



Diodes Incorporated Discrete and Analog Semiconductors

Qualification Report – PCN-2235

Manufacturer No.: Qualification of Palladium Coated Copper (PdCu) Bond Wire or Bare Copper (Cu) Bond Wire as Alternative Wire Bond Materials for Selected SOT-23, SOT-223 and SM-8 Packaged Products

Revision: 0

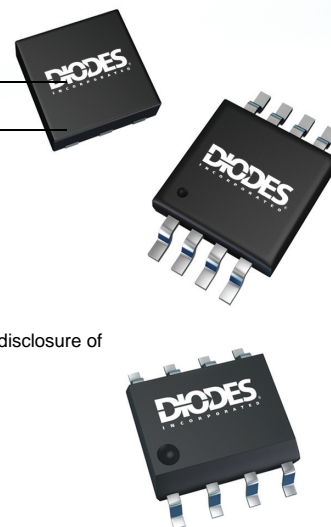
Date: June 14, 2016

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.

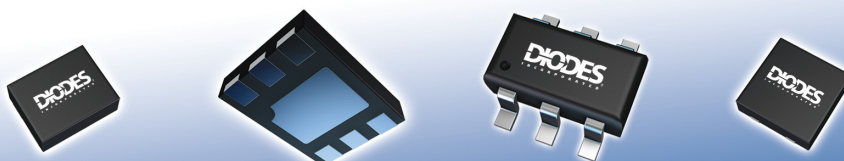
Please go to www.diodes.com for current data sheets on associated devices

Prepared By:	<u>Diodes US Document Control</u>	Date	<u>June 14, 2016</u>
Approved By:	<u>Diodes US QRA Department</u>	Date	<u>June 14, 2016</u>



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DATE: 14th June, 2016

PCN #: 2235

PCN Title: Qualification of Palladium Coated Copper (PdCu) Bond Wire or Bare Copper (Cu) Bond Wire as Alternative Wire Bond Materials for Selected SOT-23, SOT-223 and SM-8 Packaged 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-2235 REV 00

Notification Date:	Implementation Date:	Product Family:	Change Type:	PCN #:
14 th June, 2016	13 th September, 2016	Discrete Semiconductors	Bond Wire Material	2235
TITLE				
Qualification of Palladium Coated Copper Bond Wire or Bare Copper Bond Wire for Selected SOT-23, SOT-223 and SM-8 Packaged Products				
DESCRIPTION OF CHANGE				
This PCN is being issued to notify customers that Diodes has qualified palladium coated copper bond wire or bare copper bond wire as alternative wire bond materials for the part numbers listed in this PCN.				
Full electrical characterization and reliability testing has been completed on representative part numbers built using palladium coated copper bond wire or bare copper bond wire to ensure there is 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				
No change in datasheet parameters and product performance.				
PRODUCTS AFFECTED				
Please refer to Table 1 for the affected devices with PdCu bond wire Please refer to Table 2 for the affected devices with Cu bond wire				
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 Devices with PdCu wire				
ZXTN25100BFHTA	ZXTN25060BFHTA	ZXTP25040DFHTA	ZXTP19020DGTA	ZX5T949GTA
ZXTN25100DFHTA	ZXTP25100BFHTA	ZXTP25060BFHTA	ZX5T1951GTA	ZXTP2008GTA
ZXTN25012EFHTA	ZXTP25100CFHTA	ZXTN25100DGTA	ZXTP19060CGTA	ZX5T951GTA
ZXTN25015DFHTA	ZXTP25012EFHTA	ZXTN25020DGTA	ZX5T849GTA	ZXTP2012GTA
ZXTN25020BFHTA	ZXTP25140BFHTA	ZXTP25020DGTA	ZXTN2007GTA	ZX5T953GTA
ZXTN25020CFHTA	ZXTP25015DFHTA	ZXTN19100CGTA	ZX5T851GTA	ZXTP2013GTA
ZXTN25020DFHTA	ZXTP25020BFHTA	ZXTN19020DGTA	ZXTN2010GTA	ZX5T955GTA
ZXTN25040DFHTA	ZXTP25020CFHTA	ZXTN19060CGTA	ZX5T853GTA	ZXTP2014GTA
ZXTN25050DFHTA	ZXTP25020DFHTA	ZXTP19100CGTA	ZXTN2011GTA	ZXTP03200BGTA

Table 2 - Affected Devices with Cu wire				
ZDS1009	ZDT1053TA	ZDT6753TA	ZDT6790TC	ZHB6790TA
ZDT1048TA	ZDT6702TA	ZDT6753TC	ZHB6718TA	ZHB6792TA
ZDT1049TA	ZDT6718TA	ZDT6790TA		



Certificate of Design, Construction & Qualification

Description: SOT23 Gen5 / X25 - CuPd wire bonding qual NAT

Category	Product	Part Number	Qual Device 1	Qual Device 2
Assembly	Product	Part Number	ZXTN25100BFH	ZXTP25100BFH
Assembly	Assembly	Package Type	SOT23	SOT23
Assembly	Assembly	Package Size	3.0 x 2.38x 1.0	3.0 x 2.38x 1.0
Wafer	Wafer	Die Name(s)	X25N100BD	X25P100BD
Wafer	Wafer	Die Size (W/L/Thickness) - After Saw	0.81 x 0.81 x 0.178	0.81 x 0.81 x 0.178
Wafer	Wafer	Die Process / Technology	Gen5 - BJT	Gen5 - BJT
Wafer	Wafer	Wafer FAB/ Location	OFAB	OFAB
Wafer	Wafer	Wafer Diameter	150mm	150mm
Wafer	Wafer	Front Metal Type	AlSi	AlSi
Wafer	Wafer	Front Metal Layer Number/ Thickness	6.0um	6.0um
Wafer	Wafer	Back Metal Type (All Layers)	Ti/NiV/Ag	Ti/NiV/Ag
Wafer	Wafer	Back Metal Thickness (All Layers)	300/2600/5500A	300/2600/5500A
Assembly	Assembly	Die quantity per package (e.g. single or dual dies)	1	1
Assembly	Assembly	Die Attach Method (DB Epoxy/Solder Type)	Epoxy	Epoxy
Assembly	Assembly	Die Attach Material/ Supplier	QMI529HT/Henkel	QMI529HT/Henkel
Assembly	Assembly	Bond Wire/Clip Bond Material/ Supplier	CuPd/Heraeus	CuPd/Heraeus
Assembly	Assembly	Bond Type (at Die)	Thermosonic	Thermosonic
Assembly	Assembly	Bond Type (at LF)	Thermosonic	Thermosonic
Assembly	Assembly	No. of bond over active area	4	4
Assembly	Assembly	Glass Transition Temp	125 degree C	125 degree C
Assembly	Assembly	Terminal Finish (Plating) Material	Matt Sn	Matt Sn
Assembly	Assembly	Header plating (Die Land Area)	Spot Ag	Spot Ag
Assembly	Assembly	Wire Diameter	43um	43um
Assembly	Assembly	Leadframe Type	DZN1020	DZN1020
Assembly	Assembly	Leadframe Material	EFTEC64	EFTEC64
Assembly	Assembly	Lead Frame Manufacturer	JihLin	JihLin
Assembly	Assembly	Molding Compound Type	GE1030M	GE1030M
Assembly	Assembly	Mold Compound Material Manufacturer	Hitachi	Hitachi
Assembly	Assembly	Green Compound (Yes/No)	Yes	Yes
Assembly	Assembly	Lead-Free (Yes/No)	Yes	Yes
Assembly	Assembly	Assembly Site/ Location	NAT	NAT
Assembly	Assembly	Test Site/ Location	NAT	NAT
Product	Product	Max Junction Temp	150 degree C	150 degree C
Product	Product	Max Thermal resistance Junc (ambient)	171 °C/W	171 °C/W
Product	Product	DataSheet	ZXTN25100BFH	ZXTP25100BFH

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°C 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
5a	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
			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
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	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 alt	H3TRB	Ta=85°C, 85% RH, with 80% Maximum Reverse Bias. JESD22A-101	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
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
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)	per STD-750	0/5	1 Assembly lot	X	pass	X	pass

Summary: passed
 Submitted By: FD
 Approved By: I Smith



Certificate of Design, Construction & Qualification

Description: Change to Cu wire bonding of bipolar devices in SM-8

Category	Product	Part Number	Qual Device 1	Qual Device 2
Assembly	Product	Part Number	ZHB6790	ZDT1053
Assembly	Package Type		SM-8	SM-8
Assembly	Package Size		6.5 x 3.5	6.5 x 3.5
Wafer	Die Name(s)		CZ651BD / FZT751AT3D	FZT1053AT3D
Wafer	Die Size (W/L/Thickness) - After Saw		1066.8 x 1066.8 x 279 μm	1295.4x1295.4x279
Wafer	Die Process / Technology		Bipolar	Bipolar
Wafer	Wafer FAB/ Location		KFAB / OFAB	OFAB
Wafer	Wafer Diameter		150 mm	150 mm
Wafer	Front Metal Type		AlSiCu	AlSiCu
Wafer	Front Metal Layer Number/ Thickness		3 μm	3 μm
Wafer	Back Metal Type (All Layers)		Ti/NiV/Ag	Ti/NiV/Ag
Wafer	Back Metal Thickness (All Layers)		300 / 2600 / 5500 A	300 / 2600 / 5500 A
Assembly	Die quantity per package (e.g. single or dual dies)		2xN / 2xP	2xN
Assembly	Die Attach Method (DB Epoxy/Solder Type)		Soft Solder	Soft Solder
Assembly	Die Attach Material/ Supplier		PbSn5Ag2.5/Heraeus	PbSn5Ag2.5/Heraeus
Assembly	Bond Wire/Clip Bond Material/ Supplier		Cu / Heraeus	Cu / Heraeus
Assembly	Bond Type (at Die)		Thermosonic - ball bonds	Thermosonic - ball bonds
Assembly	Bond Type (at LF)		Thermosonic - wedge bonds	Thermosonic - wedge bonds
Assembly	No. of bond over active area		8	6
Assembly	Glass Transition Temp		125 °C	125 °C
Assembly	Terminal Finish (Plating) Material		Matt Sn	Matt Sn
Assembly	Header plating (Die Land Area)		Spot Ag	Spot Ag
Assembly	Wire Diameter		43 μm	43 μm
Assembly	Leadframe Type		Matrix Lead Frame	Matrix Lead Frame
Assembly	Leadframe Material		K65	K65
Assembly	Lead Frame Manufacturer		Wieland Werke Ag Possehl	Wieland Werke Ag Possehl
Assembly	Molding Compound Type		GE1030M	GE1030M
Assembly	Mold Compound Material Manufacturer		Hitachi	Hitachi
Assembly	Green Compound (Yes/No)		Yes	Yes
Assembly	Lead-Free (Yes/No)		Yes	Yes
Assembly	Assembly Site/ Location		NAT	NAT
Assembly	Test Site/ Location		NAT	NAT
Product	Max Junction Temp		150 °C	150 °C
Product	Max Thermal resistance Junc (ambient)		100 °C/W	55.6 °C/W
Product	DataSheet		ZHB6790	DS33206

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°C 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
5a	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
			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
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	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 alt	H3TRB	Ta=85°C, 85% RH, with 80% Maximum Reverse Bias. JESD22A-101	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 (NO QBS)	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
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
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

Remark: * This test is done on the ZDT6790 (same dies as in ZHB6790) because of no technical conditions for testing H-bridges

Summary:

Submitted By: ES

Approved By: I Smith