

| | | | |
|---|--|--|------------------|
| PCN Number: | 20230328000.1 | PCN Date: | March 30, 2023 |
| Title: | Qualification of new Fab site (RFAB) using qualified Process Technology, Die Revision, and additional Assembly site options for select devices | | |
| Customer Contact: | PCN Manager | Dept: | Quality Services |
| Proposed 1st Ship Date: | Jun 28, 2023 | Sample requests accepted until: | April 28, 2023* |

***Sample requests received after April 28, 2023 will not be supported.**

| | | | | | |
|-------------------------------------|-----------------|-------------------------------------|---------------------------|-------------------------------------|--------------------------|
| Change Type: | | | | | |
| <input checked="" type="checkbox"/> | Assembly Site | <input type="checkbox"/> | Assembly Process | <input checked="" type="checkbox"/> | Assembly Materials |
| <input checked="" type="checkbox"/> | Design | <input type="checkbox"/> | Electrical Specification | <input type="checkbox"/> | Mechanical Specification |
| <input type="checkbox"/> | Test Site | <input checked="" 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 checked="" type="checkbox"/> | Wafer Fab Site | <input checked="" type="checkbox"/> | Wafer Fab Materials | <input checked="" type="checkbox"/> | Wafer Fab Process |
| | | <input type="checkbox"/> | Part number change | | |

PCN Details

Description of Change:

Texas Instruments is pleased to announce the qualification of a new fab & process technology (RFAB, LBC9) and additional Assembly site (PHI, MLA) for selected devices listed below in the product affected section.

| Current Fab Site | | | Additional Fab Site | | |
|------------------|---------|----------------|---------------------|---------|----------------|
| Current Fab Site | Process | Wafer Diameter | Additional Fab Site | Process | Wafer Diameter |
| DL-LIN | VIP | 150 mm | RFAB | LBC9 | 300 mm |
| SFAB | J11 | 150 mm | | | |
| DL-LIN | LINCMOS | 150 mm | | | |

The die was also changed as a result of the process change.

Construction Differences are as follows:

Group 1 Devices (RFAB as an additional Fab site & TIEMA/LEN adding PHI as an additional Assembly site):

| | TIEMA | LEN | TIPI |
|---------------------------------|--------------|----------------|-------------|
| Mount Compound | 8075531 | SID#0003C10332 | 8095733 |
| Mold Compound | 8097131 | SID#0011G60007 | 4222198 |
| Bond wire composition, diameter | Cu, 0.96 mil | Au, 1.0 mil | Cu, 0.8 mil |
| Lead Finish | Matte Sn | NiPdAu | NiPdAu |

Group 2 Devices (RFAB as an additional Fab site & FMX/TAI adding MLA as an additional Assembly site):

| | FMX | MLA |
|---------------------------------|--------------|-------------|
| Mount Compound | 4147858 | 4147858 |
| Mold Compound | 4211880 | 4211880 |
| Bond wire composition, diameter | Cu, 0.96 mil | Cu, 0.8 mil |

Group 3 Devices (RFAB as an additional Fab site & TAI adding MLA as an additional Assembly site):

| | TAI | MLA |
|---------------------------------|--------------|-------------|
| Bond wire composition, diameter | Cu, 0.96 mil | Cu, 0.8 mil |

Qual details are provided in the Qual Data Section.

Reason for Change:

These changes are part of our multiyear plan to transition products from our 150-millimeter factories to newer, more efficient manufacturing processes and technologies, underscoring our commitment to product longevity and supply continuity.

Anticipated impact on Form, Fit, Function, Quality or Reliability (positive / negative):

None

Impact on Environmental Ratings:

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.

| 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:

Fab Site Information:

| Chip Site | Chip Site Origin Code (20L) | Chip Site Country Code (21L) | Chip Site City |
|-------------|-----------------------------|------------------------------|-------------------|
| DL-LIN | DLN | USA | Dallas |
| SH-BIP-1 | SHE | USA | Sherman |
| RFAB | RFB | USA | Richardson |

Die Rev:

Current

New

| | |
|--------------|---------------------|
| Die Rev [2P] | Die Rev [2P] |
| B, C | A |

Assembly Site Information:

| Assembly Site | Assembly Site Origin (22L) | Assembly Country Code (23L) | Assembly City |
|---------------|----------------------------|-----------------------------|---------------------------|
| TIEM | CU6 | MYS | Melaka |
| LEN | LIN | TWN | Taichung |
| FMX | MEX | MEX | Aguascalientes |
| TAI | TAI | TWN | Chung Ho, New Taipei City |
| TIPI | PHI | PHL | Baguio City MLA |
| MLA | MLA | MYS | Kuala Lumpur |

Sample product shipping label (not actual product label)



MADE IN: Malaysia
2DC: 20:



| | |
|---------------------|----------|
| 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) GSO: SHE (21L) CCO:USA
(22L) ASO: MLA (23L) ACO: MYS

Product Affected:

Group 1 Device List (RFAB as additional Fab site & PHI as an additional Assembly site):

| | | | |
|----------------|---------------------|---------------------|--------------|
| LM7301IM5 | LM7301IM5X/NOPB | LM7301IM5X/S7000823 | TLV2231IDBVR |
| LM7301IM5/NOPB | LM7301IM5X/S5000655 | LM7341MFX/NOPB | TLV2731IDBVR |
| LM7301IM5X | | | |

Group 2 Device List (RFAB as additional Fab site & MLA as an additional Assembly site):

| | |
|-----------|-----------|
| TLC277CDR | TLC277IDR |
|-----------|-----------|

Group 3 Device List (RFAB as additional Fab site & MLA as an additional Assembly site):

| | |
|-----------|-----------|
| TLC279CDR | TLC279IDR |
|-----------|-----------|

For alternate parts with similar or improved performance, please visit the product page on TI.com

Qualification Report

Approve Date 28-Jul-2020

Qualification Results

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

| Type | Test Name / Condition | Duration | Qual Device: OPA991IDBVR | QBS Process Reference: OPA4990IDR | QBS Package Reference: OPA990IDBVR |
|------|-------------------------------|--------------------------|-----------------------------|--------------------------------------|---------------------------------------|
| PC | PreCon Level 1 | Level 1-260C | - | - | 6/933/0 |
| PC | PreCon Level 2 | Level 2-260C | - | 3/1477/1 (1) | 3/246/0 |
| ED | Electrical Characterization | Per Datasheet Parameters | 3/90/0 | 3/90/0 | 3/90/0 |
| HAST | Biased HAST, 130C/85%RH | 96 Hours | - | 3/231/0 | 6/462/0 |
| AC | Autoclave 121C | 96 Hours | - | 3/231/5 (2) | 1/77/0 |
| AC | Autoclave 121C | 96 hours | - | - | 2/154/0 |
| TC | Temperature Cycle, -65/150C | 500 Cycles | - | 3/231/0 | 3/231/0 |
| HTSL | High Temp Storage Bake 170C | 420 Hours | - | - | 3/231/0 |
| HTSL | High Temp Storage Bake 175C | 500 Hours | - | 3/231/0 | - |
| HTOL | Life Test, 150C | 300 Hours | - | 3/231/10 (3) | - |
| ELFR | Early Life Failure Rate, 125C | 48 Hours | - | 1/800/0 | - |
| HBM | ESD - HBM | 2500 V | 1/3/0 | - | - |
| HBM | ESD - HBM | 3000 V | - | 3/9/0 | - |
| CDM | ESD - CDM | 1500 V | 3/9/0 | 2/6/0 | 3/9/0 |
| LI | Lead Pull to Destruction | Leads | - | 1/24/0 | - |
| LU | Latch-up | Per JESD78 | 3/18/0 | 3/18/0 | 3/18/0 |
| MSL | Automotive Moist Sens. L2 | Level 2-260C | - | 3/36/0 | - |
| MSL | Moisture Sensitivity | Level 1-260C | - | - | 3/36/0 |

| Type | Test Name / Condition | Duration | Qual Device: OPA991DBVR | QBS Process Reference: OPA4990IDR | QBS Package Reference: OPA990IDBVR |
|------|-----------------------|----------|----------------------------|--------------------------------------|---------------------------------------|
| WBP | Bond Pull | Wires | 1/76/0 | 3/228/0 | 3/228/0 |
| WBS | Ball Bond Shear | Wires | 1/76/0 | 3/288/0 | 3/228/0 |

- QBS: Qual By Similarity
- Qual Device OPA991DBVR 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
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
NOTE (1): T0 failing units got mixed back in with passing ones for the post-stress test resulting in false fails. See 8D attached to the eQDB
NOTE (2): Fails were due to mechanical damage from mishandling at test. Discounted.
NOTE (3): Fails due to faulty BI sockets. See 8D attached to the eQDB.

Qualification Report

Approve Date 21-May-2021

Qualification Results

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

| Type | Test Name / Condition | Duration | Qual Device: OPA2991IDR | QBS Product Reference: OPA2991IDR | QBS Process Reference: OPA4990IDR | QBS Package Reference: OPA2990IDR |
|-------|-------------------------------|--------------------------|----------------------------|--------------------------------------|--------------------------------------|--------------------------------------|
| PC | PreCon Level 1 | Level 1-260C | 1/160/0 | - | - | - |
| PC | PreCon Level 2 | Level 2-260C | - | - | 3/1477/0 | 3/990/0 |
| ED | Electrical Characterization | Per Datasheet Parameters | - | 1/30/0 | 3/90/0 | 3/90/0 |
| HAST | Biased HAST, 130C/85%RH | 96 Hours | - | - | 3/231/0 | 3/231/0 |
| AC | Autoclave 121C | 96 Hours | 1/77/0 | - | 3/231/0 | - |
| UHAST | Unbiased HAST 130C/85%RH | 96 Hours | - | - | - | 3/231/0 |
| TC | Temperature Cycle, -65/150C | 500 Cycles | 1/77/0 | - | 3/231/0 | 3/231/0 |
| HTSL | High Temp Storage Bake 170C | 420 Hours | - | - | - | 3/231/0 |
| HTSL | High Temp Storage Bake 175C | 500 Hours | - | - | 3/231/0 | - |
| HTOL | Life Test, 150C | 300 Hours | - | - | 3/231/10 (1) | 3/231/0 |
| ELFR | Early Life Failure Rate, 125C | 48 Hours | - | - | 1/800/0 | - |
| HBM | ESD - HBM | 2500 V | - | 1/3/0 | - | - |
| HBM | ESD - HBM | 3000 V | - | - | 3/9/0 | 3/9/0 |
| CDM | ESD - CDM | 1500 V | - | 1/3/0 | 2/6/0 | 3/9/0 |
| LU | Latch-up | Per JESD78 | - | 1/6/0 | 3/18/0 | 6/36/0 |
| MSL | Moisture Sensitivity, L2 | Level 2-260C | - | 1/12/0 | 3/36/0 | - |

| Type | Test Name / Condition | Duration | Qual Device: OPA2991IDR | QBS Product Reference: OPA2991IDR | QBS Process Reference: OPA4990IDR | QBS Package Reference: OPA2990IDR |
|------|-----------------------|----------|----------------------------|--------------------------------------|--------------------------------------|--------------------------------------|
| 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 |

- QBS: Qual By Similarity
- Qual Device OPA2991IDR 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
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
NOTE (1): Fails due to faulty BI sockets. See 8D attached to the eQDB.

Qualification Report
Approve Date 21-May-2021

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

| Type | Test Name / Condition | Duration | Qual Device: OPA4991IDR | QBS Product Reference: OPA4991IDR | QBS Process / Package Reference: OPA4990IDR |
|------|-------------------------------|--------------------------|----------------------------|--------------------------------------|--|
| PC | PreCon Level 1 | Level 1-260C | 1/80/0 | - | - |
| PC | PreCon Level 2 | Level 2-260C | - | 1/166/0 | 3/1477/0 |
| ED | Electrical Characterization | Per Datasheet Parameters | - | 3/90/0 | 3/90/0 |
| HAST | Biased HAST, 130C/85%RH | 96 Hours | - | - | 3/231/0 |
| AC | Autoclave 121C | 96 Hours | 1/77/0 | 1/77/0 | 3/231/0 |
| TC | Temperature Cycle, -65/150C | 500 Cycles | 1/77/0 | 1/77/0 | 3/231/0 |
| HTSL | High Temp Storage Bake 175C | 500 Hours | - | - | 3/231/0 |
| HTOL | Life Test, 150C | 300 Hours | - | 1/77/0 | 3/231/10 (1) |
| ELFR | Early Life Failure Rate, 125C | 48 Hours | - | - | 1/800/0 |
| HBM | ESD - HBM | 4000 V | - | 3/9/0 | - |
| HBM | ESD - HBM | 3000 V | - | - | 3/9/0 |
| CDM | ESD - CDM | 1500 V | - | 3/9/0 | 2/6/0 |
| LU | Latch-up | Per JESD78 | - | 3/18/0 | 3/18/0 |
| MSL | Moisture Sensitivity, L1 | Level 1-260C | 1/12/0 | - | - |
| MSL | Moisture Sensitivity, L2 | Level 2-260C | - | 1/12/0 | 3/36/0 |
| WBP | Bond Pull | Wires | - | 1/76/0 | 3/228/0 |
| WBS | Ball Bond Shear | Wires | - | 1/76/0 | 3/228/0 |

- QBS: Qual By Similarity
- Qual Device OPA4991IDR is qualified at LEVEL2-260C
- 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

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

NOTE (1): Fails due to faulty BI sockets. See 8D attached to the eQDB.

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

| Location | E-Mail |
|---------------------------|--|
| WW Change Management Team | PCN_ww_admin_team@list.ti.com |

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