




| <b>PCN Number:</b>   | 20240221008.1   | <b>PCN Date:</b>                                       | February 21, 2024   |         |                |                     |  |  |          |         |                |          |         |                |        |       |        |      |      |        |      |       |        |  |
|--|---|--|---------------------|---------|----------------|---------------------|--|--|----------|---------|----------------|----------|---------|----------------|--------|-------|--------|------|------|--------|------|-------|--------|--|
| <b>Title:</b>  | Qualification of RFAB using qualified Process Technology, Die Revision, Datasheet and additional Assembly site options for select devices |  |                     |         |                |                     |  |  |          |         |                |          |         |                |        |       |        |      |      |        |      |       |        |  |
| <b>Customer Contact:</b>   | Change Management Team  | <b>Dept:</b>   | Quality Services    |         |                |                     |  |  |          |         |                |          |         |                |        |       |        |      |      |        |      |       |        |  |
| <b>Proposed 1<sup>st</sup> Ship Date:</b>  | May 21, 2024  | <b>Sample requests accepted until:</b>                 | March 22, 2024*     |         |                |                     |  |  |          |         |                |          |         |                |        |       |        |      |      |        |      |       |        |  |
| <b>*Sample requests received after March 22, 2024 will not be supported.</b>   |   |  |                     |         |                |                     |  |  |          |         |                |          |         |                |        |       |        |      |      |        |      |       |        |  |
| <b>Change Type:</b>  |   |  |                     |         |                |                     |  |  |          |         |                |          |         |                |        |       |        |      |      |        |      |       |        |  |
| <input checked="" type="checkbox"/> Assembly Site  | <input checked="" type="checkbox"/> Design  | <input type="checkbox"/> Wafer Bump Material           |                     |         |                |                     |  |  |          |         |                |          |         |                |        |       |        |      |      |        |      |       |        |  |
| <input type="checkbox"/> Assembly Process  | <input checked="" type="checkbox"/> Data Sheet  | <input type="checkbox"/> Wafer Bump Process            |                     |         |                |                     |  |  |          |         |                |          |         |                |        |       |        |      |      |        |      |       |        |  |
| <input 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 Material |                     |         |                |                     |  |  |          |         |                |          |         |                |        |       |        |      |      |        |      |       |        |  |
| <input checked="" type="checkbox"/> Packing/Shipping/Labeling  | <input type="checkbox"/> Test Process   | <input checked="" type="checkbox"/> Wafer Fab Process  |                     |         |                |                     |  |  |          |         |                |          |         |                |        |       |        |      |      |        |      |       |        |  |
| <b>PCN Details</b>   |   |  |                     |         |                |                     |  |  |          |         |                |          |         |                |        |       |        |      |      |        |      |       |        |  |
| <b>Description of Change:</b>  |   |  |                     |         |                |                     |  |  |          |         |                |          |         |                |        |       |        |      |      |        |      |       |        |  |
| 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 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>Fab Site</th> <th>Process</th> <th>Wafer Diameter</th> <th>Fab Site</th> <th>Process</th> <th>Wafer Diameter</th> </tr> </thead> <tbody> <tr> <td>DL-LIN</td> <td>LBC3S</td> <td>200 mm</td> <td rowspan="2">RFAB</td> <td rowspan="2">LBC7</td> <td rowspan="2">300 mm</td> </tr> <tr> <td>CFAB</td> <td>LBC3S</td> <td>200 mm</td> </tr> </tbody> </table> |   |  | Current Fab Site    |         |                | Additional Fab Site |  |  | Fab Site | Process | Wafer Diameter | Fab Site | Process | Wafer Diameter | DL-LIN | LBC3S | 200 mm | RFAB | LBC7 | 300 mm | CFAB | LBC3S | 200 mm |  |
| Current Fab Site   |   |  | Additional Fab Site |         |                |                     |  |  |          |         |                |          |         |                |        |       |        |      |      |        |      |       |        |  |
| Fab Site   | Process   | Wafer Diameter   | Fab Site            | Process | Wafer Diameter |                     |  |  |          |         |                |          |         |                |        |       |        |      |      |        |      |       |        |  |
| DL-LIN   | LBC3S   | 200 mm   | RFAB                | LBC7    | 300 mm         |                     |  |  |          |         |                |          |         |                |        |       |        |      |      |        |      |       |        |  |
| CFAB   | LBC3S   | 200 mm   |                     |         |                |                     |  |  |          |         |                |          |         |                |        |       |        |      |      |        |      |       |        |  |
| The die was also changed as a result of the process change.  |   |  |                     |         |                |                     |  |  |          |         |                |          |         |                |        |       |        |      |      |        |      |       |        |  |
| There are no construction differences, but only additional assembly site qualifications for some of the devices. Please see product affected section below for details.  |   |  |                     |         |                |                     |  |  |          |         |                |          |         |                |        |       |        |      |      |        |      |       |        |  |
| The datasheets will be changing as a result of the above mentioned changes. The datasheet change details can be reviewed in the datasheet revision history. The link to the revised datasheet is available in the table below.   |   |  |                     |         |                |                     |  |  |          |         |                |          |         |                |        |       |        |      |      |        |      |       |        |  |
| <div>  <div style="float: right; text-align: right;"> <b>MAX232</b><br/> SLLS047N – FEBRUARY 1989 – REVISED FEBRUARY 2024 </div> </div>   |   |  |                     |         |                |                     |  |  |          |         |                |          |         |                |        |       |        |      |      |        |      |       |        |  |
| <b>Changes from Revision M (November 2004) to Revision N (February 2024)</b>   |   |  | <b>Page</b>         |         |                |                     |  |  |          |         |                |          |         |                |        |       |        |      |      |        |      |       |        |  |
| • Changed the Handling Ratings table to the <i>ESD Ratings</i> table.....  |   |  | 4                   |         |                |                     |  |  |          |         |                |          |         |                |        |       |        |      |      |        |      |       |        |  |
| • Changed the <i>Thermal Information</i> table.....  |   |  | 4                   |         |                |                     |  |  |          |         |                |          |         |                |        |       |        |      |      |        |      |       |        |  |
| <hr/>  |   |  |                     |         |                |                     |  |  |          |         |                |          |         |                |        |       |        |      |      |        |      |       |        |  |
| <div>  <div style="float: right; text-align: right;"> <b>MAX202</b><br/> SLLS576G – JULY 2003 – REVISED FEBRUARY 2024 </div> </div>   |   |  |                     |         |                |                     |  |  |          |         |                |          |         |                |        |       |        |      |      |        |      |       |        |  |
| <b>Changes from Revision F (September 2016) to Revision G (February 2024)</b>  |   |  | <b>Page</b>         |         |                |                     |  |  |          |         |                |          |         |                |        |       |        |      |      |        |      |       |        |  |
| • Changed the <i>Package Information</i> table.....  |   |  | 1                   |         |                |                     |  |  |          |         |                |          |         |                |        |       |        |      |      |        |      |       |        |  |
| • Changed values in the <i>Thermal Information</i> table.....  |   |  | 4                   |         |                |                     |  |  |          |         |                |          |         |                |        |       |        |      |      |        |      |       |        |  |
| <hr/>  |   |  |                     |         |                |                     |  |  |          |         |                |          |         |                |        |       |        |      |      |        |      |       |        |  |
| <div>  <div style="float: right; text-align: right;"> <b>MAX232E</b><br/> SLLS723D – APRIL 2006 – REVISED FEBRUARY 2024 </div> </div>   |   |  |                     |         |                |                     |  |  |          |         |                |          |         |                |        |       |        |      |      |        |      |       |        |  |
| <b>Changes from Revision C (August 2016) to Revision D (February 2024)</b>   |   |  | <b>Page</b>         |         |                |                     |  |  |          |         |                |          |         |                |        |       |        |      |      |        |      |       |        |  |
| • Changed the Device Information table to the <i>Package Information</i> table.....  |   |  | 1                   |         |                |                     |  |  |          |         |                |          |         |                |        |       |        |      |      |        |      |       |        |  |
| • Changed the <i>Thermal Information</i> table.....  |   |  | 5                   |         |                |                     |  |  |          |         |                |          |         |                |        |       |        |      |      |        |      |       |        |  |

| Changes from Revision D (March 2021) to Revision E (February 2024)                                    | Page |
|---|------|
| • Changed the numbering format for tables, figures, and cross-references throughout the document..... | 1    |

| Changes from Revision E (November 2016) to Revision F (February 2024) | Page |
|---|------|
| • Changed the <i>Package Information</i> table.....                   | 1    |
| • Changed the <i>Thermal Information</i> table.....                   | 5    |

| Product Folder | Current Datasheet Number | New Datasheet Number | Link to full datasheet  |
|----------------|--------------------------|----------------------|---|
| MAX232         | SLLS047M                 | SLLS047N             | <a href="http://www.ti.com/product/MAX232">http://www.ti.com/product/MAX232</a>   |
| MAX202         | SLLS576F                 | SLLS576G             | <a href="http://www.ti.com/product/MAX202">http://www.ti.com/product/MAX202</a>   |
| MAX232E        | SLLS723C                 | SLLS723D             | <a href="http://www.ti.com/product/MAX232E">http://www.ti.com/product/MAX232E</a> |
| TRS232E        | SLLS791C                 | SLLS791D             | <a href="http://www.ti.com/product/TRS232E">http://www.ti.com/product/TRS232E</a> |
| TRS202E        | SLLS847E                 | SLLS847F             | <a href="http://www.ti.com/product/TRS202E">http://www.ti.com/product/TRS202E</a> |

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 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    |
|-------------|-----------------------------|------------------------------|-------------------|
| CFAB        | CU3                         | CHN                          | Chengdu           |
| DL-LIN      | DLN                         | USA                          | Dallas            |
| <b>RFAB</b> | <b>RFB</b>                  | <b>USA</b>                   | <b>Richardson</b> |

##### Die Rev:

| Current      | New                 |
|--------------|---------------------|
| Die Rev [2P] | <b>Die Rev [2P]</b> |
| A, B, -      | -                   |

##### Assembly Site Information:

| Assembly Site    | Assembly Site Origin (22L) | Assembly Country Code (23L) | Assembly City         |
|------------------|----------------------------|-----------------------------|-----------------------|
| ASESH            | ASH                        | CHN                         | Shanghai              |
| <b>TI Mexico</b> | <b>MEX</b>                 | <b>MEX</b>                  | <b>Aguascalientes</b> |
| <b>MLA</b>       | <b>MLA</b>                 | <b>MYS</b>                  | <b>Kuala Lumpur</b>   |

Sample product shipping label (not actual product label):



#### Product Affected:

##### Group 1 Device Table (RFAB/Process migration only):

|             |             |             |             |
|-------------|-------------|-------------|-------------|
| MAX202IDR   | MAX232EIN   | MAX232IDR   | MAX232NSR   |
| MAX202IDRE4 | MAX232EINE4 | MAX232IDRG4 | TRS202EIPWR |
| MAX202IDWR  | MAX232EIPWR | MAX232IDWR  | TRS232EIDWR |
| MAX202IPWR  |             |             |             |

##### Group 2 Device Table (RFAB/Process migration plus TI Mexico as additional Assembly site):

|          |            |            |            |
|----------|------------|------------|------------|
| MAX232DR | MAX232ECDR | MAX232EIDR | TRS202EIDR |
|----------|------------|------------|------------|

##### Group 3 Device Table (RFAB/Process migration plus TI Malaysia as additional Assembly site):

|         |           |
|---------|-----------|
| MAX232N | MAX232NE4 |
|---------|-----------|

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

## Qualification Results

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

| Type  | #  | Test Name                     | Condition   | Duration   | Qual Device: CD4051BM96 | Qual Device: CD4052BM96 | Qual Device: CD4053BM96 | QBS Reference (Process, Product): TMUX4051PWR | QBS Reference (Process, Product): TP525221D6VR | QBS Reference (Process, Product): TMUX4053PWR | QBS Reference (Package): ULQ200SAQDRQ1 | QBS Reference (Package): MC3395AADR | QBS Reference (Process, Product): TMUX4051PWRQ1 | QBS Reference (Process, Product): TMUX4053PWRQ1 | QBS Reference (Process, Product): TMUX4053PWR |
|-------|----|-------------------------------|---|------------|-------------------------|-------------------------|-------------------------|---|--|---|--|-------------------------------------|---|---|---|
| HAST  | A2 | Biased HAST                   | 130C/85%RH  | 96 Hours   | -                       | -                       | -                       | -   | -  | -   | 3/231/0                                | 3/231/0                             | -   | -   | -   |
| UHAST | A3 | Autoclave                     | 121C/15psig   | 96 Hours   | -                       | -                       | -                       | -   | -  | -   | 3/231/0                                | -                                   | -   | -   | -   |
| UHAST | A3 | Unbiased HAST                 | 130C/85%RH  | 96 Hours   | -                       | -                       | -                       | -   | -  | -   | -                                      | 3/231/0                             | -   | -   | -   |
| TC    | A4 | Temperature Cycle             | -65C/150C   | 500 Cycles | -                       | -                       | -                       | -   | -  | -   | 3/231/0                                | 3/231/0                             | -   | -   | -   |
| HTSL  | A6 | High Temperature Storage Life | 150C  | 1000 Hours | -                       | -                       | -                       | -   | -  | -   | 3/135/0                                | -                                   | -   | -   | -   |
| HTSL  | A6 | High Temperature Storage Life | 170C  | 420 Hours  | -                       | -                       | -                       | -   | -  | -   | -                                      | 3/231/0                             | -   | -   | -   |
| HTOL  | B1 | Life Test                     | 140C  | 480 Hours  | -                       | -                       | -                       | -   | 3/231/0  | -   | -                                      | -                                   | -   | -   | -   |
| HTOL  | B1 | Life Test                     | 150C  | 300 Hours  | -                       | -                       | -                       | -   | -  | -   | -                                      | -                                   | 1/77/0  | -   | -   |
| ELFR  | B2 | Early Life Failure Rate       | 125C  | 48 Hours   | -                       | -                       | -                       | -   | 3/2400/0                                       | -   | -                                      | -                                   | -   | -   | -   |
| 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                       | -   | 250 Volts  | 1/3/0                   | -                       | -                       | -   | -  | -   | -                                      | -                                   | -   | -   | -   |
| ESD   | E2 | ESD HBM                       | -   | 1000 Volts | 1/3/0                   | -                       | -                       | -   | -  | -   | -                                      | -                                   | -   | -   | -   |
| LU    | E4 | Latch-Up                      | Per JESD78  | -          | -                       | -                       | -                       | 1/3/0   | -  | -   | -                                      | -                                   | 1/6/0   | 1/6/0   | 1/3/0   |
| CHAR  | E5 | Electrical Characterization   | Per Datasheet Parameters                            | -          | 1/30/0                  | 1/30/0                  | 1/30/0                  | 1/30/0  | -  | 1/30/0  | -                                      | -                                   | 1/30/0  | 1/30/0  | 1/30/0  |

- QBS: Qual By Similarity
- Qual Device CD4051BM96 is qualified at MSL1 260C
- Qual Device CD4052BM96 is qualified at MSL1 260C
- Qual Device CD4053BM96 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-2110-063

## Qualification Results

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

| Type  | #  | Test Name                     | Condition                | Duration   | Qual Device: CD4051BNSR | Qual Device: CD4052BNSR | Qual Device: CD4053BNSR | QBS Reference (Package): TL092CPS | QBS Reference (Package): SN75ALS1177NS | QBS Reference (Process, Product): TMUX4053PWR | QBS Reference (Package): AMP6LS32ACN | QBS Reference (Process, Product): TMUX4051PWRQ1 | QBS Reference (Process, Product): TMUX4052PWRQ1 |
|-------|----|-------------------------------|--------------------------|------------|-------------------------|-------------------------|-------------------------|-----------------------------------|--|---|--------------------------------------|---|---|
| UHAST | A3 | Autoclave                     | 121C/15psig              | 96 Hours   | -                       | -                       | -                       | 3/230/0                           | 3/231/0                                | -   | -                                    | -   | -   |
| TC    | A4 | Temperature Cycle             | -65C/150C                | 500 Cycles | -                       | -                       | -                       | 3/231/0                           | 3/231/0                                | -   | -                                    | -   | -   |
| HTSL  | A6 | High Temperature Storage Life | 170C                     | 420 Hours  | -                       | -                       | -                       | 3/231/0                           | -                                      | -   | -                                    | -   | -   |
| HTOL  | B1 | Life Test                     | 150C                     | 300 Hours  | -                       | -                       | -                       | -                                 | -                                      | -   | -                                    | 1/77/0  | -   |
| WBS   | C1 | Ball Shear                    | 76 balls, 3 units min    | Wires      | -                       | -                       | -                       | -                                 | -                                      | 1/76/0  | 1/76/0                               | -   | -   |
| WBP   | C2 | Bond Pull                     | 76 Wires, 3 units min    | Wires      | -                       | -                       | -                       | -                                 | -                                      | 1/76/0  | 1/76/0                               | -   | -   |
| ESD   | E2 | ESD CDM                       | -                        | 250 Volts  | 1/3/0                   | -                       | -                       | -                                 | -                                      | -   | -                                    | -   | -   |
| ESD   | E2 | ESD HBM                       | -                        | 1000 Volts | 1/3/0                   | -                       | -                       | -                                 | -                                      | -   | -                                    | -   | -   |
| LU    | E4 | Latch-Up                      | Per JESD78               | -          | -                       | -                       | -                       | -                                 | -                                      | -   | -                                    | 1/6/0   | 1/6/0   |
| CHAR  | E5 | Electrical Characterization   | Per Datasheet Parameters | -          | 1/10/0                  | 1/10/0                  | 1/10/0                  | -                                 | -                                      | -   | -                                    | -   | -   |
| FTY   | E6 | Final Test Yield              | -                        | -          | -                       | -                       | -                       | -                                 | -                                      | -   | 1/1/0                                | -   | -   |

- QBS: Qual By Similarity
- Qual Device CD4051BNSR is qualified at MSL1 260C
- Qual Device CD4052BNSR is qualified at MSL1 260C
- Qual Device CD4053BNSR 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-2308-005

## Qualification Results

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

| Type | #  | Test Name                     | Condition             | Duration   | Qual Device:<br>CD4051BE | Qual Device:<br>CD4052BE | Qual Device:<br>CD4053BE | QBS Reference<br>(Package):<br>SN74HC595N | QBS Reference<br>(Package, Process, Product):<br>TPS25221DBVR | QBS Reference<br>(Package, Process):<br>AM26LS32ACN | QBS Reference<br>(Process, Product):<br>TMUX4051PWRQ1 | QBS Reference<br>(Process, Product):<br>TMUX4052PWRQ1 | QBS Reference<br>(Process, Product):<br>TMUX4053PWR |
|------|----|-------------------------------|-----------------------|------------|--------------------------|--------------------------|--------------------------|---|---|---|---|---|---|
| HAST | A2 | Biased HAST                   | 130C/85%RH            | 96 Hours   | -                        | -                        | -                        | -   | 3/231/0   | -   | -   | -   | -   |
| UHA  | A3 | Autoclave                     | 121C/15psig           | 96 Hours   | -                        | -                        | -                        | 3/231/0                                   | -   | -   | -   | -   | -   |
| UHA  | A3 | Unbiased HAST                 | 130C/85%RH            | 96 Hours   | -                        | -                        | -                        | -   | 3/231/0   | -   | -   | -   | -   |
| TC   | A4 | Temperature Cycle             | -65C/150C             | 500 Cycles | -                        | -                        | -                        | 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                     | 140C                  | 480 Hours  | -                        | -                        | -                        | -   | 3/231/0   | -   | -   | -   | -   |
| HTOL | B1 | Life Test                     | 150C                  | 300 Hours  | -                        | -                        | -                        | -   | -   | 1/77/0  | -   | -   | -   |
| ELFR | B2 | Early Life Failure Rate       | 125C                  | 48 Hours   | -                        | -                        | -                        | -   | 3/2400/0  | -   | -   | -   | -   |
| WBS  | C1 | Ball Shear                    | 76 balls, 3 units min | Wires      | -                        | -                        | -                        | -   | 3/9/0   | 1/76/0  | -   | -   | -   |
| WBP  | C2 | Bond Pull                     | 76 Wires, 3 units min | Wires      | -                        | -                        | -                        | -   | 3/9/0   | 1/76/0  | -   | -   | -   |
| SD   | C3 | PB-Free Solderability         | 8 Hours Steam Age     | -          | -                        | -                        | -                        | 3/66/0                                    | -   | -   | -   | -   | -   |
| ESD  | E2 | ESD CDM                       | -                     | 250 Volts  | 1/3/0                    | -                        | -                        | -   | -   | -   | -   | -   | -   |
| ESD  | E2 | ESD HBM                       | -                     | 1000 Volts | 1/3/0                    | -                        | -                        | -   | -   | -   | -   | -   | -   |

| Type | #  | Test Name                   | Condition                | Duration | Qual Device:<br>CD4051BE | Qual Device:<br>CD4052BE | Qual Device:<br>CD4053BE | QBS Reference<br>(Package):<br>SN74HC595N | QBS Reference<br>(Package, Process, Product):<br>TPS25221DBVR | QBS Reference<br>(Package, Process):<br>AM26LS32ACN | QBS Reference<br>(Process, Product):<br>TMUX4051PWRQ1 | QBS Reference<br>(Process, Product):<br>TMUX4052PWRQ1 | QBS Reference<br>(Process, Product):<br>TMUX4053PWR |
|------|----|-----------------------------|--------------------------|----------|--------------------------|--------------------------|--------------------------|---|---|---|---|---|---|
| LU   | E4 | Latch-Up                    | Per JESD78               | -        | -                        | -                        | -                        | -   | -   | -   | 1/6/0   | 1/6/0   | 1/3/0   |
| CHAR | E5 | Electrical Characterization | Per Datasheet Parameters | -        | 1/10/0                   | 1/10/0                   | 1/10/0                   | -   | -   | -   | -   | -   | -   |
| FTY  | E6 | Final Test Yield            | -                        | -        | -                        | -                        | -                        | -   | -   | 1/1/0   | -   | -   | -   |

- QBS: Qual By Similarity
- Qual Device CD4051BE is qualified at MSL1 260C
- Qual Device CD4052BE is qualified at MSL1 260C
- Qual Device CD4053BE 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

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TI Qualification ID: R-CHG-2307-070

## Qualification Results

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

| Type | #  | Test Name                     | Condition   | Duration   | Qual Device:<br>TRS202EIDR | QBS Reference<br>(Process):<br>TPS51217DSCR | QBS Reference<br>(Package):<br>ULQ2003AQDRQ1 | QBS Reference<br>(Package, Process, Product):<br>MAX232EIDR |
|------|----|-------------------------------|---|------------|----------------------------|---|--|---|
| HAST | A2 | Biased HAST                   | 130C/85%RH  | 96 Hours   | -                          | -   | 3/231/0                                      | -   |
| UHA  | A3 | Autoclave                     | 121C/15psig   | 96 Hours   | -                          | -   | 3/231/0                                      | -   |
| TC   | A4 | Temperature Cycle             | -65C/150C   | 500 Cycles | -                          | -   | 3/231/0                                      | -   |
| HTSL | A6 | High Temperature Storage Life | 150C  | 1000 Hours | -                          | -   | 3/135/0                                      | -   |
| HTOL | B1 | Life Test                     | 135C  | 635 Hours  | -                          | 3/231/0                                     | -  | -   |
| WBS  | C1 | Ball Shear                    | 76 balls, 3 units min                               | Wires      | -                          | -   | -  | 1/76/0  |
| WBP  | C2 | Bond Pull                     | 76 Wires, 3 units min                               | Wires      | -                          | -   | -  | 1/76/0  |
| SD   | C3 | PB Solderability              | Precondition w.155C Dry Bake (4 hrs +/- 15 minutes) | -          | -                          | -   | 1/15/0                                       | -   |

| Type | #  | Test Name                   | Condition  | Duration    | Qual Device:<br><a href="#">TRS202EIDR</a> | QBS Reference<br>(Process):<br><a href="#">TPS51217DSCR</a> | QBS Reference<br>(Package):<br><a href="#">ULQ2003AQDRQ1</a> | QBS<br>Reference<br>(Package,<br>Process<br>Product):<br><a href="#">MAX232EIDR</a> |
|------|----|-----------------------------|--|-------------|--|---|--|---|
| SD   | C3 | PB-Free Solderability       | Precondition<br>w.155C Dry Bake<br>(4 hrs +/- 15<br>minutes) | -           | -  | -   | 1/15/0   | -   |
| ESD  | E2 | ESD CDM                     | -  | 1500 Volts  | 1/3/0                                      | -   | -  | -   |
| ESD  | E2 | ESD HBM (Bus Pins)          | -  | 15000 Volts | -  | -   | -  | 1/3/0   |
| ESD  | E2 | ESD HBM                     | -  | 2000 Volts  | -  | -   | -  | 1/3/0   |
| LU   | E4 | Latch-Up                    | Per JESD78   | -           | 1/3/0                                      | -   | -  | -   |
| CHAR | E5 | Electrical Characterization | Per Datasheet<br>Parameters                                  | -           | 1/30/0                                     | -   | -  | -   |

- QBS: Qual By Similarity
- Qual Device TRS202EIDR 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

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TI Qualification ID: R-CHG-2302-013

#### Qualification Results

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

| Type  | #  | Test Name                           | Condition                | Duration      | Qual Device:<br><a href="#">MAX232EIPWR</a> | Qual Device:<br><a href="#">MAX232NSR</a> | Qual Device:<br><a href="#">TRS202EIPWR</a> | Qual<br>Device:<br><a href="#">MAX232EIN</a> | QBS<br>Reference<br>(Package):<br><a href="#">SN74HC595N</a> | QBS Reference<br>(Process):<br><a href="#">TPS51217DSCR</a> | QBS Reference<br>(Package):<br><a href="#">SN74LVC8T245NSR</a> | QBS Reference<br>(Package):<br><a href="#">OPA4992QFWRQ1</a> | QBS<br>Reference<br>(Package,<br>Process,<br>Product):<br><a href="#">MAX232EIDR</a> |
|-------|----|-------------------------------------|--------------------------|---------------|---|---|---|--|--|---|--|--|--|
| HAST  | A2 | Biased HAST                         | 110C/85%RH               | 264<br>Hours  | -   | -   | -   | -  | -  | -   | -  | 1/77/0   | -  |
| HAST  | A2 | Biased HAST                         | 130C/85%RH               | 96<br>Hours   | -   | -   | -   | -  | -  | 3/231/0   | -  | -  | -  |
| UHAST | A3 | Autoclave                           | 121C/15psig              | 96<br>Hours   | -   | -   | -   | -  | 3/231/0  | -   | -  | -  | -  |
| UHAST | A3 | Unbiased HAST                       | 130C/85%RH               | 96<br>Hours   | -   | -   | -   | -  | -  | -   | -  | 1/77/0   | -  |
| TC    | A4 | Temperature<br>Cycle                | -65C/150C                | 500<br>Cycles | -   | -   | -   | -  | 3/231/0  | -   | 3/231/0  | 1/77/0   | -  |
| HTSL  | A6 | High<br>Temperature<br>Storage Life | 150C                     | 1000<br>Hours | -   | -   | -   | -  | -  | -   | 3/231/0  | -  | -  |
| HTSL  | A6 | High<br>Temperature<br>Storage Life | 170C                     | 420<br>Hours  | -   | -   | -   | -  | 3/231/0  | -   | -  | -  | -  |
| HTSL  | A6 | High<br>Temperature<br>Storage Life | 175C                     | 500<br>Hours  | -   | -   | -   | -  | -  | -   | -  | 1/77/0   | -  |
| HTOL  | B1 | Life Test                           | 135C                     | 635<br>Hours  | -   | -   | -   | -  | -  | 3/231/0   | -  | -  | -  |
| WBS   | C1 | Ball Shear                          | 76 balls, 3<br>units min | Wires         | -   | -   | -   | -  | -  | -   | -  | -  | 1/76/0   |
| WBP   | C2 | Bond Pull                           | 76 Wires, 3<br>units min | Wires         | -   | -   | -   | -  | -  | -   | -  | -  | 1/76/0   |
| SD    | C3 | PB-Free<br>Solderability            | 8 Hours<br>Steam Age     | -             | -   | -   | -   | -  | 3/66/0   | -   | -  | -  | -  |

| Type | #  | Test Name                   | Condition                | Duration    | Qual Device:<br>MAX232EIPWR | Qual Device:<br>MAX232NSR | Qual Device:<br>TRS202EIPWR | Qual Device:<br>MAX232EIN | QBS Reference<br>(Package):<br>SN74HC595N | QBS Reference<br>(Process):<br>TPS51217DSCR | QBS Reference<br>(Package):<br>SN74LVC8T245NSR | QBS Reference<br>(Package):<br>OPA4992QFVRQ1 | QBS Reference<br>(Package, Process, Product):<br>MAX232EIDR |
|------|----|-----------------------------|--------------------------|-------------|-----------------------------|---------------------------|-----------------------------|---------------------------|---|---|--|--|---|
| PD   | C4 | Physical Dimensions         | Cpk>1.67                 | -           | -                           | -                         | -                           | -                         | -   | -   | -  | 1/10/0                                       | -   |
| ESD  | E2 | ESD CDM                     | -                        | 1000 Volts  | -                           | 1/3/0                     | -                           | -                         | -   | -   | -  | -  | -   |
| ESD  | E2 | ESD CDM                     | -                        | 1500 Volts  | 1/3/0                       | -                         | 1/3/0                       | 1/3/0                     | -   | -   | -  | -  | 1/3/0   |
| ESD  | E2 | ESD HBM (Bus Pins)          | -                        | 15000 Volts | -                           | -                         | -                           | -                         | -   | -   | -  | -  | 1/3/0   |
| ESD  | E2 | ESD HBM                     | -                        | 2000 Volts  | -                           | 1/3/0                     | -                           | -                         | -   | -   | -  | -  | -   |
| ESD  | E2 | ESD HBM                     | -                        | 3000 Volts  | 1/3/0                       | -                         | -                           | 1/3/0                     | -   | -   | -  | -  | 1/3/0   |
| LU   | E4 | Latch-Up                    | Per JESD78               | -           | -                           | -                         | -                           | -                         | -   | -   | -  | -  | 1/3/0   |
| CHAR | E5 | Electrical Characterization | Per Datasheet Parameters | -           | 1/30/0                      | 1/30/0                    | 1/30/0                      | 1/30/0                    | -   | -   | -  | -  | 1/30/0  |

- QBS: Qual By Similarity
- Qual Device MAX232EIPWR is qualified at MSL1 260C
- Qual Device MAX232NSR is qualified at MSL1 260C
- Qual Device TRS202EIPWR is qualified at MSL1 260C
- Qual Device MAX232EIN is qualified at NOT CLASSIFIED NOT CLASSIFIED

- 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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TI Qualification ID: R-CHG-2302-014

### Qualification Results

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

| Type | #  | Test Name                     | Condition   | Duration   | Qual Device:<br>MAX202IDWR | Qual Device:<br>TRS232EIDWR | QBS Reference<br>(Process):<br>TPS51217DSCR | QBS Reference<br>(Package):<br>TLC59116ITPWRQ1 | QBS Reference<br>(Package):<br>TPIC6A596DW | QBS Reference<br>(Package, Process, Product):<br>MAX232EIDR |
|------|----|-------------------------------|-------------|------------|----------------------------|-----------------------------|---|--|--|---|
| HAST | A2 | Biased HAST                   | 130C/85%RH  | 96 Hours   | -                          | -                           | -   | 3/231/0  | 3/231/0                                    | -   |
| UHA  | A3 | Autoclave                     | 121C/15psig | 96 Hours   | -                          | -                           | -   | 3/231/0  | -  | -   |
| UHA  | A3 | Unbiased HAST                 | 130C/85%RH  | 96 Hours   | -                          | -                           | -   | -  | 3/231/0                                    | -   |
| TC   | A4 | Temperature Cycle             | -65C/150C   | 500 Cycles | -                          | -                           | -   | 3/231/0  | 3/231/0                                    | -   |
| HTSL | A6 | High Temperature Storage Life | 150C        | 1000 Hours | -                          | -                           | -   | -  | 3/135/0                                    | -   |
| HTSL | A6 | High Temperature Storage Life | 175C        | 500 Hours  | -                          | -                           | -   | 1/45/0   | -  | -   |
| HTOL | B1 | Life Test                     | 135C        | 635 Hours  | -                          | -                           | 3/231/0                                     | -  | -  | -   |

| Type | #  | Test Name                   | Condition                | Duration    | Qual Device:<br><a href="#">MAX202IDWR</a> | Qual Device:<br><a href="#">TRS232EIDWR</a> | QBS Reference<br>(Process):<br><a href="#">TPS51217DSCR</a> | QBS Reference<br>(Package):<br><a href="#">TLC59116ITPWRQ1</a> | QBS<br>Reference<br>(Package):<br><a href="#">TPIC6A596DW</a> | QBS<br>Reference<br>(Package, Process,<br>Product):<br><a href="#">MAX232EIDR</a> |
|------|----|-----------------------------|--------------------------|-------------|--|---|---|--|---|---|
| WBS  | C1 | Ball Shear                  | 76 balls, 3 units min    | Wires       | -  | -   | -   | -  | -   | 1/76/0  |
| WBP  | C2 | Bond Pull                   | 76 Wires, 3 units min    | Wires       | -  | -   | -   | -  | -   | 1/76/0  |
| ESD  | E2 | ESD CDM                     | -                        | 1000 Volts  | -  | 1/3/0                                       | -   | -  | -   | -   |
| ESD  | E2 | ESD CDM                     | -                        | 1500 Volts  | 1/3/0                                      | -   | -   | -  | -   | -   |
| ESD  | E2 | ESD HBM (Bus Pins)          | -                        | 15000 Volts | -  | -   | -   | -  | -   | 1/3/0   |
| ESD  | E2 | ESD HBM                     | -                        | 3000 Volts  | -  | 1/3/0                                       | -   | -  | -   | -   |
| LU   | E4 | Latch-Up                    | Per JESD78               | -           | -  | -   | -   | -  | -   | 1/3/0   |
| CHAR | E5 | Electrical Characterization | Per Datasheet Parameters | -           | 1/30/0                                     | 1/30/0                                      | -   | -  | -   | 1/30/0  |

- QBS: Qual By Similarity
- Qual Device MAX202IDWR is qualified at MSL1 260C
- Qual Device TRS232EIDWR 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

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TI Qualification ID: R-CHG-2302-015

#### Qualification Results

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

| Type  | #  | Test Name                     | Condition   | Duration   | Qual Device:<br><a href="#">MAX232EIDR</a> | QBS Reference<br>(Process):<br><a href="#">TPS51217DSCR</a> | QBS Reference<br>(Package):<br><a href="#">ULQ2003AQDRQ1</a> | QBS<br>Reference<br>(Product, Package):<br><a href="#">MAX232DR</a> |
|-------|----|-------------------------------|---|------------|--|---|--|---|
| HAST  | A2 | Biased HAST                   | 130C/85%RH  | 96 Hours   | -  | -   | 3/231/0  | 3/231/0   |
| UHAST | A3 | Autoclave                     | 121C/15psig   | 96 Hours   | -  | -   | 3/231/0  | 3/231/0   |
| TC    | A4 | Temperature Cycle             | -65C/150C   | 500 Cycles | -  | -   | 3/231/0  | 3/231/0   |
| HTSL  | A6 | High Temperature Storage Life | 150C  | 1000 Hours | -  | -   | 3/135/0  | -   |
| HTSL  | A6 | High Temperature Storage Life | 170C  | 420 Hours  | -  | -   | -  | 3/231/0   |
| HTOL  | B1 | Life Test                     | 135C  | 635 Hours  | -  | 3/231/0   | -  | -   |
| WBS   | C1 | Ball Shear                    | 76 balls, 3 units min                               | Wires      | 1/76/0                                     | -   | -  | -   |
| WBP   | C2 | Bond Pull                     | 76 Wires, 3 units min                               | Wires      | 1/76/0                                     | -   | -  | -   |
| 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   | -   |

| Type | #  | Test Name                   | Condition                   | Duration    | Qual Device:<br><a href="#">MAX232EIDR</a> | QBS Reference<br>(Process):<br><a href="#">TPS51217DSCR</a> | QBS Reference<br>(Package):<br><a href="#">ULQ2003AQDRQ1</a> | QBS<br>Reference<br>(Product,<br>Package):<br><a href="#">MAX232DR</a> |
|------|----|-----------------------------|-----------------------------|-------------|--|---|--|--|
| ESD  | E2 | ESD CDM                     | -                           | 1500 Volts  | 1/3/0                                      | -   | -  | -  |
| ESD  | E2 | ESD HBM (Bus Pins)          | -                           | 15000 Volts | 1/3/0                                      | -   | -  | -  |
| ESD  | E2 | ESD HBM                     | -                           | 3000 Volts  | 1/3/0                                      | -   | -  | -  |
| LU   | E4 | Latch-Up                    | Per JESD78                  | -           | 1/3/0                                      | -   | -  | -  |
| CHAR | E5 | Electrical Characterization | Per Datasheet<br>Parameters | -           | 1/30/0                                     | -   | -  | -  |

- QBS: Qual By Similarity
- Qual Device MAX232EIDR 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

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TI Qualification ID: R-CHG-2302-012

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