



Diodes Incorporated Discrete and Analog Semiconductors

Qualification Report – PCN-2169

Manufacturer No.: PCN-2169 - Lead Frame Structure, Mold Compound and Solder Type changes to enhance PowerDI-5 package

Revision: 0

Date: January 9, 2015

Qualified By: Diodes Incorporated

Also Applicable To: The part numbers listed in the associated PCN are Qualified by Similarity (QBS) to the devices listed in this report.

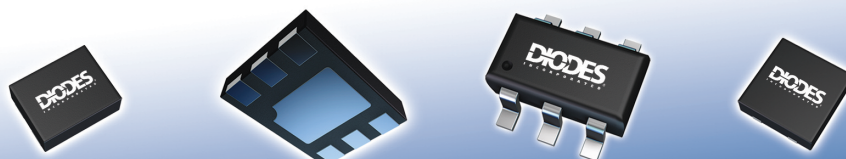
Please go to www.diodes.com for current data sheets on associated devices

Prepared By:	<u>Diodes US Document Control</u>	Date	<u>January 9, 2015</u>
Approved By:	<u>Diodes US QRA Department</u>	Date	<u>January 9, 2015</u>



The information contained herein is DIODES INCORPORATED PROPRIETARY information. Reproduction of this document, disclosure of the information, and use for any purpose other than the conduct of business with Diodes is expressly prohibited

DIODES INCORPORATED 4949 Hedgcoxe Road, Suite # 200, Plano, TX 75024 USA www.diodes.com





Quality and Reliability Data Notice

Plastic encapsulated Diodes Incorporated semiconductor devices are not designed and are not warranted to be suitable for use in some military applications and/or military environments. Use of plastic encapsulated Diodes Incorporated semiconductor devices in military applications and/or military environments, in lieu of hermetically sealed ceramic devices, is understood to be fully at the risk of Buyer.

Quality and reliability data provided by Diodes Incorporated is intended to be an estimate of product performance based upon history only. It does not imply that any performance levels reflected in such data can be met if the product is operated outside the conditions expressly stated in the latest published data sheet for a device.

Existing industry standards for plastic encapsulated microcircuit qualification and reliability monitors are based upon historical data, experiments, and field experience with the use of these devices in commercial and industrial applications. The applicability of these standards in determining the suitability for use and safety performance in life support, military and aerospace applications has not been established. Due to the multiple variations in field operating conditions, a component manufacturer can only base estimates of product life on models and the results of package and die level qualification. The buyer's use of this data, and all consequences of such use, is solely the buyer's responsibility. Buyer assumes full responsibility to perform sufficient engineering and additional qualification testing in order to properly evaluate the buyer's application and determine whether a candidate device is suitable for use in that application. The information provided by Diodes Incorporated shall not be considered sufficient grounds on which to base any such determination.

THIS INFORMATION IS PROVIDED "AS IS" WITHOUT ANY EXPRESS OR IMPLIED WARRANTY OF ANY KIND INCLUDING WARRANTIES OF MERCHANTABILITY, NONINFRINGEMENT OF INTELLECTUAL PROPERTY, OR FITNESS FOR ANY PARTICULAR PURPOSE. IN NO EVENT SHALL DIODES INCORPORATED OR ITS SUPPLIERS BE LIABLE FOR ANY DAMAGES WHATSOEVER (INCLUDING, WITHOUT LIMITATION, DAMAGES FOR LOSS OF PROFITS, BUSINESS INTERRUPTION, LOSS OF INFORMATION) ARISING OUT OF THE USE OF OR INABILITY TO USE THE INFORMATION, EVEN IF DIODES INCORPORATED HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

Diodes Incorporated may provide technical, applications or design advice, quality characterization, and reliability data or service providing these items shall not expand or otherwise affect Diodes Incorporated warranties as set forth in the Diodes Incorporated Standard Terms and Conditions of Sale for and no obligation or liability shall arise from Diodes Incorporated provision of such items.

"The information contained herein is DIODES INCORPORATED PROPRIETARY information. Reproduction of this document, disclosure of the information, and use for any purpose other than the conduct of business with Diodes Incorporated is expressly prohibited".

DIODES INCORPORATED
4949 Hedgcoxe Road, Suite # 200
Plano, TX 75024 USA
(972) 987-3900
www.diodes.com



DATE: 9th January, 2015

PCN #: 2169

PCN Title: Lead Frame Structure, Mold Compound and Solder Type changes to enhance PowerDI-5 package

Dear Customer:

This is an announcement of change(s) to products that are currently being offered by Diodes Incorporated.

We request that you acknowledge receipt of this notification within 30 days of the date of this PCN. If you require samples for evaluation purposes, please make a request within 30 days as well. Otherwise, samples may not be built prior to this change. Please refer to the implementation date of this change as it is stated in the attached PCN form. Please contact your local Diodes sales representative to acknowledge receipt of this PCN and for any sample requests.

The changes announced in this PCN will not be implemented earlier than 90 days from the notification date stated in the attached PCN form.

Previously agreed upon customer specific change process requirements or device specific requirements will be addressed separately.

For questions or clarification regarding this PCN, please contact your local Diodes sales representative.

Sincerely,

Diodes Incorporated PCN Team



PRODUCT CHANGE NOTICE**PCN-2169 REV 00**

Notification Date:	Implementation Date:	Product Family:	Change Type:	PCN #:
9 th January, 2015	9 th April, 2015	Discrete Products	Lead Frame structure, Assembly Materials	2169
TITLE				
Lead Frame Structure, Mold Compound and Solder Type changes to enhance PowerDI-5 package robustness				
DESCRIPTION OF CHANGE				
<p>This PCN is being issued to notify customers that in order to improve PowerDI-5 package body strength and gain better device power dissipation capability, Diodes Incorporated has qualified an enhanced lead frame structure, mold compound and solder materials for PowerDI-5 packaged products.</p> <p>Full electrical characterization and high reliability testing have been completed to ensure that no changes in product reliability, device functionality or data sheet electrical specifications exist.</p> <p>There will be no change to the Form, Fit, or Function of affected products.</p> <p>No other changes will be made.</p>				
IMPACT				
No change in datasheet parameters and product performance				
PRODUCTS AFFECTED				
Please refer to the attached part lists				
WEB LINKS				
Manufacturer's Notice:	http://www.diodes.com/quality/pcns			
For More Information Contact:	http://www.diodes.com/contacts			
Data Sheet:	http://www.diodes.com/products			
DISCLAIMER				
Unless a Diodes Incorporated Sales representative is contacted in writing within 30 days of the posting of this notice, all changes described in this announcement are considered approved.				

Table 1 - Affected Part List				
PDR3G-13	PDS1040L-13	PDU340-13	SBR12U100P5-13	SBRT20U60SP5-13
PDR5K-13	PDS1040S-13	PDU420-13	SBR15U30SP5-13	SBRT15M50AP5-7
PDS1045-13	PDS3100-13	PDU540-13	SBR10A45SP5-13	SBRT15U100SP5-7
PDS3200-13	PDS360-13	PDU620-13	PDS1240CTL-13	SBRT20U60SP5-7
SBR10U200P5-13	PDS4150-13	PDU620CT-13	SBR6U400P5-13	SBRT20U60SP5-7D
SBR8A45SP5-13	PDS4200H-13	PDS340-13	SBR8U20SP5-13	SBRT20M60SP5-7
SBR15U50SP5-13	PDS5100-13	SBR10U45SP5-13	SBR8A60P5-13	SBRT20M60SP5-7D
SBRT10U50SP5-13	PDS5100H-13	SBR1045SP5-13	SBRT15U50SP5-13	SBRT15U50SP5-13D
SBRT15U100SP5-13	PDS540-13	SBR8U60P5-13	SBR8M45SP5-13	PDS540-13D
PDR5G-13	PDS560-13	SBR12A45SP5-13	SBR15A30SP5-13	SBR8U60P5-7
PDS1040-13	PDS760-13	SBR12U120P5-13	SBRT10M50SP5-13	SBR12U120P5-13D
PDS1040CTL-13	PDS835L-13			

Table 2 - Affected Automotive (Q) Part List				
PDS1040Q-13	PDS3100Q-13	PDS3100Q-7	PDS3200Q-13	PDS340Q-13
PDS4150Q-13	PDS5100HQ-13	PDS5100HQ-13D	PDS5100Q-13D	PDS540Q-13
PDS560Q-13	PDS760Q-13	SBR10A45SP5Q-13	SBR10U45SP5Q-13	SBR12U100P5Q-13
SBR12U100P5Q-13D	SBR8U20SP5Q-13	SBR8U60P5Q-13D		



Certificate of Design, Construction & Qualification

Description: PDI-5 package enhancement qualification

Category	Product	Part Number	Qual Device 1	Qual Device 2	Qual Device 3	Qual Device 4	Qual Device 5	Qual Device 6	Qual Device 7	Qual Device 8										
Product	PDR3G-13	PDR3G-13	PDR3G-13	PDR3G-13	PDR3G-13	PDR3G-13	PDR3G-13	PDR3G-13	PDR3G-13	PDR3G-13										
Assembly	Package Type	POWERDI-5	POWERDI-5	POWERDI-5	POWERDI-5	POWERDI-5	POWERDI-5	POWERDI-5	POWERDI-5	POWERDI-5										
Assembly	Package Size	6.5*3.97*1.10	6.5*3.97*1.10	6.5*3.97*1.10	6.5*3.97*1.10	6.5*3.97*1.10	6.5*3.97*1.10	6.5*3.97*1.10	6.5*3.97*1.10	6.5*3.97*1.10										
Wafer	Die Name(s)	STDGPP340	GDS120080N25W	S0667K	S7806K	S9140K	H100A0200LHA2	H100A0405LFA2	H100A0405LFA2	C150A0045LBA2										
Wafer	Die Size (W/L/Thickness) - After Saw	2.41*2.41	3.048*3.048	3.125*3.12	2.61*2.61	1.691*1.69	2.652*2.652	2.652*2.652	2.652*2.652	3.048*3.048										
Wafer	Die Process / Technology	Schottky	Schottky	Schottky	Schottky	Schottky	SBR	SBR	SBR	SBR										
Wafer	Wafer FAB	LITEON	TGI	KFAB	KFAB	KFAB	KFAB	KFAB	HHNEC	HHNEC										
Wafer	Wafer Diameter	3"	4"	4"	5"	5"	5"	5"	5"	6"										
Wafer	Front Metal Type	Ni-Ni-Au	Al-Ti-Ni-Au	Al-Ti-Ni-Au	Al-Ti-Ni-Au	Al-Ti-Ni-Au	Al-Ti-Ni-Au	Al-Ti-Ni-Au	TiN/Ag	TiN/Ag										
Wafer	Front Metal Thickness	20-50uminch	4um	4um	4um	4um	4um	4um	4um	4.5um										
Wafer	Back Metal Type (All Layers)	Ni-Ni-Au	TiN/NiV-Au	TiN/NiV-Au	TiN/NiV-Au	TiN/NiV-Au	TiN/Ag	TiN/Ag	TiN/Ag	TiN/Ag										
Wafer	Back Metal Thickness (All Layers)	20-50uminch	1.5um	1.5um	1.5um	1.5um	1.5um	1.5um	1.5um	1.14um										
Assembly	Die quantity per package (e.g. single or dual dies)	1	1	1	1	1	1	1	1	1										
Assembly	Die Attach Method (DB Epoxy/Solder Type)	Solder	Solder	Solder	Solder	Solder	Solder	Solder	Solder	Solder										
Assembly	ES-500-SPA	ES-500-SPA	ES-500-SPA	ES-500-SPA	ES-500-SPA	ES-500-SPA	ES-500-SPA	ES-500-SPA	ES-500-SPA	ES-500-SPA										
Assembly	Bond Wire/Clip Bond Material	CLIP (KLP00013)	CLIP (KLP00014)	CLIP (KLP00014)	CLIP (KLP00014)	CLIP (KLP00014)	CLIP (KLP00013)	CLIP (KLP00014)	CLIP (KLP00013)	CLIP (KLP00014)										
Assembly	Bond Type (at Die)	Solder	Solder	Solder	Solder	Solder	Solder	Solder	Solder	Solder										
Assembly	Bond Type (at LF)	Solder	Solder	Solder	Solder	Solder	Solder	Solder	Solder	Solder										
Assembly	No. of bond over active area	1	1	1	1	1	1	1	1	1										
Assembly	Glass Transition Temp	135C	135C	135C	135C	135C	135C	135C	135C	135C										
Assembly	Terminal Finish (Plating) Material	100% matte Tin	100% matte Tin	100% matte Tin	100% matte Tin	100% matte Tin	100% matte Tin	100% matte Tin	Pure Sn	100% matte Tin										
Assembly	Header plating (Die Land Area)	Spot Ag	Spot Ag	Spot Ag	Spot Ag	Spot Ag	Spot Ag	Spot Ag	Pure Sn	Spot Ag										
Assembly	Wire Diameter	KLP00013	KLP00014	KLP00014	KLP00014	KLP00014	KLP00013	KLP00014	KLP00013	KLP00014										
Assembly	Leadframe Type	PowerDI-5 spot Ag	PowerDI-5 spot Ag	PowerDI-5 spot Ag	PowerDI-5 spot Ag	PowerDI-5 spot Ag	PowerDI-5 spot Ag	PowerDI-5 spot Ag	PowerDI-5 spot Ag	PowerDI-5 spot Ag										
Assembly	Leadframe Material	A194	A194	A194	A194	A194	A194	A194	A194	A194										
Assembly	Lead Frame Manufacturer	NBKQ	NBKQ	NBKQ	NBKQ	NBKQ	NBKQ	NBKQ	NBKQ	NBKQ										
Assembly	Molding Compound Type	EME-G700L	EME-G700L	EME-G700L	EME-G700L	EME-G700L	EME-G700L	EME-G700L	EME-G700L	EME-G700L										
Assembly	Mold Compound Material Manufacturer	SUMITOMO	SUMITOMO	SUMITOMO	SUMITOMO	SUMITOMO	SUMITOMO	SUMITOMO	SUMITOMO	SUMITOMO										
Assembly	Green Compound (Yes/No)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes										
Assembly	Lead-Free (Yes/No)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes										
Assembly	Assembly Site	SAT	SAT	SAT	SAT	SAT	SAT	SAT	SAT	SAT										
Assembly	Test Site	SAT	SAT	SAT	SAT	SAT	SAT	SAT	SAT	SAT										
Product	Max Junction Temp	175 C	150 C	150 C	175 C	175 C	175 C	175 C	175 C	150 C										
Product	Max Thermal resistance Junc. (case)	8C/W	5 C/W	5 C/W	8C/W	8C/W	8C/W	8C/W	8C/W	5 C/W										
Product	Max Thermal resistance Junc. (ambient)	102C/W	42 C/W	42 C/W	77C/W	77C/W	102C/W	102C/W	102C/W	42 C/W										
Product	DataSheet	PDR3G	PDR3G	PDS1045	PDS3200	PDS340	PDS340	PDS340	PDS340	PDS340										
Reliability and Characterization Testing																				
# in AEC-Q101 (DI)	Test	Test Conditions	Duration / Limits	Fail/SS - Sample Size	X = Test Needed	Results Pass/Fail	QBS Test Completed	Results Pass/Fail	QBS Test Completed	Results Pass/Fail	X = Test Needed	Results Pass/Fail	QBS Test Completed	Results Pass/Fail	QBS Test Completed	Results Pass/Fail	QBS Test Completed	Results Pass/Fail	QBS Test Completed	Results Pass/Fail
2	MSL1 Pre-conditioning	Bake 125C	24 Hrs	0/385	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass
		Soak 85C, 85% RH	168hrs	0/385	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass
		IR reflow 260C	3 cycles	0/385	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass
3	EXTERNAL VISUAL (EV)	MIL-STD-750 METHOD 2071	PER SPEC	0/500	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass
		PARAMETRIC VERIFICATION (PV)	-55C, 25C, 85C, 125C, 150C	Operating Range, Per Data Sheet	0/25	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X
4	FORWARD SURGE	MIL-7500, METHOD 4066	PER DATA SHEET	0/45	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass
		168 Hrs	0/77	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	
		500 Hrs	0/77	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	
5	HTRB	T=150°C Vd=100%, PER JESD22 A-108	1000 Hrs	0/77	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass
		168 Cycles	0/77	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	
		500 Cycles	0/77	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	
7	TC	-65C to 150C PER JESD22A-104	1000 Cycles	0/77	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass
		168 Hrs	0/77	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	
		500 Hrs	0/77	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	
9 alt	H3TRB	TA=85°C, 85% RH, with 80% Reverse bias. JESD22A-101	1000 Hrs	0/77	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass
		96 Hrs	0/77	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	
		2520 Cycles	0/77	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	
8 alt	PCT/AC	T=121°C 15PSIG 100%RH	1000 Hrs	0/77	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass
		96 Hrs	0/77	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	
		2520 Cycles	0/77	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	
10	IOL	MIL-STD-750 Method 1037 (N/A for TVS)	7500 Cycles	0/77	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass
		15000 Cycles	0/77	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	
		PER DATA SHEET	0/30	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	
11	ESD	HBM (AEC-Q101-001)	PER DATA SHEET	0/30	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass
		CDM (AEC-Q100-005)	PER DATA SHEET	0/30	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass
12	DPA	AEC Q101-004 SEC. 4	2	0/30	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass
13	PD	JESD22-B100B	Package Outline	0/30	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass
20	RESISTANCE TO SOLDER HEAT (RH)	JESD22 B-106 (260C @30S)	PER SPEC	0/30	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass
21	Solderability	J-STD-002 (245C +0/SS)	5 seconds	0/10	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass
22	THERMAL RESISTANCE (TR)	JESD 24-3, 24-4, 24-6 AS APPROPRIATE	PER SPEC	0/10	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass
Summary: Submitted By: Moore Mao, 2014-12-26 Approved By:																				