RELIABILITY REPORT

FOR

MAX5128ELA+

PLASTIC ENCAPSULATED DEVICES

October 1, 2009

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Approved by
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Director, Reliability Engineering

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Conclusion

The MAX5128ELA+ 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 MAX5128 nonvolatile, single, linear-taper, digital potentiometer performs the function of a mechanical potentiometer, but replaces the mechanics with a simple 2-wire digital interface. The MAX5128 performs the same function as a discrete potentiometer or variable resistor and features 128 taps and 22k end-to-end resistance. The MAX5128 also features an ultra-small, 2mm x 2mm µDFN package and low 0.5µA (typ) standby supply current, making this device ideal for portable applications. The MAX5128 operates from a +2.7V to +5.25V power supply. An integrated nonvolatile memory recalls the programmed wiper position of the digital potentiometer. A simple 2-wire up/down interface programs the wiper position. The digital potentiometer provides a low 5ppm/°C ratiometric temperature coefficient and is specified over the extended -40°C to +85°C temperature range.

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II. Manufacturing Information

A. Description/Function:	128-Tap, Nonvolatile, Linear-Taper Digital Potentiometer in 2mm x 2mm µDFN Package
B. Process:	E35
C. Number of Device Transistors:	7177
D. Fabrication Location:	Texas
E. Assembly Location:	Thailand
F. Date of Initial Production:	January 21, 2006

III. Packaging Information

A. Package Type:	8-pin uDFN
B. Lead Frame:	Substrate
C. Lead Finish:	Gold
D. Die Attach:	Non-conductive Epoxy
E. Bondwire:	Gold (1 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-9000-1815
H. Flammability Rating:	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	Level 1
J. Multi Layer Theta Ja:	210.2°C/W
K. Multi Layer Theta Jc:	122.1°C/W

IV. Die Information

A. Dimensions:	62 X 45 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

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V. Quality Assurance Information

A. Quality Assurance Contacts: Ken Wendel (Director, Reliability Engineering)
Bryan Preeshl (Managing Director 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)

$\lambda = 22.4 \times 10^{-9}$

λ = 22.4 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. Moisture Resistance Tests

The industry standard 85°C/85%RH or HAST testing is monitored per device process once a quarter.

C. E.S.D. and Latch-Up Testing

The DP27 die type has been found to have all pins able to withstand a HBM transient pulse of +/-2500 V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/-250 mA.

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Table 1
Reliability Evaluation Test Results

MAX5128ELA+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES
Static Life Test (Note 1)				
	Ta = 125°C Biased Time = 192 hrs.	DC Parameters & functionality	48	0
Moisture Testing (Note 2)				
HAST	Ta = 130°C RH = 85% Biased Time = 96hrs.	DC Parameters & functionality	77	0
Mechanical Stress (Note 2)				
Temperature Cycle	-55ºC/125ºC 1000 Cycles Method 1010	DC Parameters & functionality	77	0

Note 1: Life Test Data may represent plastic DIP qualification lots.
Note 2: Generic Package/Process data

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