12500 TI Boulevard, MS 8640, Dallas, Texas 75243

**PCN#20240312000.2**
**Qualification of RFAB as an additional Fab site option, Die Revision, and new Assembly/Test site Option for select devices**
**Change Notification / Sample Request**

**Date:** March 13, 2024
**To:** MOUSER PCN

Dear Customer:

This is an announcement of a change to a device that is currently offered by Texas Instruments. The details of this change are on the following pages.

Texas Instruments requires acknowledgement of receipt of this notification within **30** days of the date of this notice. Lack of acknowledgement of this notice within 30 days constitutes acceptance and approval of this change. If samples or additional data are required, requests must be received within **30 days** of this notification.

The changes discussed within this PCN will not take effect any earlier than the proposed first ship date on Page 3 of this notification, unless customer agreement has been reached on an earlier implementation of the change.

This notice does not change the end-of-life status of any product. Should product affected be on a previously issued product withdrawal/discontinuance notice, this notification does not extend the life of that product or change the life time buy offering/discontinuance plan.

For questions regarding this notice or to provide acknowledgement of this PCN, you may contact your local Field Sales Representative or the change management team.

For sample requests or sample related questions, contact your local Field Sales Representative.

Sincerely,

Change Management Team
SC Business Services

**20240312000.2**
**Attachment: 1**

## Products Affected:

The devices listed on this page are a subset of the complete list of affected devices. According to our records, you have recently purchased these devices. The corresponding customer part number is also listed, if available.

| DEVICE | CUSTOMER PART NUMBER |
|---|---|
| TL331IDBVRQ1 | NULL |
| TL331QDBVRQ1 | NULL |

Technical details of this Product Change follow on the next page(s).

| | | | |
|---|---|---|---|
| **PCN Number:** | 20240312000.2 | **PCN Date:** | March 13, 2024 |
| **Title:** | Qualification of RFAB as an additional Fab site option, Die Revision, and new Assembly/Test site Option for select devices | | |
| **Customer Contact:** | Change Management Team | **Dept:** | Quality Services |
| **Proposed 1st Ship Date:** | September 09, 2024 | **Sample requests accepted until:** | April 12, 2024* |

***Sample requests received after April 12, 2024 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 and Die revision in addition to Assembly/Test site options for the devices listed below.

| Current Fab Site | | | Additional Fab site | | |
|---|---|---|---|---|---|
| **Current Fab Site** | **Process** | **Wafer Diameter** | **Additional Fab site** | **Process** | **Wafer Diameter** |
| CFAB | JI3 | 200mm | RFAB | TIB | 300mm |

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

Constriction differences are as follows:

**BOM Table (RFAB/Process migration/Qualify CDAT as and additional Assembly site):**

| | TIPI | CDAT |
|---|---|---|
| Lead finish | NiPdAu | Matte Sn |
| Final Test site | TIPI | CDAT |

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; ***TL331IDBVRQ1*** – can ship with both Matte Sn and NiPdAu.
Example:

- Customer order for 7500 units of TL331IDBVRQ1 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.

Test coverage, insertions, conditions will remain consistent with current testing and verified with test MQ

Qual details are provided in the Qual Data Section.

## Reason for Change:

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 |
|---|---|---|---|
| CFAB | CU3 | CHN | Chengdu |
| **RFAB** | **RFB** | **USA** | **Richardson** |

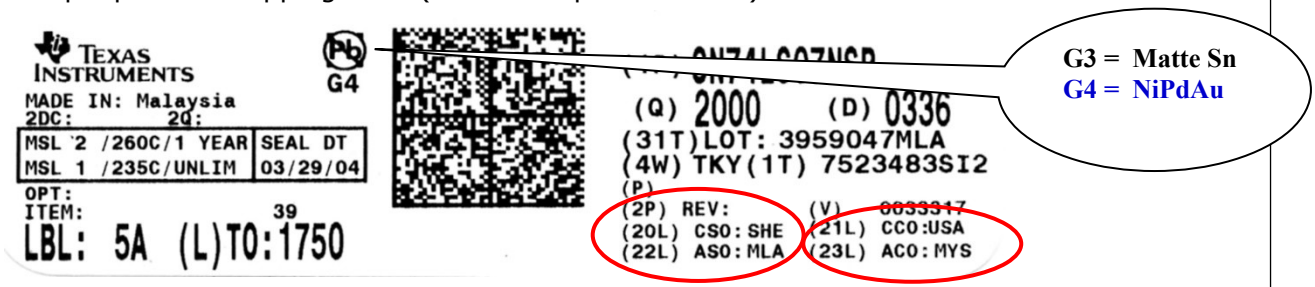
**Die Rev:**

| **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 Phillippines | PHI | PHL | Baguio City |
| **TI Chengdu** | **CDA** | **CHN** | **Chengdu** |

Sample product shipping label (not actual product label):




## Product Affected:

| | | |
|---|---|---|
| SN331QDBVRQ1 | TL331IDBVRQ1 | TL331QDBVRQ1 |

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

## Automotive Qualification Summary
## (As per AEC-Q100 Rev. H and JEDEC Guidelines)

## TL331QDBVRQ1 (TIB, PHI, Automotive)
## Approve Date 18-JANUARY -2024

### Product Attributes

| Attributes | Qual Device: TL331QDBVRQ1 | QBS Package Reference: TL331BQDBVRQ1 | QBS Process Reference: LM2902BQPWRQ1 | QBS Package Reference: TL391BQDBVRQ1 | QBS Process Reference: LM2901BQPWRQ1 |
|---|---|---|---|---|---|
| **Automotive Grade Level** | Grade 1 | Grade 1 | Grade 1 | Grade 1 | Grade 1 |
| **Operating Temp Range (C)** | -40 to 125 | -40 to 125 | -40 to 125 | -40 to 125 | -40 to 125 |
| **Product Function** | Signal Chain | Signal Chain | Signal Chain | Signal Chain | Signal Chain |
| **Wafer Fab Supplier** | RFAB | CFAB | RFAB | CFAB | RFAB |
| **Assembly Site** | PHI | PHI | MLA | PHI | MLA |
| **Package Group** | SOT | SOT | TSSOP | SOT | TSSOP |
| **Package Designator** | DBV | DBV | PW | DBV | PW |
| **Pin Count** | 5 | 5 | 14 | 5 | 14 |

- QBS: Qual By Similarity
- Qual Device TL331QDBVRQ1 is qualified at MSL1 260C

### Qualification Results

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

| Type | # | Test Spec | Min Lot Qty | SS / Lot | Test Name | Condition | Duration | Qual Device: TL331QDBVRQ1 | QBS Package Reference: TL331BQDBVRQ1 | QBS Process Reference: LM2902BQPWRQ1 | QBS Package Reference: TL391BQDBVRQ1 | QBS Process Reference: LM2901BQPWRQ1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Test Group A - Accelerated Environment Stress Tests** | | | | | | | | | | | | |
| PC | A1 | JEDEC J-STD-020 JESD22-A113 | 3 | 77 | Preconditioning | MSL1 260C | - | 1/308/0 | 1/308/0 | - | 2/616/0 | - |
| HAST | A2 | JEDEC JESD22-A110 | 3 | 77 | Biased HAST | 130C/85%RH | 96 Hours | 1/77/0 | 1/77/0 | - | 2/154/0 | - |
| AC/UHAST | A3 | JEDEC JESD22-A102/JEDEC JESD22-A118 | 3 | 77 | Unbiased HAST | 110C/85%RH | 264 Hours | - | - | - | - | - |
| AC/UHAST | A3 | JEDEC JESD22-A102/JEDEC JESD22-A118 | 3 | 77 | Unbiased HAST | 130C/85%RH | 96 Hours | 1/77/0 | 1/77/0 | - | 2/154/0 | - |
| TC | A4 | JEDEC JESD22-A104 and Appendix 3 | 3 | 77 | Temperature Cycle | -65C/150C | 500 Cycles | 1/77/0 | 1/77/0 | - | 2/154/0 | - |
| TC-BP | A4 | MIL-STD883 Method 2011 | 1 | 5 | Post Temp Cycle Bond Pull | - | - | 1/6/0 | - | - | - | - |
| HTSL | A6 | JEDEC JESD22-A103 | 1 | 45 | High Temperature Storage Life | 150C | 1000 Hours | - | 1/45/0 | - | 2/90/0 | - |
| HTSL | A6 | JEDEC JESD22-A103 | 1 | 45 | High Temperature Storage Life | 175C | 500 Hours | 1/77/0 | - | - | - | - |
| **Test Group B - Accelerated Lifetime Simulation Tests** | | | | | | | | | | | | |
| HTOL | B1 | JEDEC JESD22-A108 | 3 | 77 | Life Test | 150C | 300 Hours | 1/77/0 | - | - | - | 1/77/0 |
| HTOL | B1 | JEDEC JESD22-A108 | 3 | 77 | Life Test | 150C | 408 Hours | - | - | 3/231/0 | - | - |
| ELFR | B2 | AEC Q100-008 | 3 | 800 | Early Life Failure Rate | 125C | 48 Hours | - | - | 3/2400/0 | - | - |
| **Test Group C - Package Assembly Integrity Tests** | | | | | | | | | | | | |

| Type | # | Test Spec | Min Lot Qty | SS / Lot | Test Name | Condition | Duration | Qual Device: TL331QDBVRQ1 | QBS Package Reference: TL331BQDBVRQ1 | QBS Process Reference: LM2902BQPWRQ1 | QBS Package Reference: TL391BQDBVRQ1 | QBS Process Reference: LM2901BQPWRQ1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WBS | C1 | AEC Q100-001 | 1 | 30 | Wire Bond Shear | Minimum of 5 devices, 30 wires Cpk>1.67 | Wires | 1/30/0 | 1/30/0 | - | 2/60/0 | - |
| WBP | C2 | MIL-STD883 Method 2011 | 1 | 30 | Wire Bond Pull | Minimum of 5 devices, 30 wires Cpk>1.67 | Wires | 1/30/0 | 1/30/0 | - | 2/60/0 | - |
| SD | C3 | JEDEC J-STD-002 | 1 | 15 | PB Solderability | >95% Lead Coverage | - | 1/15/0 | 1/15/0 | - | - | - |
| SD | C3 | JEDEC J-STD-002 | 1 | 15 | PB-Free Solderability | >95% Lead Coverage | - | 1/15/0 | 1/15/0 | - | - | - |
| PD | C4 | JEDEC JESD22-B100 and B108 | 3 | 10 | Physical Dimensions | Cpk>1.67 | - | 1/10/0 | 1/10/0 | - | 2/20/0 | - |
| **Test Group D - Die Fabrication Reliability Tests** | | | | | | | | | | | | |
| EM | D1 | JESD61 | - | - | Electromigration | - | - | Completed Per Process Technology Requirements | - | - | - | - |
| TDDB | D2 | JESD35 | - | - | Time Dependent Dielectric Breakdown | - | - | Completed Per Process Technology Requirements | - | - | - | - |
| HCI | D3 | JESD60 & 28 | - | - | Hot Carrier Injection | - | - | Completed Per Process Technology Requirements | - | - | - | - |
| BTI | D4 | - | - | - | Bias Temperature Instability | - | - | Completed Per Process Technology Requirements | - | - | - | - |
| SM | D5 | - | - | - | Stress Migration | - | - | Completed Per Process Technology Requirements | - | - | - | - |
| **Test Group E - Electrical Verification Tests** | | | | | | | | | | | | |
| ESD | E2 | AEC Q100-002 | 1 | 3 | ESD HBM | - | 2000 Volts | 1/3/0 | - | - | - | - |
| ESD | E3 | AEC Q100-011 | 1 | 3 | ESD CDM | - | 1000 Volts | 1/3/0 | - | - | - | - |

| Type | # | Test Spec | Min Lot Qty | SS / Lot | Test Name | Condition | Duration | Qual Device: TL331QDBVRQ1 | QBS Package Reference: TL331BQDBVRQ1 | QBS Process Reference: LM2902BQPWRQ1 | QBS Package Reference: TL391BQDBVRQ1 | QBS Process Reference: LM2901BQPWRQ1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LU | E4 | AEC Q100-004 | 1 | 6 | Latch-Up | Per AEC Q100-004 | - | 1/6/0 | - | - | - | - |
| ED | E5 | AEC Q100-009 | 3 | 30 | Electrical Distributions | Cpk>1.67 Room, hot, and cold | - | 1/30/0 | - | - | - | 3/90/0 |
| **Additional Tests** | | | | | | | | | | | | |

- 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

**Ambient Operating Temperature by Automotive Grade Level:**

- Grade 0 (or E): -40C to +150C
- Grade 1 (or Q): -40C to +125C
- Grade 2 (or T): -40C to +105C
- Grade 3 (or I) : -40C to +85C

**E1 (TEST): Electrical test temperatures of Qual samples (High temperature according to Grade level):**

- Room/Hot/Cold : HTOL, ED
- Room/Hot : THB / HAST, TC / PTC, HTSL, ELFR, ESD & LU
- Room : AC/uHAST

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

TI Qualification ID: R-CHG-2301-058

Package cracked down the middle

# Automotive Qualification Summary
# (As per AEC-Q100 Rev. H and JEDEC Guidelines)

## TL331QDBVRQ1 (TIB, CDAT, Automotive)
## Approve Date 19-JANUARY -2024

### Product Attributes

| Attributes | Qual Device: TL331QDBVRQ1 | QBS Process Reference: LM2902BQPWRQ1 | QBS Product Reference: LM2901BQPWRQ1 |
|---|---|---|---|
| **Automotive Grade Level** | Grade 1 | Grade 1 | Grade 1 |
| **Operating Temp Range (C)** | -40 to 125 | -40 to 125 | -40 to 125 |
| **Product Function** | Signal Chain | Signal Chain | Signal Chain |
| **Wafer Fab Supplier** | RFAB | RFAB | RFAB |
| **Assembly Site** | CDAT | MLA | MLA |
| **Package Group** | SOT | TSSOP | TSSOP |
| **Package Designator** | DBV | PW | PW |
| **Pin Count** | 5 | 14 | 14 |

- QBS: Qual By Similarity
- Qual Device TL331QDBVRQ1 is qualified at MSL1 260C

### Qualification Results

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

| Type | # | Test Spec | Min Lot Qty | SS / Lot | Test Name | Condition | Duration | Qual Device: TL331QDBVRQ1 | QBS Process Reference: LM2902BQPWRQ1 | QBS Product Reference: LM2901BQPWRQ1 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Test Group A - Accelerated Environment Stress Tests** | | | | | | | | | | |
| PC | A1 | JEDEC J-STD-020 JESD22-A113 | 3 | 77 | Preconditioning | MSL1 260C | - | 3/924/0 | - | - |
| HAST | A2 | JEDEC JESD22-A110 | 3 | 77 | Biased HAST | 130C/85%RH | 96 Hours | 3/231/0 | - | - |
| AC/UHAST | A3 | JEDEC JESD22-A102/JEDEC JESD22-A118 | 3 | 77 | Unbiased HAST | 110C/85%RH | 264 Hours | - | - | - |
| AC/UHAST | A3 | JEDEC JESD22-A102/JEDEC JESD22-A118 | 3 | 77 | Unbiased HAST | 130C/85%RH | 96 Hours | 3/231/0 | - | - |
| TC | A4 | JEDEC JESD22-A104 and Appendix 3 | 3 | 77 | Temperature Cycle | -65C/150C | 500 Cycles | 3/231/0 | - | - |
| TC-BP | A4 | MIL-STD883 Method 2011 | 1 | 5 | Post Temp Cycle Bond Pull | - | - | 1/6/0 | - | - |
| HTSL | A6 | JEDEC JESD22-A103 | 1 | 45 | High Temperature Storage Life | 150C | 1000 Hours | - | - | - |
| HTSL | A6 | JEDEC JESD22-A103 | 1 | 45 | High Temperature Storage Life | 175C | 500 Hours | 1/45/0 | - | - |
| **Test Group B - Accelerated Lifetime Simulation Tests** | | | | | | | | | | |
| HTOL | B1 | JEDEC JESD22-A108 | 3 | 77 | Life Test | 150C | 300 Hours | 1/77/0 | - | 1/77/0 |
| HTOL | B1 | JEDEC JESD22-A108 | 3 | 77 | Life Test | 150C | 408 Hours | - | 3/231/0 | - |

| Type | # | Test Spec | Min Lot Qty | SS / Lot | Test Name | Condition | Duration | Qual Device: TL331QDBVRQ1 | QBS Process Reference: LM2902BQPWRQ1 | QBS Product Reference: LM2901BQPWRQ1 |
|---|---|---|---|---|---|---|---|---|---|---|
| ELFR | B2 | AEC Q100-008 | 3 | 800 | Early Life Failure Rate | 125C | 48 Hours | - | 3/2400/0 | - |
| **Test Group C - Package Assembly Integrity Tests** | | | | | | | | | | |
| WBS | C1 | AEC Q100-001 | 1 | 30 | Wire Bond Shear | Minimum of 5 devices, 30 wires Cpk>1.67 | Wires | 3/90/0 | - | - |
| WBP | C2 | MIL-STD883 Method 2011 | 1 | 30 | Wire Bond Pull | Minimum of 5 devices, 30 wires Cpk>1.67 | Wires | 3/90/0 | - | - |
| SD | C3 | JEDEC J-STD-002 | 1 | 15 | PB Solderability | >95% Lead Coverage | - | 1/15/0 | - | - |
| SD | C3 | JEDEC J-STD-002 | 1 | 15 | PB-Free Solderability | >95% Lead Coverage | - | 1/15/0 | - | - |
| PD | C4 | JEDEC JESD22-B100 and B108 | 3 | 10 | Physical Dimensions | Cpk>1.67 | - | 3/30/0 | - | - |
| **Test Group D - Die Fabrication Reliability Tests** | | | | | | | | | | |
| EM | D1 | JESD61 | - | - | Electromigration | - | - | Completed Per Process Technology Requirements | - | - |
| TDDB | D2 | JESD35 | - | - | Time Dependent Dielectric Breakdown | - | - | Completed Per Process Technology Requirements | - | - |
| HCI | D3 | JESD60 & 28 | - | - | Hot Carrier Injection | - | - | Completed Per Process Technology Requirements | - | - |
| BTI | D4 | - | - | - | Bias Temperature Instability | - | - | Completed Per Process Technology Requirements | - | - |

| Type | # | Test Spec | Min Lot Qty | SS / Lot | Test Name | Condition | Duration | Qual Device: TL331QDBVRQ1 | QBS Process Reference: LM2902BQPWRQ1 | QBS Product Reference: LM2901BQPWRQ1 |
|---|---|---|---|---|---|---|---|---|---|---|
| SM | D5 | - | - | - | Stress Migration | - | - | Completed Per Process Technology Requirements | - | - |
| **Test Group E - Electrical Verification Tests** | | | | | | | | | | |
| ESD | E2 | AEC Q100-002 | 1 | 3 | ESD HBM | - | 2000 Volts | 1/3/0 | - | - |
| ESD | E3 | AEC Q100-011 | 1 | 3 | ESD CDM | - | 1000 Volts | 1/3/0 | - | - |
| LU | E4 | AEC Q100-004 | 1 | 6 | Latch-Up | Per AEC Q100-004 | - | 1/6/0 | - | - |
| ED | E5 | AEC Q100-009 | 3 | 30 | Electrical Distributions | Cpk>1.67 Room, hot, and cold | - | 1/30/0 | - | 3/90/0 |
| **Additional Tests** | | | | | | | | | | |

- 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

- Grade 0 (or E): -40C to +150C
- Grade 1 (or Q): -40C to +125C
- Grade 2 (or T): -40C to +105C
- Grade 3 (or I) : -40C to +85C

**E1 (TEST): Electrical test temperatures of Qual samples (High temperature according to Grade level):**

- Room/Hot/Cold : HTOL, ED
- Room/Hot : THB / HAST, TC / PTC, HTSL, ELFR, ESD & LU
- Room : AC/uHAST

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

TI Qualification ID: R-CHG-2301-052

[1]-Units lost - QFLL closed
[2]-Unit lost - QFLL closed
[3]-Unit damaged prior to ATE
Package cracked down the middle

ZVEI IDs: SEM-DE-03, SEM-PW-02, SEM-PW-09, SEM-PW-13, SEM-PA-05, SEM-PA-18, SEM-PS-04, SEM-TF-01

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