

RELIABILITY REPORT
FOR
MAX5407EKA+
PLASTIC ENCAPSULATED DEVICES

April 27, 2011

MAXIM INTEGRATED PRODUCTS

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Conclusion

The MAX5407EKA+ 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 MAX5407 SOT-PoT™ is a logarithmic taper digital potentiometer with 32 tap points that has 1dB steps between taps. This device is ideal for audio applications, such as volume control and fading/balancing audio signals. The MAX5407 consists of a resistor string and CMOS switches that are digitally controlled through a simple 2-wire serial interface. This device performs the same function as a mechanical potentiometer. The device has a fixed end-to-end resistance of 20k and features zero-crossing detection to minimize the audible noise generated by the wiper transitions. This device has nominal resistor temperature coefficients of 35ppm/°C end-to-end and 5ppm/°C ratiometric. The MAX5407 is available in a space saving 8-pin SOT23 package and is guaranteed from -40°C to +85°C.

II. Manufacturing Information

A. Description/Function:	32-Tap Audio Logarithmic Taper Digital Potentiometer
B. Process:	C6Y
C. Number of Device Transistors:	2197
D. Fabrication Location:	Japan
E. Assembly Location:	Thailand
F. Date of Initial Production:	October 26, 2001

III. Packaging Information

A. Package Type:	8-pin SOT23
B. Lead Frame:	NiPd
C. Lead Finish:	100% matte Tin
D. Die Attach:	Non-conductive
E. Bondwire:	Au (1 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-3401-0008
H. Flammability Rating:	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	Level 1
J. Single Layer Theta Jb:	112°C/W
K. Single Layer Theta Jc:	80°C/W
L. Multi Layer Theta Ja:	180°C/W
M. Multi Layer Theta Jc:	60°C/W

IV. Die Information

A. Dimensions:	57 X 29 mils
B. Passivation:	Si ₃ N ₄ /SiO ₂ (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Al with Ti/TiN Barrier
D. Backside Metallization:	None
E. Minimum Metal Width:	0.6 microns (as drawn)
F. Minimum Metal Spacing:	0.6 microns (as drawn)
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 Engineering)
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 135°C biased (static) life test are shown in Table 1. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 77 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 14.3 \times 10^{-9}$$

$$\lambda = 14.3 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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 C6Y Process results in a FIT Rate of 0.90 @ 25C and 15.55 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (ESD lot I1U0BQ001D D/C 0130, Latch-Up lot N1U0BQ001D D/C 0130)

The DP05 die type has been found to have all pins able to withstand a HBM transient pulse of +/-2500V per Mil-Std 883 Method 3015.7. Latch-Up testing has shown that this device withstands a current of +/-250mA.

Table 1
Reliability Evaluation Test Results

MAX5407EKA+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality	77	0	I1U0BQ001D, D/C 0130

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