



## ABSTRACT

The TLV1704-SEP (Quad) device offers a wide supply range, rail-to-rail inputs, low quiescent current, and low propagation delay. All these features come in industry-standard, extremely-small packages, making these devices the best general-purpose comparators available.

The open collector output offers the advantage of allowing the output to be pulled to any voltage rail up to 36 V above the negative power supply, regardless of the TLV1704-SEP supply voltage.

The device is a microPower comparator. Low input offset voltage, low input bias currents, low supply current, and open-collector configuration make the TLV1704-SEP device flexible enough to handle almost any application, from simple voltage detection to driving a single relay.

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## Table of Contents

<b>1 Trademarks</b> .....	<b>1</b>
<b>2 Device Introduction</b> .....	<b>1</b>
<b>3 TLV1704-SEP Production Flow</b> .....	<b>2</b>
<b>4 Device Qualification</b> .....	<b>3</b>
<b>5 Outgas Test Report</b> .....	<b>5</b>
<b>6 Revision History</b> .....	<b>6</b>

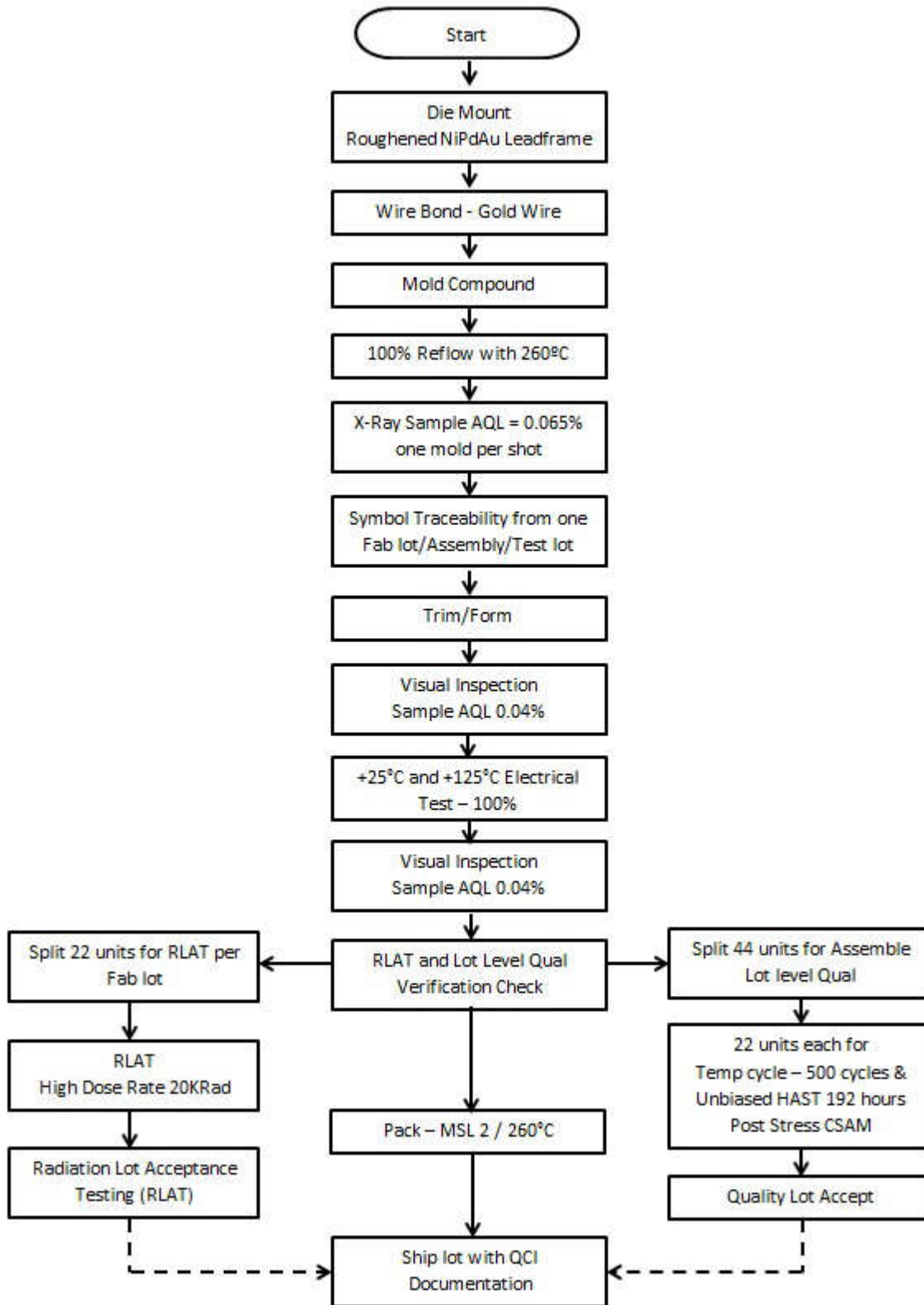
### 1 Trademarks

All trademarks are the property of their respective owners.

### 2 Device Introduction

TLV1704-SEP is a Radiation Tolerant device in a plastic package which allows this device to be used in space applications. The device was verified immune to 43 MeV·cm<sup>2</sup>/mg at 125°C for single event latchup. Each Fab lot was tested according to MIL-STD-883 for Radiation Lot Acceptance Tested (RLAT) up to 20 krad(Si) and each Assembly and Test lot will go thru process flow as shown in [Section 3](#). To ensure the quality of TLV1704-SEP it is qualified with Space EP requirement, which is explained in [Section 4](#).

### 3 TLV1704-SEP Production Flow



## 4 Device Qualification

The following is the device qualification summary:

### 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 <sup>(1)</sup>			
<i>TI Device:</i>	TLV1704AMPWTPSEP/ TLV1704AMPWPSEP	<i>Assembly Site:</i>	TI-MLA (Malaysia)
<i>DLA VID:</i>	V62/18613-01XE	<i>Test Site:</i>	TI-MLA (Malaysia)
<i>Wafer Fab:</i>	FFAB	<i>Pin/Package Type:</i>	TSSOP (PW)   14
<i>Fab Process:</i>	BICOM3XHV	<i>Leadframe:</i>	Cu
<i>Fab Technology:</i>	BICOM	<i>Termination Finish:</i>	NiPdAu
<i>Die Revision:</i>	E	<i>Bond Wire:</i>	24.3 μm Au
<i>Die Name:</i>	RTL1704PAH2	<i>Moisture Sensitivity:</i>	MSL 2 / 260°C
<i>ESD CDM:</i>	±1000 V		
<i>ESD HBM:</i>	±1000 V		

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

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
<i>Electromigration</i>	Maximum Recommended Operating Conditions	N/A	N/A	Per TI Design Rules
<i>Wire Bond Life</i>	Maximum Recommended Operating Conditions	N/A	N/A	Per TI Design Rules
<i>Electrical Characterization</i>	TI Data Sheet	15	3	N/A
<i>Electrostatic Discharge Sensitivity</i>	HBM	3 units/voltage	N/A	EIA/JESD22-A114
	CDM			EIA/JESD22-C101
<i>Latch-up</i>	Per Technology	5/0	3	EIA/JESD78
<i>Physical Dimensions</i>	TI Data Sheet	5/0	1	EIA/JESD22- B100
<i>Thermal Impedance</i>	Theta-JA on board	Per Pin-Package	N/A	EIA/JESD51
<i>Bias Life Test</i>	125°C / 1000 hours or equivalent	45/0	3	JESD22-A108 <sup>(1)</sup>
<i>Biased Humidity</i>	85°C / 85% / 1000 hours	77/0	3	JESD22-A101 <sup>(1)</sup>
<i>or</i>	<i>or</i>			JESD22-A110 <sup>(1)</sup>
<i>Biased HAST</i>	130°C / 85% / 96 hours			JESD22-A110 <sup>(1)</sup>
<i>Extended Biased Humidity</i>	85°C / 85% / 2600 hours (for reference)	77/0	1	JESD22-A101 <sup>(1)</sup>
<i>or</i>	<i>or</i>			JESD22-A110 <sup>(1)</sup>
<i>Extended Biased HAST</i>	130°C / 85% / 250 hours (for reference)			JESD22-A110 <sup>(1)</sup>
<i>Unbiased HAST</i>	130°C / 85% / 96 hours	77/0	3	JESD22-A.118 <sup>(1)</sup>
<i>Temperature Cycle</i>	-65°C to +150°C non-biased for 500 cycles	77/0	3	JESD22-A104 <sup>(1)</sup>
<i>Solder Heat</i>	260°C for 10 seconds	22/0	1	JESD22-B106
<i>Resistance to Solvents</i>	Ink symbol only	12/0	1	JESD22-B107
<i>Solderability</i>	Condition A (steam age for 8 hours)	22/0	1	ANSI/J-STD-002-92
<i>Flammability</i>	Method A / Method B	5/0	1	UL-1964
<i>Bond Shear</i>	Per wire size	5 units × 30/0 bonds	3	JESD22-B116
<i>Bond Pull Strength</i>	Per wire size	5 units × 30/0 bonds	3	ASTM F-459
<i>Die Shear</i>	Per die size	5/0	3	TM 2019
<i>High Temp Storage</i>	150°C / 1000 hours	15/0	3	JESD22-A103-A <sup>(1)</sup>
<i>Moisture Sensitivity</i>	Surface Mount Only	12	1	J-STD-020-A <sup>(1)</sup>
<i>Radiation Response Characterization</i>	Total Ionization Dose, and Single-Event Latchup	N/A	N/A	MIL-STD-883/Method 1019
<i>Outgassing Characterization</i>	TML (Total Mass Lost), CVCM (Collected Volatile Condensable Material), WVR (Water Vapor Recorded)	5	1	ASTM E595

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

## 5 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  $5 \times 10^{-5}$  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.

**RESULTS** : The following tables list the results of the testing:

Table 1: Outgas test results.

Sample	TML (%)	CVCM (%)	WVR (%)
	<0.01	0.04	0.03

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## 6 Revision History

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

<b>Changes from Revision * (July 2019) to Revision A (August 2025)</b>	<b>Page</b>
• Updated Device Introduction section.....	1

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