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Mar. 30th, 2015

RE: LFPCN41229

TO: our valued customers

From: Littelfuse Product Management Team

Subject: LFPCN41229- Alternative Assembly Location Approval

Notification of alternative assembly facility approval for some unidirectional TVS Part Numbers of DO-214AC, DO-214AA Package to enable capacity expansion and fulfill rush demand .

Qualification efforts are completed and All affected products have been fully qualified in accordance with established performance and reliability criteria.

There is NO die change at all , both assembly sites uses current Wuxi in-house chips, however there is a minor outline dimension difference , but both outline dimension from in-house assembly and outsource assembly site comply to JEDEC standard , Please refer to subsequent page for outline dimension difference comparison , refer to attachment for affected parts number List.

The new Facility will begin shipments starting in July 1st 2015, Full qualification data and/or samples will be available upon request.

Form, fit, function changes: Slight outline difference, please check qualification report
Part number changes: None
Effective date: July 1st, 2015
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, Assistant Product Manager.

We value your business and look forward to assisting you

Best Regards,

Meng Wang

Assistant Product Marketing Manager,
Tel: +86 510 85277701, extension 7955
Mwang3@littelfuse.com

800 E. Northwest Highway Des Plaines, IL 60016

Product/Process Change Notice (PCN)

PCN#: LFPCN41229 Date: Mar 30th 2015

Product Identification:

Littelfuse TVS DO-214AA, DO-214AC package

Implementation Date for Change:

July 1st 2015

Contact Information

Name: Meng Wang

Title: Assistant Product Manager

Phone #: +86 510 87277955

Fax#: +86 510 85277700

E-mail: mwang3@littelfuse.com

Category of Change:

- ☐ Assembly Process
- ☒ Data Sheet
- ☐ Technology
- ☐ Discontinuance/Obsolescence
- ☐ Equipment
- ☒ Manufacturing Site
- ☐ Raw Material
- ☐ Testing
- ☐ Fabrication Process
- ☐ Other: _____

Description of Change:

Littelfuse would notify you that Goodark assembly facility is qualified as an Littelfuse alternative assembly ,Testing and packing facility for Unidirectional TVS of DO-214AC, DO-214AA Package .

There is no electrical parameter change, but outline has minor difference both comply to JEDEC standard, all relevant details are included in the supplemental qualfication report page

Important Dates:

- ☒ Qualification Samples Available: Mar 30th 2015
- ☐ Last Time Buy: N/A
- ☒ Final Qualification Data Available: Mar 30th 2015
- ☐ Date of Final Product Shipment:

Method of Distinguishing Changed Product

- ☒ Product Mark,
- ☒ Date Code, 5G6xx
- ☐ Other,

Demonstrated or Anticipated Impact on Form, Fit, Function or Reliability:

N/A

LF Qualification Plan/Results:

Please refer to supplemental page

Customer Acknowledgement of Receipt: Littelfuse requests you acknowledge receipt of this PCN. In your acknowledgement, you can grant approval or request additional information. Littelfuse will assume the change is acceptable if no acknowledgement is received within 30 days of this notice. Lack of any additional response within 90 days of PCN issuance further constitutes acceptance of the change.

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Littelfuse, WX
East 3# Zhen Fa 6 Road
Shuo Fang Industrial Park
Wuxi, Jiangsu 214142

Product Qualification Report

To: Those who may concern

From: Changjun Tang, Product Engineer, Littelfuse, Wuxi

Date: March 09,2015

Purpose:

This report is to inform the successful qualification test results associated with TVS DO-214AC&DO-214AA uni-directional single die Product Series in outsource plant.

1. Qualification Types (Test Vehicle)

Product Series	Representative Test Sample Part Numbers	Package (Assembly Location)
Commercial TVS	SMAJ5.0A	DO-214AC (Wuxi)
	SMAJ12A	DO-214AC (Wuxi)
	SMAJ6J12A	DO-214AC (Wuxi)
	SMBJ13A	DO-214AA (Wuxi)
	SMBJ15A	DO-214AA (Wuxi)
	P6SMB68A	DO-214AA (Wuxi)

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	SMAJ5.0A	270	68087	VBR, IR	100% meet published spec.
		SMAJ12A	270	64493		
		SMAJ6J12A	270	67779		
		SMBJ13A	270	67779		
		SMBJ15A	270	68376		
		P6SMB68A	270	67783		
Surge IPP test	10X1000us Surge Out	SMAJ12A	10	64495	+/- 1 hit, from rated IPP, 0.1 IPP step	100% passing at 1.1xRated IPP
		SMAJ6J12A	10	67780		
		SMBJ13A	10	67780		
		SMBJ15A	10	68377		
		P6SMB68A	10	67785		

Reliability Test	Pre-condition (PC)	SMAJ5.0A	120	68087	SMD qualification parts for TC,AC,H3TRB	0% failure at MSL Level 1
		SMAJ12A	120	64493		
		SMAJ6J12A	120	67779		
		SMBJ13A	120	67779		
		SMBJ15A	120	68376		
		P6SMB68A	120	67783		
	DC Blocking (HTRB)	SMAJ5.0A	40	68087	150℃, VR	0% failure at 1008 hours
		SMAJ12A	40	64493		
		SMAJ6J12A	40	67779		
		SMBJ13A	40	67779		
		SMBJ15A	40	68376		
		P6SMB68A	40	67783		
	High Temp Storage (HTSL)	SMAJ5.0A	40	68087	150℃, no bias	0% failure at 1008 hours
		SMAJ12A	40	64493		
		SMAJ6J12A	40	67779		
		SMBJ13A	40	67779		
		SMBJ15A	40	68376		
		P6SMB68A	40	67783		
	Biased Temp & Humidity (H3TRB)	SMAJ5.0A	40	68087	VR@85C,85%RH	0% failure at 1008 hours
		SMAJ12A	40	64493		
		SMAJ6J12A	40	67779		
		SMBJ13A	40	67779		
		SMBJ15A	40	68376		
		P6SMB68A	40	67783		
	Autoclave	SMAJ5.0A	40	68087	TA = 121℃, RH =100%, 15psig	0% failure at 96 hours
		SMAJ12A	40	64493		
		SMAJ6J12A	40	67779		
		SMBJ13A	40	67779		
		SMBJ15A	40	68376		
		P6SMB68A	40	67783		
	MSL	SMAJ12A	10	64495	260C/Steam	0% failure at MSL Level 1
		P6SMB68A	10	64495		
	Temp Cycle	SMAJ5.0A	40	68087	-55℃&150℃ (air to air)	0% failure at 1000 cycles
		SMAJ12A	40	64493		
		SMAJ6J12A	40	67779		
		SMBJ13A	40	67779		
		SMBJ15A	40	68376		
		P6SMB68A	40	67783		
	Solderability	SMAJ12A	10	64495	Both B and D test methods	0% failure after Solderability
		P6SMB68A	10	64495		
	Resistance to	SMAJ5.0A	30	68087	260℃, 10 seconds	0% failure

	Solder Heat (RSH)	SMAJ12A	30	64493		after RSH
		SMAJ6J12A	30	67779		
		SMBJ13A	30	67779		
		SMBJ15A	30	68376		
		P6SMB68A	30	67783		
	External Inspection	SMAJ5.0A	270	68087	Inspect parts construction, marking and workmanship.	0% failure after inspection
		SMAJ12A	270	64493		
		SMAJ6J12A	270	67779		
		SMBJ13A	270	67779		
		SMBJ15A	270	68376		
		P6SMB68A	270	67783		
	Destructive Physical Analysis(DPA)	SMAJ12A	10	64495	Completed H3TRB	0% failure
		P6SMB68A	10	64495		

3. Conclusion

According to the above qualification test results, Littelfuse concluded that the product series which completed by outsource passed the all Reliability Test at WTC Lab.
Outsource will be ready to start mass production in July 2015.

4. MTBF Calculation

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

Temp ℃	% FR/khrs	MTBF (K)	FITS
30	0.000015	6837954.97	0.15
60	0.0005	217753.30	4.59
80	0.0033	30288.83	33.02
100	0.019	5205.12	192.12
125	0.135	738.62	1353.88
150	0.758	132.01	7575.15

Note: The **M**ean-**T**ime-**B**etween-**F**ailure (MTBF) in hours and the percent failure rate per 1008 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.

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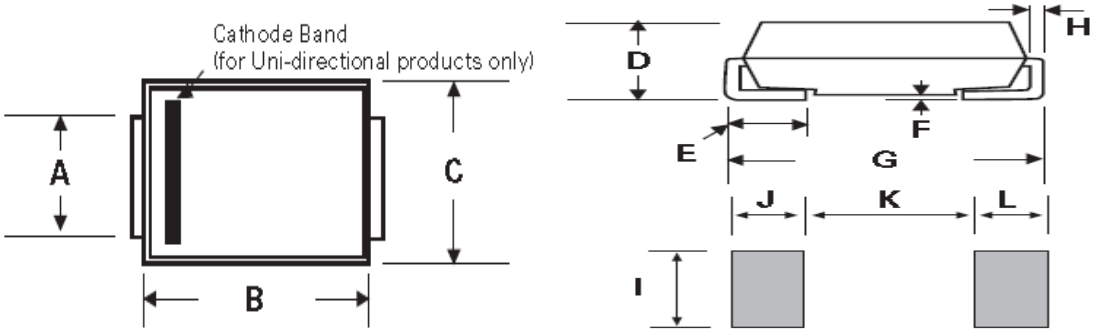
There will be some change for the products in outsource and just as below:

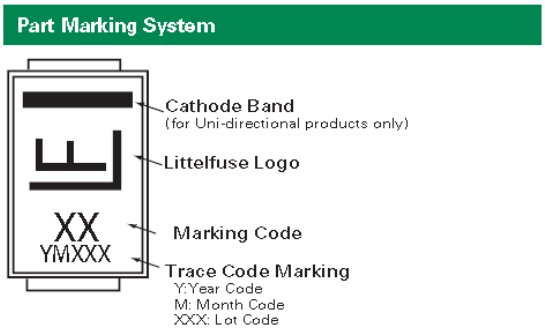
1. Appearance

1.1. Actual dimension change and update datasheet

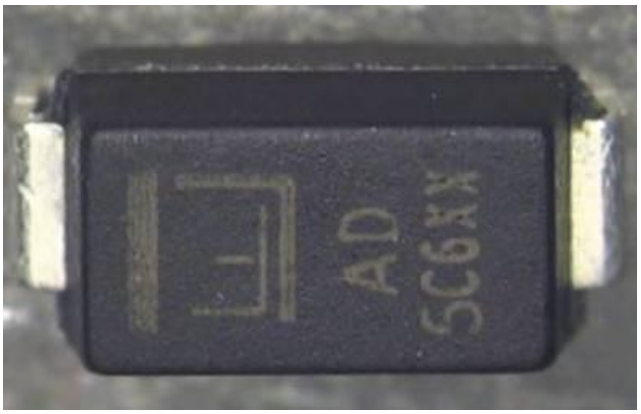


SMA/DO-214AC	Littelfuse				Outsource			
Dimensions	Inches		Millimeters		Inches		Millimeters	
	Min	Max	Min	Max	Min	Max	Min	Max
A	0.049	0.065	1.250	1.650	No change			
B	0.157	0.177	3.990	4.500	0.157	0.181	4.000	4.600
C	0.100	0.110	2.540	2.790	0.095	0.104	2.400	2.650
D	0.078	0.090	1.980	2.290	0.075	0.089	1.900	2.250
E	0.030	0.060	0.780	1.520	No change			
F	-	0.008	-	0.203	No change			
G	0.194	0.208	4.930	5.280	0.189	0.205	4.800	5.200
H	0.006	0.012	0.152	0.305	No change			
I	0.070	-	1.800	-	No change			
J	0.082	-	2.100	-	No change			
K	-	0.090	-	2.300	No change			
L	0.082	-	2.100	-	No change			
SMB/DO-214AA	**Littelfuse**				**Outsource**			
Dimensions	Inches		Millimeters		Inches		Millimeters	
	Min	Max	Min	Max	Min	Max	Min	Max
A	0.077	0.086	1.950	2.200	0.076	0.082	1.930	2.080
B	0.160	0.180	4.060	4.570	0.167	0.187	4.250	4.750
C	0.130	0.155	3.300	3.940	No change			
D	0.084	0.096	2.130	2.440	0.078	0.103	1.990	2.610
E	0.030	0.060	0.780	1.520	No change			
F	-	0.008	-	0.203	No change			
G	0.205	0.220	5.210	5.590	No change			
H	0.006	0.012	0.152	0.305	No change			
I	0.089	-	2.260	-	No change			
J	0.085	-	2.160	-	No change			
K	-	0.107	-	2.740	No change			
L	0.085	-	2.160	-	No change			

1.2. Marking change



SMA/DO-214AC Marking



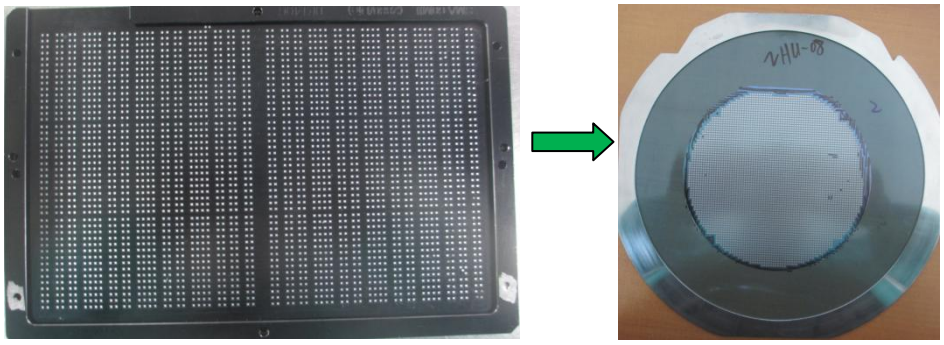
SMB/DO-214AA Marking

Will change the trace code marking from YMXXX to YM6XX and number 6 is the outsource code.

2. Process change

Process	Littelfuse	Outsource
Dicing	None tape	Blue tape cutting
Soldering	Manual soldering boat	Die-bonding
Molding	Molding profile for Littelfuse epoxy	Molding profile for outsource epoxy
Trim form	Trim form per Littelfuse process	Trim form per goodark process
Plating	Barrel plating	Rack plating
Test	per Littelfuse test spec and flow	per Littelfuse test spec and flow

2.1. The method loading method will be changed to adapt outsource process, so the dicing and soldering process is different

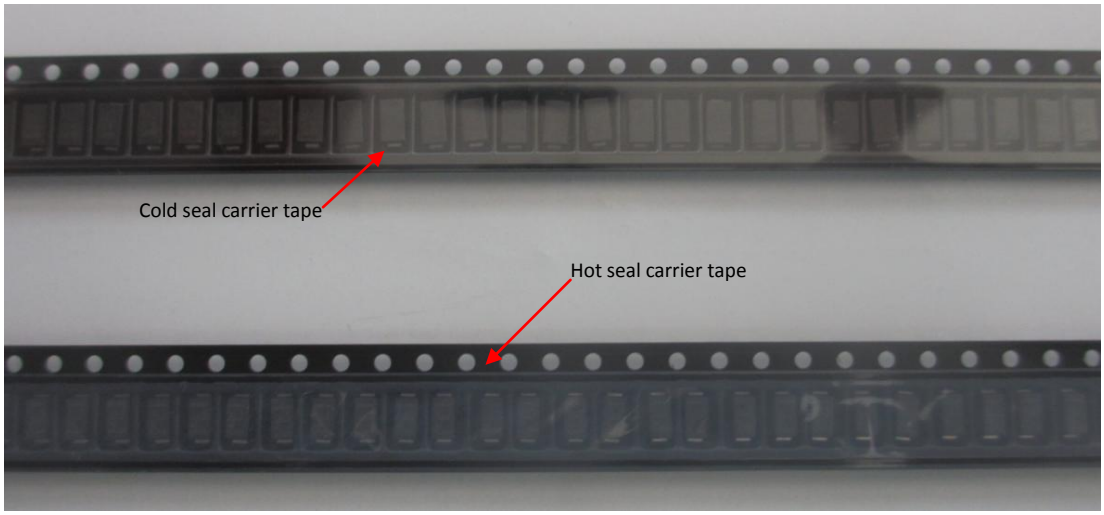


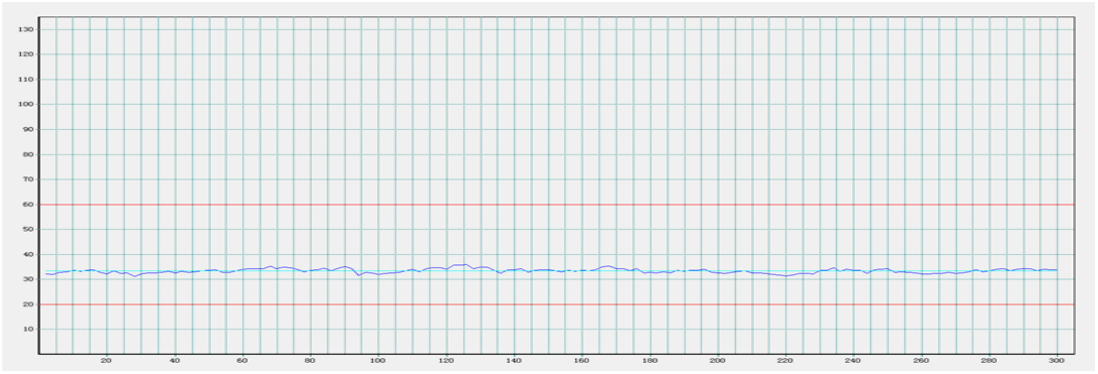
2.2. The outside plating in outsource is racking plating.

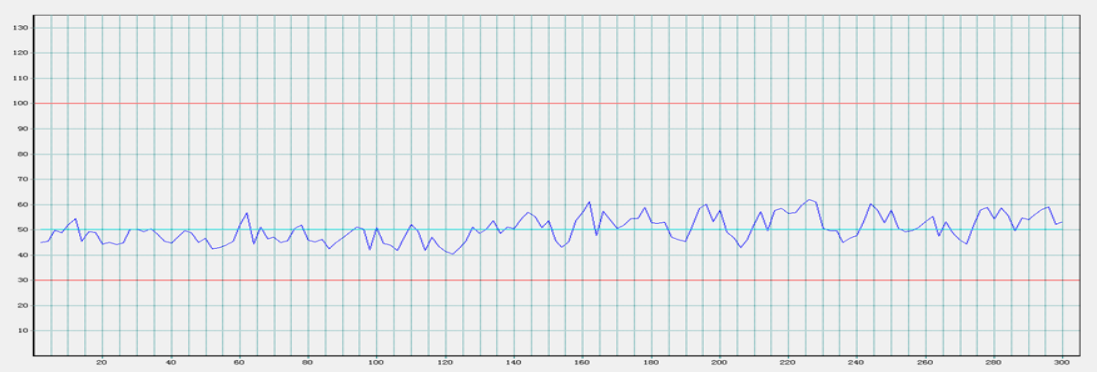
3. Packing

Packing	Littelfuse	Outsource
Tape	Cold seal carrier tape for SMA Hot seal carrier tape for SMB	Hold seal carrier tape for SMA&SMB
Reel	Littelfuse blue plastic tape, 13 inches	Outsource blue plastic tape, 13 inches
Internal pizza box	Per littelfuse	Per littelfuse
Label on pizza box	70mmx38mm,Front is internal font B, font size is 12 Bar code is code 128(B), height is 4.6mm	70mmx40mm,Front is Arial, font size is 12 Bar code is code 128(B), height is 4.57mm
Outside carton Box	Per Littelfuse	Per Littelfuse

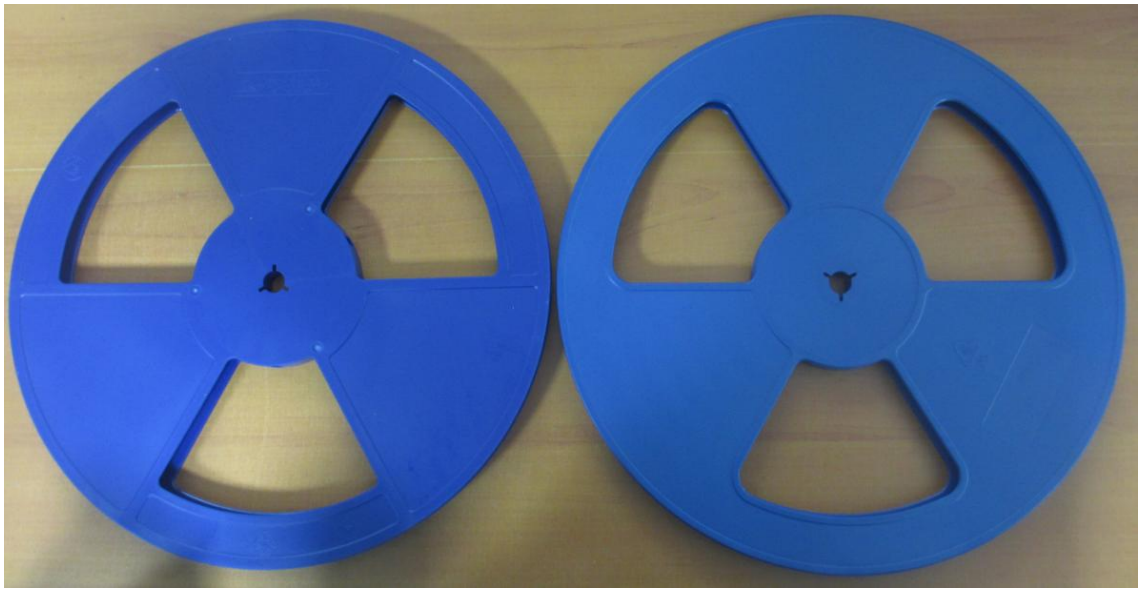
3.1. The carrier pull force also change from 20~60g to 30~100g because Change SMA/DO-214AC series carrier tape to hot seal carrier tape.



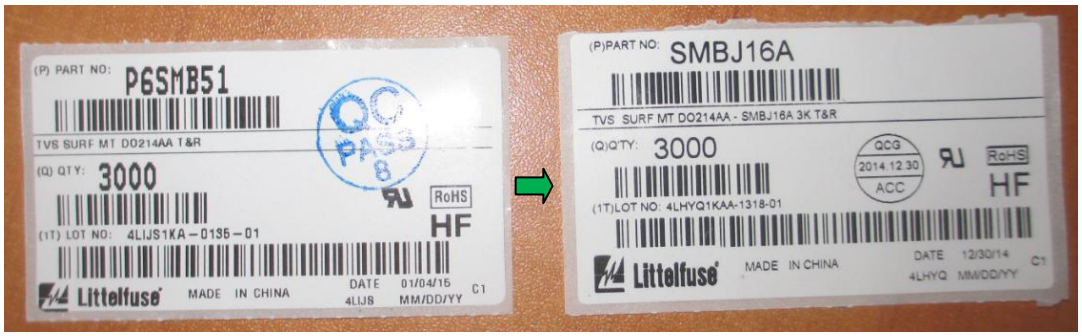




3.2. The blue plastic tape will change to outsource tape and the dimension will not change.



3.3. The label on internal pizza box is changed and print the QC signet on the label.



Approvals:

Changjun Tang	**Zhiwei Wang**
TVS Product Engineer	**Product Engineer Manager**
Littelfuse, WUXI	**Littelfuse, WUXI**