

RELIABILITY REPORT FOR MAX774EPA+

PLASTIC ENCAPSULATED DEVICES

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MAXIM INTEGRATED PRODUCTS

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Approved by		
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Conclusion

The MAX774EPA+ 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 MAX774/MAX775/MAX776 inverting switching regulators deliver high efficiency over three decades of load current. A unique current-limited, pulse-frequency modulated (PFM) control scheme provides the benefits of pulse-width modulation (high efficiency with heavy loads), while using less than 100µA of supply current (vs. 2mA to 10mA for PWM converters). The result is high efficiency over a wide range of loads. These ICs also use tiny external components; their high switching frequency (up to 300kHz) allows for less than 5mm diameter surface-mount magnetics. The MAX774/MAX775/MAX776 accept input voltages from 3V to 16.5V, and have preset output voltages of -5V, -12V, and -15V, respectively. Or, the output voltage can be user-adjusted with two resistors. Maximum VIN - VOUT differential voltage is limited only by the break-down voltage of the chosen external switch transistor. These inverters use external P-channel MOSFET switches, allowing them to power loads up to 5W. If less power is required, use the MAX764/MAX765/MAX766 inverting switching regulators with on-board MOSFETs.



II. Manufacturing Information

A. Description/Function:	-5V/-12V/-15V or Adjustable, High-Efficiency, Low I _Q Inverting DC-to-DC Controllers
B. Process:	SG5
C. Number of Device Transistors:	
D. Fabrication Location:	Oregon
E. Assembly Location:	Thailand

Pre 1997

F. Date of Initial Production:

III. Packaging Information

A. Package Type:	300 mil 8L 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:	#05-1701-0110 / B
H. Flammability Rating:	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	1
J. Single Layer Theta Ja:	110°C/W
K. Single Layer Theta Jc:	40°C/W
L. Multi Layer Theta Ja:	N/A
M. Multi Layer Theta Jc:	N/A

IV. Die Information

Α.	Dimensions:	80 X 109 mils
В.	Passivation:	$Si_3N_4/SiO_2\;$ (Silicon nitride/ Silicon dioxide)
C.	Interconnect:	Al/0.5%Cu with Ti/TiN Barrier
D.	Backside Metallization:	None
E.	Minimum Metal Width:	5.0 microns (as drawn)
F.	Minimum Metal Spacing:	5.0 microns (as drawn)
G.	Bondpad Dimensions:	
Η.	Isolation Dielectric:	SiO ₂
١.	Die Separation Method:	Wafer Saw



V. Quality Assurance Information

Α.	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 biased (static) life test are shown in Table 1. Using these results, the Failure Rate (λ) is calculated as follows:

 $\lambda = \underbrace{1}_{\text{MTTF}} = \underbrace{1.83}_{\text{192 x 4340 x 80 x 2}} \text{ (Chi square value for MTTF upper limit)}$ $\lambda = 13.7 \times 10^{-9}$ $\lambda = 13.7 \times 10^{-9}$ $\lambda = 13.7 \text{ F.I.T. (60\% confidence level @ 25°C)}$

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 SG5 Process results in a FIT Rate of 0.12 @ 25C and 2.04 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (ESD lot NSJAD4022B D/C 9951, Latch-Up lot XSJABB036E D/C 9639)

The PW11 die type has been found to have all pins able to withstand a HBM transient pulse of +/-2000V per Mil-Std 883 Method 3015.7. Latch-Up testing has shown that this device withstands a current of +/-100mA.



Table 1 Reliability Evaluation Test Results

MAX774EPA+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note	e 1) Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality	80	0	NSJBD4022A, D/C 9951

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