



RELIABILITY REPORT
FOR
MAX31820MCR+
PLASTIC ENCAPSULATED DEVICES

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MAXIM INTEGRATED

160 RIO ROBLES
SAN JOSE, CA 95134

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Conclusion

The MAX31820MCR+ 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 MAX31820 ambient temperature sensor provides 9-bit to 12-bit Celsius temperature measurements with $\pm 0.5^{\circ}\text{C}$ accuracy over a $+10^{\circ}\text{C}$ to $+45^{\circ}\text{C}$ temperature range. Over its entire -55°C to $+125^{\circ}\text{C}$ operating range, the device has $\pm 2.0^{\circ}\text{C}$ accuracy. The device communicates over a 1-Wire® bus that, by definition, requires only one data line (and ground) for communication with a central microprocessor. In addition, the device can derive power directly from the data line ("parasite power"), eliminating the need for an external power supply. Requiring so few pins enables the device to be placed in a 3-pin TO-92 package. The form factor of this package allows the device to be placed above the board and thus measure the ambient temperature of a system, as opposed to the board temperature that a surface-mount package would measure. Each MAX31820 has a unique 64-bit serial code, which allows multiple MAX31820 devices to function on the same 1-Wire bus. Therefore, it is simple to use one microprocessor to control many devices distributed over a large area.

II. Manufacturing Information

A. Description/Function:	1-Wire Ambient Temperature Sensor
B. Process:	E6
C. Fabrication Location:	USA
D. Assembly Location:	Philippines, Thailand, Malaysia
E. Date of Initial Production:	June 28, 2013

III. Packaging Information

A. Package Type:	3-pin TO-92
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Bondwire:	Au (1 mil dia.)
E. Mold Material:	Epoxy with silica filler
F. Assembly Diagram:	#05-MAXCIM-0556
G. Flammability Rating:	Class UL94-V0
H. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	Level 1
I. Single Layer Theta Ja:	160°C/W
J. Single Layer Theta Jc:	4°C/W
K. Multi Layer Theta Ja:	131.9°C/W
L. Multi Layer Theta Jc:	4°C/W

IV. Die Information

A. Dimensions:	78X54 mils
B. Passivation:	NRL Laser w/Nov TEOS Oxide-Nitride
C. Interconnect:	Aluminum / 1% Silicon / 0.5% Copper

V. Quality Assurance Information

- A. Quality Assurance Contacts: Eric Wright (Reliability Engineering)
 Brian Standley (Manager, Reliability)
 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 125C biased (static) life test are shown in Table 1. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{1000 \times 4340 \times 77 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 4.5 \times 10^{-9}$$

$$\lambda = 4.5 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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

The A18X20 die type has been found to have all pins able to withstand a HBM transient pulse of +/-4000V per Mil-Std 883 Method 3015.7. Latch-Up testing has shown that this device withstands a current of +/-100mA and overvoltage per JEDEC JESD78.

Table 1
Reliability Evaluation Test Results

MAX31820MCR+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES
Static Life Test (Note 1)	Ta = 125C Biased Time = 1000 hrs.	DC Parameters & functionality	77	0

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