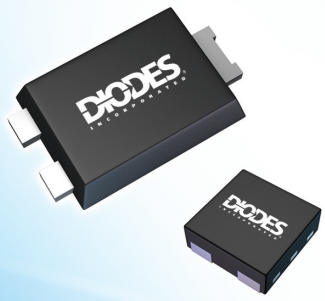


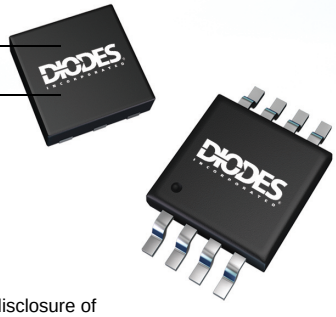
Diodes Incorporated
Discrete and Analog Semiconductors

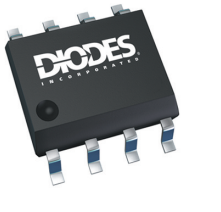
Qualification Report – PCN-2223

Manufacturer No.:	Qualification of Additional Wafer Fabrication Source, and Conversion to Green Mold Compound
Revision:	0
Date:	April 12, 2016
Qualified By:	Diodes Incorporated
Also Applicable To:	The part numbers listed in the associated PCN are Qualified by Similarity (QBS) to the devices included in this report.

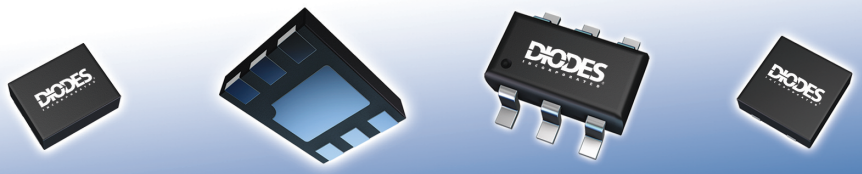
Please go to www.diodes.com for current data sheets on associated devices

Prepared By:	Diodes US Document Control	Date	April 12, 2016
Approved By:	Diodes US QRA Department	Date	April 12, 2016





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 INCORPORATEDOR 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.

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

DATE: 12th April, 2016

PCN #: 2223

PCN Title: Qualification of Additional Wafer Fabrication Source, and Conversion to Green Mold Compound

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-2223 REV 00

Notification Date:	Implementation Date:	Product Family:	Change Type:	PCN #:
12th April, 2016	11th July, 2016	Discrete Semiconductors	Additional Wafer Fabrication Source / Assembly Material	**2223**

TITLE

Qualification of Additional Wafer Fabrication Source, and Conversion to Green Mold Compound

DESCRIPTION OF CHANGE

This PCN is being issued to notify customers that in order to assure continuity of supply, Diodes Incorporated has qualified Diodes internal BCD (Shanghai) Micro-electronics Limited (SFAB) as an additional wafer fabrication facility for the devices listed below. In addition, the mold compound for the products listed below is being converted from non-Green to Green. The green encapsulate will contain no halogens or Sb_2O_3 fire retardants. The products will remain 94-V0 compliant with a 260°C maximum reflow temperature for 30 sec (total) and MSL 1.

Full electrical characterization and reliability testing have been completed using representative devices built with wafer materials from the additional wafer fabrication source and/or with green mold compound to ensure there is no change to device functionality, electrical specifications in the datasheet, or package performance.

IMPACT

Continuity of Supply

PRODUCTS AFFECTED

Please refer to Table 1 for Additional Wafer Source and Conversion to Green Mold Compound

Please refer to Table 2 for Additional Wafer Source

Please refer to Table 3 for Conversion to Green Mold Compound

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 - Additional Wafer Source and Conversion to Green Mold Compound				
SBR10100CTB-13	SBR20A40CT	SBR30A100CT	SBR40U100CT	SBR40U120CT
SBR10100CT	SBR20A100CT	SBR40150CT	SBR60A60CT	SBR40U60CTE
SBR10U100CT	SBR20A200CT	SBR30A120CT	SBR60A150CT	SBR20100CTB-13
SBR10U150CT	SBR20U60CT	SBR20A120CT	SBR40U60CT	SBR3060CTB-13
SBR20100CT	SBR20U100CT	SBR40U45CT	SBR40U150CT	SBR60A300CT
SBR20150CT	SBR30A60CT			

Table 2 - Additional Wafer Source				
SBR20A100CT-G	SBR10150CTFP	SBR40U120CT-G	SBR2A40P1-7	SBR3U40P1-7
SBR30A45CT-G	SBR30A60CT-G	SBR40U150CT-G	SBR1045SP5-13	SBR3U60P1-7
SBR20A45CT-G	SBR30A100CT-G	SBR40U60CT-G	SBR3U30P1-7	SBR10A45SP5-13
SBR40U100CT-G	SBR30A120CT-G	SBR60A60CT-G	SBR05M100BLP-7	SBR1U400P1-7
SBR40U45CT-G	SBR20A120CT-G	SBR8A45SP5-13	SBR8M45SP5-13	SBR12U120P5-13D
SBR20A40CT-G	SBR20100CTFP	SBR10U45SP5-13	SBR15U30SP5-13	SBR12U120P5-13
SBR20A40CTFP-G	SBR20100CTFP-G	SBR8U60P5-13	SBR12U100P5-13	SBR8U20SP5-13
SBR20U60CT-G	SBR20150CTFP	SBR15U50SP5-13	SBR10U200P5-13	SBR1A400P1-7
SBR10U100CTFP	SBR20150CTFP-G	SBR12U45LH1-13R	SBR6100CTL-13	SBR15U100CTL-13
SBR10200CTFP				

Table 3 - Conversion to Green Mold Compound				
SBR10100CTB	SBR3045CT	SBR60A100CT	SBR20100CTB	SBG3060CT-T-F
SBR1040CT	SBR3060CT	SBR40U200CT	SBR30A60CTB	SBG3045CT-T-F
SBR1060CT	SBR30100CT	SBR60A200CT	SBR20A100CTE	SBG3040CT-T-F
SBR10150CT	SBR30150CT	SBR10200CT	SBR20A60CTB	SBG3030CT-T-F
SBR10U40CT	SBR30200CT	SBR40U100CTE	SBR40U120CTE	SBR20A60CTB-13
SBR10U60CT	SBR30A40CT	SBR40S45CT	SBR30A100CTB	SBR10U200CTB-13
SBR10U200CT	SBR30A45CT	SBR30S30CT	SBR3045SCTB	SBR10200CTB
SBR2040CT	SBR30A50CT	SBR20A200CTB-13	SBR20U100CTE	SBR30A45CTB
SBR2045CT	SBR30A150CT	SBR30A45CTB-13	SBR20100CTE	SBR10U300CT
SBR2060CT	SBR30M100CT	SBR30A60CTB-13	SBR30A100CTE	SBR20A300CT
SBR20A45CT	SBR4040CT	SBR30A100CTB-13	SBR40U200CTB	SBR30300CT
SBR20A60CT	SBR4045CT	SBR1040CTB-13	MBRB1545CT-T	SBR40U300CT
SBR20A150CT	SBR4060CT	SBR20A200CTB	MBRB1540CT-T	SBR20A300CTB
SBR20U40CT	SBR40100CT	SBR10U200CTB	MBRB1535CT-T	SBR40U300CTB
SBR20U150CT	SBR30U30CT	SBR1040CTB	MBRB1530CT-T	SBR40U300CTB-13
SBR3040CT	SBR60A45CT	SBR40U200CTB-13		

Certificate of Design, Construction & Qualification

Description: SAT TO220/TO263/TO262 Non-green to Green Mold Compound

	Category					Qual Device 1		Qual Device 2		Qual Device 3		Qual Device 4	
	Product	Part Number				SBR20A200CTB-13		SBR10100CT		SBR40U45CT		SBR20A300CT	
	Assembly	Package Type				TO263AB		TO-220AB		TO-220AB		TO-220AB	
	Assembly	Package Size				15.24*10.11*4.57mm		28.6*10.11*4.57		28.6*10.11*4.57		28.6*10.11*4.57	
	Wafer	Die Name(s)				C100EA0200DA1		Z050BA0100AGA1		C300AA0045BA1		C100EA0300DA1	
	Wafer	Die Size (W/L/Thickness) - After Saw				2.61*2.61*0.25mm		1.47*1.47*0.250mm		7*3.92*0.250mm		2.61*2.61*0.29mm	
	Wafer	Die Process / Technology				SBR		SBR		SBR		SBR	
	Wafer	Wafer FAB/ Location				CSMC/Wuxi		Ofab/Oldham		CSMC/Wuxi		CSMC/Wuxi	
	Wafer	Wafer Diameter				6"		6"		6"		6"	
	Wafer	Front Metal Type				AlSiCu		AlSiCu		AlSiCu		AlSiCu	
	Wafer	Front Metal Layer Number/ Thickness				4um		4um		4um		4um	
	Wafer	Number of Poly Layers				1		1		1		1	
	Wafer	Back Metal Type (All Layers)				TiNiAg		TiNiAg		TiNiAg		TiNiAg	
	Wafer	Back Metal Thickness (All Layers)				1.3um		1.3um		1.3um		1.3um	
	Wafer	No of masks Steps				4		3		3		3	
	Assembly	Die quantity per package (e.g. single or dual dies)				2 single dies		2 single dies		Dualdies		Dualdies	
	Assembly	Die Attach Method (DB Epoxy/Solder Type)				SOFT SOLDER		SOFT SOLDER		SOFT SOLDER		SOFT SOLDER	
	Assembly	Die Attach Material/ Supplier				SOFT SOLDER		SOFT SOLDER		SOFT SOLDER		SOFT SOLDER	
	Assembly	Bond Wire/Clip Bond Material/ Supplier				15mil Al		15mil Al		15mil Al		15mil Al	
	Assembly	Bond Type (at Die)				ultrasonic		ultrasonic		ultrasonic		ultrasonic	
	Assembly	Bond Type (at LF)				ultrasonic		ultrasonic		ultrasonic		ultrasonic	
	Assembly	No. of bond over active area				4		2		2		2	
	Assembly	Glass Transistion Temp				160 C		160 C		160 C		160 C	
	Assembly	Terminal Finish (Plating) Material				100% matte Tin		100% matte Tin		100% matte Tin		100% matte Tin	
	Assembly	Header plating (Die Land Area)				N/A		N/A		N/A		N/A	
	Assembly	Wire Diameter				15mil		15mil		15mil		15mil	
	Assembly	Leadframe Type				TO263-3L		TO220-3L C		TO220-3L C		TO220-3L C	
	Assembly	Leadframe Material				Cu		KFC-1/2H		KFC-1/2H		KFC-1/2H	
	Assembly	Lead Frame Manufacturer				XMYM/ NBKQ		NBKQ/XMYH		NBKQ/XMYH		NBKQ/XMYH	
	Assembly	Molding Compound Type				KTMC1050G		KTMC1050G		KTMC1050G		KTMC1050G	
	Assembly	Mold Compound Material Manufacturer				KCC		KCC		KCC		KCC	
	Assembly	Green Compound (Yes/No)				Yes		Yes		Yes		Yes	
	Assembly	Lead-Free (Yes/No)				Yes		Yes		Yes		Yes	
	Assembly	Assembly Site/ Location				SAT		SAT		SAT		SAT	
	Assembly	Test Site/ Location				SAT		SAT		SAT		SAT	
	Product	Max Junction Temp				175°C		150°C		150°C		150°C	
	Product	DataSheet				DS31076		DS30961		DS31097		DS30993	
		Reliability and Characterization Testing											

# in AEC Q101 (D)	Test	Test Conditions	Duration / Limits	Accept on # Failed/ Sample Size per Lot	# of Lots	X = Test Needed	Results Pass/Fail	X = Test Needed	Results Pass/Fail	X = Test Needed	Results Pass/Fail	X = Test Needed	Results Pass/Fail
2	MSL1 Pre-conditioning	Bake 125C	24 Hrs	SMD only, for Test #7, 8, 9 & 10	3 Assembly lots	X	Pass						
		Soak 85C, 85% RH	168Hrs			X	Pass						
		IR reflow 260C	3 cycles			X	Pass						
3	EXTERNAL VISUAL (EV)	MIL-STD-750 METHOD 2071	PER SPEC	All qualification parts submitted for testing		X	Pass	X	Pass	X	Pass	X	Pass
4	PARAMETRIC VERIFICATION (PV)	-55C, 25C, 85C, 125C, 150C	Operating Range, Per Data Sheet	0/25	3 wafer lots	X	pass	X	Pass	X	Pass	X	Pass
	FORWARD SURGE	MIL-750D, METHOD 4066	PER DATA SHEET	0/45	3 wafer lots	X	pass	X	pass	X	pass	X	Pass
5	HTRB	Ta=150°C or Max Tj, Vd=100%, PER MIL-STD-750-1	168 Hrs	0/77	3 wafer lots	X	pass	X	pass	X	pass	X	Pass
			500 Hrs	0/77		X	pass	X	pass	X	pass	X	Pass
			1000 Hrs	0/77		X	pass	X	pass	X	pass	X	Pass
7	TC	Ta=-65C to 150C or Max Tj, PER JESD22A-104	168 Cycles	0/77	3 Assembly lots	X	pass	X	pass	X	pass	X	pass
			500 Cycles	0/77		X	pass	X	pass	X	pass	X	pass
			1000 Cycles	0/77		X	pass	X	pass	X	pass	X	pass
8	PCT/AC	Ta=121°C 15PSIG 100%RH; PER JESD22-A102	96 Hrs	0/77	3 Assembly lots	X	pass	X	pass	X	pass	X	pass
9 alt	HHT	Ta=85ºC, 85% RH,	168 Hrs	0/77	3 wafer lots	X	pass	X	pass	X	pass	X	pass
			500 Hrs	0/77		X	pass	X	pass	X	pass	X	pass
			1000 Hrs	0/77		X	pass	X	pass	X	pass	X	pass
10	IOL	MIL-STD-750 Method 1037 (N/A for TVS)	2520 Cycles	0/77	3 wafer lots	X	pass	X	pass	X	pass	X	pass
			7560 Cycles	0/77		X	pass	X	pass	X	pass	X	pass
			15000 Cycles	0/77		X	pass	X	pass	X	pass	X	pass
11	ESD	HBM (AEC-Q101-001)	PER DATA SHEET	0/30	1 wafer lot	X	pass	X	pass	X	pass	X	pass
		CDM (AEC-Q100-005)	PER DATA SHEET	0/30	1 wafer lot	X	pass	X	pass	X	pass	X	pass
12	DPA	AEC Q101-004 SEC. 4		0/2	1 Assembly lot	X	pass	X	pass	X	pass	X	pass
13	Package Physical Dimemsions (PD)	JESD22-B100	Package Outline	0/30	1 Assembly lot	X	pass	X	pass	X	pass	X	pass
20	RESISTANCE TO SOLDER HEAT (RSH)	JESD22 A-111 (SMD), B-106 (PTH) (260C @30S)	PER SPEC	0/30	1 Assembly lot	X	pass	X	pass	X	pass	X	pass
21	Solderability	J-STD-002; JESD22B102 (245C +0/5S)	5 Seconds	0/10	1 Assembly lot	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	1 Assembly lot	X	pass	X	pass	X	Pass	X	pass

Summary: Pass 1000h Hi-rel
Submitted By: Caixia Wei 2015-11-03
Approved By:

Certificate of Design, Construction & Qualification

Description: Qualtify SFAB wafer source into existing qualified SBR parts at ERIS.

	Category					Qual Device 1		Qual Device 2	
	Product	Part Number				SBR30A45CT		SBR30A120CT	
	Assembly	Package Type				TO220-AB		TO220-AB	
	Assembly	Package Size				28.6*10.11*4.57mm		28.6*10.11*4.57mm	
	Wafer	Die Name(s)				SS112AA0045WEB2		SS112AA0120WJC2	
	Wafer	Die Size (W/L/Thickness) - After Saw				2.84 x 2.84 x 0.262 mm		2.84 x 2.84 x 0.262 mm	
	Wafer	Die Process / Technology				SBR		SBR	
	Wafer	Wafer FAB/ Location				SFAB		SFAB	
	Wafer	Wafer Diameter				6 inch		6 inch	
	Wafer	Front Metal Type				Ti-Ni-Ag		Ti-Ni-Ag	
	Wafer	Front Metal Layer Number/ Thickness				AlSiCu 10K+TiNiAg 18K		AlSiCu 10K+TiNiAg 18K	
	Wafer	Number of Poly Layers				1 Poly		1 Poly	
	Wafer	Back Metal Type (All Layers)				Ti-Ni-Ag		Ti-Ni-Ag	
	Wafer	Back Metal Thickness (All Layers)				1kA/2kA/8kA		1kA/ 2kA/ 8kA	
	Wafer	No of masks Steps				4		4	
	Assembly	Die quantity per package (e.g. single or dual dies)				Dual		Dual	
	Assembly	Die Attach Method (DB Epoxy/Solder Type)				SOLDER		SOLDER	
	Assembly	Die Attach Material/ Supplier				Solder paste/Everteam		Solder paste/Everteam	
	Assembly	Bond Wire/Clip Bond Material/ Supplier				Cu Clip /JIH LONG		Cu Clip /JIH LONG	
	Assembly	Bond Type (at Die)				Soldering		Soldering	
	Assembly	Bond Type (at LF)				Soldering		Soldering	
	Assembly	No. of bond over active area				1 clip		1 clip	
	Assembly	Glass Transistion Temp				150℃		150℃	
	Assembly	Terminal Finish (Plating) Material				Tin		Tin	
	Assembly	Header plating (Die Land Area)				N/A		N/A	
	Assembly	Wire Diameter				Cu Clip		Cu Clip	
	Assembly	Leadframe Type				CDA19210		CDA19210	
	Assembly	Leadframe Material				Cu		Cu	
	Assembly	Lead Frame Manufacturer				JIH LONG INDUSTRY CO., LTD.		JIH LONG INDUSTRY CO., LTD.	
	Assembly	Molding Compound Type				EME-E120G		EME-E120G	
	Assembly	Mold Compound Material Manufacturer				Tsu Kong Co., Ltd		Tsu Kong Co., Ltd	
	Assembly	Green Compound (Yes/No)				Yes		Yes	
	Assembly	Lead-Free (Yes/No)				Yes		Yes	
	Assembly	Assembly Site/ Location				ERIS TW		ERIS TW	
	Assembly	Test Site/ Location				ERIS TW		ERIS TW	
	Product	Max Junction Temp				175℃		175℃	
	Product	DataSheet				DS#30981		DS#31094	
		Reliability and Characterization Testing							

# in AEC-Q101 (D)	Test	Test Conditions	Duration / Limits	Accept on # Failed/ Sample Size per Lot	# of Lots	X = Test Needed	Results Pass/Fail	X = Test Needed	Results Pass/Fail
3	EXTERNAL VISUAL (EV)	MIL-STD-750 METHOD 2071	PER SPEC	All qualification parts submitted for testing		X	Pass	X	Pass
4	PARAMETRIC VERIFICATION (PV)	-55C, 25C, 85C, 125C, 150C	Operating Range, Per Data Sheet	0/25	3 wafer lots	X	Pass	X	Pass
	FORWARD SURGE	MIL-750D, METHOD 4066	PER DATA SHEET	0/45	3 wafer lots	X	Pass	X	Pass
5	HTRB	Ta=150℃ or Max Tj, Vd=100%, PER MIL-STD-750-1	168 Hrs	0/77	3 wafer lots	X	Pass	X	Pass
			500 Hrs	0/77		X	Pass	X	Pass
			1000 Hrs	0/77		X	Pass	X	Pass
7	TC	Ta=-65C to 150C or Max Tj, PER JESD22A-104	168 Cycles	0/77	3 Assembly lots	X	Pass	X	Pass
			500 Cycles	0/77		X	Pass	X	Pass
			1000 Cycles	0/77		X	Pass	X	Pass
8	PCT/AC	Ta=121℃ 15PSIG 100%RH; PER JESD22-A102	96 Hrs	0/77	3 Assembly lots	X	Pass	X	Pass
9 alt	HHT	Ta=85ºC, 85% RH,	168 Hrs	0/77	3 wafer lots	X	Pass	X	Pass
			500 Hrs	0/77		X	Pass	X	Pass
			1000 Hrs	0/77		X	Pass	X	Pass
10	IOL	MIL-STD-750 Method 1037 (N/A for TVS)	2520 Cycles	0/77	3 wafer lots	X	Pass	X	Pass
			7560 Cycles	0/77		X	Pass	X	Pass
			15000 Cycles	0/77		X	Pass	X	Pass
11	ESD	HBM (AEC-Q101-001)	PER DATA SHEET	0/30	1 wafer lot	X	Pass	X	Pass
		CDM (AEC-Q100-005)	PER DATA SHEET	0/30	1 wafer lot	X	Pass	X	Pass
		MM (AEC-Q101-002)	PER DATA SHEET	0/30	1 wafer lot	X	Pass	X	Pass
12	DPA	AEC Q101-004 SEC. 4		0/2	1 Assembly lot	X	Pass	X	Pass
13	Package Physical Dimemsions (PD)	JESD22-B100	Package Outline	0/30	1 Assembly lot	X	Pass	X	Pass
20	RESISTANCE TO SOLDER HEAT (RSH)	JESD22 A-111 (SMD), B-106 (PTH) (260C @30S)	PER SPEC	0/30	1 Assembly lot	X	Pass	X	Pass
21	Solderability	J-STD-002; JESD22B102 (245C +0/5S)	5 Seconds	0/10	1 Assembly lot	X	Pass	X	Pass
22	THERMAL RESISTANCE (TR)	JESD 24-3, 24-4, 24-6 AS APPROPRIATE	PER SPEC	0/10	1 Assembly lot	X	Pass	X	Pass
25	Die Shear	MIL-STD-750 (2017)	Cpk>1.66	0/5	1 Assembly lot	X	Pass	X	Pass

Summary:
Submitted By: Shane 2016-04-08
Approved By: Shane 2016-04-08

Certificate of Design, Construction & Qualification

Description: Qualtify SFAB wafer source into existing qualified SBR parts at SAT.

					SAT																					
	Category				**Qual Device 1**		**Qual Device 2**		**Qual Device 3**		**Qual Device 4**		**Qual Device 5**		**Qual Device 6**		**Qual Device 7**		**Qual Device 8**		**Qual Device 9**		**Qual Device 10**	
	Product	Part Number			SBR1A400P1		SBR02U100LP		SBR60A20CT		SBR60A150CT		SBR60A300CT		SBR02E20LP		SBR20B100CT		SBR8E60P5		SBR10E45P5		SBR30E45CTB	
	Assembly	Package Type			POWERDI-123		DFN1006-2		TO220-3L		TO220-3L		TO220-3L		DFN1006-2		TO220-3L		PowerDi-5		PowerDi-5		TO-263AB	
	Assembly	Package Size			3.7*1.775*0.98mm		1.0*0.6*0.5mm		28.6*10.11*4.57mm		28.6*10.11*4.57mm		28.6*10.11*4.57mm		1.0*0.6*0.5mm		28.6*10.11*4.57mm		6.5*3.97*1.10mm		6.5*3.97*1.10mm		15.24*10.11*4.57mm	
	Wafer	Die Name(s)			SS044AA0400WIA2		SS014AA0100AGB7		SS146AA0020AEC2		SS146AA0150AJB2		SS146AA0300AHA1		SS014AA0020AEB7		SS082AA0100AGB2		SS102AA0060WEC2		SS112AA0045WEA2		SS112AA0045AEA2	
	Wafer	Die Size (W/L/Thickness) - After Saw			1.156*1.156*0.25mm		0.40*0.35*0.14mm		3.504*3.922*0.25mm		3.504*3.922*0.25mm		3.504*3.922*0.29mm		0.40*0.35*0.14mm		2.086*2.086*0.262mm		2.610*2.610*0.262mm		2.840*2.840*0.262mm		2.84 x 2.84 x 0.262mm	
	Wafer	Die Process / Technology			SBR		SBR		SBR		SBR		SBR		SBR		SBR		SBR		SBR		SBR	
	Wafer	Wafer FAB/ Location			SFAB		SFAB		SFAB		SFAB		SFAB		SFAB		SFAB		SFAB		SFAB		SFAB	
	Wafer	Wafer Diameter			6 inch		6 inch		6 inch		6 inch		6 inch		6 inch		6 inch		6 inch		6 inch		6 inch	
	Wafer	Front Metal Type			Ti-Ni-Ag		Al-Si-Cu		Al-Si-Cu		Al-Si-Cu		Al-Si-Cu		Al-Si-Cu		Al-Si-Cu		Ti-Ni-Ag		Ti-Ni-Ag		Al-Si-Cu	
	Wafer	Front Metal Layer Number/ Thickness			Al-Si-Cu/25kA; Ti-Ni-Ag/1kA/2kA/15kA		Al-Si-Cu/40kA		Al-Si-Cu/40kA		Al-Si-Cu/40kA		Al-Si-Cu/40kA		Al-Si-Cu/40kA		Al-Si-Cu/40kA		AlSiCu 10K+TiNiAg 18K		AlSiCu 10K+TiNiAg 18K		Al-Si-Cu/40kA	
	Wafer	Number of Poly Layers			1 poly		1 poly		1 poly		1 poly		1 poly		1 poly		1 Poly		1 Poly		1 Poly		1 Poly	
	Wafer	Back Metal Type (All Layers)			Ti-Ni-Ag		Ti-Ni-Ag		Ti-Ni-Ag		Ti-Ni-Ag		Ti-Ni-Ag		Ti-Ni-Ag		Ti-Ni-Ag		Ti-Ni-Ag		Ti-Ni-Ag		Ti-Ni-Ag	
	Wafer	Back Metal Thickness (All Layers)			1kA/ 2kA/ 8kA		1kA/ 2kA/ 8kA		1kA/ 2kA/ 8kA		1kA/ 2kA/ 8kA		1kA/ 2kA/ 8kA		1kA/ 2kA/ 8kA		1kA/ 2kA/ 8kA		1kA/ 2kA/ 8kA		1kA/ 2kA/ 8kA		1kA/2kA/8kA	
	Wafer	No of masks Steps			6		4		4		5		5		4		4		4		4		4	
	Assembly	Die quantity per package (e.g. single or dual dies)			Single		Single		Single		Single		Single		Single		Dual		Single		Single		Dual	
	Assembly	Die Attach Method (DB Epoxy/Solder Type)			SOLDER		Epoxy		Soft solder		Soft solder		Soft solder		Epoxy		Soft Solder		Solder		Solder		Soft Solder	
	Assembly	Die Attach Material/ Supplier			ES-500-SPA/Early Sun		QMI519/HENKEL		Pb92.5Sn5Ag2.5/HERAEUS		Pb92.5Sn5Ag2.5/HERAEUS		Pb92.5Sn5Ag2.5/HERAEUS		QMI519/HENKEL		Pb92.5Sn5Ag2.5/HERAEUS		NC-SMQ51SC/Indium		NC-SMQ51SC/Indium		Pb92.5Sn5Ag2.5/HERAEUS	
	Assembly	Bond Wire/Clip Bond Material/ Supplier			CLIP/HITACHI CABLE		Au/HERAEUS&NBKQ		Al/HERAEUS&Nichetech		Al/HERAEUS&Nichetech		Al/HERAEUS&Nichetech		Cu/TANAKA&HERAEUS&NBKQ		Al/HERAEUS/Nichetech		Clip/HITACHI CABLE		Clip/HITACHI CABLE		Al/HERAEUS/Nichetech	
	Assembly	Bond Type (at Die)			Solder Curing		Thermo sonic		ultrasonic		ultrasonic		ultrasonic		Thermo sonic		Ultrasonic		Solder		Solder		Ultrasonic	
	Assembly	Bond Type (at LF)			Solder Curing		Thermo sonic		ultrasonic		ultrasonic		ultrasonic		Thermo sonic		Ultrasonic		Solder		Solder		Ultrasonic	
	Assembly	No. of bond over active area			1		2		6		6		6		2		4		1		1		4	
	Assembly	Glass Transistion Temp			135℃		135℃		135℃		135℃		135℃		135℃		135℃		130℃		130℃		160℃	
	Assembly	Terminal Finish (Plating) Material			Matt Tin		NiPdAu		Pbfree		Pbfree		Pbfree		NiPdAu		100% Matte Tin		Pbfree		Pbfree		100% Matte Tin	
	Assembly	Header plating (Die Land Area)			Bare		NiPdAu		Bare copper		Bare copper		Bare copper		NiPdAu		Bare copper		Spot Ag		Spot Ag		Bare copper	
	Assembly	Wire Diameter			KLP00011		1.0mil		15mil		15mil		15mil		1.0mil		20mil		KLP00014		KLP00014		15mil	
	Assembly	Leadframe Type			KLF00281		SLP1006P2		TO220-3L C		TO220-3L C		TO220-3L C		SLP1006P2		TO220-3L C(bare copper)		PowerDi-5 F type		PowerDi-5 F type		TO263-3L bare	
	Assembly	Leadframe Material			CDA194HH		C7025HH		KFC		KFC		KFC		C7025HH		KFC		CDA194FH		CDA194FH		KFC	
	Assembly	Lead Frame Manufacturer			Hitachi Cable		ASM&PBE&MHT		XMYM/ NBKQ		XMYM/ NBKQ		XMYM/ NBKQ		ASM&PBE&MHT		XMYM/ NBKQ		NBKQ		NBKQ		XMYM/ NBKQ	
	Assembly	Molding Compound Type			EME-G600		EME-G770HCD		KTMC1050G		KTMC1050G		KTMC1050G		EME-G770HCD		KTMC1050G		EME-G700LA		EME-G700LA		KTMC1050G	
	Assembly	Mold Compound Material Manufacturer			SUMITOMO		SUMITOMO		KCC		KCC		KCC		SUMITOMO		KCC		Sumitomo		Sumitomo		KCC	
	Assembly	Green Compound (Yes/No)			Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes	
	Assembly	Lead-Free (Yes/No)			Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes	
	Assembly	Assembly Site/ Location			SKE		DSH		DSH		DSH		DSH		DSH		SAT		SAT		SAT		SAT	
	Assembly	Test Site/ Location			DSH		DSH		DSH		DSH		DSH		DSH		SAT		SAT		SAT		SAT	
	Product	Max Junction Temp			175℃		150℃		150℃		175℃		175℃		150℃		175℃		150℃		150℃		150℃	
	Product	Max Thermal resistance Junc (case)			15*C/W		-		2*C/W		1.2*C/W		8*C/W		15*C/W		N/A		15 *C/W		15 *C/W		N/A	
	Product	Max Thermal resistance Junc (amibent)			175*C/W		235*C/W		13*C/W		8*C/W		52*C/W		300*C/W		N/A		100 *C/W		100 *C/W		N/A	
	Product	DataSheet			DS37709		DS31134		DS31421		DS31133		DS31200		DS38607		DS38091		DS38002		DS37867		DS38052	

Reliability and Characterization Testing

# in AEC-Q101 (D)	Test	Test Conditions	Duration / Limits	Accept on # Failed/ Sample Size per Lot	# of Lots	X = Test Needed	Results Pass/ Fail	X = Test Needed	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	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	SMD only, for Test #7, 8, 9 & 10	3 Assembly lots	X	pass	X	pass							X	pass			X	pass	X	pass	X	pass	X	pass
		Soak 85C, 85% RH	168Hrs			X	pass	X	pass							X	pass			X	pass	X	pass	X	pass	X	pass
		IR reflow 260C	3 cycles			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	All qualification parts submitted for testing		X	pass	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass
4	PARAMETRIC VERIFICATION (PV)	-55C, 25C, 85C, 125C, 150C	Operating Range, Per Data Sheet	0/25	3 wafer lots	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass
	FORWARD SURGE	MIL-750D, METHOD 4066	PER DATA SHEET	0/45	3 wafer lots	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass
5	HTRB	Ta=150℃ or Max Tj, Vd=100%, PER MIL-STD-750-1	168 Hrs	0/77	3 wafer lots	X	pass	X	pass	X	pass	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	X	pass	X	pass	X	pass
			1000 Hrs	0/77		X	pass	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass
7	TC[1]	Ta=-65C to 150C or Max Tj, PER JESD22A-104	168 Cycles	0/77	3 Assembly lots	X	pass	X	pass	X	pass	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	X	pass	X	pass	X	pass
			1000 Cycles	0/77		X	pass	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass
8	PCT/AC	Ta=121℃ 15PSIG 100%RH; PER JESD22-A102	96 Hrs	0/77	3 Assembly lots	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass
9	HAST	Ta=130C, 85%RH 33.3 psia 80% Bias; PER JESD22-A110	96 Hrs	0/77	3 wafer lots											X	pass										
9 alt	H3TRB	Ta=85℃, 85% RH, with 80% Maximum Reverse Bias. JESD22A-101	168 Hrs	0/77	3 wafer lots	X	pass	X	pass													X	pass				
			500 Hrs	0/77		X	pass	X	pass													X	pass				
			1000 Hrs	0/77		X	pass	X	pass																		
9 alt	HHT	Ta=85℃, 85% RH,	168 Hrs	0/77	3 wafer lots					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
			1000 Hrs	0/77						X	pass	X	pass	X	pass			X	pass	X	pass					X	pass
10	IOL	MIL-STD-750 Method 1037 (N/A for TVS)	2520 Cycles	0/77	3 wafer lots	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass
			7560 Cycles	0/77		X	pass	X	pass	X	pass	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	X	pass	X	pass	X	pass
11	ESD	HBM (AEC-Q101-001)	PER DATA SHEET	0/30	1 wafer lot	X	pass	X	pass	X	pass	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	1 wafer lot	X	pass			X	pass	X	pass	X	pass			X	pass	X	pass	X	pass	X	pass	X	pass
		MM (AEC-Q101-002)	PER DATA SHEET	0/30	1 wafer lot	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass					X	pass
12	DPA	AEC Q101-004 SEC. 4		0/2	1 Assembly lot	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass
13	Package Physical Dimemsions (PD)	JESD22-B100	Package Outline	0/30	1 Assembly lot	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass
20	RESISTANCE TO SOLDER HEAT (RSH)	JESD22 A-111 (SMD), B-106 (PTH) (260C @30S)	PER SPEC	0/30	1 Assembly lot	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass
21	Solderability	J-STD-002; JESD22B102 (245C +0/5S)	5 Seconds	0/10	1 Assembly lot	X	pass	X	pass	X	pass	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	1 Assembly lot	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass
23	Wire Bond Strength	MIL-STD-750 METHOD 2037 (JESD22-B116B)	Cpk>1.66	0/ min of 5	1 Assembly lot			X	pass	X	pass	X	pass	X	pass	X	pass	X	pass							X	pass
24	BOND SHEAR	AEC-Q101-003	Cpk>1.66	0/ min of 5	1 Assembly lot			X	pass	X	pass	X	pass	X	pass	X	pass	X	pass							X	pass
25	Die Shear	MIL-STD-750 (2017)	Cpk>1.66	0/5	1 Assembly lot	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass	X	pass

Summary:	
Submitted By:	Shane 2016-2-15
Approved By:	Shane 2016-2-15