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May 17th, 2018

Littelfuse TVS STD DO-214AB Package Capacity Expansion Notification Letter

To: Our Valued Customers

In order to support growing demand, Littelfuse SBU (Semiconductor Business Unit) completed TVS STD DO-214AB package capacity expansion qualification. With this new capacity expansion line released, there will have more capacity to support growing demand of TVS STD DO-214AB package.

This DO-214AB package backend new line for capacity expansion is installed in Littelfuse Semiconductor Wuxi China, and is planned to have production since June 2018. As rolling change, please expect to receive products manufactured by either current line or new capacity expansion automation line.

The affected part numbers as attached excel file, have been fully qualified in accordance with established performance and reliability criteria. The next few pages summarize the qualification results for your reference please.

There are no changes on FIT, form, function and reliability of the finished product.

Form, fit, function, reliability changes: None

Part number changes: None

Effective date: June 2018 or sooner

Replacement products: N/A

Last time buy: N/A

This communication letter is for your information and acknowledgement. If you have any other questions or concerns, please contact your local sales team or product team below for further assistance.

We highly value your business and look forward to assisting you whenever possible.

Sincerely,

Jenny Chen
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Product Qualification Report

From: Zhihui Chen, Product Engineering, Littelfuse

Date: Apr 27th, 2018

Subject: **Qualification report for Littelfuse TVS STD DO-214AB capacity expansion project**

Backend capacity expansion Line Picture

Automation Assembly Process Flow



Purpose:

This report is to inform the successful TVS STD DO-214AB capacity expansion qualification test results.

1. Qualification Types (Test Vehicle)

| Product Package | Product Series | Representative Test Sample Part Numbers | Assembly Location |
|-----------------|----------------|---|-------------------|
| DO-214AB | TVS | 1.5SMC6.8A | Wuxi |
| | | 1.5SMC300CA | |
| | | SMDJ6.0CA | |
| | | 1.5SMC170A | |

2. Qualification Test Items and Result Summary

| Test Category | Description | Sample P/N | Sample Qty | Littelfuse test Ref# | Contents/Conditions | Result Summary | |
|------------------|--------------------------------|--------------------------------|-------------|----------------------|--------------------------------------|-------------------------------------|----------------------|
| Parametric | Electrical Parameters | 1.5SMC6.8A | 207 | 106592 | VBR, IR | 100% meet published spec. | |
| | | 1.5SMC300CA | 207 | 106592 | | | |
| | | 1.5SMC170A | 207 | 106592 | | | |
| | | SMDJ6.0CA | 207 | 106592 | | | |
| Surge out test | 10*1000us Surge out Test | 1.5SMC6.8A | 10 | 106592 | +/- 1 hit, at rated IPP | 100% passing at Rated IPP | |
| | | 1.5SMC300CA | 10 | 106592 | | | |
| | | 1.5SMC170A | 10 | 106592 | | | |
| | | SMDJ6.0CA | 10 | 106592 | | | |
| Reliability Test | Pre-condition (PC) | 1.5SMC6.8A | 80 | 106590 | SMD qualification parts for TC,H3TRB | 0 failure | |
| | | 1.5SMC300CA | 80 | 106593 | | | |
| | | 1.5SMC170A | 80 | 106595 | | | |
| | | SMDJ6.0CA | 80 | 106601 | | | |
| | DC Blocking (HTRB) | DC Blocking (HTRB) | 1.5SMC6.8A | 77 | 106590 | 150°C, DC bias=100% of VR spec | 0 failure at 1008hrs |
| | | | 1.5SMC300CA | 77 | 106593 | | |
| | | | 1.5SMC170A | 77 | 106595 | | |
| | | | SMDJ6.0CA | 77 | 106601 | | |
| | RSH | RSH | 1.5SMC6.8A | 30 | 106590 | 260°C,10second | 0 failure after RSH |
| | | | 1.5SMC300CA | 30 | 106593 | | |
| | | | 1.5SMC170A | 30 | 106595 | | |
| | | | SMDJ6.0CA | 30 | 106601 | | |
| | Biased Temp & Humidity (H3TRB) | Biased Temp & Humidity (H3TRB) | 1.5SMC6.8A | 40 | 106590 | 85°C, 85%RH DC bias=100% of VR spec | 0 failure at 1008hrs |
| | | | 1.5SMC300CA | 40 | 106593 | | |
| | | | 1.5SMC170A | 40 | 106595 | | |
| | | | SMDJ6.0CA | 40 | 106601 | | |
| | Autoclave | Autoclave | 1.5SMC6.8A | 40 | 106590 | TA=121°C , RH=100%,2atm | 0 failure at 96hrs |
| | | | 1.5SMC300CA | 40 | 106593 | | |
| | | | 1.5SMC170A | 40 | 106595 | | |
| | | | SMDJ6.0CA | 40 | 106601 | | |
| Temp Cycle | Temp Cycle | 1.5SMC6.8A | 40 | 106590 | -55°C&150°C (air to air) | 0 failure at 1008hrs | |
| | | 1.5SMC300CA | 40 | 106593 | | | |
| | | 1.5SMC170A | 40 | 106595 | | | |
| | | SMDJ6.0CA | 40 | 106601 | | | |

3. MTBF Calculation

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

| Temp °C | % FR/khrs | MTBF (K) | FITS |
|---------|-----------|----------|--------|
| 30 | 0.00001 | 17490735 | 0.06 |
| 55 | 0.00011 | 947835 | 1.1 |
| 85 | 0.00204 | 49062 | 20.4 |
| 100 | 0.00749 | 13344 | 74.9 |
| 125 | 0.05278 | 1895 | 527.8 |
| 150 | 0.29514 | 339 | 2951.4 |

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.

4. Conclusion

According to the above qualification test results, Littelfuse concluded that TVS STD DO-214AB package capacity expansion project has been fully qualified and released to production.