

RELIABILITY REPORT
FOR
MAX868EUB+
PLASTIC ENCAPSULATED DEVICES

August 28, 2012

MAXIM INTEGRATED PRODUCTS

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Conclusion

The MAX868EUB+ 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 MAX868 inverting charge pump provides a low-cost and compact means of generating a regulated negative voltage up to $-2 \times V_{IN}$ from a positive input voltage between 1.8V and 5.5V. It uses a pulse-frequency-modulation (PFM) control scheme to generate the regulated negative output voltage. PFM operation is obtained by gating the internal 450kHz oscillator on and off as needed to maintain output voltage regulation. This unique on-demand switching scheme gives the MAX868 excellent light-load efficiency without degrading its full-load operation (up to 30mA), permitting smaller capacitors to take advantage of the oscillator's high switching frequency. The MAX868 requires no inductors; only four capacitors are required to build a complete DC-DC converter. Output voltage regulation is achieved by adding just two resistors. The MAX868 comes in a 10-pin μ MAX® package, which is only 1.11mm high and occupies just half the board area of a standard 8-pin SO.

II. Manufacturing Information

A. Description/Function:	Regulated, Adjustable -2x Inverting Charge Pump
B. Process:	SG5
C. Number of Device Transistors:	
D. Fabrication Location:	Oregon
E. Assembly Location:	Philippines, Thailand, Malaysia
F. Date of Initial Production:	October 10, 1997

III. Packaging Information

A. Package Type:	10L 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:	#05-1101-0047 / 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:	180°C/W
K. Single Layer Theta Jc:	36°C/W
L. Multi Layer Theta Ja:	113.1°C/W
M. Multi Layer Theta Jc:	36°C/W

IV. Die Information

A. Dimensions:	61 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:	5.0 microns (as drawn)
F. Minimum Metal Spacing:	5.0 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 biased (static) life test are shown in Table 1. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{500 \times 4340 \times 58 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 7.3 \times 10^{-9}$$

$$\lambda = 7.3 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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 (lot NI3AEA077B D/C 0646)

The PX25 die type has been found to have all pins able to withstand a HBM transient pulse of +/-2500V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/-250mA.

Table 1
Reliability Evaluation Test Results

MAX868EUB+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)	Ta = 135°C Biased Time = 500 hrs.	DC Parameters & functionality	58	0	NI3AEA077B, D/C 0646

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