

PCN Number:	20140721003		PCN Date:	07/22/2014	
Title:	Qualification of new BOM for select devices in QFP package				
Customer Contact:	PCN Manager	Phone:	+1(214)480-6037	Dept:	Quality Services
Proposed 1st Ship Date:	10/22/2014	Estimated Sample Availability:	Date provided upon request		
Change Type:					
<input type="checkbox"/>	Assembly Site	<input checked="" type="checkbox"/>	Assembly Process	<input checked="" type="checkbox"/>	Assembly Materials
<input type="checkbox"/>	Design	<input type="checkbox"/>	Electrical Specification	<input type="checkbox"/>	Mechanical Specification
<input type="checkbox"/>	Test Site	<input type="checkbox"/>	Packing/Shipping/Labeling	<input type="checkbox"/>	Test Process
<input type="checkbox"/>	Wafer Bump Site	<input type="checkbox"/>	Wafer Bump Material	<input type="checkbox"/>	Wafer Bump Process
<input type="checkbox"/>	Wafer Fab Site	<input type="checkbox"/>	Wafer Fab Materials	<input type="checkbox"/>	Wafer Fab Process
	<input type="checkbox"/>		Part number change		
PCN Details					
Description of Change:					
<p>Texas Instruments is pleased to announce the qualification of a new material set for the 3 groups of devices listed below: Group A will be converted to Cu wire only. Group C will be converted to Cu wire as well as a new mold compound.</p>					
Change Group# A					
			Current		New
	Bond Wire/Diameter		Au, 1.0 mil		Cu, 0.8 mil
Change Group# C					
			Current		New
	Mold Compound		4205442 4073520		4211649
	Bond Wire/Diameter		Au, 0.96 mil		Cu, 0.8 mil
Reason for Change:					
<p>Continuity of Supply.</p> <ol style="list-style-type: none"> 1) To align with world technology trends and use wiring with enhanced mechanical and electrical properties. 2) Maximize flexibility within our Assembly/Test production sites 3) Copper wire is easier to obtain and stock 					
Anticipated impact on Fit, Form, Function, Quality or Reliability (positive / negative):					
None					
Changes to product identification resulting from this PCN:					
None					

Product Affected

Group A Devices:

TMS320F28062PZPS	TMS320F28064PZPS	TMS320F28066PZPS	TMS320F28068PFPS
TMS320F28062UPFPS	TMS320F28064UPFPS	TMS320F28066UPFPS	TMS320F28068PZPS
TMS320F28062UPZPS	TMS320F28064UPZPS	TMS320F28066UPZPS	TMS320F28068UPFPS
TMS320F28063PFPS	TMS320F28065PFPS	TMS320F28067PFPS	TMS320F28068UPZPS
TMS320F28063PZPS	TMS320F28065PZPS	TMS320F28067PZPS	TMS320F28069PZPS
TMS320F28063UPFPS	TMS320F28065UPFPS	TMS320F28067UPFPS	TMS320F28069UPFPS
TMS320F28063UPZPS	TMS320F28065UPZPS	TMS320F28067UPZPS	TMS320F28069UPZPS
TMS320F28064PFPS	TMS320F28066PFPS		

Group C Devices:

TMS470R1A256PZ-T	TMS470R1A288PZ-T	TMS470R1A64PNT	TMS470R1B512PGET
TMS470R1A288PGEA	TMS470R1A384PGEQ	TMS470R1B1MPGEA	TMS470R1B768PGET
TMS470R1A288PGET	TMS470R1A384PGET	TMS470R1B1MPGEAR	TMS470R1R384PZ-T
TMS470R1A288PGETR	TMS470R1A384PZ-T		



Embedded Processors

Technology Qualification Report

F05 and C05 silicon technology products in QFP package family using Cu wire

Qualification Information			
Qual Type:	Bonding wire qualification using AEC-Q100: with x05 Silicon node	Affected Sites:	Wafer fab: TI DALLAS EAST - DMOS5 Assembly / test : TI PHILIPPINES
Affected business:	Microcontroller and C2000 Products	Status:	Approved
Summary:			
QFP package technology level qualification on Cu bond wire on F05 (Embedded Flash) and C05 (CMOS) automotive products out of DMOS5 wafer fab. Qualification is based on AEC-Q100 grade 1 conditions. Reliability robustness above Q100 standard was demonstrated with extended duration read points.			
Family level qualification is applicable:			
<ol style="list-style-type: none"> Same ball bond parameters are used across all automotive F05 and C05 devices from DMOS5 The same bond pad design/ construction is used on all automotive F05 and C05 devices from DMOS5 			
Three main material set combinations passed reliability testing:-			
<u>Combination</u>	<u>Mold compound</u>	<u>Die attach</u>	<u>Comments</u>
A	4205442	4042504	Existing materials used with current x05 LQFP production.
B	4211649	4208458	Plan for <u>Powerpad</u> and conventional LQFP/TQFP <u>leadframe</u>
C	4211649	4073495	Plan for LQFP/ TQFP "SPAD" type of <u>leadframe</u>
Plan of record is to release material combinations B and C for automotive MCU and C2000 devices.			

Construction information:

Package Attributes:			
Assembly Site	PHI	Body Thickness	1.4 mm or 1.6mm.
Bond Wire Composition	Copper	Bond Wire Diameter	0.8 mils
Die Attach Technique	Epoxy Dispense	Flammability Rating	UL 94 V-0
Lead Finish	NiPdAu	Lead Frame Material	Copper
Pin Count	Up to 176 pin.	Moisture Sensitivity Level	LEVEL3-260C
Mold Compound	4211649	Mount Compound	4208458 or 4073495
Package Designators	Px suffixes.	Package Families	LQFP, TQFP and Powerpad.

Silicon Attributes:

Die Size	Varies per device type	Fab Process	F05 (Flash) and C05 (CMOS) nodes
Wafer Fab Site	DMOS5	Wafer Size	200 mm

QUALIFICATION RESULTS

Test Type	Condition/Duration	Lots	Fails	Sample size	Actual duration/ results	Qualification vehicle	Comments
AEC Q100: TEST GROUPS A – ACCELERATED ENVIRONMENT STRESS TESTS							
PC : Preconditioning	MSL3/ 260C	3 lots x 231 min	0	Units before THB, AC and TC.	MSL3/260C	See appendix A	Pass
THB : Biased Humidity	THB 85C/85% RH 1000 hours	3 lots x 77 units	0	231 exceeded	1000 hours	See appendix A	Pass
AC: Autoclave	121C/15psig/96 hours	3 lots x 77 units	0	231 exceeded	Up to 268 hours	See appendix A	Pass
TC: Temp cycling	-65C/150C, 500 cycles	3 lots x 77 units	0	231 exceeded	1000 cycles	See appendix A	Pass
	Post-TC bond pull		0	5	Passed 3gF limit	Driver qualification devices	Pass
HTSL : High Temp storage	150C/1000 hours	1 lots x 45 units	0	45 units exceeded	Up to 2000 hours	See appendix A	Pass
AEC Q100: TEST GROUPS B – ACCELERATED LIFETIME SIMULATION TESTS							
HTOL	125C x 1000 hours	3 lots x 77 units	0	231	1000 hours	QBS to enterprise Qual	Pass
ELFR: Early life failure rate	8 hours, 48 hours	3 lots x 800 units	0	2400	48 hours	QBS to enterprise Qual	Pass
EDR: Non-Volatile memory endurance	150C/ 1008 hours	3 lots x 77 units	0	231	1000 hours	QBS to enterprise Qual	Pass
WE / Write and Erase cycling	1000 cycles	3 lots x 77 units	0	231	1000 cycles	QBS to enterprise Qual	Pass
AEC Q100: TEST GROUPS C – PACKAGE INTEGRITY TESTS							
WBS: Wire bond test	Rpk > 1.67 and Cpk > 1.33	1 lot x 5 parts x 30 bonds	0	150 bonds	Passed	Validated on each package type during manufacturing qual.	Pass
WBP: Wire bond pull	Rpk > 1.67 and Cpk > 1.33	1 lot x 5 parts x 30 bonds	0	150 bonds	Passed	Validated on each package type during manufacturing qual.	Pass
SD: Solderability	95% coverage	3 lots x 15 units	-	-		QBS to existing devices: leadframe unchanged	Pass
PD: Physical dimensions	Rpk > 1.67 and Cpk > 1.33	3 lots x 10	0	30	Passed	QBS to existing devices: dimensions unchanged	Pass
AEC Q100: TEST GROUPS E – ELECTRICAL VERIFICATION							
HBM: ESD	2000V	1 lot	0	9	Passed	QBS to existing device qualifications	Pass
CDM: ESD	500V (750V corner pins)	1 lot	0	9	Passed	QBS to existing device qualifications	Pass
LU : Latchup	100mA / 1.5V @ 125C	1 lot	0	15	Passed	QBS to existing device qualifications	Pass
	200mA / 1.5V @ 25C	1 lot	0	15	passed	QBS to existing device qualifications	Pass
Electrical distributions	Split lot characterization	Split lot x 5 units per split	0	15	Passed	QBS to existing device qualifications	Pass

Appendix A: Package reliability testing of Cu wire with x05 silicon and mold compound/ die attach combinations



Mold Compound 4205442
Die attach 4042504

Device	Reliability Tests	Condition	Q100 Grade 1	Extended reliability Testing	Results
TMS320F28035PN (80 pin LQFP)	Preconditioning	MSL3/260C	-	-	3 x 0/320
	Autoclave	121C 2ATM	96 hours	192, 288 hrs	3 x 0/77 including extended tests
	Temperature Cycling	-65C/150C	500 cycles	1000 cycles	3 x 0/77 including extended tests
	High Temp Storage	150C	1000 hours	2000, 3000 hours	3 x 0/77 including extended tests
	THB	85C/85% RH	1000 hours	not conducted	3 x 0/77
TMS320F2812PGF (176 pin LQFP)	Preconditioning	MSL3/260C	all units	NA	2 x 0/180
	Autoclave	121C 2ATM	96 hours	192	2 x 0/77 including extended tests
	Temperature Cycling	-65C/150C	500 cycles	1000 cycles	2 x 0/77 including extended tests

Mold compound 4211649
Die attach 4208458

Device	Reliability Tests	Condition	Q100 Grade 1	Extended reliability Testing	Results
52C1RFPT (144 pin HTQFP)	Preconditioning	MSL3/260C	-	-	3 x 0/346
	Autoclave	121C 2ATM	96 hours	268 hrs	3 x 0/77 including extended tests
	Temperature Cycling	-65C/150C	500 cycles	1000, 2000 cycles	3 x 0/77 including extended tests
	High Temp Storage	150C	1000 hours	1500 hours	3 x 0/77 including extended tests
	THB	85C/85% RH	1000 hours	not conducted	3 x 0/77
TMS320F28055PN (80 pin LQFP)	Preconditioning	MSL3/260C	all units	-	2 x 0/180
	Autoclave	121C 2ATM	96 hours	192	2 x 0/77 including extended tests
	Temperature Cycling	-65C/150C	500 cycles	1000 cycles	2 x 0/77 including extended tests
S470PEF363APZQRCV (100 pin LQFP)	Preconditioning	MSL3/260C	all units	-	3 x 0/231
	Autoclave	121C 2ATM	96 hours	192	3 x 0/77 including extended tests
	Temperature Cycling	-65C/150C	500 cycles	1000 cycles	3 x 0/77 including extended tests
	High Temp Storage	150C	1000 hours	-	3 x 0/77

Mold compound 4211649
Die attach 4073495

Device	Reliability Tests	Condition	Q100 Grade 1	Extended reliability Testing	Results
S5PB61PGEQ* (144 pin LQFP)	Preconditioning	MSL3/260C	-	NA	3 x 0/276
	Autoclave	121C 2ATM	96 hours	240 hrs	3 x 0/77 including extended tests
	Temperature Cycling	-65C/150C	500 cycles	1000 cycles	3 x 0/77 including extended tests
	High Temp Storage	150C	1000 hours	-	3 x 0/77 including extended tests
	THB	85C/85% RH	1000 hours	-	2 x 0/77
S470AV689GPGEQRQ1 (144 pin LQFP)	Preconditioning	MSL3/260C	all units	-	3 x 0/231
	Autoclave	121C 2ATM	96 hours	192	3 x 0/77 including extended tests
	Temperature Cycling	-65C/150C	500 cycles	1000	3 x 0/77 including extended tests
	High Temp Storage	150C	1000 hours	-	3 x 0/77
S470PV241BBPN-TRB (80 pin LQFP)	Preconditioning	MSL3/260C	all units	-	3 x 0/231
	Autoclave	121C 2ATM	96 hours	192	3 x 0/77 including extended tests
	Temperature Cycling	-65C/150C	500 cycles	1000	3 x 0/77 including extended tests
	High Temp Storage	150C	1000 hours	-	3 x 0/77
S4703388HPZQRDL (80 pin LQFP)	Preconditioning	MSL3/260C	all units	-	3 x 0/231
	Autoclave	121C 2ATM	96 hours	192	3 x 0/77 including extended tests
	Temperature Cycling	-65C/150C	500 cycles	1000	3 x 0/77 including extended tests
	High Temp Storage	150C	1000 hours	-	3 x 0/77

* S5PB61PGEQ is an Automotive MCU from F035 technology but provides THB data for 4073495 die attach with 4211649 mold compound /Cu wire. F05 devices in 4073495 will refer to this THB data to Qualify by similarity.

All other devices are F05 devices.

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