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June 30th 2017

To: Our Valued Customers.

From: **Littelfuse Product Management Team**

Littelfuse SBU DO-214AA package Backend Automation Notification Letter.

In order to support growing demand, Littelfuse SBU (Semiconductor Business Unit) has completed DO-214AA package automation qualification , with this automation line release We will have more capacity to support customer growing demand for Package DO-214AA TVS and SIDACTor® .

The DO-214AA package backend automation line for capacity expansion is installed in Littelfuse Semiconductor Wuxi China , Please refer to below page for the picture of automation line .

This automation line plan to have pilot productions on Aug 1st 2017 . The affected part numbers as attached excel file , this is rolling change, You will be expected to have either old line products or new automation line products.

All affected products have been fully qualified in accordance with established performance and reliability criteria. The next few pages summarize the qualification results. Full qualification data and/or samples will be available upon request.

There are no changes on FIT, form or function of the finished product

Form, fit, function changes: None
Part number changes: None
Effective date: Aug 1st, 2017 or sooner
Replacement products: N/A
Last time buy: N/A

This notification is for your information and acknowledgement. If you have any other questions or concerns, please contact Meng Wang, Product Manager. We highly value your business and look forward to assisting you whenever possible.

Best Regards

Meng Wang (Rex Wang)

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Product Qualification Report

To: Those who may concern
 From: Zhihui Chen ,Product Engineering, Littelfuse,
 Date: May 24th, 2017 -
 Subject: **Qualification Report for Littelfuse TVS/SIDACtor DO-214AA full Automation expanding**

Backend Assembly Automation Line Picture

Automation Assembly Process Flow



Purpose:

This report is to inform the successful TVS/SIDACtor DO-214AA full automation expanding qualification test results

1. Qualification Types (Test Vehicle)

Product Package	Product Series	Representative Test Sample Part Numbers	Assembly Location
DO-214AA	TVS	P6SMB6.8CA	Wuxi
		P6SMB220A	
		P6SMB510CA	
		SACB5.0	
	SIDACtor	P4500SCLHLP	
		P0080SCLRP	
		P7002SCLRP	

2. Qualification Test Items and Result Summary:

TVS result:

Test Category	Description	Sample P/N	Sample Qty	Littelfuse test Ref#	Contents/Conditions	Result Summary
Parametric	Electrical Parameters	P6SMB6.8CA	207	95226	VBR, IR	100% meet published spec.
		P6SMB220A	207	95228		
		P6SMB510CA	207	95232		
		SACB5.0	207	95236		
Surge IPP test	8*20us Surge out Test	P6SMB6.8CA	10	95226	+/- 1 hit, at rated IPP	100% passing at Rated IPP
		P6SMB220A	10	95228		
		P6SMB510CA	10	95232		
		SACB5.0	10	95236		
	10*1000us Surge out Test	P6SMB6.8CA	10	95226	+/- 1 hit, at rated IPP	100% passing at Rated IPP
		P6SMB220A	10	95228		
		P6SMB510CA	10	95232		
		SACB5.0	10	95236		
Reliability Test	Pre-condition (PC)	P6SMB6.8CA	80	95224	SMD qualification parts for TC,H3TRB	0 failure
		P6SMB220A	80	95227		
		P6SMB510CA	80	95230		
		SACB5.0	80	95235		
	DC Blocking (HTRB)	P6SMB6.8CA	77	95224	150°C, DC bias=100% of VR spec	0 failure at 1008hrs
		P6SMB220A	77	95227		
		P6SMB510CA	77	95230		
		SACB5.0	77	95235		
	RSH	P6SMB6.8CA	30	95224	260C,10s	0 failure
		P6SMB220A	30	95227		
		P6SMB510CA	30	95230		
		SACB5.0	30	95235		
	Biased Temp & Humidity (H3TRB)	P6SMB6.8CA	40	95224	85°C, 85%,RH DC bias=100% of VR spec	0 failure at 1008hrs
		P6SMB220A	40	95227		
		P6SMB510CA	40	95230		
		SACB5.0	40	95235		
	Temp Cycle	P6SMB6.8CA	40	95224	-55°C&150°C (air to air)	0 failure at 1008hrs
		P6SMB220A	40	95227		
		P6SMB510CA	40	95230		
		SACB5.0	40	95235		

SIDACTor result:

Test Category	Description	Sample P/N	Sample Qty	Littelfuse test Ref#	Contents/Conditions	Result summary
Parametric	Electrical Parameters	P4500SCLHLP	247	95245	Vdrm,IH,VT	Meet datasheet spec
		P0080SCLRP	247	95247		
		P7002SCLRP	247	95252		
Surge out	Surge out 8*20us	P4500SCLHLP	10	95245	+/- hit,from rated lpp,0.1lpp step	100% passing at Rated IPP
		P0080SCLRP	10	95247		
		P7002SCLRP	10	95252		
	Surge out 10*700us	P4500SCLHLP	10	95245	+/- hit,from rated lpp,0.1lpp step	100% passing at Rated IPP
		P0080SCLRP	10	95247		
		P7002SCLRP	10	95252		
	Surge out 10*1000us	P4500SCLHLP	10	95245	+/- hit,from rated lpp,0.1lpp step	100% passing at Rated IPP
		P0080SCLRP	10	95247		
		P7002SCLRP	10	95252		
VS	VS,100V/S	P4500SCLHLP	10	95245	100V/us	Meet datasheet spec
		P0080SCLRP	10	95247		
		P7002SCLRP	10	95252		
Reliability Test	Pre-condition (PC)	P4500SCLHLP	80	95244	SMD qualification parts for TC,H3TRB	0 failure
		P0080SCLRP	80	95246		
		P7002SCLRP	80	95251		
	DC/AC Blocking (HTRB)	P4500SCLHLP	77	95244	125°C,24h at +/- 80%Vdrm,AC blocking test with AC peak 80% Vdrm 168/504/1008h	0 failure at 1008hrs
		P0080SCLRP	77	95246		
		P7002SCLRP	77	95251		
	Temperature Cycling (TC)	P4500SCLHLP	40	95244	-55°C ~+150°C,1000cycles	0 failure at 1000Cycle
		P0080SCLRP	40	95246		
		P7002SCLRP	40	95251		
	HTSL	P4500SCLHLP	40	95244	168/504/1008h at Tj=150C	0 failure at 1008hrs
		P0080SCLRP	40	95246		
		P7002SCLRP	40	95251		
	H3TRB	P4500SCLHLP	40	95244	168/504/1008h at Tj=85C/85% RH with device reverse biased at 80% VDRM and not exceed 52V	0 failure at 1008hrs
		P0080SCLRP	40	95246		
		P7002SCLRP	40	95251		

3. MTBF Calculation

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

1. TVS

Temp °C	% FR/khrs	MTBF (K)	FITS
30	0.0000569776	2003	0.06
60	0.00178923	64	1.79
80	0.01286317	8.87	12.86
100	0.07485144	1.53	74.85
125	0.52748607	0.22	527.49
150	2.95135904	0.04	2951.36

2. SIDACtor

Temp °C	% FR/khrs	MTBF (K)	FITS
30	0.000425064	2352588	0.43
60	0.01334799	74917	13.35
80	0.09596166	10420	95.96
100	0.55840583	1791	558.41
125	3.93514538	254	3935.15

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/SIDACtor DO-214AA full automation expanding family parts have passed the reliability test at WTC Lab.