

RELIABILITY REPORT
FOR
MAX1909ETI+
PLASTIC ENCAPSULATED DEVICES

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MAXIM INTEGRATED

160 RIO ROBLES
SAN JOSE, CA 95134

Approved by
Sokhom Chum
Quality Assurance
Reliability Engineer

Conclusion

The MAX1909ETI+ 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 MAX1909/MAX8725 highly integrated control ICs simplify construction of accurate and efficient multichemistry battery chargers. The MAX1909/MAX8725 use analog inputs to control charge current and voltage, and can be programmed by a host microcontroller (μC) or hardwired. High efficiency is achieved through use of buck topology with synchronous rectification. The maximum current drawn from the AC adapter is programmable to avoid overloading the AC adapter when supplying the load and the battery charger simultaneously. The MAX1909/MAX8725 provide a digital output that indicates the presence of an AC adapter, and an analog output that monitors the current drawn from the AC adapter. Based on the presence or absence of the AC adapter, the MAX1909/MAX8725 automatically select the appropriate source for supplying power to the system by controlling two external p-channel MOSFETs. Under system control, the MAX1909/MAX8725 allow the battery to undergo a relearning or conditioning cycle in which the battery is completely discharged through the system load and then recharged. The MAX1909 includes a conditioning charge feature while the MAX8725 does not. The MAX1909/MAX8725 are available in space-saving 28-pin, 5mm x 5mm thin QFN packages and operate over the extended -40°C to $+85^{\circ}\text{C}$ temperature range. The MAX1909/MAX8725 are now available in lead-free packages.

II. Manufacturing Information

A. Description/Function:	Multichemistry Battery Chargers with Automatic System Power Selector
B. Process:	B12
C. Number of Device Transistors:	
D. Fabrication Location:	Oregon, California or Texas
E. Assembly Location:	China, Thailand, or Malaysia
F. Date of Initial Production:	April 26, 2003

III. Packaging Information

A. Package Type:	28-pin TQFN 5x5
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:	#05-9000-0069
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:	47°C/W
K. Single Layer Theta Jc:	2.1°C/W
L. Multi Layer Theta Ja:	29°C/W
M. Multi Layer Theta Jc:	2.1°C/W

IV. Die Information

A. Dimensions:	114 X 117 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:	1.2 microns (as drawn)
F. Minimum Metal Spacing:	1.2 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: 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 135C biased (static) life test are shown in Table 1. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 144 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 7.6 \times 10^{-9}$$

$$\lambda = 7.6 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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 B12 Process results in a FIT Rate of 0.02 @ 25C and 0.33 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (lot SM60EA040B, D/C 0531)

The PD16 die type has been found to have all pins able to withstand a HBM transient pulse of +/-500V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/-250mA.

Table 1
Reliability Evaluation Test Results

MAX1909ETI+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)	Ta = 135°C	DC Parameters	48	0	SM60DQ001A, D/C 0417
	Biased	& functionality	48	0	SM60CQ001B, D/C 0415
	Time = 192 hrs.		48	0	NM60BQ001C, D/C 0310

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