

|  |   |                                     |  |                                 |                     |
|--|---|-------------------------------------|--|---------------------------------|---------------------|
| <b>PCN Number:</b>   | 20190426000.1B  |                                     | <b>PCN Date:</b>   | Aug. 13, 2019                   |                     |
| <b>Title:</b>  | Qualification of TI Chengdu A/T (CDAT) as an Assembly site for Select Devices |                                     |  |                                 |                     |
| <b>Customer Contact:</b>   | <a href="#">PCN Manager</a>   | <b>Dept:</b>                        | Quality Services   |                                 |                     |
| <b>Proposed 1<sup>st</sup> Ship Date:</b>  | Aug. 3, 2019  |                                     | <b>Estimated Sample Availability:</b>  | Date provided at sample request |                     |
| <b>Change Type:</b>  |   |                                     |  |                                 |                     |
| <input checked="" type="checkbox"/>  | Assembly Site   | <input type="checkbox"/>            | Design   | <input type="checkbox"/>        | Wafer Bump Site     |
| <input type="checkbox"/>   | Assembly Process  | <input type="checkbox"/>            | Data Sheet   | <input type="checkbox"/>        | Wafer Bump Material |
| <input checked="" type="checkbox"/>  | Assembly Materials  | <input type="checkbox"/>            | Part number change   | <input type="checkbox"/>        | Wafer Bump Process  |
| <input type="checkbox"/>   | Mechanical Specification  | <input type="checkbox"/>            | Test Site  | <input type="checkbox"/>        | Wafer Fab Site      |
| <input type="checkbox"/>   | Packing/Shipping/Labeling   | <input type="checkbox"/>            | Test Process   | <input type="checkbox"/>        | Wafer Fab Materials |
|  |   | <input type="checkbox"/>            |  | <input type="checkbox"/>        | Wafer Fab Process   |
| <b>PCN Details</b>   |   |                                     |  |                                 |                     |
| <b>Description of Change:</b>  |   |                                     |  |                                 |                     |
| <p><b>Revision B</b> is to announce the <u>addition</u> of new devices that were not included on the original PCN notification. These new devices are under Group 3 in the device list below. The expected first shipment date for these new devices will be 90 days from this notice (Oct 15, 2019) for these newly added devices only. The proposed 1<sup>st</sup> ship date of Aug 3, 2019 still applies for the original set of devices.</p> <p>Texas Instruments is pleased to announce the qualification of TI Chengdu (CDAT) as an Additional Assembly &amp; Test site for the list of devices shown below. Current assembly sites and Material differences are as follows:</p> |   |                                     |  |                                 |                     |
| <b>Group 1 Device:</b>   |   |                                     |  |                                 |                     |
|  | <b>Carsem Suzhou</b>  | <b>Carsem S</b>                     | <b>CDAT</b>  |                                 |                     |
| Mount Compound   | SID#455143  | SID#435143                          | 4207123  |                                 |                     |
| Mold compound  | SID#441086  | SID#435370                          | 4222198  |                                 |                     |
| <b>Group 2 Devices:</b>  |   |                                     |  |                                 |                     |
|  | <b>Clark</b>  | <b>CDAT</b>                         |  |                                 |                     |
| Mount compound   | 4207768   | 4207123                             |  |                                 |                     |
| Mold compound  | 4208625   | 4222198                             |  |                                 |                     |
| <b>Group 3 Devices:</b>  |   |                                     |  |                                 |                     |
|  | <b>TIEM</b>   | <b>CDAT</b>                         |  |                                 |                     |
| Mold compound  | 8095387   | 4222198                             |  |                                 |                     |
| Lead finish  | Matte Sn  | NiPdAu                              |  |                                 |                     |
| <b>Reason for Change:</b>  |   |                                     |  |                                 |                     |
| Continuity of Supply   |   |                                     |  |                                 |                     |
| <b>Anticipated impact on Form, Fit, Function, Quality or Reliability (positive / negative):</b>  |   |                                     |  |                                 |                     |
| None   |   |                                     |  |                                 |                     |
| <b>Anticipated impact on Material Declaration</b>  |   |                                     |  |                                 |                     |
| <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 at the site link below<br><a href="http://www.ti.com/quality/docs/materialcontentsearch.tsp">http://www.ti.com/quality/docs/materialcontentsearch.tsp</a> |                                 |                     |
| <b>Changes to product identification resulting from this PCN:</b>  |   |                                     |  |                                 |                     |

| Assembly Site | Assembly Site Origin (22L) | Assembly Country Code (23L) | Assembly City          |
|---------------|----------------------------|-----------------------------|------------------------|
| TI Clark      | QAB                        | PHL                         | Angeles City, Pampanga |
| Carsem S      | CRS                        | MYS                         | Jelapang               |
| Carsem Suzhou | CSZ                        | CHN                         | Jiangsu                |
| <b>CDAT</b>   | <b>CDA</b>                 | <b>CHN</b>                  | <b>Chengdu</b>         |

Sample product shipping label (not actual product label)



**TEXAS INSTRUMENTS**  
 MADE IN: Malaysia  
 2DC: 2Q:

|                    |          |
|--------------------|----------|
| MSL 2 /260C/1 YEAR | SEAL DT  |
| MSL 1 /235C/UNLIM  | 03/29/04 |

OPT:  
 ITEM: 39  
**LBL: 5A (L)T0:1750**

(1P) SN74LS07NSR  
 (Q) 2000 (D) 0336  
 (31T) LOT: 3959047MLA  
 (4W) TKY (1T) 7523483SI2  
 (P)  
 (2P) REV: (V) 0033317  
 (20L) CSO: SHE (21L) CCO:USA  
 (22L) ASO: MLA (23L) ACO: MYS

**Product Affected:**

**Group 1 Devices:**

|               |                 |                 |
|---------------|-----------------|-----------------|
| SN0803054DRCR | SN75LVCP601RTJR | SN75LVCP601RTJT |
|---------------|-----------------|-----------------|

**Group 2 Devices:**

|              |              |
|--------------|--------------|
| TPS65233RTER | TPS65233RTET |
|--------------|--------------|

**Group 3 Devices:**

|                   |                    |                    |
|-------------------|--------------------|--------------------|
| LP8556SQ-E00/NOPB | LP8556SQE-E00/NOPB | LP8556SQX-E00/NOPB |
| LP8556SQ-E08/NOPB | LP8556SQE-E08/NOPB | LP8556SQX-E08/NOPB |
| LP8556SQ-E09/NOPB | LP8556SQE-E09/NOPB | LP8556SQX-E09/NOPB |

**Group 1 Devices Qual Memo:**

**Qualification Results**

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

| Type  | Test Name / Condition         | Duration                 | QBS Package Reference: BQ294504DRV | QBS Package Reference: TRS3122ERGE | QBS Package Reference: BQ24196RGE | QBS Package Reference: TPS51285BRUK | QBS Package Reference: TPS53641RSB |
|-------|-------------------------------|--------------------------|------------------------------------|------------------------------------|-----------------------------------|-------------------------------------|------------------------------------|
| AC    | Autoclave 121C                | 96 Hours                 | 3/231/0                            | 3/231/0                            | 3/231/0                           | 3/231/0                             | 3/231/0                            |
| ED    | Electrical Characterization   | Per Datasheet Parameters | -                                  | 1/30/0                             | -                                 | -                                   | -                                  |
| HAST  | Biased HAST, 130C/85%RH       | 96 Hours                 | 3/231/0                            | 3/231/0                            | -                                 | -                                   | -                                  |
| HTOL  | Life Test, 150C               | 300 Hours                | -                                  | 1/77/0                             | -                                 | -                                   | -                                  |
| HTSL  | High Temp. Storage Bake, 150C | 1000 Hours               | -                                  | 3/231/0                            | -                                 | -                                   | -                                  |
| HTSL  | High Temp. Storage Bake, 170C | 420 Hours                | -                                  | -                                  | -                                 | -                                   | 3/231/0                            |
| SD    | Solderability                 | Pb Free                  | -                                  | 1/22/0                             | -                                 | -                                   | -                                  |
| TC    | Temperature Cycle, -65/150C   | 500 Cycles               | 3/231/0                            | 3/231/0                            | 3/231/0                           | 3/231/0                             | 3/231/0                            |
| UHAST | Unbiased HAST, 110C/85%RH     | 264 Hours                | -                                  | -                                  | -                                 | -                                   | -                                  |
| WBP   | Bond Pull                     | Wires                    | 3/228/0                            | 3/228/0                            | 3/228/0                           | 3/228/0                             | 3/228/0                            |
| WBS   | Ball Bond Shear               | Wires                    | 3/228/0                            | 3/228/0                            | 3/228/0                           | 3/228/0                             | 3/228/0                            |

- 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  
 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

# Qualification Report

Approve Date 07-June-2019

## Qualification Results

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

| Type      | Test Name / Condition                 | Duration                      | Qual Device:<br><u>SN75LVCP601RTJR/</u><br><u>T</u> | Qual Device:<br><u>HD3SS460RNH</u> | QBS Process<br>Reference:<br><u>HD3SS3411TRWAQ1</u> |
|-----------|---------------------------------------|-------------------------------|---|------------------------------------|---|
| AC        | Autoclave 121C                        | 96 Hours                      | 1/77/0  | 1/77/0                             | 3/231/0   |
| ED        | Electrical Characterization           | Per Datasheet Parameters      | -   | Pass                               | Pass  |
| ELFR      | Early Life Failure Rate, 140C         | 24 Hours                      | -   | -                                  | 3/2400/0  |
| HAST      | Biased HAST, 130C/85%RH               | 96 Hours                      | -   | -                                  | 3/231/0   |
| HBM       | ESD - HBM                             | 4000 V                        | -   | 1/3/0                              | 1/3/0   |
| CDM       | ESD - CDM                             | 1500 V                        | -   | 1/3/0                              | 1/3/0   |
| HTOL      | Life Test, 140C                       | 480 Hours                     | -   | -                                  | 3/231/0   |
| HTSL      | High Temp. Storage Bake, 150C         | 1000 Hours                    | -   | 3/231/0                            | 2/90/0  |
| LU        | Latch-up 90C                          | (per JESD78)                  | -   | 1/6/0                              | 1/6/0   |
| LU        | Latch-up 25C                          | (per JESD78)                  | -   | 1/6/0                              | 1/6/0   |
| PD        | Physical Dimensions                   | Cpk>1.67                      | 1/5/0   | 3/15/0                             | 3/30/0  |
| SD        | Surface Mount Solderability           | Pb Free                       | 1/22/0  | 3/15/0                             | 1/15/0  |
| SD        | Surface Mount Solderability           | Pb                            | 1/22/0  | 3/15/0                             | 1/15/0  |
| TC        | Temperature Cycle, -65/150C           | 500 Cycles                    | 1/77/0  | 1/77/0                             | 3/231/0   |
| MQ        | Manufacturing Assembly                | (per mfg. Site specification) | Pass  | Pass                               | Pass  |
| BPC       | Bond Pad Cratering Check              |                               |   | 3/6/0                              |   |
| TPI       | Thermal Path Integrity                | Level 2-260C( +5/-0C)         |   | 3/26/0                             | -   |
| UHAS<br>T | Unbiased HAST, 130C/85%RH             | 96 Hours                      | -   | 3/231/0                            | -   |
| WBP       | Bond Pull                             | Wires                         | 1/76/0  | 3/228/0                            | 3/228/0   |
| WBS       | Ball Bond Shear                       | Wires                         | 1/76/0  | 3/228/0                            | 3/228/0   |
| VQR       | Visual Quality Reliability Inspection | Post 500 Temp Cycle           | 1/2/0   | 1/2/0                              | -   |

- QBS: Qual By Similarity

- Qual Devices qualified at LEVEL2-260C: HD3SS460RNH, HD3SS460RNH

- 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

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

THIS INFORMATION RELATING TO QUALITY AND RELIABILITY IS PROVIDED "AS IS." Product information detailed in this report may not accurately reflect TI's current product materials, processes and testing used in the construction of the TI products. Customers are solely responsible to conduct sufficient engineering and additional qualification testing to determine whether a device is suitable for use in their applications. Using TI products outside limits stated in TI's datasheet may void TI's warranty. See TI's Terms of Sale at "<http://www.ti.com/lsds/ti/legal/termsofsale.page>"

## Group 2 Devices Qual Memo: Qualification Results

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

| Type | Test Name / Condition                     | Duration                 | Qual Device:<br>TPS65233RTE | QBS Package<br>Reference:<br>BQ24196RGER | QBS Package<br>Reference:<br>TPS54678RTE |
|------|---|--------------------------|-----------------------------|--|--|
| ED   | Electrical Characterization               | Per Datasheet Parameters | -                           | -  | -  |
| ED   | Electrical Characterization, side by side | -                        | Pass                        | -  | Pass                                     |
| HBM  | ESD - HBM                                 | 4000 V                   | -                           | -  | -  |
| HBM  | ESD - HBM                                 | 2000 V                   | -                           | -  | -  |
| CDM  | ESD - CDM                                 | 1500 V                   | -                           | -  | 1/3/0                                    |
| CDM  | ESD - CDM                                 | 1000 V                   | -                           | -  | -  |
| CDM  | ESD - CDM                                 | 750 V                    | -                           | -  | -  |
| LU   | Latch-up                                  | (per JESD78)             | -                           | -  | -  |
| MM   | ESD - MM                                  | 100 V                    | -                           | -  | -  |
| HTOL | Life Test, 125C                           | 1000 Hours               | -                           | -  | -  |
| HTSL | High Temp Storage Bake, 150C              | 1000 Hours               | -                           | -  | -  |
| HAST | Biased HAST, 130C/85%RH                   | 96 Hours                 | -                           | -  | -  |
| AC   | Autoclave 121C                            | 96 Hours                 | -                           | 3/231/0                                  | -  |
| TC   | Temperature Cycle, -65/150C               | 500 Cycles               | -                           | 3/231/0                                  | -  |
| TS   | Thermal Shock, -65/150C                   | 500 Cycles               | -                           | -  | -  |
| WBP  | Bond Pull                                 | Wires                    | -                           | 3/228/0                                  | -  |
| WBS  | Ball Bond Shear                           | Wires                    | -                           | 3/228/0                                  | -  |

- 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

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

## Group 3 Qualification Report

Approve Date 26-June-2019

### Qualification Results

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

| Type | Test Name / Condition         | Duration                   | Qual Device:<br>LP8556SQE0WZ8<br>5 | QBS Product/Processes Reference:<br>LP8556TMX-E09/S1 | QBS Package Reference:<br>TPS53641RSBR | QBS Package Reference:<br>TPS51285BRUKR | QBS Package Reference:<br>TRS3122ERRR |
|------|-------------------------------|----------------------------|------------------------------------|--|--|---|---------------------------------------|
| AC   | Autoclave                     | 96 Hours                   | 1/77/0                             | -  | 3/231/0                                | 3/231/0                                 | 3/231/0                               |
| ED   | Electrical Characterization   | (Per Datasheet Parameters) | 1/30/0                             | -  | -                                      | -                                       | 3/90/0                                |
| ELFR | Early Life Failure Rate, 125C | 48 Hours                   | -                                  | 3/913/0  | -                                      | -                                       | -                                     |
| HBM  | ESD - HBM                     | 1000 V                     | 1/77/0                             | 1/3/0  | -                                      | -                                       | -                                     |
| HBM  | ESD - HBM                     | 2500 V                     | -                                  | 1/3/0  | -                                      | -                                       | -                                     |
| CDM  | ESD - CDM                     | 1000 V                     | -                                  | 1/3/0  | -                                      | -                                       | -                                     |
| CDM  | ESD - CDM                     | 1500 V                     | 1/3/0                              | -  | -                                      | -                                       | -                                     |
| HAST | Biased HAST, 130C/85%RH       | 96 Hours                   | -                                  | 2/154/0  | -                                      | -                                       | 3/231/0                               |
| HAST | Biased HAST, 110C/85%RH       | 264 Hours                  | -                                  | 1/77/0   | -                                      | -                                       | -                                     |
| HTOL | Life Test, 125C               | 1000 Hours                 | -                                  | 3/228/0  | -                                      | -                                       | -                                     |

|       |                               |                               |        |         |         |         |         |
|-------|-------------------------------|-------------------------------|--------|---------|---------|---------|---------|
| HTSL  | High Temp. Storage Bake, 170C | 420 Hours                     | 1/77/0 | -       | 3/231/0 | -       | -       |
| HTSL  | High Temp. Storage Bake, 150C | 1000 Hours                    | -      | 1/77/0  | -       | -       | -       |
| LU    | Latch-up                      | (per JESD78) 25C              | -      | 3/18/0  | -       | -       | -       |
| LU    | Latch-up                      | (per JESD78) 125C             | -      | 3/18/0  | -       | -       | -       |
| TC    | Temperature Cycle, -65/150C   | 500 Cycles                    | 1/77/0 | 3/231/0 | 3/231/0 | 3/231/0 | 3/231/0 |
| THBT  | Temp Humidity 85C/85%Rh       | 1000 Hours                    | -      | -       | -       | -       | -       |
| uHAST | unBiased HAST, 130C/85%RH     | 96 Hours                      | 1/77/0 | 3/231/0 | -       | -       | -       |
| WBP   | Bond Pull                     | 76 Wires, 3 units min         | -      | -       | 3/228/0 | 3/228/0 | 3/228/0 |
| WBS   | Ball Bond Shear               | 76 Wires, 3 units min         | -      | -       | 3/228/0 | 3/228/0 | 3/228/0 |
| MQ    | Manufacturability (Assembly)  | (Per Mfg. Site Specification) | 3/Pass | -       | -       | -       | -       |

- QBS: Qual By Similarity

- Qual Device LP8556SQE0WZ85//NOPB is qualified at LEVEL1-260C

- 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

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**Green/Pb-free Status:**

Qualified Pb-Free(SMT) and Green

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