Reliability Report

LP5912-EP Texas Instruments Enhanced Product Qualification and Reliability Report

ABSTRACT

This report presents the reliability and qualifications results for the LP5912-EP. The LP5912-EP is manufactured with a controlled baseline and has the following:

- Controlled baseline
- One assembly or test site
- One fabrication site
- Extended product life cycle
- Extended product-change notification
- Product traceability

Table of Contents

List of Tables

Trademarks

1 Introduction

TI qualification testing is a risk mitigation process that is engineered to provide device longevity in customer applications. Wafer fabrication processes and package level reliability are evaluated in a variety of ways that can 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 maintain continuity of supply to customers. TI Enhanced Products are qualified with industry standard test methodologies performed to the intent of the 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.

2 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 devices through the *qualification by similarity"* (QBS) rules. By establishing similarity between the new device and those qualified previously, repetitive tests are 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 define which attributes are required to remain fixed for the QBS rules to apply. The attributes that are expected and allowed to vary are reviewed and a QBS plan is developed, based on the reliability impact assessment, specifying what subset of the full complement of environmental stresses is required to evaluate the reliability impact of those variations. Each new device is reviewed for conformance to the QBS rule sets applicable to that device. See JEDEC JESD47 for more information.

Table 2-1. Device Baseline

Baseline[1]			
Description	**Condition**	**Description**	**Condition**
TI device	LP591209-EP LP591212-EP LP591218-EP LP591225-EP LP591230-EP LP591233-EP LP591250-EP	Assembly site	TI CLARK (Philippines)
DLA VID	V62/22601-01XE V62/22601-04XE V62/22601-06XE V62/22601-07XE V62/22601-09XE V62/22601-10XE V62/22601-11XE	Test site	TI CLARK (Philippines)
Wafer fab	TI MIHO8 (Japan)	Pin, package type	WSON (DRV) | 6
Fab process	LBC7T	Leadframe	Cu
Fab technology	CMOS	Termination finish	NiPdAu
Die revision	A	Mount compound	SUMITOMO CRM-1076NS
Die name	LLP5912MA3Z	Bond wire	25.4 µm Au
ESD CDM	±1000 V	Mold compound	SUMITOMO EME-G700LTD
ESD HBM	±2000 V	Moisture sensitivity	MSL 2 / 260°C

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

Table 2-2. Enhanced Products New Device Qualification Matrix

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	θ_{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 130°C/85%/96 hours or 110°C/85%/264 hours	77(0)	3	JESD22-A101(1) JESD22-A110(1)
Extended biased humidity(2) or Extended biased HAST(2)	85°C/85%/2600 hours 130°C/85%/250 hours or 110°C/85%/687 hours	77(–)	1	JESD22-A101(1) 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	230°C–250°C for 30-60 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 or method B	5(0)	1	UL94
Bond shear	Per wire size	5 units × 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 temperature 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.

3 Technology Family FIT and 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, failure rates are not comparable.

TI DPPM/FIT/MTBF estimator search tool web page link:

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

4 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. See Table 2-2 for the full suite of qualification testing performed to release Enhanced Product devices.

TI Qualification Summary Search web page link:

www.ti.com/qualificationsummary/qualsumm/home

5 Ongoing Reliability Monitoring

TI periodically monitors the reliability of products, wafer fab processes, and package technologies through the 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 web page link:

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

6 Summary

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

7 Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from Revision * (August 2022) to Revision A (November 2022)	Page
• Added LP591209-EP, LP591225-EP, LP591250-EP, V62/22601-01XE, V62/22601-07XE, and V62/22601-11XE to *Device Baseline* table	3

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