

| PCN Number: | | 20170510000A | | PCN Date: | | June 23, 2017 | | | | | | | | | | | | | | | | | |
|---|---------------------------------------|---|--|-------------------------------------|--------------------------|------------------|--|------|-----|----------|-------|---------------|------------|---------|----------------------|-------------|----------|--------|-----------------|---------------------|--------------|--------------|--|
| Title: | | Qualification of Amkor and TI Clark as an additional Assembly and Test Sites and for select Devices | | | | | | | | | | | | | | | | | | | | | |
| Customer Contact: | | PCN Manager | | Dept: | | Quality Services | | | | | | | | | | | | | | | | | |
| Change Type: | | | | | | | | | | | | | | | | | | | | | | | |
| <input checked="" 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 checked="" 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: | | | | | | | | | | | | | | | | | | | | | | | |
| Revision A is to update the description of change to provide correction on the material differences table. Bond wire type at Amkor should be Au wire and not Cu wire. We apologize for any inconvenience this may have caused. | | | | | | | | | | | | | | | | | | | | | | | |
| Texas Instruments is pleased to announce the qualification of Amkor and TI Clark as and additional Assembly and Test site for the devices listed below. Construction differences are as follows: | | | | | | | | | | | | | | | | | | | | | | | |
| <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 25%;">What</th> <th style="width: 25%;">PSi</th> <th style="width: 25%;">TI Clark</th> <th style="width: 25%;">Amkor</th> </tr> </thead> <tbody> <tr> <td>Mold Compound</td> <td>SID#202828</td> <td>4208625</td> <td>SID#101384766</td> </tr> <tr> <td>Lead finish</td> <td>Matte Sn</td> <td>NiPdAu</td> <td>Matte Sn</td> </tr> <tr> <td>Bond Wire, Diameter</td> <td>Au, 1.0 mils</td> <td>Au, 1.0 mils</td> <td>Cu, 0.96 Mils Au, 0.96 Mils</td> </tr> </tbody> </table> | | | | | | | | What | PSi | TI Clark | Amkor | Mold Compound | SID#202828 | 4208625 | SID#101384766 | Lead finish | Matte Sn | NiPdAu | Matte Sn | Bond Wire, Diameter | Au, 1.0 mils | Au, 1.0 mils | Cu, 0.96 Mils Au, 0.96 Mils |
| What | PSi | TI Clark | Amkor | | | | | | | | | | | | | | | | | | | | |
| Mold Compound | SID#202828 | 4208625 | SID#101384766 | | | | | | | | | | | | | | | | | | | | |
| Lead finish | Matte Sn | NiPdAu | Matte Sn | | | | | | | | | | | | | | | | | | | | |
| Bond Wire, Diameter | Au, 1.0 mils | Au, 1.0 mils | Cu, 0.96 Mils Au, 0.96 Mils | | | | | | | | | | | | | | | | | | | | |
| Upon expiry of this PCN TI will combine lead free solutions in a single <u>standard part number</u> , for the <u>CSD5888Q5D</u> – can ship with both Matte Sn and NiPdAu/Ag. | | | | | | | | | | | | | | | | | | | | | | | |
| Example: | | | | | | | | | | | | | | | | | | | | | | | |
| <ul style="list-style-type: none"> – Customer order for 7500units of CSD5888Q5D with 2500 units SPQ (Standard Pack Quantity per Reel). – TI can satisfy the above order in one of the following ways. <ul style="list-style-type: none"> I. 3 Reels of NiPdAu finish. II. 3 Reels of Matte Sn finish III. 2 Reels of Matte Sn and 1 reel of NiPdAu finish. IV. 2 Reels of NiPdAu and 1 reel of Matte Sn finish. | | | | | | | | | | | | | | | | | | | | | | | |
| Test coverage, insertions, conditions will remain consistent with current testing and verified with test MQ. | | | | | | | | | | | | | | | | | | | | | | | |
| Reason for Change: | | | | | | | | | | | | | | | | | | | | | | | |
| Continuity of Supply | | | | | | | | | | | | | | | | | | | | | | | |
| Anticipated impact on Fit, Form, Function, Quality or Reliability (positive / negative): | | | | | | | | | | | | | | | | | | | | | | | |
| None | | | | | | | | | | | | | | | | | | | | | | | |
| Anticipated impact on Material Declaration | | | | | | | | | | | | | | | | | | | | | | | |
| <input type="checkbox"/> | No Impact to the Material Declaration | <input checked="" type="checkbox"/> | Material Declarations or Product Content reports are driven from production data and will be available following the production release. Upon production release the revised reports can be obtained from the TI ECO website . | | | | | | | | | | | | | | | | | | | | |

Changes to product identification resulting from this PCN:

| Assembly Site | Assembly Site Origin (22L) | Assembly Country Code (21L) | Assembly City |
|---------------|----------------------------|-----------------------------|---------------|
| PSI | PAC | PHL | Taguig City |
| TI Clark | QAB | PHL | Angeles City |
| Amkor | AP3 | PHL | Binan |

Sample product shipping label (not actual product label)

Topside Device marking (if included):

Assembly site code for PAC= E
 Assembly site code for QAB = I
Assembly site code for AP3 = 3

Product Affected

Group 1 Device list: Current AT site = PSi & Clark, Additional AT site = Amkor

| | |
|-------------|-------------|
| CSD58872Q5D | CSD58873Q3D |
|-------------|-------------|

Group 2 Device list: Current AT site= PSi, Additional AT site = Amkor

| | | | |
|-------------|---------------|--------------|--------------|
| CSD17575Q3 | CSD18532NQ5B | CSD19502Q5B | SN1607042Q5B |
| CSD17575Q3T | CSD18532NQ5BT | CSD19502Q5BT | |

Group 3 Device list: Current AT site= PSi, Additional AT site = TI Clark

| |
|-------------|
| CSD58888Q5D |
|-------------|

Qualification Report

Phase 7 Power Block Qual in Amkor P3: CSD87333Q3D, CSD87334Q3D, CSD87335Q3D Approve Date 06-February-2017

Product Attributes

| Attributes | Qual Device: CSD87333Q3D | Qual Device: CSD87334Q3D | Qual Device: CSD87335Q3D |
|---------------------|-----------------------------|-----------------------------|-----------------------------|
| Assembly Site | AMKOR P3 A/T PHIL | AMKOR P3 A/T PHIL | AMKOR P3 A/T PHIL |
| Package Family | DQZ | DQZ | DQZ |
| Flammability Rating | UL 94 V-0 | UL 94 V-0 | UL 94 V-0 |
| Wafer Fab Supplier | CFAB | CFAB | CFAB |
| Wafer Fab Process | NEXFET-LV 30N10 | NEXFET-LV 30N10 | NEXFET-LV 30N10 |

- QBS: Qual By Similarity
- Qual Device CSD87333Q3D is qualified at LEVEL1-260C
- Qual Device CSD87335Q3D is qualified at LEVEL1-260C
- Qual Device CSD87334Q3D is qualified at LEVEL1-260C
- Device CSD87333Q3D contains multiple dies.
- Device CSD87334Q3D contains multiple dies.
- Device CSD87335Q3D contains multiple dies.

Qualification Results

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

| Type | Test Name / Condition | Duration | Qual Device: CSD87333Q3D | Qual Device: CSD87334Q3D | Qual Device: CSD87335Q3D |
|------|------------------------------|---------------------------------|-----------------------------|-----------------------------|-----------------------------|
| MQ | Manufacturability (Assembly) | (per mfg. Site specification) | 3/1/0 - Pass | 3/1/0 - Pass | 3/1/0 - Pass |
| PC | Preconditioning | (per the appropriate pkg level) | - | 3/462/0 | 3/462/0 |
| TC | **T/C -40C/125C | -40C/+125C (500,1000 Cycles) | - | 3/231/0 | 3/231/0 |
| TC | **T/C -55C/125C | -55C/+125C (500,1000 Cycles) | - | 3/231/0 | 3/231/0 |

** Preconditioning was performed for Temperature Cycle as applicable

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

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

Green/Pb-free Status:

Qualified Pb-Free(SMT) and Green



5x6 QFN Q5D Power Block Qualification Summary
NCH MOSFET – Gen 2.0 30-10

| CSD87353Q5D Qualification Test Summary | | | | |
|--|--|---------------|-------------------|---------|
| Stress | Conditions | Test Duration | Sample Size | Results |
| HTRB | 150°C/80% Rated Vds | 1K hrs | 3 lots x 77 units | Pass |
| HTGB | 150°C/80% Rated Vgs | 1K hrs | 3 lots x 77 units | Pass |
| THB | 85°C/85%R.H./80% Rated Vds | 1K hrs | 3 lots x 77 units | Pass |
| Autoclave | 121C/100% RH | 96 hrs | 3 lots x 77 units | Pass |
| Intermittent Op Life | Delta Tj = 100°C 2 min on/2 min off | 10K cycles | 3 lots x 77 units | Pass |
| Temp Cycle | -40°C to 125°C | 1K cycles | 3 lots x 77 units | Pass |

Pass = 0/77 x 3 lots

MSL1 preconditioning performed on devices prior to THB, Autoclave, & Temp Cycle stresses

- External Visual @ 40X
- Temp Cycle: -40°C to +60°C, 5 cycles, 10 min dwell
- Bake: 24 hours @ 125°C
- Damp Heat: 168 hours @ 85°C/85% RH (Level 1)
- 3X reflow + flux + rinse, 260°C Pb free reflow temp

Original full qualification on CSD87353Q5D was run at PSi (above table). Clark assembly site is qualified by similarity since full qualification of 3 lots on CSD87350Q5D and full qualification of 1 lot on CSD87353Q5D was performed at Clark.

| CSD87353Q5D Qualification Test Summary | | | | |
|--|--|---------------|------------------|---------|
| Stress | Conditions | Test Duration | Sample Size | Results |
| HTRB | 150°C/80% Rated Vds | 1K hrs | 1 lot x 77 units | Pass |
| HTGB | 150°C/80% Rated Vgs | 1K hrs | 1 lot x 77 units | Pass |
| THB | 85°C/85%R.H./80% Rated Vds | 1K hrs | 1 lot x 77 units | Pass |
| Autoclave | 121C/100% RH | 96 hrs | 1 lot x 77 units | Pass |
| Intermittent Op Life | Delta Tj = 100°C 2 min on/2 min off | 10K cycles | 1 lot x 77 units | Pass |
| Temp Cycle | -40°C to 125°C | 1K cycles | 1 lot x 77 units | Pass |

TI Information – Selective Disclosure

For questions regarding this notice, e-mails can be sent to the regional contacts shown below or your local Field Sales Representative.

| Location | E-Mail |
|--------------|--|
| USA | PCNAmericasContact@list.ti.com |
| Europe | PCNEuropeContact@list.ti.com |
| Asia Pacific | PCNAsiaContact@list.ti.com |
| Japan | PCNJapanContact@list.ti.com |