

RELIABILITY REPORT
FOR
MAX5956BU EE+
PLASTIC ENCAPSULATED DEVICES

June 13, 2011

MAXIM INTEGRATED PRODUCTS

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Approved by
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Quality Assurance
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Conclusion

The MAX5956BUUE+ 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 MAX5955 and MAX5956 are +1V to +13.2V dual hot-swap controllers with independent on/off control for complete protection of dual-supply systems. They allow the safe insertion and removal of circuit cards into live backplanes. The MAX5955 and MAX5956 operate down to 1V provided one of the inputs is above 2.7V. The discharged filter capacitors of the circuit card provide low impedance to the live backplane. High inrush currents from the backplane to the circuit card can burn up connectors and components, or momentarily collapse the backplane power supply leading to a system reset. The MAX5955 and MAX5956 hot-swap controllers prevent such problems by gradually ramping up the output voltage and regulating the current to a preset limit when the board is plugged in, allowing the system to stabilize safely. After the startup cycle is completed, two on-chip comparators provide VariableSpeed/BiLevel protection against short-circuit and overcurrent faults, as well as immunity against system noise and load transients. In the event of a fault condition, the load is disconnected. The MAX5955B and MAX5956B must be unlatched after a fault, and the MAX5955A and MAX5956A automatically restart after a fault. The MAX5955 and MAX5956 integrate an on-board charge pump to drive the gates of low-cost, external n-channel MOSFETs. The devices offer integrated features like startup current regulation and current glitch protection to eliminate external timing resistors and capacitors. These devices provide open-drain status outputs, an adjustable startup timer, and adjustable current limits. The MAX5955 provides output undervoltage/ overvoltage protection for each channel, while the MAX5956 provides undervoltage/overvoltage monitoring for each channel. The MAX5955 and MAX5956 are available in a space-saving 16-pin QSOP package.

II. Manufacturing Information

A. Description/Function:	Low-Voltage, Dual Hot-Swap Controllers with Independent On/Off Control
B. Process:	B8
C. Number of Device Transistors:	
D. Fabrication Location:	Oregon
E. Assembly Location:	Malaysia, Philippines, Thailand
F. Date of Initial Production:	September 28, 2005

III. Packaging Information

A. Package Type:	16-pin QSOP
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:	#05-1301-0054
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:	120°C/W
K. Single Layer Theta Jc:	37°C/W
L. Multi Layer Theta Ja:	103.7°C/W
M. Multi Layer Theta Jc:	37°C/W

IV. Die Information

A. Dimensions:	81 X 78 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:	0.8 microns (as drawn)
F. Minimum Metal Spacing:	0.8 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: Richard Aburano (Manager, Reliability Engineering)
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)

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

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

The following failure rate represents data collected from Maxim's reliability monitor program. Maxim performs quarterly life test monitors on its processes. This data is published in the Reliability Report found at <http://www.maxim-ic.com/qa/reliability/monitor>. Cumulative monitor data for the B8 Process results in a FIT Rate of 0.06 @ 25C and 0.99 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (lot SG74CQ001R D/C 0535)

The NP47-5 die type has been found to have all pins able to withstand a HBM transient pulse of +/-1000V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/-250mA.

Table 1
Reliability Evaluation Test Results

MAX5956BU EE+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality	80	0	IG73BQ001B, D/C 0218

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