RELIABILITY REPORT

FOR

MAX5481ETE+ / MAX5481EUD+

PLASTIC ENCAPSULATED DEVICES

February 15, 2011

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Approved by
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Quality Assurance
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Conclusion

The MAX5481ETE+/MAX5481EUD+ successfully meets the quality and reliability standards required of all Maxim products. In addition, Maxim's continuous reliability monitoring program ensures that all outgoing product will continue to meet Maxim's quality and reliability standards.

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I. Device Description

A. General

The MAX5481-MAX5484 10-bit (1024-tap) nonvolatile, linear-taper, programmable voltage-dividers and variable resistors perform the function of a mechanical potentiometer, but replace the mechanics with a pin-configurable 3-wire serial SPI™-compatible interface or up/down digital interface. The MAX5481/MAX5482 are 3-terminal voltage-dividers and the MAX5483/MAX5484 are 2-terminal variable resistors. The MAX5481-MAX5484 feature an internal, nonvolatile, electrically erasable programmable read-only memory (EEPROM) that stores the wiper position for initialization during power-up. The 3-wire SPI-compatible serial interface allows communication at data rates up to 7MHz. A pin-selectable up/down digital interface is also available.

The MAX5481-MAX5484 are ideal for applications requiring digitally controlled potentiometers. Two end-to-end resistance values are available (10k and 50k) in a voltage-divider or a variable-resistor configuration (see the *Selector Guide* in the full data sheet). The nominal resistor temperature coefficient is 35ppm/°C end-to-end, and only 5ppm/°C ratiometric, making these devices ideal for applications requiring low-temperature-coefficient voltage-dividers, such as low-drift, programmable gain-amplifiers. The MAX5481-MAX5484 operate with either a +2.7V to +5.25V single power supply or ±2.5V dual power supplies. These devices consume 400µA (max) of supply current when writing data to the nonvolatile memory and 1.0µA (max) of standby supply current. The MAX5481-MAX5484 are available in a space-saving (3mm x 3mm), 16-pin TQFN, or a 14-pin TSSOP package and are specified over the extended (-40°C to +85°C) temperature range.

II. Manufacturing Information

A. Description/Function:	10-Bit, Nonvolatile, Linear-Taper Digital Potentiometers
B. Process:	E35
C. Number of Device Transistors:	20029
D. Fabrication Location:	Texas
E. Assembly Location:	Malaysia, Thailand
F. Date of Initial Production:	April 23, 2005

III. Packaging Information

A. Package Type:	16-pin TQFN 3x3	14-pin TSSOP
B. Lead Frame:	Copper	Copper
C. Lead Finish:	100% matte Tin	100% matte Tin
D. Die Attach:	None	Conductive
E. Bondwire:	N/A (N/A mil dia.)	Au (1 mil dia.)
F. Mold Material:	Epoxy with silica filler	Epoxy with silica filler
G. Assembly Diagram:	#05-9000-1448	#05-9000-1449
H. Flammability Rating:	Class UL94-V0	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	Level 1	Level 1
J. Single Layer Theta Ja:	°C/W	110°C/W
K. Single Layer Theta Jc:	°C/W	30°C/W
L. Multi Layer Theta Ja:	57.2°C/W	100.4°C/W
M. Multi Layer Theta Jc:	40°C/W	30°C/W

IV. Die Information

A. Dimensions:	97 X 97 mils
B. Passivation:	Si_3N_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:	0.35µm
F. Minimum Metal Spacing:	0.35µm
G. Bondpad Dimensions:	5 mil. Sq.
H. Isolation Dielectric:	SiO_2
I. Die Separation Method:	Wafer Saw

V. Quality Assurance Information

A. Quality Assurance Contacts:	Richard Aburano (Manager, Reliability Operations) 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 125°C biased (static) life test are shown in Table 1. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4340 \times 48 \times 2}$$ (Chi square value for MTTF upper limit)

(where 4340 = Temperature Acceleration factor assuming an activation energy of 0.8eV)

$\lambda = 22.9 \times 10^{-9}$

λ = 22.9 F.I.T. (60% confidence level @ 25°C)

The following failure rate represents data collected from Maxim's reliability monitor program. Maxim performs quarterly life test monitors on its processes. This data is published in the Reliability Report found at http://www.maxim-ic.com/qa/reliability/monitor. Cumulative monitor data for the E35 Process results in a FIT Rate of 0.68 @ 25C and 11.68 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (lot CUB0AQ002T, D/C 0506)

The DP22 die type has been found to have all pins able to withstand a HBM transient pulse of +/- 2000V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of 250mA.

Table 1
Reliability Evaluation Test Results

MAX5481

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)					
	Ta = 125°C Biased Time = 192 hrs.	DC Parameters & functionality	48	0	CUB0AQ002A, D/C 0537

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