

RELIABILITY REPORT
FOR
MAX5223EKA+
PLASTIC ENCAPSULATED DEVICES

October 27, 2009

MAXIM INTEGRATED PRODUCTS

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Conclusion

The MAX5223EKA+ 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 MAX5223 contains two 8-bit, buffered, voltage output digital-to-analog converters (DAC A and DAC B) in a small 8-pin SOT23 package. DAC outputs can source and sink 1mA to within 100mV of ground and VDD. The MAX5223 operates with a single +2.7V to +5.5V supply. The device uses a 3-wire serial interface, which operates at clock rates up to 25MHz and is compatible with SPI(tm), QSPI(tm), and MICROWIRE(tm) interface standards. The serial input shift register is 16 bits long and consists of 8 bits of DAC input data and 8 bits for DAC selection and shutdown control. DAC registers can be loaded independently or in parallel at the positive edge of active-low CS. The MAX5223's ultra-low power consumption and tiny 8-pin SOT23 package make it ideal for portable and battery-powered applications. Supply current is a low 100µA and drops below 1µA in shutdown mode. In addition, the reference input is disconnected from the REF pin during shutdown, which reduces the system's total power consumption.

II. Manufacturing Information

A. Description/Function:	Low-Power, Dual, 8-Bit, Voltage-Output Serial DAC in 8-Pin SOT23
B. Process:	C6Y
C. Number of Device Transistors:	1496
D. Fabrication Location:	Japan
E. Assembly Location:	Malaysia, Thailand
F. Date of Initial Production:	January 12, 2001

III. Packaging Information

A. Package Type:	8-pin SOT23
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive Epoxy
E. Bondwire:	Gold (1 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-0401-0539
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

IV. Die Information

A. Dimensions:	24 X 67 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: 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 135°C biased (static) life test are shown in Table 1. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 80 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 13.4 \times 10^{-9}$$

$\lambda = 13.4$ 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 C6Y Process results in a FIT Rate of 0.90 @ 25C and 15.55 @ 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 DA98-1 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.

Table 1
Reliability Evaluation Test Results

MAX5223EKA+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES
Static Life Test (Note 1)				
	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality	80	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	-65°C/150°C 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