

Texas Instruments Enhanced Product Qualification and Reliability Report



ABSTRACT

TI qualification testing is a risk mitigation process that is engineered to assure device longevity in customer applications. Wafer fabrication processes and package level reliability are evaluated in a variety of ways that may include accelerated environmental test conditions with subsequent derating to actual use conditions. Manufacturability of the device is evaluated to verify a robust assembly flow and assure continuity of supply to customers. TI Enhanced Products are qualified with industry standard test methodologies performed to the intent of Joint Electron Devices Engineering Council (JEDEC) standards and procedures. Texas Instruments Enhanced Products are certified to meet GEIA-STD-0002-1 [Aerospace Qualified Electronic Components](#).

Qualification by Similarity (Qualification Family)

A new device can be qualified either by performing full scale quality and reliability tests on the actual device or using previously qualified device(s) through "Qualification by Similarity" (QBS) rules. By establishing similarity between the new device and those qualified previously, repetitive tests will be eliminated, allowing for timely production release. When adopting QBS methodology, the emphasis is on qualifying the differences between a previously qualified product and the new product under consideration. The QBS rules for a technology, product, test parameters or package shall define which attributes are required to remain fixed in order for the QBS rules to apply. The attributes which are expected and allowed to vary will be reviewed and a QBS plan shall be developed, based on the reliability impact assessment above, specifying what subset of the full complement of environmental stresses is required to evaluate the reliability impact of those variations. Each new device shall be reviewed for conformance to the QBS rule sets applicable to that device. See JEDEC JESD47 for more information.

| Device Baseline ⁽¹⁾ | |
|--------------------------------|--|
| TI Device: | LM74700MDDFREP |
| DLA VID: | V62/21608 |
| Moisture Sensitivity: | MSL 2 / 260°C |
| ESD CDM: | ±750 V (corner pins) ±500 V (other pins) |
| ESD HBM: | ±2000 V |

(1) Baseline information in effect as of the date of this report.

| Enhanced Products New Device Qualification Matrix (Note that qualification by similarity ("qualification family") per JEDEC JESD47 is allowed) | | | | |
|---|--|-------------------------------------|------------------|--|
| Description | Condition | Sample Size (Allowed Rejects) | Lots Required | Test Method |
| Electromigration | Maximum Recommended Operating Conditions | N/A | N/A | Per TI Design Rules |
| Wire Bond Life | Maximum Recommended Operating Conditions | N/A | N/A | Per TI Design Rules |
| Electrical Characterization | TI Data Sheet | 15 | 3 | N/A |
| Electrostatic Discharge Sensitivity | HBM | 3 units/voltage | N/A | EIA/JESD22-A114 or ANSI/ESDA/JEDEC JS-001 |
| | CDM | | | EIA/JESD22-C101 or ANSI/ESDA/JEDEC JS-002 |
| Latch-up | Per Technology | 3(0) | 1 | EIA/JESD78 |
| Physical Dimensions | TI Data Sheet | 5(0) | 1 | EIA/JESD22- B100 |
| Thermal Impedance | Theta-JA on board | Per Pin-Package | N/A | EIA/JESD51 |
| Bias Life Test | 125°C/1000 hours or equivalent | 45(0) | 3 | JESD22-A108 ⁽¹⁾ |
| Biased Humidity or Biased HAST | 85°C/85%/1000 hours | 77(0) | 3 | JESD22-A101 ⁽¹⁾ |
| | 130°C/85%/96 hours or 110°C/85%/264 hours | | | JESD22-A110 ⁽¹⁾ |
| Extended Biased Humidity ⁽²⁾ or Extended Biased HAST ⁽²⁾ | 85°C/85%/2600 hours | 77(-) | 1 | JESD22-A101 ⁽¹⁾ |
| | 130°C/85%/250 hours or 110°C/85%/687 hours | | | JESD22-A110 ⁽¹⁾ |
| Unbiased HAST | 130°C/85%/96 hours or 110°C/85%/264 hours | 77(0) | 3 | JESD22-A.118 ⁽¹⁾ |
| Temperature Cycle | -65°C to +150°C non-biased for 500 cycles | 77(0) | 3 | JESD22-A104 ⁽¹⁾ |
| Solder Heat | 260°C for 10 seconds | 22(0) | 1 | JESD22-B106 |
| Resistance to Solvents | Ink symbol only | 12(0) | 1 | JESD22-B107 |
| Solderability | Bake Preconditioning | 22(0) | 1 | ANSI/J-STD-002 |
| Flammability | Method A / Method B | 5(0) | 1 | UL94 |
| Bond Shear | Per wire size | 5 units x 30(0) bonds | 3 | JESD22-B116 |
| Bond Pull Strength | Per wire size | 5 units x 30(0) bonds | 3 | ASTM F-459 or TM2011 |
| Die Shear | Per die size | 5(0) | 3 | TM 2019 |
| High Temp Storage | 150 °C / 1,000 hours | 15(0) | 3 | JESD22-A103 ⁽¹⁾ |
| Moisture Sensitivity | Surface Mount Only | 12 | 1 | J-STD-020 ⁽¹⁾ |

(1) Precondition performed per JEDEC Std. 22, Method A112/A113.

(2) For information only.

Technology Family FIT / MTBF Data

Mean Time Between Fails (MTBF) and Failures in Time (FIT) rates are device reliability statistics calculated based on data collected from TI's internal reliability testing (life test).

TI's DPPM/FIT/MTBF Estimator Search Tool reports the generic data based on technology groupings and shows conditions under which the rates were derived. All terms used in the tool and definitions can be found on the TI reliability terminology page. Failure rates are summarized by technology and mapped to the associated material part numbers. The failure rates are highly dependent on the number of units tested, therefore, it is not recommended to compare failure rates.

TI DPPM/FIT/MTBF Estimator Search Tool webpage link:

www.ti.com/quality/docs/estimator.tsp

Device Family Qualification Data

TI's Qualification Summary Search Tool reports generic qualification data representative of the material sets, processes, and manufacturing sites used by the device family and may not include all of the testing performed for a specific EP device. Please see the Enhanced Products New Device Qualification Matrix above for the full suite of qualification testing performed to release Enhanced Product devices.

TI Qualification Summary Search webpage link:

www.ti.com/qualificationsummary/qualsumm/home

Ongoing Reliability Monitoring

TI periodically monitors the reliability of its products, wafer fab processes, and package technologies, through its Ongoing Reliability Monitor (ORM) program. The ORM program involves collecting environmental reliability stress data on representative sets of devices, processes and packages. The results from the ORM program are updated quarterly in this report.

TI Ongoing Reliability Monitoring Search webpage link:

www.ti.com/orm/home?actionId=2801.html

For additional information or technical support please contact the Texas Instruments Customer Support Center at www.ti.com/csc For more information on TI Enhanced Products please visit www.ti.com/ep

Important Limitations on Use of Data Exceeding Specified Limits

TI is providing this data for your convenience. However, we want to make clear the significant limitations of its usefulness as an indicator of how devices may perform in various applications.

THIS DATA IS PROVIDED "AS IS" WITHOUT ANY EXPRESS OR IMPLIED WARRANTY OF ANY KIND INCLUDING WARRANTIES OF MERCHANTABILITY, NONINFRINGEMENT OF INTELLECTUAL PROPERTY, OR FITNESS FOR ANY PARTICULAR PURPOSE. IN NO EVENT SHALL TI OR ITS SUPPLIERS BE LIABLE FOR ANY DAMAGES WHATSOEVER (INCLUDING, WITHOUT LIMITATION, DAMAGES FOR LOSS OF PROFITS, BUSINESS INTERRUPTION, LOSS OF INFORMATION) ARISING OUT OF THE USE OF OR INABILITY TO USE THE INFORMATION, EVEN IF TI HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

Your use of this data, and all consequences of such use, is solely your responsibility. You must perform sufficient engineering and additional qualification testing in order to properly evaluate your application and determine whether a candidate device is suitable for use in that application.

TI semiconductor components are specifically designed and manufactured to be used within the electrical, thermal, mechanical and other parameters set forth in TI's product data sheets. Quality and reliability data provided by Texas Instruments, such as MTBF and fit rate data, is intended to be an estimate of product performance based upon history only. It does not imply that any performance levels reflected in such data can be met if the product is operated outside the conditions expressly stated in the latest published data sheet for a device.

Plastic encapsulated TI semiconductor devices are neither designed nor warranted as suitable for use in military applications and/or military environments.

THIS INFORMATION SHOULD NOT BE USED TO ASSIST IN THE PRACTICE OF "UPRATING" OR "UPSCREENING" DEVICES FOR USE IN MILITARY OR OTHER CRITICAL APPLICATIONS. There are significant limitations of this information as an indicator of how commercial, off-the-shelf (COTS) devices may perform in such applications or environments, and about the hazards of using COTS devices in such applications. TI strongly believes that semiconductor components should never be used outside their specified tolerance levels as up-screening can lead directly to system or component failure. Such failures may present distinct risks to end-users and to third parties. TI cannot accept any responsibility for component or system failures that occur due to the misuse of its products, including misuse that may result from the practice of up-screening.

Any use of TI components beyond their rated limits voids all warranty responsibility of TI with respect to such devices, and also voids all responsibility of TI with respect to any applications assistance, product design, software performance or services of any kind that were or may have been performed in connection with the sale of any such devices. Further, resale of TI's products or services with statements different from or beyond the parameters stated by TI for that product or service in official TI data books or data sheets, or without the warnings or instructions provided by TI, voids all express and any implied warranties for the associated TI product or service, and is an unfair and deceptive business practice.

IMPORTANT NOTICE AND DISCLAIMER

TI PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATA SHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES "AS IS" AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for skilled developers designing with TI products. You are solely responsible for (1) selecting the appropriate TI products for your application, (2) designing, validating and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, regulatory or other requirements.

These resources are subject to change without notice. TI grants you permission to use these resources only for development of an application that uses the TI products described in the resource. Other reproduction and display of these resources is prohibited. No license is granted to any other TI intellectual property right or to any third party intellectual property right. TI disclaims responsibility for, and you will fully indemnify TI and its representatives against, any claims, damages, costs, losses, and liabilities arising out of your use of these resources.

TI's products are provided subject to [TI's Terms of Sale](#) or other applicable terms available either on ti.com or provided in conjunction with such TI products. TI's provision of these resources does not expand or otherwise alter TI's applicable warranties or warranty disclaimers for TI products.

TI objects to and rejects any additional or different terms you may have proposed.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2022, Texas Instruments Incorporated