



8755 W. Higgins Road Suite 500
Chicago, Illinois USA 60631

March 27, 2018

RE: PCN Production Transfer for Acquired ON Semiconductor Automotive TVS Diodes SMA (DO-214AC) and SMC (DO-214AB)

To our valued customers,

On August 29, 2016, Littelfuse completed the acquisition of select ON Semiconductor product lines. The acquired product lines included TVS Diodes, Thyristors, and IGBT's for ignition applications as well as all relevant intellectual property.

It's our pleasure to announce that Littelfuse has successfully qualified the SMA (DO-214AC) and SMC (DO-214AB) automotive grade TVS Diode products (with part number starting with SZ or SC prefix), Qualification reports and part number lists are attached as appendices.

To ensure a smooth transition to serve our customers better, we ask that you contact your local Littelfuse sales teams with any specific questions or requests within 180 days or before September 26, 2018 at the latest.

Littelfuse will start to produce SMA (DO-214AC) and SMC (DO-214AB) automotive grade TVS Diode products (with part number starting with SZ or SC prefix) in our Wuxi, China manufacturing site starting October 1, 2018. During the production transition period we will ship from both the current ON Semiconductor Seremban site and the Littelfuse Wuxi China site. Littelfuse will provide customer specific cutover date codes based on each individual customer's approval process and the Littelfuse production conversion timeline.

For the customers who have already engaged with Littelfuse to receive validation samples and manage internal testing, Littelfuse will keep providing our support and service for customer qualifications until the final approvals is obtained.

Qualification Plan and Part Number List

Enclosed separately are the part numbers which are qualified in our Wuxi, China site, along with the qualification result.

Project Milestones	
Date	Milestone
2/27/2017	SAP Go live: ordering/shipment of ON Semiconductor part numbers through Littelfuse – Finished
5/30/2017	Clean Rooms and Facility Hook Up completed by Littelfuse – Finished
10/31/2017	FAB & ASSY Equipment and Process Qualification completed by Littelfuse – Finished
3/26/2018	Internal Product Qualification Completed, Start Sampling and Initial Production from Littelfuse facilities SMA (DO-214AC) and SMC (DO-214AB) TVS products
10/01/2018	Initial Production from Littelfuse Wuxi site of SMA (DO-214AC) and SMC (DO-214AB) automotive grade TVS products and start the deliveries
12/31/2018	Last Order Date of ON Semiconductor part numbers from ON Semiconductor facilities for customers
6/30/2019	Automotive Customer Qualification Completed by Littelfuse
7/31/2019	Last Shipment Date of ON Semiconductor part numbers from ON Semiconductor facilities to customers
8/29/2019	Automotive TSA completed and Full Mass Production from Littelfuse Wuxi China



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Product Discontinuity

Littelfuse has obsoleted all commercial grade TVS Diodes (those PNs without the **SZ/SC** prefix) starting from December 31, 2017, and will obsolete SMA-FL (SZNS6A), and replace it with the TPSMA6L series starting December 31, 2018.

Production Support and Last Time Buy from ON Semiconductor Seremban site

ON Semiconductor will continue to manufacture and ship the automotive grade TVS Diodes (with part number starting with SZ or SC prefix) up to August 29, 2019 (or 3 years from acquisition date) to support those customers who require additional time to approve the Littelfuse made TVS Diodes. We ask that you communicate your approval requirements and timelines to your local Littelfuse sales representative as soon as possible if you have not done so already, and place your Last Time Buy orders before December 31, 2018 to ensure supply continuity.

All new SMA (DO-214AC) and SMC (DO-214AB) automotive grade TVS Diode sample orders and requests will be fulfilled from our Wuxi manufacturing site starting today (March 27, 2018)

Manufacturing Changes

Although we are working with the ON Semiconductor team to duplicate their processes to the greatest extent possible, there are still some changes we would like to draw your attention to below.

	Current	Change to
Raw Silicon	ON Semiconductor, 6 inches	Littelfuse , 5 inches
Wafer Fab	ON Semiconductor	Littelfuse (Wuxi, China)
Backend	ON Semiconductor (DO-214AA,SMB)	Littelfuse (Wuxi, China)
	ON Semiconductor (DO-214AB,SMC)	Littelfuse (Wuxi, China)
	ON Semiconductor (DO-214AC,SMA)	Littelfuse (Wuxi, China)
	ON Semiconductor (SOD-123)	Littelfuse (Wuxi, China)
	ON Semiconductor (SMA-FL)	Obsolete SZNS6A and replace it with Littelfuse TPSMA6L series



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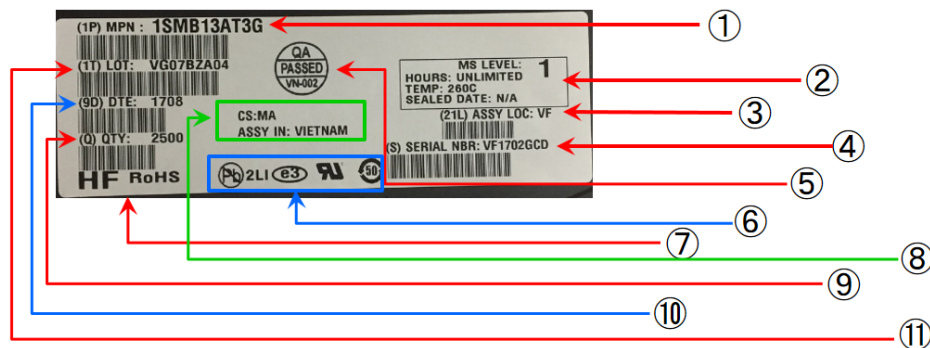
Meanwhile, Littelfuse will enhance the body marking and label specification for better traceability and service.

Device Marking Change: following production transfer into our Wuxi, China site.

Package	SMA	SMB	SMC	SMF (SOD123 - FL)
Existing (ON)				
Modified (LF)	 XXXX = Device Code Y = Year M = Month A = Assembly Location WW = Lot Code			 XX = Device Code Y = Year M = Month A = Assembly Location WW = Lot Code
Modification Items	1. Intergrat SMA, SMB and SMC using same marking diagram. 2. Use five digits trace code for better traceability. 3. Remove Pb-free dot. 4. Change polarity band quantity from three to one.			1. Change marking from one line to two lines. 2. Use five digits trace code for better traceability. 3. Remove Pb-free dot. 4. Change polarity band quantity from three to one.

Note: Polarity band is only for uni-directional components.

Current label format:



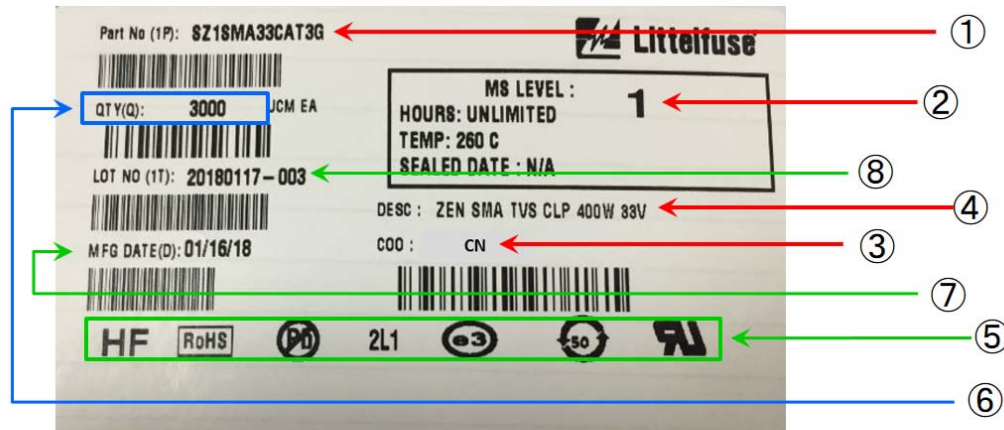
Legend:

- 1. Part number
- 2. MSL Level
- 3. Assembly site
- 4. ON Serial Number
- 5. QA passed mark
- 6. Pb and UL symbol
- 7. RoHS Compliance and HF symbol
- 8. Assembly location
- 9. Quantity
- 10. Manufacturing date
- 11. Lot number



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New label format: following production transfer into our Wuxi, China site.



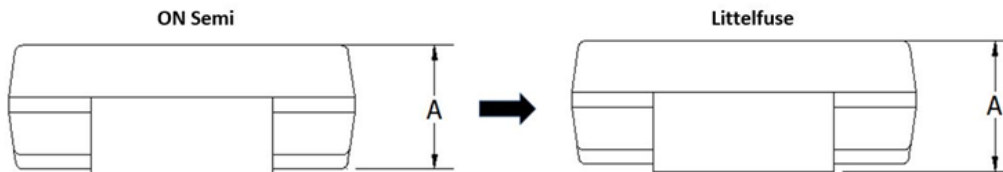
- Legend:
- 1. Part number
- 2. MSL Level
- 3. Assembly site
- 4. Component Description
- 5. Environmental symbol
- 6. Quantity
- 7. Manufacturing date
- 8. Lot number



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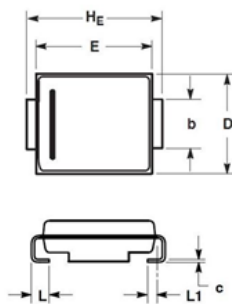
With an intensive qualification, Littelfuse would further clarify the SMC (DO214-AB) dimensions as below:

Dimension A is changed from body height to total height to keep with JEDEC standard.



DO214AB outline

--- Dimensions A, A1 and b are changed, other dimension specifications are no difference.



DIM	ON Semi(old)			Littelfuse(new)		
	MILLIMETERS			MILLIMETERS		
	MIN	NOM	MAX	MIN	NOM	MAX
A	1.90	2.13	2.41	2.00	2.22	2.41
A1	0.05	0.10	0.15	0.05	0.10	0.20
b	2.92	3.00	3.07	2.92	3.00	3.18
c	0.15	0.23	0.30	0.15	0.23	0.30
D	5.59	5.84	6.10	5.59	5.84	6.10
E	6.60	6.86	7.11	6.60	6.86	7.11
H _E	7.75	7.94	8.13	7.75	7.94	8.13
L	0.76	1.02	1.27	0.76	1.02	1.27
L1	0.51 REF			0.51 REF		

Both SMA (DO-214AC) and SMC (DO-214AB) qualification reports and datasheets are included with this PCN letter reflecting the improvements above. The new datasheets will be on the Littelfuse website once all the customer approvals are obtained.

This PCN package is for your information and acknowledgement. If you require any specific data or product samples to certify this change, please contact Littelfuse as soon as possible.

If you have any further questions or concerns, please contact your Littelfuse local sales representative.

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

Best Regards,

Charlie Cai
Product Manager Automotive and Hi-Rel TVS

PCN Report

Prepared By : Haipeng Xu, Senior Product Engineer
Date : Mar 16th, 2018
Products : Automotive TVS in SMA package acquired from ON Semiconductor
Revision : A

1.0 Objective:

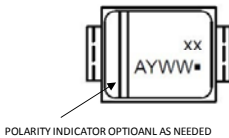
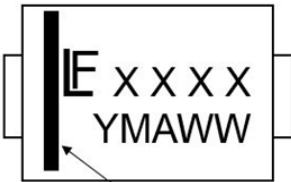
This report covers manufacturing size transfer activities of automotive TVS of SMA package acquired from ON Semiconductor. Site transfer includes fab manufacturing, backend assembly, final test and packaging operations.

2.0 Affected Devices:

Automotive TVS components acquired from ON Semiconductor in package of SMA.
Please see the attached Appendix I for a full list of affected part numbers.

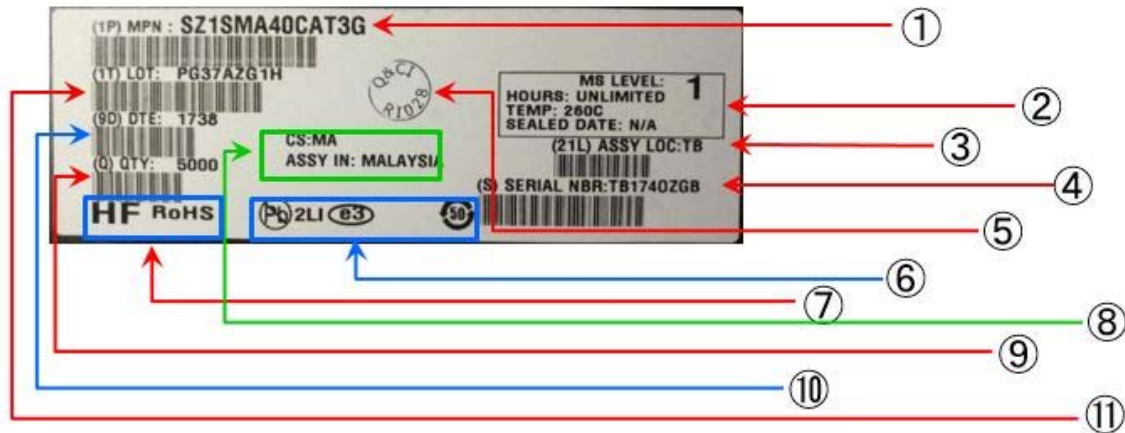
3.0 Physical Differences/Changes:

3.1 Marking diagram format change

Package	ON Semi Marking [OLD]	Littelfuse Marking [NEW]	Modification Items
SMA	 <p>XX = Device Code A = Assembly Location Y = Year WW = Work Week ▪ = Pb-Free Package</p>	 <p>XXXX = Device Code(Max four digits) Y = Year M = Month A = Assembly Location WW = Lot Code</p>	<ol style="list-style-type: none"> 1.Add Littelfuse logo 2.Optimize trace code for better traceability 3.Remove Pb-free dot 4.Change polarity band quantity from three to one

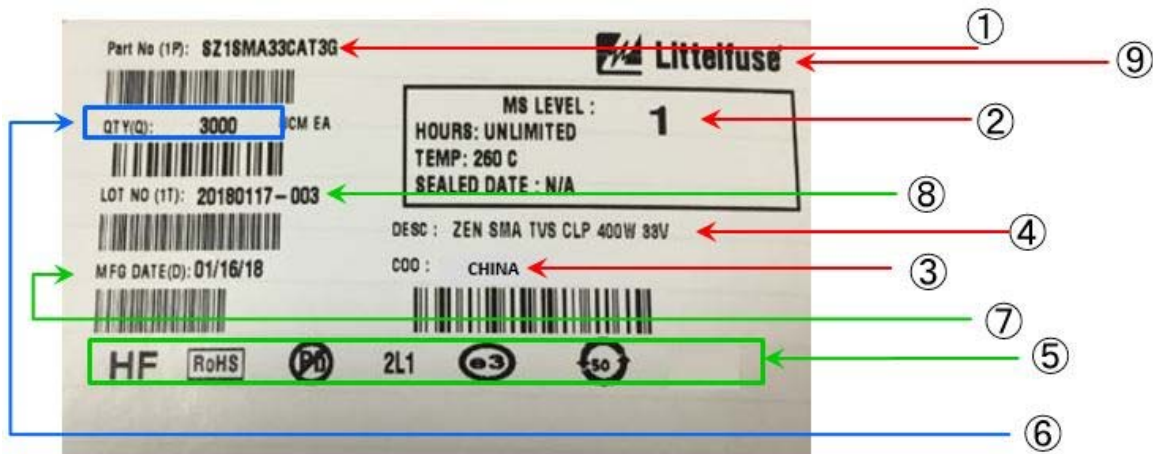
3.2 Label format change

a. ON Semiconductor's label [OLD]



- Legend:
- 1. Part number
- 2. MSL Level
- 3. Assembly site
- 4. ON Serial Number
- 5. QA passed mark
- 6. Pb and UL symbol
- 7. RoHS Compliance and HF symbol
- 8. Assembly location
- 9. Quantity
- 10. Manufacturing date
- 11. Lot number

b. Littelfuse's label [NEW]



- Legend:
- 1. Part number
- 2. MSL Level
- 3. Assembly site
- 4. Component description
- 5. Environmental symbol
- 6. Quantity
- 7. Manufacturing date
- 8. Lot number
- 9. Littelfuse Logo

4.0 Qualification Test Items and Result Summary:

Discrete Semiconductor Component Qualification Result								Rev.A	March 15, 2018
General Specification: AEC-Q101 Rev D Supplier: Littelfuse, Inc Supplier Generic P/N: SZ1SMAxxAT3G and SZ1SMAxxCAT3G Supplier Internal P/N: SZ1SMAxxAT3G and SZ1SMAxxCAT3G Requested PPAP submission date:TBD					Supplier Manufacturing Site: Wuxi, Jiangsu, China Package Type: SMA Family Type: Zener				
Reason for qual: Manufacturing site change for TVS acquired from ON Semi									
Item #	Test	Test Conditions	Littelfsue Test Ref#	Ref. Spec	# Lots	S.S.	Result Fail/Total	Remarks	
1	Pre- and Post-Stress Electrical Test	Electrical Characterization @ 25°C		Datasheet spec	all	all	0/all	Before and after all test	
2	Pre-conditioning	24hrs 125°C bake, 168hrs 85°C/85% humidity storage, 3 times Reflow	105536&105538&105552 &105553&105806	JA113	27	80	0/2160	Performed prior to UHAST, TC, IOL, H3TRB	
3	External Visual	Per AEC-Q101		MIL750-2071	all	all	0/all		
4	Parametric Verification	Electrical Characterization @ -65°C, 25°C & 150°C	105539&105540&105807	Individual AEC user specification	7	30	0/210		
5	High Temperature Reverse Bias	Tj=150°C, 1,008hr, biased at VR	105536&105538&105806	MIL-STD-750-1 M1038 Method A	7	80	0/560		
6	High Temperature Gate Bias	Per AEC-Q101	N/A	JA108					
7	Temperature Cycling	TA: -65°C to +150°C , dwell time >15mins, 1,000 cycle	105536&105538&105806	JA104	7	80	0/560		
8	Unbiased Highly Accelerated Stress Test	96 hours at TA=130°C/85%RH.	105536&105538&105806	JA118	7	80	0/560		
9	High Humidity High Temp. Reverse Bias	TA: 85°C, RH: 85%, 1000hr, Reverse biased at VR or max 100V	105536&105538&105806	JA101	7	80	0/560		
10	Intermittent Operational Life	TA:25°C, ΔTJ: 100°C, TON/OFF: 2 minutes, 15,000cycles	105552&105553	MIL-STD-750 Method 1037	6	80	0/480		
11	ESD Characterization	HBM:16KV,MM:1.6KV,IEC61000-4-2: 30KV	105536&105538&105806	CDF-AEC Q101-001 & 002	7	90	0/630	HBM :3B IEC-61000-4-2 ≥ 30KV MM : M4	
12	Destructive Physical Analysis	Per AEC-Q101	108906&109059&109060	AEC-Q101-004	3	2	0/6	Samples from passed H3TRB and TC	
13	Physical Dimension	Per JEDECSD123 package dimension	105539&105540&105807	JB-100	3	30	0/90	Per Datasheet Spec	
14	Terminal Strength	Per AEC-Q101	N/A	MIL750-2006				Evaluate lead integrity of leaded parts only	
15	Resistance to Solvents	per AEC - Q101	N/A	JB-107				Laser marked	
16	Constant Acceleration		N/A					Not hermetic packaged devices	
17	Vibration Variable Frequency		N/A					Not hermetic packaged devices	
18	Mechanical Shock		N/A					Not hermetic packaged devices	
19	Hermeticity		N/A					Not hermetic packaged devices	
20	Resistance to Solder Heat	260°C, 10 secs	105536&105538&105806	JB-106-A	7	30	0/210		
21	Solderability	245°C, 10 secs	105536&105538&105806	J-STD002	7	15	0/105		
22	Thermal Resistance	Typical Thermal Resistance Junction to Lead	105554	JESD-24-3, 24-4, 24-6 as appropriate	3	15	0/45	Per Datasheet Spec	
23	Wire Bond Strength	Per AEC-Q101	N/A	MIL750, 2037				wire bond only	
24	Bond Shear		N/A					wire bond only	
25	Die Shear	Per AEC-Q101	N/A	MIL750, 2017				wire bond only	
26	Unclamped Inductive Switching	Per AEC-Q101	N/A	CDF-AECQ101-004 Section 2				Power MOS & internally clamped IGBT only	
27	Dielectric Integrity	Per AEC-Q101	N/A	CDF-AECQ101-004 Section 2				Power MOS & IGBT only	
28	Short Circuit Reliability	Per AEC-Q101	N/A					For smart power parts only	
29	Lead Free	Per AEC-Q101	N/A	AEC-Q005				Will provide separate whisker report once	
30	Capacitance	Bias=1V,2V,5V, 10V,50%VR, 100%VR, 1MHz,TJ = 25°C	105539&105540&105807	Individual AEC user specification	7	15	0/105		
31	Surge Life(10*1000us)	10*1000us waveform,50hits	105539&105540&105807	Individual AEC user specification	7	10	0/70		
32	Surge Out(10*1000)	10*1000us waveform,25°C,85°C and 150°C	105539&105540&105807	Individual AEC user specification	7	30	0/210	each temp 10Pcs	
33	High Temperature Storage Life	TA=150°C, 1008hours	105536&105538&105806	JA103	7	80	0/560		
All samples passed all requested test items by AEC-Q101 Rev.D successfully.									

5.0 Recommendations & Conclusions:



Expertise Applied | Answers Delivered

Based on above qualification test results, Littelfuse judged that manufacturing site transfer activities of SMA package have been completed and TVS components in SMA package are successfully qualified by AEC-Q101 tests.

Littelfuse released new manufacturing site to production for automotive TVS of SMA package.

6.0 Approvals:

Haipeng Xu
Senior Product Engineer
Littelfuse, Inc.

Sewall Wang
Product Engineering Manager
Littelfuse,



Expertise Applied | Answers Delivered

7.0 Appendix I – List of part numbers affected by this PCN report

SC1SMA12AT3G	SZ1SMA10CAT3G
SZ1SMA10AT3G	SZ1SMA12CAT3G
SZ1SMA11AT3G	SZ1SMA13CAT3G
SZ1SMA12AT3G	SZ1SMA15CAT3G
SZ1SMA13AT3G	SZ1SMA16CAT3G
SZ1SMA14AT3G	SZ1SMA18CAT3G
SZ1SMA15AT3G	SZ1SMA20CAT3G
SZ1SMA16AT3G	SZ1SMA24CAT3G
SZ1SMA17AT3G	SZ1SMA26CAT3G
SZ1SMA18AT3G	SZ1SMA28CAT3G
SZ1SMA20AT3G	SZ1SMA30CAT3G
SZ1SMA22AT3G	SZ1SMA33CAT3G
SZ1SMA24AT3G	SZ1SMA36CAT3G
SZ1SMA26AT3G	SZ1SMA40CAT3G
SZ1SMA28AT3G	SZ1SMA48CAT3G
SZ1SMA30AT3G	SZ1SMA58CAT3G
SZ1SMA33AT3G	SZ1SMA60CAT3G
SZ1SMA36AT3G	SZ1SMA70CAT3G
SZ1SMA40AT3G	SZ1SMA78CAT3G
SZ1SMA43AT3G	
SZ1SMA45AT3G	
SZ1SMA48AT3G	
SZ1SMA5.0AT3G	
SZ1SMA54AT3G	
SZ1SMA58AT3G	
SZ1SMA6.0AT3G	
SZ1SMA6.5AT3G	
SZ1SMA70AT3G	
SZ1SMA8.0AT3G	
SZ1SMA8.5AT3G	
SZ1SMA9.0AT3G	