

PCN Number:	PCN#20240423000.2			PCN Date:	April 23, 2024								
Title:	Qualification of Cu as an alternate bond wire for select devices												
Customer Contact:	Change Management Team		Dept:	Quality Services									
Proposed 1st Ship Date:	October 20, 2024		Sample Requests accepted until:	May 23, 2024*									
*Sample requests received after May 23, 2024 will not be supported.													
<input type="checkbox"/>	Assembly Site	<input type="checkbox"/>	Design	<input type="checkbox"/>	Wafer Bump Material								
<input checked="" type="checkbox"/>	Assembly Process	<input type="checkbox"/>	Data Sheet	<input type="checkbox"/>	Wafer Bump Process								
<input checked="" type="checkbox"/>	Assembly Materials	<input type="checkbox"/>	Part number change	<input type="checkbox"/>	Wafer Fab Site								
<input type="checkbox"/>	Mechanical Specification	<input type="checkbox"/>	Test Site	<input type="checkbox"/>	Wafer Fab Material								
<input type="checkbox"/>	Packing/Shipping/Labeling	<input type="checkbox"/>	Test Process	<input type="checkbox"/>	Wafer Fab Process								
PCN Details													
Description of Change:													
<p>This PCN is to inform of an alternative bond wire qualification for the devices in the product affected section as follows:</p> <table border="1" style="width: 100%;"> <thead> <tr> <th>What</th> <th>Current</th> <th>Additional</th> </tr> </thead> <tbody> <tr> <td>Bond wire type, Diameter</td> <td>Au, 0.96 mil</td> <td>Cu, 0.8 mil</td> </tr> </tbody> </table>						What	Current	Additional	Bond wire type, Diameter	Au, 0.96 mil	Cu, 0.8 mil		
What	Current	Additional											
Bond wire type, Diameter	Au, 0.96 mil	Cu, 0.8 mil											
Reason for Change:													
<p>Continuity of supply.</p> <p>1) To align with world technology trends and use wiring with enhanced mechanical and electrical properties</p> <p>2) Maximize flexibility within our Assembly/Test production sites.</p> <p>3) Cu is easier to obtain and stock</p>													
Anticipated impact on Form, Fit, Function, Quality or Reliability (positive / negative):													
None													
Impact on Environmental Ratings													
<p>Checked boxes indicate the status of environmental ratings following implementation of this change. If below boxes are checked, there are no changes to the associated environmental ratings.</p> <table border="1" style="width: 100%;"> <thead> <tr> <th>RoHS</th> <th>REACH</th> <th>Green Status</th> <th>IEC 62474</th> </tr> </thead> <tbody> <tr> <td><input checked="" type="checkbox"/> No Change</td> <td><input checked="" type="checkbox"/> No Change</td> <td><input checked="" type="checkbox"/> No Change</td> <td><input checked="" type="checkbox"/> No Change</td> </tr> </tbody> </table>						RoHS	REACH	Green Status	IEC 62474	<input checked="" type="checkbox"/> No Change	<input checked="" type="checkbox"/> No Change	<input checked="" type="checkbox"/> No Change	<input checked="" type="checkbox"/> No Change
RoHS	REACH	Green Status	IEC 62474										
<input checked="" type="checkbox"/> No Change	<input checked="" type="checkbox"/> No Change	<input checked="" type="checkbox"/> No Change	<input checked="" type="checkbox"/> No Change										
Changes to product identification resulting from this PCN:													
None													
Product Affected:													
SN1607039QPWPRQ1	TPS92691QPWPRQ1	TPS92692QPWPQ1	TPS92692QPWPTQ1										
TPS92691QPWPQ1	TPS92691QPWPTQ1	TPS92692QPWPRQ1											

Automotive Qualification Summary

(As per AEC-Q100 Rev. J and JEDEC Guidelines)

Approve Date 31-March-2024

Product Attributes

Attributes	Qual Device: TPS92691QPWPRQ1	QBS Process Reference: S0704038C0PLPR	QBS Package Reference: TPS61175QPWPRQ1	QBS Package Reference: SN2HA08CQPWPRQ1	QBS Product Reference: TPS92691QPWPRQ1
Automotive Grade Level	Grade 1	Grade 1	Grade 1	Grade 1	Grade 1
Operating Temp Range (C)	-40 to 125	-40 to 125	-40 to 125	-40 to 125	-40 to 125
Product Function	Power Management	Power Management	Power Management	Power Management	Power Management
Wafer Fab Supplier	RFAB	RFAB	MH8	RFAB	RFAB
Assembly Site	TAI	TAI	TAI	TAI	TAI
Package Group	TSSOP	QFP	TSSOP	TSSOP	TSSOP
Package Designator	PWP	PLP	PWP	PWP	PWP
Pin Count	16	128	14	24	16

QBS: Qual By Similarity
Qual Device TPS92691QPWPRQ1 is qualified at MSL3 260C

Qualification Results

Data Displayed as: Number of lots / Total sample size / Total failed

Type	#	Test Spec	Min Lot Qty	SS / Lot	Test Name	Condition	Duration	Qual Device: TPS92691QPWPRQ1	QBS Process Reference: S0704038C0PLPR	QBS Package Reference: TPS61175QPWPRQ1	QBS Package Reference: SN2HA08CQPWPRQ1	QBS Product Reference: TPS92691QPWPRQ1
Test Group A - Accelerated Environment Stress Tests												
PC	A1	JEDEC J-STD-020 JESD22-A113	3	77	Preconditioning	MSL3 260C	-	1/All/0	3/All/0	3/All/0	3/All/0	1/All/0
HAST	A2	JEDEC JESD22-A110	3	77	Biased HAST	130C/85%RH	96 Hours	1/77/0	3/231/0	-	3/231/0	1/77/0
AC/UHAST	A3	JEDEC JESD22-A102/JEDEC JESD22-A118	3	77	Autoclave	121C/15psig	96 Hours	-	3/231/0	-	3/231/0	1/77/0
AC/UHAST	A3	JEDEC JESD22-A102/JEDEC JESD22-A118	3	77	Unbiased HAST	130C/85%RH	96 Hours	1/77/0	-	3/231/0	-	-
TC	A4	JEDEC JESD22-A104 and Appendix 3	3	77	Temperature Cycle	-55C/150C	1000 Cycles	1/77/0	-	-	-	-
TC	A4	JEDEC JESD22-A104 and Appendix 3	3	77	Temperature Cycle	-65C/150C	500 Cycles	-	3/236/0	3/231/0	3/231/0	1/77/0
TC-BP	A4	MIL-STD883 Method 2011	1	5	Post Temp Cycle Bond Pull	-	-	-	1/5/0	1/5/0	-	1/5/0
PTC	A5	JEDEC JESD22-A105	1	45	PTC	-40/125C	1000 Cycles	-	3/45/0	-	1/45/0	-
HTSL	A6	JEDEC JESD22-A103	1	45	High Temperature Storage Life	150C	1000 Hours	1/45/0	-	1/45/0	3/135/0	-
HTSL	A6	JEDEC JESD22-A103	1	45	High Temperature Storage Life	175C	500 Hours	-	3/45/0	-	-	-
Test Group B - Accelerated Lifetime Simulation Tests												
HTOL	B1	JEDEC JESD22-A108	3	77	Life Test	125C	1000 Hours	-	3/231/0	-	-	-
HTOL	B1	JEDEC JESD22-A108	3	77	Life Test	150C	300 Hours	-	-	-	-	3/231/0

Type	#	Test Spec	Min Lot Qty	SS / Lot	Test Name	Condition	Duration	Qual Device: TPS92691QPWPQ1	QBS Process Reference: S0704038C0PLPR	QBS Package Reference: TPS61175QPWPQ1	QBS Package Reference: SN2HA08CQPWPQ1	QBS Product Reference: TPS92691QPWPQ1
HTOL	B1	JEDEC JESD22-A108	3	77	Life Test	150C	408 Hours	-	-	-	3/231/0	-
ELFR	B2	AEC Q100-008	3	800	Early Life Failure Rate	125C	48 Hours	-	3/2400/0	-	-	-
ELFR	B2	AEC Q100-008	3	800	Early Life Failure Rate	150C	24 Hours	-	-	-	3/2400/0	-
EDR	B3	AEC Q100-005	1	77	NVM Endurance, Data Retention, and Op Life	Per QSS-009-018	1 Step	-	-	-	3/231/0	-
Test Group C - Package Assembly Integrity Tests												
WBS	C1	AEC Q100-001	1	30	Wire Bond Shear	Minimum of 5 devices, 30 wires Cpk>1.67	Wires	1/30/0	-	3/90/0	3/90/0	1/30/0
WBP	C2	MIL-STD883 Method 2011	1	30	Wire Bond Pull	Minimum of 5 devices, 30 wires Cpk>1.67	Wires	1/30/0	-	3/90/0	3/90/0	1/30/0
SD	C3	JEDEC J-STD-002	1	15	PB-Free Solderability	>95% Lead Coverage	-	-	-	-	1/15/0	1/15/0
PD	C4	JEDEC JESD22-B100 and B108	3	10	Physical Dimensions	Cpk>1.67	-	-	-	3/30/0	3/30/0	1/10/0
Test Group D - Die Fabrication Reliability Tests												
EM	D1	JESD61	-	-	Electromigration	-	-	Completed Per Process Technology Requirements	Completed Per Process Technology Requirements	Completed Per Process Technology Requirements	Completed Per Process Technology Requirements	Completed Per Process Technology Requirements
TDDb	D2	JESD35	-	-	Time Dependent Dielectric Breakdown	-	-	Completed Per Process Technology Requirements	Completed Per Process Technology Requirements	Completed Per Process Technology Requirements	Completed Per Process Technology Requirements	Completed Per Process Technology Requirements
HCI	D3	JESD60 & 28	-	-	Hot Carrier Injection	-	-	Completed Per Process Technology Requirements	Completed Per Process Technology Requirements	Completed Per Process Technology Requirements	Completed Per Process Technology Requirements	Completed Per Process Technology Requirements
BTI	D4	-	-	-	Bias Temperature Instability	-	-	Completed Per Process Technology Requirements	Completed Per Process Technology Requirements	Completed Per Process Technology Requirements	Completed Per Process Technology Requirements	Completed Per Process Technology Requirements
SM	D5	-	-	-	Stress Migration	-	-	Completed Per Process Technology Requirements	Completed Per Process Technology Requirements	Completed Per Process Technology Requirements	Completed Per Process Technology Requirements	Completed Per Process Technology Requirements
Test Group E - Electrical Verification Tests												
ESD	E2	AEC Q100-002	1	3	ESD HBM	-	2000 Volts	-	1/3/0	-	3/9/0	1/3/0
ESD	E3	AEC Q100-011	1	3	ESD CDM	-	500 Volts	-	1/3/0	-	3/9/0	1/3/0
LU	E4	AEC Q100-004	1	6	Latch-Up	Per AEC Q100-004	-	-	1/6/0	-	1/6/0	1/3/0
ED	E5	AEC Q100-009	3	30	Electrical Distributions	Cpk>1.67 Room, hot, and cold	-	-	3/90/0	-	3/90/0	3/90/0

Preconditioning was performed for Autoclave, Unbiased HAST, THB/Biased HAST, Temperature Cycle, Thermal Shock, and HTSL, as applicable

The following are equivalent HTOL options based on an activation energy of 0.7eV : 125C/1k Hours, 140C/480 Hours, 150C/300 Hours, and 155C/240 Hours

The following are equivalent HTSL options based on an activation energy of 0.7eV : 150C/1k Hours, and 170C/420 Hours

The following are equivalent Temp Cycle options per JESD47 : -55C/125C/700 Cycles and -65C/150C/500 Cycles

Ambient Operating Temperature by Automotive Grade Level:

Grade 0 (or E): -40C to +150C

Grade 1 (or Q): -40C to +125C

Grade 2 (or T): -40C to +105C

Grade 3 (or I) : -40C to +85C

E1 (TEST): Electrical test temperatures of Qual samples (High temperature according to Grade level):

Room/Hot/Cold : HTOL, ED

Room/Hot : THB / HAST, TC / PTC, HTSL, ELFR, ESD & LU

Room : AC/uHAST

Quality and Environmental data is available at TI's external Web site: <http://www.ti.com/>

Automotive Qualification Summary
(As per AEC-Q100, Q006 and JEDEC Guidelines)
Approve Date 31-March-2024

Product Attributes

Attributes	Qual Device: TPIC6C596PWRG4
Operating Temp Range	-40 to +125 C
Automotive Grade Level	Grade 1
Product Function	Logic
Wafer Fab Supplier	DFAB
Die Revision	B
Assembly Site	TAI
Package Type	TSSOP
Package Designator	PW
Ball/Lead Count	16

- QBS: Qual By Similarity
- Qual Device TPIC6C596PWRG4 is qualified at LEVEL1-260CG

Qualification Results

Data Displayed as: Number of lots / Total sample size / Total failed

Type	#	Test Spec	Min Lot Qty	SS/Lot	Test Name / Condition	Duration	Qual Device: TPIC6C596PWRG4
Test Group A – Accelerated Environment Stress Tests							
		AEC-Q006	-	-	Pre-Preconditioning SAM	-	Pass
PC	A1	JEDEC J-STD-020 JESD22-A113	3	77	Automotive Preconditioning	Level 1-260C	Pass
		AEC-Q006	-	-	Post-Preconditioning SAM	-	Pass
HAST	A2	JEDEC JESD22-A110	3	77	Biased HAST, 130C/85%RH	96 Hours	3/231/0
		AEC-Q006	3	22	HAST SAM	Post 96 Hours	3/66/0
HAST	A2	JEDEC JESD22-A110	3	70	Biased HAST, 130C/85%RH	192 Hours	3/210/0
		AEC-Q006	3	22	HAST SAM	Post 192 Hours	3/66/0
AC	A3	JEDEC JESD22-A102	3	77	Autoclave 121C	96 Hours	3/231/0
AC	A3	JEDEC JESD22-A102	3	77	Autoclave 121C	192 Hours	3/231/0
TC	A4	JEDEC JESD22-A104 and Appendix 3	3	77	Temperature Cycle, -65/150C	500 Cycles	3/231/0
		AEC-Q006	3	22	Temp Cycle SAM	Post 500 Cycles	3/66/0
		AEC-Q006	3	3	Temp Cycle Bond Pull (Ball Bond)	Post 500 Cycles	3/9/0

		AEC-Q006	3	3	Temp Cycle Bond Pull (Stitch Bond)	Post 500 Cycles	3/9/0
		AEC-Q006	3	3	Temp Cycle Bond Shear	Post 500 Cycles	3/9/0
		AEC-Q006	3	1	Temp Cycle Cross-Section	Post 500 Cycles	3/3/0
TC	A4	JEDEC JESD22-A104 and Appendix 3	3	70	Temperature Cycle, -65/150C	1000 Cycles	3/210/0
		AEC-Q006	3	22	Temp Cycle SAM	Post 1000 Cycles	3/66/0
		AEC-Q006	3	2	Temp Cycle Bond Pull (Ball Bond)	Post 1000 Cycles	3/6/0
		AEC-Q006	3	2	Temp Cycle Bond Pull (Stitch Bond)	Post 1000 Cycles	3/6/0
		AEC-Q006	3	2	Temp Cycle Bond Shear	Post 1000 Cycles	3/6/0
		AEC-Q006	3	1	Temp Cycle Cross-Section	Post 1000 Cycles	3/3/0
PTC	A5	JEDEC JESD22-A105	1	45	Power Temperature Cycle, -40/125C	1000 Cycles	1/45/0
PTC	A5	JEDEC JESD22-A105	1	45	Power Temperature Cycle, -40/125C	2000 Cycles	1/45/0
HTSL	A6	JEDEC JESD22-A103	3	45	High Temp. Storage Bake, 150C	1000 Hours	3/135/0
		AEC-Q006	3	1	HTSL Cross-Section	Post 1000 Hours	3/3/0
HTSL	A6	JEDEC JESD22-A103	3	45	High Temp. Storage Bake, 150C	2000 Hours	3/132/0
		AEC-Q006	3	1	HTSL Cross-Section	Post 2000 Hours	3/3/0
Test Group B – Accelerated Lifetime Simulation Tests							
HTOL	B1	JEDEC JESD22-A108	3	77	Life Test, 125C	1000 Hours	3/231/0
EDR	B3	AEC Q100-005	3	77	NVM Endurance, Data Retention, and Operational Life	--	N/A
Test Group C – Package Assembly Integrity Tests							
WBS	C1	AEC Q100-001	1	30	Bond Shear (Cpk>1.67)	Wires	3/90/0
WBP	C2	MIL-STD883 Method 2011	1	30	Bond Pull (Cpk>1.67)	Wires	3/90/0
SD	C3	JEDEC JESD22-B102	1	15	Surface Mount Solderability	Pb	3/45/0
SD	C3	JEDEC JESD22-B102	1	15	Surface Mount Solderability	Pb Free	3/45/0
LI	C6	JEDEC JESD22-B105	1	50	Lead Fatigue	Leads	3/66/0
LI	C6	JEDEC JESD22-B105	1	50	Lead Pull to Destruction	Leads	3/66/0
Test Group E – Electrical Verification Tests							

	ED	E5	AEC Q100-009	3	30	Auto Electrical Distributions	Cpk>1.67	3/90/0
Additional Tests								
	FLAM			-	-	Flammability (UL 94V-0)	Method A	3/15/0

A1 (PC): Preconditioning:

Performed for THB, Biased HAST, AC, uHAST & TC samples, as applicable.

Junction Operating Temperature by Automotive Grade Level:

Grade 0 (or E): -40°C to +150°C

Grade 1 (or Q): -40°C to +125°C

Grade 2 (or T): -40°C to +105°C

Grade 3 (or I): -40°C to +85°C

E1 (TEST): Electrical test temperatures of Qual samples (High temperature according to Grade level):

Room/Hot/Cold : HTOL, ED

Room/Hot : THB / HAST, TC / PTC, HTSL, ELFR, ESD & LU

Room : AC/uHAST

Green/Pb-free Status:

Qualified Pb-Free(SMT) and Green

ZVEI ID: SEM-PA-08

For questions regarding this notice, e-mails can be sent to Change Management team or your local Field Sales Representative.

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