



PCN Report

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Device : Automotive TVS
Revision : A

1.0 Objective:

The purpose of this project is to qualify 6" wafer, design improvement, 2nd source and Matrix line for Automotive TVS.

Succeeding pages summarize the physical, electrical and reliability test performed in qualification lots.

2.0 Applicable Devices:

2.1 Qualify samples:

Part No.	Package	Lot No.
TPSMB17A-VR	DO-214AA	4A57ZPEE
TPSMB20CA		4A52ZPEE
TPSMB85A-VR		4A11ZPEE
TPSMB85CA-VR		4A12ZPEE
TPSMB250CA-UA		4F15ZPEE
TPSMB650CA-A		3G27ZPEE
TPSMC20A	DO-214AB	4A08ZPEE
TPSMC43CA		4A50ZPEE
TPSMC85CA-VR		4A18ZPEE
SMCJ200A-JD		4A118ZPEE
TPSMD17A		4A89ZPEE
TPSMD18CA-UA		4E26ZPEE
TPSMD43A		4A91ZPEE
TPSMD85A		4A85ZPEE
SLD5S40A	SMTO-263	4A61ZPEE

SLD5S24A		3H55ZPEE
SLD6S14A		3J13ZPEE
SLD6S57A		4A62ZPEE
SLD8S64A		4A64ZPEE
SLD10-018	P600	4B14ZPEE
SLD33-018		4B11ZPEE
SLD33U-017		4B08ZPEE
TP5KP11A		3K16ZPEE
TP5KP54CA		4A66ZPEE
TP5KP64CA		4C44ZPEE
TP6KE13CA	DO-15	T4AL381501
TP6KE36CA		T4AL381601
TP6KE91A		T4AL381701
TP1.5KE12CA	DO-201	T4AL381101
TP1.5KE24A		T4AL381201
TP1.5KE47CA		T4AL381301
TPSMF4L5.0A	SOD123-FL	G4FA240501
TPSMF4L10A-UA		G4FA239901
TPSMF4L85A		G4FA240001
TPSMA6L5.0A	DO221-AC	SP24-00035
TPSMA6L7.5A		SP23-00147
TPSMA6L12A		SP23-00148
TPSMA6L40A		SP23-00149
TPSMA6L85A		SP24-00036



3.0 Assembly, Process & Material Differences/Changes:

Series	Wafer Diameter	Plating	EMC	Solder paste/Solder wafer	Matrix line
TPSMB/C/D Part# list 1	6" with design improvement	2nd source	2nd source		
TPSMB/C/D Part# list 2	6"	2nd source	2nd source		
SLD8S/5S/6S	6"	2nd source		2nd source	
TP5KP	6"	2nd source		2nd source	
P600 SLD	6"	2nd source	2nd source	2nd source	
TP5.OSMDJ	6"	2nd source	2nd source		
TPSMB600CA-A TPSMB650CA-A	6"	2nd source	2nd source		
TPSMB250A-VR, TPSMB250CA-VR TPSMB300A-VR, TPSMB300CA-VR	6" and dual dies to single die	2nd source	2nd source		
TP6KE	6"				
TP1.5KE	6"				
TPSMF4L	6"				
TPSMA6L	6"		2nd source		Matrix line

4.0 Packing Method

There will be no changes in the packing method.

5.0 Physical Differences/Changes:

There is no change in mechanical specification or package outline dimension (POD).

6.0 Reliability Test Results Summary:



test result:

DO-214AA series

Test Category	Description	Sample P/N	Package	Sample Qty	Littelfuse test Ref#	Contents/Conditions	Standard	Result Summary				
Parametric	Electrical Parameters	TPSMB17A-VR	DO-214AA	308	TR24-01-6486	VBR, IR		100% meet published spec.				
		TPSMB20CA	DO-214AA	308	TR24-01-6486							
		TPSMB85A-VR	DO-214AA	308	TR24-01-6448							
		TPSMB85CA-VR	DO-214AA	308	TR24-01-6448							
		TPSMB250CA-UA	DO-214AA	308	TR24-06-9597							
		TPSMB650CA-A	DO-214AA	308	TR23-08-3245							
Reliability Test	Pre-condition (PC)	TPSMB17A-VR	DO-214AA	231	TR24-01-6486	SMD qualification parts for TC, H3TRB, UHAST	JESD22-A113	0% failure at MSL Level 1				
		TPSMB20CA	DO-214AA	231	TR24-01-6486							
		TPSMB85A-VR	DO-214AA	231	TR24-01-6448							
		TPSMB85CA-VR	DO-214AA	231	TR24-01-6448							
		TPSMB250CA-UA	DO-214AA	231	TR24-06-9597							
	DC Blocking (HTRB)	TPSMB17A-VR	DO-214AA	77	TR24-01-6486	Tj, VR	JESD22-A108	0% failure at 1008 hours				
		TPSMB20CA	DO-214AA	77	TR24-01-6486							
		TPSMB85A-VR	DO-214AA	77	TR24-01-6448							
		TPSMB85CA-VR	DO-214AA	77	TR24-01-6448							
		TPSMB250CA-UA	DO-214AA	77	TR24-06-9597							
		TPSMB650CA-A	DO-214AA	77	TR23-08-3245							
	Biased Temp & Humidity (H3TRB)	TPSMB17A-VR	DO-214AA	77	TR24-01-6486	VR@85C,85% RH	JESD22-A101	0% failure at 1008 hours				
		TPSMB20CA	DO-214AA	77	TR24-01-6486							
		TPSMB85A-VR	DO-214AA	77	TR24-01-6448							
		TPSMB85CA-VR	DO-214AA	77	TR24-01-6448							
		TPSMB250CA-UA	DO-214AA	77	TR24-06-9597							
	UHAST	TPSMB17A-VR	DO-214AA	77	TR24-01-6486	96 hours at TA=130°C/85% RH.	EIA/JESD22-A102B	0% failure at 96 hours				
		TPSMB20CA	DO-214AA	77	TR24-01-6486							
		TPSMB85A-VR	DO-214AA	77	TR24-01-6448							
		TPSMB85CA-VR	DO-214AA	77	TR24-01-6448							
		TPSMB250CA-UA	DO-214AA	77	TR24-06-9597							
		TPSMB650CA-A	DO-214AA	77	TR23-08-3245							
		Temp Cycle	TPSMB17A-VR	DO-214AA	77				TR24-01-6486	-55°C & 150°C (air to air)	JESD22-A104	0% failure at 1000 cycles
			TPSMB20CA	DO-214AA	77				TR24-01-6486			
			TPSMB85A-VR	DO-214AA	77				TR24-01-6448			
			TPSMB85CA-VR	DO-214AA	77				TR24-01-6448			
	TPSMB250CA-UA		DO-214AA	77	TR24-06-9597							
	Resistance to Solder Heat (RSH)	TPSMB17A-VR	DO-214AA	30	TR24-01-6486	260°C, 10 seconds	JESD22-B106	0% failure after RSH				
TPSMB20CA		DO-214AA	30	TR24-01-6486								
TPSMB85A-VR		DO-214AA	30	TR24-01-6448								
TPSMB85CA-VR		DO-214AA	30	TR24-01-6448								
TPSMB250CA-UA		DO-214AA	30	TR24-06-9597								
MSL	TPSMB17A-VR	DO-214AA	22	TR24-01-6486	260C/Steam	J-STD-020	0% failure at MSL Level 1					
	TPSMB20CA	DO-214AA	22	TR24-01-6486								
	TPSMB85A-VR	DO-214AA	22	TR24-01-6448								
	TPSMB85CA-VR	DO-214AA	22	TR24-01-6448								
	TPSMB250CA-UA	DO-214AA	22	TR24-06-9597								
		TPSMB650CA-A	DO-214AA	22	TR23-08-3245							



DO-214AB series

Test Category	Description	Sample P/N	Package	Sample Qty	Littelfuse test Ref#	Contents/Conditions	Standard	Result Summary
Parametric	Electrical Parameters	TPSMC20A	DO-214AB	308	TR24-01-6450	VBR, IR		100% meet published spec.
		TPSMC43CA	DO-214AB	308	TR24-01-6449			
		TPSMC85CA-VR	DO-214AB	308	TR24-01-6450			
		SMCJ200A-JD	DO-214AB	308	TR24-02-6895			
		TPSMD17A	DO-214AB	308	TR24-02-6893			
		TPSMD18CA-UA	DO-214AB	308	TR24-06-9597			
		TPSMD43A	DO-214AB	308	TR24-01-6549			
		TPSMD85A	DO-214AB	308	TR24-01-6487			
Reliability Test	Pre-condition (PC)	TPSMC20A	DO-214AB	231	TR24-01-6450	SMD qualification parts for TC, H3TRB, UHAST	JESD22-A113	0% failure at MSL Level 1
		TPSMC43CA	DO-214AB	231	TR24-01-6449			
		TPSMC85CA-VR	DO-214AB	231	TR24-01-6450			
		SMCJ200A-JD	DO-214AB	231	TR24-02-6895			
		TPSMD17A	DO-214AB	231	TR24-02-6893			
		TPSMD18CA-UA	DO-214AB	231	TR24-06-9597			
		TPSMD43A	DO-214AB	231	TR24-01-6549			
		TPSMD85A	DO-214AB	231	TR24-01-6487			
	DC Blocking (HTRB)	TPSMC20A	DO-214AB	77	TR24-01-6450	Tj, VR	JESD22-A108	0% failure at 1008 hours
		TPSMC43CA	DO-214AB	77	TR24-01-6449			
		TPSMC85CA-VR	DO-214AB	77	TR24-01-6450			
		SMCJ200A-JD	DO-214AB	77	TR24-02-6895			
		TPSMD17A	DO-214AB	77	TR24-02-6893			
		TPSMD18CA-UA	DO-214AB	77	TR24-06-9597			
		TPSMD43A	DO-214AB	77	TR24-01-6549			
		TPSMD85A	DO-214AB	77	TR24-01-6487			
	Biased Temp & Humidity (H3TRB)	TPSMC20A	DO-214AB	77	TR24-01-6450	VR@85C,85% RH	JESD22-A101	0% failure at 1008 hours
		TPSMC43CA	DO-214AB	77	TR24-01-6449			
		TPSMC85CA-VR	DO-214AB	77	TR24-01-6450			
		SMCJ200A-JD	DO-214AB	77	TR24-02-6895			
		TPSMD17A	DO-214AB	77	TR24-02-6893			
		TPSMD18CA-UA	DO-214AB	77	TR24-06-9597			
		TPSMD43A	DO-214AB	77	TR24-01-6549			
		TPSMD85A	DO-214AB	77	TR24-01-6487			
	UHAST	TPSMC20A	DO-214AB	77	TR24-01-6450	96 hours at TA=130°C/85% RH.	EIA/JESD22-A102B	0% failure at 96 hours
		TPSMC43CA	DO-214AB	77	TR24-01-6449			
		TPSMC85CA-VR	DO-214AB	77	TR24-01-6450			
		SMCJ200A-JD	DO-214AB	77	TR24-02-6895			
		TPSMD17A	DO-214AB	77	TR24-02-6893			
		TPSMD18CA-UA	DO-214AB	77	TR24-06-9597			
		TPSMD43A	DO-214AB	77	TR24-01-6549			
		TPSMD85A	DO-214AB	77	TR24-01-6487			
Temp Cycle	TPSMC20A	DO-214AB	77	TR24-01-6450	-55°C&150°C (air to air)	JESD22-A104	0% failure at 1000 cycles	
	TPSMC43CA	DO-214AB	77	TR24-01-6449				
	TPSMC85CA-VR	DO-214AB	77	TR24-01-6450				
	SMCJ200A-JD	DO-214AB	77	TR24-02-6895				
	TPSMD17A	DO-214AB	77	TR24-02-6893				
	TPSMD18CA-UA	DO-214AB	77	TR24-06-9597				
	TPSMD43A	DO-214AB	77	TR24-01-6549				
	TPSMD85A	DO-214AB	77	TR24-01-6487				
Resistance to Solder Heat (RSH)	TPSMC20A	DO-214AB	30	TR24-01-6450	260°C, 10 seconds	JESD22-B106	0% failure after RSH	
	TPSMC43CA	DO-214AB	30	TR24-01-6449				
	TPSMC85CA-VR	DO-214AB	30	TR24-01-6450				
	SMCJ200A-JD	DO-214AB	30	TR24-02-6895				
	TPSMD17A	DO-214AB	30	TR24-02-6893				
	TPSMD18CA-UA	DO-214AB	30	TR24-06-9597				
TPSMD43A	DO-214AB	30	TR24-01-6549					

		TPSMD85A	DO-214AB	30	TR24-01-6487			
	MSL	TPSMC20A	DO-214AB	22	TR24-01-6450	260C/Steam	J-STD-020	0% failure at MSL Level 1
		TPSMC43CA	DO-214AB	22	TR24-01-6449			
		TPSMC85CA-VR	DO-214AB	22	TR24-01-6450			
		SMCJ200A-JD	DO-214AB	22	TR24-02-6895			
		TPSMD17A	DO-214AB	22	TR24-02-6893			
		TPSMD18CA-UA	DO-214AB	22	TR24-06-9597			
		TPSMD43A	DO-214AB	22	TR24-01-6549			
		TPSMD85A	DO-214AB	22	TR24-01-6487			

SLD5S/6S/8S series

Test Category	Description	Sample P/N	Package	Sample Qty	Littelfuse test Ref#	Contents/Conditions	Standard	Result Summary
Parametric	Electrical Parameters	SLD5S24A	SMTO-263	308	TR23-12-5516	VBR, IR		100% meet published spec.
		SLD5S40A	SMTO-263	308	TR24-02-6848			
		SLD6S14A	SMTO-263	308	TR23-12-5515			
		SLD6S57A	SMTO-263	308	TR24-02-6848			
		SLD8S64A	SMTO-263	308	TR24-01-6641			
Reliability Test	Pre-condition (PC)	SLD5S24A	SMTO-263	231	TR23-12-5516	SMD qualification parts for TC, H3TRB, UHAST	JESD22-A113	0% failure at MSL Level 1
		SLD5S40A	SMTO-263	231	TR24-02-6848			
		SLD6S14A	SMTO-263	231	TR23-12-5515			
		SLD6S57A	SMTO-263	231	TR24-02-6848			
		SLD8S64A	SMTO-263	231	TR24-01-6641			
	DC Blocking (HTRB)	SLD5S24A	SMTO-263	77	TR23-12-5516	Tj, VR	JESD22-A108	0% failure at 1008 hours
		SLD5S40A	SMTO-263	77	TR24-02-6848			
		SLD6S14A	SMTO-263	77	TR23-12-5515			
		SLD6S57A	SMTO-263	77	TR24-02-6848			
		SLD8S64A	SMTO-263	77	TR24-01-6641			
	Biased Temp & Humidity (H3TRB)	SLD5S24A	SMTO-263	77	TR23-12-5516	VR@85C,85% RH	JESD22-A101	0% failure at 1008 hours
		SLD5S40A	SMTO-263	77	TR24-02-6848			
		SLD6S14A	SMTO-263	77	TR23-12-5515			
		SLD6S57A	SMTO-263	77	TR24-02-6848			
		SLD8S64A	SMTO-263	77	TR24-01-6641			
	UHAST	SLD5S24A	SMTO-263	77	TR23-12-5516	96 hours at TA=130°C/85% RH.	EIA/JESD22-A102B	0% failure at 96 hours
		SLD5S40A	SMTO-263	77	TR24-02-6848			
		SLD6S14A	SMTO-263	77	TR23-12-5515			
		SLD6S57A	SMTO-263	77	TR24-02-6848			
		SLD8S64A	SMTO-263	77	TR24-01-6641			
	Temp Cycle	SLD5S24A	SMTO-263	77	TR23-12-5516	-55°C & 150°C (air to air)	JESD22-A104	0% failure at 1000 cycles
		SLD5S40A	SMTO-263	77	TR24-02-6848			
		SLD6S14A	SMTO-263	77	TR23-12-5515			
		SLD6S57A	SMTO-263	77	TR24-02-6848			
		SLD8S64A	SMTO-263	77	TR24-01-6641			
	Resistance to Solder Heat (RSH)	SLD5S24A	SMTO-263	30	TR23-12-5516	260°C, 10 seconds	JESD22-B106	0% failure after RSH
		SLD5S40A	SMTO-263	30	TR24-02-6848			
		SLD6S14A	SMTO-263	30	TR23-12-5515			
SLD6S57A		SMTO-263	30	TR24-02-6848				
SLD8S64A		SMTO-263	30	TR24-01-6641				
MSL	SLD5S24A	SMTO-263	22	TR23-12-5516	260C/Steam	J-STD-020	0% failure at MSL Level 1	
	SLD5S40A	SMTO-263	22	TR24-02-6848				
	SLD6S14A	SMTO-263	22	TR23-12-5515				
	SLD6S57A	SMTO-263	22	TR24-02-6848				
	SLD8S64A	SMTO-263	22	TR24-01-6641				



P600 series

Test Category	Description	Sample P/N	Package	Sample Qty	Littelfuse test Ref#	Contents/Conditions	Standard	Result Summary	
Parametric	Electrical Parameters	SLD10-018	P600	308	TR24-04-7925	VBR, IR		100% meet published spec.	
		SLD33-018	P600	308	TR24-03-7322				
		SLD33U-017	P600	308	TR24-05-8505				
		TP5KP11A	P600	308	TR23-12-5741				
		TP5KP54CA	P600	308	TR24-03-7191				
		TP5KP64CA	P600	308	TR24-04-7879				
Reliability Test	Pre-condition (PC)	SLD10-018	P600	231	TR24-04-7925	SMD qualification parts for TC, H3TRB, UHAST	JESD22-A113	0% failure at MSL Level 1	
		SLD33-018	P600	231	TR24-03-7322				
		SLD33U-017	P600	231	TR24-05-8505				
		TP5KP11A	P600	231	TR23-12-5741				
		TP5KP54CA	P600	231	TR24-03-7191				
			TP5KP64CA	P600	231	TR24-04-7879			
	DC Blocking (HTRB)	SLD10-018	P600	77	TR24-04-7925	Tj, VR	JESD22-A108	0% failure at 1008 hours	
		SLD33-018	P600	77	TR24-03-7322				
		SLD33U-017	P600	77	TR24-05-8505				
		TP5KP11A	P600	77	TR23-12-5741				
		TP5KP54CA	P600	77	TR24-03-7191				
			TP5KP64CA	P600	77	TR24-04-7879			
	Biased Temp & Humidity (H3TRB)	SLD10-018	P600	77	TR24-04-7925	VR@85C,85% RH	JESD22-A101	0% failure at 1008 hours	
		SLD33-018	P600	77	TR24-03-7322				
		SLD33U-017	P600	77	TR24-05-8505				
		TP5KP11A	P600	77	TR23-12-5741				
		TP5KP54CA	P600	77	TR24-03-7191				
			TP5KP64CA	P600	77	TR24-04-7879			
	UHAST	SLD10-018	P600	77	TR24-04-7925	96 hours at TA=130°C/85% RH.	EIA/JESD22-A102B	0% failure at 96 hours	
		SLD33-018	P600	77	TR24-03-7322				
		SLD33U-017	P600	77	TR24-05-8505				
		TP5KP11A	P600	77	TR23-12-5741				
		TP5KP54CA	P600	77	TR24-03-7191				
			TP5KP64CA	P600	77	TR24-04-7879			
	Temp Cycle	SLD10-018	P600	77	TR24-04-7925	-55°C & 150°C (air to air)	JESD22-A104	0% failure at 1000 cycles	
		SLD33-018	P600	77	TR24-03-7322				
		SLD33U-017	P600	77	TR24-05-8505				
		TP5KP11A	P600	77	TR23-12-5741				
TP5KP54CA		P600	77	TR24-03-7191					
		TP5KP64CA	P600	77	TR24-04-7879				
Resistance to Solder Heat (RSH)	SLD10-018	P600	30	TR24-04-7925	260°C, 10 seconds	JESD22-B106	0% failure after RSH		
	SLD33-018	P600	30	TR24-03-7322					
	SLD33U-017	P600	30	TR24-05-8505					
	TP5KP11A	P600	30	TR23-12-5741					
	TP5KP54CA	P600	30	TR24-03-7191					
		TP5KP64CA	P600	30	TR24-04-7879				
MSL	SLD10-018	P600	22	TR24-04-7925	260C/Steam	J-STD-020	0% failure at MSL Level 1		
	SLD33-018	P600	22	TR24-03-7322					
	SLD33U-017	P600	22	TR24-05-8505					
	TP5KP11A	P600	22	TR23-12-5741					
	TP5KP54CA	P600	22	TR24-03-7191					
		TP5KP64CA	P600	22	TR24-04-7879				



DO-15 series

Test Category	Description	Sample P/N	Package	Sample Qty	Littelfuse test Ref#	Contents/Conditions	Standard	Result Summary
Parametric	Electrical Parameters	TP1.5KE12CA	DO-201	308	TR24-07-9872	VBR, IR		100% meet published spec.
		TP1.5KE24A	DO-201	308	TR24-07-9872			
		TP1.5KE47CA	DO-201	308	TR24-07-9872			
Reliability Test	DC Blocking (HTRB)	TP1.5KE12CA	DO-201	77	TR24-07-9872	Tj, VR	JESD22-A108	0% failure at 1008 hours
		TP1.5KE24A	DO-201	77	TR24-07-9872			
		TP1.5KE47CA	DO-201	77	TR24-07-9872			
	Biased Temp & Humidity (H3TRB)	TP1.5KE12CA	DO-201	77	TR24-07-9872	VR@85C,85%RH	JESD22-A101	0% failure at 1008 hours
		TP1.5KE24A	DO-201	77	TR24-07-9872			
		TP1.5KE47CA	DO-201	77	TR24-07-9872			
	UHAST	TP1.5KE12CA	DO-201	77	TR24-07-9872	96 hours at TA=130°C/85%RH.	EIA/JESD22-A102B	0% failure at 96 hours
		TP1.5KE24A	DO-201	77	TR24-07-9872			
		TP1.5KE47CA	DO-201	77	TR24-07-9872			
	Temp Cycle	TP1.5KE12CA	DO-201	77	TR24-07-9872	-55°C&150°C (air to air)	JESD22-A104	0% failure at 1000 cycles
		TP1.5KE24A	DO-201	77	TR24-07-9872			
		TP1.5KE47CA	DO-201	77	TR24-07-9872			
	Resistance to Solder Heat (RSH)	TP1.5KE12CA	DO-201	30	TR24-07-9872	260°C, 10 seconds	JESD22-B106	0% failure after RSH
		TP1.5KE24A	DO-201	30	TR24-07-9872			
		TP1.5KE47CA	DO-201	30	TR24-07-9872			
MSL	TP1.5KE12CA	DO-201	22	TR24-07-9872	260C/Steam	J-STD-020	0% failure at MSL Level 1	
	TP1.5KE24A	DO-201	22	TR24-07-9872				
	TP1.5KE47CA	DO-201	22	TR24-07-9872				

SOD123-FL series

Test Category	Description	Sample P/N	Package	Sample Qty	Littelfuse test Ref#	Contents/Conditions	Standard	Result Summary
Parametric	Electrical Parameters	TPSMF4L5.0A	SOD123-FL	308	TR24-06-9124	VBR, IR		100% meet published spec.
		TPSMF4L10A-UA	SOD123-FL	308	TR24-06-9124			
		TPSMF4L85A	SOD123-FL	308	TR24-06-9124			
Reliability Test	Pre-condition (PC)	TPSMF4L5.0A	SOD123-FL	231	TR24-06-9124	SMD qualification parts for TC, H3TRB, UHAST	JESD22-A113	0% failure at MSL Level 1
		TPSMF4L10A-UA	SOD123-FL	231	TR24-06-9124			
		TPSMF4L85A	SOD123-FL	231	TR24-06-9124			
	DC Blocking (HTRB)	TPSMF4L5.0A	SOD123-FL	77	TR24-06-9124	Tj, VR	JESD22-A108	0% failure at 1008 hours
		TPSMF4L10A-UA	SOD123-FL	77	TR24-06-9124			
		TPSMF4L85A	SOD123-FL	77	TR24-06-9124			
	Biased Temp & Humidity (H3TRB)	TPSMF4L5.0A	SOD123-FL	77	TR24-06-9124	VR@85C,85%RH	JESD22-A101	0% failure at 1008 hours
		TPSMF4L10A-UA	SOD123-FL	77	TR24-06-9124			
		TPSMF4L85A	SOD123-FL	77	TR24-06-9124			

	UHASt	TPSMF4L5.0A	SOD123-FL	77	TR24-06-9124	96 hours at TA=130°C/85% RH.	EIA/JESD22- A102B	0% failure at 96 hours	
		TPSMF4L10A-UA	SOD123-FL	77	TR24-06-9124				
		TPSMF4L85A	SOD123-FL	77	TR24-06-9124				
	Temp Cycle		TPSMF4L5.0A	SOD123-FL	77	TR24-06-9124	-55°C&150°C (air to air)	JESD22-A104	0% failure at 1000 cycles
			TPSMF4L10A-UA	SOD123-FL	77	TR24-06-9124			
			TPSMF4L85A	SOD123-FL	77	TR24-06-9124			
	Resistance to Solder Heat (RSH)		TPSMF4L5.0A	SOD123-FL	30	TR24-06-9124	260°C, 10 seconds	JESD22-B106	0% failure after RSH
			TPSMF4L10A-UA	SOD123-FL	30	TR24-06-9124			
			TPSMF4L85A	SOD123-FL	30	TR24-06-9124			
	MSL		TPSMF4L5.0A	SOD123-FL	22	TR24-06-9124	260C/Steam	J-STD-020	0% failure at MSL Level 1
			TPSMF4L10A-UA	SOD123-FL	22	TR24-06-9124			
			TPSMF4L85A	SOD123-FL	22	TR24-06-9124			

DO221-AC series

Test Category	Description	Sample P/N	Package	Sample Qty	Littelfuse test Ref#	Contents/Conditions	Standard	Result Summary	
Parametric	Electrical Parameters	TPSMA6L5.0A	DO221-AC	308	TR24-06-9126	VBR, IR		100% meet published spec.	
		TPSMA6L85A	DO221-AC	308	TR24-06-9126				
		TPSMA6L7.5A	DO221-AC	308	TR24-02-6985				
		TPSMA6L12A	DO221-AC	308	TR24-02-6985				
		TPSMA6L40A	DO221-AC	308	TR24-02-6985				
Reliability Test	Pre-condition (PC)	TPSMA6L5.0A	DO221-AC	231	TR24-06-9126	SMD qualification parts for TC, H3TRB, UHASt	JESD22-A113	0% failure at MSL Level 1	
		TPSMA6L85A	DO221-AC	231	TR24-06-9126				
		TPSMA6L7.5A	DO221-AC	231	TR24-02-6985				
		TPSMA6L12A	DO221-AC	231	TR24-02-6985				
		TPSMA6L40A	DO221-AC	231	TR24-02-6985				
	DC Blocking (HTRB)		TPSMA6L5.0A	DO221-AC	77	TR24-06-9126	Tj, VR	JESD22-A108	0% failure at 1008 hours
			TPSMA6L85A	DO221-AC	77	TR24-06-9126			
			TPSMA6L7.5A	DO221-AC	77	TR24-02-6985			
			TPSMA6L12A	DO221-AC	77	TR24-02-6985			
			TPSMA6L40A	DO221-AC	77	TR24-02-6985			
	Biased Temp & Humidity (H3TRB)		TPSMA6L5.0A	DO221-AC	77	TR24-06-9126	VR@85C,85%RH	JESD22-A101	0% failure at 1008 hours
			TPSMA6L85A	DO221-AC	77	TR24-06-9126			
			TPSMA6L7.5A	DO221-AC	77	TR24-02-6985			
			TPSMA6L12A	DO221-AC	77	TR24-02-6985			
			TPSMA6L40A	DO221-AC	77	TR24-02-6985			
UHASt		TPSMA6L5.0A	DO221-AC	77	TR24-06-9126	96 hours at TA=130°C/85%RH.	EIA/JESD22-A102B	0% failure at 96 hours	
		TPSMA6L85A	DO221-AC	77	TR24-06-9126				

		TPSMA6L7.5A	DO221-AC	77	TR24-02-6985				
		TPSMA6L12A	DO221-AC	77	TR24-02-6985				
		TPSMA6L40A	DO221-AC	77	TR24-02-6985				
	Temp Cycle		TPSMA6L5.0A	DO221-AC	77	TR24-06-9126	-55°C&150°C (air to air)	JESD22- A104	0% failure at 1000 cycles
			TPSMA6L85A	DO221-AC	77	TR24-06-9126			
			TPSMA6L7.5A	DO221-AC	77	TR24-02-6985			
			TPSMA6L12A	DO221-AC	77	TR24-02-6985			
			TPSMA6L40A	DO221-AC	77	TR24-02-6985			
	Resistance to Solder Heat (RSH)		TPSMA6L5.0A	DO221-AC	30	TR24-06-9126	260°C, 10 seconds	JESD22- B106	0% failure after RSH
			TPSMA6L85A	DO221-AC	30	TR24-06-9126			
			TPSMA6L7.5A	DO221-AC	30	TR24-02-6985			
			TPSMA6L12A	DO221-AC	30	TR24-02-6985			
			TPSMA6L40A	DO221-AC	30	TR24-02-6985			
	MSL		TPSMA6L5.0A	DO221-AC	22	TR24-06-9126	260C/Steam	J-STD-020	0% failure at MSL Level 1
			TPSMA6L85A	DO221-AC	22	TR24-06-9126			
TPSMA6L7.5A			DO221-AC	22	TR24-02-6985				
TPSMA6L12A			DO221-AC	22	TR24-02-6985				
TPSMA6L40A			DO221-AC	22	TR24-02-6985				

MTBF Calculation

Estimate of Failure Rate, MTBF, FITS for a Given Operation Temperature (**See note**)

150C product

Temp °C	% FR/khrs	MTBF (K)	FITS
30	0.00000760	13163061.53	0.076
60	0.00023856	419175.11	2.386
80	0.00171509	58306.01	17.151
100	0.00998019	10019.85	99.802
125	0.07033148	1421.84	703.315
150	0.39351454	254.12	3935.145



175C product

Temp °C	% FR/khrs	MTBF (K)	FITS
30	0.0000016	60776642.58	0.016
60	0.0000517	1935420.24	0.517
80	0.0003715	269211.18	3.715
100	0.0021615	46263.76	21.615
125	0.0152325	6564.93	152.325
175	0.3935145	254.12	3935.145

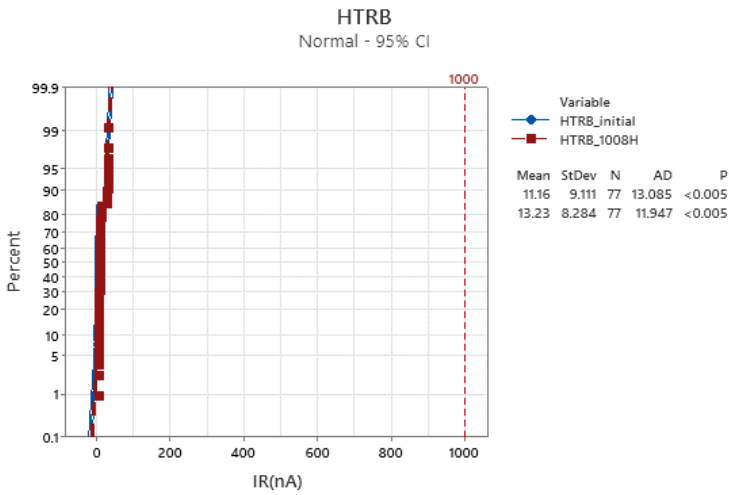
Note: The **Mean-Time-Between-Failure** (MTBF) in hours and the percent failure rate per 1000 hours (%FR/khr) are computed at a 60% confidence level using the chi square method and the Arrhenius derating model for various junction operating temperatures. For the calculations, a value of 1 eV was used for the activation energy.

7.0 Electrical Characteristic Summary:

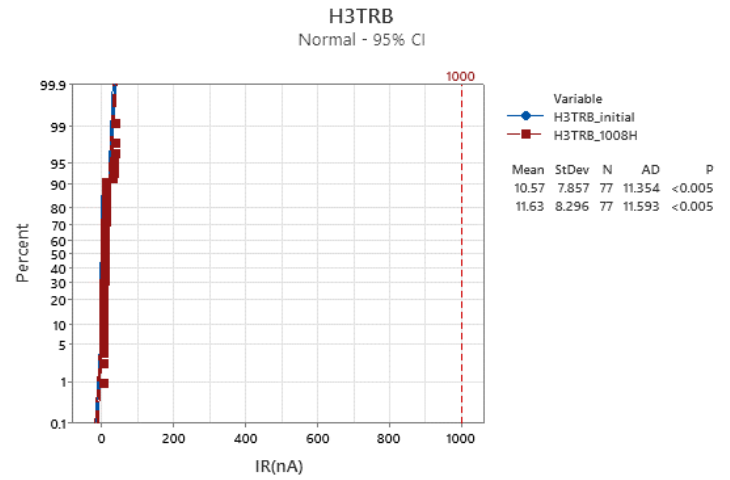
There is no change in electrical characteristics. Characterization data is available upon request.

TPSMB17A-VR

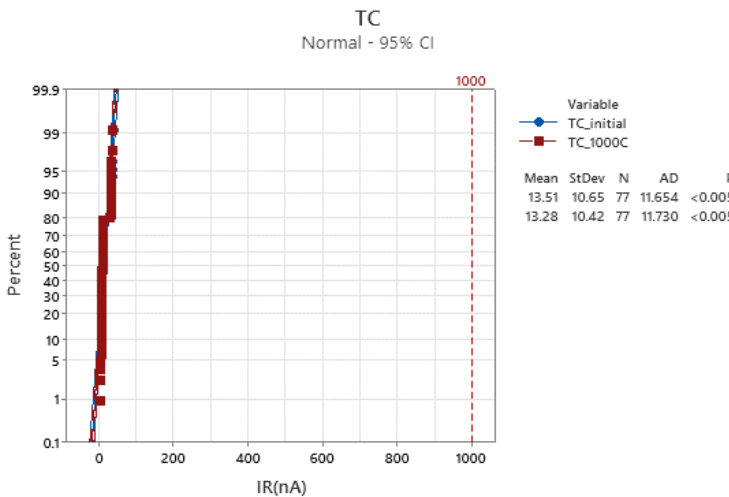
HTRB 1008hrs



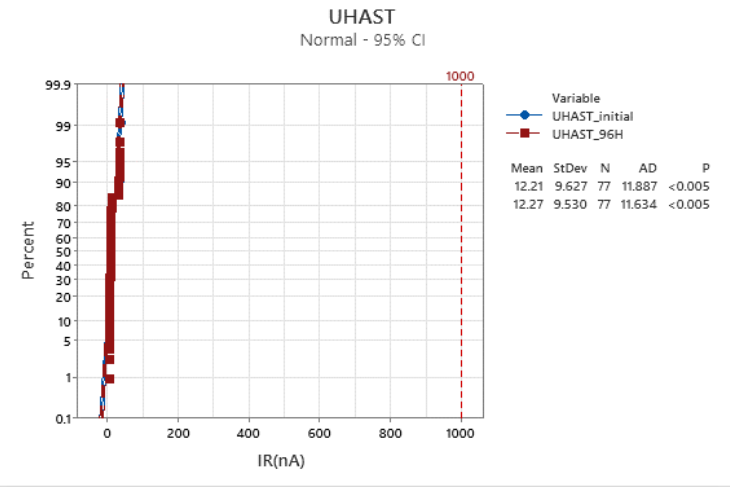
H3TRB 1008hrs



TC 1000cycles

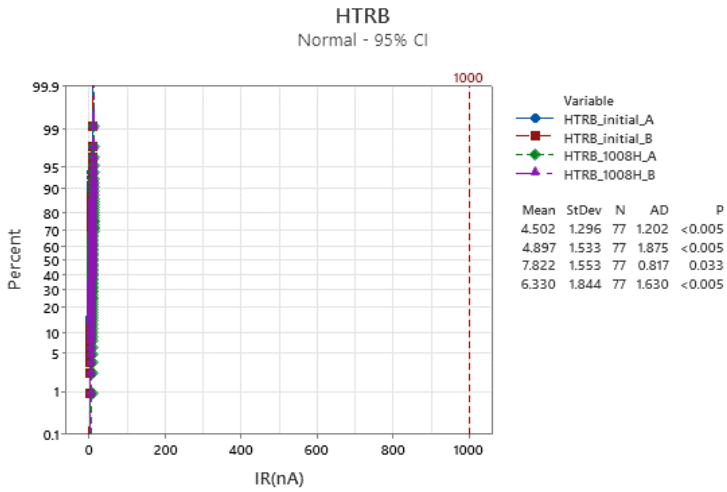


UHAST 96hrs

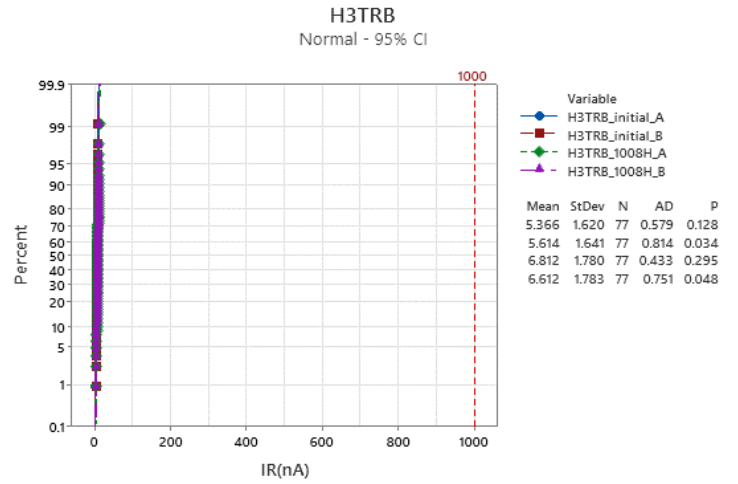


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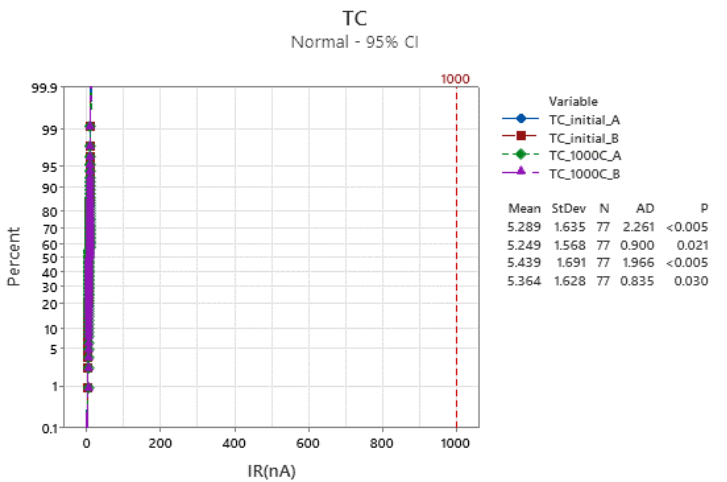
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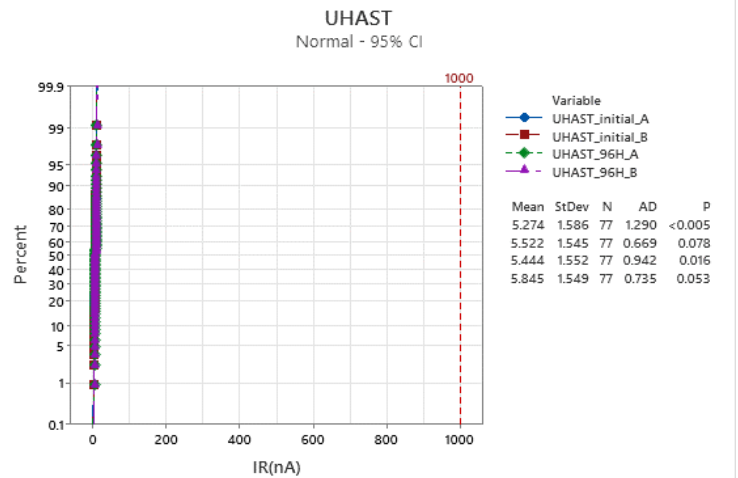
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TC 1000cycles



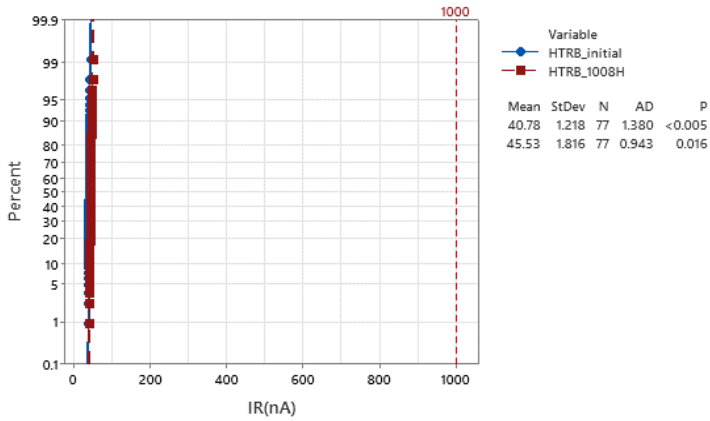
UHASt 96hrs



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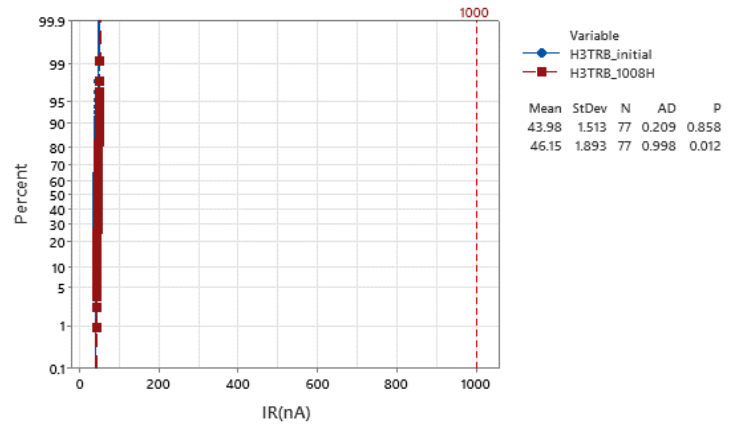
HTRB 1008hrs

HTRB
Normal - 95% CI



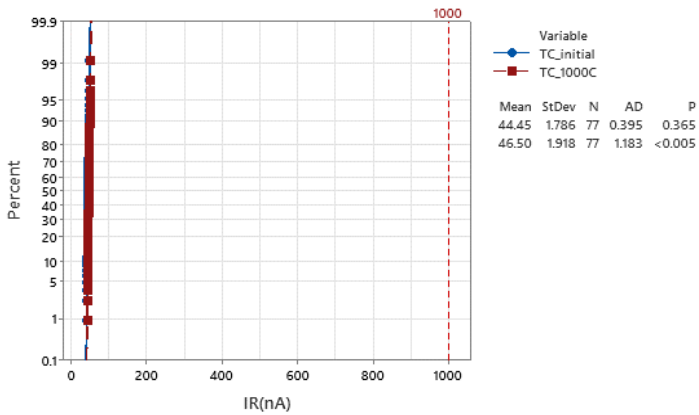
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H3TRB
Normal - 95% CI



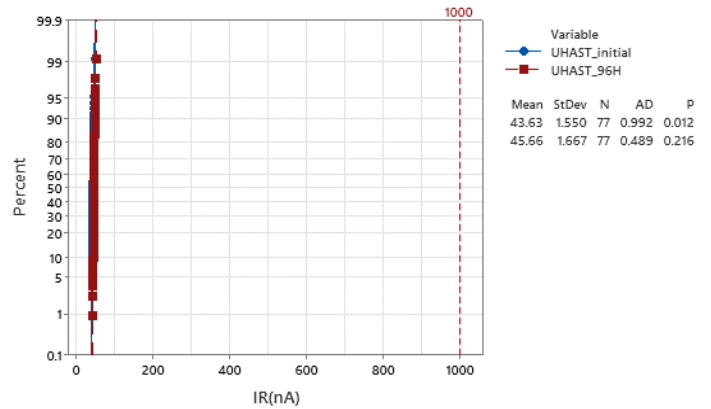
TC 1000cycles

TC
Normal - 95% CI



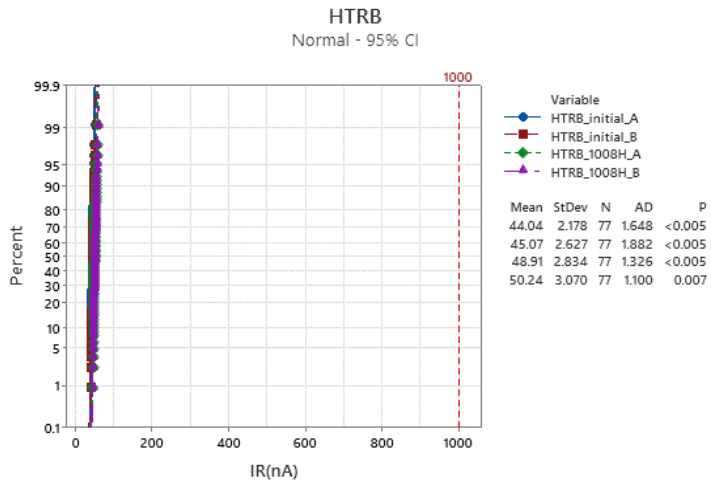
UHASt 96hrs

UHASt
Normal - 95% CI

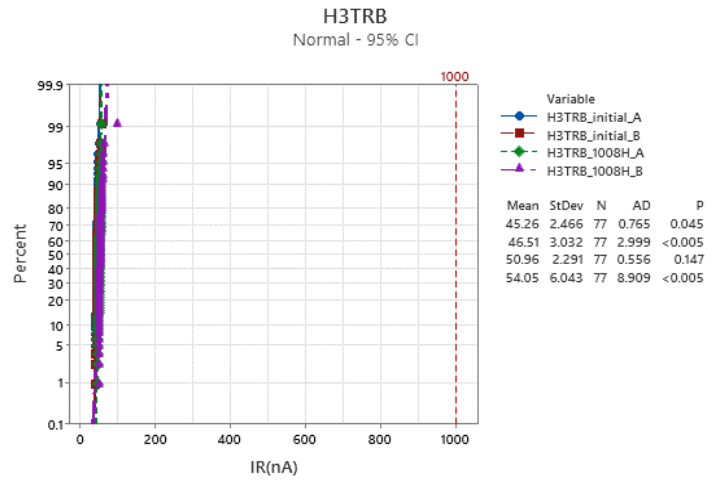


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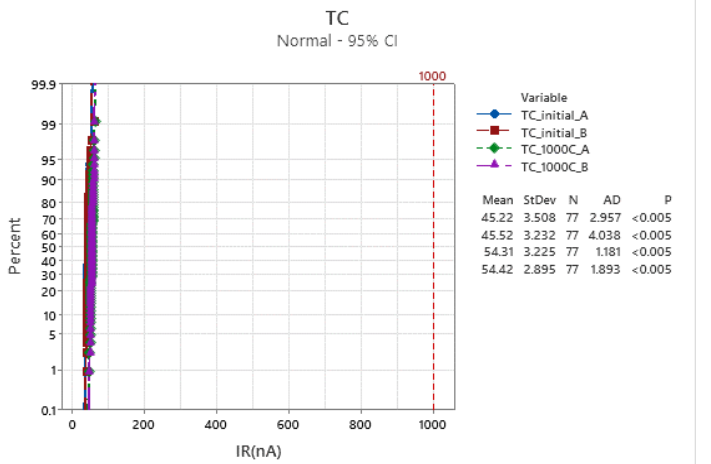
HTRB 1008hrs



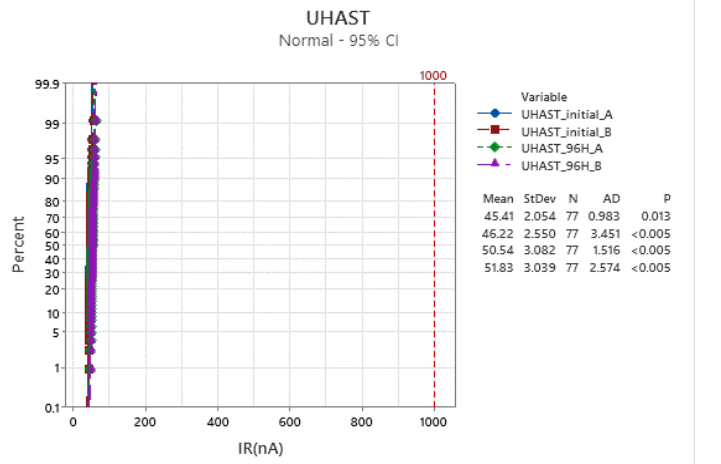
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TC 1000cycles

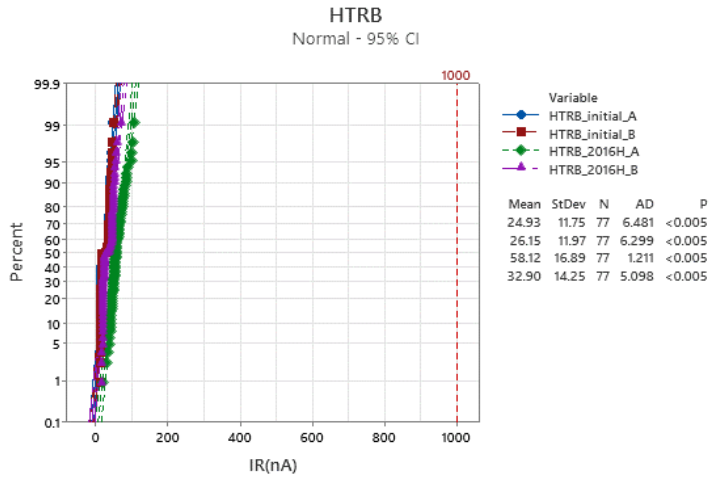


UHASt 96hrs

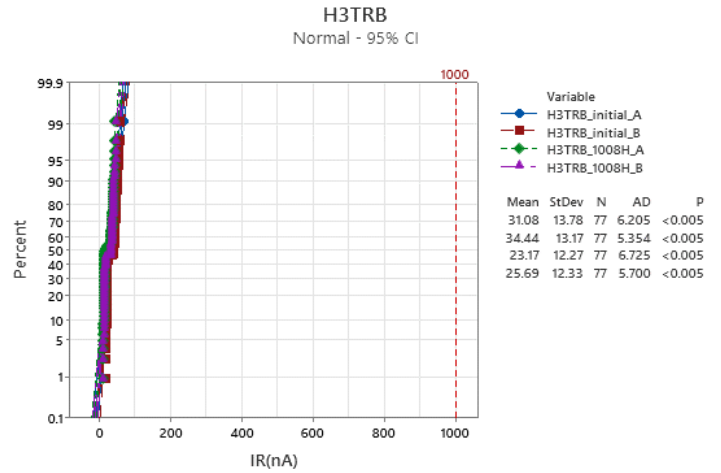


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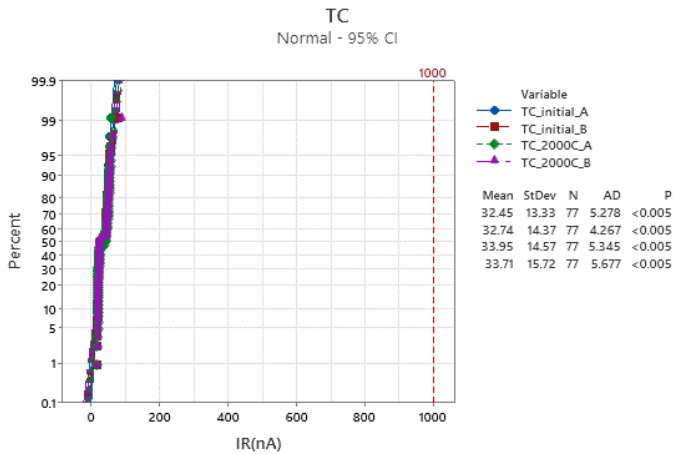
HTRB 1008hrs



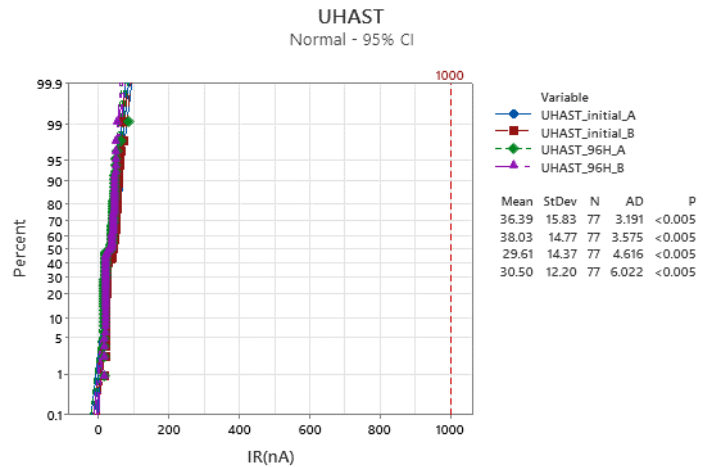
H3TRB 1008hrs



TC 1000cycles

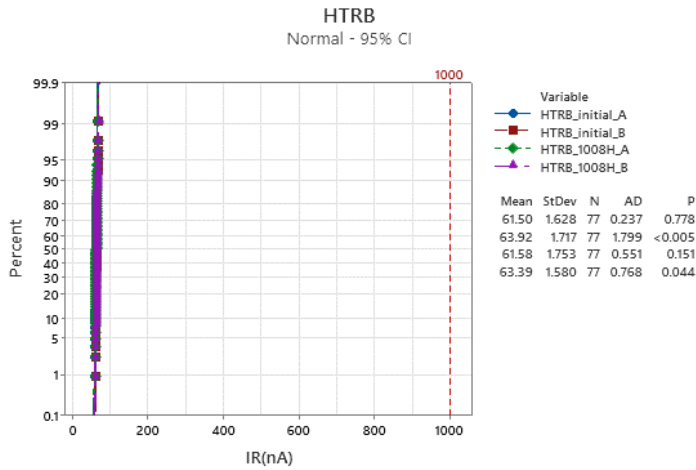


UHASt 96hrs

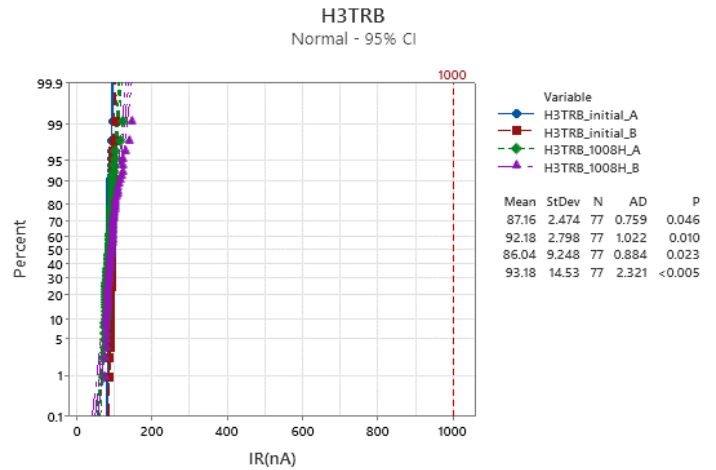


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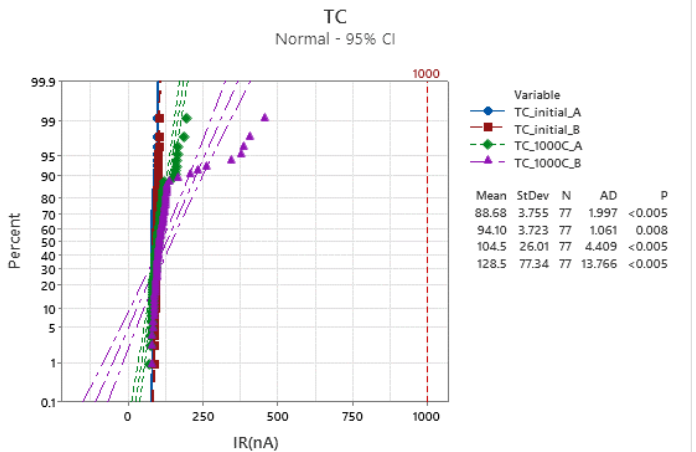
HTRB 1008hrs



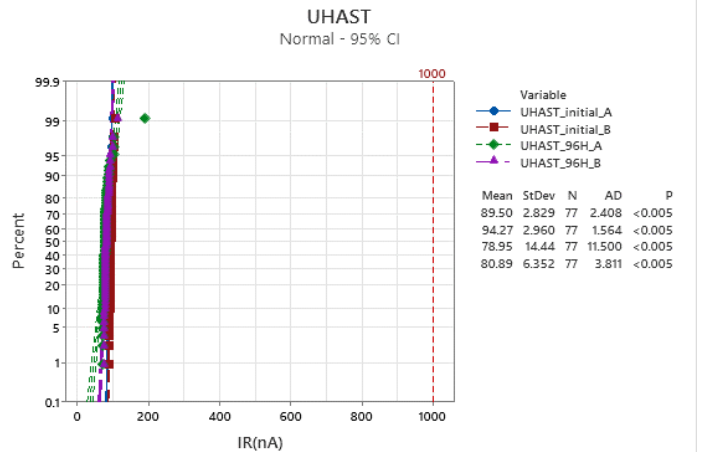
H3TRB 1008hrs



TC 1000cycles



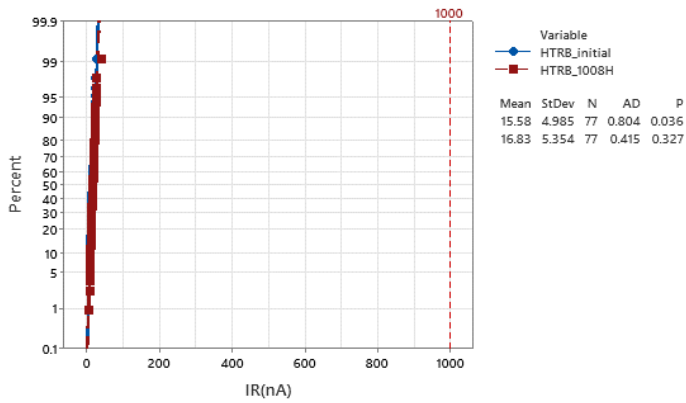
UHASt 96hrs



TPSMC20A

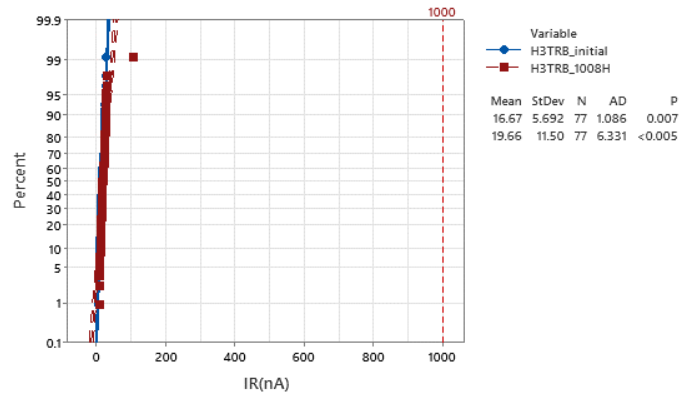
HTRB 1008hrs

HTRB
Normal - 95% CI



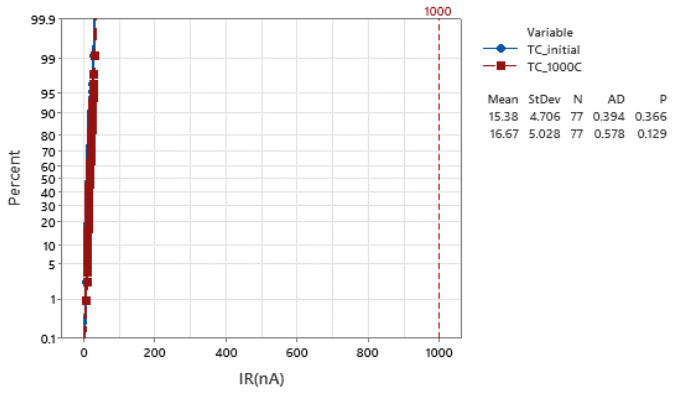
H3TRB 1008hrs

H3TRB
Normal - 95% CI



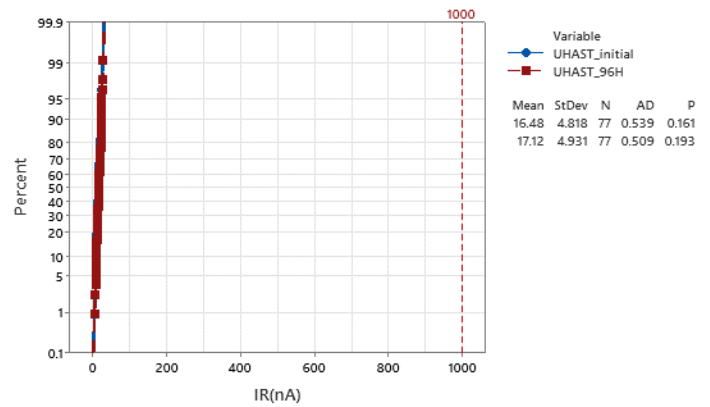
TC 1000cycles

TC
Normal - 95% CI



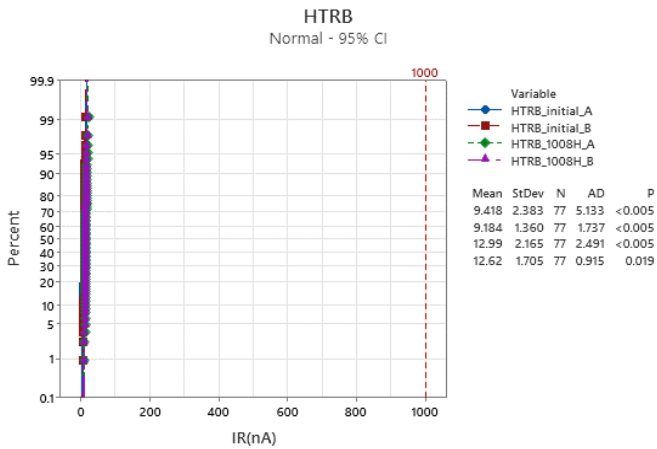
UHASt 96hrs

UHASt
Normal - 95% CI

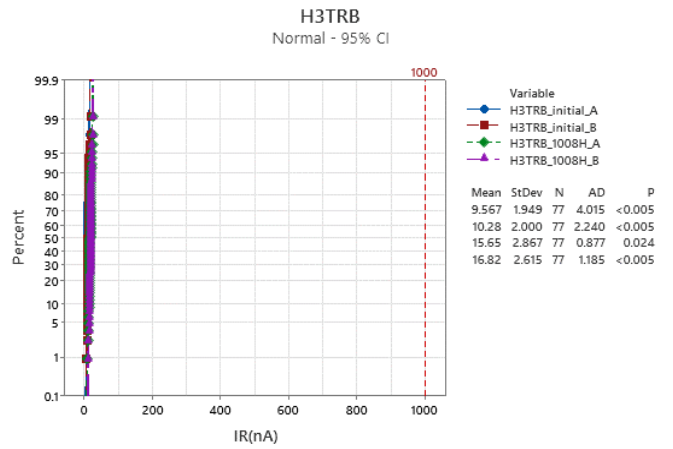


TPSMC43CA

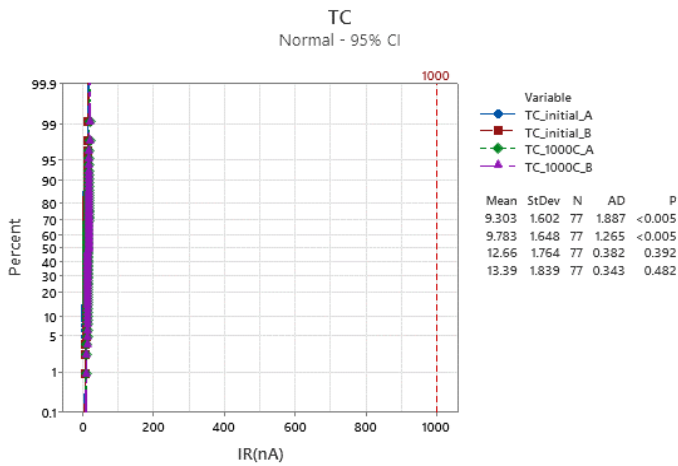
HTRB 1008hrs



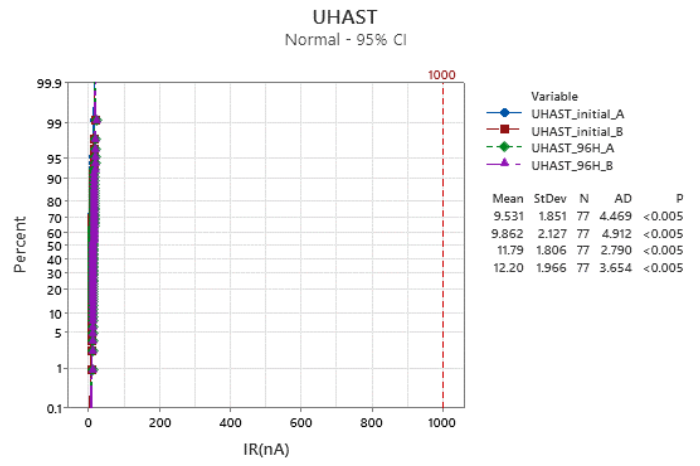
H3TRB 1008hrs



TC 1000cycles

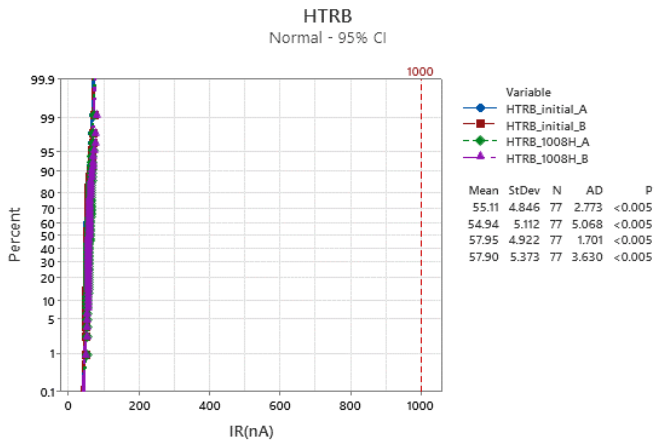


UHASt 96hrs

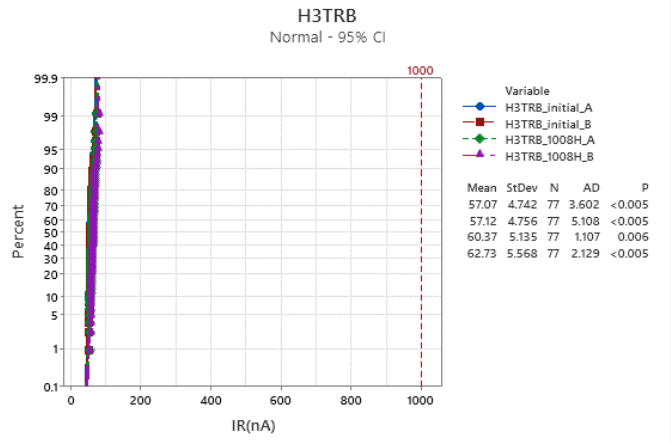


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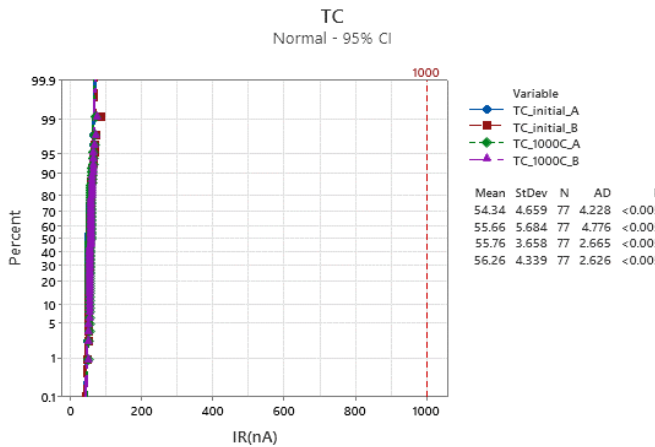
HTRB 1008hrs



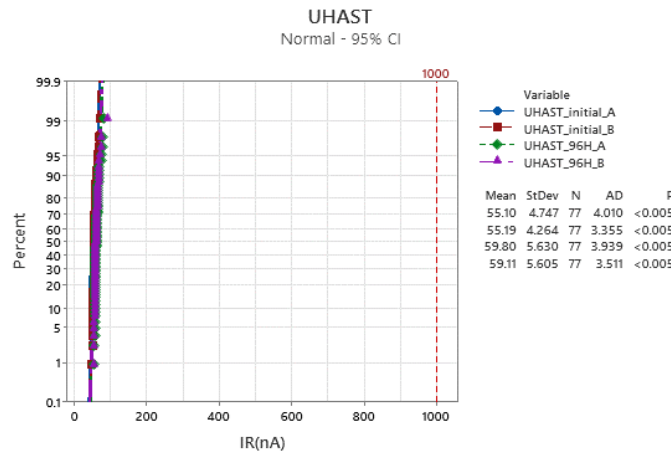
H3TRB 1008hrs



TC 1000cycles

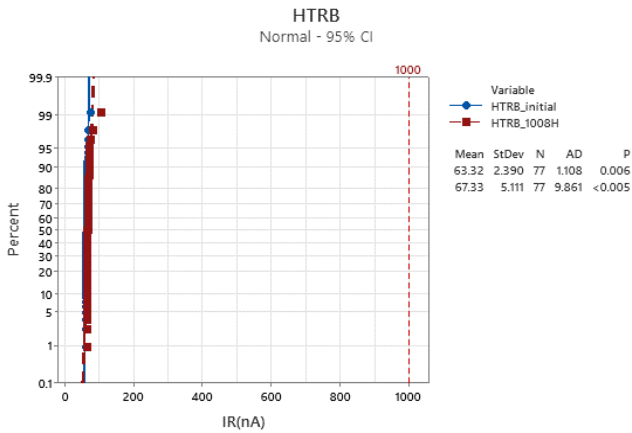


UHAST 96hrs

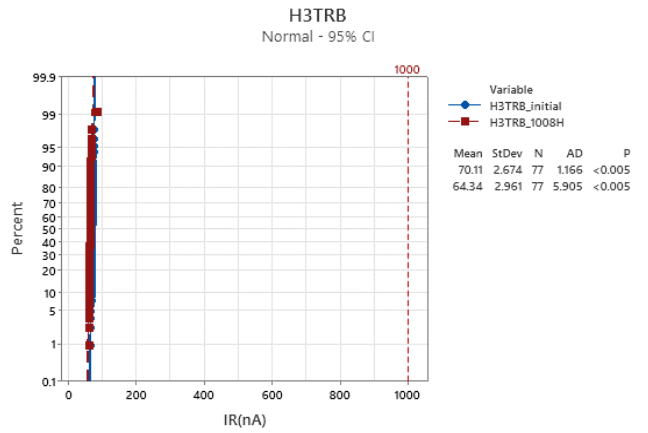


SMCJ200A-JD

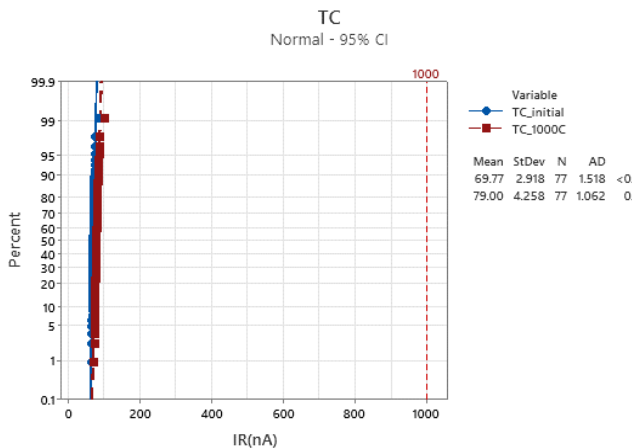
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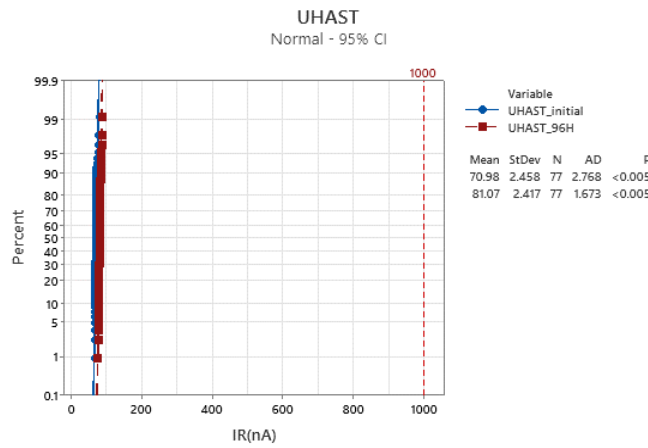
H3TRB 1008hrs



TC 1000cycles

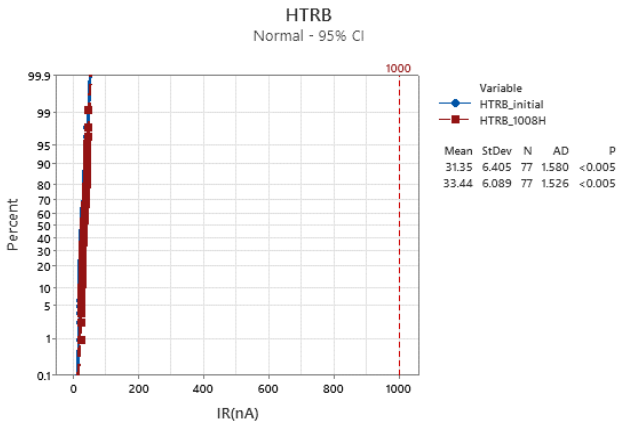


UHASt 96hrs

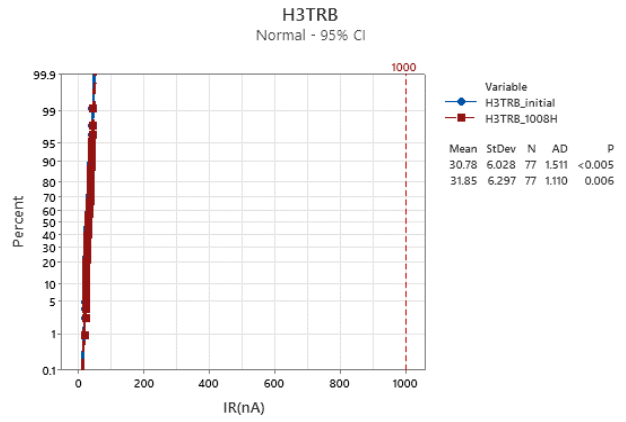


TPSMD17A

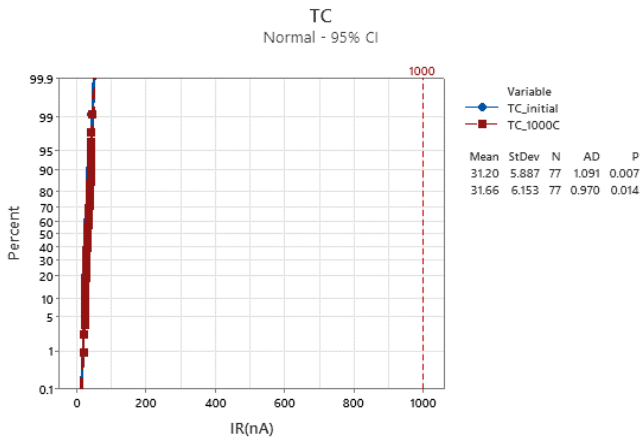
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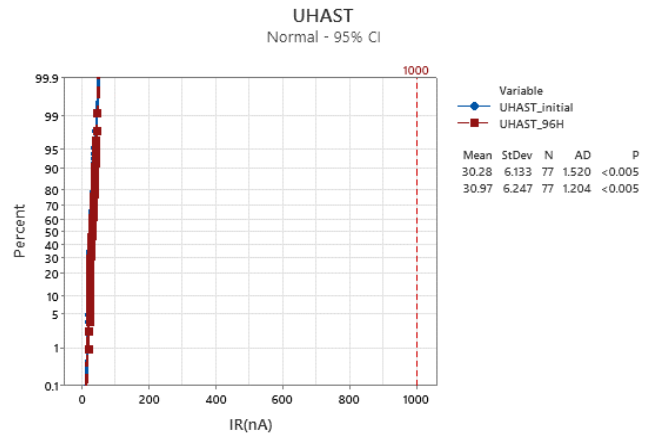
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TC 1000cycles

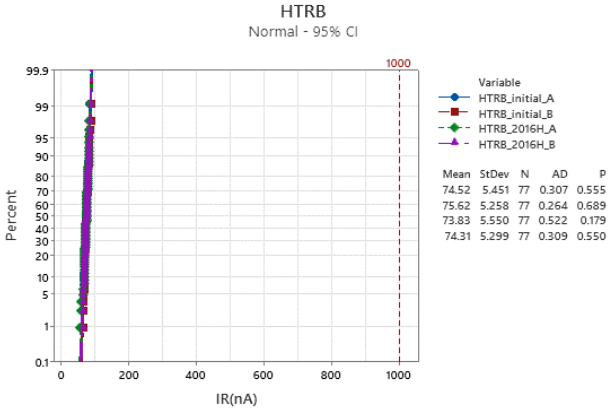


UHASt 96hrs

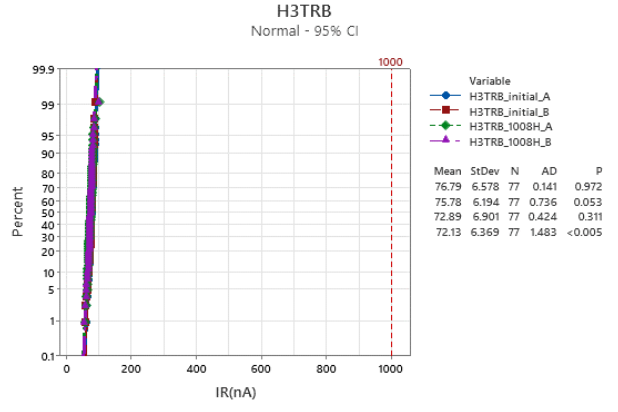


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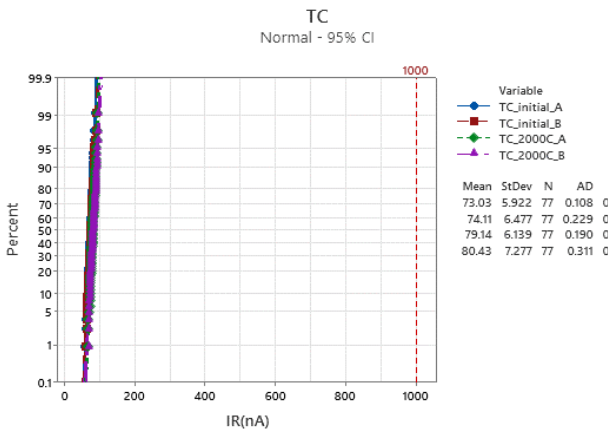
HTRB 1008hrs



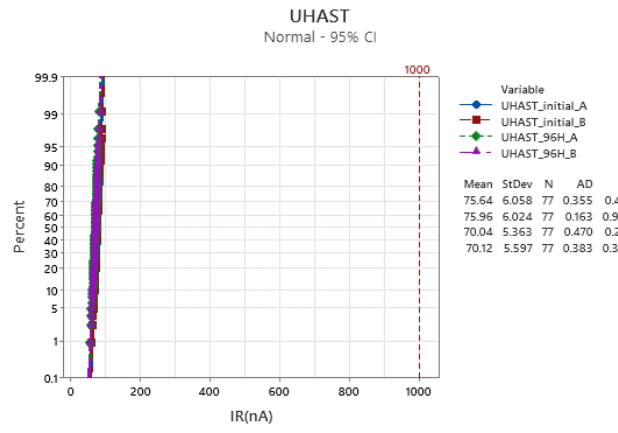
H3TRB 1008hrs



TC 1000cycles

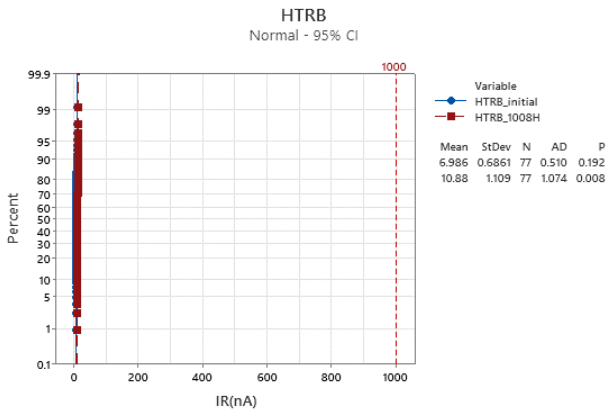


UHAST 96hrs

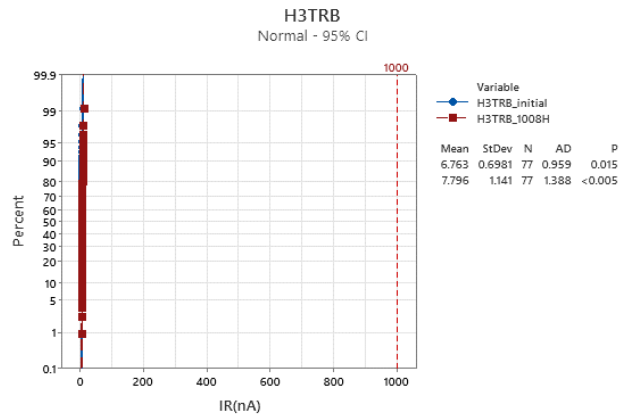


TPSMD43A

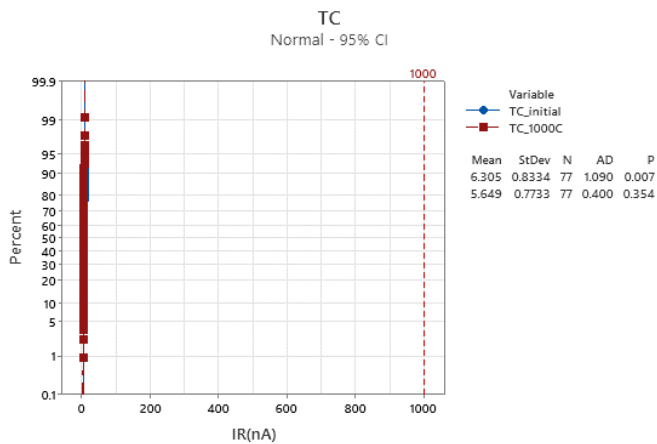
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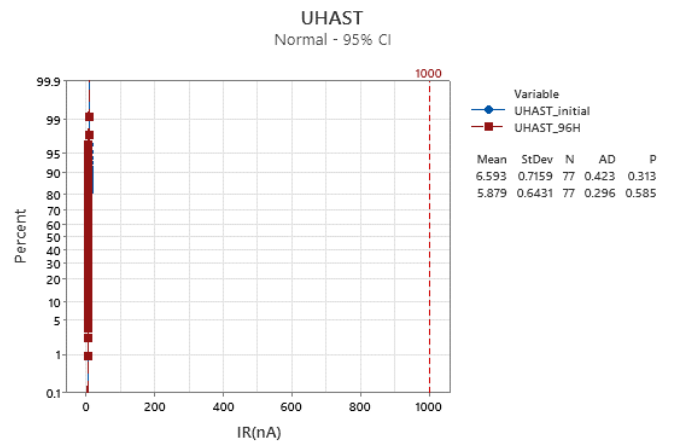
H3TRB 1008hrs



TC 1000cycles



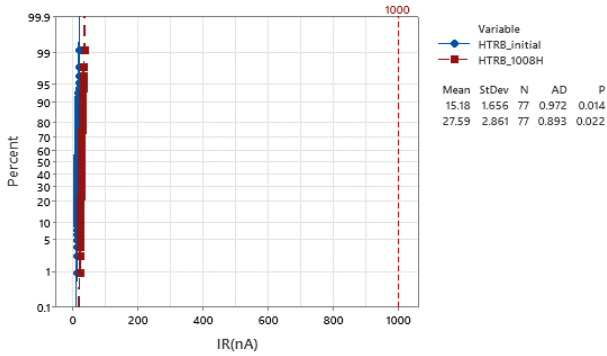
UHASt 96hrs



TPSMD85A

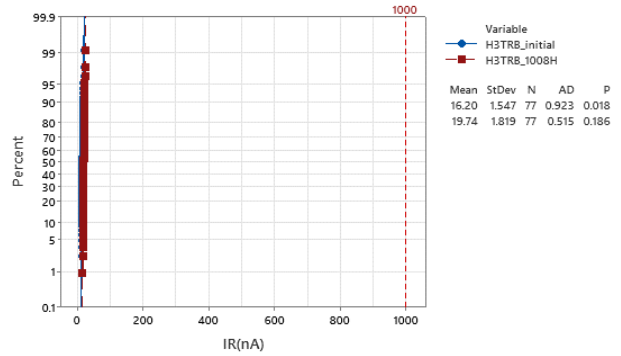
HTRB 1008hrs

HTRB
Normal - 95% CI



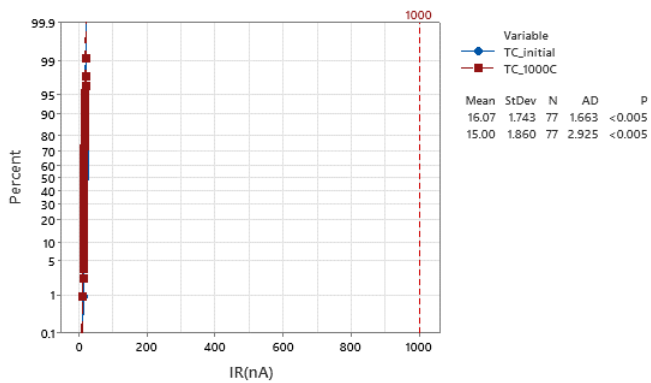
H3TRB 1008hrs

H3TRB
Normal - 95% CI



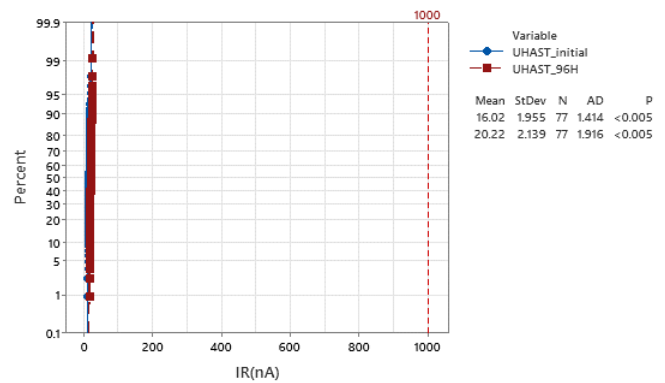
TC 1000cycles

TC
Normal - 95% CI



UHASt 96hrs

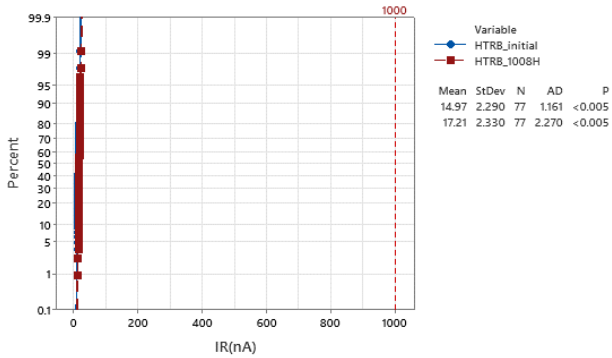
UHASt
Normal - 95% CI



SLD5S24A

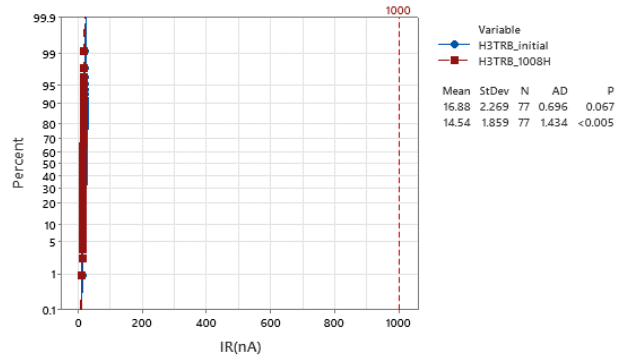
HTRB 1008hrs

HTRB
Normal - 95% CI



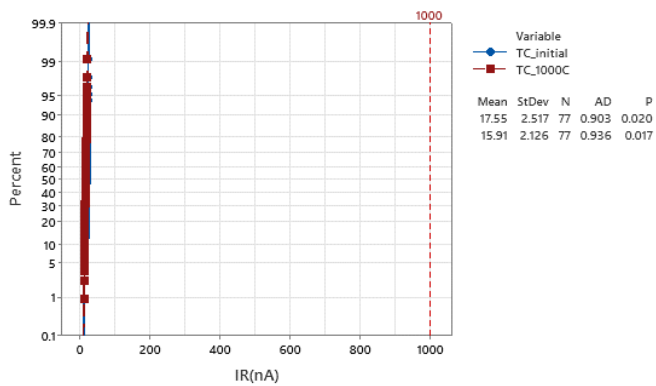
H3TRB 1008hrs

H3TRB
Normal - 95% CI



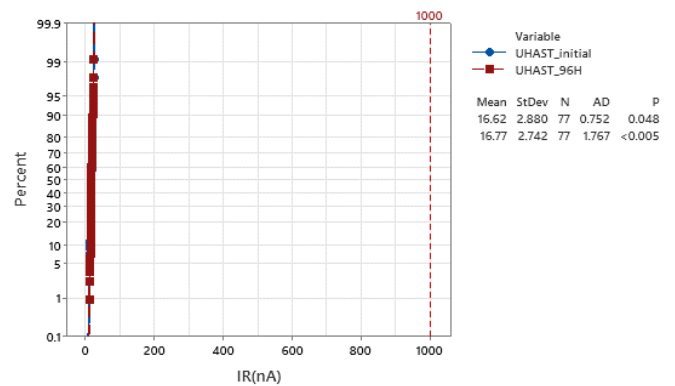
TC 1000cycles

TC
Normal - 95% CI



UHAST 96hrs

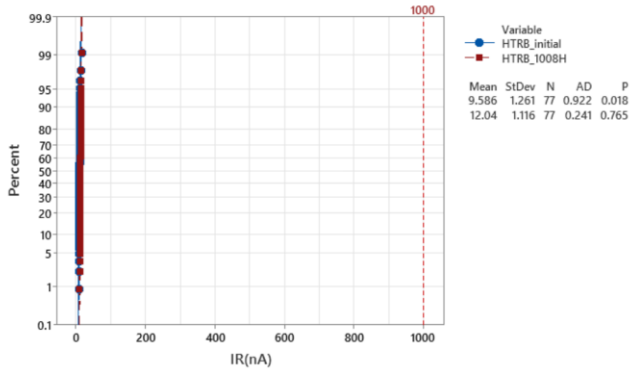
UHAST
Normal - 95% CI



SLD5S40A

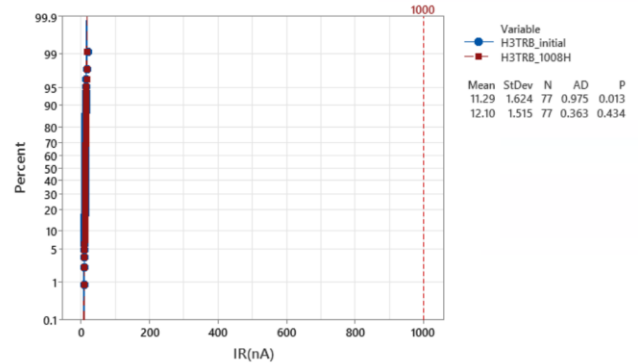
HTRB 1008hrs

HTRB
Normal - 95% CI



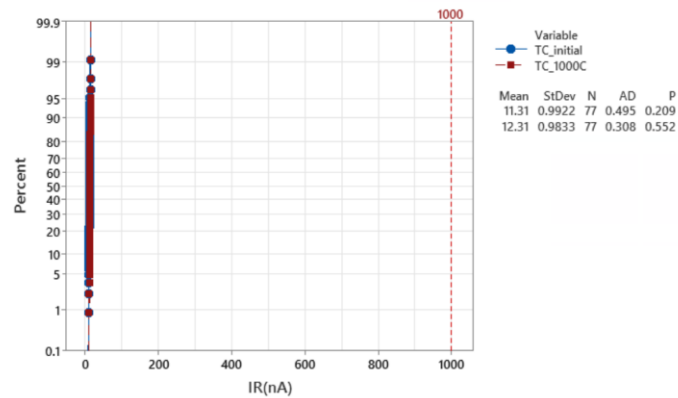
H3TRB 1008hrs

H3TRB
Normal - 95% CI



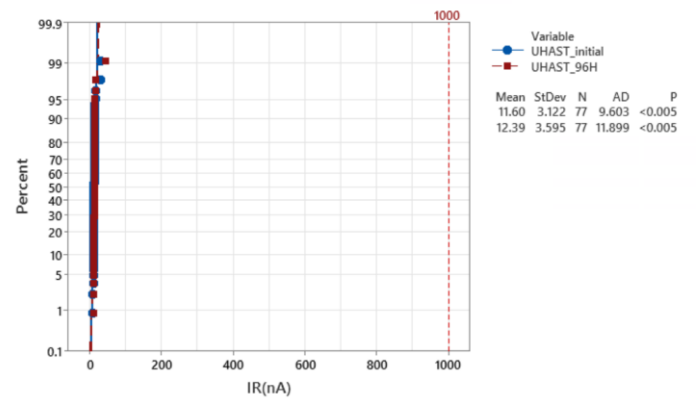
TC 1000cycles

TC
Normal - 95% CI



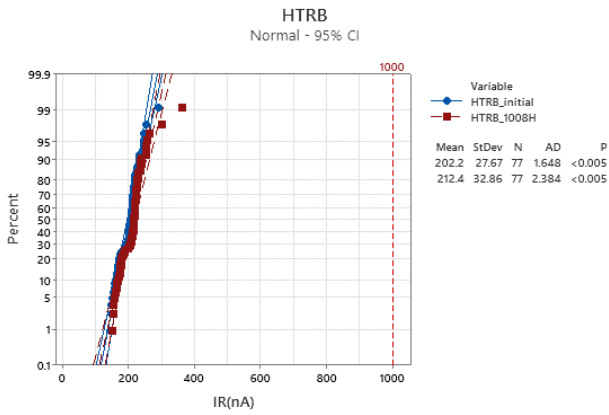
UHASt 96hrs

UHASt
Normal - 95% CI

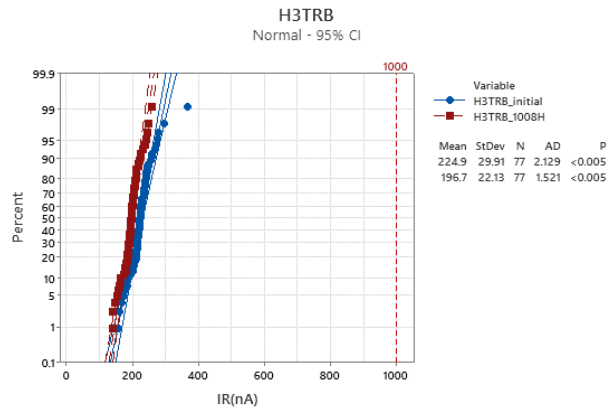


SLD6S14A

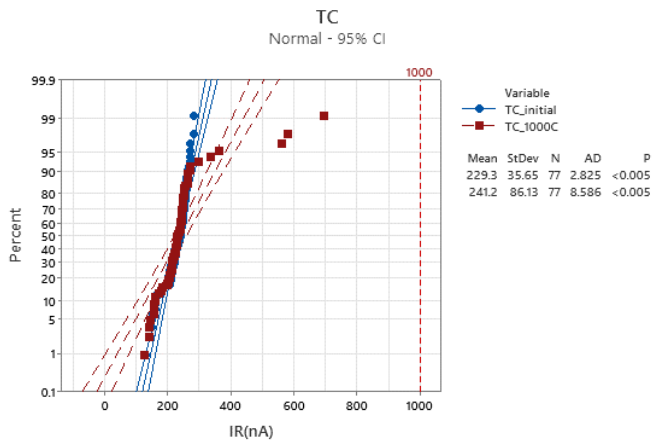
HTRB 1008hrs



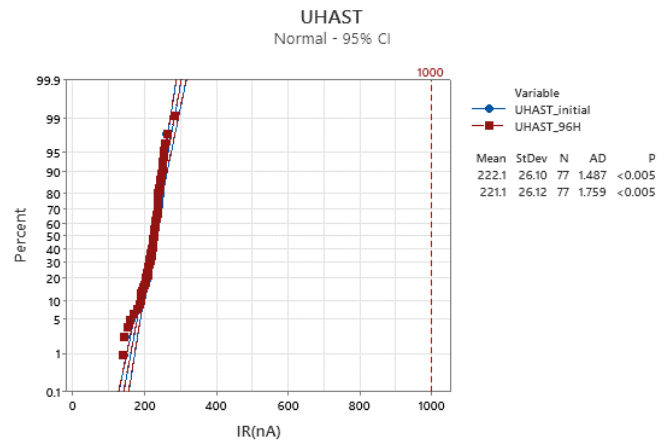
H3TRB 1008hrs



TC 1000cycles

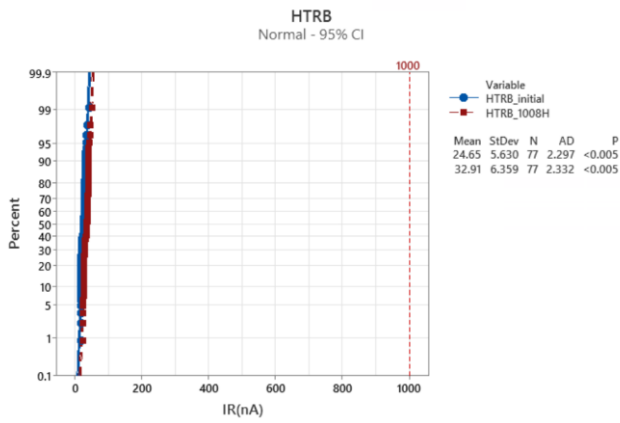


UHAST 96hrs

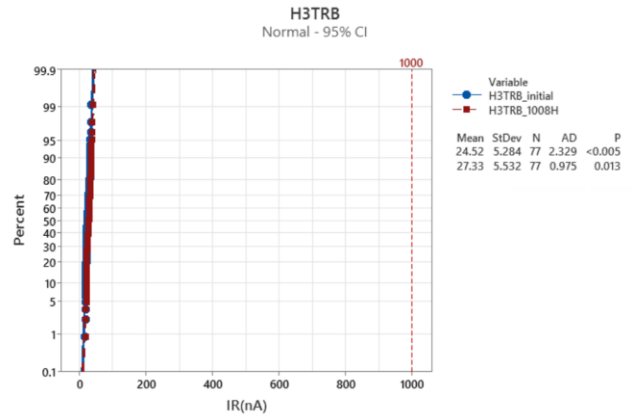


SLD6S57A

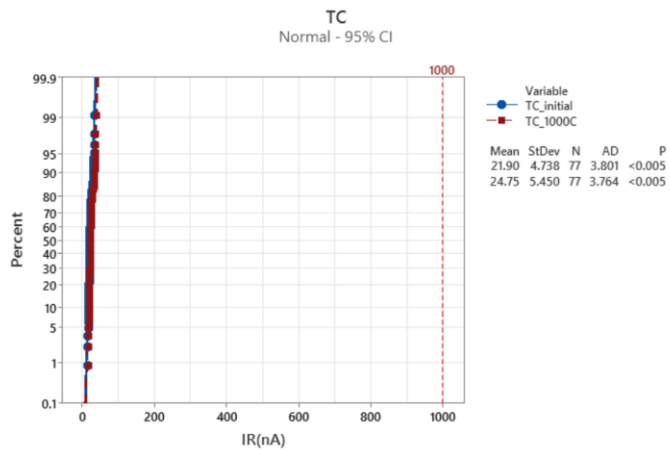
HTRB 1008hrs



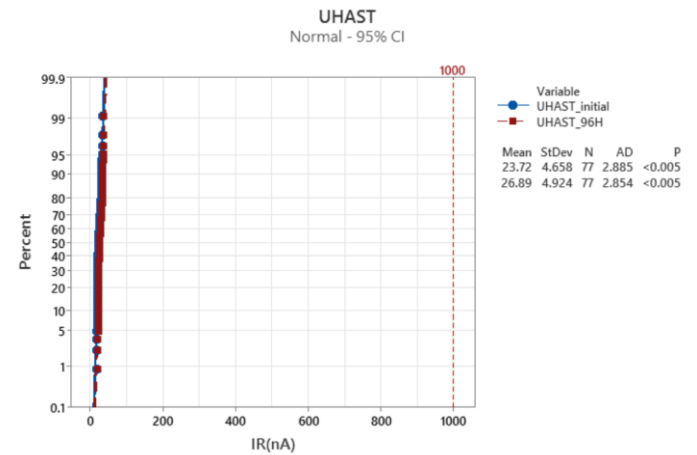
H3TRB 1008hrs



TC 1000cycles

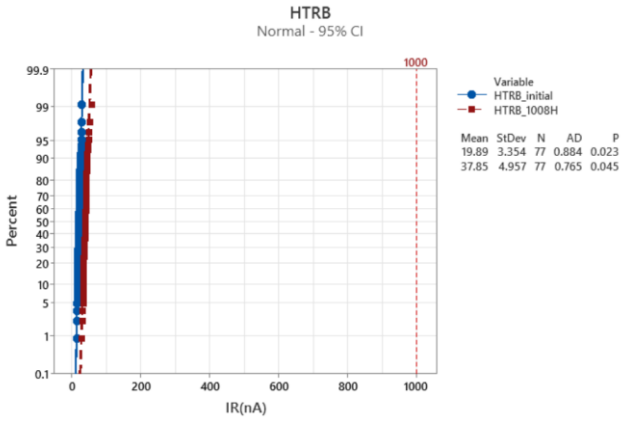


UHAST 96hrs

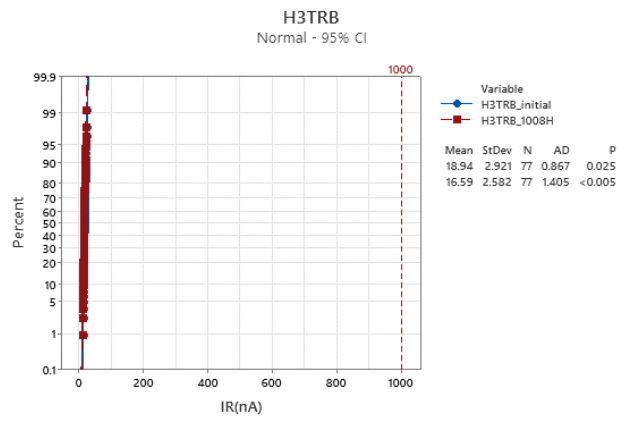


SLD8S64A

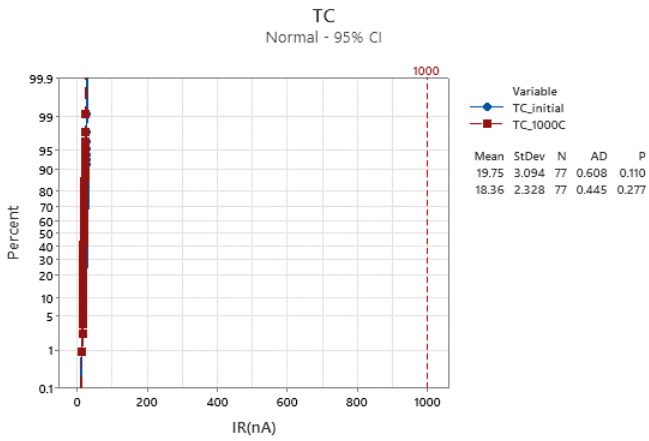
HTRB 1008hrs



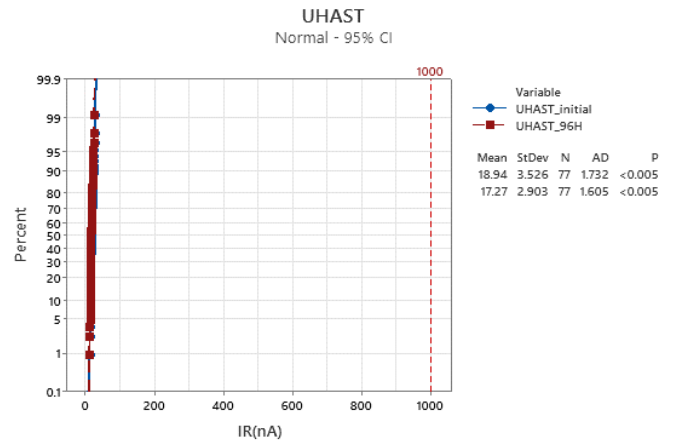
H3TRB 1008hrs



TC 1000cycles

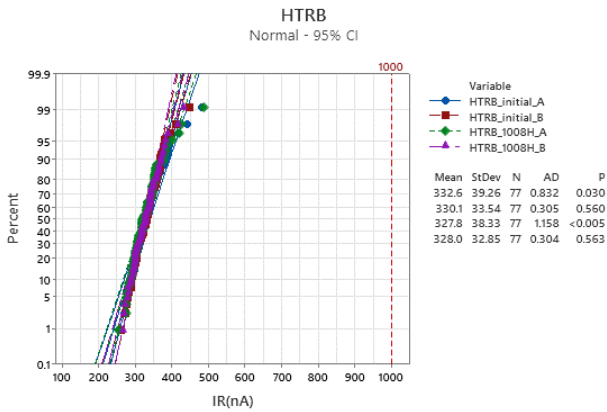


UHASt 96hrs

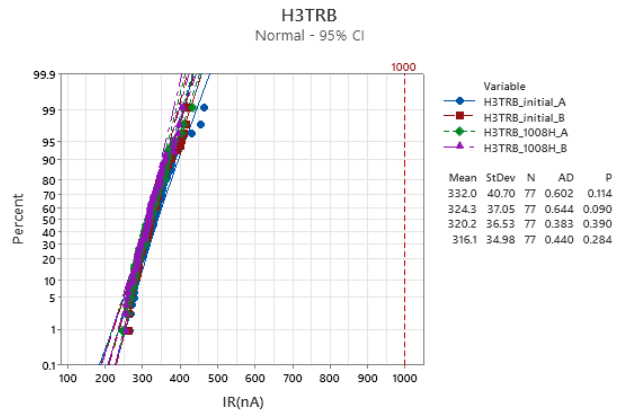


SLD10-018

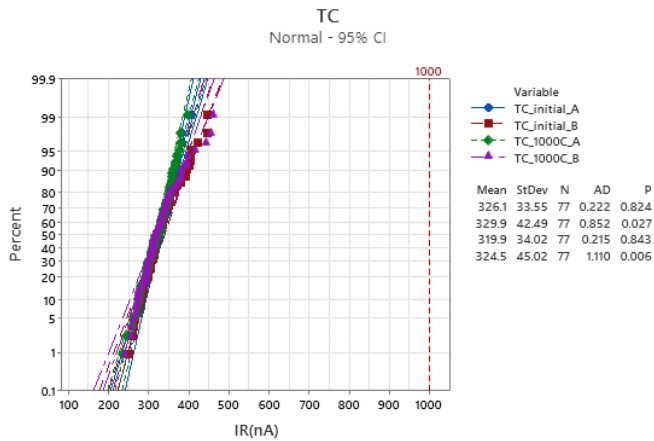
HTRB 1008hrs



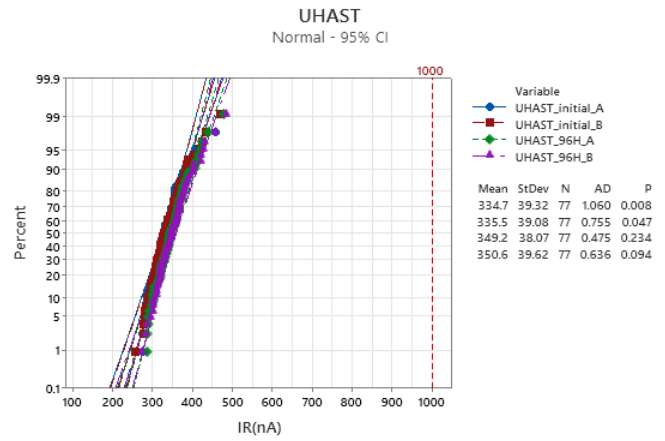
H3TRB 1008hrs



TC 1000cycles

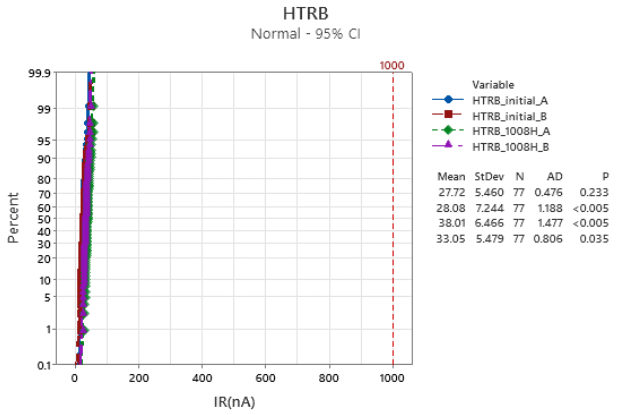


UHASt 96hrs

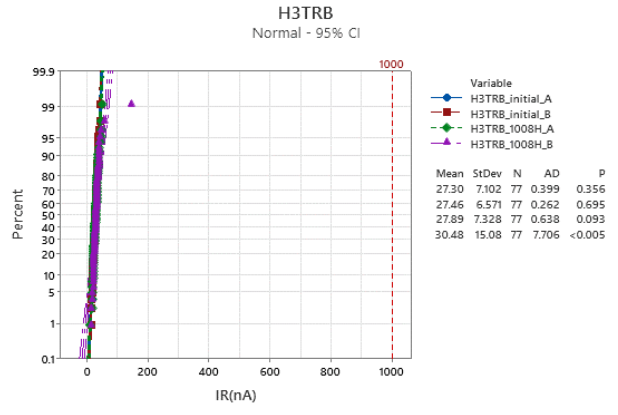


SLD33-018

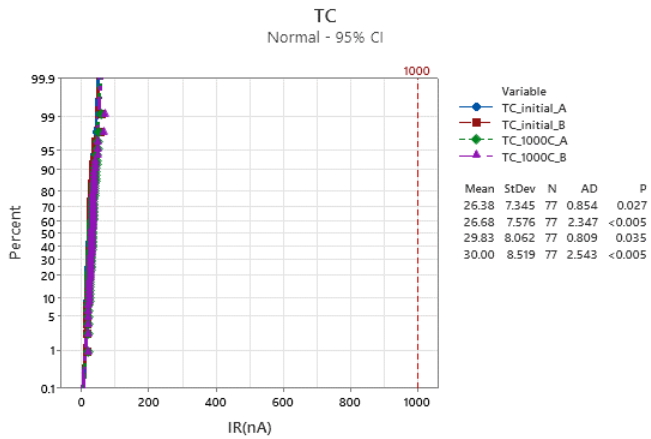
HTRB 1008hrs



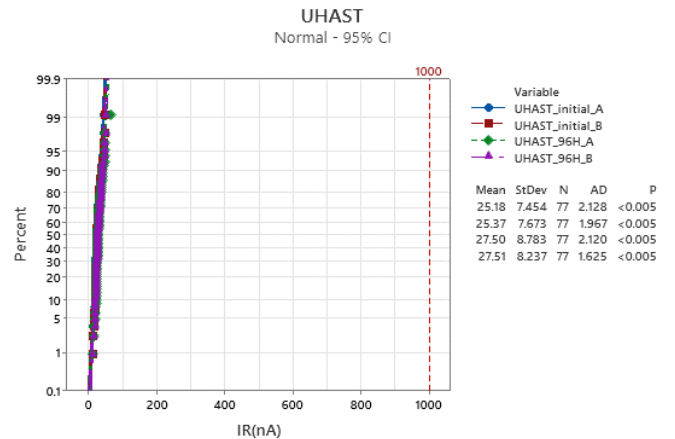
H3TRB 1008hrs



TC 1000cycles

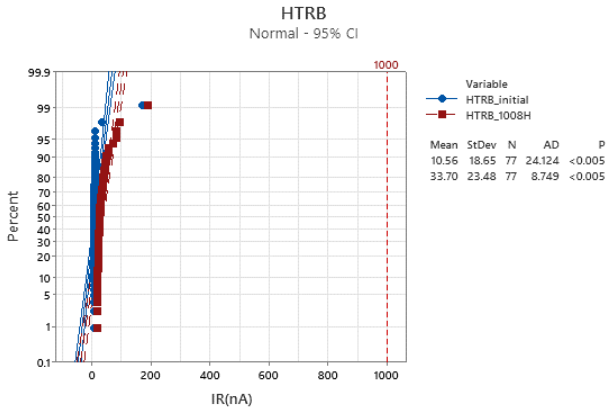


UHAST 96hrs

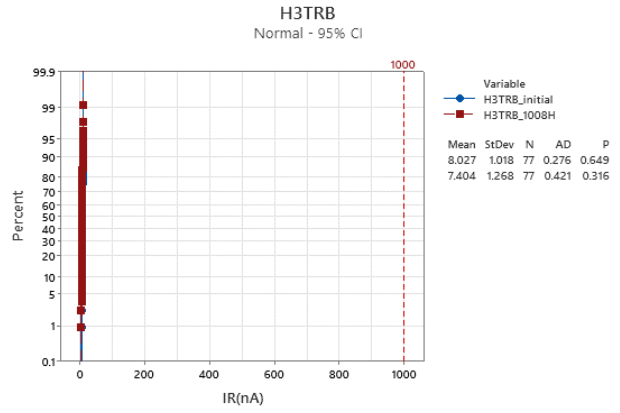


SLD33U-017

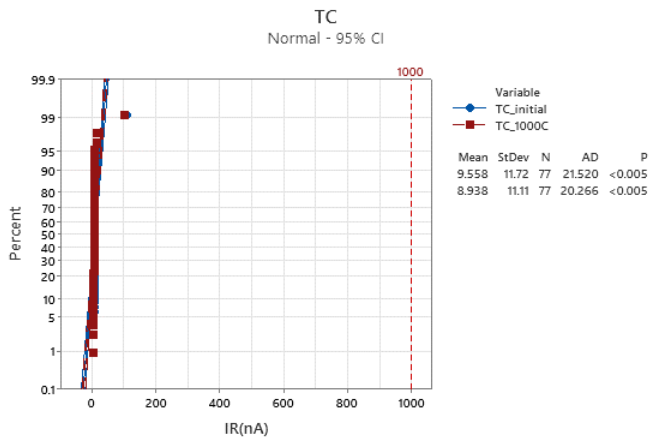
HTRB 1008hrs



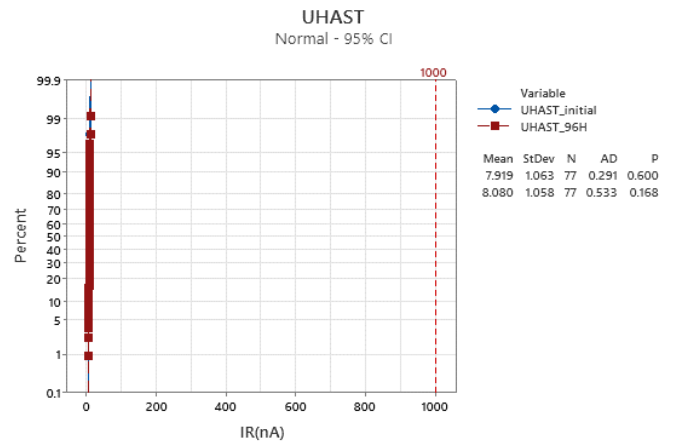
H3TRB 1008hrs



TC 1000cycles

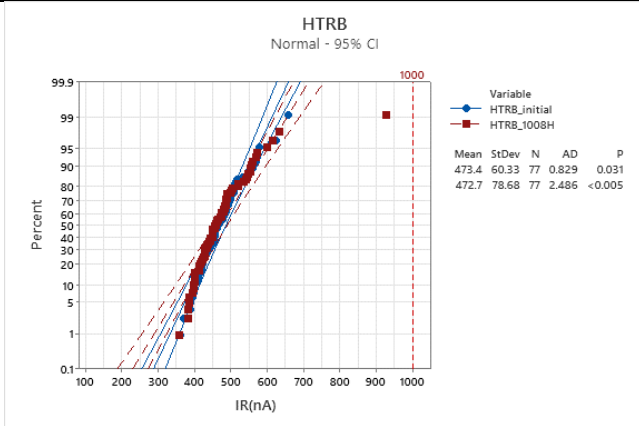


UHASt 96hrs

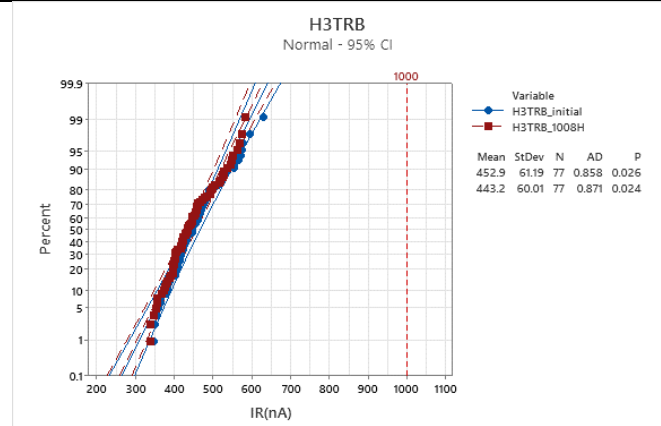


TP5KP11A

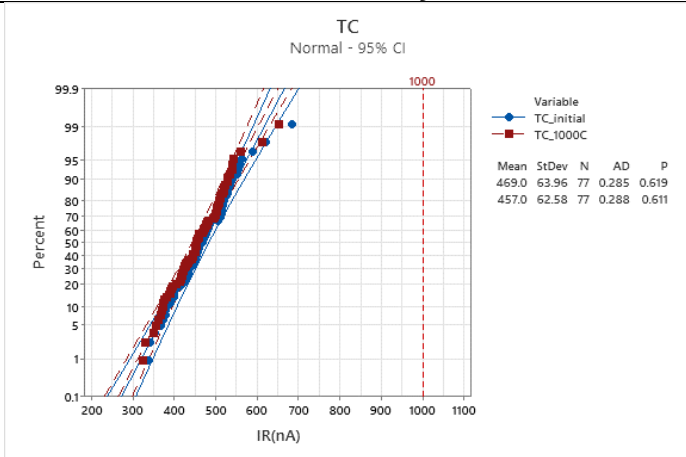
HTRB 1008hrs



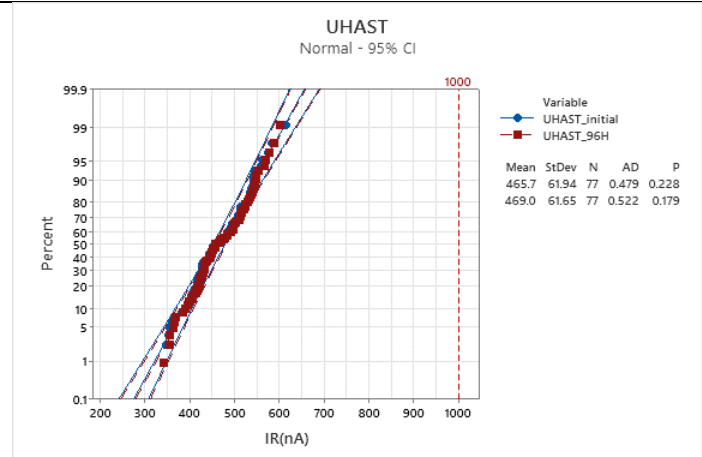
H3TRB 1008hrs



TC 1000cycles

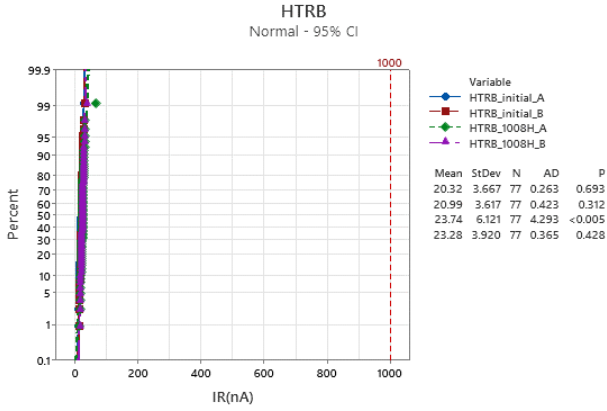


UHASt 96hrs

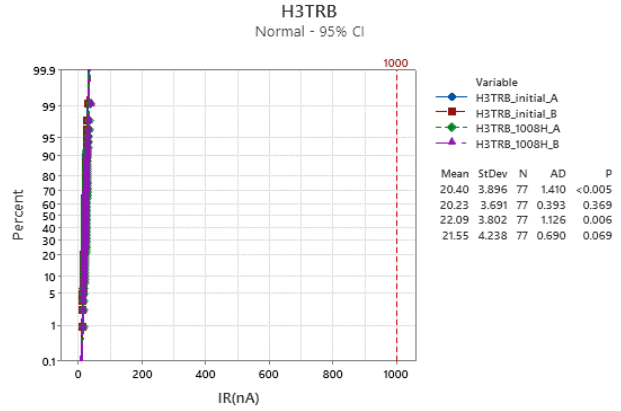


TP5KP54CA

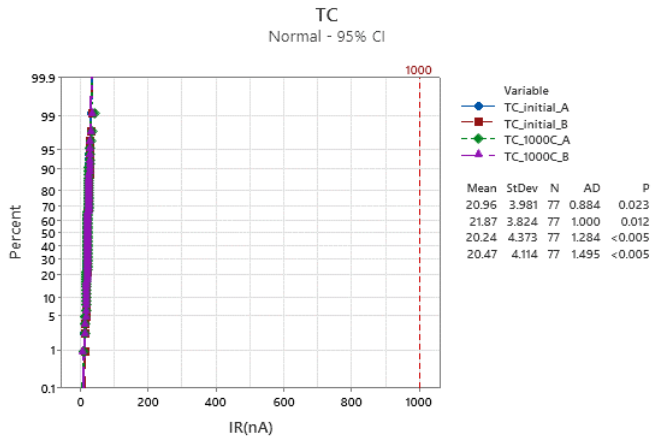
HTRB 1008hrs



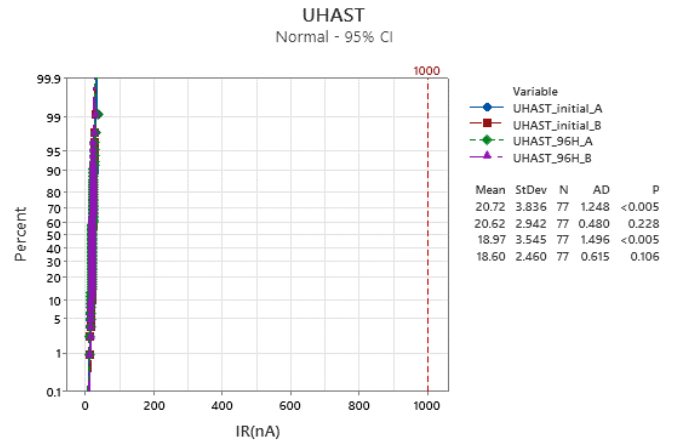
H3TRB 1008hrs



TC 1000cycles



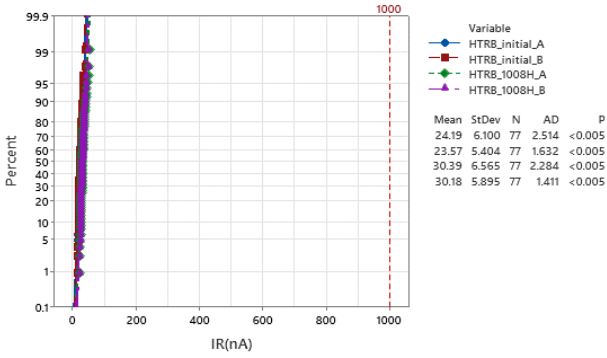
UHAST 96hrs



TP5KP64CA

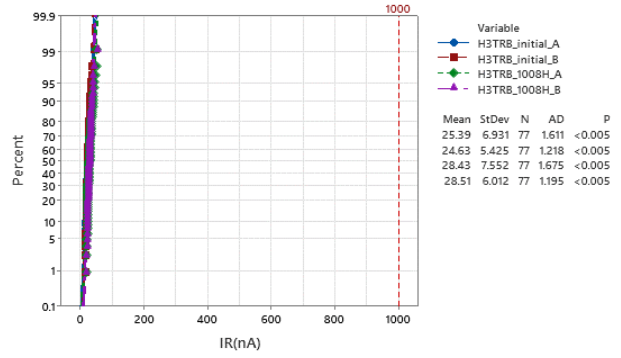
HTRB 1008hrs

HTRB
Normal - 95% CI



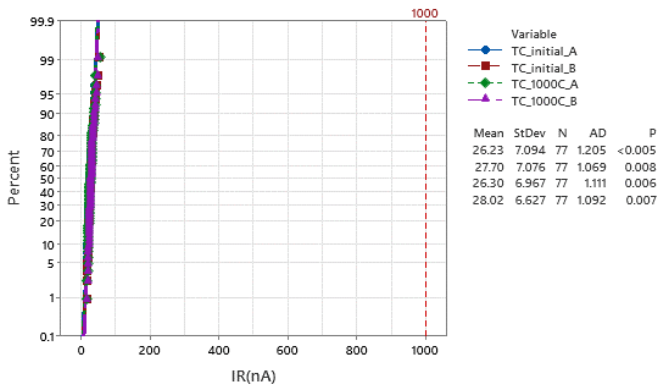
H3TRB 1008hrs

H3TRB
Normal - 95% CI



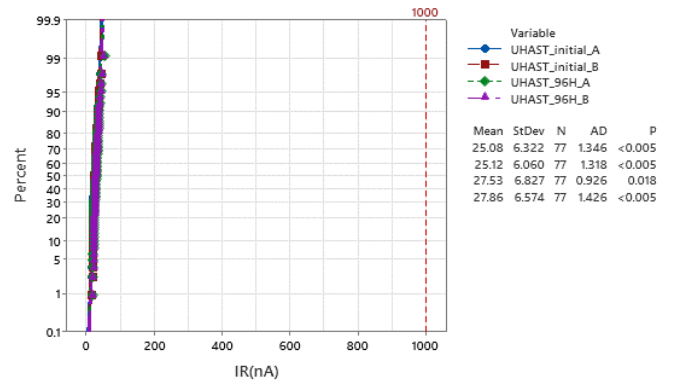
TC 1000cycles

TC
Normal - 95% CI



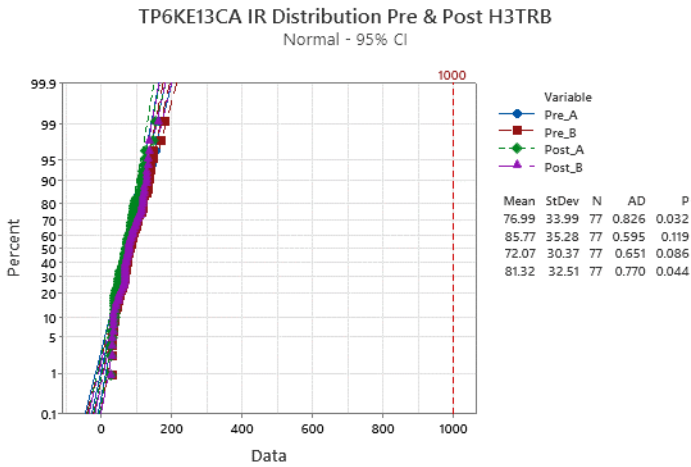
UHASt 96hrs

UHASt
Normal - 95% CI

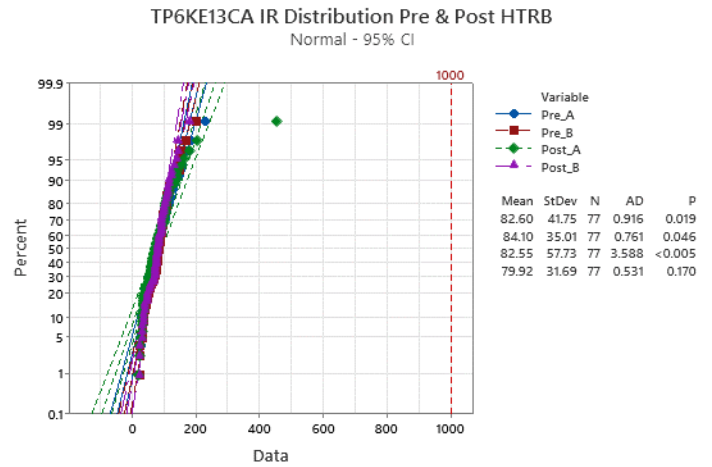


TP6KE13CA

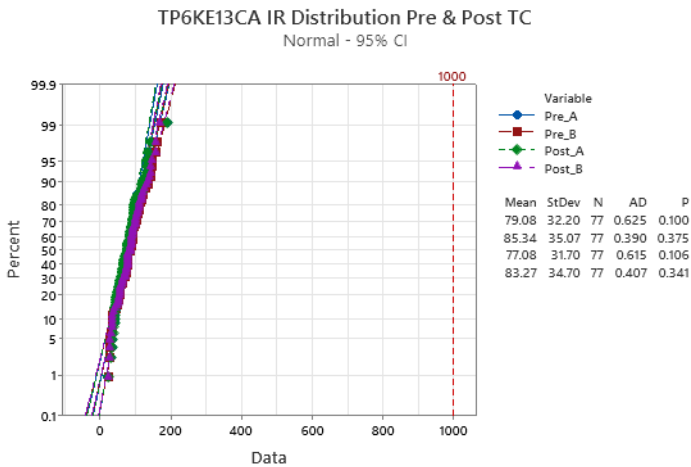
IR Distribution Pre & Post H3TRB



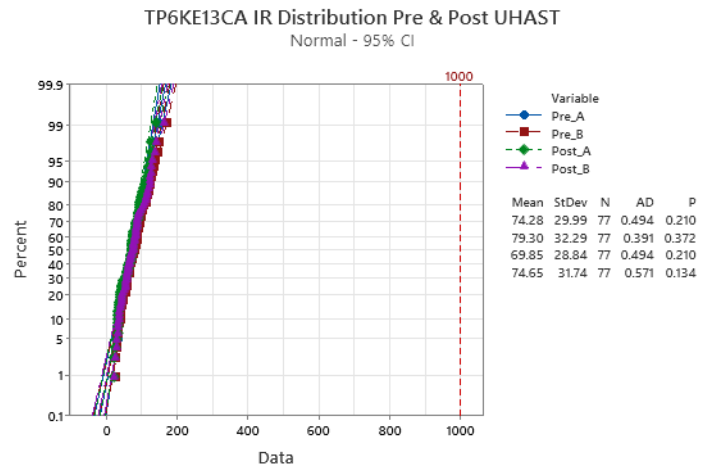
IR Distribution Pre & Post HTRB



IR Distribution Pre & Post TC

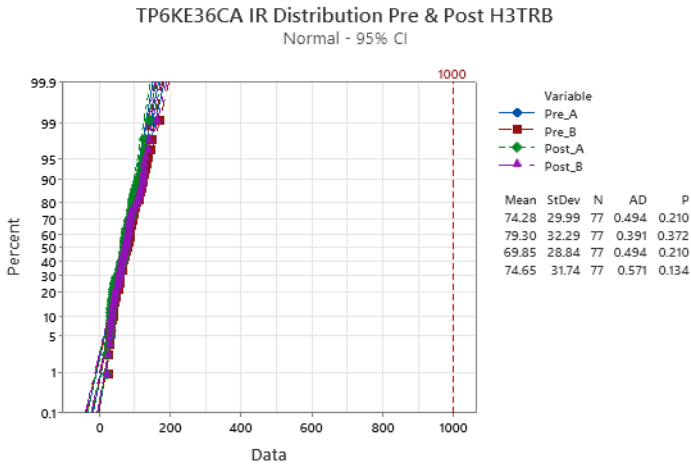


IR Distribution Pre & Post UHAST

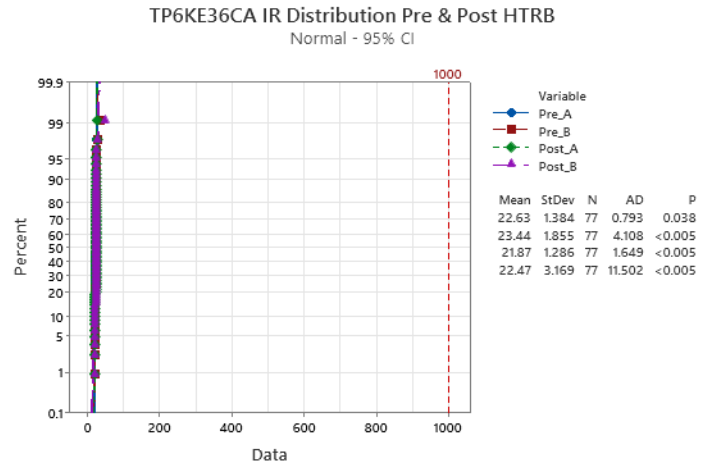


TP6KE36CA

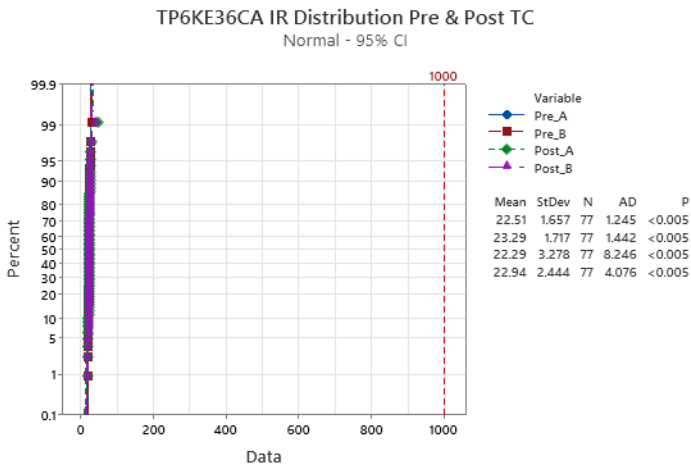
IR Distribution Pre & Post H3TRB



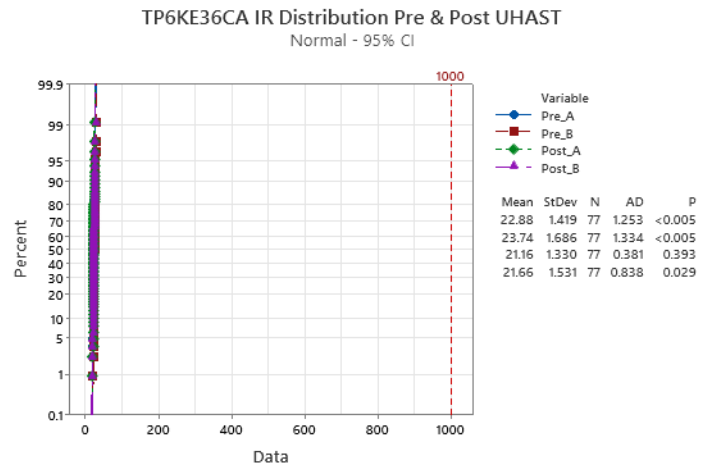
IR Distribution Pre & Post HTRB



IR Distribution Pre & Post TC

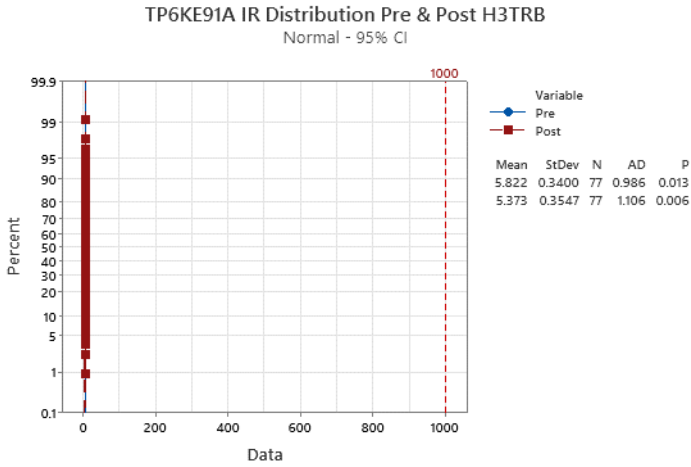


IR Distribution Pre & Post UHAST

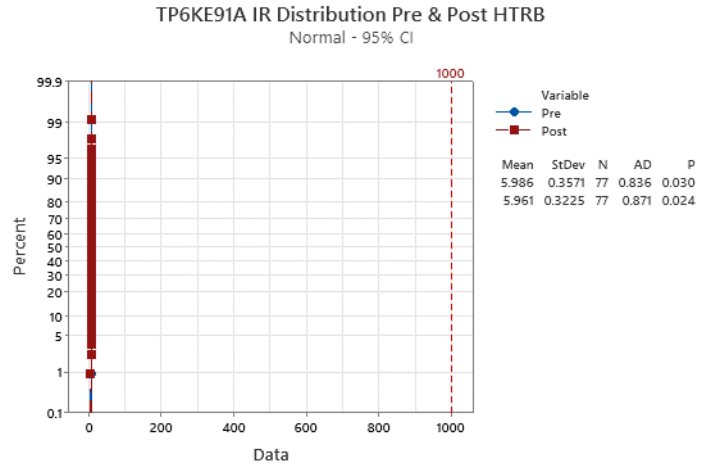


TP6KE91A

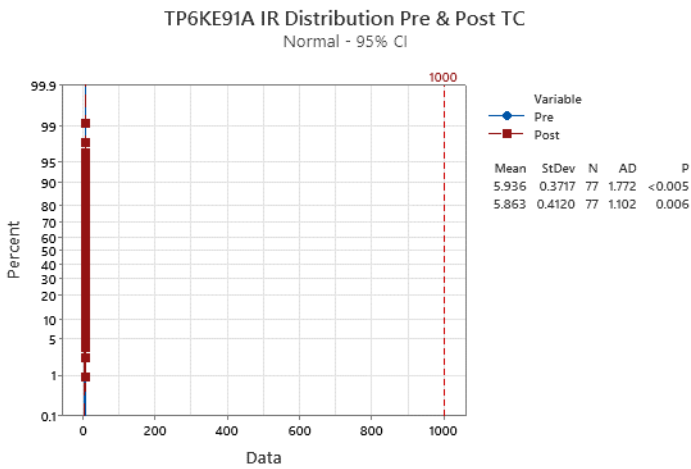
IR Distribution Pre & Post H3TRB



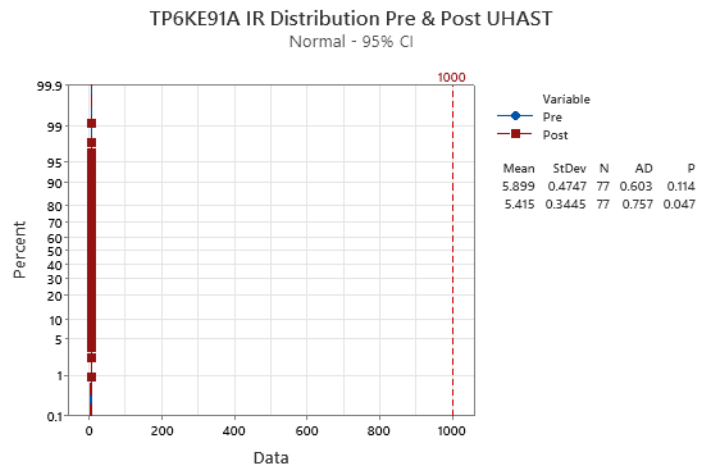
IR Distribution Pre & Post HTRB



IR Distribution Pre & Post TC

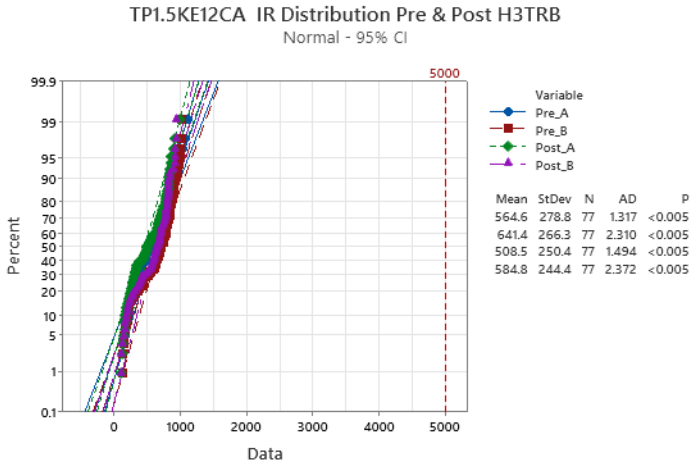


IR Distribution Pre & Post UHAST

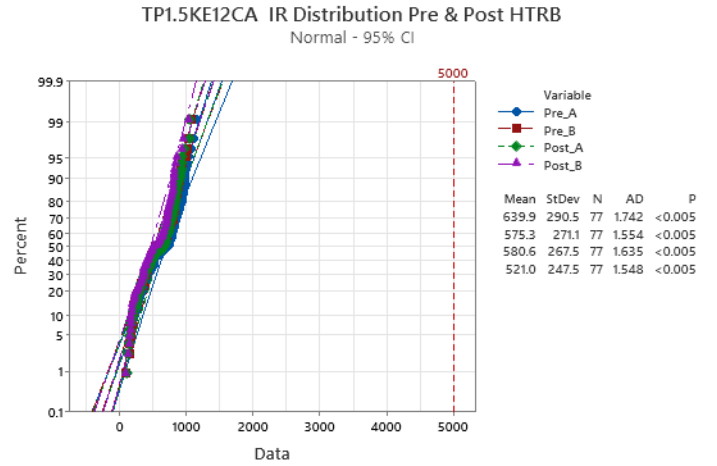


TP1.5KE12CA

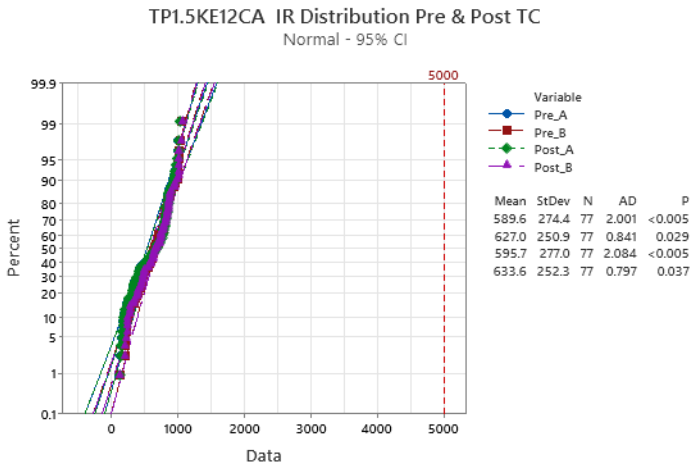
IR Distribution Pre & Post H3TRB



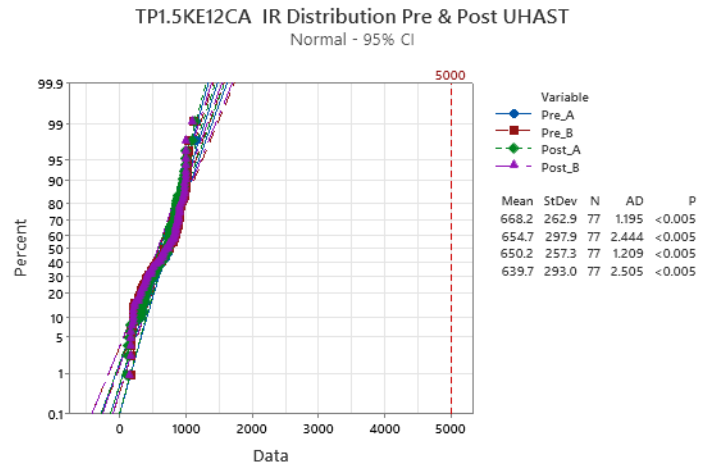
IR Distribution Pre & Post HTRB



IR Distribution Pre & Post TC



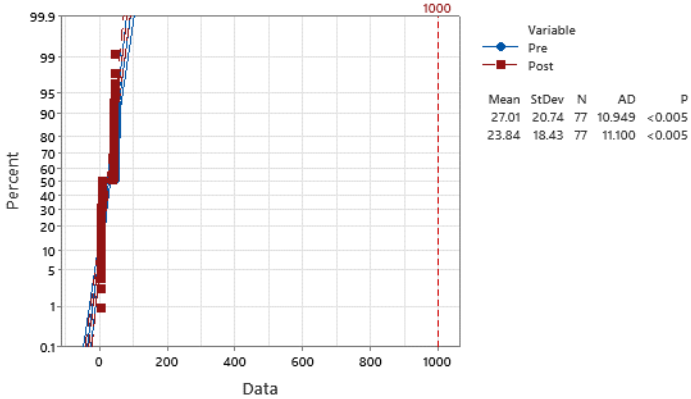
IR Distribution Pre & Post UHASt



TP1.5KE24A

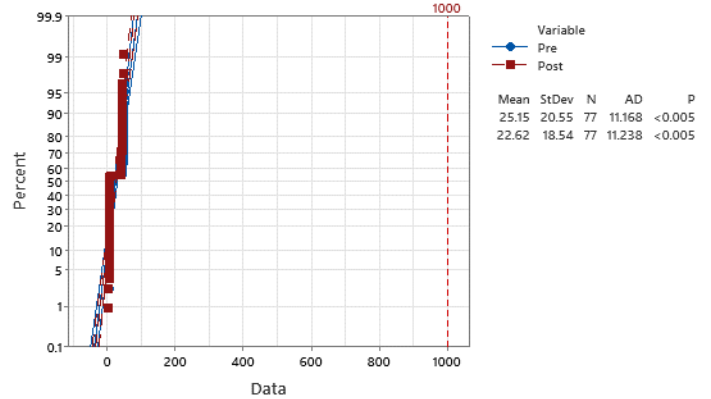
IR Distribution Pre & Post H3TRB

TP1.5KE24A IR Distribution Pre & Post H3TRB
Normal - 95% CI



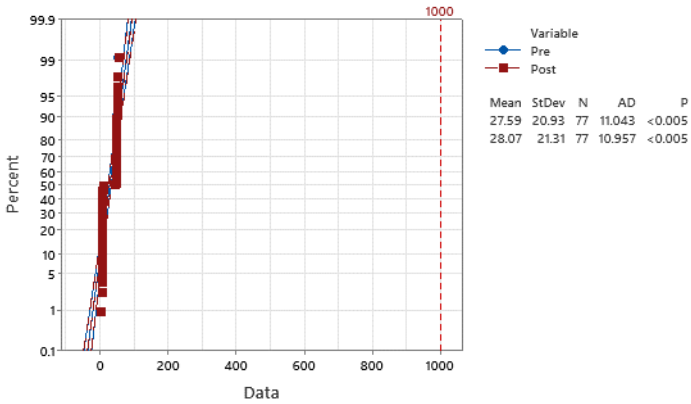
IR Distribution Pre & Post HTRB

TP1.5KE24A IR Distribution Pre & Post HTRB
Normal - 95% CI



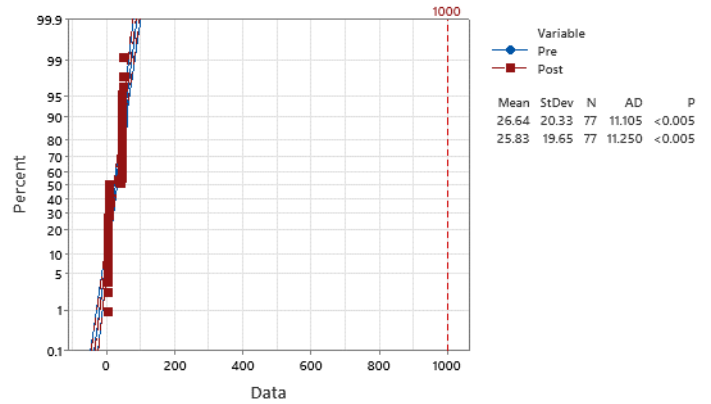
IR Distribution Pre & Post TC

TP1.5KE24A IR Distribution Pre & Post TC
Normal - 95% CI



IR Distribution Pre & Post UHAST

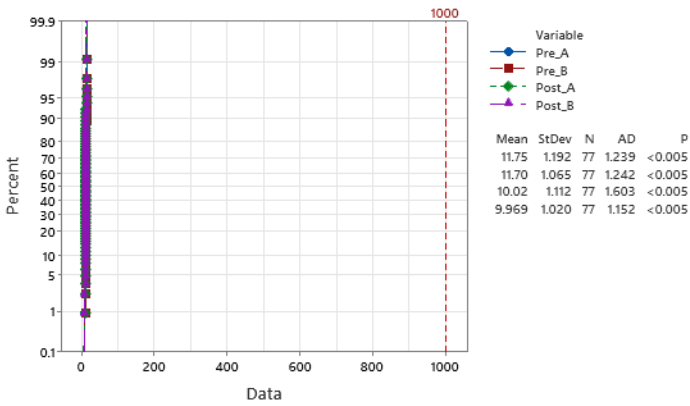
TP1.5KE24A IR Distribution Pre & Post UHAST
Normal - 95% CI



TP1.5KE47CA

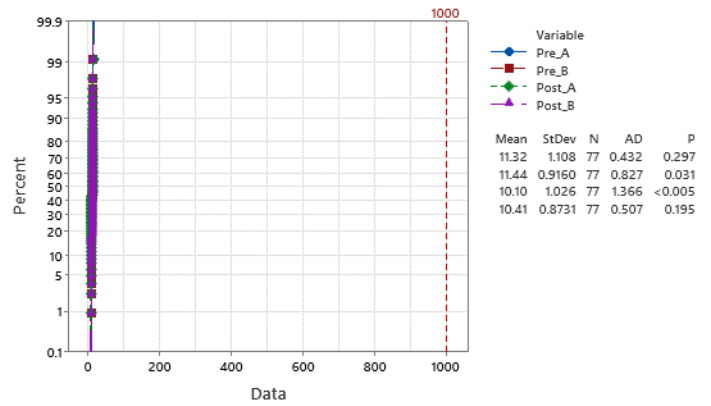
IR Distribution Pre & Post H3TRB

TP1.5KE47CA IR Distribution Pre & Post H3TRB
Normal - 95% CI



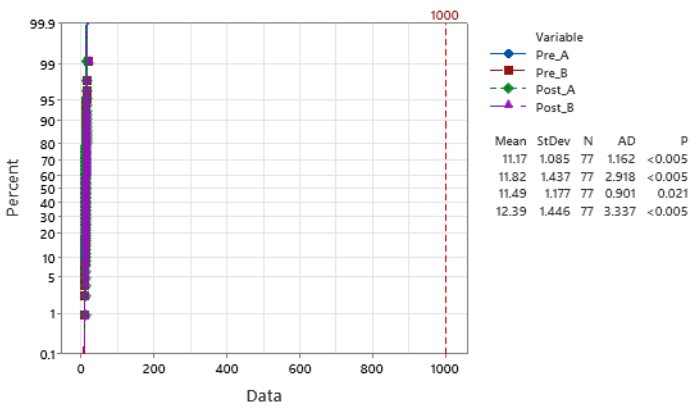
IR Distribution Pre & Post HTRB

TP1.5KE47CA IR Distribution Pre & Post HTRB
Normal - 95% CI



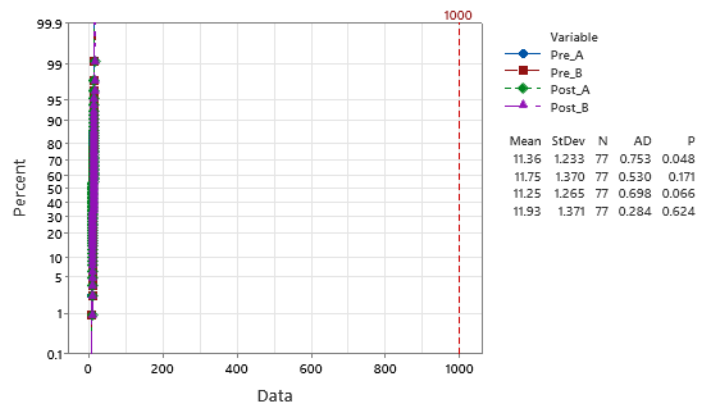
IR Distribution Pre & Post TC

TP1.5KE47CA IR Distribution Pre & Post TC
Normal - 95% CI



IR Distribution Pre & Post UHAST

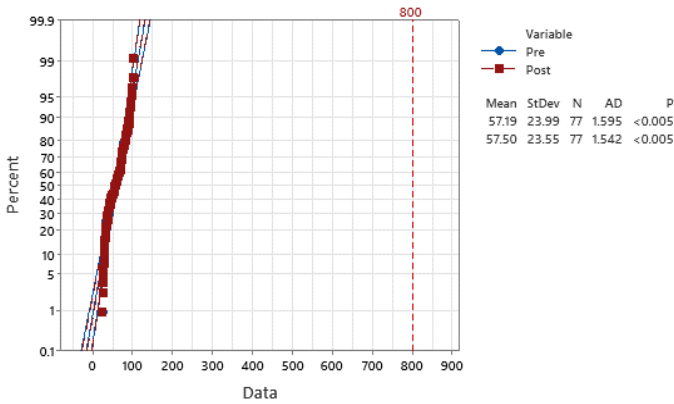
TP1.5KE47CA IR Distribution Pre & Post UHAST
Normal - 95% CI



TPSMF4L5.0A

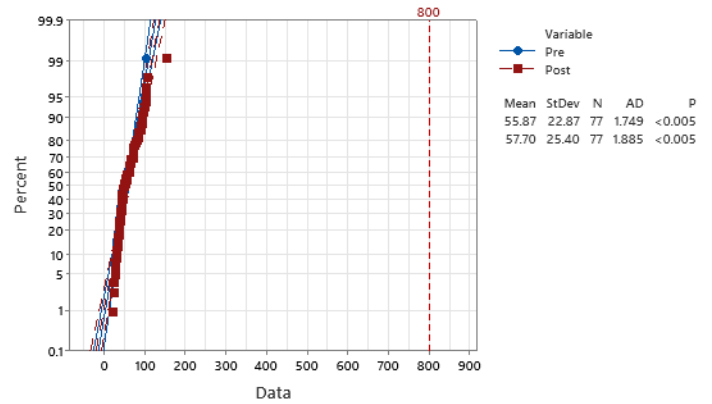
IR Distribution Pre & Post H3TRB

TPSMF4L5.0A IR Distribution Pre & Post H3TRB
Normal - 95% CI



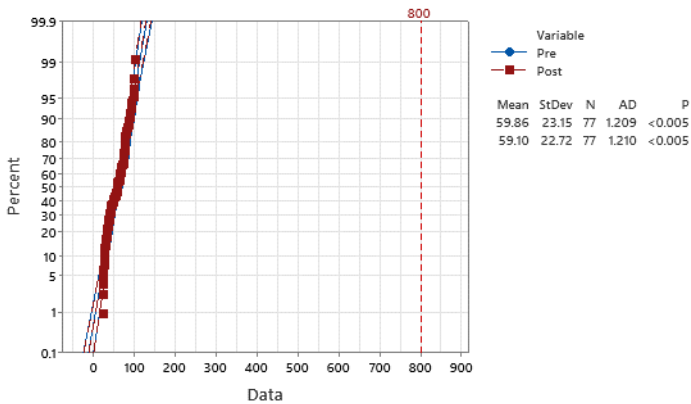
IR Distribution Pre & Post HTRB

TPSMF4L5.0A IR Distribution Pre & Post HTRB
Normal - 95% CI



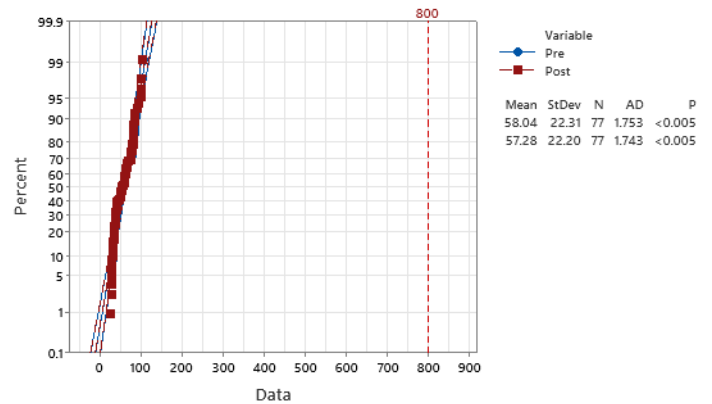
IR Distribution Pre & Post TC

TPSMF4L5.0A IR Distribution Pre & Post TC
Normal - 95% CI



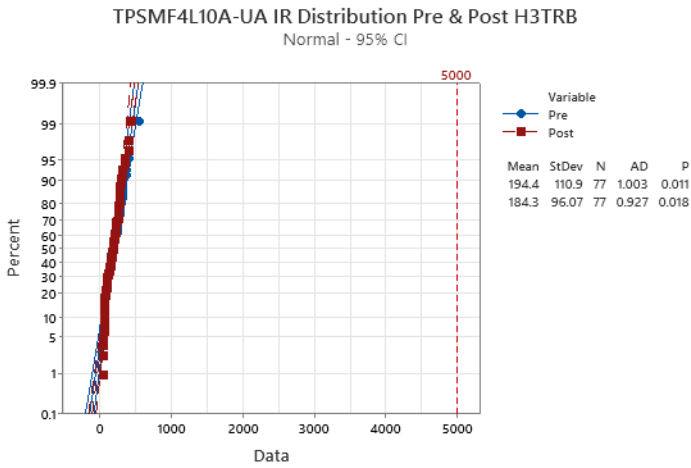
IR Distribution Pre & Post UHAST

TPSMF4L5.0A IR Distribution Pre & Post UHAST
Normal - 95% CI

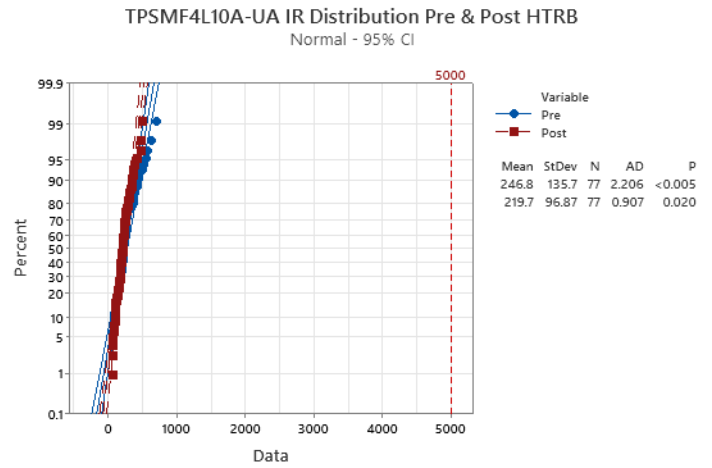


TPSMF4L10A-UA

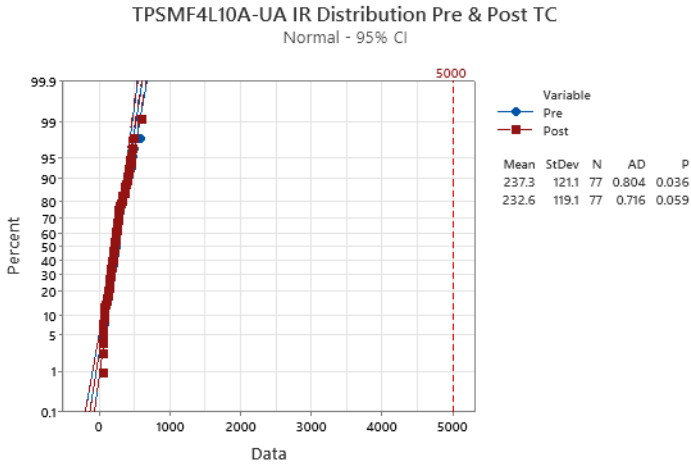
IR Distribution Pre & Post H3TRB



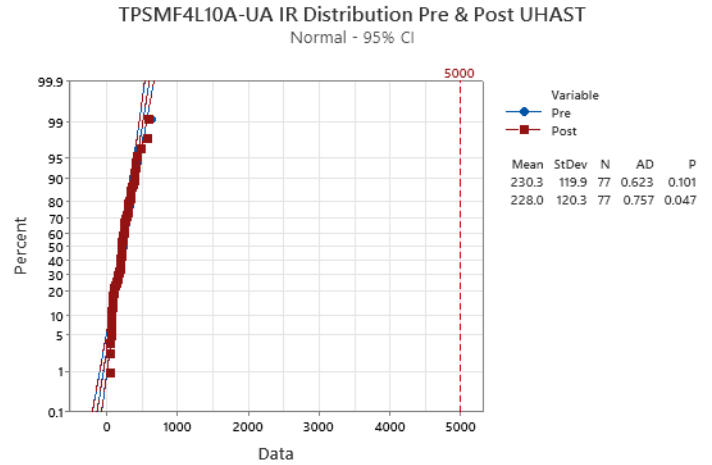
IR Distribution Pre & Post HTRB



IR Distribution Pre & Post TC

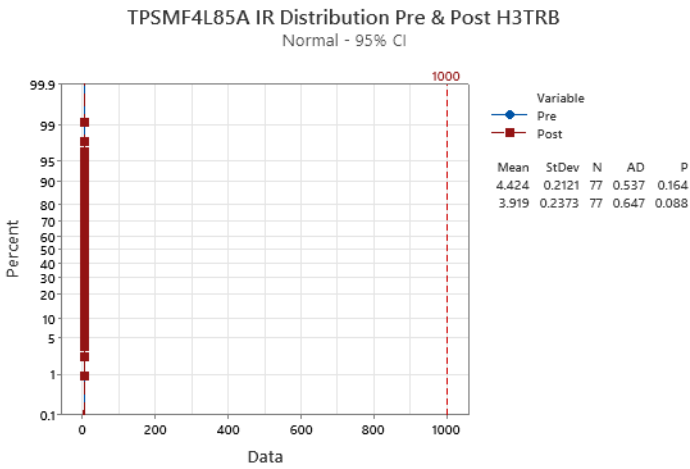


IR Distribution Pre & Post UHAST

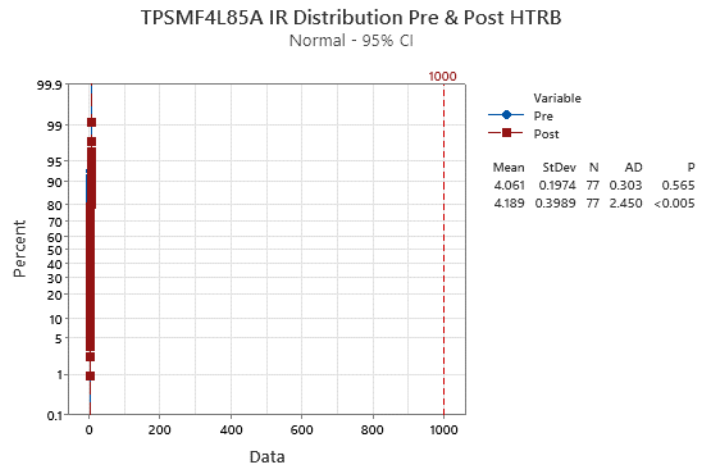


TPSMF4L85A

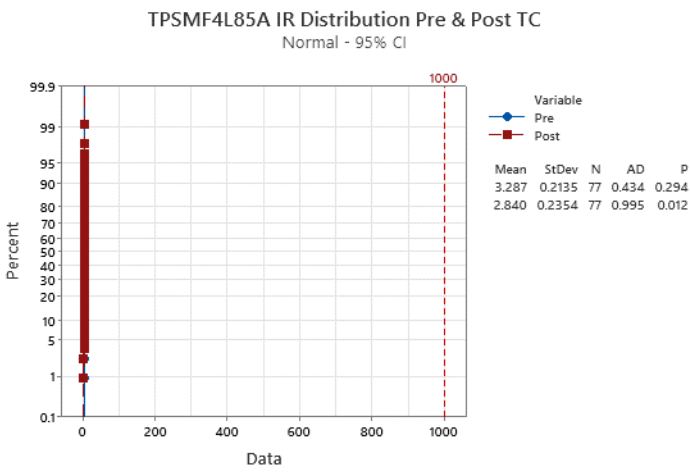
IR Distribution Pre & Post H3TRB



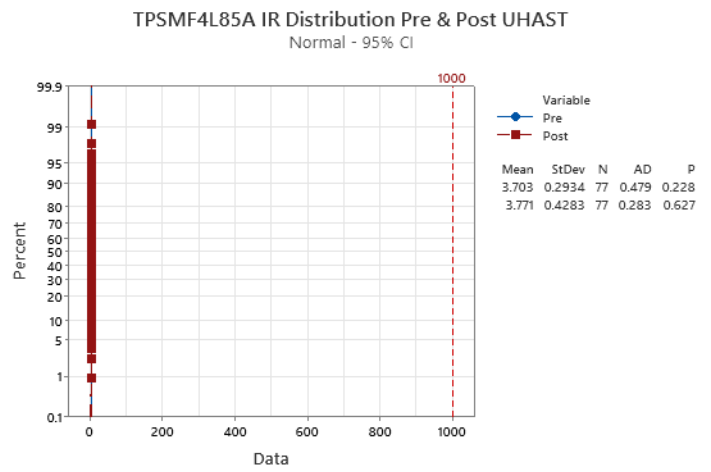
IR Distribution Pre & Post HTRB



IR Distribution Pre & Post TC



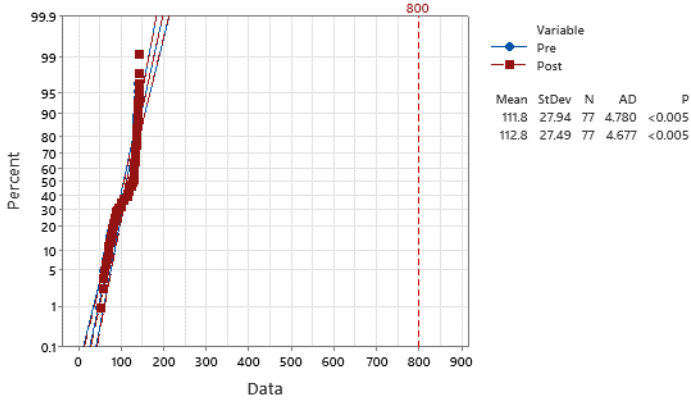
IR Distribution Pre & Post UHASt



TPSMA6L5.0A

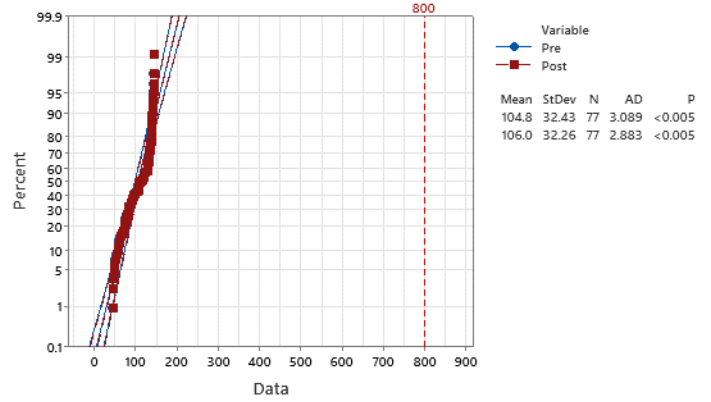
IR Distribution Pre & Post H3TRB

TPSMA6L5.0A IR Distribution Pre & Post H3TRB
Normal - 95% CI



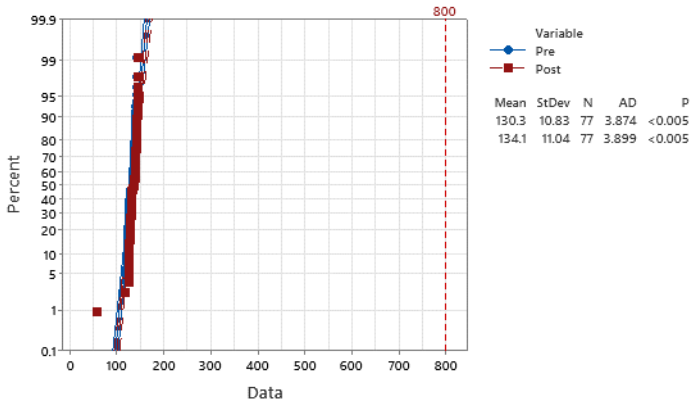
IR Distribution Pre & Post HTRB

TPSMA6L5.0A IR Distribution Pre & Post HTRB
Normal - 95% CI



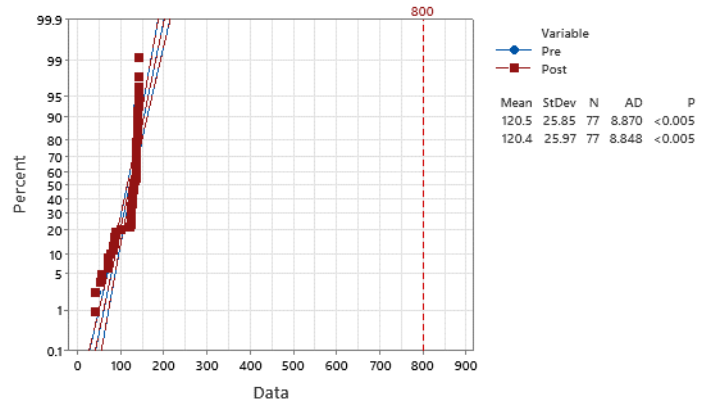
IR Distribution Pre & Post TC

TPSMA6L5.0A IR Distribution Pre & Post TC
Normal - 95% CI



IR Distribution Pre & Post UHAST

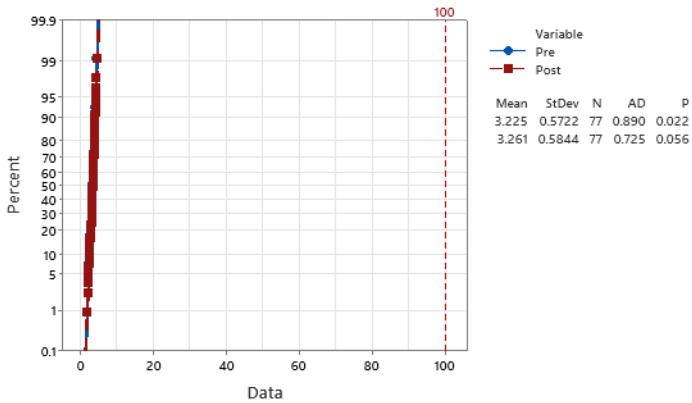
TPSMA6L5.0A IR Distribution Pre & Post UHAST
Normal - 95% CI



TPSMA6L7.5A

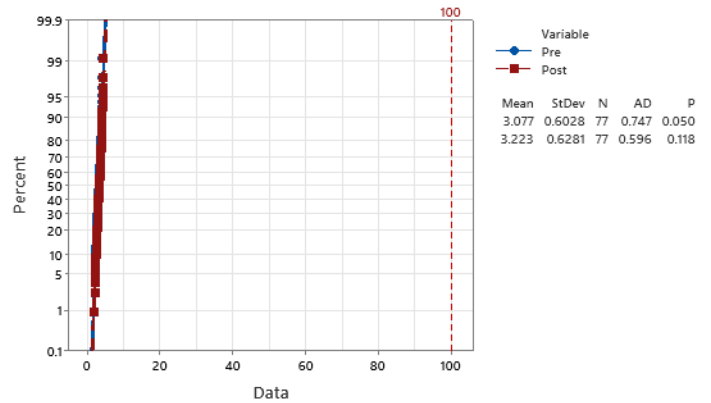
IR Distribution Pre & Post H3TRB

TPSMA6L7.5A Ir Distribution Pre & Post H3TRB
Normal - 95% CI



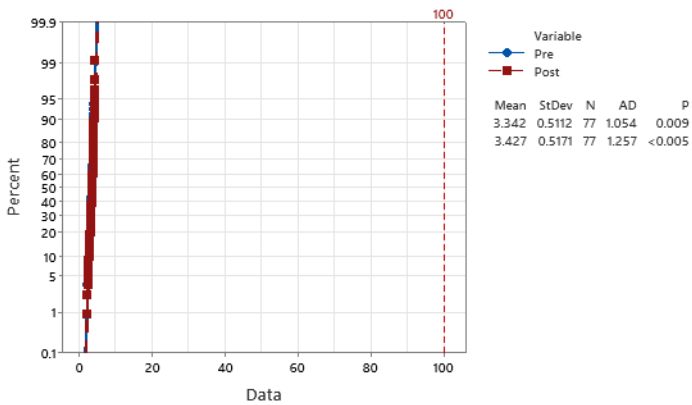
IR Distribution Pre & Post HTRB

TPSMA6L7.5A Ir Distribution Pre & Post HTRB
Normal - 95% CI



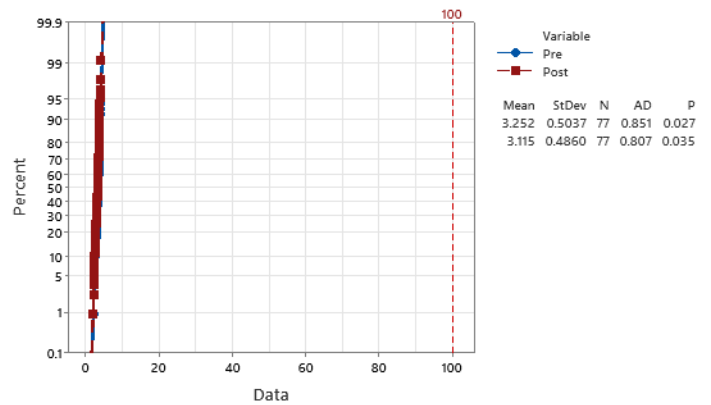
IR Distribution Pre & Post TC

TPSMA6L7.5A Ir Distribution Pre & Post TC
Normal - 95% CI



IR Distribution Pre & Post UHASt

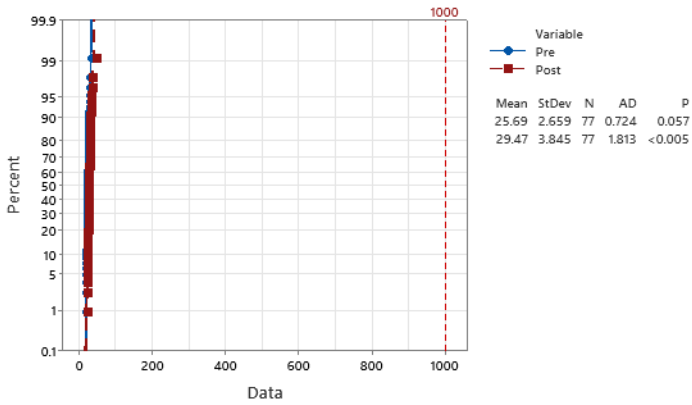
TPSMA6L7.5A Ir Distribution Pre & Post UHASt
Normal - 95% CI



TPSMA6L12A

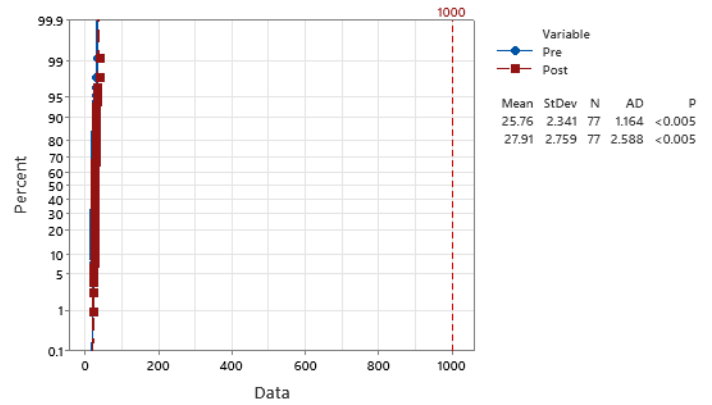
IR Distribution Pre & Post H3TRB

TPSMA6L12A Ir Distribution Pre & Post H3TRB
Normal - 95% CI



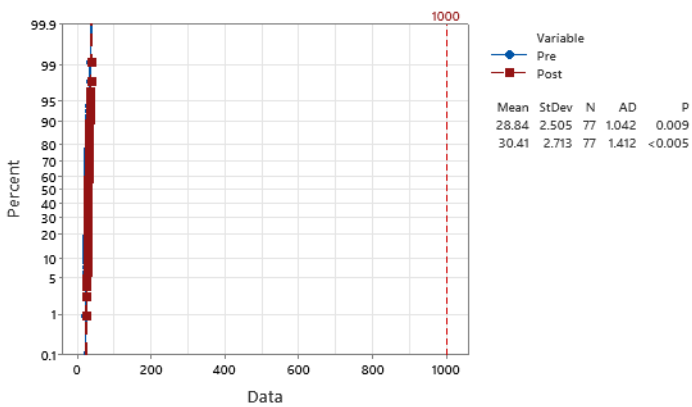
IR Distribution Pre & Post HTRB

TPSMA6L12A Ir Distribution Pre & Post HTRB
Normal - 95% CI



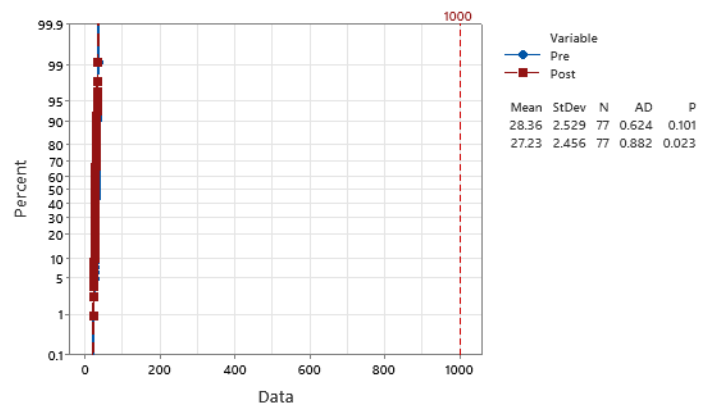
IR Distribution Pre & Post TC

TPSMA6L12A Ir Distribution Pre & Post TC
Normal - 95% CI



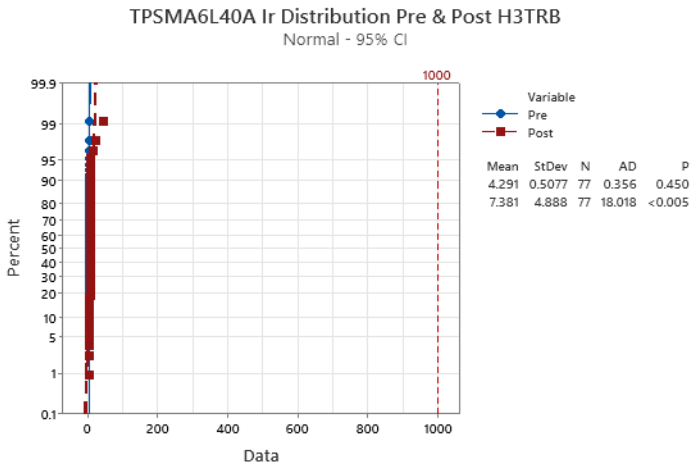
IR Distribution Pre & Post UHAST

TPSMA6L12A Ir Distribution Pre & Post UHAST
Normal - 95% CI

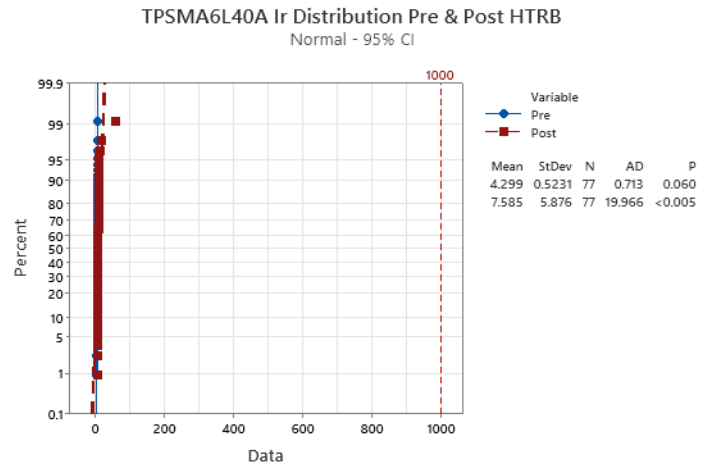


TPSMA6L40A

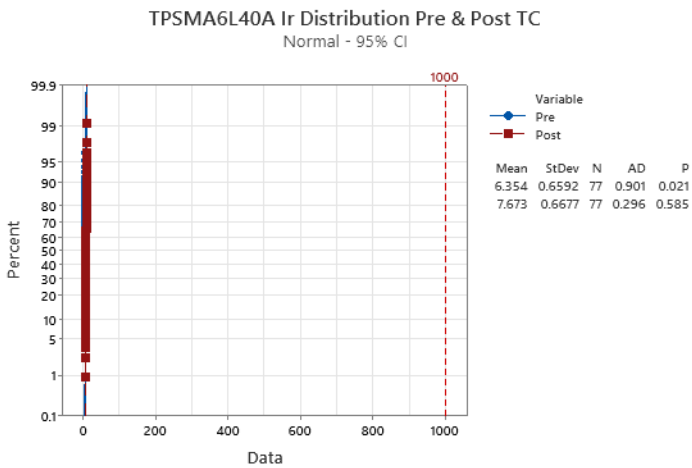
IR Distribution Pre & Post H3TRB



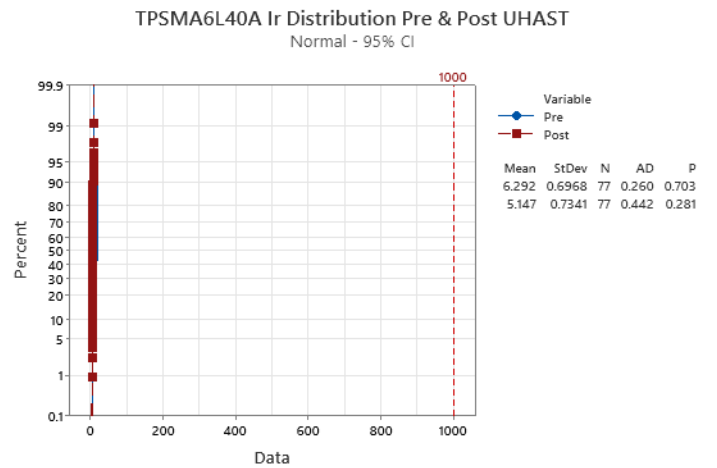
IR Distribution Pre & Post HTRB



IR Distribution Pre & Post TC



IR Distribution Pre & Post UHAST

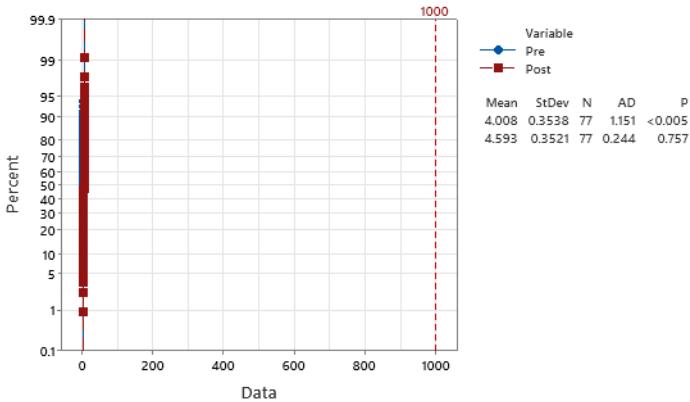




TPSMA6L85A

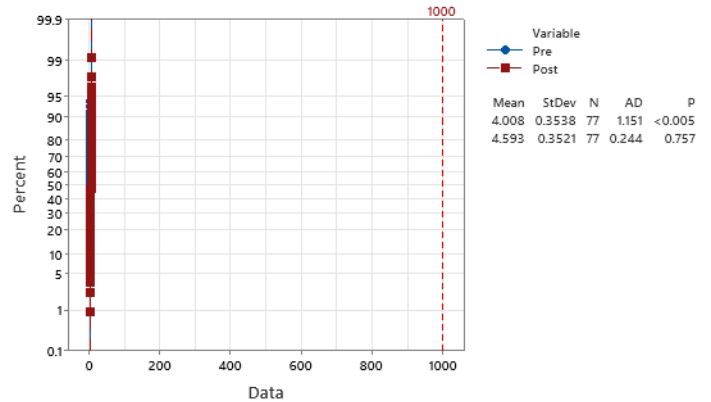
IR Distribution Pre & Post H3TRB

TPSMA6L85A IR Distribution Pre & Post H3TRB
Normal - 95% CI



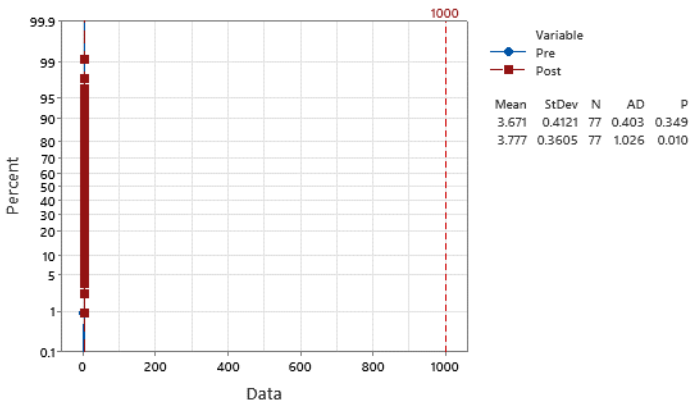
IR Distribution Pre & Post HTRB

TPSMA6L85A IR Distribution Pre & Post HTRB
Normal - 95% CI



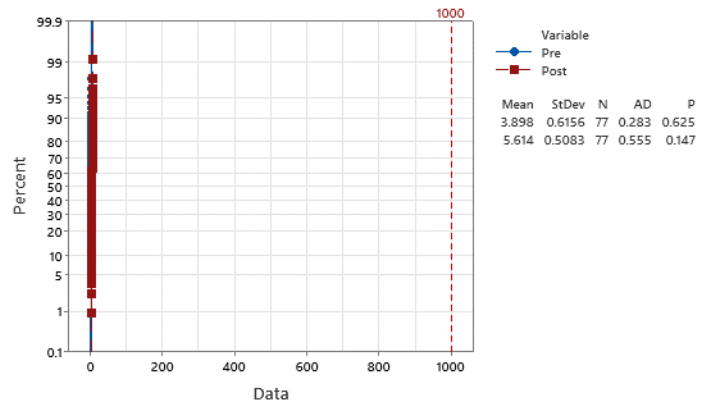
IR Distribution Pre & Post TC

TPSMA6L85A IR Distribution Pre & Post TC
Normal - 95% CI



IR Distribution Pre & Post UHASt

TPSMA6L85A IR Distribution Pre & Post UHASt
Normal - 95% CI



8.0 Changed Part Identification:

NA

9.0 Recommendations & Conclusions:

Based on the test results, it is determined that 6" wafer, design improvement, 2nd source and Matrix line are qualified and certified for Automotive TVS Product Series.

10.0 Approvals:

Hellen Yang
Product Manager
Littelfuse, Inc.

Peter Liu
Sr. Manager , SBU Global Outsource Manufacturing
Littelfuse, Wuxi