

RELIABILITY REPORT
FOR
MAX5052AEUA+T
PLASTIC ENCAPSULATED DEVICES

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MAXIM INTEGRATED

160 RIO ROBLES
SAN JOSE, CA 95134

Approved by
Eric Wright
Quality Assurance
Reliability Engineer

Conclusion

The MAX5052AEUA+T 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 MAX5052/MAX5053 current-mode PWM controllers contain all the control circuitry required for the design of wide-input-voltage isolated and nonisolated power supplies. The MAX5052 is well suited for universal input (rectified 85VAC to 265VAC) or telecom (-36VDC to -72VDC) power supplies. The MAX5053 is well suited for low-input-voltage (10.8VDC to 24VDC) power supplies. The MAX5052/MAX5053 contain an internal error amplifier that regulates the tertiary winding output voltage. This implements a primary-side regulated, isolated power supply, eliminating the need for an optocoupler. An input undervoltage lockout (UVLO) is provided for programming the input-supply start voltage and to ensure proper operation during brownout conditions. The input-supply start voltage is externally programmable with a voltage-divider. To shutdown the device, the UVLO pin is pulled low. Internal digital soft-start reduces output voltage overshoot. The internal thermal shutdown circuit protects the device in the event the junction temperature exceeds +130°C. The MAX5052 has an internal bootstrap UVLO with large hysteresis that requires a minimum voltage of 23.6V for startup. The MAX5053 does not have the internal bootstrap UVLO and can be biased directly from a minimum voltage of 10.8V. The 262kHz switching frequency is internally trimmed to $\pm 12\%$ accuracy; this allows the optimization of the magnetic and filter components resulting in compact, cost-effective power supplies. The MAX5052A/MAX5053A are offered with a 50% maximum duty-cycle limit. The MAX5052B/MAX5053B are offered with a 75% maximum duty-cycle limit. These devices are available in 8-pin μ MAX packages and operate over the -40°C to +85°C temperature range.

II. Manufacturing Information

A. Description/Function:	Current-Mode PWM Controllers with an Error Amplifier for Isolated/Nonisolated Power Supplies
B. Process:	B8
C. Fabrication Location:	USA
D. Assembly Location:	Thailand, Malaysia
E. Date of Initial Production:	October 25, 2002

III. Packaging Information

A. Package Type:	8-pin uMAX
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:	#05-9000-0088
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:	221°C/W
K. Single Layer Theta Jc:	41.9°C/W
L. Multi Layer Theta Ja:	206.3°C/W
M. Multi Layer Theta Jc:	41.9°C/W

IV. Die Information

A. Dimensions:	62X80 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:	
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:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 95 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 11.6 \times 10^{-9}$$

$$\lambda = 11.6 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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 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

The NP46 die type has been found to have all pins able to withstand an HBM transient pulse of +/-2500V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/-250mA and overvoltage per JEDEC JESD78.

Table 1
Reliability Evaluation Test Results

MAX5052AEUA+T

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	95	0	

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