RELIABILITY REPORT

FOR

MAX378CPE+

PLASTIC ENCAPSULATED DEVICES

February 15, 2016

MAXIM INTEGRATED

160 RIO ROBLES

SAN JOSE, CA 95134

Approved by
Sokhom Chum
Quality Assurance
Reliability Engineer

Conclusion

The MAX378CPE+ 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 MAX378 8-channel single-ended (1-of-8) multiplexer and the MAX379 4-channel differential (2-of-8) multiplexer use a series N-channel/P-channel/N-channel structure to provide significant fault protection. If the power supplies to the MAX378/MAX379 are inadvertently turned off while input voltages are still applied, *all* channels in the muxes are turned off, and only a few nanoamperes of leakage current will flow into the inputs. This protects not only the MAX378/MAX379 and the circuitry they drive, but also the sensors or signal sources that drive the muxes. The series N-channel/P-channel/N-channel protection structure has two significant advantages over the simple current-limiting protection scheme of the industry's first-generation fault-protected muxes. First, the Maxim protection scheme limits fault currents to nanoamp leakage values rather than many milliamperes. This prevents damage to sensors or other sensitive signal sources. Second, the MAX378/MAX379 fault-protected muxes can withstand a *continuous*±60V input, unlike the first generation, which had a continuous ±35V input limitation imposed by power dissipation considerations. All digital inputs have logic thresholds of 0.8V and 2.4V, ensuring both TTL and CMOS compatibility without requiring pull-up resistors. Break-before-make operation is guaranteed. Power dissipation is less than 2mW.

II. Manufacturing Information

A. Description/Function:	8-Channel, High-Voltage, Fault-Protected Multiplexers
B. Process:	M6H
C. Number of Device Transistors:	
D. Fabrication Location:	Oregon
E. Assembly Location:	Philippines
F. Date of Initial Production:	Pre 1997

III. Packaging Information

A. Package Type:	16-pin PDIP
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:	#05-0301-0528
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:	95°C/W
K. Single Layer Theta Jc:	35°C/W
L. Multi Layer Theta Ja:	N/A
M. Multi Layer Theta Jc:	N/A

IV. Die Information

A. Dimensions:	148X230 mils
B. Passivation:	Si_3N_4/SiO_2 (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Al/1.0%Si
D. Backside Metallization:	None
E. Minimum Metal Width:	Metal1 = 0.5 microns (as drawn)
F. Minimum Metal Spacing:	Metal1 = 0.45 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 135C biased (static) life test are shown in Table 1. Using these results, the Failure Rate (λ) is calculated as follows:

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

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

$\lambda = 2.74 \times 10^{-9}$

λ = 2.74 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 M6H Process results in a FIT Rate of 0.09 @ 25C and 1.59 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (ESD lot XRYAJQ005A D/C 9141, Larch-Up lot NRYABA008A D/C 0005)

The AG51 die type has been found to have all pins able to withstand a HBM transient pulse of +/-500V per Mil-Std 883 Method 3015.7. Latch-Up testing has shown that this device withstands a current of +/-250mA.

Table 1
Reliability Evaluation Test Results

MAX378CPE+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)	Ta = 135°C Biased Time = 1000 hrs.	DC Parameters & functionality	77	0	NRYBBA088B, D/C 0528

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