

RELIABILITY REPORT
FOR
MAX1776EUA+T
PLASTIC ENCAPSULATED DEVICES

October 26, 2014

MAXIM INTEGRATED

160 RIO ROBLES
SAN JOSE, CA 95134

Approved by
Eric Wright
Quality Assurance
Reliability Engineering

Conclusion

The MAX1776EUA+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 MAX1776 high-efficiency step-down converter provides an adjustable output voltage from 1.25V to V_{IN} from supply voltages as high as 24V. An internal current-limited 0.4 MOSFET delivers load currents up to 600mA. Operation to 100% duty cycle minimizes dropout voltage (240mV at 600mA). The MAX1776 has a low 15 μ A quiescent current to improve light-load efficiency and conserve battery life. The device draws only 3 μ A while in shutdown. High switching frequencies (up to 200kHz) allow the use of tiny surface-mount inductors and output capacitors. The MAX1776 is available in an 8-pin μ MAX package, which uses half the space of an 8-pin SO. For increased output drive capability, use the MAX1626/ MAX1627 step-down controllers, which drive an external P-channel MOSFET to deliver up to 20W.

II. Manufacturing Information

A. Description/Function:	24V, 600mA Internal Switch, 100% Duty Cycle, Step-Down Converter
B. Process:	B8
C. Number of Device Transistors:	932
D. Fabrication Location:	USA
E. Assembly Location:	Philippines, Thailand, Malaysia
F. Date of Initial Production:	April 03, 2001

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 (1.3 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-2301-0079
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:	42°C/W
L. Multi Layer Theta Ja:	206.3°C/W
M. Multi Layer Theta Jc:	42°C/W

IV. Die Information

A. Dimensions:	62 X 87 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:	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:	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:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 148 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 7.4 \times 10^{-9}$$

$$\lambda = 7.4 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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 0.05 @ 25°C and 0.9 @ 55°C (0.8 eV, 60% UCL)

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

The PY12 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 +/-150mA and overvoltage per JEDEC JESD78.

Table 1
Reliability Evaluation Test Results

MAX1776EUA+T

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES
Static Life Test (Note 1)	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality	148	0

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