Diodes Incorporated
Discrete and Analog Semiconductors

Qualification Report – PCN-2181

Manufacturer No.:	Conversion to Copper Bond Wire, Additional A/T site, and/or Additional Wafer Source with Smaller Die Size on Selected Discrete Products
Revision:	0
Date:	February 23, 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	February 23, 2016
Approved By:	Diodes US QRA Department	Date	February 23, 2016

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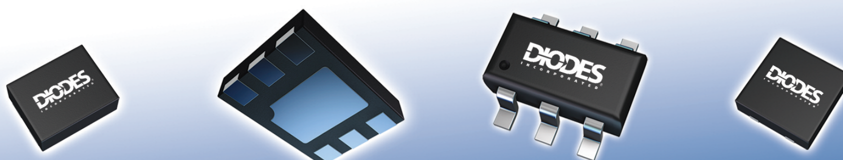

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DATE: 23rd February, 2016

PCN #: 2181

PCN Title: Conversion to Copper Bond Wire, Additional A/T site, and/or Additional Wafer Source with Smaller Die Size on Selected Discrete Products

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-2181 REV 00

Notification Date:	Implementation Date:	Product Family:	Change Type:	PCN #:
23rd February, 2016	22nd May, 2016	Discrete Semiconductors	Bond Wire Material / Wafer FAB Material / Additional Assembly & Test Site	**2181**

TITLE

Conversion to Copper Bond Wire, Additional A/T site, and/or Additional Wafer Source with Smaller Die Size on Selected Discrete Products

DESCRIPTION OF CHANGE

This PCN is being issued to notify customers that Diodes has qualified Copper bond wire for the selected Discrete products listed in this PCN. In order to accommodate the Copper bond wire, the top metal composition and/or top metal thickness of the wafer has been modified. Diodes Incorporated has also qualified an additional wafer source with smaller die size, Diodes internal FabTech Inc. (KFAB) or external Phenitec Semiconductor (*), and qualified “Diodes Technology (Chengdu) Company Limited” (CAT) as an additional Assembly & Test Site (A/T Site) for the selected Discrete products.

Full electrical characterization and high reliability testing has been completed on representative part numbers built using Copper bond wire, alternative wafer source and/or additional A/T site to ensure no change to device functionality or electrical specifications in the datasheet.

There will be no change to the Form, Fit, or Function of affected products.

IMPACT

There is no change in datasheet parameters and product performance.

PRODUCTS AFFECTED

Please refer to Table 1 for Cu bond wire conversion

Please refer to Table 2 for Cu bond wire conversion and additional wafer source with smaller die size

Please refer to Table 3 for additional A/T site and additional wafer source with smaller die size

Please refer to Table 4 for additional wafer source with smaller die size

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 - Cu Bond Wire Conversion				
DCX114EU-7-F	DDC114TU-7-F	DDTA144WE-7-F	DCX114EH-7	ZUMT718TA
DCX114TU-7-F	DDC114YU-7-F	DDTC113ZE-7-F	DDA114EH-7	ZUMT720TA
DCX114YU-7-F	DDC123JU-7-F	DDTC114EE-7-F	DDA114TH-7	BC817-40W-7
DCX123JU-7-F	DDC124EU-7-F	DDTC114GE-7-F	DDA114YH-7	MMST5401-7-F
DCX124EU-7-F	DDC143TU-7-F	DDTC114YE-7-F	DDA124EH-7	MMST5551-7-F
DCX143EU-7-F	DDC144EU-7-F	DDTC115EE-7-F	DDC114EH-7	MMST6427-7-F
DCX143TU-7-F	DDC144NS-7	DDTC122LE-7-F	DDC114YH-7	MMSTA13-7-F
DCX144EU-7-F	DDC144TU-7	DDTC123JE-7-F	DDC123JH-7	MMSTA14-7-F
DDA113TU-7-F	DDTA113TE-7-F	DDTC123YE-7-F	DDC142TH-7	MMSTA42-7-F
DDA114EU-7-F	DDTA113ZE-7-F	DDTC124EE-7-F	DDC143TH-7	MMSTA55-7-F
DDA114TU-7-F	DDTA114EE-7-F	DDTC124XE-7-F	ZUMT491TA	MMSTA56-7-F
DDA114YU-7-F	DDTA114WE-7-F	DDTC143EE-7-F	ZUMT591TA	MMSTA92-7-F
DDA123JU-7-F	DDTA123JE-7-F	DDTC143TE-7-F	ZUMT617TA	2DB1689-7
DDA143TU-7-F	DDTA123YE-7-F	DDTC143XE-7-F	ZUMT618TA	2DB1694-7
DDA144EU-7-F	DDTA143EE-7-F	DDTC143ZE-7-F	ZUMT619TA	2DD2652-7
DDC113TU-7-F	DDTA143TE-7-F	DDTC144EE-7-F	ZUMT619TC	2DD2656-7
DDC114EU-7-F	DDTA144EE-7-F	DDTC144WE-7-F	ZUMT717TA	T6V0S5-7

Table 2 - Cu Bond Wire Conversion and Additional Wafer Source with Smaller Dies Size				
MMBT2907AT-7-F	MMDT2222V-7	MMDT2907V-7	MMDT3906VC-7	MMBT3906T-13-F
MMBT2222A-7-G	DLP05LC-7-F*			

* Phenitec Semiconductor as an additional wafer source

Table 3 - Additional A/T site and Additional Wafer Source with Smaller Die Size				
MMDT4124-7-F	MMDT3946-7-F	MMBT4126-7-F	MMBT3904-13-F	DMMT3904W-7-F
MMDT3906-7-F	MMDT4146-7-F	MMDT3904-7-F	MMBT3906-13-F	DMMT3906W-7-F
MMDT4126-7-F	MMBT4124-7-F	MMDT2907A-7-F		

Table 4 - Additional Wafer Source with Smaller Die Size				
MMBT2222AT-7-F	MMDT3904VC-7	MMST3904-7-F	MMST4126-7-F	MMBT2907A-13-F
MMBT3904T-7-F	MMDT2222A-7-F	MMST3906-7-F	MMBT3904-7-F	MMBT2907A-7-F
MMBT3906T-7-F	MMDT2227-7-F	MMST4124-7-F	MMBT3906-7-F	MMDT2227M-7
MMDT3904V-7	MMST2907A-7-F			

Certificate of Design, Construction & Qualification

Description: Qualification of the KFAB C2222S die at SAT across all packages

Category		Qual Device 1	Qual Device 2	Qual Device 4	Qual Device 5
Product	Part Number	MMBT2222A	MMDT2222A	MMDT2222V	MMBT2222ALP4
Assembly	Package Type	SOT-23	SOT-363	SOT-563	X2-DFN1006-3
Assembly	Package Size (mm)	2.9 x 1.3 x 0.975	2.0 x 1.25 x 0.95	1.6 x 1.2 x 0.6	1.0 x 0.6 x 0.4
Wafer	Die Name(s)	C2222S	C2222S	C2222S	C2222S
Wafer	Die Size (W/L/Thickness) - After Saw	348 x 348 x 216 um	348 x 348 x 216 um	348 x 348 x 216 um	348 x 348 x 216 um
Wafer	Die Process / Technology	Bipolar	Bipolar	Bipolar	Bipolar
Wafer	Wafer FAB/ Location	KFAB / Kansas	KFAB / Kansas	KFAB / Kansas	KFAB / Kansas
Wafer	Wafer Diameter	150mm	150mm	150mm	150mm
Wafer	Front Metal Type	AlSiCu	AlSiCu	AlSiCu	AlSiCu
Wafer	Front Metal Layer Number/ Thickness	3.5um	3.5um	3.0um	3.0um
Wafer	Number of Poly Layers	none	none	none	none
Wafer	Back Metal Type (All Layers)	NiV-Au	NiV-Au	NiV-Au	NiV-Au
Wafer	Back Metal Thickness (All Layers)	NiV(125A)+Au(5150A)	NiV(125A)+Au(5150A)	NiV(125A)+Au(5150A)	NiV(125A)+Au(5150A)
Wafer	Die Conforming Coating (Passivation)	Oxide / Nitride	Oxide / Nitride	Oxide / Nitride	Oxide / Nitride
Wafer	Die passivation thickness range	OX 6000A / NIT 1500A	OX 6000A / NIT 1500A	OX 6000A / NIT 1500A	OX 6000A / NIT 1500A
Wafer	No of masks Steps	5	5	5	5
Assembly	Die quantity per package (e.g. single or dual dies)	1	2	2	1
Assembly	Die Attach Method (DB Epoxy/Solder Type)	Eutectic	Eutectic	Eutectic	Epoxy
Assembly	Die Attach Material/ Supplier	n/a	n/a	n/a	QMI519
Assembly	Bond Wire/Clip Bond Material/ Supplier	Cu	Cu	Cu	Au
Assembly	Bond Type (at Die)	Thermosonic	Thermosonic	Thermosonic	Thermosonic
Assembly	Bond Type (at LF)	Thermosonic	Thermosonic	Thermosonic	Thermosonic
Assembly	No. of bond over active area	2	4	2	2
Assembly	Glass Transistion Temp	130°C	130°C	130°C	130°C
Assembly	Terminal Finish (Plating) Material	Matte Sn	Matte Sn	Matte Sn	NIPdAu
Assembly	Header plating (Die Land Area)	Spot Ag	Spot Ag	Spot Ag	Spot Ag
Assembly	Wire Diameter	1 mil	1 mil	1 mil	0,8mil
Assembly	Leadframe Type	SOT-23A	SOT-363E	SOT-563E	SLP1006P3
Assembly	Leadframe Material	Alloy42	Alloy42	EFTEC-64T	C7025HH
Assembly	Lead Frame Manufacturer	PBE/XMYH/JYKQ/JihLin	PBE/XMYH/JYKQ/JihLin	MHT	MHT
Assembly	Molding Compound Type	GR640HV-L1	CEL-1702HF9 SK	CEL-1702HF9 SK	EME-G770HCD
Assembly	Mold Compound Material Manufacturer	HenKel	HITACHI	HITACHI	SUMITOMO
Assembly	Green Compound (Yes/No)	Yes	Yes	Yes	Yes
Assembly	Lead-Free (Yes/No)	Yes	Yes	Yes	Yes
Assembly	Assembly Site/ Location	SAT / Shanghai	SAT / Shanghai	SAT / Shanghai	SAT / Shanghai
Assembly	Test Site/ Location	SAT / Shanghai	SAT / Shanghai	SAT / Shanghai	SAT / Shanghai
Product	Max Junction Temp	150°C	150°C	150°C	150°C
Product	Max Thermal resistance Junc (amibent)	403°C/W	625°C/W	833°C/W	272°C/W
Product	DataSheet	DS30041	DS30125	DS30563	DS35506

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	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
		Soak 85C, 85% RH	168Hrs			X	Pass	X	Pass	X	Pass	X	Pass
		IR reflow 260C	3 cycles			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
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
5	HTRB	Ta=150°C or Max Tj, Vd/Vr/Vcbo=80%, MIL-STD-750-1 / PER JESD22 A-108	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	HAST	Ta=130C, 85%RH 33.3 psia 80% Bias; PER JESD22-A110	96 Hrs	0/77	3 wafer lots	X	Pass	X	Pass	X	Pass		
9 alt	H3TRB	Ta=85ºC, 85% RH, with 80% Maximum Reverse Bias. JESD22A-101	168 Hrs	0/77	3 wafer lots							X	Pass
			500 Hrs	0/77								X	Pass
			1000 Hrs	0/77								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
		MM (AEC-Q101-002)	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
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
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
24	BOND SHEAR	AEC-Q101-003	Cpk>1.66	0/ min of 5	1 Assembly lot	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

Summary: ____________________________

Submitted By: Jon Stocker

Approved By:

Certificate of Design, Construction & Qualification

Description: **Qualification of KFAB C3904S die across SAT Packages**

Category		Qual Device 1	Qual Device 2	Qual Device 3	Qual Device 4	Qual Device 5
Product	Part Number	MMST3904	MMDT3904	MMBT3904T	MMDT3904V	DXT3904
Assembly	Package Type	SOT-323	SOT-363	SOT-523	SOT-563	SOT-89
Assembly	Package Size	2.0 x 1.25	2.15 x 1.3	1.6 x 0.8	1.6 x 1.2	4.5 x 2.5
Wafer	Die Name(s)	C3904S	C3904S	C3904S	C3904S	C3904S
Wafer	Die Size (W/L/Thickness) - After Saw	278x278x216	260x260x216	260x260x216	260x260x216	260x260x216
Wafer	Die Process / Technology	Small signal BJT	Small signal BJT	Small signal BJT	Small signal BJT	Small signal BJT
Wafer	Wafer FAB	KFAB	KFAB	KFAB	KFAB	KFAB
Wafer	*Wafer Diameter*	150mm	150mm	150mm	150mm	150mm
Wafer	*Front Metal Type*	AlSiCu	AlSiCu	AlSiCu	AlSiCu	AlSiCu
Wafer	Front Metal Thickness	3.5um	3.5um	3.5um	3.5um	3.5um
Wafer	*Back Metal Type (All Layers)*	NiV-Au	NiV-Au	NiV-Au	NiV-Au	NiV-Au
Wafer	*Back Metal Thickness (All Layers)*	300/2600/5500A	300/2600/5500A	300/2600/5500A	300/2600/5500A	300/2600/5500A
Wafer	*Die Conforming Coating (Passivation)*	OX/NIT	OX/NIT	OX/NIT	OX/NIT	OX/NIT
Wafer	*Die passivation thickness range*	OX 6000A / NIT 1500A	OX 6000A / NIT 1500A	OX 6000A / NIT 1500A	OX 6000A / NIT 1500A	OX 6000A / NIT 1500A
Wafer	*No of masks Steps*	5	5	5	5	5
Assembly	Die quantity per package (e.g. single or dual dies)	1	2	1	2	1
Assembly	Die Attach Method (DB Epoxy/Solder Type)	Eu	Eu	Eu	Eu	Epoxy
Assembly	Die Attach Material	N/A	N/A	N/A	N/A	8200TI
Assembly	Bond Wire/Clip Bond Material	Cu	Cu	Cu	Cu	Cu
Assembly	*Bond Type (at Die)*	Thermosonic	Thermosonic	Thermosonic	Thermosonic	Thermosonic
Assembly	*Bond Type (at LF)*	Thermosonic	Thermosonic	Thermosonic	Thermosonic	Thermosonic
Assembly	*No. of bond over active area*	2	4	2	4	2
Assembly	*Glass Transistion Temp*	130C	130	130	130	130
Assembly	*Terminal Finish (Plating) Material*	matt Sn	matt Sn	matt Sn	matt Sn	Mat Sn
Assembly	*Header plating (Die Land Area)*	Spot Ag	Spot Ag	Spot Ag	Spot Ag	Spot Ag
Assembly	Wire Diameter	1 mil	1 mil	1 mil	1 mil	1 mil
Assembly	Leadframe Type	SOT-323A	SOT-363E	SOT-523A	SOT-563D	SOT-89 3 lead
Assembly	Leadframe Material	Alloy 42	Alloy 42	Alloy 42	EFTEC-64T	CDA194HH
Assembly	Lead Frame Manufacturer	PBE/JihLin/ASM	PBE/JihLin/ASM	PBE/JihLin/ASM	MHT	PBE/HITACHI
Assembly	Molding Compound Type	CEL-1702HF9 SK	CEL-1702HF9 SK	CEL-1702HF9 SK	CEL-1702HF9 SKF	EME-G600
Assembly	Mold Compound Material Manufacturer	HITACHI	HITACHI	HITACHI	HITACHI	SUMITOMO
Assembly	Green Compound (Yes/No)	yes	yes	yes	yes	yes
Assembly	Lead-Free (Yes/No)	yes	yes	yes	yes	yes
Assembly	Assembly Site	SAT	SAT	SAT	SAT	SAT
Assembly	Test Site	SAT	SAT	SAT	SAT	SAT
Product	*Max Junction Temp*	150C	150C	150C	150C	150C
Product	*Max Thermal resistance Junc (amibent)*	625°C/W	625°C/W	833°C/W	625°C/W	125°C/W
Product	DataSheet	DS300082	DS300088	DS30270	DS30636	DS31141

Reliability and Characterization Testing

# in AEC-Q101 (D)	Test	Test Conditions	Duration / Limits	Fail/SS - Sample Size	X = Test Needed	Results Pass/Fail	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	0/385	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
		IR reflow 260C	3 cycles	0/385	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
4	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
5	HTRB	T=150°C Vd=100%, PER JESD22 A-108	168 Hrs	0/77	X	Pass								
			500 Hrs	0/77	X	Pass								
			1000 Hrs	0/77	X	Pass								
5-1	HTRB	T=150°C Vd=80%, PER JESD22 A-108	168 Hrs	0/77			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	-65C to 150C PER JESD22A-104	168 Cycles	0/77	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass
			500 Cycles	0/77	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass
			1000 Cycles	0/77	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass
9	HAST	130C, 85%RH 33.3 psia 80% Bias	96 Hrs	0/77	X	Pass								
9 alt	H3TRB	TA=85ºC, 85% RH, with 80% Reverse bias. JESD22A-101	168 Hrs	0/77			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
8 alt	PCT/AC	T=121°C 15PSIG 100%RH	96 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	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass
			7560 Cycles	0/77	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass
			15000 Cycles	0/77	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
		MM (AEC-Q101-002)	PER DATA SHEET	0/30	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass
12	DPA	AEC Q101-004 SEC. 4		0/2	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass
20	RESISTANCE TO SOLDER HEAT (RSH)	JESD22 B-106 (260C @30S)	PER SPEC	0/30	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass
21	Solderability	J-STD-002 (245C +0/5S)	5 Seconds	0/10						Pass		Pass		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
23	Wire Bond Strength	MIL-STD-750 METHOD 2037 (JESD22-B116B)	Cpk>1.66	0/30	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass
24	BOND SHEAR	AEC-Q101-003	Cpk>1.66	0/30	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass
25	Die Shear	MIL-STD-750 (2017)	Cpk>1.66	0/30	X	Pass	X	Pass	X	Pass	X	Pass	X	Pass

Summary: ________________________________

Submitted By: Jon Stocker

Approved By:

Certificate of Design, Construction & Qualification

Description: qualification of C3906S die in SOT363, SOT23, SOT323 packages at CAT

Category		Qual Device 1	Qual Device 2	Qual Device 3
Product	Part Number	DMMT3906W-7-F	MMBT3906-7-F	MMST3906-7-F
Assembly	Package Type	SOT-363	SOT-23	SOT-323
Assembly	Package Size	2.15x1.3x1.0mm	2.9 x1.3x0.975mm	2.15x1.3x0.95mm
Wafer	Die Name(s)	C3906S	C3906S	C3906S
Wafer	Die Size (W/L/Thickness) - After Saw	0.284 x 0.284 x 0.216	0.284 x 0.284 x 0.216	0.284 x 0.284 x 0.216
Wafer	Die Process / Technology	Bipolar	Bipolar	Bipolar
Wafer	Wafer FAB/ Location	KFAB/Kansas	KFAB/Kansas	KFAB/Kansas
Wafer	Wafer Diameter	150mm	150mm	150mm
Wafer	Front Metal Type	AlSiCu	AlSiCu	AlSiCu
Wafer	Front Metal Layer Number/ Thickness	3.5Um	3.5Um	3.5Um
Wafer	Number of Poly Layers	n/a	n/a	n/a
Wafer	Back Metal Type (All Layers)	NiV-Au	NiV-Au	NiV-Au
Wafer	Back Metal Thickness (All Layers)	300/2600/5500A	300/2600/5500A	300/2600/5500A
Wafer	Die Conforming Coating (Passivation)	Oxide / Nitride	Oxide / Nitride	Oxide / Nitride
Wafer	Die passivation thickness range	OX 6000A / NIT 1500A	OX 6000A / NIT 1500A	OX 6000A / NIT 1500A
Wafer	No of masks Steps	5	5	5
Assembly	Die quantity per package (e.g. single or dual dies)	2	1	1
Assembly	Die Attach Method (DB Epoxy/Solder Type)	Eutectic	Eutectic	Eutectic
Assembly	Die Attach Material/ Supplier	n/a	n/a	n/a
Assembly	Bond Wire/Clip Bond Material/ Supplier	Cu	Cu	Cu
Assembly	Bond Type (at Die)	Thermosonic	Thermosonic	Thermosonic
Assembly	Bond Type (at LF)	Thermosonic	Thermosonic	Thermosonic
Assembly	No. of bond over active area	4	4	4
Assembly	Glass Transistion Temp	110°C	130C	110°C
Assembly	Terminal Finish (Plating) Material	Matt Sn	Matt Sn	Matt Sn
Assembly	Header plating (Die Land Area)	Spot Ag	Cu plate	Spot Ag
Assembly	Wire Diameter	0.8mm	0.8mm	0.8mm
Assembly	Leadframe Type	SOT-363 18R	SOT-23C Copper plated LDF	SOT-323 H (Cu plated)
Assembly	Leadframe Material	ALLOY42	ALLOY42	ALLOY42
Assembly	Lead Frame Manufacturer	ASM / SDI	ASM	ASM / SDI
Assembly	Molding Compound Type	CEL-1702HF9SK	GR640HV	CEL-1702HF9SK
Assembly	Mold Compound Material Manufacturer	HITACHI	HENKEL	HITACHI
Assembly	Green Compound (Yes/No)	Yes	Yes	Yes
Assembly	Lead-Free (Yes/No)	Yes	Yes	Yes
Assembly	Assembly Site/ Location	CAT / Chengdu	CAT / Chengdu	CAT / Chengdu
Assembly	Test Site/ Location	CAT / Chengdu	CAT / Chengdu	CAT / Chengdu
Product	Max Junction Temp	150°C	150°C	150°C
Product	Max Thermal resistance Junc (amibent)	625 °C/W	403°C/W	625 °C/W
Product	DataSheet	DS30312	DS300059	DS300082

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
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
		Soak 85C, 85% RH	168Hrs			X	Pass	X	Pass	X	Pass
		IR reflow 260C	3 cycles			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
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
5	HTRB	Ta=150°C or Max Tj, Vd/Vr/Vcbo=80%, MIL-STD-750-1 / PER JESD22 A-108	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	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
			500 Cycles	0/77		X	Pass	X	Pass	X	Pass
			1000 Cycles	0/77		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
9	HAST	Ta=130C, 85%RH 33.3 psia 80% Bias; PER JESD22-A110	96 Hrs	0/77	3 wafer lots			X	Pass	X	Pass
9 alt	H3TRB	Ta=85ºC, 85% RH, with 80% Maximum Reverse Bias. JESD22A-101	168 Hrs	0/77	3 wafer lots	X	Pass				
			500 Hrs	0/77		X	Pass				
			1000 Hrs	0/77		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
			7560 Cycles	0/77		X	Pass	X	Pass	X	Pass
			15000 Cycles	0/77		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
		MM (AEC-Q101-002)	PER DATA SHEET	0/30	1 wafer lot	X	Pass	X	Pass	X	Pass
12	DPA	AEC Q101-004 SEC. 4		0/2	1 Assembly lot	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
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
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
24	BOND SHEAR	AEC-Q101-003	Cpk>1.66	0/ min of 5	1 Assembly lot	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
	HS	Ta=150ºC,	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

Summary: Final Report
Submitted By: Jon Stocker
Approved By:

Certificate of Design, Construction & Qualification

Qualification: KFAB C3906S Die Assembled at SAT in SOT23, SOT323, SOT363 and SOT523 Packages

				TRB2013-046		TRB2013-046		TRB2014-045		TRB2014-045	
Category				**Qual Device 1**		**Qual Device 2**		**Qual Device 3**		**Qual Device 4**	
Product	Part Number			MMBT3906-7-F		MMBT3906-7-F		MMBT3906-7-F		MMBT3906T-7-F	
Assembly	Package Type			SOT-23		SOT-23		SOT-23		SOT-523	
Assembly	Package Size			2.9 x 1.3		2.9 x 1.3		2.9 x 1.3		1.6 x 0.8	
Wafer	Die Name(s)			C3906C (40um grid)		C3906C (40um grid)		C3906C (50um grid)		C3906C (50um grid)	
Wafer	Die Size (W/L/Thickness)			0.26/0.26/0.215		0.26/0.26/0.215		0.26/0.26/0.215		0.284/0.284/0.215	
Wafer	Die Process / Technology			SS BJT		SS BJT		SS BJT		SS BJT	
Wafer	Wafer FAB			KFAB		KFAB		KFAB		KFAB	
Wafer	*Wafer Diameter*			150mm		150mm		150mm		150mm	
Wafer	*Front Metal Type*			ALSiCu		ALSiCu		ALSiCu		ALSiCu	
Wafer	Front Metal Thickness			3.5um		3.5um		3.5um		3.5um	
Wafer	*Back Metal Type (All Layers)*			NiV-Au		NiV-Au		NiV-Au		NiV-Au	
Wafer	*Back Metal Thickness (All Layers)*			125/5150A		125/5150A		125/5150A		125/5150A	
Wafer	*Die Conforming Coating (Passivation)*			Oxide/Nitride		Oxide/Nitride		Oxide/Nitride		Oxide/Nitride	
Wafer	*Die passivation thickness range*			6KA/1.5KA		6KA/1.5KA		6KA/1.5KA		6KA/1.5KA	
Wafer	*No of masks Steps*			6		6		6		6	
Assembly	Die quantity per package (e.g. single or dual dies)			1		1		1		1	
Assembly	Die Attach Method (DB Epoxy/Solder Type)			Eutectic		Eutectic		Eutectic		Eutectic	
Assembly	Die Attach Material			n/a		n/a		n/a		n/a	
Assembly	Bond Wire/Clip Bond Material			Cu		Cu		Cu		Cu	
Assembly	*Bond Type (at Die)*			Thermosonic		Thermosonic		Thermosonic		Thermosonic	
Assembly	*Bond Type (at LF)*			Thermosonic		Thermosonic		Thermosonic		Thermosonic	
Assembly	*No. of bond over active area*			2		2		2		2	
Assembly	*Glass Transistion Temp*			130		130		130		130	
Assembly	*Terminal Finish (Plating) Material*			Matt Sn		Matt Sn		Matt Sn		Matt Sn	
Assembly	*Header plating (Die Land Area)*			Spot Ag		Spot Ag		Spot Ag		Spot Ag	
Assembly	Wire Diameter			1		1		1		1	
Assembly	Leadframe Type			SOT-23A		SOT-23A		SOT-23A		SOT-523A	
Assembly	Leadframe Material			Alloy42		Alloy42		Alloy42		Alloy42	
Assembly	*Lead Frame Manufacturer*			MHL/PBE/NBKQ		MHL/PBE/NBKQ		MHL/PBE/NBKQ		JihLin/ASM/NBKQ	
Assembly	Molding Compound Type			GR640HV-L1		GR640HV-L1		GR640HV-L1		CEL-1702HF9 SK	
Assembly	Mold Compound Material Manufacturer			Henkel		Henkel		Henkel		Hitachi	
Assembly	Green Compound (Yes/No)			Yes		Yes		Yes		Yes	
Assembly	Lead-Free (Yes/No)			Yes		Yes		Yes		Yes	
Assembly	Assembly Site			SKE		SKE		SKE		SKE	
Assembly	Test Site			SKE		SKE		SKE		SKE	
Product	*Max Junction Temp*			150°C		150°C		150°C		150°C	
Product	*Max Thermal resistance Junc (amibent)*			403°C/W		403°C/W		403°C/W		833°C/W	
Product	DataSheet			DS300059		DS300059		DS300059		DS30271	
	Realibility and Characterization Testing										
Test	**Test Conditions**	**Duration / Limits**	**Fail/SS**	**X = Test Needed**	**Results Pass/Fail**	**X = Test Needed**	**Results Pass/Fail**	**X = Test Needed**	**Results Pass/Fail**	**X = Test Needed**	**Results Pass/Fail**
MSL1 Pre-conditioning	Bake 125C	24 Hrs	0/385	X	Pass			X	Pass	X	Pass
	Soak 85C, 85% RH	168Hrs	0/385	X	Pass			X	Pass	X	Pass
	IR reflow 260C	3 cycles	0/385	X	Pass			X	Pass	X	Pass
EXTERNAL VISUAL (EV)	MIL-STD-750 METHOD 2071	PER SPEC	0/500					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
HTRB	T=150°C Vd=80%, PER JESD22 A-108	168 Hrs	0/77	X	Pass						
		500 Hrs	0/77	X	Pass						
		1000 Hrs	0/77	X	Pass						
HTRB	T=150°C Vd=100%, PER JESD22 A-108	168 Hrs	0/77					X	Pass	X	Pass
		500 Hrs	0/77					X	Pass	X	Pass
		1000 Hrs	0/77					X	Pass	X	Pass
IOL	MIL-STD-750 Method 1037 (N/A for TVS)	2520 Cycles	0/77	X	Pass			X	Pass	X	Pass
		7560 Cycles	0/77	X	Pass			X	Pass	X	Pass
		15000 Cycles	0/77	X	Pass			X	Pass	X	Pass
TC	-65C to 150C PER JESD22A-104	168 Cycles	0/77	X	Pass			X	Pass	X	Pass
		500 Cycles	0/77	X	Pass			X	Pass	X	Pass
		1000 Cycles	0/77	X	Pass			X	Pass	X	Pass
HAST	130C, 85%RH 33.3 psia 80% Bias	96 Hrs	0/77	X	Pass			X	Pass	X	Pass
PCT/AC	T=121°C 15PSIG 100%RH	96 Hrs	0/77					X	Pass	X	Pass
ESD	HBM (AEC-Q101-001)	PER DATA SHEET	0/30	X	Pass	x	Pass	X	Pass	X	Pass
	CDM (AEC-Q100-005)	PER DATA SHEET	0/30			x	Pass				
	MM (AEC-Q101-002)	PER DATA SHEET	0/30	X	Pass	x	Pass	X	Pass	X	Pass
Die Shear	MIL-STD-750 (2017)	Cpk>1.66	0/30	X				X	Pass	X	Pass
Wire Bond Strength	MIL-STD-750 METHOD 2037 (JESD22-B116B)	Cpk>1.66	0/30	X	Pass			X	Pass	X	Pass
BOND SHEAR	AEC-Q101-003	Cpk>1.66	0/30					X	Pass	X	Pass
DPA	AEC Q101-004 SEC. 4		0/2	X	Pass			X	Pass	X	Pass
RESISTANCE TO SOLDER HEAT (RSH)	JESD22 B-106 (260C @30S)	PER SPEC	0/30	X	Pass			X	Pass	X	Pass
THERMAL RESISTANCE (TR)	JESD 24-3, 24-4, 24-6 AS APPROPRIATE	PER SPEC	0/10	X	Pass	X	Pass	X	Pass	X	Pass

Summary: ______________________________

Submitted By: Jon Stocker

Approved By:

Certificate of Design, Construction & Qualification

Description: qualification of C3904S die in SOT363 package at CAT

	Category					Qual Device 1	
	Product	Part Number				MMDT3904-7-F	
	Assembly	Package Type				SOT-363	
	Assembly	Package Size				2.15 x 1.3 mm	
	Wafer	Die Name(s)				C3904S	
	Wafer	Die Size (W/L/Thickness) - After Saw				0.26 x 0.26 x 0.216	
	Wafer	Die Process / Technology				Bipolar	
	Wafer	Wafer FAB/ Location				KFAB/Kansas	
	Wafer	Wafer Diameter				150mm	
	Wafer	Front Metal Type				AlSiCu	
	Wafer	Front Metal Layer Number/ Thickness				3.5Um	
	Wafer	Number of Poly Layers				n/a	
	Wafer	Back Metal Type (All Layers)				NiV-Au	
	Wafer	Back Metal Thickness (All Layers)				300/2600/5500A	
	Wafer	Die Conforming Coating (Passivation)				Oxide / Nitride	
	Wafer	Die passivation thickness range				OX 6000A / NIT 1500A	
	Wafer	No of masks Steps				5	
	Assembly	Die quantity per package (e.g. single or dual dies)				2	
	Assembly	Die Attach Method (DB Epoxy/Solder Type)				Eutectic	
	Assembly	Die Attach Material/ Supplier				n/a	
	Assembly	Bond Wire/Clip Bond Material/ Supplier				Cu	
	Assembly	Bond Type (at Die)				Thermosonic	
	Assembly	Bond Type (at LF)				Thermosonic	
	Assembly	No. of bond over active area				4	
	Assembly	Glass Transistion Temp				130C	
	Assembly	Terminal Finish (Plating) Material				Matt Sn	
	Assembly	Header plating (Die Land Area)				Spot Ag	
	Assembly	Wire Diameter				1.0 mil	
	Assembly	Leadframe Type				SOT-363 EA42	
	Assembly	Leadframe Material				Alloy42	
	Assembly	Lead Frame Manufacturer				ASM	
	Assembly	Molding Compound Type				CEL1702HF9SK	
	Assembly	Mold Compound Material Manufacturer				Hitachi	
	Assembly	Green Compound (Yes/No)				Yes	
	Assembly	Lead-Free (Yes/No)				Yes	
	Assembly	Assembly Site/ Location				CAT / Chengdu	
	Assembly	Test Site/ Location				CAT / Chengdu	
	Product	Max Junction Temp				150C	
	Product	Max Thermal resistance Junc (amibent)				625 °C/W	
	Product	DataSheet				DS30088	

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
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
4	PARAMETRIC VERIFICATION (PV)	-55C, 25C, 85C, 125C, 150C	Operating Range, Per Data Sheet	0/25	3 wafer lots	X	PASS
5	HTRB	Ta=150℃ or Max Tj, Vd/Vr/Vcbo=80%, MIL-STD-750-1 / PER JESD22 A-108	168 Hrs	0/77	3 wafer lots	X	PASS
			500 Hrs	0/77		X	PASS
			1000 Hrs	0/77		X	PASS
7	TC	Ta=-65C to 150C or Max Tj, PER JESD22A-104	168 Cycles	0/77	3 Assembly lots	X	PASS
			500 Cycles	0/77		X	PASS
			1000 Cycles	0/77		X	PASS
8	PCT/AC	Ta=121℃ 15PSIG 100%RH; PER JESD22-A102	96 Hrs	0/77	3 Assembly lots	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
10	IOL	MIL-STD-750 Method 1037 (N/A for TVS)	2520 Cycles	0/77	3 wafer lots	X	PASS
			7560 Cycles	0/77		X	PASS
			15000 Cycles	0/77		X	PASS
11	ESD	HBM (AEC-Q101-001)	PER DATA SHEET	0/30	1 wafer lot	X	PASS
		MM (AEC-Q101-002)	PER DATA SHEET	0/30	1 wafer lot	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
23	Wire Bond Strength	MIL-STD-750 METHOD 2037 (JESD22-B116B)	Cpk>1.66	0/ min of 5	1 Assembly lot	X	PASS
24	BOND SHEAR	AEC-Q101-003	Cpk>1.66	0/ min of 5	1 Assembly lot	X	PASS
25	Die Shear	MIL-STD-750 (2017)	Cpk>1.66	0/5	1 Assembly lot	X	PASS

Summary:

Submitted By: JON STOCKER

Approved By:

Certificate of Design, Construction & Qualification

Description: Qualification of [Cu] Wire Bonding of Phenitec Small Signal NPN and PNP Die assembled at SAT in SOT563, SOT363 and SOT523 Packages

Category		Qual Device 1	Qual Device 2	Qual Device 3
Product	Part Number	BC847BV-7	MMDT2222A-7	BC857AT-7
Assembly	Package Type	SOT563	SOT-363	SOT523
Assembly	Package Size	1.6mm x 1.6mm x 0.6mm	2.15mm x 2.1mm x 1.0mm	1.6mm x 1.6mm x 0.8mm
Wafer	Die Name(s)	C5334S14 Bin2	CP998ADE	A5335_856 BIN1
Wafer	Die Size (W/L/Thickness) - After Saw	0.33mm x 0.33mm x 0.14mm	0.35mm x 0.35mm x 0.23mm	0.35mm x 0.35mm x 0.23mm
Wafer	Die Process / Technology	SS Transistor	SS Transistor	SS Transistor
Wafer	Wafer FAB/ Location	Phenitec/Okayama, Japan	Phenitec/Okayama, Japan	Phenitec/Okayama, Japan
Wafer	Wafer Diameter	5 inch	5 inch	5 inch
Wafer	Front Metal Type	AlSi	AlSiCu	AlSi
Wafer	Front Metal Layer Number/ Thickness	2.7µm	2.0µm	2.7µm
Wafer	Number of Poly Layers	n/a	n/a	n/a
Wafer	Back Metal Type (All Layers)	Au	Au	Au
Wafer	Back Metal Thickness (All Layers)	0.9µm	0.9µm	0.9µm
Wafer	Die Conforming Coating (Passivation)	No	No	No
Wafer	Die passivation thickness range	n/a	n/a	n/a
Wafer	No of masks Steps	4	5	4
Assembly	Die quantity per package (e.g. single or dual dies)	Dual Die	Dual Die	Single
Assembly	Die Attach Method (DB Epoxy/Solder Type)	Eutectic	Eutectic	Eutectic
Assembly	Die Attach Material/ Supplier	n/a	n/a	n/a
Assembly	Bond Wire/Clip Bond Material/ Supplier	Tanaka/NBKQ/Heraues	Tanaka/NBKQ/Heraues	Tanaka/NBKQ/Heraues
Assembly	Bond Type (at Die)	Thermosonic Ball Bond	Thermosonic Ball Bond	Thermosonic Ball Bond
Assembly	Bond Type (at LF)	Thermosonic Stitich Bond	Thermosonic Stitich Bond	Thermosonic Stitich Bond
Assembly	No. of bond over active area	4	4	2
Assembly	Glass Transition Temp	130°C	130°C	130°C
Assembly	Terminal Finish (Plating) Material	Matte Sn	Matte Sn	Matte Sn
Assembly	Header plating (Die Land Area)	Spot Ag	Spot Ag	Spot Ag
Assembly	Wire Diameter	1.0mil	1.0mil	1.0mil
Assembly	Leadframe Type	SOT563D	SOT363E	SOT523A
Assembly	Leadframe Material	EFTEC64T	Alloy42	Alloy42
Assembly	Lead Frame Manufacturer	PBE/ASM	PBE/APL/VAST	MHT/PBE
Assembly	Molding Compound Type	CEL-1702HF9 SK	CEL-1702HF9SK	CEL-1702HF9 SK
Assembly	Mold Compound Material Manufacturer	Hitachi	Hitachi	Hitachi
Assembly	Green Compound (Yes/No)	Yes	Yes	Yes
Assembly	Lead-Free (Yes/No)	Yes	Yes	Yes
Assembly	Assembly Site/ Location	SKE / DSH	SKE / DSH	SKE / DSH
Assembly	Test Site/ Location	SKE / DSH	SKE / DSH	SKE / DSH
Product	Max Junction Temp	150°C	150°C	150°C
Product	Max Thermal resistance Junc (ambient)	833°C/W	625°C/W	833°C/W
Product	DataSheet	DS30638	DS30125	DS30275

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
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
		Soak 85C, 85% RH	168Hrs			X	PASS	X	PASS	X	PASS
		IR reflow 260C	3 cycles			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
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
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
			500 Cycles	0/77		X	PASS	X	PASS	X	PASS
			1000 Cycles	0/77		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			X	PASS
9 alt	H3TRB	Ta=85ºC, 85% RH, with 80% Maximum Reverse Bias. JESD22A-101	168 Hrs	0/77	3 wafer lots			X	PASS		
			500 Hrs	0/77				X	PASS		
			1000 Hrs	0/77				X	PASS		
11	ESD	HBM (AEC-Q101-001)	PER DATA SHEET	0/30	1 wafer lot	X	PASS	X	PASS	X	PASS
		MM (AEC-Q101-002)	PER DATA SHEET	0/30	1 wafer lot	X	PASS	X	PASS	X	PASS
12	DPA	AEC Q101-004 SEC. 4		0/2	1 Assembly lot	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 Assmbly lot	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 Assmbly lot	X	PASS	X	PASS	X	PASS
24	BOND SHEAR	AEC-Q101-003	Cpk>1.66	0/ min of 5	1 Assmbly lot	X	PASS	X	PASS	X	PASS
25	Die Shear	MIL-STD-750 (2017)	Cpk>1.66	0/5	1 Assmbly lot	X	PASS	X	PASS	X	PASS

Summary: ______________________________

Submitted By: Cora Fernando

Approved By: Jon Stocker

Certificate of Design, Construction & Qualification

Description: Qualification of C3904S Die shrink assembled at CAT in SOT23 Package

	Category					Qual Device 1	
	Product	Part Number				MMBT3904	
	Assembly	Package Type				SOT23	
	Assembly	Package Size				2.9*2.4*1.05mm	
	Wafer	Die Name(s)				C3904S	
	Wafer	Die Size (W/L/Thickness) - After Saw				0.26*0.26*0.216mm	
	Wafer	Die Process / Technology				BJT / NPN	
	Wafer	Wafer FAB/ Location				Kfab / Kansas US	
	Wafer	Wafer Diameter				6 inch	
	Wafer	Front Metal Type				AlSiCu	
	Wafer	Front Metal Layer Number/ Thickness				3.5μm	
	Wafer	Number of Poly Layers				n/a	
	Wafer	Back Metal Type (All Layers)				Au	
	Wafer	Back Metal Thickness (All Layers)				0.5μm	
	Wafer	Die Conforming Coating (Passivation)				Ox/Nitride	
	Wafer	Die passivation thickness range				0.75um	
	Wafer	No of masks Steps				5	
	Assembly	Die quantity per package (e.g. single or dual dies)				single	
	Assembly	Die Attach Method (DB Epoxy/Solder Type)				Eutectic	
	Assembly	Die Attach Material/ Supplier				n/a	
	Assembly	Bond Wire/Clip Bond Material/ Supplier				Cu	
	Assembly	Bond Type (at Die)				Thermosonic Ball Bond	
	Assembly	Bond Type (at LF)				Thermosonic Stitch Bond	
	Assembly	No. of bond over active area				2	
	Assembly	Glass Transistion Temp				160℃	
	Assembly	Terminal Finish (Plating) Material				Leadfree	
	Assembly	Header plating (Die Land Area)				n/a	
	Assembly	Wire Diameter				0.8mil	
	Assembly	Leadframe Type				SOT-23A	
	Assembly	Leadframe Material				Alloy42	
	Assembly	Lead Frame Manufacturer				SLC	
	Assembly	Molding Compound Type				GR640HV-L1	
	Assembly	Mold Compound Material Manufacturer				Henkel	
	Assembly	Green Compound (Yes/No)				Yes	
	Assembly	Lead-Free (Yes/No)				Yes	
	Assembly	Assembly Site/ Location				CAT / Chengdu CH	
	Assembly	Test Site/ Location				CAT / Chengdu CH	
	Product	Max Junction Temp				150℃	
	Product	Max Thermal resistance Junc (ambient)				417℃/W	
	Product	DataSheet				DS30036	
		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**
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
4	PARAMETRIC VERIFICATION (PV)	-55C, 25C, 85C, 125C, 150C	Operating Range, Per Data Sheet	0/25	3 wafer lots	X	Pass
5	HTRB	Ta=150℃ or Max Tj, Vd/Vr/Vcbo=80%, MIL-STD-750-1 / PER JESD22 A-108	168 Hrs	0/77	3 wafer lots	X	Pass
			500 Hrs	0/77		X	Pass
			1000 Hrs	0/77		X	Pass
7	TC	Ta=-65C to 150C or Max Tj, PER JESD22A-104	168 Cycles	0/77	3 Assembly lots	X	Pass
			500 Cycles	0/77		X	Pass
			1000 Cycles	0/77		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
10	IOL	MIL-STD-750 Method 1037 (N/A for TVS)	2520 Cycles	0/77	3 wafer lots	X	Pass
			7560 Cycles	0/77		X	Pass
			15000 Cycles	0/77		X	Pass
11	ESD	HBM (AEC-Q101-001)	PER DATA SHEET	0/30	1 wafer lot	X	Pass
		MM (AEC-Q101-002)	PER DATA SHEET	0/30	1 wafer lot	X	Pass
12	DPA	AEC Q101-004 SEC. 4		0/2	1 Assembly lot	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
23	Wire Bond Strength	MIL-STD-750 METHOD 2037 (JESD22-B116B)	Cpk>1.66	0/ min of 5	1 Assembly lot	X	Pass
24	BOND SHEAR	AEC-Q101-003	Cpk>1.66	0/ min of 5	1 Assembly lot	X	Pass
25	Die Shear	MIL-STD-750 (2017)	Cpk>1.66	0/5	1 Assembly lot	X	Pass

Summary: ________________________________

Submitted By: Adam Knight

Approved By: Jon Stocker

Certificate of Design, Construction & Qualification

Description: C2907S die qualification at SAT

	Category					Qual Device 1		Qual Device 2	
	Product	Part Number				MMBT2907A		MMST2907A	
	Assembly	Package Type				SOT-23		SOT-323	
	Assembly	Package Size				2.9 x 1.3		2.0 x 1.25	
	Wafer	Die Name(s)				C2907S		C2907S	
	Wafer	Die Size (W/L/Thickness) - After Saw				0.35*0.35*0.216mm		0.35*0.35*0.216mm	
	Wafer	Die Process / Technology				Bipolar / Small Signal		Bipolar / Small Signal	
	Wafer	Wafer FAB/ Location				KFAB/Kansas		KFAB/Kansas	
	Wafer	Wafer Diameter				150mm		150mm	
	Wafer	Front Metal Type				AlSiCu		AlSiCu	
	Wafer	Front Metal Layer Number/ Thickness				3.5um		3.5um	
	Wafer	Number of Poly Layers				n/a		n/a	
	Wafer	Back Metal Type (All Layers)				NiV + Au		NiV + Au	
	Wafer	Back Metal Thickness (All Layers)				125A NiV + 5150A Au		125A NiV + 5150A Au	
	Wafer	Die Conforming Coating (Passivation)				PECVD Oxide/Ntride		PECVD Oxide/Ntride	
	Wafer	Die passivation thickness range				15kA Nitride / 6kA Oxide		15kA Nitride / 6kA Oxide	
	Wafer	No of masks Steps				6		6	
	Assembly	Die quantity per package (e.g. single or dual dies)				1		1	
	Assembly	Die Attach Method (DB Epoxy/Solder Type)				Eutectic		Eutectic	
	Assembly	Die Attach Material/ Supplier				n/a		n/a	
	Assembly	Bond Wire/Clip Bond Material/ Supplier				Cu		Cu	
	Assembly	Bond Type (at Die)				Thermosonic		Thermosonic	
	Assembly	Bond Type (at LF)				Thermosonic		Thermosonic	
	Assembly	No. of bond over active area				2		2	
	Assembly	Glass Transition Temp				130℃		130℃	
	Assembly	Terminal Finish (Plating) Material				Matte Sn		Matte Sn	
	Assembly	Header plating (Die Land Area)				Spot Ag		Spot Ag	
	Assembly	Wire Diameter				1 mil		1 mil	
	Assembly	Leadframe Type				SOT-23A		SOT-323A	
	Assembly	Leadframe Material				Alloy42		ACDA194FH	
	Assembly	Lead Frame Manufacturer				PBE / VAST / APL		PBE / Hitachi	
	Assembly	Molding Compound Type				GR640HV-L1		CEL-1702HF9SKF	
	Assembly	Mold Compound Material Manufacturer				Henkel		HITACHI	
	Assembly	Green Compound (Yes/No)				yes		yes	
	Assembly	Lead-Free (Yes/No)				yes		yes	
	Assembly	Assembly Site/ Location				SAT/Shanghai		SAT/Shanghai	
	Assembly	Test Site/ Location				SAT/Shanghai		SAT/Shanghai	
	Product	Max Junction Temp				150℃		150℃	
	Product	Max Thermal resistance Junc (amibent)				403 °C/W		625 °C/W	
	Product	DataSheet				DS30040		DS30081	
		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**
2	MSL1 Pre-conditioning	Bake 125C	24 Hrs	SMD only, for Test #7, 8, 9 & 10	3 Assembly lots	X	PASS	X	PASS
		Soak 85C, 85% RH	168Hrs			X	PASS	X	PASS
		IR reflow 260C	3 cycles			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
4	PARAMETRIC VERIFICATION (PV)	-55C, 25C, 85C, 125C, 150C	Operating Range, Per Data Sheet	0/25	3 wafer lots	X	PASS	X	PASS
5	HTRB	Ta=150℃ or Max Tj, Vd/Vr/Vcbo=80%, MIL-STD-750-1 / PER JESD22 A-108	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
9	HAST	Ta=130C, 85%RH 33.3 psia 80% Bias; PER JESD22-A110	96 Hrs	0/77	3 wafer lots	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
		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
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
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
24	BOND SHEAR	AEC-Q101-003	Cpk>1.66	0/ min of 5	1 Assembly lot	X	PASS	X	PASS

Summary:	
Submitted By:	Jon Stocker
Approved By:	Paul Whitehead

Certificate of Design, Construction & Qualification

Description: Qualification of KFAB C2907S used in MMBT2907A and MMST2907A assembled at CAT

Category		Qual Device 1	Qual Device 2
Product	Part Number	MMST2907A-7-F	MMBT2907A-7-F
Assembly	Package Type	SOT-323	SOT-23
Assembly	Package Size	2 x 1.25	2.9 x 1.3mm
Wafer	Die Name(s)	C2907S	C2907S
Wafer	Die Size (W/L/Thickness) - After Saw	0.35 x 0.35 x 0.216mm	0.35 x 0.35 x 0.216mm
Wafer	Die Process / Technology	BJT	BJT
Wafer	Wafer FAB/ Location	KFAB	KFAB
Wafer	Wafer Diameter	6"	6"
Wafer	Front Metal Type	AlSiCu	AlSiCu
Wafer	Front Metal Layer Number/ Thickness	3.5um	3.5um
Wafer	Number of Poly Layers	n/a	n/a
Wafer	Back Metal Type (All Layers)	Au	Au
Wafer	Back Metal Thickness (All Layers)	0.5um	0.5um
Wafer	Die Conforming Coating (Passivation)	Oxide/Nitride	Oxide/Nitride
Wafer	Die passivation thickness range	0.75um	0.75um
Wafer	No of masks Steps	6	6
Assembly	Die quantity per package (e.g. single or dual dies)	1	1
Assembly	Die Attach Method (DB Epoxy/Solder Type)	Eutectic	Eutectic
Assembly	Die Attach Material/ Supplier	n/a	n/a
Assembly	Bond Wire/Clip Bond Material/ Supplier	n/a	n/a
Assembly	Bond Type (at Die)	Thermosonic	Thermosonic
Assembly	Bond Type (at LF)	THermosonic	THermosonic
Assembly	No. of bond over active area	2	2
Assembly	Glass Transistion Temp	105C	165C
Assembly	Terminal Finish (Plating) Material	Pure Tin	Pure Tin
Assembly	Header plating (Die Land Area)	Bare Copper	Bare Copper
Assembly	Wire Diameter	0.8mil	0.8mil
Assembly	Leadframe Type	SOT-323H Copper plated	SOT-23C
Assembly	Leadframe Material	Alloy42	Alloy42
Assembly	Lead Frame Manufacturer	ASM	SHE
Assembly	Molding Compound Type	CEL-1702HF9	GR640HV
Assembly	Mold Compound Material Manufacturer	Hitachi	Henkel
Assembly	Green Compound (Yes/No)	Yes	Yes
Assembly	Lead-Free (Yes/No)	Yes	Yes
Assembly	Assembly Site/ Location	CAT	CAT
Assembly	Test Site/ Location	CAT	CAT
Product	Max Junction Temp	150C	150C
Product	Max Thermal resistance Junc (amibent)	625 °C/W	350 °C/W
Product	DataSheet	DS30081	DS30041

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
2	MSL1 Pre-conditioning	Bake 125C	24 Hrs	SMD only, for Test #7, 8, 9 & 10	3 Assembly lots	X	PASS	X	PASS
		Soak 85C, 85% RH	168Hrs			X	PASS	X	PASS
		IR reflow 260C	3 cycles			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
4	PARAMETRIC VERIFICATION (PV)	-55C, 25C, 85C, 125C, 150C	Operating Range, Per Data Sheet	0/25	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
9	HAST	Ta=130C, 85%RH 33.3 psia 80% Bias; PER JESD22-A110	96 Hrs	0/77	3 wafer lots	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
		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
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
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
24	BOND SHEAR	AEC-Q101-003	Cpk>1.66	0/ min of 5	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: PASS

Submitted By: P WHITEHEAD

Approved By: JON STOCKER

Certificate of Design, Construction & Qualification

Description: Qualification of SOT323 BJT Gen3 Products using Copper Wire Bonding

Category		Qual Device 1	QBS Source Device 1	QBS Source Device 2
Product	Part Number	ZUMT619TA	MMST5551Q-7-F	MMST5401Q-7-F
Assembly	Package Type	SOT323	SOT323	SOT323
Assembly	Package Size	2.15mm x 2.10mm x 1.0mm	2.15mm x 2.10mm x 1.0mm	2.15mm x 2.10mm x 1.0mm
Wafer	Die Name(s)	ZUMT619T3C	CZ5551C	X30P150BT3C
Wafer	Die Size (W/L/Thickness) - After Saw	0.508mm x 0.813mm x 178mm	0.406mm x 0.406mm x 178mm	0.406mm x 0.406mm x 178mm
Wafer	Die Process / Technology	Bipolar	Bipolar	Bipolar
Wafer	Wafer FAB/ Location	OFAB / KFAB	KFAB / OFAB	OFAB
Wafer	Wafer Diameter	6"	6"	6"
Wafer	Front Metal Type	AlSiCu0.05	AlSiCu0.05	AlSiCu0.05
Wafer	Front Metal Layer Number/ Thickness	3.0µm / 3.5µm	3.5µm / 3.0µm	3.5µm / 3.0µm
Wafer	Number of Poly Layers	n/a	n/a	n/a
Wafer	Back Metal Type (All Layers)	Au	Au	Au
Wafer	Back Metal Thickness (All Layers)	1.0um	1.0um	1.0 um
Wafer	Die Conforming Coating (Passivation)	None	None	None
Wafer	Die passivation thickness range	n/a	n/a	n/a
Wafer	No of masks Steps	4	4	4
Assembly	Die quantity per package (e.g. single or dual dies)	Single	Single	Single
Assembly	Die Attach Method (DB Epoxy/Solder Type)	Eutectic	Eutectic	Eutectic
Assembly	Die Attach Material/ Supplier	N/A	N/A	N/A
Assembly	Bond Wire/Clip Bond Material/ Supplier	Copper	Copper	Copper
Assembly	Bond Type (at Die)	Thermosonic Ball Bond	Thermosonic Ball Bond	Thermosonic Ball Bond
Assembly	Bond Type (at LF)	Thermosonic Stitch Bond	Thermosonic Stitch Bond	Thermosonic Stitch Bond
Assembly	No. of bond over active area	2	2	2
Assembly	Glass Transistion Temp	130 °C	130 °C	130 °C
Assembly	Terminal Finish (Plating) Material	Pure Sn	Pure Sn	Pure Sn
Assembly	Header plating (Die Land Area)	Spot Ag	Spot Ag	Spot Ag
Assembly	Wire Diameter	25µm	25µm	25µm
Assembly	Leadframe Type	SOT-323G	SOT-323A	SOT-323A
Assembly	Leadframe Material	Alloy 42 + Cu	Alloy 42	Alloy 42
Assembly	Lead Frame Manufacturer	PBE / HITACHI	PBE / HITACHI	PBE / HITACHI
Assembly	Molding Compound Type	CEL1702HF9SKF	CEL1702HF9SKF	CEL1702HF9SKF
Assembly	Mold Compound Material Manufacturer	HITACHI	HITACHI	HITACHI
Assembly	Green Compound (Yes/No)	Yes	Yes	Yes
Assembly	Lead-Free (Yes/No)	Yes	Yes	Yes
Assembly	Assembly Site/ Location	SAT	SAT	SAT
Assembly	Test Site/ Location	SAT	SAT	SAT
Product	Max Junction Temp	150 °C	150 °C	150 °C
Product	Max Thermal resistance Junc (ambient)	325 °C/W	178 °C	178 °C
Product	DataSheet	DS33338	ds30173	ds30170

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	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
		Soak 85C, 85% RH	168Hrs			X	Pass	X	Pass	X	Pass
		IR reflow 260C	3 cycles			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
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
5	HTRB	Ta=150℃ or Max Tj, Vd=100%, PER MIL-STD-750-1	168 Hrs	0/77	3 wafer lots	X	Pass				
			500 Hrs	0/77		X	Pass				
			1000 Hrs	0/77		X	Pass				
5-1	HTRB	Ta=150℃ or Max Tj, Vd/Vr/Vcbo=80%, MIL-STD-750-1 / PER JESD22 A-108	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	X	Pass
			500 Cycles	0/77		X	Pass	X	Pass	X	Pass
			1000 Cycles	0/77		X	Pass	X	Pass	X	Pass
7b	Wire Bond Integrity	MIL-STD-750, Method 2037 (For bonding of dissimilar metals, eg: Au/Al)	500 Hrs	0/5	3 Assembly lots	X	Pass				
8	PCT/AC	Ta=121℃ 15PSIG 100%RH; PER JESD22-A102	96 Hrs	0/77	3 Assembly lots	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	X	Pass
9 alt	H3TRB	Ta=85ºC, 85% RH, with 80% Maximum Reverse Bias. JESD22A-101	168 Hrs	0/77	3 wafer lots	X	Pass				
			500 Hrs	0/77		X	Pass				
			1000 Hrs	0/77		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
			7560 Cycles	0/77		X	Pass	X	Pass	X	Pass
			15000 Cycles	0/77		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
		MM (AEC-Q101-002)	PER DATA SHEET	0/30	1 wafer lot	X	Pass	X	Pass	X	Pass
12	DPA	AEC Q101-004 SEC. 4		0/2	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	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
24	BOND SHEAR	AEC-Q101-003	Cpk>1.66	0/ min of 5	1 Assembly lot	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
29	Hot Store		168 Hrs	0/77	3 wafer lots	X	Pass				
			500 Hrs	0/77		X	Pass				

Submitted By: Cora Fernando

Approved By: Jon Stocker

DIODES INCORPORATED

CERTIFICATE OF DESIGN AND CONSTRUCTION

Assembly and Test Site	DIODES INC	**Glass transition temperature (T_G)**	110℃
DIC P/N	DLP05LC-7	**Lead material type**	SOT-23A
Package Type	SOT-23	**Lead Material manufacturer**	MHT/PBE/VAST/NBKQ
DIE P/N	RGP6V0G+B1001FM*2	**Lead plating/ coating**	Pb free
Die line or process	ARR	**Lead frame material type**	Alloy42
Wafer Diameter	5"	**Header plating (Die land area)**	Spot Ag
Wafer Fab Site(s)	Phenitec+KFAB	**Max junction temperature(T_j)**	125℃
ID method (multiple sites)	NA	**Max thermal resistance junction to case (θ_{JC})**	NA
Assembly Locations(s)	DIODES INC. IN SHANGHAI, Plant1,NO.111-10 Songjiang Export Processing Zone, Shanghai,P.R.China 201600	**Max thermal resistance junction to ambient (θ_{JA})***	NA
Test Locations(s)	DIODES INC. IN SHANGHAI, Plant1,NO.111-10 Songjiang Export Processing Zone, Shanghai,P.R.China 201600	**Front metal type (Top layer)**	AlSiCu
Die attach Method / Material	EUTECTIC	**Front metal thickness (Top layer)**	RGP6V0G - 2.5um B1001FM - 3.5um
Bond wire material & dia.	Cu wire,1.3mil	**Back metal type (All layers)**	RGP6V0G - Au B1001FM - 125A NiV + 5150A Au
Bond type (at top side of the die)	Thermo sonic	**Back metal thickness (all Layers)**	RGP6V0G - 0.9um B1001FM - 125A NiV + 5150A Au
Bond type (at leadframe)	Thermo sonic	**Die conforming coating**	NA
No. of bonds over active area	3	**Die size (width x length x thickness) in mm**	RGP6V0G - 0.44*0.44*0.18mm B1001FM - 0.28*0.28*0.216mm
Package material type	GR640HV-L1	**Die passivation thickness range**	NA
Package material manufacturer	HENKEL	**No. of mask steps**	N/A

*Show conditions (i.e. pad size, board material, copper thickness, etc.

Attachments:

1) Die Photo

2) Package outline drawing

3) Die cross-section drawing
4) Wire bond & die placement diagram
5) Test circuits, bias levels and conditions

Requirements:

A separate Certificate of Design, Construction and Qualification shall be submitted for each P/N and assembly location.
Document shall be signed by a responsible individual at the supplier who can verify that all of the above information is correct. Type name and sign.

Completed by		Date	Certified by	Date
Typed/Printed	Jenny Liu	February 24, 2014	Liang Gao	2014-2-24
Signature				
Title				

SHANGHAI KAIHONG ELECTRONIC CO.,LTD

Reliability Test Summary Report

FACTORY:		PART NUMBER: DLP05LC SWR1401234 Customer Package:SOT23 DIODES INC.:				
LABORATORY (If Different):		PART DESCRIPTION:2nd wafer source QUAL (RGP6V0G+B1001FM,GR640HV-L1,1.3Cu)				
DW-008 (AEC Q101) Test#	Test Description	Test Conditions	#Lots	#To Test	**Results**	REMARKS
7.3.2 (1)	PRE- AND POST- STRESS ELECTRICAL TEST (TEST)	Per Spec				N/A
7.3.3 (2)	PRECONDITIONING (PC)	JSED22 A-113 N/A for Axial	1	308	0/308	
7.3.5.1 (3)	EXTERNAL VISUAL (EV)	MIL-STD-750 METHOD 2071	1	500	0/500	
7.3.5.2 (4)	PARAMETRIC VERIFICATION (PV)	Per Data Sheet Characteristic VZ@IZT=1mA Characteristic IR@VR=5V Ta1=-55*C, Ta2=25*C, Ta3=85*C, Ta4=150*C	1 of 3	25	0/25	
	Lot #2		2 of 3	25		
	Lot #3		3 of 3	25		
7.3.5.3	FORWARD SURGE	MIL-750D, Method 4066	1	45		
7.3.5.4 (5)	HIGH TEMP. REVERSE BIAS (HTRB)	T=150*C/Vr=5v,PER JESD22 A-108	1	77		
	Pretest		1	77	0/77	
	@ 168 Hours	T=150*C/Vr=5v,PER JESD22 A-108	1	77	0/77	
	@ 500 Hours	T=150*C/Vr=5v,PER JESD22 A-108	1	77	0/77	
	Final 1000Hours	T=150*C/Vr=5v,PER JESD22 A-108	1	77	0/77	
(6)	HIGH TEMP GATE BIAS (HTGB)	MIL-750D, Method 4066	N/A	N/A		N/A
7.3.5.5 (7)	TEMPERATURE CYCLING (TC)	T=-65*C-150*C, PER JESD22 A-104				
	Pretest		1	77	0/77	
	@ 168Cycles	T=-65*C-150*C, PER JESD22 A-104	1	77	0/77	
	@ 500Cycles	T=-65*C-150*C, PER JESD22 A-104	1	77	0/77	
	@ 1000Cycles	T=-65*C-150*C, PER JESD22 A-104	1	77	0/77	
7.3.5.6 (8)	AUTOCLAVE (AC)	T=121*C 15PSIG 100%RH	1	77	0/77	96h
7.3.5.7 (9)	H^3TRB	T=85℃ RH=85% Vg=80%	1	77		Not required if HAST passed
	Pretest		1	77		
	@ 500 Hours	T=85℃ RH=85% Vg=80%	1	77		
	Final 1000 Hours	T=85℃ RH=85% Vg=80%	1	77		
7.3.5.7 (9a)	HIGHLY ACCELERATED STRESS TEST (HAST)	T=130℃ RH=85% Vr=80% of BVR	1	77	0/77	96hrs
7.3.5.8 (10)	INTERMITTENTOPERATING LIFE (IOL)	If=100mA, PER MIL-STD-750 METHOD 1037				15000Cycles @ 2min on/off
	Pretest	MIL-STD-750 METHOD 1037	1	77		
	After 15000cy	MIL-STD-750 METHOD 1037	1	77		
(10a)	POWER AND TEMP. CYCLE (PTC)	JESD22 A-105, Per Table AEC-Q101, p11	1	77		N/A
(Optional)	Pretest	JESD22 A-105, Per Table AEC-Q101, p11	1	77		
	Midpoint	JESD22 A-105, Per Table AEC-Q101, p11	1	77		
	After	JESD22 A-105, Per Table AEC-Q101, p11	1	77		
7.3.5.9 (11)	ESD CHARACTERIZATION (ESD)	PER AEC-Q101-001 & -002	1	60	0/60	MM 400V HBM 8kV
7.3.5.10 (12)	D.P.A. (DPA)	AEC Q101-004 SEC. 4	1	2	0/2	
7.3.5.11 (13)	PHYSICAL DIMENSION (PD)	PER JESD22 B-100	1	30	0/30	
7.3.5.12 (14)	TERMINAL STRENGTH (TS)	MIL-STD-750, Method 2036	1	30		N/A
7.3.5.12 (14)	TERMINAL STRENGTH (TS)	MIL-STD-750, Method 2036	N/A	N/A		N/A
7.3.5.13 (15)	RESISTANCE TO SOLVENTS (RTS)	JESD22 B-107	N/A	N/A		N/A
(16)	CONSTANT ACCELERATION (CA)	N/A, not hermetically sealed device.	N/A	N/A		N/A
7.3.5.14 (20)	RESISTANCE TO SOLDER HEAT (RSH)	JESD22 B-106	1	30	0/30	260*C @30S
7.3.5.16 (22)	THERMAL RESISTANCE (TR)	JESD 24-3, 24-4, 24-6 as appropriate	1	10	0/10	408*C/W
7.3.5.18 (24)	BOND SHEAR (BS)	AEC-Q101-003	1	30	0/30	
7.3.5.19 (25)	DIE SHEAR (DS)	MIL-STD-750 METHOD 2017	1	30	0/30	
(26)	UNCLAMPED INDUCTIVE SWITCHING (UI	N/A, not for Diode	N/A	N/A		N/A
(27)	DIELECTRIC INTEGRITY (DI)	N/A, not for Diode	N/A	N/A		N/A
Summary:	**The lot passed pre-con and 1000hrs full hirel test.**					
Submitted by: Joan Yu 04/29/14		**Approved by:Adam Gu 04/29/14**				