



ABSTRACT

This report presents the reliability and qualification results for the LMH5485-SEP radiation tolerant, negative rail input, rail-to-rail output, precision, 850 MHz fully differential amplifier. The LMH5485-SEP is manufactured with a controlled baseline and has the following:

1. An extended product life cycle
 2. One assembly and test site
 3. Product traceability
 4. Extended product-change notification
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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 Space Enhanced Plastic Production Flow

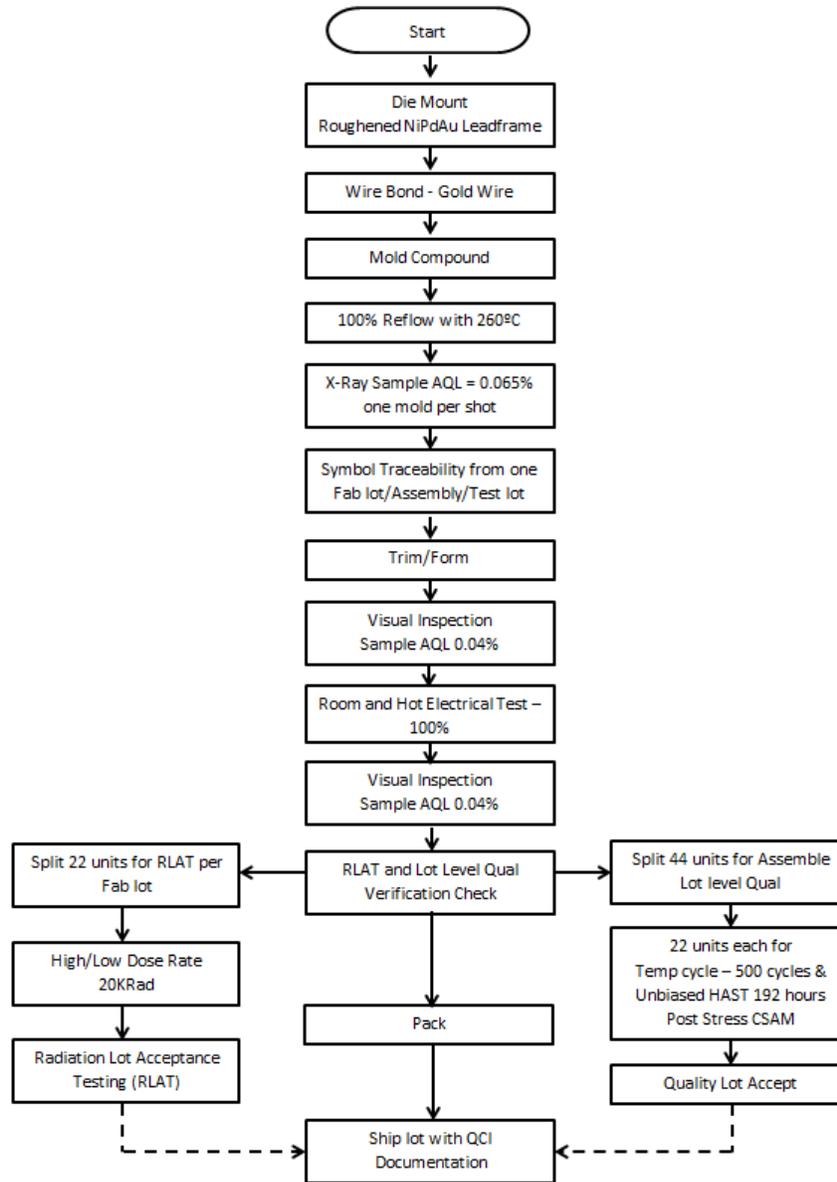


Figure 2-1. Space Enhanced Plastic Production Flow

3 Qualification by Similarity (Qualification Family)

A new device can be qualified either by performing full scale quality and reliability test on the actual device or using one or more previously qualified devices through *Qualification by Similarity* (QBS) rules. By establishing similarity between the new device and those qualified previously, repetitive test 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 parameter 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 the conformance to the QBS rule sets applicable to the device. For more information, see JEDEC JESD47.

Table 3-1. Device Baseline

TI Device:	LMH5485-SEP		Assembly Site:	TI-MLA (Malaysia)
DLA VID:	V62/21603		Test Site:	TI-MLA (Malaysia)
Wafer Fab:	FFAB		Pin/Package Type:	DGK (VSSOP) 8
Fab Process:	BICOM3X		Leadframe:	Cu
Fab Technology:	BICMOS		Termination Finish:	NiPdAu
Die Revision:			Bond Wire:	24.3 μm Au
Die Name:	RTHS4541GB0H		Moisture Sensitivity:	MSL 3/ 260°C
ESD CDM:	±1000 V			
ESD HBM:	±2500 V			
1Baseline information in effect as of the date of this report				

Table 3-2. Space Enhanced Products New Device Qualification Matrix

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	10	3	N/A
Electrostatic Discharge Sensitivity	HBM	3 units/voltage	1	EIA/JESD22-A114
	CDM			EIA/JESD22-C101
Latch-up	Per Technology	6/0	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	77/0	3	JESD22-A108*
Biased HAST	130°C / 85% / 96 hours	77/0	3	JESD22-A110*
Extended Biased HAST	130°C / 85% / 250 hours (for reference)	77/0	1	JESD22-A110*
Unbiased HAST	130°C / 85% / 96 hours	77/0	3	JESD22-A118*
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

Table 3-2. Space Enhanced Products New Device Qualification Matrix (continued)

Note that qualification by similarity ("qualification family") per JEDEC JESD47 is allowed				
Description	Condition	Sample Size Used/ Rejects	Lots Required	Test Method
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
Die Shear	Per die size	5/0	3	TM 2019
High Temp Storage	150 °C / 1,000 hours	15/0	3	JESD22-A103-A*
Moisture Sensitivity	Surface Mount Only	12	1	J-STD-020-A*
Radiation Response Characterization	Total Ionization Dose, and Single-Event Latchup	5 units/dose level	1	MIL-STD-883/Method 1019
Outgassing Characterization	TML (Total Mass Lost), CVCM (Collected Volatile Condensable material), WVR (Water vapor recorded)	5	1	ASTM E595

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

4 Outgas Test Report

Outgassing test was performed on 5 units. A total mass loss (TML) of 1.00% and collected volatile condensable material (CVCM) of 0.10% were used as screening levels for rejection of spacecraft materials. The outgas test was performed in a vacuum environment of less than 5×10^{-5} torr according to ASTM E 595, for a duration of 24 hours, at 125°C. The TML, CVCM, and the amount of Water Vapor Recovered (WVR) were measured after the test.

Table 4-1. Outgas Test Results

SAMPLE	TML (%)	CVCM (%)	WVR (%)
LMH5485-SEP	0.07	<0.01	0.06

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