

| PCN Number: | 20240529003.2 | PCN Date: | May 29, 2024 | | | | | | | | | | | | | | | | | | |
|--|--|---|---|---------|----------------|---------------------|--|--|------------------|---------|----------------|---------------------|---------|----------------|------|-----|--------|------|-----|--------|--|
| Title: | Qualification of RFAB using qualified Process Technology, Die Revision and Assembly BOM options for select devices | | | | | | | | | | | | | | | | | | | | |
| Customer Contact: | Change Management team | Dept: | Quality Services | | | | | | | | | | | | | | | | | | |
| Proposed 1st Ship Date: | November 25, 2024 | Sample requests accepted until: | June 28, 2024* | | | | | | | | | | | | | | | | | | |
| *Sample requests received after June 28, 2024 will not be supported. | | | | | | | | | | | | | | | | | | | | | |
| Change Type: | | | | | | | | | | | | | | | | | | | | | |
| <input type="checkbox"/> Assembly Site | <input checked="" type="checkbox"/> Design | <input type="checkbox"/> Wafer Bump Material | | | | | | | | | | | | | | | | | | | |
| <input checked="" type="checkbox"/> Assembly Process | <input type="checkbox"/> Data Sheet | <input type="checkbox"/> Wafer Bump Process | | | | | | | | | | | | | | | | | | | |
| <input checked="" type="checkbox"/> Assembly Materials | <input type="checkbox"/> Part number change | <input checked="" type="checkbox"/> Wafer Fab Site | | | | | | | | | | | | | | | | | | | |
| <input type="checkbox"/> Mechanical Specification | <input type="checkbox"/> Test Site | <input checked="" type="checkbox"/> Wafer Fab Materials | | | | | | | | | | | | | | | | | | | |
| <input checked="" type="checkbox"/> Packing/Shipping/Labeling | <input type="checkbox"/> Test Process | <input checked="" type="checkbox"/> Wafer Fab Process | | | | | | | | | | | | | | | | | | | |
| PCN Details | | | | | | | | | | | | | | | | | | | | | |
| Description of Change: | | | | | | | | | | | | | | | | | | | | | |
| Texas Instruments is pleased to announce the addition of RFAB using the TIB qualified process technology and additional Assembly BOM options for the devices listed below. | | | | | | | | | | | | | | | | | | | | | |
| <table border="1"> <thead> <tr> <th colspan="3">Current Fab Site</th> <th colspan="3">Additional Fab Site</th> </tr> <tr> <th>Current Fab Site</th> <th>Process</th> <th>Wafer Diameter</th> <th>Additional Fab Site</th> <th>Process</th> <th>Wafer Diameter</th> </tr> </thead> <tbody> <tr> <td>SFAB</td> <td>J11</td> <td>150 mm</td> <td>RFAB</td> <td>TIB</td> <td>300 mm</td> </tr> </tbody> </table> | | | Current Fab Site | | | Additional Fab Site | | | Current Fab Site | Process | Wafer Diameter | Additional Fab Site | Process | Wafer Diameter | SFAB | J11 | 150 mm | RFAB | TIB | 300 mm | |
| Current Fab Site | | | Additional Fab Site | | | | | | | | | | | | | | | | | | |
| Current Fab Site | Process | Wafer Diameter | Additional Fab Site | Process | Wafer Diameter | | | | | | | | | | | | | | | | |
| SFAB | J11 | 150 mm | RFAB | TIB | 300 mm | | | | | | | | | | | | | | | | |
| The die was also changed as a result of the process change. | | | | | | | | | | | | | | | | | | | | | |
| Construction differences are as follows: | | | | | | | | | | | | | | | | | | | | | |
| | Current | Proposed | | | | | | | | | | | | | | | | | | | |
| Wire diam/type | 1.15mil Au | 1.0mil Cu | | | | | | | | | | | | | | | | | | | |
| Mount compound | 4042500 | 4147858 | | | | | | | | | | | | | | | | | | | |
| Mold compound | 4206193 | 4211471 | | | | | | | | | | | | | | | | | | | |
| Marking differences | <div> U2003AT \TI/ YMSG4 LLLL O </div> <div> \TI/ = TI LOGO G4 = ECAT O = PIN 1 DIMPLE </div> | <div> U2003AT TI YMS LLLL O (CAV) </div> <div> TI = TI LETTER CAV = CAVITY NUMBER O = PIN 1 DOT </div> | | | | | | | | | | | | | | | | | | | |
| 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 and 200-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 |
|-------------|-----------------------------|------------------------------|-------------------|
| SH-BIP-1 | SHE | USA | Sherman |
| RFAB | RFB | USA | Richardson |

Die Rev:

Current

New

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

Sample product shipping label (not actual product label)



Product Affected:

ULQ2003ATPWRQ1

For alternate parts with similar or improved performance, please visit the product page on [TI.com](https://www.ti.com)

TI Information
Selective Disclosure

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

ULQ2003ATPWRQ1 MLA Qual
Approve Date 03-May-2024

Product Attributes

| Attributes | Qual Device: ULQ2003ATPWRQ1 | QBS Package Reference: SN3257QFWRQ1 | QBS Process Reference: MC33063AQDRQ1 | QBS Process, Product Reference: ULQ2003AQDRQ1 | QBS Package Reference: CD4051BQFWRQ1 |
|--------------------------|--------------------------------|--|---|--|---|
| Automotive Grade Level | Grade 2 | Grade 1 | Grade 1 | Grade 1 | Grade 1 |
| Operating Temp Range (C) | -40 to 105 | -40 to 125 | -40 to 125 | -40 to 125 | -40 to 125 |
| Product Function | Power Management | Logic | Power Management | Power Management | Interface |
| Wafer Fab Supplier | RFAB | RFAB | RFAB | RFAB | RFAB |
| Assembly Site | MLA | MLA | FMX | FMX | MLA |
| Package Group | TSSOP | - | SOIC | SOIC | TSSOP |
| Package Designator | PW | PW | D | D | PW |
| Pin Count | 16 | 16 | 8 | 16 | 16 |

- QBS: Qual By Similarity
- Qual Device ULQ2003ATPWRQ1 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: ULQ2003ATPWRQ1 | QBS Package Reference: SN3257QFWRQ1 | QBS Process Reference: MC33063AQDRQ1 | QBS Process, Product Reference: ULQ2003AQDRQ1 | QBS Package Reference: CD4051BQFWRQ1 |
|--|----|-------------------------------------|-------------|----------|-------------------------------|---|-------------|--|--|---|--|---|
| Test Group A - Accelerated Environment Stress Tests | | | | | | | | | | | | |
| PC | A1 | JEDEC J-STD-020 JESD22-A113 | 3 | 77 | Preconditioning | MSL1 260C | - | 1/0/0 | 3/0/0 | 3/0/0 | 1/0/0 | 1/0/0 |
| HAST | A2 | JEDEC JESD22-A110 | 3 | 77 | Biased HAST | 130C | 96 Hours | - | 3/231/0 | - | - | - |
| HAST | A2 | JEDEC JESD22-A110 | 3 | 77 | Biased HAST | 130C/85%RH | 96 Hours | 1/77/0 | - | 3/231/0 | 1/77/0 | 1/77/0 |
| AC/UHAST | A3 | JEDEC JESD22-A102/JEDEC JESD22-A118 | 3 | 77 | Autoclave | 121C/15psig | 96 Hours | - | 3/231/0 | - | 1/77/0 | - |
| AC/UHAST | A3 | JEDEC JESD22-A102/JEDEC JESD22-A118 | 3 | 77 | Unbiased HAST | 130C/85%RH | 96 Hours | 1/77/0 | - | 3/231/0 | - | 1/77/0 |
| TC | A4 | JEDEC JESD22-A104 and Appendix 3 | 3 | 77 | Temperature Cycle | -55/150C | 1000 Cycles | - | 3/231/0 | - | - | - |
| TC | A4 | JEDEC JESD22-A104 and Appendix 3 | 3 | 77 | Temperature Cycle | -55C/125C | 1000 Cycles | 1/77/0 | - | - | - | - |
| TC | A4 | JEDEC JESD22-A104 and Appendix 3 | 3 | 77 | Temperature Cycle | -65C/150C | 500 Cycles | - | - | 3/231/0 | 1/77/0 | 1/77/0 |
| TC-BP | A4 | MIL-STD883 Method 2011 | 1 | 5 | Post Temp Cycle Bond Pull | - | - | 1/5/0 | - | - | 1/5/0 | 1/5/0 |
| PTC | A5 | JEDEC JESD22-A105 | 1 | 45 | PTC | -40/125C | 1000 Cycles | - | - | - | 1/45/0 | - |
| HTSL | A6 | JEDEC JESD22-A103 | 1 | 45 | High Temperature Storage Life | 150C | 1000 Hours | - | - | 3/135/0 | 1/45/0 | 1/45/0 |
| Type | # | Test Spec | Min Lot Qty | SS / Lot | Test Name | Condition | Duration | Qual Device: ULQ2003ATPWRQ1 | QBS Package Reference: SN3257QFWRQ1 | QBS Process Reference: MC33063AQDRQ1 | QBS Process, Product Reference: ULQ2003AQDRQ1 | QBS Package Reference: CD4051BQFWRQ1 |
| HTSL | A6 | JEDEC JESD22-A103 | 1 | 45 | High Temperature Storage Life | 150C | 500 Hours | 1/45/0 | - | - | - | - |
| HTSL | A6 | JEDEC JESD22-A103 | 1 | 45 | High Temperature Storage Life | 175C | 500 Hours | - | 3/135/0 | - | - | - |
| Test Group B - Accelerated Lifetime Simulation Tests | | | | | | | | | | | | |
| HTOL | B1 | JEDEC JESD22-A108 | 3 | 77 | Life Test | 125C | 1000 Hours | - | - | 3/231/0 | - | 1/77/0 |
| HTOL | B1 | JEDEC JESD22-A108 | 3 | 77 | Life Test | 150C | 300 Hours | - | 3/231/0 | - | 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 | | | | | | | | | | | | |
| WBS | C1 | AEC Q100-001 | 1 | 30 | Wire Bond Shear | Minimum of 5 devices, 30 wires Cpk>1.67 | Wires | 1/30/0 | 3/90/0 | 3/90/0 | 1/30/0 | 1/30/0 |
| WBP | C2 | MIL-STD883 Method 2011 | 1 | 30 | Wire Bond Pull | Minimum of 5 devices, 30 wires Cpk>1.67 | Wires | 1/30/0 | 3/90/0 | 3/90/0 | 1/30/0 | 1/30/0 |
| SD | C3 | JEDEC J-STD-002 | 1 | 15 | PB Solderability | >95% Lead Coverage | - | - | 1/15/0 | 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 | 1/15/0 | 1/15/0 | - |
| PD | C4 | JEDEC JESD22-B100 and B108 | 3 | 10 | Physical Dimensions | Cpk>1.67 | - | 1/10/0 | 3/30/0 | 3/30/0 | 1/10/0 | 1/10/0 |
| Test Group D - Die Fabrication Reliability Tests | | | | | | | | | | | | |
| EM | D1 | JESD61 | - | - | Electromigration | - | - | Completed Per Process Technology Requirements | Completed Per Process Technology Requirements | Completed Per Process Technology Requirements | Completed Per Process Technology Requirements | Completed Per Process Technology Requirements |

| Type | # | Test Spec | Min Lot Qty | SS / Lot | Test Name | Condition | Duration | Qual Device: UL Q2003ATPWRQ1 | QBS Package Reference: SN3257QFWRQ1 | QBS Process Reference: MC33063AQDRQ1 | QBS Process, Product Reference: ULQ2003AQDRQ1 | QBS Package Reference: CD4051BQFWRQ1 |
|--|----|--------------|-------------|----------|-------------------------------------|------------------------------|------------|---|--|---|--|---|
| TDD8 | D2 | JESD35 | - | - | Time Dependent Dielectric Breakdown | - | - | Completed Per Process Technology Requirements | Completed Per Process Technology Requirements | Completed Per Process Technology Requirements | Completed Per Process Technology Requirements | Completed Per Process Technology Requirements |
| HCI | D3 | JESD60 & 28 | - | - | Hot Carrier Injection | - | - | Completed Per Process Technology Requirements | Completed Per Process Technology Requirements | Completed Per Process Technology Requirements | Completed Per Process Technology Requirements | Completed Per Process Technology Requirements |
| BTI | D4 | - | - | - | Bias Temperature Instability | - | - | Completed Per Process Technology Requirements | Completed Per Process Technology Requirements | Completed Per Process Technology Requirements | Completed Per Process Technology Requirements | Completed Per Process Technology Requirements |
| SM | D5 | - | - | - | Stress Migration | - | - | Completed Per Process Technology Requirements | Completed Per Process Technology Requirements | Completed Per Process Technology Requirements | Completed Per Process Technology Requirements | 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 | - | 1/3/0 | 1/3/0 | 1/3/0 |
| ESD | E2 | AEC Q100-002 | 1 | 3 | ESD HBM | - | 5000 Volts | - | 1/3/0 | - | - | - |
| ESD | E3 | AEC Q100-011 | 1 | 3 | ESD CDM | - | 2000 Volts | - | 1/3/0 | - | - | - |
| ESD | E3 | AEC Q100-011 | 1 | 3 | ESD CDM | - | 500 Volts | 1/3/0 | - | 1/3/0 | 1/3/0 | 1/3/0 |
| LU | E4 | AEC Q100-004 | 1 | 6 | Latch-Up | Per AEC Q100-004 | - | - | 1/6/0 | 1/6/0 | 1/6/0 | 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 | 3/90/0 | 3/90/0 | 1/30/0 |
| 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-2305-088

Automotive New Product Qualification Summary
(As per AEC-Q100, AEC-Q006, and JEDEC Guidelines)

(REDBULL) CD4051BQPWRQ1 (16PW, TSSOP) die rev, LF and wire change @ MLA
Approve Date 20-March-2023

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: CD4051BQPWRQ1 | QBS Reference: TCA6408AQWRQ1 | QBS Reference: TMUX4051PWRQ1 (PG1.0) | QBS Reference: TMUX4052PWRQ1 (PG1.0) | QBS Reference: TMUX4051PWRQ1 (PG2.0) | QBS Reference: TMUX4052PWRQ1 (PG2.0) |
|---|----|----------------------------|-------------|----------|---------------------------------------|---|------------|---|---|---|---|---|---|
| Test Group A - Accelerated Environment Stress Tests | | | | | | | | | | | | | |
| Test Group B - Accelerated Lifetime Simulation Tests | | | | | | | | | | | | | |
| HTOL | B1 | JEDEC JESD22-A108 | 1 | 77 | Life Test | 125C | 1000 Hours | 1/77/0 | 1/77/0 | - | - | - | - |
| HTOL | B1 | JEDEC JESD22-A108 | 1 | 77 | Life Test | 150C | 300 Hours | - | - | - | - | 1/77/0 | - |
| 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 | 1/30/0 | 1/5/0 | 2/60/0 | 1/30/0 | - | - |
| WBP | C2 | MIL-STD883 Method 2011 | 1 | 30 | Wire Bond Pull | Minimum of 5 devices, 30 wires Cpk>1.67 | Wires | 1/30/0 | 1/5/0 | 2/60/0 | 1/30/0 | - | - |
| PD | C4 | JEDEC JESD22-B100 and B108 | 1 | 10 | Physical Dimensions | Cpk>1.67 | - | 1/10/0 | 3/30/0 | 2/20/0 | 1/10/0 | - | - |
| Test Group D - Die Fabrication Reliability Tests | | | | | | | | | | | | | |
| EM | D1 | JESD61 | - | - | Electromigration | - | - | Completed Per Process Technology Requirements | Completed Per Process Technology Requirements | Completed Per Process Technology Requirements | Completed Per Process Technology Requirements | Completed Per Process Technology Requirements | Completed Per Process Technology Requirements |
| TDD | D2 | JESD35 | - | - | Time Dependent Dielectric Breakdown | - | - | Completed Per Process Technology Requirements | Completed Per Process Technology Requirements | Completed Per Process Technology Requirements | Completed Per Process Technology Requirements | Completed Per Process Technology Requirements | Completed Per Process Technology Requirements |
| HCI | D3 | JESD60 & 28 | - | - | Hot Carrier Injection | - | - | Completed Per Process Technology Requirements | Completed Per Process Technology Requirements | Completed Per Process Technology Requirements | Completed Per Process Technology Requirements | Completed Per Process Technology Requirements | Completed Per Process Technology Requirements |
| NBTI | D4 | - | - | - | Negative Bias Temperature Instability | - | - | Completed Per Process Technology Requirements | Completed Per Process Technology Requirements | Completed Per Process Technology Requirements | Completed Per Process Technology Requirements | Completed Per Process Technology Requirements | Completed Per Process Technology Requirements |
| SM | D5 | - | - | - | Stress Migration | - | - | Completed Per Process Technology Requirements | Completed Per Process Technology Requirements | Completed Per Process Technology Requirements | Completed Per Process Technology Requirements | Completed Per Process Technology Requirements | 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 | - | - | - | 1/3/0 | 1/3/0 |
| ESD | E2 | AEC Q100-002 | 1 | 3 | ESD HBM | - | 4000 Volts | - | 1/3/0 | - | - | - | - |
| ESD | E3 | AEC Q100-011 | 1 | 3 | ESD CDM | - | 1500 Volts | - | 1/3/0 | - | - | - | - |
| ESD | E3 | AEC Q100-011 | 1 | 3 | ESD CDM | - | 500 Volts | 1/3/0 | - | - | - | 1/3/0 | 1/3/0 |
| LU | E4 | AEC Q100-004 | 1 | 6 | Latch-Up | Per AEC Q100-004 | - | 1/6/0 | 1/6/0 | - | - | 1/6/0 | 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 | 1/30/0 | - | 1/30/0 | 1/30/0 |

- QBS: Qual By Similarity
- Qual Device CD4051BQPWRQ1 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
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- 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-2303-034

ZVEI ID's: SEM-DE-03, SEM-PW-02, SEM-PW-09, SEM-PW-13, SEM-PA-08, SEM-PA-05, SEM-PA-11, SEM-PA-13

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