

RELIABILITY REPORT
FOR
MAX5382NEUK+
PLASTIC ENCAPSULATED DEVICES

August 3, 2009

MAXIM INTEGRATED PRODUCTS

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Approved by
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Quality Assurance
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Conclusion

The MAX5382NEUK+ 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 MAX5380/MAX5381/MAX5382 are low-cost, 8-bit digital-to-analog converters (DACs) in miniature 5-pin SOT23 packages, with a simple 2-wire serial interface that allows communication with multiple devices. The MAX5380 has an internal +2V reference and operates from a +2.7V to +3.6V supply. The MAX5381 has an internal +4V reference and operates from a +4.5V to +5.5V supply. The MAX5382 operates over the full +2.7V to +5.5V supply range and has an internal reference equal to $0.9 \times V_{DD}$. The fast-mode I²C*-compatible serial interface allows communication at data rates up to 400kbps, minimizing board space and reducing interconnect complexity in many applications. Each device is available with one of four factory-preset addresses (see Selector Guide). These DACs also include an output buffer, a low-power shutdown mode, and a power-on reset that ensures the DAC outputs are at zero when power is initially applied. In shutdown mode, supply current is reduced to less than 1 μ A and the output is pulled down to GND with a 10k resistor.

II. Manufacturing Information

A. Description/Function:	Low-Cost, Low-Power, 8-Bit DACs with 2-Wire Serial Interface in SOT23
B. Process:	C6Y
C. Number of Device Transistors:	2899
D. Fabrication Location:	Japan
E. Assembly Location:	Malaysia, Thailand, Philippines
F. Date of Initial Production:	July 22, 2000

III. Packaging Information

A. Package Type:	5-pin SOT23
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive
E. Bondwire:	Au (1 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-0401-0525
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:	324.3°C/W
K. Single Layer Theta Jc:	82°C/W

IV. Die Information

A. Dimensions:	57 X 38 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:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 467 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 2.3 \times 10^{-9}$$

$\lambda = 2.3$ F.I.T. (60% confidence level @ 25°C)

The following failure rate represents data collected from Maxim's reliability monitor program. Maxim performs quarterly 1000 hour life test monitors on its processes. This data is published in the Product Reliability Report found at <http://www.maxim-ic.com/>. Current monitor data for the C6Y Process results in a FIT Rate of 0.82 @ 25C and 14.21 @ 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 DA68-9 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, 1.5x VCCMax Overvoltage per JESD78.

Table 1
Reliability Evaluation Test Results

MAX5382NEUK+

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	467	0
Moisture Testing (Note 2) 85/85	Ta = 85°C RH = 85% Biased Time = 1000hrs.	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