

RELIABILITY REPORT
FOR
MAX6501UKP075+
PLASTIC ENCAPSULATED DEVICES

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MAXIM INTEGRATED

160 RIO ROBLES
SAN JOSE, CA 95134

Approved by
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Conclusion

The MAX6501UKP075+ 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 MAX6501-MAX6504 low-cost, fully integrated temperature switches assert a logic signal when their die temperature crosses a factory-programmed threshold. Operating from a +2.7V to +5.5V supply, these devices feature two on-chip, temperature-dependent voltage references and a comparator. They are available with factory-trimmed temperature trip thresholds from -45°C to +125°C in 10°C increments, and are accurate to $\pm 0.5^\circ\text{C}$ (typ) or $\pm 6^\circ\text{C}$ (max). These devices require no external components and typically consume 30 μA supply current. Hysteresis is pin-selectable at 2°C or 10°C. The MAX6501/MAX6503 have an active-low, open-drain output intended to interface with a microprocessor (μP) reset input. The MAX6502/MAX6504 have an active-high, push-pull output intended to directly drive fan-control logic. The MAX6501/MAX6502 are offered with hot-temperature thresholds (+35°C to +125°C), asserting when the temperature is above the threshold. The MAX6503/MAX6504 are offered with cold-temperature thresholds (-45°C to +15°C), asserting when the temperature is below the threshold. The MAX6501-MAX6504 are offered in eight standard temperature versions; contact the factory for pricing and availability of nonstandard temperature versions. They are available in 5-pin SOT23 package.

II. Manufacturing Information

A. Description/Function:	Low-Cost, +2.7V to +5.5V, Micropower Temperature Switches in SOT23
B. Process:	S3
C. Fabrication Location:	USA
D. Assembly Location:	Thailand
E. Date of Initial Production:	September 09, 1997

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:	#05-1601-0028
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
L. Multi Layer Theta Ja:	255.90°C/W
M. Multi Layer Theta Jc:	81°C/W

IV. Die Information

A. Dimensions:	38X57 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:	3.0 microns (as drawn)
F. Minimum Metal Spacing:	3.0 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: Eric Wright (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 135C 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 S3 Process results in a FIT Rate of 0.04 @ 25C and 0.69 @ 55C (0.8 eV, 60% UCL)

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

The MS12 die type has been found to have all pins able to withstand an HBM transient pulse of +/-1000V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/-200mA and overvoltage per JEDEC JESD78.

Table 1
Reliability Evaluation Test Results

MAX6501UKP075+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)	Ta = 135C Biased Time = 192 hrs.	DC Parameters & functionality	80	0	

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