Reliability Report

LMX2694-EP Reliability Report

ABSTRACT

This report presents the reliability and qualification results for the LMX2694-EP device: a high-performance, wideband phase-locked loop (PLL) with an integrated voltage-controlled oscillator (VCO) and voltage regulators. The LMX2694-EP is manufactured with a controlled baseline and contains the following:

- Product Traceability
- Extended Product-Change Notification

Table of Contents

Trademarks

1 Texas Instruments Enhanced Product Qualification and Reliability Report

TI qualification testing is a risk mitigation process that is engineered to assure device longevity in customer applications. Wafer fabrication process 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.

2 Qualification by Similarity (Qualification Family)

A new device can be qualified either by performing a full scale quality and reliability test on the actual device or using previously qualified devices through *Qualification by Similarity* (QBS) rules. By establishing similarity between the new device and those previously qualified, 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 parameter, or package defines which attributes are required to remain fixed in order 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 above, 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 the conformance to the QBS rule sets applicable to the device. See JEDEC JESD47 for more information.

Table 2-1. Device Baseline[1]

Device Baseline[1]			
DLA VID	V62/19616	Test Site	TI PHILIPPINES CLARK A/T
Wafer Fab	Texas Instruments Deutschland- FFAB (Freising)	Pin/Package Type	VQFNP (RTC) | 48
Fab Process	BICMOS13	Leadframe	Cu
Fab Technology	CMOS	Termination Finish	NiPdAu-Ag
Bond Wire	25.4µm Au	Mount Compound	Hitachi EN-4900GC
ESD CDM	±1000V	Mold Compound	Sumitomo EME-G700E
ESD HBM	±1000V	Moisture Sensitivity	MSL 3 / 260°C
Baseline information in effect as of the date of this report.[1]			

Table 2-2. Enhanced Products New Device Qualification Matrix(1)

Note that qualification by similarity ("qualification family") per JEDEC JESD47 is allowed.				
Description	**Condition**	**Sample Size Used/ 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
	CDM			EIA/JESD22-C101
Latch-up	Per Technology	5/0	3	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*
Biased Humidity or Biased HAST	85°C / 85% / 1000 hours or 130°C / 85% / 96 hours	77/0	3	JESD22-A101* JESD22-A110*
Extended Biased Humidity or Extended Biased HAST	85°C / 85% / 2600 hours (for reference) or 130°C / 85% / 250 hours (for reference)	77/0	1	JESD22-A101* JESD22-A110*
Unbiased HAST	130°C / 85% / 96 hours	77/0	3	JESD22-A.118*
Temperature Cycle	-65°C to +150 °C non-biased for 500 cycles	77/0	3	JESD22-A104*
Solder Heat	260°C for 10 seconds	22/0	1	JESD22-B106
Resistance to Solvents	Ink symbol only	12/0	1	JESD22-B107
Solderability	Condition A (steam age for 8 hours)	22/0	1	ANSI/J-STD-002-92
Flammability	Method A / Method B	5/0	1	UL-1964
Bond Shear	Per wire size	5 units × 30/0 bonds	3	JESD22-B116
Bond Pull Strength	Per wire size	5 units × 30/0 bonds	3	ASTM F-459
Die Shear	Per die size	5/0	3	TM 2019
High Temperature Storage	150°C / 1000 hours	15/0	3	JESD22-A103-A*
Moisture Sensitivity	Surface Mount Only	12	1	J-STD-020-A*

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

3 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.

Visit the TI DPPM/FIT/MTBF Estimator Search Tool at 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.

Contact the Texas Instruments Customer Support Center at www.ti.com/support or send an email to support@ti.com for additional information or technical support. Visit www.ti.com/ep for more information on TI Enhanced Products.

5 Revision History

Changes from Revision * (June 2019) to Revision A (April 2024)	Page
• Updated format of Table 2-1	3
• Deleted Quality and Reliability Data Disclaimer	6

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