| | | | |
|---|---|---|---|
| **PCN Number:** | 20250129000.1 | **PCN Date:** | February 03, 2025 |
| **Title:** | Qualification of RFAB using qualified Process Technology, Die Revision, and additional Assembly site (MLA) & BOM options for select devices | | |
| **Customer Contact:** | Change Management Team | **Dept:** | Quality Services |
| **Proposed 1st Ship Date:** | May 04, 2025 | **Sample requests accepted until:** | April 04, 2025* |

***Sample requests received after April 04, 2025 will not be supported.**

**Change Type:**

| | | | | | |
|---|---|---|---|---|---|
| ☒ | Assembly Site | ☒ | Design | ☐ | Wafer Bump Material |
| ☒ | Assembly Process | ☒ | Data Sheet | ☐ | Wafer Bump Process |
| ☒ | Assembly Materials | ☐ | Part number change | ☒ | Wafer Fab Site |
| ☐ | Mechanical Specification | ☐ | Test Site | ☒ | Wafer Fab Material |
| ☒ | Packing/Shipping/Labeling | ☐ | Test Process | ☒ | Wafer Fab Process |

## PCN Details

**Description of Change:**

Texas Instruments is pleased to announce the qualification of its RFAB fabrication facility as an additional Wafer Fab option in addition to an Assembly site (MLA) and BOM options for the devices listed below.

| Current Fab Site | | | Additional Fab Site | | |
|---|---|---|---|---|---|
| **Fab Site** | **Process** | **Wafer Diameter** | **Fab Site** | **Process** | **Wafer Diameter** |
| DL-LIN GFAB6/8 | P2CMOS | 200 mm 150/200 mm | RFAB | HPA8 | 300 mm |

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

Construction differences are as follows:

**Group 1 BOM Table (FAB/Process migration, die change plus MLA as new Assembly sit & BOM update – SSOP Packaged devicers**

| | TIEM | **MLA** |
|---|---|---|
| Lead Finish | Matte Sn | **NiPdAu** |
| Bond Wire composition/diameter | Cu 0.96 mil | **Cu, 0.8 mil** |
| Mold Compound | 8096859 | **4226323** |
| Mount Compound | 8075531 | **4147858** |
| Device Marking | NS Logo, pin 1 dot | **TI letters, pin 1 dot** |

**Group 2 BOM Table (RFAB/Process migration, die change plus MLA as new Assembly site & BOM update – SOIC Packaged Devices):**

| What | **TIEM** | **AP1** | **MLA** |
|---|---|---|---|
| Bond Wire composition, diameter | Cu, 0.96 mil | Au, 0.9 mil | Cu, 0.8 mil |
| Mold Compound | 8095179 | SID#101323397 | 4226323 |
| Mount Compound | 8075531 | SID#101375281 | 4147858 |

Upon expiry of this PCN, there will be a transition period where TI will combine lead free solutions in a single ***standard part number*** For example; ***OPA320AQDBVTQ1*** – can ship with both Matte Sn and NiPdAu.
Example:

- Customer order for 7500 units of OPA320AQDBVTQ1 with 2500 units SPQ (Standard Pack Quantity per Reel).

- TI can satisfy the above order in one of the following ways.
  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.

Datasheet updates are as follows:

TEXAS INSTRUMENTS
LMC6035, LMC6036
SNOS875H – JANUARY 2000 – REVISED DECEMBER 2024

**Changes from Revision G (April 2013) to Revision H (December 2024)** **Page**

- Updated the numbering format for tables, figures, and cross-references throughout the document ..... 1
- Moved LMC6035-Q1 to a new document ..... 1
- Updated *Description* text for clarity ..... 1
- Updated front-page image ..... 1
- Added difference amplifier with RES11 application image ..... 1
- Added *Pin Configuration and Functions* ..... 3
- Updated figures and tables in *Pin Configuration and Functions* ..... 3
- Added input pin voltage to *Absolute Maximum Ratings* ..... 5
- Added *ESD Ratings* ..... 5
- Deleted machine model in *ESD Ratings* ..... 5
- Added Thermal Information ..... 6
- Updated junction-to-ambient thermal resistance values ..... 6
- Updated parameter names and symbols ..... 7
- Added input voltage noise density specification for V+ = 15V ..... 7
- Changed input current noise density TYP from 0.2fA/$\sqrt{Hz}$ to 6fA/$\sqrt{Hz}$ ..... 7
- Deleted footnotes 1 and 2 from DC *Electrical Characteristics* ..... 7
- Moved footnotes 4 into open-loop gain test conditions ..... 7
- Deleted footnote 1 from AC *Electrical Characteristics* ..... 7
- Updated footnote 2 and moved conditions to slew rate test conditions ..... 7
- Moved footnote 3 from AC *Electrical Characteristics* conditions crosstalk test conditions ..... 7
- Added Figures 5-3, 5-4, 5-17 ..... 9
- Deleted Figures 16 and 17 ..... 9
- Added *Overview* ..... 16
- Added *Functional Block Diagram* ..... 16
- Changed $A_{VOL}$ to $A_{OL}$ ..... 18
- Updated Figure 7-7 ..... 20
- Updated Figure 7-8 ..... 21
- Updated Figure 7-9 ..... 22
- Changed the value of $f_c$ from 3kHz to 1kHz to fix error in equation ..... 22
- Added reference to *Measurement and Calibration Techniques for Ultra-low Current Measurement Systems* application note in Printed Circuit Board (PCB) Layout for High-Impedance Work ..... 23
- Updated thermal resistance information in *DSBGA Considerations* ..... 24

| Product Folder | Current Datasheet Number | New Datasheet Number | Link to full datasheet |
|---|---|---|---|
| LMC603x | SNOS875G | **SNOS875H** | https://www.ti.com/product/LMC6035 |

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 |
|---|---|---|---|
| ☒ No Change | ☒ No Change | ☒ No Change | ☒ 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 |
| GFAB6/8 | GF6/GF8 | GBR | Greenock |
| **RFAB** | **RFB** | **USA** | **Richardson** |

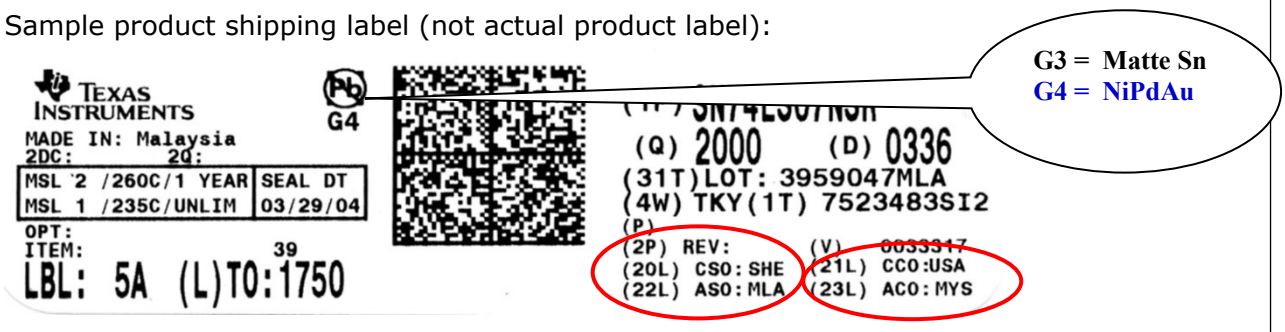
**Die Rev:**

| Current | New |
|---|---|
| Die Rev [2P] | **Die Rev [2P]** |
| A | **A** |

**Assembly Site Information:**

| Assembly Site | Assembly Site Origin (22L) | Assembly Country Code (23L) | Assembly City |
|---|---|---|---|
| TI Melaka | CU6 | MYS | Melaka |
| AP1 | AKR | PHL | Cupang, Muntinlupa City |
| **TI Malaysia** | **MLA** | **MYS** | **Kuala Lumpur** |

Sample product shipping label (not actual product label):




**Product Affected:**

**Group 1 Device List (FAB/Process migration, die change plus MLA as new Assembly sit & BOM update – SSOP Packaged devicers):**

| | | |
|---|---|---|
| LMC6035IMM/NOPB | LMC6035IMMX/NOPB | LMC6036IMTX/NOPB |

**Group 2 Device List (RFAB/Process migration, die change plus MLA as new Assembly site & BOM update – SOIC Packaged Devices):**

| | |
|---|---|
| LMC6035IMX/NOPB | LMC6036IMX/NOPB |

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

TI Information
Selective Disclosure

**Qualification Results**

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

| Type | # | Test Name | Condition | Duration | Qual Device: LMC6082IMX/NOPB | QBS Reference: OPA1671IDCKR | QBS Reference: INA849DR | QBS Reference: LMC6482IM/NOPB |
|---|---|---|---|---|---|---|---|---|
| HAST | A2 | Biased HAST | 130C/85%RH | 96 Hours | - | 3/231/0 | - | 1/77/0 |
| HAST | A2 | Temperature Humidity Bias | 85C/85%RH | 1000 Hours | - | - | 3/231/0 | - |
| UHAST | A3 | Unbiased HAST | 130C/85%RH | 96 Hours | - | 3/231/0 | 3/231/0 | 3/231/0[1] |
| TC | A4 | Temperature Cycle | -65C/150C | 500 Cycles | - | 3/231/0 | 3/231/0 | 3/231/0 |
| HTSL | A6 | High Temperature Storage Life | 170C | 420 Hours | - | 3/231/0 | 3/231/0 | - |
| HTOL | B1 | Life Test | 100C[2] | 300 Hours | - | - | 1/77/0 | - |
| HTOL | B1 | Life Test | 150C | 300 Hours | - | 3/231/0 | - | 3/231/0 |
| ELFR | B2 | Early Life Failure Rate | 125C | 48 Hours | - | 3/2397/0[1] | - | - |
| ESD | E2 | ESD CDM | - | 250 Volts | 1/3/0 | 3/9/0 | 1/3/0 | 1/3/0 |
| ESD | E2 | ESD HBM | - | 1000 Volts | 1/3/0 | 3/9/0 | 1/3/0 | 1/3/0 |
| LU | E4 | Latch-Up | Per JESD78 | - | 1/3/0 | 3/18/0 | 1/6/0 | 1/3/0 |
| CHAR | E5 | Electrical Characterization | Per Datasheet Parameters | - | 1/30/0 | 3/90/0 | 1/30/0 | 3/90/0 |

- QBS: Qual By Similarity
- Qual Device LMC6082IMX/NOPB is qualified at MSL1 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/

TI Qualification ID: R-CHG-2302-065

[1] Lost 3 units.
[2] Tj=150C

## Qualification Results

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

| Type | # | Test Name | Condition | Duration | Qual Device: LMC6035IMMX/NOPB | QBS Process Reference: OPA1671IDCKR | QBS Product Reference: LMC6482IM/NOPB | QBS Package Reference: SN74LV244AQDGSRQ1 | QBS Package Reference: SN74LV273AQDGSRQ1 | QBS Package Reference: TPS2001EDGKR | QBS Package Reference: TLV1812QDGKRQ1 | QBS Package Reference: TLV1822QDGKRQ1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HAST | A2 | Biased HAST | 130C/85%RH | 96 Hours | - | 3/231/0 | 1/77/0 | 1/77/0 | 1/77/0 | 1/77/0 | 1/77/0 | - |
| UHAST | A3 | Autoclave | 121C/15psig | 96 Hours | - | - | - | 1/77/0 | 1/77/0 | 1/77/0 | - | - |
| UHAST | A3 | Unbiased HAST | 130C/85%RH | 96 Hours | - | 3/231/0 | 3/231/0 | - | - | - | 1/77/0 | - |
| TC | A4 | Temperature Cycle | -65C/150C | 500 Cycles | - | 3/231/0 | 3/231/0 | 1/77/0 | 1/77/0 | 1/77/0 | 1/77/0 | - |
| HTSL | A6 | High Temperature Storage Life | 150C | 1000 Hours | - | - | - | 1/45/0 | 1/45/0 | 1/77/0 | - | - |
| HTSL | A6 | High Temperature Storage Life | 170C | 420 Hours | - | 3/231/0 | - | - | - | - | - | - |
| HTSL | A6 | High Temperature Storage Life | 175C | 500 Hours | - | - | - | - | - | - | 1/77/0 | - |
| HTOL | B1 | Life Test | 125C | 1000 Hours | - | - | - | 1/77/0 | - | - | - | - |
| HTOL | B1 | Life Test | 150C | 300 Hours | - | 3/231/0 | 3/231/0 | - | - | - | 1/77/0 | - |
| ELFR | B2 | Early Life Failure Rate | 125C | 48 Hours | - | 3/2397/0 | - | - | - | - | - | - |
| SD | C3 | PB Solderability | Precondition w.155C Dry Bake (4 hrs +/- 15 minutes) | - | - | - | - | 1/15/0 | - | - | 1/15/0 | - |
| SD | C3 | PB-Free Solderability | Precondition w.155C Dry Bake (4 hrs +/- 15 minutes) | - | - | - | - | 1/15/0 | - | 1/22/0 | 1/15/0 | - |
| PD | C4 | Physical Dimensions | Cpk>1.67 | - | - | - | - | 1/10/0 | 1/10/0 | - | 1/10/0 | - |

| Type | # | Test Name | Condition | Duration | Qual Device: LMC6035IMMX/NOPB | QBS Process Reference: OPA1671IDCKR | QBS Product Reference: LMC6482IM/NOPB | QBS Package Reference: SN74LV244AQDGSRQ1 | QBS Package Reference: SN74LV273AQDGSRQ1 | QBS Package Reference: TPS2001EDGKR | QBS Package Reference: TLV1812QDGKRQ1 | QBS Package Reference: TLV1822QDGKRQ1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ESD | E2 | ESD CDM | - | 250 Volts | 1/3/0 | 3/9/0 | 1/3/0 | - | - | 1/3/0 | - | - |
| ESD | E2 | ESD CDM | - | 500 Volts | - | - | - | 1/3/0 | 1/3/0 | - | 1/3/0 | 1/3/0 |
| ESD | E2 | ESD HBM | - | 1000 Volts | 1/3/0 | 3/9/0 | 1/3/0 | - | - | 1/3/0 | - | - |
| ESD | E2 | ESD HBM | - | 2000 Volts | - | - | - | 1/3/0 | 1/3/0 | - | 1/3/0 | 1/3/0 |
| LU | E4 | Latch-Up | Per JESD78 | - | 1/3/0 | 3/18/0 | 1/3/0 | 1/6/0 | 1/6/0 | 1/3/0 | 1/6/0 | 1/6/0 |
| CHAR | E5 | Electrical Characterization | Per Datasheet Parameters | - | 1/30/0 | 3/90/0 | 3/90/0 | 1/30/0 | 1/30/0 | - | 1/30/0 | 1/30/0 |

- QBS: Qual By Similarity, also known as Generic Data
- Qual Device LMC6035IMMX/NOPB is qualified at MSL1 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/

TI Qualification ID: R-CHG-2310-040

## Qualification Results

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

| Type | # | Test Name | Condition | Duration | Qual Device: LMC6084AIMX | QBS Process Reference: OPA1671IDCKR | QBS Package Reference: LMC6482IM/NOPB | QBS Package Reference: ULQ2003AQDRQ1 | QBS Package Reference: OPA4991QDRQ1 |
|---|---|---|---|---|---|---|---|---|---|
| HAST | A2 | Biased HAST | 130C/85%RH | 96 Hours | - | 3/231/0 | 1/77/0 | 3/231/0 | 3/231/0 |
| UHAST | A3 | Autoclave | 121C/15psig | 96 Hours | - | - | - | 3/231/0 | 3/231/0 |
| UHAST | A3 | Unbiased HAST | 130C/85%RH | 96 Hours | - | 3/231/0 | 3/231/0 | - | - |
| TC | A4 | Temperature Cycle | -65C/150C | 500 Cycles | - | 3/231/0 | 3/231/0 | 3/231/0 | 1/77/0 |
| HTSL | A6 | High Temperature Storage Life | 150C | 1000 Hours | - | - | - | 3/135/0 | - |
| HTSL | A6 | High Temperature Storage Life | 170C | 420 Hours | - | 3/231/0 | - | - | - |
| HTSL | A6 | High Temperature Storage Life | 175C | 500 Hours | - | - | - | - | 1/45/0 |
| HTOL | B1 | Life Test | 125C | 1000 Hours | - | - | - | 3/231/0 | - |
| HTOL | B1 | Life Test | 150C | 300 Hours | - | 3/231/0 | 3/231/0 | - | - |
| HTOL | B1 | Life Test | 150C | 408 Hours | - | - | - | - | 1/77/0 |
| ELFR | B2 | Early Life Failure Rate | 125C | 48 Hours | - | 3/2397/0 | - | - | - |

| Type | # | Test Name | Condition | Duration | Qual Device: LMC6084AIMX | QBS Process Reference: OPA1671IDCKR | QBS Package Reference: LMC6482IM/NOPB | QBS Package Reference: ULQ2003AQDRQ1 | QBS Package Reference: OPA4991QDRQ1 |
|---|---|---|---|---|---|---|---|---|---|
| SD | C3 | PB Solderability | Precondition w.155C Dry Bake (4 hrs +/- 15 minutes) | - | - | - | - | 1/15/0 | - |
| SD | C3 | PB-Free Solderability | Precondition w.155C Dry Bake (4 hrs +/- 15 minutes) | - | - | - | - | 1/15/0 | - |
| ESD | E2 | ESD CDM | - | 1500 Volts | - | - | - | - | 1/3/0 |
| ESD | E2 | ESD CDM | - | 250 Volts | 1/3/0 | 3/9/0 | 1/3/0 | - | - |
| ESD | E2 | ESD HBM | - | 1000 Volts | 1/3/0 | 3/9/0 | 1/3/0 | - | - |
| ESD | E2 | ESD HBM | - | 2000 Volts | - | - | - | - | 1/3/0 |
| LU | E4 | Latch-Up | Per JESD78 | - | 1/3/0 | 3/18/0 | 1/3/0 | - | 1/6/0 |
| CHAR | E5 | Electrical Characterization | Per Datasheet Parameters | - | 1/30/0 | 3/90/0 | 3/90/0 | 3/90/0 | 3/90/0 |

- QBS: Qual By Similarity
- Qual Device LMC6084AIMX is qualified at MSL1 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/

TI Qualification ID: R-CHG-2303-017

TEXAS INSTRUMENTS

TI Information
Selective Disclosure

**Qualification Results**

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

| Type | # | Test Name | Condition | Duration | Qual Device: LMC6036IMTX/NOPB | QBS Reference: OPA1671IDCKR | QBS Reference: LMC6482IM/NOPB | QBS Reference: OPA4205APWR |
|---|---|---|---|---|---|---|---|---|
| HAST | A2 | Biased HAST | 130C/85%RH | 96 Hours | - | 3/231/0 | 1/77/0 | 3/231/0 |
| UHAST | A3 | Unbiased HAST | 130C/85%RH | 96 Hours | 1/77/0 | 3/231/0 | 3/231/0 | 3/231/0 |
| TC | A4 | Temperature Cycle | -65C/150C | 500 Cycles | 1/77/0 | 3/231/0 | 3/231/0 | 3/231/0 |
| HTSL | A6 | High Temperature Storage Life | 170C | 420 Hours | - | 3/231/0 | - | 3/231/0 |
| HTOL | B1 | Life Test | 150C | 300 Hours | - | 3/231/0 | 3/231/0 | - |
| ELFR | B2 | Early Life Failure Rate | 125C | 48 Hours | - | 3/2397/0 | - | - |
| ESD | E2 | ESD CDM | - | 250 Volts | 1/3/0 | 3/9/0 | 1/3/0 | 1/3/0 |
| ESD | E2 | ESD HBM | - | 1000 Volts | 1/3/0 | 3/9/0 | 1/3/0 | - |
| LU | E4 | Latch-Up | Per JESD78 | - | 1/3/0 | 3/18/0 | 1/3/0 | 1/3/0 |
| CHAR | E5 | Electrical Characterization | Min, Typ, Max Temp | - | 1/30/0 | 3/90/0 | 3/90/0 | 1/30/0 |
| CHAR | E5 | Electrical Characterization | Per Datasheet Parameters | - | 1/30/0 | 3/90/0 | 3/90/0 | 1/30/0 |

- QBS: Qual By Similarity, also known as Generic Data

- Qual Device LMC6036IMTX/NOPB is qualified at MSL1 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/

TI Qualification ID: R-CHG-2401-082

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