

RELIABILITY REPORT
FOR
MAX5250BCAP+T
PLASTIC ENCAPSULATED DEVICES

July 2, 2014

MAXIM INTEGRATED

160 RIO ROBLES
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Approved by
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Conclusion

The MAX5250BCAP+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 +5V MAX5250 combines four low-power, voltage-output, 10-bit digital-to-analog converters (DACs) and four precision output amplifiers in a space-saving, 20-pin package. In addition to the four voltage outputs, each amplifier's negative input is also available to the user. This facilitates specific gain configurations, remote sensing, and high output drive capacity, making the MAX5250 ideal for industrial-process-control applications. Other features include software shutdown, hardware shutdown lockout, an active-low reset that clears all registers and DACs to zero, a user-programmable logic output, and a serial-data output. Each DAC has a double-buffered input organized as an input register followed by a DAC register. A 16-bit serial word loads data into each input/DAC register. The 3-wire serial interface is compatible with SPI™/QSPI™ and Microwire™. It allows the input and DAC registers to be updated independently or simultaneously with a single software command. All logic inputs are TTL/CMOS-logic compatible.

II. Manufacturing Information

A. Description/Function:	Low-Power, Quad, 10-Bit Voltage-Output DAC with Serial Interface
B. Process:	S12
C. Number of Device Transistors:	4337
D. Fabrication Location:	USA
E. Assembly Location:	Malaysia, Philippines, Thailand
F. Date of Initial Production:	November 24, 1997

III. Packaging Information

A. Package Type:	20-pin SSOP
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive
E. Bondwire:	Au (1.3 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-0401-0460
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:	125°C/W
K. Single Layer Theta Jc:	33°C/W
L. Multi Layer Theta Ja:	83°C/W
M. Multi Layer Theta Jc:	33°C/W

IV. Die Information

A. Dimensions:	124 X 153 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:	1.8 microns (as drawn)
F. Minimum Metal Spacing:	1.2 microns (as drawn)
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 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)

$$\lambda = 13.7 \times 10^{-9}$$

$$\lambda = 13.7 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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 S12 Process results in a FIT Rate of 0.03 @ 25°C and 0.5 @ 55°C (0.8 eV, 60% UCL)

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

The DA59 die type has been found to have all pins able to withstand an HBM transient pulse of +/-2500V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/-250mA and overvoltage per JEDEC JESD78.

Table 1
Reliability Evaluation Test Results

MAX5250BCAP+T

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

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