

RELIABILITY REPORT
FOR
MAX5487ETE+T
PLASTIC ENCAPSULATED DEVICES

September 2, 2014

MAXIM INTEGRATED

160 RIO ROBLES
SAN JOSE, CA 95134

Approved by
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Conclusion

The MAX5487ETE+T successfully meets the quality and reliability standards required of all Maxim Integrated products. In addition, Maxim Integrated's continuous reliability monitoring program ensures that all outgoing product will continue to meet Maxim Integrated's quality and reliability standards.

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I. Device Description

A. General

The MAX5487/MAX5488/MAX5489 dual, linear-taper, digital potentiometers function as mechanical potentiometers with a simple 3-wire SPI(tm)-compatible digital interface that programs the wipers to any one of 256 tap positions. These digital potentiometers feature a nonvolatile memory (EEPROM) to return the wipers to their previously stored positions upon power-up. The MAX5487 has an end-to-end resistance of 10k , while the MAX5488 and MAX5489 have resistances of 50k and 100k , respectively. These devices have a low 35ppm/°C end-to-end temperature coefficient, and operate from a single +2.7V to +5.25V supply. The MAX5487/MAX5488/MAX5489 are available in 16-pin 3mm x 3mm x 0.8mm thin QFN or 14-pin TSSOP packages. Each device is guaranteed over the extended -40°C to +85°C temperature range.

II. Manufacturing Information

A. Description/Function:	Dual, 256-Tap, Nonvolatile, SPI-Interface, Linear-Taper Digital Potentiometers
B. Process:	E35
C. Number of Device Transistors:	
D. Fabrication Location:	Texas
E. Assembly Location:	Thailand
F. Date of Initial Production:	January 21, 2006

III. Packaging Information

A. Package Type:	16-pin TQFN 3x3
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	None
E. Bondwire:	0.005HL (mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-9000-1182
H. Flammability Rating:	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	Level 1
J. Single Layer Theta Ja:	N/A
K. Single Layer Theta Jc:	N/A
L. Multi Layer Theta Ja:	57.2°C/W
M. Multi Layer Theta Jc:	40°C/W

IV. Die Information

A. Dimensions:	91X94 mils
B. Passivation:	Si ₃ N ₄ /SiO ₂ (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Al/0.5%Cu with Ti/TiN Barrier
D. Backside Metallization:	None
E. Minimum Metal Width:	0.35um
F. Minimum Metal Spacing:	0.35um
G. Bondpad Dimensions:	
H. Isolation Dielectric:	SiO ₂
I. Die Separation Method:	Wafer Saw

V. Quality Assurance Information

- A. Quality Assurance Contacts: Don Lipps (Manager, Reliability Engineering)
Bryan Preeshl (Vice President of QA)
- B. Outgoing Inspection Level: 0.1% for all electrical parameters guaranteed by the Datasheet.
0.1% for all Visual Defects.
- C. Observed Outgoing Defect Rate: < 50 ppm
- D. Sampling Plan: Mil-Std-105D

VI. Reliability Evaluation

A. Accelerated Life Test

The results of the 125C biased (static) life test are shown in Table 1. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 2454 \times 192 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

(where 2454 = Temperature Acceleration factor assuming an activation energy of 0.8eV)

$$\lambda = 10.13 \times 10^{-9}$$

$$\lambda = 10.13 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

The following failure rate represents data collected from Maxim Integrated's reliability monitor program. Maxim Integrated performs quarterly life test monitors on its processes. This data is published in the Reliability Report found at <http://www.maximintegrated.com/qa/reliability/monitor>. Cumulative monitor data for the E35 Process results in a FIT Rate of 0.4 @ 25C and 6.84 @ 55C (0.8 eV, 60% UCL).

B. E.S.D. and Latch-Up Testing (lot DSE0CA001C, D/C 0640)

The DP21 die type has been found to have all pins able to withstand a HBM transient pulse of +/-2500 per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/-250mA.

Table 1
Reliability Evaluation Test Results

MAX5487ETE+T

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)	Ta = 125°C	DC Parameters & functionality	48	0	DSE0D3046A, D/C 0906
	Biased		48	0	DSE0CA001C, D/C 0640
	Time = 192 hrs.		48	0	DSE0BQ001A, D/C 0547
			48	0	CSE1AQ002B, D/C 0438

Note 1: Life Test Data may represent plastic DIP qualification lots.