23.54	8.47	7.6E+01	22.78	8.25	5.0E+01	-3.24
	44	23.51	8.46	6.9E+01	22.70	8.27	5.9E+01	-3.44
	45	23.46	8.45	6.8E+01	22.68	8.28	4.6E+01	-3.33
	46	23.53	8.43	5.6E+01	22.76	8.31	6.6E+01	-3.30
	47	23.57	8.47	5.7E+01	22.86	8.29	5.3E+01	-3.01
	48	23.64	8.44	7.5E+01	22.92	8.32	5.5E+01	-3.05
	49	23.29	8.45	6.4E+01	22.62	8.24	5.3E+01	-2.90
	50	23.39	8.44	7.0E+01	22.75	8.29	5.1E+01	-2.74

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM31CR70J226KE23
Manufacturung Location: Phillipine	Lot No: A
Date before test:2018/04/24	Date after test:2018/06/19

#8 - Operational Life

Test conditions : 1000hr ,125deg C , 1.5WV

	51	23.29	8.44	6.2E+01	22.51	8.28	5.0E+01	-3.34
	52	23.42	8.45	7.3E+01	22.70	8.28	6.2E+01	-3.05
	53	23.54	8.46	6.4E+01	22.74	8.28	5.9E+01	-3.39
	54	23.31	8.49	7.0E+01	22.65	8.26	4.9E+01	-2.83
	55	23.59	8.47	5.3E+01	22.77	8.29	5.5E+01	-3.46
	56	23.37	8.45	5.2E+01	22.72	8.22	5.8E+01	-2.76
	57	23.28	8.43	7.7E+01	22.57	8.29	5.5E+01	-3.03
	58	23.35	8.44	4.0E+01	22.62	8.26	6.3E+01	-3.15
	59	23.26	8.45	7.2E+01	22.61	8.31	4.9E+01	-2.78
	60	23.30	8.45	7.6E+01	22.55	8.33	4.5E+01	-3.25
	61	23.28	8.44	7.1E+01	22.65	8.32	6.8E+01	-2.74
	62	23.27	8.45	7.3E+01	22.62	8.24	4.9E+01	-2.81
	63	23.45	8.44	7.2E+01	22.86	8.28	5.8E+01	-2.51
A	64	23.27	8.46	7.4E+01	22.44	8.26	4.8E+01	-3.54
	65	23.42	8.48	7.5E+01	22.74	8.31	5.9E+01	-2.88
	66	23.55	8.44	7.2E+01	22.83	8.31	5.6E+01	-3.07
	67	23.45	8.42	6.9E+01	22.78	8.24	5.4E+01	-2.85
	68	23.60	8.42	7.5E+01	22.88	8.31	4.7E+01	-3.06
	69	23.34	8.45	7.3E+01	22.55	8.25	5.8E+01	-3.38
	70	23.36	8.45	4.8E+01	22.59	8.26	5.5E+01	-3.31
	71	23.37	8.47	6.0E+01	22.74	8.27	5.0E+01	-2.71
	72	23.44	8.44	8.1E+01	22.69	8.25	6.3E+01	-3.19
	73	23.26	8.43	7.2E+01	22.59	8.25	5.1E+01	-2.89
	74	23.48	8.47	8.0E+01	22.83	8.29	6.4E+01	-2.74
	75	23.38	8.44	6.3E+01	22.62	8.29	5.3E+01	-3.27
	76	23.36	8.44	6.7E+01	22.67	8.30	5.3E+01	-2.97
	77	23.42	8.47	6.6E+01	22.62	8.28	6.1E+01	-3.42

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM31CR70J226KE23
Manufacturung Location: Phillipine	Lot No: A

#9 - External Visual Examination

Number of Samples: 812 Number of Lots: 1	Number of failures: 0

Lot #	Test No.	Result (pass/fail)
A	3	pass
	4	pass
	5	pass
	6	pass
	7-1	pass
	7-2	pass
	8	pass
	10	pass
	12-1	pass
	12-2	pass
	12-3	pass
	13	pass
	14	pass
	15	pass
	16	pass
	17	pass
	18	pass
	18	pass
	18	pass
	19	pass
	21	pass
	22	pass
	23	pass

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM31CR70J226KE23
Manufacturung Location: Phillipine	Lot No: A
Date before test:2018/05/10	

#10 - Physical Dimensions

Number of Samples: 30 Number of Lots: 1		Readings at Room Temp: 25C					
		L [mm]	W [mm]	T [mm]	e1 [mm]	e2 [mm]	g [mm]
Spec limits	lower	3.00	1.40	1.40	0.30	0.30	1.50
	upper	3.40	1.80	1.80	0.80	0.80	
Measurement Statistics	minimum	3.33	1.73	1.72	0.57	0.56	1.99
	maximum	3.36	1.75	1.74	0.68	0.69	2.14
	mean	3.34	1.74	1.73	0.61	0.61	2.09
	standard deviation	0.01	0.00	0.01	0.02	0.03	0.04
Presence of failures		in spec	in spec	in spec	in spec	in spec	in spec
Measurements	Sample	L [mm]	W [mm]	T [mm]	e1 [mm]	e2 [mm]	g [mm]
	1	3.33	1.75	1.72	0.62	0.57	2.10
	2	3.33	1.74	1.73	0.63	0.62	2.04
	3	3.35	1.74	1.73	0.61	0.58	2.12
	4	3.34	1.74	1.74	0.63	0.60	2.05
	5	3.34	1.75	1.73	0.61	0.59	2.06
	6	3.34	1.74	1.73	0.64	0.58	2.10
	7	3.33	1.74	1.72	0.60	0.66	2.09
	8	3.33	1.73	1.72	0.62	0.66	2.06
	9	3.33	1.74	1.73	0.68	0.61	2.07
	10	3.33	1.74	1.73	0.61	0.56	2.12
	11	3.34	1.74	1.73	0.60	0.64	2.07
	12	3.34	1.75	1.73	0.63	0.57	2.08
	13	3.34	1.75	1.74	0.60	0.63	2.10
	14	3.34	1.74	1.74	0.61	0.62	2.08
	15	3.34	1.73	1.73	0.57	0.63	2.14
	16	3.36	1.74	1.73	0.59	0.63	2.10
	17	3.34	1.74	1.72	0.60	0.57	2.10
	18	3.35	1.74	1.73	0.62	0.58	2.11
	19	3.33	1.74	1.74	0.63	0.62	2.10
	20	3.33	1.74	1.73	0.58	0.69	2.00
	21	3.34	1.74	1.74	0.60	0.60	2.12
	22	3.34	1.74	1.73	0.62	0.63	2.07
	23	3.35	1.74	1.72	0.61	0.59	2.09
	24	3.34	1.74	1.73	0.60	0.59	1.99
	25	3.35	1.74	1.74	0.62	0.59	2.10
	26	3.33	1.74	1.73	0.57	0.64	2.12
	27	3.34	1.73	1.73	0.61	0.61	2.08
	28	3.34	1.74	1.74	0.65	0.65	2.14
	29	3.33	1.74	1.74	0.62	0.66	2.06
	30	3.34	1.73	1.72	0.64	0.63	2.10

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM31CR70J226KE23
Manufacturung Location: Phillipine	Lot No: A
Date before test:2018/04/19	Date after test:2018/04/26

#12 Resistance to solvents

Number of Samples: 5 Number of Lots: 1	*Test conditions* A : 1 part (by volume) of isopropyl alcohol and 3 parts (by volume) of mineral sperits , 25deg C 3min immersion test conditions B : terpene defluxer, 25deg C 3min immersion test conditions C : 42 parts(by volume) of water and 1 part (by volume) of propylene glycol monomethylether and 1 part (by volume) of monoethanolamine, 63-70deg C 3min immersion

Number of Samples: 5 Number of Lots: 1	Number of failures: 0	
A	1	No Failure
	2	No Failure
	3	No Failure
	4	No Failure
	5	No Failure

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM31CR70J226KE23
Manufacturung Location: Phillipine	Lot No: A
Date before test:2018/04/13	Date after test:2018/05/02

#13 - Mechanical Shock

Test conditions : shock pulse : 1500g's, 0.5ms, 4.7m/s, 3 times each of 6 orientations

No. of samples:	30	Initial readings			Final readings			
No. of lots:	1	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
Spec limits	lower	19.80		2.3E+00	19.80		2.3E+00	
	upper	24.20	10.00		24.20	10.00		
Measurement Statistics	minimum	23.36	8.46	4.2E+01	21.26	8.02	5.6E+01	-9.25
	maximum	23.76	8.57	7.4E+01	21.75	8.15	7.3E+01	-8.58
	mean	23.61	8.50	5.8E+01	21.50	8.07	6.7E+01	-8.92
	standard deviation	0.10	0.03	7.5E+00	0.11	0.03	3.9E+00	0.18
Presence of Failures		in spec	in spec	in spec	in spec	in spec	in spec	in spec

Test Data

Lot #	Sample	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
A	1	23.71	8.52	5.0E+01	21.62	8.03	6.4E+01	-8.83
	2	23.56	8.49	5.8E+01	21.40	8.11	6.1E+01	-9.20
	3	23.68	8.51	5.8E+01	21.60	8.02	6.3E+01	-8.78
	4	23.67	8.55	6.4E+01	21.50	8.08	7.2E+01	-9.16
	5	23.61	8.50	5.3E+01	21.48	8.07	6.9E+01	-9.01
	6	23.49	8.46	6.3E+01	21.39	8.03	6.9E+01	-8.93
	7	23.60	8.52	6.7E+01	21.49	8.15	6.5E+01	-8.96
	8	23.73	8.50	4.2E+01	21.54	8.04	6.4E+01	-9.25
	9	23.63	8.49	7.4E+01	21.47	8.13	7.3E+01	-9.14
	10	23.70	8.53	6.0E+01	21.55	8.08	6.7E+01	-9.07
	11	23.57	8.53	6.5E+01	21.50	8.05	7.3E+01	-8.78
	12	23.72	8.52	4.8E+01	21.59	8.10	6.9E+01	-8.98
	13	23.43	8.50	5.7E+01	21.33	8.10	6.6E+01	-8.93
	14	23.36	8.51	4.7E+01	21.26	8.06	6.2E+01	-8.99
	15	23.58	8.46	4.5E+01	21.55	8.12	6.6E+01	-8.58
	16	23.73	8.53	5.8E+01	21.66	8.06	6.5E+01	-8.69
	17	23.43	8.57	6.5E+01	21.32	8.05	6.7E+01	-8.99
	18	23.64	8.51	5.6E+01	21.53	8.05	7.3E+01	-8.90
	19	23.57	8.47	5.3E+01	21.45	8.09	6.7E+01	-8.99
	20	23.49	8.49	7.4E+01	21.39	8.07	7.1E+01	-8.96
	21	23.62	8.51	6.1E+01	21.51	8.14	6.5E+01	-8.91
	22	23.59	8.46	5.9E+01	21.49	8.07	6.8E+01	-8.92
	23	23.62	8.53	5.9E+01	21.59	8.05	7.0E+01	-8.60
	24	23.54	8.47	6.7E+01	21.36	8.03	6.9E+01	-9.24
	25	23.76	8.48	5.8E+01	21.62	8.03	5.6E+01	-9.02
	26	23.74	8.50	5.8E+01	21.68	8.04	6.3E+01	-8.69
	27	23.64	8.46	6.1E+01	21.60	8.13	6.8E+01	-8.61
	28	23.57	8.50	5.4E+01	21.47	8.07	6.3E+01	-8.89
	29	23.48	8.49	6.0E+01	21.40	8.06	6.9E+01	-8.89
	30	23.71	8.50	6.1E+01	21.65	8.06	6.4E+01	-8.69

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM31CR70J226KE23
Manufacturung Location: Phillipine	Lot No: A
Date before test:2018/04/09	Date after test:2018/04/23

#14 - Vibration

Test conditions : 5g's for 20min, 12 cycles each of 3 orientations, test frequency 10 - 2000Hz

No. of samples:	30	Initial readings			Final readings			
No. of lots:	1	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
Spec limits	lower	19.80		2.3E+00	19.80		2.3E+00	
	upper	24.20	10.00		24.20	10.00		
Measurement Statistics	minimum	23.06	8.40	4.7E+01	23.09	8.36	6.0E+01	0.03
	maximum	23.51	8.48	7.8E+01	23.56	8.43	9.9E+01	0.25
	mean	23.26	8.43	6.5E+01	23.29	8.40	8.3E+01	0.16
	standard deviation	0.12	0.02	8.5E+00	0.12	0.02	1.1E+01	0.06
Presence of Failures		in spec	in spec	in spec	in spec	in spec	in spec	in spec

Test Data

Lot #	Sample	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
A	1	23.20	8.43	7.8E+01	23.23	8.43	7.2E+01	0.14
	2	23.38	8.42	6.2E+01	23.43	8.42	8.2E+01	0.23
	3	23.12	8.46	7.6E+01	23.18	8.40	8.3E+01	0.24
	4	23.51	8.45	4.7E+01	23.56	8.43	9.7E+01	0.20
	5	23.35	8.45	7.0E+01	23.40	8.42	7.1E+01	0.22
	6	23.08	8.46	7.0E+01	23.12	8.38	8.6E+01	0.19
	7	23.47	8.44	7.3E+01	23.49	8.42	7.8E+01	0.07
	8	23.31	8.48	6.8E+01	23.35	8.41	8.1E+01	0.18
	9	23.33	8.42	7.2E+01	23.35	8.36	8.4E+01	0.12
	10	23.08	8.43	5.3E+01	23.09	8.38	6.9E+01	0.03
	11	23.15	8.43	6.2E+01	23.17	8.40	9.9E+01	0.09
	12	23.29	8.43	6.6E+01	23.30	8.38	8.7E+01	0.06
	13	23.18	8.42	5.7E+01	23.20	8.36	7.8E+01	0.11
	14	23.26	8.44	4.9E+01	23.31	8.37	8.2E+01	0.21
	15	23.06	8.44	7.3E+01	23.11	8.39	7.1E+01	0.22
	16	23.47	8.41	7.2E+01	23.49	8.38	7.8E+01	0.09
	17	23.36	8.41	5.2E+01	23.41	8.38	9.7E+01	0.22
	18	23.28	8.42	5.7E+01	23.32	8.40	9.7E+01	0.15
	19	23.17	8.44	5.4E+01	23.20	8.41	8.9E+01	0.10
	20	23.19	8.41	6.3E+01	23.22	8.39	9.9E+01	0.13
	21	23.30	8.44	7.0E+01	23.35	8.38	7.0E+01	0.22
	22	23.24	8.42	5.7E+01	23.28	8.39	9.3E+01	0.16
	23	23.11	8.40	6.4E+01	23.15	8.43	9.0E+01	0.17
	24	23.33	8.44	5.8E+01	23.38	8.40	8.7E+01	0.22
	25	23.10	8.41	7.1E+01	23.14	8.40	6.5E+01	0.19
	26	23.17	8.41	6.6E+01	23.21	8.43	6.0E+01	0.18
	27	23.34	8.44	7.1E+01	23.39	8.41	8.1E+01	0.25
	28	23.16	8.46	6.0E+01	23.20	8.40	9.9E+01	0.20
	29	23.29	8.43	7.1E+01	23.32	8.36	9.2E+01	0.12
	30	23.35	8.47	7.6E+01	23.38	8.40	8.3E+01	0.13

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM31CR70J226KE23
Manufacturung Location: Phillipine	Lot No: A
Date before test:2018/04/23	Date after test:2018/05/14

#15 - Resistance to Soldering Heat

Test Conditions : soldering , 260C 10sec immersion

Number of Samples: 30 Number of Lots: 1	Number of failures: 0

Lot #	Sample	Result
A	1	No failure
	2	No failure
	3	No failure
	4	No failure
	5	No failure
	6	No failure
	7	No failure
	8	No failure
	9	No failure
	10	No failure
	11	No failure
	12	No failure
	13	No failure
	14	No failure
	15	No failure
	16	No failure
	17	No failure
	18	No failure
	19	No failure
	20	No failure
	21	No failure
	22	No failure
	23	No failure
	24	No failure
	25	No failure
	26	No failure
	27	No failure
	28	No failure
	29	No failure
	30	No failure

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM31CR70J226KE23
Manufacturung Location: Phillipine	Lot No: A
Date before test:2018/04/17	Date after test:2018/05/22

#16 - Thermal Shock

Test conditions : 300Cycles (-55deg C to 125deg C) , Maximum transfer time 20sec , keeping time 15min

No. of samples:	30	Initial readings			Final readings			
No. of lots:	1	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
Spec limits	lower	19.80		2.3E+00			2.3E+00	-10.00
	upper	24.20	10.00			10.00		10.00
Measurement Statistics	minimum	23.41	8.45	4.0E+01	23.04	8.26	4.6E+01	-1.70
	maximum	23.81	8.51	5.5E+01	23.40	8.33	7.0E+01	-1.33
	mean	23.60	8.48	4.7E+01	23.25	8.29	5.6E+01	-1.48
	standard deviation	0.12	0.01	3.6E+00	0.12	0.02	6.6E+00	0.10
Presence of Failures		in spec	in spec	in spec	in spec	in spec	in spec	in spec

Test Data

Lot #	Sample	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
A	1	23.51	8.47	5.2E+01	23.18	8.30	5.7E+01	-1.42
	2	23.72	8.48	4.8E+01	23.36	8.28	5.2E+01	-1.50
	3	23.60	8.48	4.6E+01	23.26	8.28	5.2E+01	-1.47
	4	23.43	8.48	4.5E+01	23.09	8.28	5.4E+01	-1.46
	5	23.59	8.45	5.3E+01	23.26	8.29	5.8E+01	-1.37
	6	23.75	8.47	4.4E+01	23.39	8.33	5.4E+01	-1.51
	7	23.67	8.47	4.7E+01	23.35	8.28	5.1E+01	-1.36
	8	23.42	8.48	4.8E+01	23.11	8.28	4.6E+01	-1.33
	9	23.60	8.47	4.8E+01	23.27	8.30	5.4E+01	-1.40
	10	23.72	8.49	4.6E+01	23.40	8.30	5.2E+01	-1.34
	11	23.58	8.47	4.9E+01	23.24	8.30	5.4E+01	-1.45
	12	23.62	8.48	4.4E+01	23.23	8.32	5.9E+01	-1.68
	13	23.41	8.48	4.7E+01	23.04	8.28	5.9E+01	-1.54
	14	23.62	8.48	4.9E+01	23.26	8.32	4.8E+01	-1.54
	15	23.56	8.47	4.9E+01	23.19	8.29	5.1E+01	-1.56
	16	23.70	8.50	5.4E+01	23.30	8.29	6.6E+01	-1.70
	17	23.63	8.49	4.0E+01	23.25	8.31	6.1E+01	-1.60
	18	23.59	8.48	4.2E+01	23.24	8.28	6.0E+01	-1.49
	19	23.63	8.50	4.5E+01	23.27	8.27	5.9E+01	-1.54
	20	23.68	8.46	4.6E+01	23.32	8.29	4.8E+01	-1.51
	21	23.47	8.45	5.2E+01	23.12	8.28	5.3E+01	-1.52
	22	23.79	8.46	5.3E+01	23.45	8.26	6.3E+01	-1.44
	23	23.67	8.51	4.3E+01	23.30	8.31	5.1E+01	-1.58
	24	23.81	8.47	4.2E+01	23.49	8.31	5.3E+01	-1.33
	25	23.51	8.47	4.7E+01	23.16	8.29	4.6E+01	-1.47
	26	23.41	8.49	5.5E+01	23.04	8.29	7.0E+01	-1.60
	27	23.43	8.48	4.3E+01	23.09	8.27	7.0E+01	-1.42
	28	23.57	8.46	4.8E+01	23.22	8.31	5.1E+01	-1.48
	29	23.63	8.48	4.6E+01	23.26	8.28	6.4E+01	-1.54
	30	23.78	8.47	4.7E+01	23.46	8.32	6.6E+01	-1.37

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM31CR70J226KE23
Manufacturung Location: Phillipine	Lot No: A
Date before test:2018/05/01	Date after test:2018/05/03

#17 - ESD Test

Test conditions : charge capacitor 150pF, discharge resistor 2000ohm

Number of Samples: 15 Number of Lots: 1		Greatest Breakdown Voltage with no failures
Breakdown Voltage	Sample	Result (pass/fail)
min 1kV D.C.	1	pass
	2	pass
	3	pass
	4	pass
	5	pass
	6	pass
	7	pass
	8	pass
	9	pass
	10	pass
	11	pass
	12	pass
	13	pass
	14	pass
	15	pass

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM31CR70J226KE23
Manufacturung Location: Phillipine	Lot No: A
Date before test:2018/04/13	

#18 - Solderability

Test conditions : 1.soldering 235C 5sec immersion, 2.soldering 235C 5sec immersion, 3.soldering 260C 120sec immersion

Number of Samples: 45 Number of Lots: 1	Number of failures: 0

Test No.	Sample	Result (pass/fail)
1	1	pass
	2	pass
	3	pass
	4	pass
	5	pass
	6	pass
	7	pass
	8	pass
	9	pass
	10	pass
	11	pass
	12	pass
	13	pass
	14	pass
	15	pass
2	1	pass
	2	pass
	3	pass
	4	pass
	5	pass
	6	pass
	7	pass
	8	pass
	9	pass
	10	pass
	11	pass
	12	pass
	13	pass
	14	pass
	15	pass
3	1	pass
	2	pass
	3	pass
	4	pass
	5	pass
	6	pass
	7	pass
	8	pass
	9	pass
	10	pass
	11	pass
	12	pass
	13	pass
	14	pass
	15	pass

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM31CR70J226KE23
Manufacturung Location: Phillipine	Lot No: A
Date before test:2018/04/19	

#19 - Electrical Characterization

Test conditions : 120+/-24Hz, 0.5+/-0.1Vrms

Number of Samples: 30 Number of Lots: 1		Readings at Room Temp: 25C			at Min Operating Temperature: -55C			at Max Operating Temperature: 125C			
		Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	Change in capacitance %	Capacitance uF	Dissipation Factor %	IR 125C Mohm	Change in capacitance %
Spec limits	lower	19.80		2.3E+00			-15.00			2.3E-01	-15.00
	upper	24.20	10.00				15.00				15.00
Measurement Statistics	minimum	22.75	8.25	5.2E+01	21.17	11.97	-7.54	20.59	0.52	3.4E+00	-9.61
	maximum	23.75	8.38	5.3E+01	22.01	12.40	-6.72	21.52	1.02	3.9E+00	-9.14
	mean	23.17	8.32	5.2E+01	21.52	12.16	-7.10	21.00	0.74	3.7E+00	-9.36
	standard deviation	0.22	0.04	3.2E-01	0.20	0.13	0.20	0.20	0.11	1.1E-01	0.10
Presence of failures		in spec	in spec	in spec	in spec	in spec	in spec	in spec	in spec	in spec	in spec

Measurements	Sample	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	Change in capacitance %	Capacitance uF	Dissipation Factor %	IR 125C Mohm	Change in capacitance %
A	1	23.40	8.28	5.2E+01	21.74	12.00	-7.08	21.20	0.63	3.7E+00	-9.38
	2	22.93	8.28	5.2E+01	21.32	12.23	-7.02	20.82	0.71	3.7E+00	-9.22
	3	23.10	8.29	5.2E+01	21.52	12.03	-6.85	20.96	0.78	3.7E+00	-9.28
	4	23.15	8.31	5.3E+01	21.60	12.37	-6.72	20.98	0.78	3.5E+00	-9.40
	5	23.20	8.29	5.2E+01	21.60	12.12	-6.89	21.03	0.58	3.9E+00	-9.36
	6	23.01	8.33	5.2E+01	21.36	12.32	-7.17	20.83	0.73	3.8E+00	-9.44
	7	23.35	8.35	5.2E+01	21.73	12.18	-6.93	21.18	0.75	3.8E+00	-9.27
	8	23.47	8.38	5.2E+01	21.83	12.11	-6.98	21.21	0.64	3.8E+00	-9.61
	9	23.40	8.34	5.2E+01	21.77	12.10	-6.95	21.17	1.02	3.5E+00	-9.51
	10	23.19	8.26	5.2E+01	21.49	12.25	-7.34	20.99	0.83	3.7E+00	-9.46
	11	23.36	8.36	5.3E+01	21.61	12.09	-7.49	21.18	0.73	3.7E+00	-9.34
	12	23.10	8.34	5.2E+01	21.42	12.28	-7.25	20.90	0.66	3.8E+00	-9.51
	13	22.88	8.31	5.2E+01	21.31	12.23	-6.86	20.73	0.79	3.4E+00	-9.39
	14	23.21	8.25	5.2E+01	21.54	12.04	-7.21	21.06	0.66	3.8E+00	-9.29
	15	23.32	8.37	5.2E+01	21.67	12.16	-7.10	21.12	0.71	3.7E+00	-9.43
	16	22.81	8.32	5.2E+01	21.17	12.27	-7.22	20.67	0.85	3.6E+00	-9.39
	17	23.19	8.33	5.3E+01	21.51	12.37	-7.25	21.02	0.52	3.7E+00	-9.33
	18	23.17	8.32	5.3E+01	21.49	12.28	-7.24	20.97	0.88	3.6E+00	-9.48
	19	22.75	8.35	5.2E+01	21.20	12.34	-6.81	20.59	0.56	3.7E+00	-9.49
	20	23.29	8.31	5.2E+01	21.63	12.08	-7.13	21.11	0.96	3.6E+00	-9.36
	21	23.09	8.31	5.2E+01	21.44	12.40	-7.18	20.95	0.58	3.5E+00	-9.27
	22	22.96	8.37	5.2E+01	21.29	11.97	-7.25	20.80	0.79	3.7E+00	-9.40
	23	23.22	8.36	5.2E+01	21.60	11.98	-6.97	21.06	0.69	3.8E+00	-9.27
	24	23.34	8.34	5.2E+01	21.58	12.07	-7.54	21.21	0.75	3.8E+00	-9.14
	25	23.20	8.37	5.2E+01	21.60	12.03	-6.93	21.06	0.82	3.6E+00	-9.23
	26	23.23	8.32	5.2E+01	21.57	12.03	-7.14	21.08	0.78	3.7E+00	-9.24
	27	23.75	8.25	5.2E+01	22.01	12.13	-7.31	21.52	0.85	3.8E+00	-9.39
	28	22.92	8.36	5.3E+01	21.31	12.19	-7.00	20.78	0.80	3.8E+00	-9.32
	29	23.23	8.31	5.2E+01	21.60	12.18	-7.00	21.04	0.80	3.7E+00	-9.41
	30	22.83	8.35	5.2E+01	21.18	12.02	-7.22	20.72	0.68	3.7E+00	-9.23

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM31CR70J226KE23
Manufacturung Location: Phillipine	Lot No: A
Date before test:2018/04/23	Date after test:2018/04/24

#21 - Board Flex

Test conditions : bend board at 2mm for 60sec
pass/fail criteria : cap change within +/-10%

Test Data

Number of Samples: 30 Number of Lots: 1	Number of failures: 0

Lot #	Sample	Result (pass/fail)
A	1	pass
	2	pass
	3	pass
	4	pass
	5	pass
	6	pass
	7	pass
	8	pass
	9	pass
	10	pass
	11	pass
	12	pass
	13	pass
	14	pass
	15	pass
	16	pass
	17	pass
	18	pass
	19	pass
	20	pass
	21	pass
	22	pass
	23	pass
	24	pass
	25	pass
	26	pass
	27	pass
	28	pass
	29	pass
	30	pass

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM31CR70J226KE23
Manufacturung Location: Phillipine	Lot No: A
Date before test:2018/04/16	Date after test:2018/04/16

#22 - Terminal Strength (SMD)

Test conditions : Force of 18N for 60sec

Number of Samples: 30 Number of Lots: 1	Number of failures: 0

Lot #	Sample	Result (pass/fail)
A	1	pass
	2	pass
	3	pass
	4	pass
	5	pass
	6	pass
	7	pass
	8	pass
	9	pass
	10	pass
	11	pass
	12	pass
	13	pass
	14	pass
	15	pass
	16	pass
	17	pass
	18	pass
	19	pass
	20	pass
	21	pass
	22	pass
	23	pass
	24	pass
	25	pass
	26	pass
	27	pass
	28	pass
	29	pass
	30	pass

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM31CR70J226KE23
Manufacturung Location: Phillipine	Lot No: A
Date before test:2018/04/16	

#23 - Beam Load

Test conditions : Apply a force until the part brakes
pass/fail criteria : 0805 size or smaller: 20N over (t>0.5mm), 8N over (t<=0.5mm)
1206 size or bigger: 15N over (t<1.25mm), 54.5N over (t>=1.25mm)

Number of Samples: 30 Number of Lots: 1	Number of failures: 0

Lot #	Sample	Result (pass/fail)
A	1	pass
	2	pass
	3	pass
	4	pass
	5	pass
	6	pass
	7	pass
	8	pass
	9	pass
	10	pass
	11	pass
	12	pass
	13	pass
	14	pass
	15	pass
	16	pass
	17	pass
	18	pass
	19	pass
	20	pass
	21	pass
	22	pass
	23	pass
	24	pass
	25	pass
	26	pass
	27	pass
	28	pass
	29	pass
	30	pass

AEC Q200 Summary of Test Results

Supplier: Murata

Submission Date: July / 2018

Part Name:

GCM32ER70J476KE19

Series description:

GCM / 1210 / X7R / 6.3V Series

muRata
INNOVATOR IN ELECTRONICS

Murata P/N: GCM32ER70J476KE19

Part Series GCM / 1210 / X7R / 6.3V Series

Operating Temperature: -55℃ ~ +125℃

Test Item	Test Conditions	No of Lots	Qty per Lot	No of Failure
#3 - High Temperature Exposure	Test conditions : 1000hr , 150deg C	1	77	0
#4 - Temperature Cycling	Test conditions : 1000cycles , -55deg C to 125deg C	1	77	0
#5 - Destructive Physical Analysis		1	10	0
#6 - Moisture Resistance	Test conditions : 10cycles(1cycle : 24hr) , 25deg C / 80% RH to 65deg C / 98% RH	1	77	0
#7 - Biased Humidity (I)	Test Conditions : 1000hr , 85deg C / 85% RH , 1WV	1	77	0
#7 - Biased Humidity (II)	Test Conditions : 1000hr , 85deg C / 85% RH , 1.3V	1	77	0
#8 - Operational Life	Test conditions : 1000hr ,125deg C , 1.5WV	1	77	0
#9 - External Visual Examination		all qualification parts		0
#10 - Physical Dimensions		1	30	0
#12 Resistance to solvents	Test conditions A : 1 part (by volume) of isopropyl alcohol and 3 parts (by volume) of mineral sperits , 25deg C 3min immersion test conditions B : terpene defluxer, 25deg C 3min immersion test conditions C : 42 parts(by volume) of water and 1 part (by volume) of propylene glycol monomethylether and 1 part (by volume) of monoethanolamine, 63-70deg C 3min immersion	1	5	0
#13 - Mechanical Shock	Test conditions : shock pulse : 1500g's, 0.5ms, 4.7m/s, 3 times each of 6 orientations	1	30	0
#14 - Vibration	Test conditions : 5g's for 20min, 12 cycles each of 3 orientations, test frequency 10 - 2000Hz	1	30	0
#15 - Resistance to Soldering Heat	Test Conditions : soldering , 260C 10sec immersion	1	30	0
#16 - Thermal Shock	Test conditions : 300Cycles (-55deg C to 125deg C) , Maximum transfer time 20sec , keeping time 15min	1	15	0
#17 - ESD Test	Test conditions : charge capacitor 150pF, discharge resistor 2000ohm	1	30	0
#18 - Solderability	Test conditions : 1.soldering 235C 5sec immersion, 2.soldering 235C 5sec immersion, 3.soldering 260C 120sec immersion	1	15	0
#19 - Electrical Characterization	Test conditions : 120+/-24Hz, 0.5+/-0.1Vrms	1	30	0
#21 - Board Flex	Test conditions : bend board at 2mm for 60sec pass/fail criteria : cap change within +/-10%	1	30	0
#22 - Terminal Strength (SMD)	Test conditions : Force of 1.8kg for 60sec	1	30	0
#23 - Beam Load	Test conditions : Apply a force until the part brakes pass/fail criteria: 0805 size or smaller: 20N over (t>0.5mm), 8N over (t<=0.5mm) 1206 size or bigger: 15N over (t<1.25mm), 54.5N over (t>=1.25mm)	1	30	0

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM32ER70J476KE19
Manufacturung Location: Philippine	Lot No: A
Date before test:2018/03/27	Date after test:2018/05/08

#3 - High Temperature Exposure

Test conditions : 1000hr , 150deg C

No. of samples:	77	Initial readings			Final readings			
No. of lots:	1	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
Spec limits	lower	42.30		1.1E+00			1.1E+00	-10.00
	upper	51.70	10.00			20.00		10.00
Measurement Statistics	minimum	48.84	8.16	1.7E+01	46.44	7.65	1.8E+01	-5.38
	maximum	50.29	8.42	3.6E+01	47.87	7.79	3.7E+01	-4.50
	mean	49.48	8.32	2.8E+01	47.08	7.73	2.8E+01	-4.85
	standard deviation	0.35	0.06	5.3E+00	0.34	0.03	4.7E+00	0.21
Presence of Failures		in spec	in spec	in spec	in spec	in spec	in spec	in spec

Test Data

Lot #	Sample	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
A	1	49.74	8.26	2.3E+01	47.40	7.73	2.5E+01	-4.69
	2	50.04	8.23	2.5E+01	47.76	7.75	3.0E+01	-4.55
	3	49.73	8.26	2.5E+01	47.29	7.71	2.7E+01	-4.92
	4	48.87	8.34	3.0E+01	46.47	7.72	3.2E+01	-4.91
	5	49.38	8.29	2.2E+01	47.02	7.68	3.1E+01	-4.77
	6	49.41	8.27	2.4E+01	46.89	7.74	2.2E+01	-5.10
	7	49.06	8.37	1.8E+01	46.82	7.65	2.9E+01	-4.56
	8	49.60	8.27	2.4E+01	47.34	7.67	3.0E+01	-4.55
	9	48.96	8.21	3.2E+01	46.63	7.76	2.8E+01	-4.77
	10	49.70	8.21	3.0E+01	47.28	7.70	2.5E+01	-4.88
	11	49.30	8.41	2.9E+01	47.00	7.71	3.7E+01	-4.67
	12	50.07	8.38	2.7E+01	47.56	7.74	3.1E+01	-5.02
	13	49.24	8.29	3.0E+01	46.73	7.75	2.4E+01	-5.10
	14	49.58	8.42	2.2E+01	47.24	7.73	2.7E+01	-4.71
	15	49.73	8.37	2.2E+01	47.43	7.73	3.3E+01	-4.63
	16	49.79	8.42	2.4E+01	47.49	7.72	2.5E+01	-4.61
	17	49.87	8.36	3.5E+01	47.38	7.69	2.6E+01	-4.99
	18	49.43	8.32	2.3E+01	46.90	7.75	3.3E+01	-5.12
	19	49.47	8.26	3.3E+01	47.17	7.70	2.1E+01	-4.65
	20	49.24	8.37	3.6E+01	46.69	7.69	2.7E+01	-5.18
	21	49.10	8.29	2.6E+01	46.71	7.79	2.9E+01	-4.87
	22	49.47	8.39	3.1E+01	47.08	7.74	3.5E+01	-4.83
	23	49.15	8.39	2.1E+01	46.76	7.71	1.9E+01	-4.86
	24	49.02	8.26	2.6E+01	46.68	7.75	3.6E+01	-4.77
	25	49.62	8.27	3.3E+01	47.29	7.73	2.8E+01	-4.70
	26	48.91	8.33	2.9E+01	46.53	7.69	2.3E+01	-4.85
	27	49.67	8.36	3.4E+01	47.31	7.67	1.8E+01	-4.76
	28	50.29	8.34	3.2E+01	47.87	7.77	2.3E+01	-4.81
	29	49.29	8.38	3.1E+01	46.95	7.72	2.6E+01	-4.76
	30	49.34	8.26	3.3E+01	47.03	7.73	3.0E+01	-4.68
	31	49.20	8.30	2.7E+01	46.91	7.72	3.6E+01	-4.66
	32	49.23	8.30	1.8E+01	46.94	7.70	2.4E+01	-4.66
	33	49.21	8.42	2.2E+01	46.79	7.72	3.5E+01	-4.92
	34	48.84	8.27	3.3E+01	46.52	7.75	2.9E+01	-4.74
	35	49.09	8.39	2.5E+01	46.88	7.71	3.1E+01	-4.50
	36	49.37	8.35	2.9E+01	47.14	7.71	3.1E+01	-4.52
	37	50.07	8.41	1.9E+01	47.69	7.72	2.4E+01	-4.77
	38	50.13	8.32	3.6E+01	47.57	7.76	2.7E+01	-5.12
	39	49.65	8.38	3.2E+01	47.09	7.75	3.7E+01	-5.16
	40	49.83	8.40	1.7E+01	47.39	7.70	2.7E+01	-4.91
	41	49.14	8.34	3.4E+01	46.55	7.78	2.7E+01	-5.27
	42	49.65	8.38	1.8E+01	47.20	7.75	3.1E+01	-4.95
	43	49.37	8.29	3.3E+01	46.97	7.70	2.7E+01	-4.86
	44	50.00	8.29	1.7E+01	47.46	7.69	2.4E+01	-5.07
	45	49.74	8.32	1.9E+01	47.34	7.70	3.0E+01	-4.83
	46	49.23	8.37	3.0E+01	46.99	7.76	3.2E+01	-4.55
	47	49.94	8.35	3.3E+01	47.39	7.78	3.7E+01	-5.11
	48	49.64	8.26	2.4E+01	47.05	7.73	3.2E+01	-5.21
	49	49.44	8.26	3.2E+01	47.19	7.70	2.6E+01	-4.55
	50	49.74	8.37	2.0E+01	47.25	7.77	3.1E+01	-5.01

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM32ER70J476KE19
Manufacturung Location: Philippine	Lot No: A
Date before test:2018/03/27	Date after test:2018/05/08

#3 - High Temperature Exposure

Test conditions : 1000hr , 150deg C

	51	49.73	8.36	2.6E+01	47.16	7.72	3.0E+01	-5.16
	52	50.10	8.34	3.0E+01	47.63	7.73	2.2E+01	-4.92
	53	49.50	8.33	3.0E+01	47.02	7.68	2.4E+01	-5.01
	54	49.00	8.36	3.2E+01	46.63	7.77	2.0E+01	-4.84
	55	49.93	8.37	2.2E+01	47.61	7.68	2.0E+01	-4.65
	56	48.92	8.21	3.2E+01	46.44	7.78	3.3E+01	-5.06
	57	49.13	8.34	3.4E+01	46.57	7.76	3.0E+01	-5.21
	58	49.39	8.20	3.4E+01	47.02	7.70	3.5E+01	-4.80
	59	49.84	8.36	3.5E+01	47.45	7.73	2.5E+01	-4.81
	60	49.74	8.27	3.1E+01	47.30	7.75	2.7E+01	-4.91
	61	49.20	8.36	2.8E+01	46.87	7.79	3.0E+01	-4.74
	62	49.21	8.32	2.6E+01	46.72	7.73	3.6E+01	-5.05
	63	49.43	8.32	3.1E+01	46.77	7.67	2.9E+01	-5.38
A	64	49.43	8.31	2.4E+01	47.14	7.71	2.9E+01	-4.63
	65	49.19	8.33	1.8E+01	46.71	7.77	2.4E+01	-5.04
	66	49.00	8.35	2.7E+01	46.63	7.74	2.9E+01	-4.85
	67	49.93	8.36	2.9E+01	47.51	7.73	2.1E+01	-4.84
	68	49.25	8.37	2.3E+01	46.93	7.69	3.7E+01	-4.70
	69	49.78	8.27	2.9E+01	47.27	7.75	2.7E+01	-5.05
	70	49.84	8.28	2.9E+01	47.58	7.75	3.1E+01	-4.54
	71	49.43	8.36	1.9E+01	47.18	7.73	2.0E+01	-4.56
	72	49.01	8.42	3.0E+01	46.75	7.77	3.4E+01	-4.62
	73	49.48	8.26	3.4E+01	47.15	7.74	2.2E+01	-4.71
	74	49.45	8.32	3.0E+01	46.97	7.73	2.9E+01	-5.01
	75	49.59	8.39	3.5E+01	47.12	7.75	2.8E+01	-4.99
	76	49.07	8.30	2.6E+01	46.78	7.77	3.2E+01	-4.66
	77	49.50	8.16	3.4E+01	47.09	7.70	3.5E+01	-4.85

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM32ER70J476KE19
Manufacturung Location: Philippine	Lot No: A
Date before test:2018/04/03	Date after test:2018/06/05

#4 - Temperature Cycling

Test conditions : 1000cycles , -55deg C to 125deg C

No. of samples:	77	Initial readings			Final readings			
No. of lots:	1	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
Spec limits	lower	42.30		1.1E+00			1.1E+00	-7.50
	upper	51.70	10.00			20.00		7.50
Measurement Statistics	minimum	48.41	7.98	1.4E+01	47.95	7.91	1.8E+01	-1.15
	maximum	49.98	8.11	2.3E+01	49.67	8.05	3.1E+01	-0.55
	mean	49.31	8.05	1.8E+01	48.88	7.99	2.5E+01	-0.87
	standard deviation	0.35	0.03	1.9E+00	0.35	0.03	3.2E+00	0.15
Presence of Failures		in spec	in spec	in spec	in spec	in spec	in spec	in spec

Test Data

Lot #	Sample	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
A	1	48.72	8.06	1.9E+01	48.22	7.99	2.2E+01	-1.03
	2	49.43	8.04	1.7E+01	48.96	7.94	2.2E+01	-0.93
	3	49.57	8.08	2.0E+01	49.19	7.93	2.6E+01	-0.77
	4	48.41	8.09	2.0E+01	47.95	8.04	2.5E+01	-0.95
	5	49.60	8.06	1.6E+01	49.24	8.02	3.0E+01	-0.72
	6	49.33	8.07	1.9E+01	48.76	7.99	2.7E+01	-1.14
	7	49.46	8.05	1.6E+01	49.05	7.98	2.7E+01	-0.83
	8	49.84	8.06	1.7E+01	49.48	7.94	3.0E+01	-0.71
	9	49.39	8.11	2.0E+01	48.96	7.99	2.2E+01	-0.87
	10	49.70	8.04	1.6E+01	49.14	8.03	2.9E+01	-1.13
	11	48.73	8.01	2.0E+01	48.32	7.97	2.9E+01	-0.85
	12	49.51	8.10	1.5E+01	49.08	7.97	2.3E+01	-0.88
	13	49.34	8.11	1.9E+01	48.88	7.98	2.9E+01	-0.93
	14	49.24	8.01	2.3E+01	48.82	8.02	2.1E+01	-0.86
	15	49.22	8.11	1.8E+01	48.70	7.97	2.7E+01	-1.05
	16	49.74	8.05	1.7E+01	49.26	7.99	2.6E+01	-0.96
	17	49.62	8.02	1.7E+01	49.31	8.01	3.1E+01	-0.64
	18	49.12	8.02	2.0E+01	48.81	7.98	2.9E+01	-0.63
	19	49.13	8.06	2.2E+01	48.75	8.01	2.6E+01	-0.76
	20	49.14	8.05	1.7E+01	48.75	7.99	2.4E+01	-0.81
	21	49.49	8.08	1.6E+01	48.94	7.99	2.4E+01	-1.10
	22	48.61	8.06	1.6E+01	48.11	7.99	2.4E+01	-1.03
	23	49.62	8.09	2.2E+01	49.18	7.96	2.7E+01	-0.88
	24	49.52	8.04	1.8E+01	49.05	7.94	2.5E+01	-0.96
	25	49.26	8.04	1.6E+01	48.81	8.05	1.9E+01	-0.92
	26	49.34	8.07	2.1E+01	49.02	7.99	2.8E+01	-0.64
	27	49.79	7.99	1.8E+01	49.22	8.00	2.3E+01	-1.14
	28	49.63	8.07	2.0E+01	49.19	7.93	2.8E+01	-0.90
	29	48.68	8.04	1.5E+01	48.30	7.99	2.9E+01	-0.78
	30	49.16	8.11	1.8E+01	48.64	8.02	2.5E+01	-1.06
	31	49.28	8.07	2.0E+01	48.92	7.99	2.5E+01	-0.74
	32	49.18	8.01	1.6E+01	48.83	7.98	2.6E+01	-0.71
	33	49.16	8.06	1.8E+01	48.75	7.97	2.2E+01	-0.83
	34	48.93	7.99	1.9E+01	48.59	8.00	2.6E+01	-0.71
	35	49.47	8.06	1.8E+01	49.11	8.00	1.8E+01	-0.74
	36	49.36	7.98	2.2E+01	48.83	8.00	2.6E+01	-1.09
	37	49.98	8.05	2.1E+01	49.66	8.01	2.8E+01	-0.65
	38	49.44	8.04	1.7E+01	48.96	8.03	2.8E+01	-0.99
	39	49.34	8.04	1.4E+01	48.95	7.98	2.8E+01	-0.77
	40	48.89	8.05	1.8E+01	48.40	7.97	2.7E+01	-1.01
	41	49.23	8.05	1.7E+01	48.74	7.98	2.9E+01	-0.98
	42	49.62	8.06	1.9E+01	49.12	8.03	3.0E+01	-1.00
	43	48.61	8.08	2.2E+01	48.18	7.98	2.1E+01	-0.88
	44	49.43	8.00	2.0E+01	48.98	7.98	2.2E+01	-0.90
	45	49.31	8.03	1.7E+01	48.88	7.94	2.8E+01	-0.86
	46	49.35	8.03	1.7E+01	49.00	8.02	3.0E+01	-0.72
	47	49.37	8.06	1.7E+01	49.00	8.02	1.8E+01	-0.75
	48	49.13	8.04	2.0E+01	48.68	7.98	2.3E+01	-0.91
	49	49.96	8.06	1.7E+01	49.52	7.96	2.3E+01	-0.87
	50	49.78	8.03	2.2E+01	49.31	7.99	3.0E+01	-0.95

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM32ER70J476KE19
Manufacturung Location: Philippine	Lot No: A
Date before test:2018/04/03	Date after test:2018/06/05

#4 - Temperature Cycling

Test conditions : 1000cycles , -55deg C to 125deg C

	51	49.31	8.04	2.0E+01	48.84	7.99	2.5E+01	-0.96
	52	49.66	8.08	2.1E+01	49.21	7.95	2.5E+01	-0.91
	53	48.66	8.02	1.7E+01	48.25	7.96	2.8E+01	-0.83
	54	49.25	8.07	1.8E+01	48.85	7.96	1.9E+01	-0.82
	55	49.23	8.09	1.8E+01	48.74	7.99	2.5E+01	-0.99
	56	49.14	8.06	1.7E+01	48.64	8.00	2.5E+01	-1.02
	57	49.63	8.02	1.6E+01	49.25	7.95	2.7E+01	-0.77
	58	48.83	8.04	1.9E+01	48.50	7.98	2.4E+01	-0.67
	59	49.61	8.09	2.1E+01	49.34	8.01	2.1E+01	-0.55
	60	49.13	8.01	1.8E+01	48.77	8.02	1.9E+01	-0.73
	61	49.54	8.02	1.8E+01	49.25	8.00	2.2E+01	-0.57
	62	48.97	8.09	1.7E+01	48.57	8.01	2.4E+01	-0.81
	63	49.26	8.04	2.0E+01	48.78	8.00	2.4E+01	-0.97
A	64	48.94	8.08	1.8E+01	48.39	7.98	2.4E+01	-1.13
	65	49.51	7.99	1.8E+01	49.05	7.98	2.6E+01	-0.93
	66	48.94	8.07	1.7E+01	48.49	8.03	2.7E+01	-0.92
	67	49.49	8.05	1.6E+01	49.16	7.98	2.3E+01	-0.67
	68	49.84	8.02	1.9E+01	49.38	8.01	2.4E+01	-0.93
	69	48.83	8.03	1.9E+01	48.48	7.98	2.8E+01	-0.71
	70	49.27	8.01	1.9E+01	48.80	8.00	2.6E+01	-0.95
	71	48.85	8.08	2.2E+01	48.43	7.98	1.8E+01	-0.86
	72	49.32	8.06	1.8E+01	48.87	8.02	2.5E+01	-0.91
	73	49.98	8.09	1.7E+01	49.67	7.94	2.2E+01	-0.63
	74	49.66	7.98	1.7E+01	49.16	8.03	2.7E+01	-1.02
	75	49.52	8.04	1.9E+01	48.95	8.01	2.9E+01	-1.15
	76	49.06	8.04	1.9E+01	48.73	8.00	2.8E+01	-0.69
	77	49.30	8.07	1.8E+01	48.92	7.91	2.4E+01	-0.76

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM32ER70J476KE19
Manufacturung Location: Philippine	Lot No: A
Date before test:2018/03/29	

#5 - Destructive Physical Analysis

Number of Samples: 10 Number of Lots: 1	Number of failures: 0

Lot #	Sample	Result (pass/fail)
A	1	pass
	2	pass
	3	pass
	4	pass
	5	pass
	6	pass
	7	pass
	8	pass
	9	pass
	10	pass

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM32ER70J476KE19
Manufacturung Location: Philippine	Lot No: A
Date before test:2018/04/10	Date after test:2018/05/08

#6 - Moisture Resistance

Test conditions : 10cycles(1cycle : 24hr) , 25deg C / 80% RH to 65deg C / 98% RH

No. of samples:	77	Initial readings			Final readings			
No. of lots:	1	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
Spec limits	lower	42.30		1.1E+00			1.1E+00	-10.00
	upper	51.70	10.00			20.00		10.00
Measurement Statistics	minimum	48.60	8.26	1.7E+01	48.64	8.16	2.0E+01	-0.35
	maximum	50.20	8.44	3.5E+01	50.37	8.30	4.0E+01	0.87
	mean	49.33	8.35	2.5E+01	49.48	8.23	3.1E+01	0.30
	standard deviation	0.35	0.04	4.4E+00	0.37	0.03	5.5E+00	0.28
Presence of Failures		in spec	in spec	in spec	in spec	in spec	in spec	in spec

Test Data

Lot #	Sample	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
A	1	49.61	8.28	3.1E+01	49.46	8.23	3.9E+01	-0.29
	2	49.63	8.37	1.8E+01	49.69	8.29	3.2E+01	0.12
	3	48.97	8.32	2.9E+01	49.02	8.24	2.5E+01	0.09
	4	49.07	8.33	1.9E+01	49.25	8.25	3.4E+01	0.38
	5	48.96	8.40	2.7E+01	49.28	8.23	2.9E+01	0.67
	6	48.98	8.33	1.9E+01	49.25	8.23	2.6E+01	0.54
	7	49.37	8.34	3.4E+01	49.50	8.22	4.0E+01	0.27
	8	49.55	8.38	2.5E+01	49.62	8.23	2.2E+01	0.14
	9	48.78	8.41	1.9E+01	48.64	8.27	3.6E+01	-0.28
	10	49.86	8.36	2.2E+01	49.89	8.22	2.6E+01	0.06
	11	50.06	8.34	2.1E+01	50.13	8.25	3.3E+01	0.14
	12	48.77	8.29	2.7E+01	48.89	8.25	3.5E+01	0.24
	13	48.60	8.34	2.0E+01	49.00	8.22	3.4E+01	0.82
	14	49.57	8.28	2.5E+01	49.64	8.29	2.2E+01	0.14
	15	49.43	8.29	2.5E+01	49.36	8.21	2.1E+01	-0.14
	16	49.30	8.31	2.4E+01	49.71	8.21	3.0E+01	0.84
	17	49.48	8.33	2.6E+01	49.82	8.20	2.2E+01	0.68
	18	49.06	8.34	2.7E+01	48.89	8.27	3.2E+01	-0.35
	19	49.89	8.33	2.8E+01	49.99	8.22	3.9E+01	0.21
	20	49.63	8.30	2.8E+01	49.60	8.19	3.9E+01	-0.06
	21	49.21	8.30	3.2E+01	49.46	8.26	3.5E+01	0.52
	22	49.44	8.41	3.5E+01	49.68	8.30	3.6E+01	0.50
	23	49.11	8.29	1.8E+01	49.13	8.20	3.7E+01	0.03
	24	49.40	8.37	2.8E+01	49.48	8.24	2.6E+01	0.17
	25	49.29	8.41	2.6E+01	49.60	8.28	3.2E+01	0.64
	26	49.25	8.39	2.5E+01	49.28	8.22	2.6E+01	0.07
	27	49.64	8.36	3.0E+01	49.95	8.21	3.0E+01	0.62
	28	49.34	8.29	2.6E+01	49.77	8.26	3.1E+01	0.87
	29	49.56	8.34	2.9E+01	49.70	8.18	3.8E+01	0.29
	30	49.11	8.34	3.2E+01	49.29	8.23	3.5E+01	0.38
	31	49.40	8.41	2.5E+01	49.70	8.25	3.2E+01	0.61
	32	49.00	8.37	2.6E+01	49.23	8.25	3.6E+01	0.48
	33	49.02	8.42	2.4E+01	48.99	8.29	2.4E+01	-0.05
	34	48.98	8.30	1.9E+01	49.18	8.20	3.7E+01	0.42
	35	48.68	8.28	1.9E+01	48.77	8.21	2.2E+01	0.18
	36	49.42	8.42	2.5E+01	49.43	8.28	4.0E+01	0.02
	37	49.69	8.42	1.8E+01	49.78	8.17	2.9E+01	0.18
	38	48.95	8.26	2.8E+01	49.06	8.21	3.5E+01	0.23
	39	49.74	8.33	2.9E+01	49.98	8.16	3.2E+01	0.49
	40	48.87	8.32	2.0E+01	48.84	8.24	2.3E+01	-0.06
	41	49.38	8.36	2.5E+01	49.57	8.25	3.1E+01	0.37
	42	49.45	8.34	2.2E+01	49.67	8.23	2.3E+01	0.44
	43	50.07	8.32	2.0E+01	50.23	8.17	2.6E+01	0.31
	44	49.45	8.36	3.1E+01	49.62	8.22	2.7E+01	0.36
	45	49.79	8.38	2.2E+01	50.06	8.24	3.9E+01	0.54
	46	48.94	8.27	2.4E+01	49.35	8.20	2.4E+01	0.84
	47	49.50	8.35	2.2E+01	49.69	8.28	2.6E+01	0.37
	48	48.82	8.37	2.6E+01	48.98	8.19	2.8E+01	0.33
	49	49.39	8.39	2.4E+01	49.54	8.27	3.3E+01	0.30
	50	49.35	8.44	2.2E+01	49.53	8.21	3.0E+01	0.37

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM32ER70J476KE19
Manufacturung Location: Philippine	Lot No: A
Date before test:2018/04/10	Date after test:2018/05/08

#6 - Moisture Resistance

Test conditions : 10cycles(1cycle : 24hr) , 25deg C / 80% RH to 65deg C / 98% RH

	51	49.11	8.38	2.7E+01	49.19	8.21	3.5E+01	0.18
	52	49.02	8.40	2.1E+01	49.17	8.18	3.0E+01	0.31
	53	49.87	8.35	2.7E+01	50.07	8.28	2.9E+01	0.40
	54	49.25	8.38	2.7E+01	49.50	8.27	3.5E+01	0.52
	55	49.97	8.39	3.4E+01	49.98	8.29	3.3E+01	0.03
	56	49.46	8.32	2.6E+01	49.62	8.24	2.2E+01	0.34
	57	49.15	8.33	2.5E+01	49.25	8.17	3.5E+01	0.20
	58	49.07	8.38	1.9E+01	49.26	8.23	2.8E+01	0.39
	59	49.29	8.36	3.0E+01	49.45	8.23	2.1E+01	0.31
	60	49.24	8.42	2.9E+01	49.39	8.24	3.0E+01	0.31
	61	49.33	8.37	3.1E+01	49.33	8.23	3.5E+01	0.01
	62	48.79	8.39	1.7E+01	49.04	8.22	3.3E+01	0.52
	63	48.71	8.31	2.4E+01	48.79	8.23	3.6E+01	0.17
A	64	49.72	8.28	2.8E+01	49.89	8.24	3.4E+01	0.34
	65	49.89	8.29	2.6E+01	50.08	8.26	3.3E+01	0.38
	66	49.53	8.38	2.6E+01	49.44	8.24	3.5E+01	-0.19
	67	49.43	8.34	3.0E+01	49.76	8.23	3.1E+01	0.68
	68	49.26	8.34	2.0E+01	49.24	8.26	3.2E+01	-0.03
	69	49.51	8.31	2.7E+01	49.87	8.23	3.1E+01	0.74
	70	49.20	8.37	3.2E+01	49.25	8.27	2.6E+01	0.11
	71	50.20	8.26	2.6E+01	50.37	8.27	2.7E+01	0.33
	72	49.30	8.29	1.9E+01	49.26	8.23	2.0E+01	-0.10
	73	48.94	8.39	1.8E+01	49.33	8.18	2.1E+01	0.78
	74	49.14	8.30	1.9E+01	49.54	8.18	4.0E+01	0.82
	75	49.05	8.37	2.5E+01	49.21	8.25	2.7E+01	0.33
	76	49.45	8.32	3.0E+01	49.43	8.26	3.0E+01	-0.04
	77	49.64	8.34	2.8E+01	49.69	8.26	3.3E+01	0.10

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM32ER70J476KE19
Manufacturung Location: Philippine	Lot No: A
Date before test:2018/04/12	Date after test:2018/06/07

#7 - Biased Humidity

Test Conditions : 1000hr , 85deg C / 85% RH , 1WV

No. of samples:	77	Initial readings			Final readings			
No. of lots:	1	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
Spec limits	lower	42.30		1.1E+00			1.1E-01	-10.00
	upper	51.70	10.00			20.00		10.00
Measurement Statistics	minimum	48.45	8.23	1.0E+01	47.96	8.18	3.1E+01	-1.15
	maximum	50.48	8.40	1.5E+01	49.97	8.34	3.8E+01	-0.68
	mean	49.44	8.33	1.3E+01	48.99	8.28	3.5E+01	-0.91
	standard deviation	0.39	0.04	1.1E+00	0.39	0.04	1.8E+00	0.11
Presence of Failures		in spec	in spec	in spec	in spec	in spec	in spec	in spec

Test Data

Lot #	Sample	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
A	1	49.12	8.32	1.3E+01	48.67	8.25	3.2E+01	-0.92
	2	49.80	8.35	1.2E+01	49.33	8.27	3.2E+01	-0.94
	3	49.40	8.37	1.3E+01	49.01	8.31	3.5E+01	-0.80
	4	50.14	8.32	1.5E+01	49.63	8.25	3.7E+01	-1.01
	5	49.88	8.29	1.1E+01	49.47	8.28	3.5E+01	-0.83
	6	49.59	8.33	1.1E+01	49.12	8.28	3.3E+01	-0.94
	7	49.37	8.27	1.3E+01	48.98	8.33	3.4E+01	-0.79
	8	49.20	8.28	1.3E+01	48.79	8.31	3.5E+01	-0.83
	9	49.50	8.31	1.3E+01	49.02	8.25	3.7E+01	-0.98
	10	49.40	8.33	1.2E+01	48.98	8.26	3.2E+01	-0.84
	11	48.71	8.28	1.3E+01	48.27	8.20	3.4E+01	-0.92
	12	49.44	8.32	1.1E+01	48.92	8.27	3.7E+01	-1.07
	13	49.50	8.40	1.2E+01	49.05	8.30	3.4E+01	-0.91
	14	48.95	8.37	1.2E+01	48.47	8.28	3.4E+01	-0.99
	15	49.38	8.34	1.4E+01	48.89	8.29	3.3E+01	-1.00
	16	49.06	8.34	1.1E+01	48.66	8.25	3.2E+01	-0.80
	17	49.87	8.34	1.3E+01	49.44	8.25	3.2E+01	-0.87
	18	49.44	8.31	1.3E+01	49.02	8.34	3.5E+01	-0.86
	19	49.56	8.33	1.2E+01	49.08	8.30	3.2E+01	-0.97
	20	49.39	8.33	1.3E+01	48.82	8.31	3.6E+01	-1.15
	21	48.48	8.33	1.3E+01	47.96	8.32	3.6E+01	-1.09
	22	49.89	8.32	1.1E+01	49.43	8.34	3.5E+01	-0.92
	23	49.69	8.38	1.2E+01	49.23	8.31	3.5E+01	-0.92
	24	49.60	8.33	1.4E+01	49.17	8.22	3.3E+01	-0.86
	25	49.55	8.33	1.3E+01	49.08	8.26	3.3E+01	-0.95
	26	49.47	8.36	1.2E+01	49.08	8.25	3.7E+01	-0.78
	27	49.11	8.36	1.2E+01	48.61	8.33	3.5E+01	-1.02
	28	49.67	8.31	1.3E+01	49.10	8.31	3.5E+01	-1.15
	29	49.49	8.36	1.3E+01	49.04	8.24	3.7E+01	-0.91
	30	49.46	8.30	1.4E+01	48.96	8.27	3.1E+01	-1.02
	31	49.74	8.24	1.1E+01	49.26	8.30	3.5E+01	-0.96
	32	48.95	8.34	1.1E+01	48.56	8.29	3.7E+01	-0.80
	33	49.50	8.36	1.3E+01	49.12	8.31	3.6E+01	-0.76
	34	49.50	8.28	1.1E+01	49.01	8.31	3.6E+01	-0.98
	35	48.88	8.36	1.3E+01	48.55	8.29	3.7E+01	-0.68
	36	50.11	8.33	1.2E+01	49.67	8.28	3.5E+01	-0.88
	37	49.92	8.30	1.2E+01	49.56	8.18	3.6E+01	-0.72
	38	49.77	8.38	1.2E+01	49.35	8.26	3.5E+01	-0.86
	39	49.04	8.40	1.4E+01	48.60	8.33	3.7E+01	-0.91
	40	49.69	8.26	1.3E+01	49.19	8.26	3.5E+01	-1.01
	41	49.20	8.30	1.4E+01	48.72	8.31	3.6E+01	-0.98
	42	49.65	8.30	1.1E+01	49.17	8.32	3.5E+01	-0.97
	43	49.44	8.32	1.3E+01	49.06	8.34	3.7E+01	-0.78
	44	49.32	8.38	1.4E+01	48.87	8.31	3.8E+01	-0.92
	45	49.68	8.29	1.4E+01	49.22	8.33	3.7E+01	-0.93
	46	48.66	8.35	1.1E+01	48.19	8.32	3.4E+01	-0.97
	47	49.65	8.33	1.2E+01	49.20	8.30	3.5E+01	-0.90
	48	49.82	8.36	1.2E+01	49.33	8.21	3.2E+01	-0.99
	49	49.52	8.31	1.3E+01	49.07	8.26	3.2E+01	-0.91
	50	50.01	8.32	1.4E+01	49.49	8.25	3.4E+01	-1.04

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM32ER70J476KE19
Manufacturung Location: Philippine	Lot No: A
Date before test:2018/04/12	Date after test:2018/06/07

#7 - Biased Humidity

Test Conditions : 1000hr , 85deg C / 85% RH , 1WV

	51	49.40	8.36	1.2E+01	48.93	8.28	3.4E+01	-0.96
	52	48.45	8.36	1.4E+01	47.96	8.30	3.3E+01	-1.03
	53	49.57	8.35	1.4E+01	49.10	8.30	3.2E+01	-0.95
	54	49.55	8.38	1.3E+01	49.09	8.30	3.6E+01	-0.93
	55	49.53	8.37	1.0E+01	49.13	8.28	3.6E+01	-0.80
	56	49.43	8.37	1.2E+01	49.00	8.25	3.6E+01	-0.87
	57	49.49	8.30	1.2E+01	48.97	8.25	3.3E+01	-1.07
	58	49.81	8.38	1.4E+01	49.32	8.33	3.3E+01	-0.99
	59	49.46	8.29	1.2E+01	49.07	8.30	3.6E+01	-0.79
	60	49.69	8.35	1.3E+01	49.13	8.29	3.1E+01	-1.14
	61	48.74	8.28	1.2E+01	48.29	8.28	3.6E+01	-0.93
	62	49.88	8.24	1.5E+01	49.49	8.23	3.1E+01	-0.78
	63	49.24	8.33	1.3E+01	48.86	8.19	3.4E+01	-0.77
A	64	49.23	8.38	1.2E+01	48.70	8.18	3.2E+01	-1.07
	65	49.64	8.35	1.5E+01	49.23	8.31	3.8E+01	-0.82
	66	48.46	8.29	1.2E+01	47.96	8.32	3.5E+01	-1.02
	67	50.15	8.36	1.3E+01	49.79	8.33	3.5E+01	-0.71
	68	49.40	8.37	1.2E+01	48.98	8.28	3.6E+01	-0.85
	69	49.18	8.32	1.2E+01	48.77	8.27	3.5E+01	-0.83
	70	49.09	8.23	1.2E+01	48.73	8.31	3.2E+01	-0.74
	71	49.42	8.34	1.1E+01	49.09	8.28	3.3E+01	-0.68
	72	49.00	8.33	1.3E+01	48.59	8.33	3.2E+01	-0.84
	73	49.37	8.33	1.1E+01	48.92	8.21	3.3E+01	-0.93
	74	50.48	8.37	1.3E+01	49.97	8.28	3.6E+01	-0.99
	75	48.96	8.37	1.2E+01	48.50	8.24	3.4E+01	-0.94
	76	49.62	8.36	1.4E+01	49.21	8.25	3.7E+01	-0.82
	77	49.48	8.27	1.3E+01	49.02	8.28	3.7E+01	-0.92

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM32ER70J476KE19
Manufacturung Location: Philippine	Lot No: A
Date before test:2018/04/12	Date after test:2018/06/07

#7 - Biased Humidity

Test Conditions : 1000hr , 85deg C / 85% RH , 1.3V

No. of samples:	77	Initial readings			Final readings			
No. of lots:	1	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
Spec limits	lower	42.30		1.1E+00			1.1E-01	-10.00
	upper	51.70	10.00			20.00		10.00
Measurement Statistics	minimum	48.52	8.24	1.0E+01	48.55	8.26	2.0E+01	-0.21
	maximum	50.24	8.42	1.5E+01	50.33	8.40	4.4E+01	0.61
	mean	49.37	8.33	1.3E+01	49.48	8.32	2.9E+01	0.21
	standard deviation	0.36	0.04	1.1E+00	0.38	0.03	5.4E+00	0.21
Presence of Failures		in spec	in spec	in spec	in spec	in spec	in spec	in spec

Test Data

Lot #	Sample	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
A	1	49.83	8.37	1.3E+01	49.91	8.35	2.8E+01	0.16
	2	49.65	8.32	1.5E+01	49.74	8.34	2.3E+01	0.17
	3	49.30	8.32	1.1E+01	49.38	8.26	3.8E+01	0.17
	4	49.06	8.41	1.3E+01	49.29	8.36	3.4E+01	0.47
	5	48.62	8.38	1.3E+01	48.63	8.33	2.6E+01	0.02
	6	49.83	8.29	1.1E+01	49.96	8.28	3.4E+01	0.27
	7	49.38	8.37	1.3E+01	49.54	8.35	2.9E+01	0.31
	8	49.77	8.33	1.4E+01	49.83	8.34	2.6E+01	0.13
	9	49.56	8.38	1.5E+01	49.81	8.37	2.6E+01	0.51
	10	49.80	8.34	1.2E+01	49.92	8.35	2.8E+01	0.24
	11	50.06	8.27	1.3E+01	50.33	8.37	3.2E+01	0.53
	12	48.85	8.30	1.5E+01	49.04	8.28	2.2E+01	0.41
	13	49.54	8.35	1.4E+01	49.57	8.38	2.8E+01	0.06
	14	49.42	8.30	1.4E+01	49.68	8.28	2.7E+01	0.53
	15	49.40	8.30	1.4E+01	49.54	8.31	3.6E+01	0.28
	16	48.95	8.29	1.2E+01	49.00	8.30	3.6E+01	0.12
	17	49.07	8.30	1.3E+01	49.29	8.32	2.4E+01	0.45
	18	49.63	8.27	1.3E+01	49.65	8.30	3.0E+01	0.03
	19	48.90	8.28	1.2E+01	49.04	8.32	3.0E+01	0.29
	20	48.81	8.28	1.3E+01	48.88	8.32	2.3E+01	0.14
	21	49.19	8.32	1.5E+01	49.14	8.32	3.7E+01	-0.10
	22	48.96	8.30	1.3E+01	48.96	8.30	2.4E+01	0.01
	23	48.74	8.41	1.2E+01	48.78	8.35	3.5E+01	0.09
	24	49.29	8.33	1.4E+01	49.25	8.27	4.1E+01	-0.08
	25	49.49	8.27	1.3E+01	49.79	8.28	2.7E+01	0.61
	26	49.00	8.29	1.4E+01	48.95	8.27	2.4E+01	-0.09
	27	49.71	8.31	1.3E+01	49.75	8.34	3.2E+01	0.08
	28	49.69	8.29	1.4E+01	49.73	8.39	2.4E+01	0.09
	29	49.60	8.39	1.4E+01	49.76	8.30	3.8E+01	0.33
	30	49.49	8.38	1.2E+01	49.56	8.28	4.0E+01	0.14
	31	49.78	8.39	1.4E+01	49.83	8.29	2.9E+01	0.09
	32	49.73	8.42	1.4E+01	50.00	8.32	4.4E+01	0.54
	33	49.21	8.30	1.3E+01	49.21	8.33	2.4E+01	0.01
	34	49.58	8.35	1.2E+01	49.65	8.27	2.9E+01	0.15
	35	49.57	8.39	1.2E+01	49.85	8.26	2.9E+01	0.57
	36	49.62	8.28	1.4E+01	49.70	8.27	3.1E+01	0.17
	37	49.71	8.27	1.3E+01	49.70	8.29	2.5E+01	-0.02
	38	49.22	8.36	1.4E+01	49.38	8.30	3.4E+01	0.34
	39	49.20	8.42	1.0E+01	49.26	8.38	3.0E+01	0.11
	40	49.96	8.32	1.4E+01	50.05	8.30	2.4E+01	0.18
	41	49.39	8.27	1.3E+01	49.39	8.28	3.4E+01	0.00
	42	49.45	8.34	1.1E+01	49.36	8.34	2.1E+01	-0.18
	43	49.56	8.30	1.3E+01	49.70	8.30	3.3E+01	0.29
	44	49.70	8.29	1.1E+01	49.91	8.27	2.5E+01	0.41
	45	49.24	8.35	1.2E+01	49.49	8.36	3.1E+01	0.51
	46	49.48	8.36	1.2E+01	49.74	8.34	2.3E+01	0.52
	47	49.05	8.39	1.2E+01	49.07	8.34	2.4E+01	0.04
	48	50.24	8.33	1.3E+01	50.24	8.34	3.5E+01	-0.01
	49	49.57	8.34	1.0E+01	49.70	8.33	2.8E+01	0.25
	50	49.60	8.32	1.5E+01	49.66	8.34	3.4E+01	0.10

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM32ER70J476KE19
Manufacturung Location: Philippine	Lot No: A
Date before test:2018/04/12	Date after test:2018/06/07

#7 - Biased Humidity

Test Conditions : 1000hr , 85deg C / 85% RH , 1.3V

	51	49.37	8.35	1.3E+01	49.34	8.28	3.5E+01	-0.05
	52	49.44	8.41	1.1E+01	49.55	8.35	2.3E+01	0.22
	53	49.29	8.34	1.2E+01	49.19	8.34	2.1E+01	-0.19
	54	48.52	8.30	1.3E+01	48.55	8.40	2.6E+01	0.05
	55	49.01	8.32	1.2E+01	49.18	8.27	3.1E+01	0.34
	56	49.33	8.40	1.3E+01	49.55	8.38	2.1E+01	0.43
	57	49.16	8.35	1.3E+01	49.12	8.31	3.6E+01	-0.07
	58	49.83	8.30	1.4E+01	50.06	8.35	3.3E+01	0.48
	59	49.93	8.34	1.2E+01	50.06	8.31	2.9E+01	0.25
	60	49.11	8.24	1.1E+01	49.28	8.35	3.0E+01	0.33
	61	49.31	8.40	1.2E+01	49.39	8.34	2.5E+01	0.16
	62	49.39	8.38	1.1E+01	49.34	8.32	2.9E+01	-0.12
	63	49.46	8.34	1.3E+01	49.58	8.33	3.5E+01	0.24
A	64	49.50	8.32	1.5E+01	49.47	8.34	2.0E+01	-0.06
	65	49.36	8.29	1.2E+01	49.49	8.38	3.8E+01	0.26
	66	48.79	8.35	1.4E+01	48.69	8.35	2.3E+01	-0.21
	67	49.42	8.37	1.2E+01	49.68	8.36	3.2E+01	0.54
	68	48.73	8.29	1.2E+01	48.91	8.36	2.9E+01	0.37
	69	49.87	8.33	1.1E+01	49.97	8.27	3.1E+01	0.21
	70	49.25	8.37	1.4E+01	49.33	8.34	3.4E+01	0.15
	71	49.58	8.29	1.3E+01	49.68	8.28	2.6E+01	0.20
	72	48.61	8.28	1.3E+01	48.86	8.36	2.2E+01	0.51
	73	49.18	8.33	1.4E+01	49.27	8.33	2.6E+01	0.17
	74	49.39	8.31	1.1E+01	49.47	8.33	3.6E+01	0.18
	75	49.20	8.29	1.2E+01	49.49	8.29	3.0E+01	0.60
	76	49.22	8.35	1.2E+01	49.45	8.33	2.4E+01	0.48
	77	49.16	8.32	1.3E+01	49.17	8.31	3.3E+01	0.04

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM32ER70J476KE19
Manufacturung Location: Philippine	Lot No: A
Date before test:2018/04/13	Date after test:2018/06/08

#8 - Operational Life

Test conditions : 1000hr ,125deg C , 1.5WV

No. of samples:	77	Initial readings			Final readings			
No. of lots:	1	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
Spec limits	lower	42.30		1.1E+00			1.1E-01	-10.00
	upper	51.70	10.00			20.00		10.00
Measurement Statistics	minimum	48.67	8.27	1.7E+01	46.77	7.79	2.4E+01	-4.59
	maximum	50.32	8.44	3.4E+01	48.44	7.95	3.9E+01	-3.29
	mean	49.53	8.36	2.7E+01	47.55	7.87	3.1E+01	-4.00
	standard deviation	0.36	0.04	3.9E+00	0.38	0.04	3.3E+00	0.35
Presence of Failures		in spec	in spec	in spec	in spec	in spec	in spec	in spec

Test Data

Lot #	Sample	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
A	1	49.37	8.36	2.5E+01	47.56	7.91	3.3E+01	-3.66
	2	50.13	8.35	2.8E+01	48.25	7.88	3.3E+01	-3.76
	3	49.51	8.40	2.8E+01	47.59	7.79	2.9E+01	-3.88
	4	49.39	8.37	3.2E+01	47.31	7.89	2.6E+01	-4.22
	5	49.41	8.34	3.2E+01	47.72	7.94	2.9E+01	-3.42
	6	49.55	8.34	3.0E+01	47.58	7.86	3.1E+01	-3.96
	7	49.56	8.36	2.8E+01	47.72	7.81	3.3E+01	-3.71
	8	49.11	8.42	2.5E+01	47.00	7.86	3.0E+01	-4.30
	9	49.29	8.34	1.8E+01	47.35	7.86	3.5E+01	-3.94
	10	49.23	8.37	2.9E+01	47.15	7.87	3.0E+01	-4.23
	11	49.94	8.34	2.9E+01	47.95	7.94	3.1E+01	-3.99
	12	49.80	8.27	2.4E+01	47.57	7.93	3.3E+01	-4.48
	13	49.42	8.36	2.8E+01	47.68	7.84	3.0E+01	-3.52
	14	49.24	8.40	3.2E+01	47.13	7.88	2.9E+01	-4.28
	15	49.07	8.31	3.0E+01	46.91	7.83	2.9E+01	-4.41
	16	49.23	8.39	2.4E+01	47.21	7.89	3.0E+01	-4.10
	17	49.98	8.35	2.8E+01	47.93	7.86	3.6E+01	-4.11
	18	49.64	8.40	3.1E+01	47.56	7.91	3.2E+01	-4.20
	19	49.30	8.34	2.3E+01	47.29	7.87	3.2E+01	-4.06
	20	49.74	8.31	3.1E+01	47.80	7.86	2.9E+01	-3.91
	21	49.57	8.38	2.5E+01	47.41	7.88	2.7E+01	-4.35
	22	49.60	8.34	2.5E+01	47.39	7.90	2.8E+01	-4.45
	23	49.83	8.35	2.0E+01	48.18	7.93	3.2E+01	-3.32
	24	50.21	8.40	2.3E+01	48.26	7.91	2.4E+01	-3.88
	25	49.25	8.30	2.7E+01	47.40	7.84	3.4E+01	-3.75
	26	49.86	8.34	2.6E+01	47.91	7.80	3.1E+01	-3.91
	27	49.67	8.31	2.0E+01	47.56	7.93	3.0E+01	-4.24
	28	49.80	8.38	2.4E+01	47.95	7.94	3.6E+01	-3.71
	29	49.55	8.33	2.5E+01	47.46	7.80	2.6E+01	-4.21
	30	49.79	8.35	3.2E+01	47.61	7.95	2.5E+01	-4.38
	31	49.87	8.32	2.8E+01	48.02	7.86	3.2E+01	-3.71
	32	49.90	8.38	2.4E+01	48.14	7.87	3.6E+01	-3.54
	33	49.46	8.29	2.8E+01	47.29	7.87	3.1E+01	-4.40
	34	49.94	8.31	2.6E+01	48.09	7.89	3.6E+01	-3.72
	35	49.46	8.35	2.5E+01	47.32	7.91	3.0E+01	-4.33
	36	49.00	8.39	2.8E+01	47.01	7.81	3.0E+01	-4.08
	37	49.56	8.35	3.0E+01	47.35	7.90	3.9E+01	-4.46
	38	49.19	8.33	2.9E+01	47.01	7.85	2.9E+01	-4.43
	39	49.97	8.36	2.8E+01	48.04	7.91	3.8E+01	-3.86
	40	49.79	8.42	2.7E+01	47.74	7.88	3.2E+01	-4.13
	41	49.79	8.34	2.9E+01	47.52	7.90	2.9E+01	-4.56
	42	49.54	8.37	3.0E+01	47.28	7.84	2.9E+01	-4.56
	43	49.07	8.35	2.3E+01	47.21	7.88	2.9E+01	-3.78
	44	49.79	8.39	2.3E+01	47.71	7.87	2.7E+01	-4.17
	45	49.42	8.38	1.7E+01	47.40	7.91	3.0E+01	-4.09
	46	48.98	8.43	3.0E+01	47.07	7.87	3.4E+01	-3.91
	47	49.10	8.35	2.8E+01	47.28	7.81	3.1E+01	-3.72
	48	49.61	8.37	2.7E+01	47.98	7.84	2.9E+01	-3.29
	49	49.58	8.35	3.0E+01	47.43	7.84	3.7E+01	-4.33
	50	49.79	8.32	3.3E+01	47.69	7.86	3.0E+01	-4.21

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM32ER70J476KE19
Manufacturung Location: Philippine	Lot No: A
Date before test:2018/04/13	Date after test:2018/06/08

#8 - Operational Life

Test conditions : 1000hr ,125deg C , 1.5WV

	51	49.81	8.39	3.4E+01	47.67	7.90	2.5E+01	-4.30
	52	49.08	8.32	2.9E+01	47.32	7.84	3.0E+01	-3.60
	53	49.38	8.42	2.7E+01	47.48	7.88	3.1E+01	-3.84
	54	49.20	8.34	1.7E+01	47.51	7.82	3.3E+01	-3.44
	55	49.35	8.29	2.9E+01	47.39	7.90	3.1E+01	-3.97
	56	49.89	8.44	2.6E+01	47.69	7.92	2.5E+01	-4.42
	57	49.21	8.36	2.1E+01	47.24	7.85	2.5E+01	-4.00
	58	50.32	8.39	3.1E+01	48.44	7.90	3.1E+01	-3.73
	59	49.69	8.37	3.2E+01	47.83	7.83	3.1E+01	-3.74
	60	48.95	8.41	1.7E+01	46.77	7.84	3.6E+01	-4.46
	61	48.98	8.32	3.0E+01	46.77	7.89	3.0E+01	-4.50
	62	48.76	8.42	2.3E+01	46.96	7.90	3.4E+01	-3.69
	63	49.10	8.37	2.5E+01	47.36	7.92	2.6E+01	-3.55
A	64	49.84	8.32	3.2E+01	47.55	7.87	3.0E+01	-4.59
	65	50.01	8.35	2.0E+01	48.29	7.89	3.3E+01	-3.44
	66	50.06	8.39	2.6E+01	47.89	7.93	3.0E+01	-4.34
	67	49.47	8.41	3.1E+01	47.81	7.85	3.9E+01	-3.35
	68	49.28	8.31	2.9E+01	47.20	7.89	3.3E+01	-4.23
	69	49.35	8.36	2.5E+01	47.57	7.86	3.2E+01	-3.59
	70	49.68	8.30	2.8E+01	47.44	7.84	3.3E+01	-4.50
	71	50.14	8.30	2.5E+01	48.08	7.80	3.0E+01	-4.11
	72	50.23	8.35	2.7E+01	48.08	7.86	2.7E+01	-4.26
	73	49.37	8.30	2.8E+01	47.45	7.88	3.7E+01	-3.89
	74	49.10	8.30	3.0E+01	47.42	7.95	3.2E+01	-3.42
	75	48.67	8.36	2.3E+01	46.94	7.82	2.8E+01	-3.55
	76	49.36	8.42	3.1E+01	47.23	7.88	2.7E+01	-4.31
	77	49.78	8.30	2.5E+01	47.91	7.94	2.8E+01	-3.74

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM32ER70J476KE19
Manufacturung Location: Philippine	Lot No: A

#9 - External Visual Examination

Number of Samples: 812 Number of Lots: 1	Number of failures: 0

Lot #	Test No.	Result (pass/fail)
A	3	pass
	4	pass
	5	pass
	6	pass
	7-1	pass
	7-2	pass
	8	pass
	10	pass
	12-1	pass
	12-2	pass
	12-3	pass
	13	pass
	14	pass
	15	pass
	16	pass
	17	pass
	18	pass
	18	pass
	18	pass
	19	pass
	21	pass
	22	pass
	23	pass

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM32ER70J476KE19
Manufacturung Location: Philippine	Lot No: A
Date before test:2018/05/01	

#10 - Physical Dimensions

Number of Samples: 30 Number of Lots: 1		Readings at Room Temp: 25C					
		L [mm]	W [mm]	T [mm]	e1 [mm]	e2 [mm]	g [mm]
Spec limits	lower	2.90	2.30	2.30	0.30	0.30	1.00
	upper	3.50	2.70	2.70			
Measurement Statistics	minimum	3.44	2.62	2.55	0.42	0.44	2.33
	maximum	3.48	2.66	2.63	0.64	0.57	2.54
	mean	3.46	2.64	2.60	0.51	0.50	2.44
	standard deviation	0.01	0.01	0.02	0.05	0.03	0.05
Presence of failures		in spec	in spec	in spec	in spec	in spec	in spec
Measurements	Sample	L [mm]	W [mm]	T [mm]	e1 [mm]	e2 [mm]	g [mm]
	1	3.45	2.64	2.60	0.47	0.46	2.52
	2	3.45	2.64	2.62	0.56	0.47	2.42
	3	3.48	2.64	2.62	0.52	0.48	2.49
	4	3.44	2.65	2.63	0.50	0.54	2.40
	5	3.47	2.63	2.58	0.45	0.48	2.54
	6	3.47	2.64	2.59	0.51	0.47	2.49
	7	3.47	2.65	2.63	0.59	0.53	2.35
	8	3.46	2.63	2.57	0.51	0.53	2.42
	9	3.45	2.64	2.62	0.57	0.48	2.40
	10	3.45	2.64	2.63	0.50	0.57	2.39
	11	3.47	2.62	2.59	0.54	0.48	2.44
	12	3.46	2.64	2.59	0.49	0.44	2.47
	13	3.44	2.64	2.55	0.53	0.51	2.41
	14	3.47	2.64	2.60	0.53	0.51	2.50
	15	3.45	2.64	2.59	0.42	0.47	2.39
	16	3.46	2.64	2.58	0.56	0.50	2.42
	17	3.46	2.64	2.59	0.54	0.52	2.46
	18	3.47	2.65	2.60	0.48	0.46	2.36
	19	3.47	2.64	2.59	0.46	0.46	2.43
	20	3.47	2.64	2.61	0.44	0.46	2.48
	21	3.45	2.64	2.62	0.48	0.54	2.33
	22	3.46	2.64	2.61	0.64	0.51	2.50
	23	3.45	2.66	2.63	0.55	0.55	2.49
	24	3.46	2.64	2.61	0.46	0.46	2.45
	25	3.48	2.65	2.60	0.46	0.53	2.40
	26	3.46	2.65	2.59	0.55	0.51	2.52
	27	3.46	2.64	2.60	0.54	0.49	2.49
	28	3.45	2.63	2.60	0.51	0.51	2.39
	29	3.45	2.64	2.59	0.51	0.47	2.49
	30	3.45	2.63	2.59	0.49	0.49	2.46

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM32ER70J476KE19
Manufacturung Location: Philippine	Lot No: A
Date before test:2018/04/10	Date after test:2018/04/17

#12 Resistance to solvents

Number of Samples: 5 Number of Lots: 1	*Test conditions* A : 1 part (by volume) of isopropyl alcohol and 3 parts (by volume) of mineral sperits , 25deg C 3min immersion test conditions B : terpene defluxer, 25deg C 3min immersion test conditions C : 42 parts(by volume) of water and 1 part (by volume) of propylene glycol monomethylether and 1 part (by volume) of monoethanolamine, 63-70deg C 3min immersion

Number of Samples: 5 Number of Lots: 1	Number of failures: 0	
A	1	No Failure
	2	No Failure
	3	No Failure
	4	No Failure
	5	No Failure

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM32ER70J476KE19
Manufacturung Location: Philippine	Lot No: A
Date before test:2018/04/04	Date after test:2018/04/23

#13 - Mechanical Shock

Test conditions : shock pulse : 1500g's, 0.5ms, 4.7m/s, 3 times each of 6 orientations

No. of samples:	30	Initial readings			Final readings			
No. of lots:	1	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
Spec limits	lower	42.30		1.1E+00	42.30		1.1E+00	
	upper	51.70	10.00		51.70	10.00		
Measurement Statistics	minimum	48.67	8.07	1.7E+01	44.52	7.47	2.2E+01	-8.65
	maximum	49.77	8.29	2.9E+01	45.54	7.72	3.7E+01	-8.35
	mean	49.20	8.15	2.3E+01	45.02	7.56	3.0E+01	-8.49
	standard deviation	0.33	0.05	3.0E+00	0.31	0.06	3.9E+00	0.08
Presence of Failures		in spec	in spec	in spec	in spec	in spec	in spec	in spec

Test Data

Lot #	Sample	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
A	1	48.69	8.16	2.3E+01	44.52	7.63	2.9E+01	-8.57
	2	49.64	8.07	2.5E+01	45.37	7.57	2.6E+01	-8.61
	3	49.02	8.22	2.7E+01	44.86	7.58	2.6E+01	-8.49
	4	49.49	8.22	2.4E+01	45.22	7.72	2.8E+01	-8.63
	5	49.49	8.15	2.1E+01	45.33	7.57	3.1E+01	-8.41
	6	48.78	8.16	2.1E+01	44.68	7.48	2.2E+01	-8.40
	7	49.06	8.10	2.7E+01	44.87	7.53	3.2E+01	-8.54
	8	48.78	8.09	2.2E+01	44.59	7.55	3.4E+01	-8.58
	9	49.51	8.18	2.7E+01	45.32	7.62	3.1E+01	-8.46
	10	49.33	8.13	2.9E+01	45.06	7.63	2.8E+01	-8.65
	11	48.99	8.12	2.2E+01	44.81	7.54	3.2E+01	-8.53
	12	49.01	8.13	2.4E+01	44.90	7.50	2.4E+01	-8.39
	13	49.09	8.10	2.3E+01	44.97	7.47	2.4E+01	-8.38
	14	49.38	8.17	2.1E+01	45.13	7.53	3.4E+01	-8.62
	15	48.81	8.15	2.2E+01	44.66	7.56	2.6E+01	-8.50
	16	49.34	8.07	2.6E+01	45.19	7.51	2.9E+01	-8.42
	17	49.70	8.08	1.7E+01	45.50	7.57	2.6E+01	-8.45
	18	49.16	8.19	2.1E+01	44.97	7.51	3.3E+01	-8.53
	19	49.77	8.18	2.4E+01	45.54	7.62	3.7E+01	-8.51
	20	49.57	8.16	2.1E+01	45.43	7.68	3.2E+01	-8.35
	21	48.67	8.29	2.8E+01	44.61	7.49	3.0E+01	-8.35
	22	48.77	8.12	2.8E+01	44.58	7.60	2.9E+01	-8.59
	23	48.71	8.26	2.0E+01	44.57	7.51	3.5E+01	-8.51
	24	49.26	8.13	2.0E+01	45.08	7.56	3.2E+01	-8.48
	25	49.39	8.13	2.3E+01	45.19	7.49	3.6E+01	-8.50
	26	49.29	8.10	1.9E+01	45.11	7.58	3.2E+01	-8.48
	27	48.97	8.15	2.5E+01	44.86	7.59	2.7E+01	-8.39
	28	49.61	8.18	2.2E+01	45.41	7.54	2.3E+01	-8.46
	29	49.24	8.09	2.0E+01	45.07	7.50	3.6E+01	-8.48
	30	49.49	8.14	2.6E+01	45.33	7.59	2.8E+01	-8.42

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM32ER70J476KE19
Manufacturung Location: Philippine	Lot No: A
Date before test:2018/03/29	Date after test:2018/04/12

#14 - Vibration

Test conditions : 5g's for 20min, 12 cycles each of 3 orientations, test frequency 10 - 2000Hz

No. of samples:	30	Initial readings			Final readings			
No. of lots:	1	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
Spec limits	lower	42.30		1.1E+00	42.30		1.1E+00	
	upper	51.70	10.00		51.70	10.00		
Measurement Statistics	minimum	48.64	8.31	2.3E+01	48.37	8.18	2.2E+01	-1.04
	maximum	50.31	8.43	3.5E+01	50.03	8.31	3.4E+01	-0.44
	mean	49.40	8.37	2.9E+01	49.03	8.25	2.8E+01	-0.75
	standard deviation	0.36	0.03	3.2E+00	0.36	0.03	3.6E+00	0.16
Presence of Failures		in spec	in spec	in spec	in spec	in spec	in spec	in spec

Test Data

Lot #	Sample	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
A	1	49.41	8.38	2.5E+01	49.19	8.28	2.9E+01	-0.44
	2	49.71	8.31	2.9E+01	49.35	8.18	2.6E+01	-0.72
	3	49.18	8.37	2.7E+01	48.72	8.25	2.6E+01	-0.94
	4	49.46	8.42	2.6E+01	49.15	8.19	2.9E+01	-0.62
	5	49.36	8.37	3.3E+01	48.91	8.22	3.2E+01	-0.90
	6	49.72	8.37	2.4E+01	49.35	8.29	2.7E+01	-0.74
	7	48.89	8.39	2.6E+01	48.61	8.27	3.0E+01	-0.57
	8	49.93	8.38	3.1E+01	49.58	8.28	3.3E+01	-0.71
	9	49.47	8.37	3.0E+01	49.01	8.24	2.9E+01	-0.94
	10	49.12	8.39	3.1E+01	48.82	8.21	2.2E+01	-0.61
	11	50.31	8.41	2.8E+01	50.03	8.30	2.5E+01	-0.55
	12	49.42	8.34	3.2E+01	49.11	8.26	2.8E+01	-0.64
	13	48.84	8.37	3.4E+01	48.39	8.24	2.7E+01	-0.92
	14	49.17	8.39	2.3E+01	48.78	8.25	2.9E+01	-0.80
	15	49.20	8.36	3.1E+01	48.89	8.19	2.5E+01	-0.63
	16	49.48	8.38	3.1E+01	49.00	8.28	2.3E+01	-0.98
	17	49.40	8.37	2.7E+01	49.02	8.27	3.4E+01	-0.77
	18	49.31	8.39	3.0E+01	48.91	8.27	3.1E+01	-0.82
	19	49.53	8.32	3.5E+01	49.13	8.23	2.4E+01	-0.80
	20	49.46	8.32	3.3E+01	49.15	8.27	2.3E+01	-0.63
	21	49.77	8.36	2.3E+01	49.35	8.31	3.2E+01	-0.84
	22	49.07	8.41	3.0E+01	48.77	8.26	2.7E+01	-0.61
	23	48.91	8.33	3.0E+01	48.45	8.23	2.6E+01	-0.94
	24	49.54	8.40	2.5E+01	49.16	8.29	3.1E+01	-0.78
	25	48.64	8.35	3.0E+01	48.37	8.25	2.3E+01	-0.55
	26	49.70	8.35	2.6E+01	49.46	8.24	2.3E+01	-0.48
	27	49.07	8.43	2.8E+01	48.71	8.26	3.1E+01	-0.72
	28	49.78	8.39	2.9E+01	49.39	8.29	2.4E+01	-0.78
	29	49.67	8.33	3.3E+01	49.16	8.23	3.4E+01	-1.04
	30	49.54	8.39	3.2E+01	49.04	8.31	3.2E+01	-1.01

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM32ER70J476KE19
Manufacturung Location: Philippine	Lot No: A
Date before test:2018/04/12	Date after test:2018/05/03

#15 - Resistance to Soldering Heat

Test Conditions : soldering , 260C 10sec immersion

Number of Samples: 30 Number of Lots: 1	Number of failures: 0

Lot #	Sample	Result
A	1	No failure
	2	No failure
	3	No failure
	4	No failure
	5	No failure
	6	No failure
	7	No failure
	8	No failure
	9	No failure
	10	No failure
	11	No failure
	12	No failure
	13	No failure
	14	No failure
	15	No failure
	16	No failure
	17	No failure
	18	No failure
	19	No failure
	20	No failure
	21	No failure
	22	No failure
	23	No failure
	24	No failure
	25	No failure
	26	No failure
	27	No failure
	28	No failure
	29	No failure
	30	No failure

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM32ER70J476KE19
Manufacturung Location: Philippine	Lot No: A
Date before test:2018/04/06	Date after test:2018/05/11

#16 - Thermal Shock

Test conditions : 300Cycles (-55deg C to 125deg C) , Maximum transfer time 20sec , keeping time 15min

No. of samples:	30	Initial readings			Final readings			
No. of lots:	1	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
Spec limits	lower	42.30		1.1E+00			1.1E+00	-10.00
	upper	51.70	10.00			10.00		10.00
Measurement Statistics	minimum	48.54	8.02	1.1E+01	47.89	7.87	1.1E+01	-1.56
	maximum	50.13	8.10	1.4E+01	49.30	7.98	1.4E+01	-1.01
	mean	49.45	8.07	1.3E+01	48.82	7.93	1.3E+01	-1.27
	standard deviation	0.45	0.02	7.6E-01	0.45	0.04	6.7E-01	0.15
Presence of Failures		in spec	in spec	in spec	in spec	in spec	in spec	in spec

Test Data

Lot #	Sample	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Change in capacitance %
A	1	48.67	8.06	1.3E+01	48.07	7.93	1.2E+01	-1.23
	2	49.75	8.03	1.3E+01	48.97	7.90	1.2E+01	-1.56
	3	49.52	8.10	1.4E+01	48.80	7.95	1.3E+01	-1.46
	4	49.34	8.05	1.2E+01	48.80	7.90	1.3E+01	-1.11
	5	49.47	8.10	1.4E+01	48.77	7.95	1.4E+01	-1.42
	6	49.59	8.06	1.2E+01	48.92	7.97	1.3E+01	-1.36
	7	49.56	8.07	1.3E+01	49.05	7.97	1.3E+01	-1.01
	8	48.56	8.05	1.3E+01	47.89	7.96	1.2E+01	-1.38
	9	49.17	8.08	1.3E+01	48.53	7.87	1.3E+01	-1.30
	10	49.31	8.02	1.3E+01	48.65	7.88	1.4E+01	-1.34
	11	49.01	8.06	1.3E+01	48.26	7.93	1.2E+01	-1.55
	12	48.54	8.10	1.2E+01	47.93	7.92	1.2E+01	-1.26
	13	50.03	8.04	1.2E+01	49.30	7.98	1.3E+01	-1.46
	14	49.08	8.06	1.2E+01	48.39	7.88	1.3E+01	-1.41
	15	49.17	8.08	1.3E+01	48.65	7.89	1.2E+01	-1.05
	16	49.28	8.05	1.2E+01	48.75	7.94	1.2E+01	-1.08
	17	49.87	8.09	1.2E+01	49.33	7.87	1.3E+01	-1.09
	18	49.92	8.04	1.1E+01	49.30	7.97	1.3E+01	-1.25
	19	48.67	8.10	1.2E+01	48.16	7.88	1.3E+01	-1.04
	20	49.22	8.08	1.1E+01	48.63	7.94	1.3E+01	-1.19
	21	49.44	8.10	1.4E+01	48.90	7.89	1.2E+01	-1.10
	22	49.98	8.06	1.4E+01	49.26	7.94	1.3E+01	-1.44
	23	49.89	8.06	1.2E+01	49.31	7.88	1.1E+01	-1.17
	24	49.69	8.10	1.3E+01	49.04	7.95	1.3E+01	-1.30
	25	49.79	8.07	1.2E+01	49.18	7.93	1.4E+01	-1.23
	26	49.76	8.10	1.3E+01	49.12	7.89	1.3E+01	-1.28
	27	49.51	8.07	1.4E+01	48.94	7.98	1.2E+01	-1.14
	28	49.56	8.09	1.2E+01	48.86	7.93	1.2E+01	-1.42
	29	50.07	8.06	1.2E+01	49.46	7.95	1.2E+01	-1.23
	30	50.13	8.05	1.2E+01	49.52	7.95	1.3E+01	-1.21

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM32ER70J476KE19
Manufacturung Location: Philippine	Lot No: A
Date before test:2018/04/20	Date after test:2018/04/24

#17 - ESD Test

Test conditions : charge capacitor 150pF, discharge resistor 2000ohm

Number of Samples: 15 Number of Lots: 1		Greatest Breakdown Voltage with no failures
Breakdown Voltage	Sample	Result (pass/fail)
min 1kV D.C.	1	pass
	2	pass
	3	pass
	4	pass
	5	pass
	6	pass
	7	pass
	8	pass
	9	pass
	10	pass
	11	pass
	12	pass
	13	pass
	14	pass
	15	pass

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM32ER70J476KE19
Manufacturung Location: Philippine	Lot No: A
Date before test:2018/04/04	

#18 - Solderability

Test conditions : 1.soldering 235C 5sec immersion, 2.soldering 235C 5sec immersion, 3.soldering 260C 120sec immersion

Number of Samples: 45 Number of Lots: 1	Number of failures: 0

Test No.	Sample	Result (pass/fail)
1	1	pass
	2	pass
	3	pass
	4	pass
	5	pass
	6	pass
	7	pass
	8	pass
	9	pass
	10	pass
	11	pass
	12	pass
	13	pass
	14	pass
	15	pass
2	1	pass
	2	pass
	3	pass
	4	pass
	5	pass
	6	pass
	7	pass
	8	pass
	9	pass
	10	pass
	11	pass
	12	pass
	13	pass
	14	pass
	15	pass
3	1	pass
	2	pass
	3	pass
	4	pass
	5	pass
	6	pass
	7	pass
	8	pass
	9	pass
	10	pass
	11	pass
	12	pass
	13	pass
	14	pass
	15	pass

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM32ER70J476KE19
Manufacturung Location: Philippine	Lot No: A
Date before test:2018/04/10	

#19 - Electrical Characterization

Test conditions : 120+/-24Hz, 0.5+/-0.1Vrms

Number of Samples: 30 Number of Lots: 1		Readings at Room Temp: 25C			at Min Operating Temperature: -55C			at Max Operating Temperature: 125C			
		Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	Change in capacitance %	Capacitance uF	Dissipation Factor %	IR 125C Mohm	Change in capacitance %
Spec limits	lower	42.30		1.1E+00			-15.00			1.1E-01	-15.00
	upper	51.70	10.00				15.00				15.00
Measurement Statistics	minimum	48.42	7.73	1.2E+01	44.01	14.31	-9.79	42.65	1.43	1.5E+00	-12.54
	maximum	49.69	9.18	2.9E+01	45.49	18.38	-8.36	44.04	2.55	2.0E+00	-11.16
	mean	49.13	8.40	2.2E+01	44.76	15.91	-8.89	43.26	1.84	1.8E+00	-11.94
	standard deviation	0.30	0.44	3.7E+00	0.35	0.86	0.32	0.30	0.25	1.2E-01	0.34
Presence of failures		in spec	in spec	in spec	in spec	in spec	in spec	in spec	in spec	in spec	in spec

Measurements	Sample	Capacitance uF	Dissipation Factor %	IR 25C Mohm	Capacitance uF	Dissipation Factor %	Change in capacitance %	Capacitance uF	Dissipation Factor %	IR 125C Mohm	Change in capacitance %
A	1	48.83	9.18	2.1E+01	44.75	17.53	-8.36	43.23	1.87	2.0E+00	-11.47
	2	49.23	7.86	2.3E+01	44.66	14.31	-9.28	43.25	2.20	1.9E+00	-12.14
	3	48.42	8.84	2.2E+01	44.01	16.64	-9.11	42.65	2.01	1.7E+00	-11.90
	4	49.18	7.91	2.0E+01	44.37	15.34	-9.79	43.34	1.85	1.9E+00	-11.89
	5	49.14	8.57	1.2E+01	44.75	18.38	-8.95	43.02	1.95	1.7E+00	-12.45
	6	49.69	7.74	2.4E+01	45.27	15.80	-8.90	43.94	1.62	1.6E+00	-11.56
	7	49.69	8.77	2.6E+01	45.49	15.18	-8.46	43.47	1.67	1.7E+00	-12.51
	8	49.19	9.17	2.9E+01	44.79	14.90	-8.94	43.19	1.89	1.8E+00	-12.19
	9	49.37	8.79	2.1E+01	45.02	14.84	-8.80	43.45	2.01	1.9E+00	-11.99
	10	48.90	8.63	2.1E+01	44.52	15.82	-8.95	43.17	1.89	1.8E+00	-11.71
	11	48.92	7.73	2.6E+01	44.52	15.39	-9.00	42.98	1.99	1.8E+00	-12.15
	12	49.11	8.22	2.3E+01	44.77	16.55	-8.84	43.31	2.15	1.6E+00	-11.82
	13	48.78	8.26	2.4E+01	44.54	16.52	-8.69	42.89	1.76	1.8E+00	-12.09
	14	49.05	7.95	1.8E+01	44.55	16.47	-9.18	43.08	2.01	1.8E+00	-12.17
	15	49.69	8.50	2.8E+01	45.46	16.30	-8.51	44.04	1.84	1.6E+00	-11.39
	16	49.17	9.02	2.3E+01	44.76	14.72	-8.96	43.11	2.55	1.9E+00	-12.31
	17	49.18	7.79	1.8E+01	44.98	15.66	-8.53	43.23	1.63	1.8E+00	-12.09
	18	49.11	8.83	2.0E+01	44.51	15.42	-9.37	43.18	1.43	1.8E+00	-12.08
	19	49.31	7.84	2.1E+01	45.00	16.12	-8.74	43.67	1.43	1.7E+00	-11.44
	20	48.93	8.79	1.7E+01	44.48	15.69	-9.10	43.05	1.72	1.9E+00	-12.02
	21	49.41	8.22	2.1E+01	45.11	16.51	-8.71	43.62	1.70	1.6E+00	-11.72
	22	48.90	8.62	2.6E+01	44.49	15.47	-9.03	42.77	1.65	1.7E+00	-12.54
	23	48.82	8.59	2.2E+01	44.50	15.64	-8.86	42.99	2.09	1.9E+00	-11.94
	24	49.42	8.63	2.2E+01	45.18	15.50	-8.58	43.39	2.14	1.6E+00	-12.20
	25	49.40	7.76	2.5E+01	45.22	16.38	-8.46	43.36	1.44	1.6E+00	-12.23
	26	49.08	8.29	1.6E+01	44.56	15.92	-9.21	43.29	1.71	1.7E+00	-11.80
	27	48.93	8.75	2.1E+01	44.40	15.31	-9.26	43.15	1.91	1.5E+00	-11.81
	28	48.61	8.17	2.4E+01	44.43	17.24	-8.60	43.19	1.51	1.9E+00	-11.16
	29	49.36	8.27	1.6E+01	45.00	15.99	-8.83	43.58	1.68	1.7E+00	-11.70
	30	49.06	8.25	1.9E+01	44.82	15.78	-8.65	43.25	1.92	1.8E+00	-11.86

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM32ER70J476KE19
Manufacturung Location: Philippine	Lot No: A
Date before test:2018/04/12	Date after test:2018/04/13

#21 - Board Flex

Test conditions : bend board at 2mm for 60sec
pass/fail criteria : cap change within +/-10%

Test Data

Number of Samples: 30 Number of Lots: 1	Number of failures: 0

Lot #	Sample	Result (pass/fail)
A	1	pass
	2	pass
	3	pass
	4	pass
	5	pass
	6	pass
	7	pass
	8	pass
	9	pass
	10	pass
	11	pass
	12	pass
	13	pass
	14	pass
	15	pass
	16	pass
	17	pass
	18	pass
	19	pass
	20	pass
	21	pass
	22	pass
	23	pass
	24	pass
	25	pass
	26	pass
	27	pass
	28	pass
	29	pass
	30	pass

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM32ER70J476KE19
Manufacturung Location: Philippine	Lot No: A
Date before test:2018/04/05	Date after test:2018/04/05

#22 - Terminal Strength (SMD)

Test conditions : Force of 1.8kg for 60sec

Number of Samples: 30 Number of Lots: 1	Number of failures: 0

Lot #	Sample	Result (pass/fail)
A	1	pass
	2	pass
	3	pass
	4	pass
	5	pass
	6	pass
	7	pass
	8	pass
	9	pass
	10	pass
	11	pass
	12	pass
	13	pass
	14	pass
	15	pass
	16	pass
	17	pass
	18	pass
	19	pass
	20	pass
	21	pass
	22	pass
	23	pass
	24	pass
	25	pass
	26	pass
	27	pass
	28	pass
	29	pass
	30	pass

AEC-Q200 Summary of Test Results

Customer P/N: ------	Murata P/N: GCM32ER70J476KE19
Manufacturung Location: Philippine	Lot No: A
Date before test:2018/04/05	

#23 - Beam Load

Test conditions : Apply a force until the part brakes
pass/fail criteria : 0805 size or smaller: 20N over (t>0.5mm), 8N over (t<=0.5mm)
1206 size or bigger: 15N over (t<1.25mm), 54.5N over (t>=1.25mm)

Number of Samples: 30 Number of Lots: 1	Number of failures: 0

Lot #	Sample	Result (pass/fail)
A	1	pass
	2	pass
	3	pass
	4	pass
	5	pass
	6	pass
	7	pass
	8	pass
	9	pass
	10	pass
	11	pass
	12	pass
	13	pass
	14	pass
	15	pass
	16	pass
	17	pass
	18	pass
	19	pass
	20	pass
	21	pass
	22	pass
	23	pass
	24	pass
	25	pass
	26	pass
	27	pass
	28	pass
	29	pass
	30	pass

8. Initial Process Study

This data is typical of X7R of this size.

Cpk data

Customer P/N: ------		Murata P/N: GCM188R71E105KA64	
Manufacturung Location: Philippine		Lot No: A	
Content	L (mm)	W (mm)	T (mm)
No.1	1.68	0.87	0.86
2	1.67	0.87	0.86
3	1.68	0.87	0.85
4	1.68	0.87	0.86
5	1.67	0.87	0.86
6	1.67	0.87	0.86
7	1.67	0.87	0.86
8	1.68	0.87	0.86
9	1.67	0.87	0.86
10	1.67	0.87	0.86
11	1.67	0.86	0.86
12	1.68	0.87	0.87
13	1.68	0.87	0.87
14	1.68	0.87	0.86
15	1.67	0.87	0.86
16	1.68	0.87	0.86
17	1.67	0.87	0.86
18	1.67	0.86	0.86
19	1.68	0.87	0.86
20	1.68	0.87	0.87
21	1.68	0.86	0.86
22	1.67	0.87	0.85
23	1.67	0.88	0.87
24	1.68	0.86	0.86
25	1.67	0.87	0.86
26	1.67	0.86	0.86
27	1.68	0.87	0.86
28	1.67	0.87	0.85
29	1.67	0.87	0.86
30	1.67	0.87	0.86
31	1.68	0.87	0.86
32	1.68	0.87	0.86
33	1.67	0.87	0.86
34	1.68	0.87	0.86
35	1.67	0.87	0.86
36	1.67	0.87	0.87
37	1.68	0.87	0.87
38	1.68	0.87	0.86
39	1.68	0.87	0.86
40	1.68	0.87	0.86
41	1.67	0.86	0.86
42	1.68	0.87	0.86
43	1.68	0.87	0.86
44	1.67	0.87	0.87
45	1.67	0.87	0.87
46	1.67	0.86	0.86
47	1.67	0.86	0.87
48	1.67	0.87	0.85
49	1.67	0.86	0.86
50	1.67	0.87	0.87
51	1.67	0.87	0.86
52	1.67	0.86	0.85
53	1.67	0.86	0.86
54	1.68	0.87	0.86
55	1.68	0.87	0.87
56	1.67	0.87	0.86
57	1.68	0.87	0.86
58	1.68	0.87	0.87
59	1.68	0.87	0.86
60	1.68	0.87	0.86
61	1.68	0.87	0.86
62	1.67	0.87	0.86
63	1.67	0.87	0.86
64	1.68	0.87	0.87
65	1.67	0.87	0.87
66	1.67	0.87	0.87
67	1.67	0.86	0.86
68	1.67	0.87	0.86
69	1.68	0.87	0.87
70	1.68	0.87	0.87
71	1.68	0.87	0.86
72	1.67	0.87	0.86
73	1.68	0.87	0.86
74	1.68	0.87	0.86
75	1.67	0.87	0.86
76	1.68	0.87	0.86
77	1.67	0.86	0.86
78	1.67	0.86	0.87
79	1.67	0.87	0.87
80	1.68	0.87	0.87
81	1.67	0.87	0.86
82	1.68	0.87	0.86
83	1.68	0.87	0.86
84	1.68	0.87	0.87
85	1.68	0.87	0.86
86	1.68	0.87	0.87
87	1.68	0.87	0.87
88	1.68	0.87	0.86
89	1.67	0.87	0.86
90	1.68	0.87	0.86
91	1.68	0.87	0.86
92	1.67	0.87	0.87
93	1.68	0.86	0.85
94	1.68	0.87	0.86
95	1.68	0.87	0.86
96	1.68	0.87	0.86
97	1.68	0.86	0.86
98	1.68	0.86	0.86
99	1.68	0.87	0.86
100	1.68	0.87	0.86
Average	1.68	0.87	0.86
Std dev	0.004	0.003	0.005
MAX	1.68	0.88	0.87
MIN	1.67	0.86	0.85
Cpk	2.00	3.63	2.76
SL	1.50	0.70	0.70
SU	1.70	0.90	0.90

Cpk data

Customer P/N: ------		Murata P/N: GCM21BR70J106KE22	
Manufacturung Location: Phillipine		Lot No: A	
Content	L (mm)	W (mm)	T (mm)
No.1	2.08	1.36	1.36
2	2.08	1.36	1.36
3	2.09	1.36	1.37
4	2.08	1.36	1.36
5	2.08	1.37	1.36
6	2.10	1.36	1.37
7	2.08	1.35	1.36
8	2.09	1.36	1.36
9	2.10	1.36	1.36
10	2.10	1.37	1.36
11	2.06	1.37	1.36
12	2.08	1.35	1.36
13	2.08	1.37	1.36
14	2.07	1.36	1.36
15	2.07	1.36	1.36
16	2.09	1.35	1.35
17	2.11	1.36	1.36
18	2.10	1.36	1.36
19	2.10	1.36	1.36
20	2.11	1.35	1.36
21	2.08	1.36	1.36
22	2.09	1.36	1.36
23	2.09	1.35	1.35
24	2.10	1.36	1.37
25	2.10	1.36	1.36
26	2.12	1.37	1.35
27	2.10	1.35	1.37
28	2.10	1.36	1.36
29	2.10	1.35	1.36
30	2.11	1.35	1.37
31	2.10	1.36	1.36
32	2.08	1.36	1.37
33	2.09	1.36	1.36
34	2.08	1.36	1.36
35	2.09	1.36	1.35
36	2.09	1.37	1.35
37	2.10	1.36	1.35
38	2.10	1.37	1.36
39	2.10	1.36	1.36
40	2.08	1.36	1.36
41	2.10	1.36	1.37
42	2.09	1.36	1.36
43	2.10	1.36	1.37
44	2.10	1.35	1.36
45	2.09	1.36	1.36
46	2.10	1.35	1.36
47	2.08	1.36	1.36
48	2.08	1.36	1.36
49	2.10	1.36	1.35
50	2.09	1.36	1.36
51	2.09	1.36	1.36
52	2.09	1.36	1.36
53	2.08	1.36	1.36
54	2.08	1.36	1.36
55	2.10	1.36	1.36
56	2.09	1.35	1.36
57	2.09	1.37	1.35
58	2.10	1.36	1.36
59	2.08	1.36	1.35
60	2.09	1.36	1.36
61	2.09	1.36	1.36
62	2.11	1.36	1.37
63	2.10	1.36	1.36
64	2.09	1.37	1.36
65	2.10	1.36	1.36
66	2.09	1.36	1.37
67	2.08	1.36	1.36
68	2.10	1.36	1.36
69	2.08	1.36	1.36
70	2.10	1.37	1.36
71	2.09	1.36	1.37
72	2.09	1.36	1.36
73	2.08	1.36	1.35
74	2.09	1.36	1.36
75	2.10	1.36	1.36
76	2.09	1.36	1.37
77	2.11	1.36	1.36
78	2.10	1.37	1.36
79	2.07	1.36	1.36
80	2.10	1.36	1.36
81	2.10	1.36	1.36
82	2.09	1.35	1.36
83	2.10	1.35	1.36
84	2.10	1.35	1.35
85	2.09	1.36	1.36
86	2.10	1.36	1.36
87	2.10	1.36	1.36
88	2.10	1.36	1.36
89	2.09	1.36	1.36
90	2.08	1.36	1.36
91	2.09	1.37	1.36
92	2.11	1.36	1.37
93	2.10	1.36	1.36
94	2.08	1.37	1.37
95	2.08	1.36	1.36
96	2.09	1.36	1.35
97	2.11	1.36	1.36
98	2.08	1.36	1.36
99	2.08	1.35	1.36
100	2.08	1.35	1.36
Average	2.09	1.36	1.36
Std dev	0.010	0.005	0.004
MAX	2.12	1.37	1.37
MIN	2.06	1.35	1.35
Cpk	1.94	2.86	3.04
SL	1.85	1.10	1.10
SU	2.15	1.40	1.40

Cpk data

Customer P/N: ------		Murata P/N: GCM31CR70J226KE23	
Manufacturung Location: Phillipine		Lot No: A	
Content	L (mm)	W (mm)	T (mm)
No.1	3.33	1.74	1.73
2	3.34	1.74	1.73
3	3.35	1.75	1.73
4	3.32	1.74	1.73
5	3.34	1.75	1.72
6	3.35	1.74	1.74
7	3.34	1.74	1.73
8	3.34	1.75	1.74
9	3.34	1.74	1.72
10	3.35	1.74	1.73
11	3.34	1.74	1.72
12	3.35	1.74	1.73
13	3.33	1.74	1.74
14	3.34	1.74	1.72
15	3.34	1.73	1.73
16	3.35	1.74	1.73
17	3.34	1.74	1.73
18	3.35	1.74	1.73
19	3.35	1.74	1.73
20	3.34	1.74	1.72
21	3.35	1.74	1.74
22	3.35	1.74	1.73
23	3.33	1.74	1.74
24	3.33	1.74	1.73
25	3.34	1.74	1.72
26	3.34	1.74	1.73
27	3.33	1.74	1.74
28	3.34	1.75	1.74
29	3.33	1.74	1.73
30	3.32	1.74	1.73
31	3.34	1.74	1.74
32	3.34	1.74	1.72
33	3.33	1.74	1.74
34	3.34	1.75	1.74
35	3.34	1.73	1.73
36	3.33	1.75	1.73
37	3.33	1.75	1.75
38	3.36	1.74	1.73
39	3.32	1.73	1.75
40	3.35	1.74	1.72
41	3.34	1.74	1.73
42	3.34	1.74	1.73
43	3.34	1.74	1.73
44	3.36	1.75	1.73
45	3.34	1.74	1.72
46	3.33	1.75	1.74
47	3.32	1.74	1.73
48	3.34	1.74	1.73
49	3.33	1.74	1.74
50	3.35	1.75	1.72
51	3.33	1.74	1.73
52	3.33	1.75	1.72
53	3.35	1.74	1.73
54	3.34	1.74	1.74
55	3.32	1.74	1.73
56	3.33	1.74	1.73
57	3.33	1.74	1.72
58	3.35	1.74	1.73
59	3.35	1.75	1.71
60	3.35	1.75	1.74
61	3.33	1.74	1.74
62	3.35	1.74	1.74
63	3.31	1.74	1.74
64	3.33	1.74	1.72
65	3.32	1.75	1.74
66	3.35	1.74	1.73
67	3.33	1.74	1.73
68	3.34	1.74	1.72
69	3.34	1.73	1.74
70	3.34	1.74	1.74
71	3.35	1.74	1.74
72	3.34	1.74	1.74
73	3.34	1.74	1.73
74	3.34	1.74	1.73
75	3.34	1.74	1.73
76	3.35	1.74	1.73
77	3.35	1.74	1.72
78	3.35	1.74	1.72
79	3.33	1.74	1.73
80	3.33	1.73	1.73
81	3.34	1.74	1.73
82	3.35	1.74	1.74
83	3.34	1.74	1.73
84	3.33	1.74	1.73
85	3.33	1.74	1.73
86	3.34	1.75	1.74
87	3.31	1.73	1.73
88	3.34	1.74	1.74
89	3.34	1.75	1.74
90	3.36	1.74	1.73
91	3.33	1.74	1.73
92	3.35	1.73	1.73
93	3.35	1.74	1.73
94	3.33	1.74	1.74
95	3.34	1.75	1.72
96	3.33	1.73	1.73
97	3.33	1.74	1.73
98	3.33	1.75	1.73
99	3.34	1.74	1.73
100	3.33	1.74	1.73
Average	3.34	1.74	1.73
Std dev	0.010	0.004	0.007
MAX	3.36	1.75	1.75
MIN	3.31	1.73	1.71
Cpk	2.01	4.51	3.40
SL	3.00	1.40	1.40
SU	3.40	1.80	1.80

Cpk data

Customer P/N: ------		Murata P/N: GCM32ER70J476KE19	
Manufacturung Location: Philippine		Lot No: A	
Content	L (mm)	W (mm)	T (mm)
No.1	3.42	2.66	2.64
2	3.39	2.65	2.63
3	3.42	2.67	2.65
4	3.39	2.66	2.65
5	3.39	2.65	2.63
6	3.40	2.66	2.65
7	3.40	2.65	2.63
8	3.40	2.65	2.63
9	3.39	2.65	2.63
10	3.38	2.65	2.64
11	3.40	2.66	2.65
12	3.41	2.66	2.63
13	3.40	2.66	2.64
14	3.39	2.66	2.64
15	3.41	2.66	2.65
16	3.39	2.65	2.66
17	3.41	2.66	2.63
18	3.37	2.66	2.65
19	3.39	2.66	2.64
20	3.39	2.66	2.64
21	3.40	2.65	2.65
22	3.40	2.65	2.65
23	3.40	2.65	2.63
24	3.40	2.65	2.65
25	3.39	2.66	2.66
26	3.40	2.64	2.64
27	3.40	2.65	2.63
28	3.40	2.66	2.65
29	3.40	2.66	2.65
30	3.40	2.66	2.64
31	3.41	2.65	2.65
32	3.41	2.65	2.65
33	3.39	2.66	2.64
34	3.39	2.64	2.65
35	3.39	2.66	2.65
36	3.42	2.66	2.66
37	3.41	2.65	2.66
38	3.39	2.66	2.64
39	3.42	2.66	2.65
40	3.40	2.66	2.64
41	3.42	2.66	2.63
42	3.39	2.65	2.64
43	3.40	2.65	2.65
44	3.41	2.65	2.63
45	3.39	2.66	2.64
46	3.39	2.65	2.65
47	3.38	2.65	2.65
48	3.40	2.65	2.65
49	3.40	2.67	2.65
50	3.40	2.66	2.64
51	3.39	2.65	2.66
52	3.41	2.65	2.65
53	3.38	2.66	2.65
54	3.40	2.66	2.65
55	3.40	2.65	2.65
56	3.40	2.67	2.64
57	3.40	2.65	2.65
58	3.40	2.66	2.67
59	3.40	2.65	2.64
60	3.40	2.67	2.64
61	3.39	2.66	2.64
62	3.41	2.65	2.66
63	3.41	2.67	2.64
64	3.40	2.66	2.64
65	3.40	2.66	2.63
66	3.41	2.66	2.63
67	3.41	2.65	2.66
68	3.37	2.66	2.64
69	3.41	2.65	2.65
70	3.40	2.65	2.65
71	3.39	2.66	2.64
72	3.38	2.66	2.66
73	3.39	2.65	2.66
74	3.39	2.65	2.66
75	3.40	2.66	2.64
76	3.40	2.65	2.65
77	3.37	2.65	2.65
78	3.39	2.66	2.65
79	3.40	2.65	2.65
80	3.38	2.66	2.62
81	3.39	2.65	2.64
82	3.38	2.67	2.64
83	3.39	2.65	2.65
84	3.39	2.66	2.66
85	3.40	2.65	2.65
86	3.40	2.64	2.64
87	3.40	2.66	2.63
88	3.39	2.65	2.66
89	3.38	2.65	2.65
90	3.41	2.66	2.65
91	3.39	2.65	2.65
92	3.38	2.65	2.64
93	3.40	2.67	2.63
94	3.40	2.66	2.65
95	3.39	2.65	2.66
96	3.38	2.66	2.63
97	3.41	2.66	2.64
98	3.39	2.65	2.63
99	3.41	2.65	2.64
100	3.40	2.65	2.64
Average	3.40	2.66	2.65
Std dev	0.011	0.007	0.009
MAX	3.42	2.67	2.67
MIN	3.37	2.64	2.62
Cpk	3.20	2.21	1.98
SL	2.90	2.30	2.30
SU	3.50	2.70	2.70

9. Measurement System Analysis Studies

Gage Repeatability and Reproducibility Analysis Report - Average and Range Method

(Tolerance Criterion)

Issued by:	Checked by:	Approved by:
Gennie Manset	Michelle Vicedo	Shunichi Matsumoto
21-Jul-17	25-Jul-17	27-Jul-17

Characteristics	Capacitance		Judgment	Acceptable
Gage name	CAP METER		Date	7/21/2017
Gage type	E4981A		Environment conditions	
Gage number	MY48103442		Temp.:℃	23.5℃
Name,type,number of test fixures,cables,etc.			Hum.:%RH	49.50%
BPPG11-003			others	
Part name	GCM188R71C104KA37		Process,location,etc.	
Part specifications	Lower limit	Upper limit	PM5132, Final inspection	
	93.3800	110.8900		
Appraisers and Qualifications	A	B	C	
	Roan Palad	Rose Marie Podulla	Edrina Licmuan	
Method,procedure,software,number		Name,type,number of standards,materials,tools,etc.		

unit	nF

Appraiser / Trial No.	PART 1	2	3	4	5	6	7	8	9	10	AVERAGE	
A 1	97.9656	98.2430	96.1663	99.0118	95.9069	97.3233	97.5386	97.3390	97.0341	95.1598	97.1688	
2	97.5758	97.8239	96.1554	99.2181	95.9914	97.3673	97.5811	97.5050	97.2806	95.1378	97.1636	
3	97.5801	97.9939	96.2496	99.2541	96.0881	97.6903	97.6526	97.6444	97.1935	95.1450	97.2492	
AVERAGE	97.7072	98.0203	96.1904	99.1613	95.9955	97.4603	97.5908	97.4961	97.1694	95.1475	97.1939	$\bar{X}_a$
RANGE	0.3897	0.4191	0.0941	0.2424	0.1812	0.3670	0.1141	0.3054	0.2465	0.0221	0.2382	$\bar{R}_a$
B 1	99.1535	97.9308	96.4952	99.0218	95.9402	97.2775	97.8245	97.4904	96.9891	95.0716	97.3194	
2	99.5704	97.7944	96.2118	98.9660	96.0212	97.2780	97.7980	97.4515	97.1086	95.0845	97.3284	
3	99.1945	97.7042	96.2254	99.0887	96.1231	97.3379	97.6999	97.4956	97.1967	95.2255	97.3292	
AVERAGE	99.3061	97.8098	96.3108	99.0255	96.0281	97.2978	97.7741	97.4791	97.0981	95.1272	97.3257	$\bar{X}_b$
RANGE	0.4169	0.2265	0.2834	0.1228	0.1829	0.0605	0.1246	0.0441	0.2076	0.1540	0.1823	$\bar{R}_b$
C 1	98.9909	97.7080	96.2331	98.8419	95.8998	97.1950	97.7137	97.4514	97.0147	95.0852	97.2134	
2	99.1531	97.8392	96.1468	99.0340	95.8231	97.1674	97.2181	97.5500	97.2021	95.0059	97.2140	
3	99.1875	97.7103	96.1847	99.0770	96.0371	97.1702	97.6519	97.4251	97.2103	94.9491	97.2603	
AVERAGE	99.1105	97.7525	96.1882	98.9843	95.9200	97.1775	97.5279	97.4755	97.1424	95.0134	97.2292	$\bar{X}_c$
RANGE	0.1966	0.1312	0.0864	0.2350	0.2140	0.0276	0.4956	0.1250	0.1956	0.1361	0.1843	$\bar{R}_c$
PART AVG Xp	98.7079	97.8609	96.2298	99.0571	95.9812	97.3119	97.6309	97.4836	97.1366	95.0960	3.9610	R_p

$\bar{\bar{R}} = (\bar{R}_a + \bar{R}_b + \bar{R}_c)/K$	K=3	$\bar{\bar{R}}$	0.2016
$\bar{X}_{diff} = Max\ \bar{X} - Min\ \bar{X}$		$\bar{X}_{diff}$	0.1318
$UCL\ (R) = \bar{\bar{R}} * D4$	D4=2.58	UCL(R)	0.5191
$LCL\ (R) = \bar{\bar{R}} * D3$	D3=0.00	LCL(R)	0.0000

計算式	定数	項目	σ	指標	%Process	%TV	%Tol
$EV = \bar{\bar{R}} * K1$	K1=0.5908	Repeatability	0.1191	%EV			4.08%
$AV = \sqrt{(\bar{X}_{diff} * K2)^2 - EV^2/(N * R)}$	K2=0.5231	Reproducibility	0.0654	%AV			2.24%
$GRR = \sqrt{EV^2 + AV^2}$	K3=0.3146	GAGE R & R	0.1359	%R&R			4.66%
$TV = Tolerance/6$ $TV = ProcessVar./6$	$PV = R_p * K3$	Part Variation	2.9152	%PV			99.89%
$PV = \sqrt{TV^2 - GRR^2}$	$TV = \sqrt{GRR^2 + PV^2}$	Total Variation	2.9183				
$ndc = 1.41\ PV/GRR$	$P_p = Tolerance/6TV$	Process Variation		P_p			2.33
		Tolerance	17.5100	ndc			30

Acceptability Criteria	%R&R
Acceptable	under 10%
*Acceptable based upon importance of application	10% to 30%
Not Acceptable	over 30%

Gage Repeatability and Reproducibility Analysis Report - Average and Range Method

(Tolerance Criterion)

Issued by:	Checked by:	Approved by:
Gennie Manset	Michelle Vicedo	Shunichi Matsumoto
21-Jul-17	25-Jul-17	27-Jul-17

Characteristics	DF		Judgment	Acceptable
Gage name	CAP METER		Date	7/21/2017
Gage type	E4981A		Environment conditions	
Gage number	MY48103442		Temp.:℃	23.5℃
Name,type,number of test fixures,cables,etc.			Hum.:%RH	49.50%
BPPG11-003			others	
Part name	GCM188R71C104KA37		Process,location,etc.	
Part specifications	Lower limit	Upper limit	PM5132 , FINAL INSPECTION	
	0.00%	2.50%		
Appraisers and Qualifications	A		B	C
	Roan Palad		Rose Marie Podulla	Edrina Licmuan
Method,procedure,software,number			Name,type,number of standards,materials,tools,etc.	

unit	%

Appraiser / Trial No.		PART 1	2	3	4	5	6	7	8	9	10	AVERAGE	
A	1	1.34%	1.32%	1.27%	1.28%	1.26%	1.26%	1.28%	1.30%	1.29%	1.30%	1%	
	2	1.35%	1.29%	1.37%	1.29%	1.31%	1.27%	1.37%	1.36%	1.30%	1.32%	1%	
	3	1.30%	1.31%	1.37%	1.31%	1.32%	1.27%	1.36%	1.37%	1.33%	1.34%	1%	
	AVERAGE	1.33%	1.31%	1.34%	1.29%	1.30%	1.27%	1.34%	1.34%	1.31%	1.32%	1%	$\bar{X}_a$
	RANGE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	$\bar{R}_a$
B	1	1.29%	1.30%	1.33%	1.32%	1.31%	1.27%	1.30%	1.33%	1.33%	1.33%	1%	
	2	1.31%	1.30%	1.30%	1.31%	1.33%	1.28%	1.36%	1.35%	1.34%	1.33%	1%	
	3	1.36%	1.34%	1.34%	1.35%	1.30%	1.27%	1.27%	1.29%	1.37%	1.32%	1%	
	AVERAGE	1.32%	1.31%	1.32%	1.33%	1.31%	1.27%	1.31%	1.32%	1.35%	1.32%	1%	$\bar{X}_b$
	RANGE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	$\bar{R}_b$
C	1	1.29%	1.32%	1.33%	1.33%	1.31%	1.32%	1.31%	1.38%	1.32%	1.32%	1%	
	2	1.34%	1.29%	1.34%	1.34%	1.35%	1.29%	1.34%	1.37%	1.36%	1.37%	1%	
	3	1.36%	1.29%	1.34%	1.35%	1.36%	1.26%	1.34%	1.36%	1.37%	1.30%	1%	
	AVERAGE	1.33%	1.30%	1.34%	1.34%	1.34%	1.29%	1.33%	1.37%	1.35%	1.33%	1%	$\bar{X}_c$
	RANGE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	$\bar{R}_c$
PART AVG Xp		0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	R_p

$\bar{\bar{R}} = (\bar{R}_a + \bar{R}_b + \bar{R}_c)/K$	K=3	$\bar{\bar{R}}$	0.0004
$\bar{X}_{diff} = Max\ \bar{X} - Min\ \bar{X}$		$\bar{X}_{diff}$	0.0002
$UCL\ (R) = \bar{\bar{R}} * D4$	D4=2.58	UCL(R)	0.0012
$LCL\ (R) = \bar{\bar{R}} * D3$	D3=0.00	LCL(R)	0.0000

計算式	定数	項目	σ	指標	%Process	%TV	%Tol
$EV = \bar{\bar{R}} * K1$	K1=0.5908	Repeatability	0.0003	%EV			6.38%
$AV = \sqrt{(\bar{X}_{diff} * K2)^2 - EV^2/(N * R)}$	K2=0.5231	Reproducibility	0.0001	%AV			2.02%
$GRR = \sqrt{EV^2 + AV^2}$	K3=0.3146	GAGE R & R	0.0003	%R&R			6.69%
$TV = Tolerance/6$ $TV = ProcessVar/6$	$PV = R_p * K3$	Part Variation	0.0042	%PV			99.78%
$PV = \sqrt{TV^2 - GRR^2}$	$TV = \sqrt{GRR^2 + PV^2}$	Total Variation	0.0042				
$ndc = 1.41\ PV/GRR$	$P_p = Tolerance/6TV$	Process Variation		P_p			11.80
		Tolerance	0.0250	ndc			21

Acceptability Criteria	%R&R
Acceptable	under 10%
*Acceptable based upon importance of application	10% to 30%
Not Acceptable	over 30%

Gage Repeatability and Reproducibility Analysis Report - Average and Range Method

(Tolerance Criterion)

Issued by:	Checked by:	Approved by:
Gennie Manset	Michelle Vicedo	Shunichi Matsumoto
25-Jul-17	26-Jul-17	27-Jul-17

Characteristics	Resistance	Judgment	Acceptable
Gage name	ULTRA HIGH RESISTANCE M	Date	7/25/2017
Gage type	8340A	Environment conditions	
Gage number	211400061	Temp.:℃	23.5℃
Name,type,number of test fixures,cables,etc.		Hum.:%RH	50.50%
BPPF30-007		others	
Part name	GCM188R71C104KA37	Process,location,etc.	
Part specifications	Lower limit: 7.0000 / Upper limit: 13.0000	PM5132, Final Inspection	
Appraisers and Qualifications	A: Roan Palad	B: Rizalynn Ernacio	C: Edrina Licmuan
Method,procedure,software,number		Name,type,number of standards,materials,tools,etc.	

unit	log Ω

Appraiser / Trial No.	PART 1	2	3	4	5	6	7	8	9	10	AVERAGE	
A 1	10.3216	10.2969	10.2232	10.3444	10.2316	10.4150	10.3181	10.3483	10.3502	10.3362	10.3186	
2	10.2227	10.2601	10.2253	10.2355	10.2261	10.2330	10.2648	10.2122	10.2279	10.2577	10.2365	
3	10.2931	10.2679	10.2742	10.2847	10.2330	10.2355	10.2405	10.2275	10.2878	10.2253	10.2570	
AVERAGE	10.2791	10.2750	10.2409	10.2882	10.2302	10.2945	10.2745	10.2627	10.2886	10.2731	10.2707	$\bar{X}_a$
RANGE	0.0989	0.0369	0.0509	0.1089	0.0069	0.1820	0.0775	0.1361	0.1224	0.1109	0.0931	$\bar{R}_a$
B 1	10.3886	10.3914	10.2969	10.3639	10.3265	10.4079	10.3098	10.3669	10.3366	10.2997	10.3488	
2	10.2695	10.2967	10.2742	10.2648	10.2504	10.4014	10.2648	10.2695	10.3118	10.2625	10.2866	
3	10.2122	10.2730	10.2504	10.2625	10.2480	10.4355	10.2355	10.2355	10.2695	10.3148	10.2737	
AVERAGE	10.2901	10.3204	10.2738	10.2971	10.2750	10.4149	10.2701	10.2906	10.3059	10.2923	10.3030	$\bar{X}_b$
RANGE	0.1764	0.1183	0.0465	0.1014	0.0785	0.0341	0.0743	0.1313	0.0670	0.0524	0.0880	$\bar{R}_b$
C 1	10.3757	10.3705	10.2263	10.4065	10.3838	10.4180	10.3966	10.3839	10.4128	10.2281	10.3602	
2	10.3579	10.4172	10.2105	10.3983	10.4249	10.4249	10.4265	10.2625	10.4314	10.2609	10.3615	
3	10.3010	10.3222	10.3483	10.2878	10.4249	10.3054	10.3579	10.3692	10.4099	10.2655	10.3392	
AVERAGE	10.3449	10.3700	10.2617	10.3642	10.4112	10.3828	10.3937	10.3385	10.4180	10.2515	10.3537	$\bar{X}_c$
RANGE	0.0746	0.0950	0.1378	0.1187	0.0411	0.1195	0.0686	0.1215	0.0214	0.0374	0.0836	$\bar{R}_c$
PART AVG Xp	10.3047	10.3218	10.2588	10.3165	10.3055	10.3641	10.3127	10.2973	10.3375	10.2723	0.1052	R_p

$\bar{\bar{R}} = (\bar{R}_a + \bar{R}_b + \bar{R}_c)/K$	K=3	$\bar{\bar{R}}$	0.0882
$\bar{X}_{diff} = Max\ \bar{X} - Min\ \bar{X}$		$\bar{X}_{diff}$	0.0830
$UCL\ (R) = \bar{\bar{R}} * D4$	D4=2.58	UCL(R)	0.2272
$LCL\ (R) = \bar{\bar{R}} * D3$	D3=0.00	LCL(R)	0.0000

計算式	定数	項目	σ	指標	%Process	%TV	%Tol
$EV = \bar{\bar{R}} * K1$	K1=0.5908	Repeatability	0.0521	%EV			5.21%
$AV = \sqrt{(\bar{X}_{diff} * K2)^2 - EV^2/(N*R)}$	K2=0.5231	Reproducibility	0.0423	%AV			4.23%
$GRR = \sqrt{EV^2 + AV^2}$	K3=0.3146	GAGE R & R	0.0672	%R&R			6.72%
$TV = Tolerance/6$ $TV = ProcessVar/6$	$PV = R_p * K3$	Part Variation	0.9977	%PV			99.77%
$PV = \sqrt{TV^2 - GRR^2}$	$TV = \sqrt{GRR^2 + PV^2}$	Total Variation	1.0000				
$ndc = 1.41\ PV/GRR$	$P_p = Tolerance/6TV$	Process Variation		P_p			13.35
		Tolerance	6.0000	ndc			20

Acceptability Criteria	%R&R
Acceptable	under 10%
*Acceptable based upon importance of application	10% to 30%
Not Acceptable	over 30%

10. Qualified Laboratory Documentation

BUREAU VERITAS
Certification

Certificate of Approval

Awarded to

Philippine Manufacturing Co. of Murata, Inc.

Lot 2A Phase 1B First Philippine Industrial Park,
Barangay Pantay Bata
Tanauan City, Batangas, 4232, Philippines

Bureau Veritas Certification certify that the Quality Management System of the above organisation has been audited and found to be in accordance with the requirements of

IATF 16949

and the applicable customer specific requirements

SCOPE

Design and manufacturing

PERMITTED EXCLUSION(S)

None

PRODUCT(S) DELIVERED

Chip Multilayer Ceramic Capacitors

Date of certification: 08 August 2018

Date of expiration: 07 August 2021

IATF Certificate N°: 322787

*Bureau Veritas Certification Certificate N°:*JPN-20631/TS

BUREAU VERITAS
Certification

Appendix to the Certificate of Approval

Awarded to

Philippine Manufacturing Co. of Murata, Inc.

Lot 2A Phase 1B First Philippine Industrial Park, Barangay Pantay Bata
Tanauan City, Batangas, 4232, Philippines

REMOTE SUPPORT FUNCTION(S)	SCOPE
Murata Electronics Europe B.V. (GE) Holbeinstrasse 23, 90441 Nurnberg, Germany	Sales, Supplier Management,
Murata Manufacturing Co., Ltd. Headquarters 1-10-1, Higashikoutari, Nagaokakyo-shi, Kyoto, 617-8555 Japan	Purchasing, Logistic, Policy Making, Strategic Planning, Warranty Management.,
Murata Manufacturing Co., Ltd. Headquarters Capacitor Division2 Marketing Dept. 1-10-1, Higashikoutari, Nagaokakyo-shi, Kyoto, 617-8555 Japan	Warranty Management, Contract Review, Marketing
Fukui Murata Manufacturing Co., Ltd. 13-1, Okamoto-cho, Echizen-shi, Fukui, 915-8601 Japan	Contract review,Testing
Izumo Murata Manufacturing Co., Ltd. 2308, Kaminaoe, Hikawa-cho, Izumo-shi, Shimane, 699-0696 Japan	Contract review, Product Design, Process Design, Testing

Date of certification: 08 August 2018

Date of expiration: 07 August 2021

IATF Certificate N°: 322787

*Bureau Veritas Certification Certificate N°:*JPN-20631/TS

BUREAU VERITAS
Certification

Appendix to the Certificate of Approval

Awarded to

Philippine Manufacturing Co. of Murata, Inc.

Lot 2A Phase 1B First Philippine Industrial Park, Barangay Pantay Bata
Tanauan City, Batangas, 4232, Philippines

REMOTE SUPPORT FUNCTION(S)	SCOPE
Murata Electronics North America, Inc. (Smyrna) 2200, Lake Park Drive, Smyrna, GA 30080-7604, United States	Sales,
Murata Electronics North America, Inc. (Rockmart) 308, Prospect Road, Rockmart, GA 30153-0487, United States	Warehousing,
Murata Electronics Trading (Shanghai) Co., Ltd. No.2, Lane318 Yonghe Road, Jing'an District, Shanghai, 200072, China	Sales,
Murata Electronics Trading(Tianjin) Co., Ltd Room1502, The Exchange Tower No.2, 189 Nanjing Road, Heping District, Tianjin, 300051, China	Sales,

Date of certification: 08 August 2018

Date of expiration: 07 August 2021

IATF Certificate N°: 322787

*Bureau Veritas Certification Certificate N°:*JPN-20631/TS

11. Control Plan

muRata INNOVATOR IN ELECTRONICS

Ｑ Ｃ 工 程 図 ／Control Plan

段 階 Phase	[ ] 試作 [ ] 量産試作 [*] 量産 [ ]Prototype [ ]Pre-launch [*]Production	工場名 / Supplier/Plant	PHILIPPINE MANUFACTURING CO. OF MURATA, INC. (株)出雲村田製作所 / Izumo Murata Mfg.Co.,Ltd)	制定日 Date(Orig.)	2016/9/19
品 番 / ｼﾘｰｽﾞ Part No.	GCM series			最新改訂日 Date(Rev.)	2018/11/19
品 種 Product Name	ﾁｯﾌﾟ積層ｾﾗﾐｯｸｺﾝﾃﾞﾝｻ Chip Multilayer Ceramic Capacitors			文書No. Document No.	LEMC66P0-012E
		CFT	製造技術、生産技術、品質管理、製造 Process Eng., Product Eng., Quality Control, Mechanical Eng., Production		

◎: 特殊特性を表わす

Special char. : Use symbol [◎] for special characteristics, and write the symbol that customer specified as a special characteristics.

工程フロー Process Flow 補助工程 Sub	本工程 Main	No.	工程名/作業概要 PROCESS NAME	材料･設備･治具 MACHINES,JIGS,TOOLS METERS,FIXTURES 製造用 Mfg.	試験･検査用 TEST,INSP.	管理項目 CONTROL PARAMETERS 原因系 PROCESS	結果系 PRODUCT	特殊特性 Special Char.	管理幅 仕様／公差 CONTROL RANGE SPEC./TOLE.	ｻﾝﾌﾟﾘﾝｸﾞﾌﾟﾗﾝ ｻﾝﾌﾟﾙｻｲｽﾞ 品質水準／頻度 SAMPLING PLAN SAMPLE SIZE LEVEL/FREQ.	管理方法 記録 ﾎﾟｶﾖｹの方法 CONTROL METHOD RECORD ERROR-PROOFING	担当者 PERSON IN CHARGE	対応計画 是正処置 REACTION PLAN /CORRECTIVE ACTION	関連標準類 RELATED STANDARDS
誘電体原料 Ceramic material		1	誘電体原料 受入検査 INCOMING INSPECTION (Ceramic material)				粉体特性 Powder characteristics		原料受入検査規格 Material incoming insp. std.	原料ﾛｯﾄ毎 Every raw material lot	出荷検査ﾃﾞｰﾀの確認 Outgoing inspection data from vendor	検査員 Inspector	工程異常処理規定 Process abnormal disposal std.	原料受入検査規格 Material incoming insp. std.
							電気特性 Electrical characteristics			原料ﾛｯﾄ毎 Every raw material lot	検査成績書 Inspection report			
							外観 Appearance			原料ﾛｯﾄ毎 Every raw material lot	検査成績書 Inspection report			
		2	調合 MIXING	調合機 Mixing machine		ﾎﾟﾝﾌﾟ周波数 Pump Frequency			原料調合加工標準 Material mixing std.	調合ﾛｯﾄ毎 Every mixing lot	作業伝票 Work order sheet	作業者 Operator	工程異常処理規定 Process abnormal disposal std.	原料調合加工標準 Material mixing std.
						回転数 Rotation speed				調合ﾛｯﾄ毎 Every mixing lot	作業伝票 Work order sheet			
					天秤 Balance	調合量 Amount of mixture				調合ﾛｯﾄ毎 Every mixing lot	作業伝票 Work order sheet			
					ﾀｲﾏｰ Timer	時間 Time				調合ﾛｯﾄ毎 Every mixing lot	作業伝票 Work order sheet			
					粘度計 Viscometer		ｽﾗﾘｰ粘度 Slurry viscosity			調合ﾛｯﾄ毎 Every mixing lot	作業伝票 Work order sheet			
					比重計 Gravimeter		ｽﾗﾘｰ比重 Slurry spec. gravity			調合ﾛｯﾄ毎 Every mixing lot	作業伝票 Work order sheet			
シート製造工程まで出雲村田製作所 Until No.4 process, the manufacturing is carried out in Izumo Murata		3	脱泡 DE-AIRING	脱泡装置 De-airing machine	粘度計 Viscometer		粘度 Viscosity		脱泡加工標準 De-airing std.	調合ﾛｯﾄ毎 Every mixing lot	作業伝票 Work Order Sheet	作業者 Operator	工程異常処理規定 Process abnormal disposal std.	脱泡加工標準 De-airing std.
		4	ｼｰﾄ製造 CASTING	ｼｰﾄ製造機 Casting machine			ｼｰﾄ状態 Sheet Condition		ｼｰﾄ製造加工標準 Sheet casting std.	ﾛｯﾄ毎 Every lot	記録紙 Record Sheet	作業者 Operator	工程異常処理規定 Process abnormal disposal std.	ｼｰﾄ製造加工標準 Sheet casting std.
						乾燥温度 Drying temp.				ﾛｯﾄ毎 Every lot	記録紙 Record Sheet			
					膜厚測定器 X-ray thickness equipment		ｼｰﾄ厚み Sheet thickness			常時ﾓﾆﾀﾘﾝｸﾞ All time monitoring	ﾁｬｰﾄ Chart			
		5	輸送 TRANSPORTING		目視 Visual		積荷状態 Physical condition of cargo		破損なきこと No damage	ﾛｯﾄ毎 Every Lot	事故報告書作成 issue accident report	作業者 Operator	品管部門に連絡し、必要であれば処理内容を変更する。 Consult QC section and re-book if necessary	

工程フロー Process Flow 補助工程 Sub / 本工程 Main	No.	工程名/作業概要 PROCESS NAME	材料・設備・治具 MACHINES,JIGS,TOOLS METERS,FIXTURES 製造用 Mfg.	試験・検査用 TEST,INSP.	管理項目 CONTROL PARAMETERS 原因系 PROCESS	結果系 PRODUCT	特殊特性 Special Char.	管理幅 仕様／公差 CONTROL RANGE SPEC./TOLE.	ｻﾝﾌﾟﾘﾝｸﾞﾌﾟﾗﾝ ｻﾝﾌﾟﾙｻｲｽﾞ 品質水準／頻度 SAMPLING PLAN SAMPLE SIZE LEVEL/FREQ.	管理方法 記録 ﾎﾟｶﾖｹの方法 CONTROL METHOD RECORD ERROR-PROOFING	担当者 PERSON IN CHARGE	対応計画 是正処置 REACTION PLAN /CORRECTIVE ACTION	関連標準類 RELATED STANDARDS
内部電極材料 Electrode paste	6	ｼｰﾄ受入検査 INCOMING INSPECTION (CERAMICS SHEET)				外観 Appearance		ｼｰﾄ受入検査規格 Ceramic sheet incoming insp. std.	原料ﾛｯﾄ毎 Every raw material lot	出荷検査ﾃﾞｰﾀの確認 Outgoing inspection from vendor 検査成績書 Inspection report	検査員 Inspector	工程異常処理規定 Process abnormal disposal std.	ｼｰﾄ受入検査規格 Ceramic sheet insp. std.
	7	内部電極受入検査 INCOMING INSPECTION (Electrode paste)		比重計口 Gravimeter		比重 Specific gravity		内部電極受入検査規格 Inner electrode incoming insp. std.	ﾍﾟｰｽﾄﾛｯﾄ毎 Every paste lot	検査成績書 Inspection report	検査員 Inspector	工程異常処理規定 Process abnormal disposal std.	内部電極受入検査規格 Inner electrode incoming insp. std.
				粘度計 Viscometer		粘度 Viscosity			ﾍﾟｰｽﾄﾛｯﾄ毎 Every paste lot	検査成績書 Inspection report			
						外観 Appearance			ﾍﾟｰｽﾄﾛｯﾄ毎 Every paste lot	検査成績書 Inspection report			
	8	内部電極印刷及び積み重ね PRINTING AND STACKING	内部電極印刷機 Printing machine			印刷状態 Printing condition		内部電極印刷加工標準 Inner Electrode printing std.	加工標準による Depend on process std.	ﾁｪｯｸｼｰﾄ Check sheet	作業者 Operator	工程異常処理規定 Process abnormal disposal std.	内部電極印刷加工標準 Inner Electrode printing std.
					ｼｮｯﾄ数 Screen Shots				加工標準による Depend on process std.	電子ﾒﾃﾞｨｱ Electric data base			
					ｽｷｰｼﾞ圧 Squeegee Pressure				ﾛｯﾄ毎 Every lot	電子ﾒﾃﾞｨｱ Electric data base			
					ｽｸﾘｰﾝﾃﾞｨｽﾀﾝｽ Screen Distance				ﾛｯﾄ毎 Every lot	電子ﾒﾃﾞｨｱ Electric data base			
			乾燥機 Dry machine	温度計 Thermometer	乾燥温度 Drying temp.				加工標準による Depend on process std.	ﾁｪｯｸｼｰﾄ Check sheet			
			積み重ね機 Stacking machine	膜厚測定機 X-ray thickness meter		電極厚み Electrode thickness			加工標準による Depend on process std.	ｸﾞﾗﾌ Graph			
	9	圧着 PRESSING	真空パック機 Vacuum pressure	真空度計 Vacuum gauge	真空度 Vacuum degree			圧着加工標準 Pressing std.	加工標準による Depend on process std.	ﾁｪｯｸｼｰﾄ Check sheet	作業者 Operator	工程異常処理規定 Process abnormal disposal std.	圧着加工標準 Pressing std.
			ﾌﾟﾚｽ機 Pressing machine	圧力計 Pressure gauge	ﾌﾟﾚｽ圧力 Pressure				加工標準による Depend on process std.	ｸﾞﾗﾌ又はﾁｪｯｸｼｰﾄ Graph or Check sheet			
				温度計 Thermometer	水温 Water temp.				加工標準による Depend on process std.	ｸﾞﾗﾌ又はﾁｪｯｸｼｰﾄ Graph or Check sheet			
				ﾏｲｸﾛﾒｰﾀｰ Micrometer		ﾌﾞﾛｯｸ厚み Block thickness			ﾛｯﾄ毎 Every lot	ｸﾞﾗﾌ Graph			
	10	ｶｯﾄ CUTTING	切断機 Cutting machine	拡大鏡 Magnifier		切断状態 Cutting condition		ｶｯﾄ加工標準 Cutting std.	ﾌﾞﾛｯｸ毎 Every block	電子ﾒﾃﾞｨｱ Electronic media	作業者 Operator	工程異常処理規定 Process abnormal disposal std.	ｶｯﾄ加工標準 Cutting std.
				表面温度計 Surface thermometer	予熱/ﾃｰﾌﾞﾙ温度 Pre-heating / table temp.				加工標準による Depend on process std.	ｸﾞﾗﾌ Graph			
	11	ｶｯﾄ（ﾀﾞｲｼﾝｸﾞ） CUTTING (Dicing saw)	切断機 Cutting machine	拡大鏡 Magnifier		切断状態 Cutting condition		ｶｯﾄ加工標準 Cutting std.	ﾌﾞﾛｯｸ毎 Every block	電子ﾒﾃﾞｨｱ Electronic media	作業者 Operator	工程異常処理規定 Process abnormal disposal std.	ｶｯﾄ加工標準 Cutting std.
				設備設定 Auto count	ｶｯﾄ刃ﾗｲﾌ Cut blade life				指定回数 Every cut	電子ﾒﾃﾞｨｱ Electronic media			
				ﾌﾛｰﾒｰﾀｰ Flow meter	水流量 Water flow amount				加工標準による Depend on process std.	ﾁｪｯｸｼｰﾄ Check sheet			
	12	生ﾕﾆｯﾄ研磨 RAW UNIT GRINDING	研磨装置 Grinding machine		回転時間 Rotation time			ﾕﾆｯﾄ研磨加工標準 Unit grinding std.	ﾛｯﾄ毎 Every lot	作業伝票 Work order sheet	作業者 Operator	工程異常処理規定 Process abnormal disposal std.	ﾕﾆｯﾄ研磨加工標準 Unit grinding std.
					回転数 Rotation speed				ﾛｯﾄ毎 Every lot	作業伝票 Work order sheet			
					ﾁｬｰｼﾞ量 Charging Q'ty				ﾛｯﾄ毎 Every lot	作業伝票 Work order sheet			

工程フロー Process Flow 補助工程 Sub / 本工程 Main	No.	工程名/作業概要 PROCESS NAME	材料・設備・治具 MACHINES,JIGS,TOOLS METERS,FIXTURES 製造用 Mfg.	試験・検査用 TEST,INSP.	管理項目 CONTROL PARAMETERS 原因系 PROCESS	結果系 PRODUCT	特殊特性 Special Char.	管理幅 仕様／公差 CONTROL RANGE SPEC./TOLE.	ｻﾝﾌﾟﾘﾝｸﾞﾌﾟﾗﾝ ｻﾝﾌﾟﾙｻｲｽﾞ 品質水準／頻度 SAMPLING PLAN SAMPLE SIZE LEVEL/FREQ.	管理方法 記録 ﾎﾟｶﾖｹの方法 CONTROL METHOD RECORD ERROR-PROOFING	担当者 PERSON IN CHARGE	対応計画 是正処置 REACTION PLAN /CORRECTIVE ACTION	関連標準類 RELATED STANDARDS
	13	焼成 FIRING			さや詰め量 Q'ty per Sagger			焼成加工標準 Firing std.	さや毎 Every sagger	記録紙 Record sheet	作業者 Operator	工程異常処理規定 Process abnormal disposal std.	焼成加工標準 Firing std.
			焼成炉 Kiln	自動温度記録計 Auto temp. recorder	温度ｶｰﾌﾞ、時間 Temp. curve, Time				加工標準による Depend on process std.	温度記録紙 Temp. record sheet			
				ﾌﾛｰﾒｰﾀｰ Flow meter	ｶﾞｽ流量 Gas flow amount				加工標準による Depend on process std.	ﾁｪｯｸｼｰﾄ Check sheet			
				酸素濃度計 Oxygen density meter	酸素濃度 Oxygen density				加工標準による Depend on process std.	ﾁｪｯｸｼｰﾄ Check sheet			
	14	ﾕﾆｯﾄ研磨 GRINDING	研磨装置 Grinding machine		回転時間 Rotation time			ﾕﾆｯﾄ研磨加工標準 Unit grinding std.	ﾛｯﾄ毎 Every lot	作業伝票 Work order sheet	作業者 Operator	工程異常処理規定 Process abnormal disposal std.	ﾕﾆｯﾄ研磨加工標準 Unit grinding std.
					回転数 Rotation speed				ﾛｯﾄ毎 Every lot	作業伝票 Work order sheet			
					ﾁｬｰｼﾞ量 Charging Q'ty				ﾛｯﾄ毎 Every lot	作業伝票 Work order sheet			
	15	外観ﾁｪｯｸ APPEARANCE CHECK		拡大鏡 Magnifier		外観 Appearance		焼成済外観ﾁｪｯｸ加工標準 Appearance checking std.	指定個数/ﾛｯﾄ Sampling number / lot	作業伝票 Work order sheet	作業者 Operator	工程異常処理規定 Process abnormal disposal std.	焼成済外観ﾁｪｯｸ加工標準 Appearance checking std.
				ﾀﾞｲﾔﾙﾉｷﾞｽ Caliper		寸法 Dimension			指定個数/ﾛｯﾄ Sampling number / lot	作業伝票 Work order sheet			
外部電極材料 Termination paste	16	外部電極受入検査 INCOMING INSPECTION (Termination paste)		比重計 Gravimeter		比重 Specific gravity		外部電極受入検査規格 Termination paste incoming insp. std.	ﾍﾟｰｽﾄﾛｯﾄ毎 Every paste lot	検査成績書 Inspection report	検査員 Inspector	工程異常処理規定 Process abnormal disposal std.	外部電極受入検査規格 Termination paste incoming insp. std.
				粘度計 Viscometer		粘度 Viscosity			ﾍﾟｰｽﾄﾛｯﾄ毎 Every paste lot	検査成績書 Inspection report			
						外観 Appearance			ﾍﾟｰｽﾄﾛｯﾄ毎 Every paste lot	検査成績書 Inspection report			
	17	外部電極塗布 TERMINATION	外部電極塗布機 Terminating machine	比重計 Gravimeter	ﾍﾟｰｽﾄ比重 Paste specific gravity			外部電極塗布加工標準 Terminating std.	加工標準による Depend on process std.	ﾁｪｯｸｼｰﾄ Check sheet	作業者 Operator	工程異常処理規定 Process abnormal disposal std.	外部電極塗布加工標準 Terminating std.
				拡大鏡 又は目視 Magnifier or Visual		外観 Appearance			加工標準による Depend on process std.	電子ﾒﾃﾞｨｱ Electronic media			
				測定器 Measuring machine		寸法 Dimension			加工標準による Depend on process std.	ｸﾞﾗﾌ Graph			
	18	外部電極焼成 TERMINATION FIRING	さや詰め機 Saggering machine		さや詰め量 Q'ty per Sagger			外部電極焼成加工標準 Termination firing std.	加工標準による Depend on process std.	作業伝票 Work Order Sheet	作業者 Operator	工程異常処理規定 Process abnormal disposal std.	外部電極焼成加工標準 Termination firing std.
			外部電極焼付炉 Kiln	自動温度記録計 Auto temp. recorder	焼成温度 Firing temp.				加工標準による Depend on process std.	温度記録紙 Temp. record sheet			
					ﾍﾞﾙﾄｽﾋﾟｰﾄﾞ Belt speed				加工標準による Depend on process std.	ﾁｪｯｸｼｰﾄ Check sheet			
				酸素濃度計 Oxygen density meter	酸素濃度 Oxygen density				加工標準による Depend on process std.	ﾁｬｰﾄ Chart			

工程フロー Process Flow 補助工程 Sub	本工程 Main	No.	工程名/作業概要 PROCESS NAME	材料・設備・治具 MACHINES,JIGS,TOOLS METERS,FIXTURES 製造用 Mfg.	試験・検査用 TEST,INSP.	管理項目 CONTROL PARAMETERS 原因系 PROCESS	結果系 PRODUCT	特殊特性 Special Char.	管理幅 仕様／公差 CONTROL RANGE SPEC./TOLE.	ｻﾝﾌﾟﾘﾝｸﾞﾌﾟﾗﾝ ｻﾝﾌﾟﾙｻｲｽﾞ 品質水準／頻度 SAMPLING PLAN SAMPLE SIZE LEVEL/FREQ.	管理方法 記録 ﾎﾟｶﾖｹの方法 CONTROL METHOD RECORD ERROR-PROOFING	担当者 PERSON IN CHARGE	対応計画 是正処置 REACTION PLAN /CORRECTIVE ACTION	関連標準類 RELATED STANDARDS
	○	19	外部電極めっき TERMINATION PLATING	自動めっき装置 Auto plating equipment	膜厚測定機 X-ray thickness meter		Ni めっき厚み Ni Plating thickness		めっき加工標準 Plating std.	加工標準による Depend on process std.	ｸﾞﾗﾌ graph	作業者 Operator	工程異常処理規定 Process abnormal disposal std.	めっき加工標準 Plating std.
							Sn めっき厚み Sn Plating thickness	◎						
					電流計 Current meter	電流値 Current value				加工標準による Depend on process std.	電子ﾒﾃﾞｨｱ Electronic media			
					温度計 Thermometer	槽温度 Bath temp.				加工標準による Depend on process std.	ｸﾞﾗﾌ graph			
					PHﾒｰﾀｰ PH meter	PH PH				加工標準による Depend on process std.	ｸﾞﾗﾌ graph			
						浴濃度（Ni&Tin） Concentration (Ni&Tin)				加工標準による Depend on process std.	ﾁｪｯｸｼｰﾄ Check sheet			
						ﾁｬｰｼﾞ量 Charging Q'ty				ﾛｯﾄ毎 Every lot	電子ﾒﾃﾞｨｱ Electronic media			
				分離機 Separator										
	◇	20	出荷検査 OUTGOING INSPECTION						出荷検査規格 Outgoing insp. std.					出荷検査規格 Outgoing insp. std.
		20-1	・特性検査 ・ELECTRICAL INSPECTION		特性検査機 Electrical inspection machine		静電容量 Capacitance			100%xﾛｯﾄ毎 100% / lot	電子ﾒﾃﾞｨｱ Electronic media	検査員 Inspector	工程異常処理規定 Process abnormal disposal std.	
							Q/DF Q/DF			100%xﾛｯﾄ毎 100% / lot	電子ﾒﾃﾞｨｱ Electronic media			
							絶縁抵抗 IR			100%xﾛｯﾄ毎 100% / lot	電子ﾒﾃﾞｨｱ Electronic media			
							耐電圧 Withstanding voltage			100%xﾛｯﾄ毎 100% / lot	電子ﾒﾃﾞｨｱ Electronic media			
		20-2	・外観検査 ・APPEARANCE INSPECTION		拡大鏡 Magnifier		外観 Appearance			抜取り又は100%xﾛｯﾄ毎 Sampling or 100% / lot	電子ﾒﾃﾞｨｱ Electronic media			
					自動外観機 Automatic appearance machine									
		20-3	・寸法検査 ・DIMENSION INSPECTION		寸法測定器 Measuring instrument of dimension		寸法 Dimensions			10個/ﾛｯﾄ 10pcs / lot	電子ﾒﾃﾞｨｱ Electronic media			
		20-4	・最終検査 （検印付与） ・FINAL INSPECTION (Numbering of Outgoing Inspection Number.)				内部解析(※1) (ﾃﾞﾗﾐﾈｰｼｮﾝ、ﾎﾞｲﾄﾞ) Inner analysis(※1) (Delamination,Void)			10個/ﾛｯﾄ 10pcs / lot	電子ﾒﾃﾞｨｱ Electronic media			
						各検査結果照合 Each inspection result confirmation				ﾛｯﾄ毎 Every lot	電子ﾒﾃﾞｨｱ又は 検査成績書 Electronic media or Inspection report			
						工程経歴確認 Process completion confirmation				ﾛｯﾄ毎 Every lot				

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包装材料 Taping material		21	包装材料受入検査 INCOMING INSPECTION (Taping material)		工具顕微鏡 Microscope		外観 Appearance		包装材料受入 検査規格 Taping material incoming insp. std.	材料ﾛｯﾄ毎 Every lot	検査成績書 Inspection report	検査員 Inspector	工程異常処理規定 Process abnormal disposal std.	包装材料受入 検査規格 Taping material incoming insp. std.
							寸法 Dimension			材料ﾛｯﾄ毎 Every lot	検査成績書 Inspection report			
		22	ﾃｰﾋﾟﾝｸﾞ TAPING	ﾃｰﾋﾟﾝｸﾞ機 Taping machine	Cﾒｰﾀｰ Capacitance meter		静電容量 Capacitance		ﾃｰﾋﾟﾝｸﾞ加工標準 Taping std.	100%xﾛｯﾄ毎 100% / lot	作業伝票 Work order sheet	作業者 Operator	工程異常処理規定 Process abnormal disposal std.	ﾃｰﾋﾟﾝｸﾞ加工標準 Taping std.
					自動外選機 Appearance sorting machine		外観 Appearance		外観選別加工標準 Appearance sorting std.	100%xﾛｯﾄ毎 100% / lot	作業伝票 Work order sheet			外観選別加工標準 Appearance sorting std.
					剥し力測定器 Peel off force tester		剥し力 Peel off force		ﾃｰﾋﾟﾝｸﾞ加工標準 Taping std.	加工標準による Depend on process std.	ｸﾞﾗﾌ or 記録紙 Graph or record sheet			ﾃｰﾋﾟﾝｸﾞ加工標準 Taping std.
						シール温度 Sealing temp				加工標準による Depend on process std.	ｸﾞﾗﾌ or 記録紙 Graph or record sheet			
		23	ﾃｰﾋﾟﾝｸﾞ検査 TAPING INSPECTION		目視 Visual		ﾘｰﾙ外観 Reel appearance		ﾃｰﾋﾟﾝｸﾞ検査規格 Taping insp. std.	ﾃｰﾋﾟﾝｸﾞ検査規格による Depend on Taping insp. std.	作業伝票 Work order sheet	検査員 Inspector	工程異常処理規定 Process abnormal disposal std.	ﾃｰﾋﾟﾝｸﾞ検査規格 Taping insp. std.
		24	個装 PACKING		ﾊﾞｰｺｰﾄﾞﾘｰﾀﾞｰ Bar code reader		ﾗﾍﾞﾙ表示内容 Label contents		個装加工標準 Packing std.	ﾛｯﾄ毎 Every lot	作業伝票 Work order sheet	作業者 Operator	工程異常処理規定 Process abnormal disposal std.	個装加工標準 Packing std.
							数量 Amount			ﾛｯﾄ毎 Every lot	作業伝票 Work order sheet			
							外観 Appearance			ﾛｯﾄ毎 Every lot	作業伝票 Work order sheet			
		25	ﾋﾟｯｷﾝｸﾞ PICKING	ﾋﾟｯｷﾝｸﾞﾌｫｰｸ Picking fork 集合ﾊﾞｹｯﾄ Collective bucket	ﾊﾝﾃﾞｨｰﾀｰﾐﾅﾙ Handy terminal	落下 Drop	ﾘｰﾙ外観 Appearance of reel		限度見本 Boundary sample	ﾘｰﾙ全数 All reels		作業者 Operator	監督者への連絡 Inform to superviser	限度見本 Boundary sample
							ﾘｰﾙ検印番号／ 集合ﾊﾞｹｯﾄID Inspection No. of reel/ Collective bucket ID		作業標準書 Operation std.	ﾘｰﾙ全数 All reels		作業者 Operator	監督者への連絡 Inform to superviser	作業標準書 Operation std.
		26	ﾘｰﾙﾗﾍﾞﾙ貼り PASTE THE REEL LABEL	PC端末 PC C−3ﾗﾍﾞﾙ C-3 label ﾘﾎﾞﾝ Ribon ﾗﾍﾞﾙﾌﾟﾘﾝﾀｰ Label printer ﾗﾍﾞﾙ貼り機 Labeling machine	ﾊﾞｰｺｰﾄﾞﾘｰﾀﾞｰ Barcode reader		印字状態 Printing condition		異常なきこと No defect	作業標準による Depend on operation std.	日常点検簿 Daily check sheet	作業者 Operator	監督者への連絡 Inform to superviser	作業標準書 Operation std.
							ﾗﾍﾞﾙ状態 Label condition		異常なきこと No defect	設備ﾏﾆｭｱﾙによる Depend on machine manual	日常点検簿 Daily check sheet	作業者 Operator	監督者への連絡 Inform to superviser	設備操作ﾏﾆｭｱﾙ Machine operating manual

工程フロー Process Flow 補助工程 Sub	工程フロー Process Flow 本工程 Main	No.	工程名/作業概要 PROCESS NAME	材料･設備･治具 MACHINES,JIGS,TOOLS METERS,FIXTURES 製造用 Mfg.	材料･設備･治具 MACHINES,JIGS,TOOLS METERS,FIXTURES 試験･検査用 TEST,INSP.	管理項目 CONTROL PARAMETERS 原因系 PROCESS	管理項目 CONTROL PARAMETERS 結果系 PRODUCT	特殊特性 Special Char.	管理幅 仕様／公差 CONTROL RANGE SPEC./TOLE.	ｻﾝﾌﾟﾘﾝｸﾞﾌﾟﾗﾝ ｻﾝﾌﾟﾙｻｲｽﾞ 品質水準／頻度 SAMPLING PLAN SAMPLE SIZE LEVEL/FREQ.	管理方法 記録 ﾎﾟｶﾖｹの方法 CONTROL METHOD RECORD ERROR-PROOFING	担当者 PERSON IN CHARGE	対応計画 是正処置 REACTION PLAN /CORRECTIVE ACTION	関連標準類 RELATED STANDARDS
	○	27	外装梱包 PACKING TO OUTER PACKAGE BOX	ﾚｰｻﾞｰﾌﾟﾘﾝﾀｰ Laser printer 外装箱 Outer package box PC端末 PC ｼｰﾗｰ Sealer	ﾊﾞｰｺｰﾄﾞﾘｰﾀﾞｰ Barcode reader	ｼｰﾗｰ設定 Setting of sealer			ｼｰﾗｰ設定 Setting of sealer	作業標準による Depend on operation std.	始業前現物確認 Check of setting before working	作業者 Operator	監督者への連絡 Inform to superviser	作業標準書 Operation std.
							外装梱包状態 Condition of packing to outer package box		異常なきこと No defect	作業標準による Depend on operation std.		作業者 Operator	監督者への連絡 Inform to superviser	作業標準書 Operation std.
	○	28	梱包ﾗﾍﾞﾙ貼り PASTE THE PACKING LABEL	PC端末 PC D,Gﾗﾍﾞﾙ D,G label ﾘﾎﾞﾝ Ribon ﾗﾍﾞﾙﾌﾟﾘﾝﾀｰ Label printer 集合ﾊﾞｹｯﾄ Collective bucket			印字状態 Printing condition		異常なきこと No defect	作業標準による Depend on operation std.	日常点検簿 Daily check sheet	作業者 Operator	監督者への連絡 Inform to superviser	作業標準書 Operation std.
							ﾗﾍﾞﾙ状態 Label condition		異常なきこと No defect	作業標準による Depend on operation std.	日常点検簿 Daily check sheet	作業者 Operator	監督者への連絡 Inform to superviser	作業標準書 Operation std.
	○	29	集合梱包 COLLECTIVE PACKING	Dﾗﾍﾞﾙ D label 出荷ｼｰﾄ Shipping sheet 集合ﾊﾞｹｯﾄ Collective bucket 集合梱包箱 Collective package box ﾗﾍﾞﾙﾌﾟﾘﾝﾀｰ Label printer 梱包資材 Packing material	ﾊﾝﾃﾞｨｰﾀｰﾐﾅﾙ Handy terminal		Dﾗﾍﾞﾙの読み取り Scanning D label		著しい破損･汚れなきこと ﾊﾞｰｺｰﾄﾞが読み取れること No damage and dirty, Readable the bar-cord	外装箱全数 All outer package box	ｼｽﾃﾑに登録 Record to system	作業者 Operator	監督者への連絡 Inform to superviser	作業標準書 Operation std.
	○	30	出荷 SHIPPING	ﾌｫｰｸﾘﾌﾄ Forklift 台車 Hand cart ﾊﾟﾚｯﾄ Pallet ﾊﾝﾄﾞﾘﾌﾄ Hand lift	ﾊﾝﾃﾞｨｰﾀｰﾐﾅﾙ Handy terminal		梱包状態 Packing condition		異常なきこと No defect	全集合梱包ID All collective package ID	ｼｽﾃﾑに登録 Record to system	作業者 Operator	監督者への連絡 Inform to superviser	作業標準書 Operation std.
	○	31	積み込み LOADING	ﾊﾝﾄﾞﾘﾌﾄ Hand lift ﾊﾟﾚｯﾄ Pallet	目視 Visual	落下 Drop	貨物の外観状態 Appearance condition of cargo		作業標準書 Operation std.	ﾛｯﾄ毎 Every lot		運送会社 Carriers	物流部門へ連絡 Inform to distribution department	作業標準書 Operation std.

工程フロー Process Flow 補助工程 Sub	工程フロー Process Flow 本工程 Main	No.	工程名/作業概要 PROCESS NAME	材料･設備･治具 MACHINES,JIGS,TOOLS METERS,FIXTURES 製造用 Mfg.	材料･設備･治具 MACHINES,JIGS,TOOLS METERS,FIXTURES 試験･検査用 TEST,INSP.	管理項目 CONTROL PARAMETERS 原因系 PROCESS	管理項目 CONTROL PARAMETERS 結果系 PRODUCT	特殊特性 Special Char.	管理幅 仕様／公差 CONTROL RANGE SPEC./TOLE.	ｻﾝﾌﾟﾘﾝｸﾞﾌﾟﾗﾝ ｻﾝﾌﾟﾙｻｲｽﾞ 品質水準／頻度 SAMPLING PLAN SAMPLE SIZE LEVEL/FREQ.	管理方法 記録 ﾎﾟｶﾖｹの方法 CONTROL METHOD RECORD ERROR-PROOFING	担当者 PERSON IN CHARGE	対応計画 是正処置 REACTION PLAN /CORRECTIVE ACTION	関連標準類 RELATED STANDARDS
	▽	32	配送･納品 DELIVERY	ﾄﾗｯｸ Truck	目視 Visual		貨物の外観状態 Appearance condition of cargo		作業標準書 Operation std.	ﾛｯﾄ毎 Every lot		運送会社 Carriers	物流部門へ連絡 Inform to distribution department	作業標準書 Operation std.
							送り状、受領書 Invoice, Receipt		作業標準書 Operation std.	ﾛｯﾄ毎 Every lot		運送会社 Carriers	物流部門へ連絡 Inform to distribution department	作業標準書 Operation std.

※1 得意先の要求に応じて実施する。
Execute according to customer's request.

ﾁｯﾌﾟ積層ｾﾗﾐｯｸｺﾝﾃﾞﾝｻの質量表
Weight table of MLCC

GCM / GCF / GCG / GCJ / GCD / GCE / GCH / GCS Series

ｻｲｽﾞ Case Size	形　式 Type	寸法(T)ｺｰﾄﾞ Thickness Code	T寸法 Thickness(mm)	温度特性 TC/HiK	ﾊﾞﾗ 数量：1個 1pcs	ﾃｰﾋﾟﾝｸﾞ T/R φ180mm	
					Weight [mg]	【pcs/reel】	Weight [g]
0603/mm 0201/inch	GC*03	3	0.3 ±0.03	TC	0.33	15,000	118
				HiK			
1005/mm 0402/inch	GC*15	5	0.5 ±0.05	TC	1.6	10,000	118
				HiK			
		3	0.3 ±0.03	TC	1		88
				HiK			
		X	0.25 ±0.05	TC	0.9		82
				HiK			
		2	0.2 ±0.05	HiK			
1608/mm 0603/inch	GC*18	8	0.8 ±0.1	TC	6.3	4,000	144
				HiK			
		6	0.6 +0.05/-0.1	TC	3.5		105
		5	0.5 +0/-0.1	TC	3		100
				HiK			
2012/mm 0805/inch	GC*21	6	0.6 ±0.1	TC	6.4	4,000	126
				HiK	9.6		142
		9	0.85 ±0.1	TC	9.5		152
				HiK	11		162
		A	1.0 ±0.1	TC	12	3,000	86
				HiK	13		89
		B	1.25 ±0.1	TC	16		91
				HiK	17		102
3216/mm 1206/inch	GC*31	6	0.6 ±0.1	TC	15	4,000	167
				HiK			
		9	0.85 ±0.1	TC	19		191
				HiK	24		208
		M	1.15 ±0.1	TC	27	3,000	125
				HiK	34		149
		B	1.25 ±0.1	TC	29		137
				HiK	40		170
		C	1.6 ±0.2	TC	38	2,000	116
				HiK	52		144
3225/mm 1210/inch	GC*32	9	0.85 ±0.1	TC	37	4,000	235
				HiK			
		M	1.15 ±0.1	TC	50	3,000	200
				HiK			
		N	1.35 ±0.15	TC	57	2,000	174
				HiK			
		C	1.6 ±0.2	TC	74		184
				HiK			
		R	1.8 ±0.2	TC	85	1,000	116
				HiK			
		D	2.0 ±0.2	TC	95		123
				HiK			
		E	2.5 ±0.2	TC	110		168
				HiK			

注.1 ） 上記の値は代表的なものであり、製造ﾛｯﾄによって重さは多少変わります。

These weight data are representative ones.

The weight of each product will be slightly different by the production lot.