



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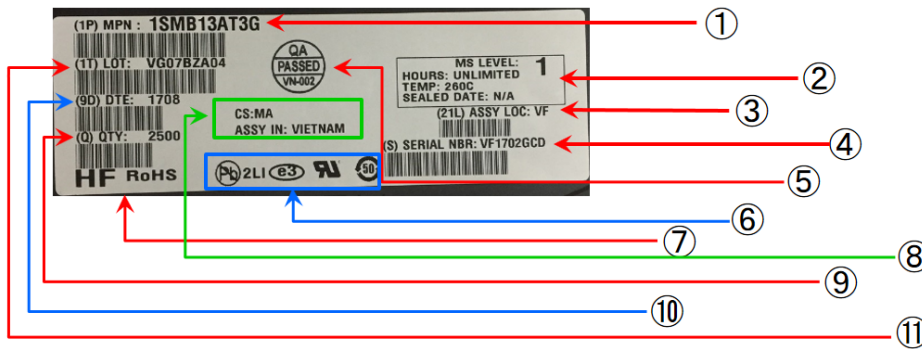
Meanwhile, Littelfuse will enhance the body marking and label specification for better traceability and service.

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:

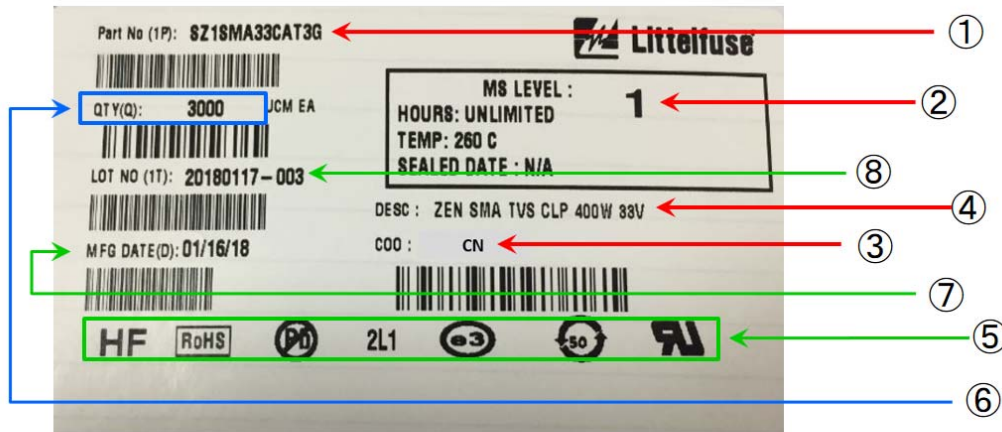


- Legend:
- 1. Part number
- 2. MSL Level
- 3. Assembly site
- 4. ON Serial Number
- 5. QA passed mark
- 6. Pb and UL symbol
- 7. RoHS Compliance and HF symbol
- 8. Assembly location
- 9. Quantity
- 10. Manufacturing date
- 11. Lot number



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



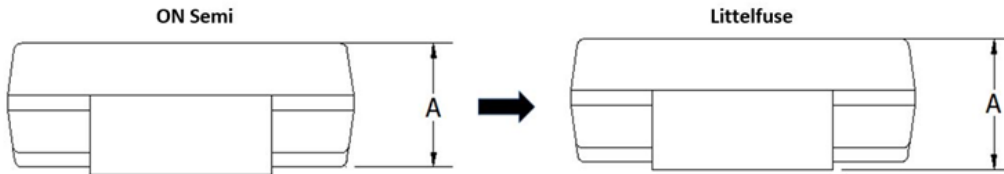
- Legend:
- 1. Part number
- 2. MSL Level
- 3. Assembly site
- 4. Component Description
- 5. Environmental symbol
- 6. Quantity
- 7. Manufacturing date
- 8. Lot number



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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 SMC package acquired from ON Semiconductor
Revision : A

1.0 Objective:

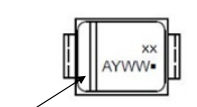

This report covers manufacturing size transfer activities of automotive TVS of SMC package acquired from ON Semiconductor. Site transfer includes fab manufacturing, backend assembly, final test and packaging operations.

2.0 Affected Devices:

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

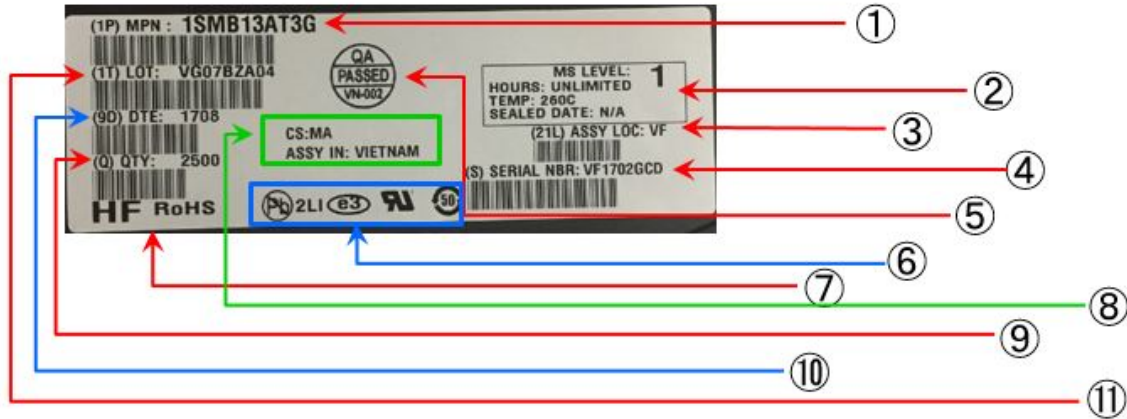
3.0 Physical Differences/Changes:

3.1 Marking diagram format change

Package	ON Semi Marking [OLD]	Littelfuse Marking [NEW]	Modification Items
SMC	<p style="text-align: center;">MARKING DIAGRAM</p>  <p style="text-align: center;"><small>POLARITY INDICATOR OPTIOANL AS NEEDED</small></p> <p> xx = Device Code (Refer to page 3) A = Assembly Location Y = Year WW = Work Week • = Pb-Free Package </p>	 <p style="text-align: center;"><small>POLARITY INDICATOR OPTIONAL AS NEEDED</small></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

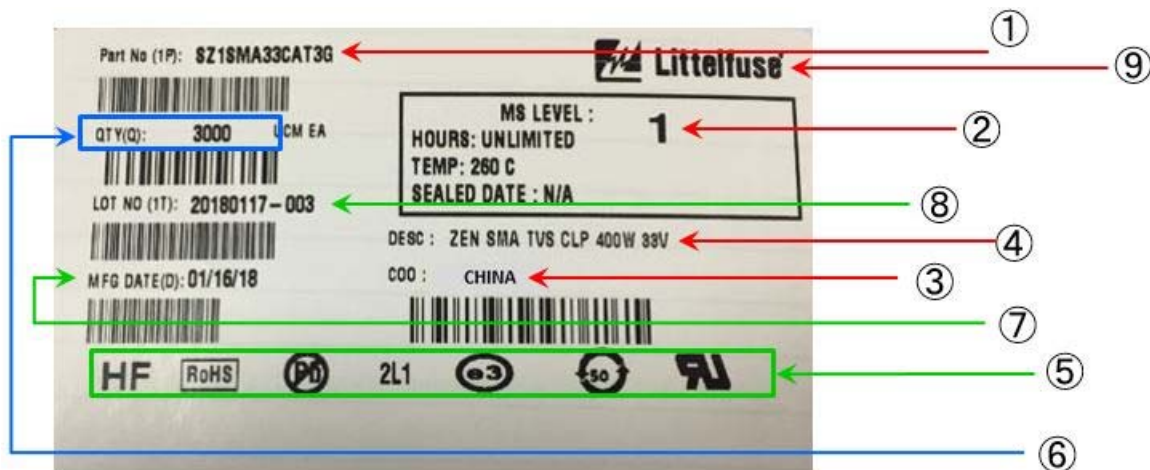
3.2 Label format change

a. ON Semiconductor's label [OLD]



- | | |
|--|---|
| <ul style="list-style-type: none"> ▪ Legend: ▪ 1. Part number ▪ 2. MSL Level ▪ 3. Assembly site ▪ 4. ON Serial Number ▪ 5. QA passed mark ▪ 6. Pb and UL symbol | <ul style="list-style-type: none"> ▪ 7. RoHS Compliance and HF symbol ▪ 8. Assembly location ▪ 9. Quantity ▪ 10. Manufacturing date ▪ 11. Lot number |
|--|---|

b. Littelfuse's label [NEW]

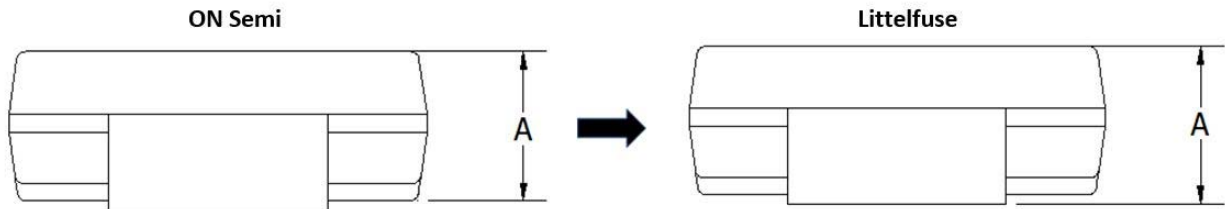


- | | |
|--|---|
| <ul style="list-style-type: none"> ▪ Legend: ▪ 1. Part number ▪ 2. MSL Level ▪ 3. Assembly site ▪ 4. Component description ▪ 5. Environmental symbol | <ul style="list-style-type: none"> ▪ 6. Quantity ▪ 7. Manufacturing date ▪ 8. Lot number ▪ 9. Littelfuse Logo |
|--|---|

4.0 Dimension specification changes:

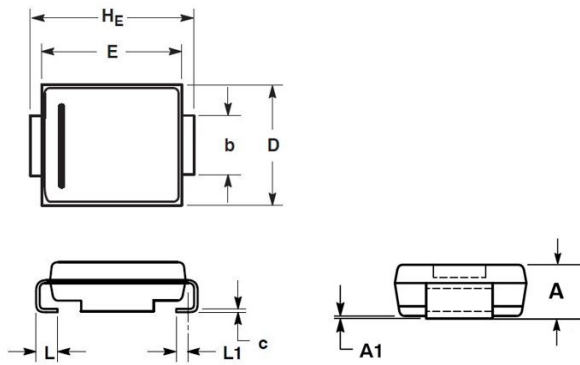
Slight changes have been proceeded for outline dimensions A, A1 and b and all new specifications are within JEDEC specifications.

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



4.2 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
HE	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		



Expertise Applied | Answers Delivered

5.0 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: SZ1SMCxxAT3G and SZ1.5SMCxxAT3G Supplier Internal P/N: SZ1SMCxxAT3G and SZ1.5SMCxxAT3G Requested PPAP submission date:TBD Reason for qual: Manufacturing site change for TVS acquired from ON Semi								
					Supplier Manufacturing Site: Wuxi, Jiangsu, China			
					Package Type: SMC			
					Family Type: Zener			
Item #	Test	Test Conditions	Littelfuse 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	105555&105557	JA113	12	80	0/960	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	105556	Individual AEC user specification	3	30	0/90	
5	High Temperature Reverse Bias	Tj=150°C, 1,008hr, biased at VR	105555	MIL-STD-750-1 M1038 Method A	3	80	0/240	
6	High Temperature Gate Bias	Per AEC-Q101	N/A	JA108				
7	Temperature Cycling	TA: -65°C to +150°C, dwell time >15mins.	105555	JA104	3	80	0/240	
8	Unbiased Highly Accelerated Stress Test	96 hours at TA=130°C/85%RH.	105555	JA118	3	80	0/240	
9	High Humidity High Temp. Reverse Bias	TA: 85°C, RH: 85%, 1000hr, Reverse biased at VR or max 100V	105555	JA101	3	80	0/240	
10	Intermittent Operational Life	TA:25°C, ΔTjz 100°C, TON/OFF: 2 minutes, 15,000cycles	105557	MIL-STD-750 Method 1037	3	80	0/240	
11	ESD Characterization	HBM:16KV,MM:1.6KV,IEC61000-4-2: 30KV	105555	CDF-AEC Q101-001 & 002	3	90	0/270	HBM :3B IEC-61000-4-2 ≥ 30KV MM: M4
12	Destructive Physical Analysis	Per AEC-Q101	107929&109062&109063	AEC-Q101-004	3	2	0/6	Samples from passed H3TRB and TC
13	Physical Dimension	Per JEDEC SOD123 package dimension	105556	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	105555	JB-106-A	3	30	0/90	
21	Solderability	245°C, 10 secs	105555	J-STD002	3	15	0/45	
22	Thermal Resistance	Typical Thermal Resistance Junction to Lead	105558	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	105556	Individual AEC user specification	3	15	0/45	
31	Surge Life(10*1000us)	10*1000us waveform,50hits	105556	Individual AEC user specification	3	10	0/30	
32	Surge Out(10*1000)	10*1000us waveform,25°C,85°C and 150°C	105556	Individual AEC user specification	3	30	0/90	each temp 10Pcs
32	High Temperature Storage Life	TA=150°C, 1008hours	105555	JA103	3	80	0/240	
All samples passed all requested test items by AEC-Q101 Rev.D successfully.								



Expertise Applied | Answers Delivered

6.0 Recommendations & Conclusions:

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

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

7.0 Approvals:

Haipeng Xu
Senior Product Engineer
Littelfuse, Inc.

Sewall Wang
Product Engineering Manager
Littelfuse, Inc

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



Expertise Applied | Answers Delivered

SZ1SMC10AT3G	SC1.5SMC62AT3G
SZ1SMC12AT3G	SZ1.5SMC10AT3G
SZ1SMC13AT3G	SZ1.5SMC12AT3G
SZ1SMC14AT3G	SZ1.5SMC13AT3G
SZ1SMC15AT3G	SZ1.5SMC15AT3G
SZ1SMC16AT3G	SZ1.5SMC16AT3G
SZ1SMC17AT3G	SZ1.5SMC18AT3G
SZ1SMC18AT3G	SZ1.5SMC20AT3G
SZ1SMC20AT3G	SZ1.5SMC22AT3G
SZ1SMC22AT3G	SZ1.5SMC24AT3G
SZ1SMC24AT3G	SZ1.5SMC27AT3G
SZ1SMC26AT3G	SZ1.5SMC30AT3G
SZ1SMC28AT3G	SZ1.5SMC33AT3G
SZ1SMC30AT3G	SZ1.5SMC36AT3G
SZ1SMC33AT3G	SZ1.5SMC39AT3G
SZ1SMC36AT3G	SZ1.5SMC43AT3G
SZ1SMC40AT3G	SZ1.5SMC47AT3G
SZ1SMC43AT3G	SZ1.5SMC51AT3G
SZ1SMC48AT3G	SZ1.5SMC56AT3G
SZ1SMC5.0AT3G	SZ1.5SMC6.8AT3G
SZ1SMC51AT3G	SZ1.5SMC62AT3G
SZ1SMC54AT3G	SZ1.5SMC68AT3G
SZ1SMC58AT3G	SZ1.5SMC7.5AT3G
SZ1SMC6.0AT3G	SZ1.5SMC75AT3G
SZ1SMC6.5AT3G	SZ1.5SMC82AT3G
SZ1SMC60AT3G	SZ1.5SMC91AT3G
SZ1SMC64AT3G	
SZ1SMC7.5AT3G	
SZ1SMC70AT3G	
SZ1SMC75AT3G	
SZ1SMC78AT3G	
SZ1SMC8.0AT3G	
SZ1SMC9.0AT3G	