

RELIABILITY REPORT
FOR
MAX1606EUA
PLASTIC ENCAPSULATED DEVICES

January 11, 2001

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

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Conclusion

The MAX1606 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

The MAX1606 is a step-up DC-DC converter that contains a 0.5A internal power switch and a 0.5A output isolation switch in an 8-pin μ MAX package. The IC operates from a 2.4V to 5.5V supply voltage but can boost battery voltages as low as 0.8V up to 28V.

The MAX1606 uses a unique control scheme that provides high efficiency over a wide range of load conditions. An internal 0.5A MOSFET reduces external component count, and a high switching frequency (up to 500kHz) allows for tiny surface-mount components. The current limit can be set to 500mA, 250mA, or 125mA, allowing the user to reduce the output ripple and component size in low-current applications.

Additional features include a low quiescent supply current and a true shutdown mode that saves power by disconnecting the output from the input. The MAX1606 is ideal for small LCD panels with low current requirements but can also be used in other applications.

B. Absolute Maximum Ratings

<u>Item</u>	<u>Rating</u>
VCC, FB, BATT, SW to Gnd	-0.3V to +6V
BATT to SW	-0.3V to +6V
SHDN,LIM to Gnd	-0.3V to (V _{cc} + 0.3V)
LX to GND	-0.3V to +30V
Operating Temp Range	-40°C to +85°C
Storage Temp Range	-65°C to +150°C
Junction Temperature	+150°C
Lead Temp Range (soldering, 10s)	+300°C
Power Dissipation	
8-Pin uMax	330mW
Derates above +70°C	
8-Pin uMax	4.1mW/°C

II. Manufacturing Information

A. Description/Function:	28V Internal Switch LCD Bias Supply with True Shutdown
B. Process:	S8
C. Number of Device Transistors:	3833
D. Fabrication Location:	Oregon, USA
E. Assembly Location:	Malaysia
F. Date of Initial Production:	July, 2000

III. Packaging Information

A. Package Type:	8-Lead uMAX
B. Lead Frame:	Copper
C. Lead Finish:	Solder Plate
D. Die Attach:	Non-Conductive Epoxy
E. Bondwire:	Gold (1.0 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	Buildsheet # 05-2301-0050
H. Flammability Rating:	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard JESD22-A112:	Level 1

IV. Die Information

A. Dimensions:	75 x 88 mils
B. Passivation:	Si ₃ N ₄ /SiO ₂ (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Aluminum/Copper/Silicon
D. Backside Metallization:	None
E. Minimum Metal Width:	.8 microns (as drawn)
F. Minimum Metal Spacing:	.8 microns (as drawn)
G. Bondpad Dimensions:	5 mil. Sq.
H. Isolation Dielectric:	SiO ₂
I. Die Separation Method:	Wafer Saw

V. Quality Assurance Information

A. Quality Assurance Contacts:

Jim Pedicord (Reliability Lab Manager)
Bryan Preeshl (Executive Director of QA)
Kenneth Huening (Vice President)

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:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4389 \times 79 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

↳ Thermal acceleration factor assuming a 0.8eV activation energy

$$\lambda = 13.75 \times 10^{-9} \quad \lambda = 13.75 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

This low failure rate represents data collected from Maxim's reliability qualification and monitor programs. Maxim also performs weekly Burn-In on samples from production to assure the reliability of its processes. The reliability required for lots which receive a burn-in qualification is 59 F.I.T. at a 60% confidence level, which equates to 3 failures in an 80 piece sample. Maxim performs failure analysis on lots exceeding this level. The following Burn-In Schematic (Spec. #06-5594) shows the static circuit used for this test. Maxim also performs 1000 hour life test monitors quarterly for each process. This data is published in the Product Reliability Report (**RR-1L**).

B. Moisture Resistance Tests

Maxim evaluates pressure pot stress from every assembly process during qualification of each new design. Pressure Pot testing must pass a 20% LTPD for acceptance. Additionally, industry standard 85°C/85%RH or HAST tests are performed quarterly per device/package family.

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

The PY32 die type has been found to have all pins able to withstand a transient pulse of $\pm 1500\text{V}$, per Mil-Std-883 Method 3015 (reference attached ESD Test Circuit). Latch-Up testing has shown that this device withstands a current of $\pm 250\text{mA}$ and/or $\pm 20\text{V}$.

Table 1
Reliability Evaluation Test Results

MAX1606EUA

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	79	0
Moisture Testing (Note 2)				
Pressure Pot	Ta = 121°C P = 15 psi. RH= 100% Time = 168hrs.	DC Parameters & functionality	258	0
85/85	Ta = 85°C RH = 85% Biased Time = 1000hrs.	DC Parameters & functionality	77	0
Mechanical Stress (Note 2)				
Temperature Cycle	-65°C/150°C 1000 Cycles Method 1010	DC Parameters	77	0

Note 1: Life Test Data may represent plastic D.I.P. qualification lots for the uMax package.

Note 2: Generic package/process data

Attachment #1

TABLE II. Pin combination to be tested. 1/ 2/

	Terminal A (Each pin individually connected to terminal A with the other floating)	Terminal B (The common combination of all like-named pins connected to terminal B)
1.	All pins except V_{PS1} 3/	All V_{PS1} pins
2.	All input and output pins	All other input-output pins

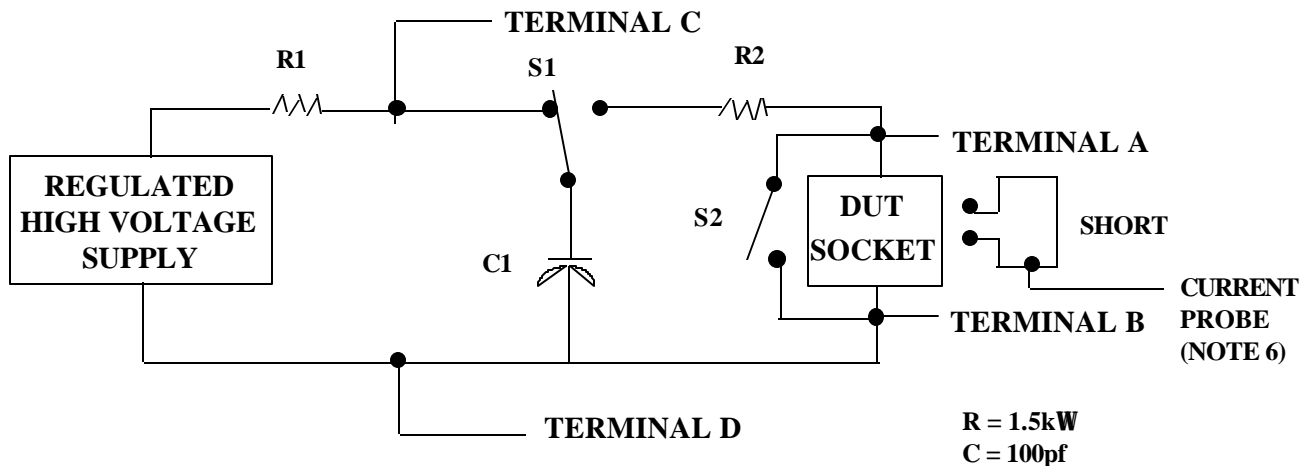
1/ Table II is restated in narrative form in 3.4 below.

2/ No connects are not to be tested.

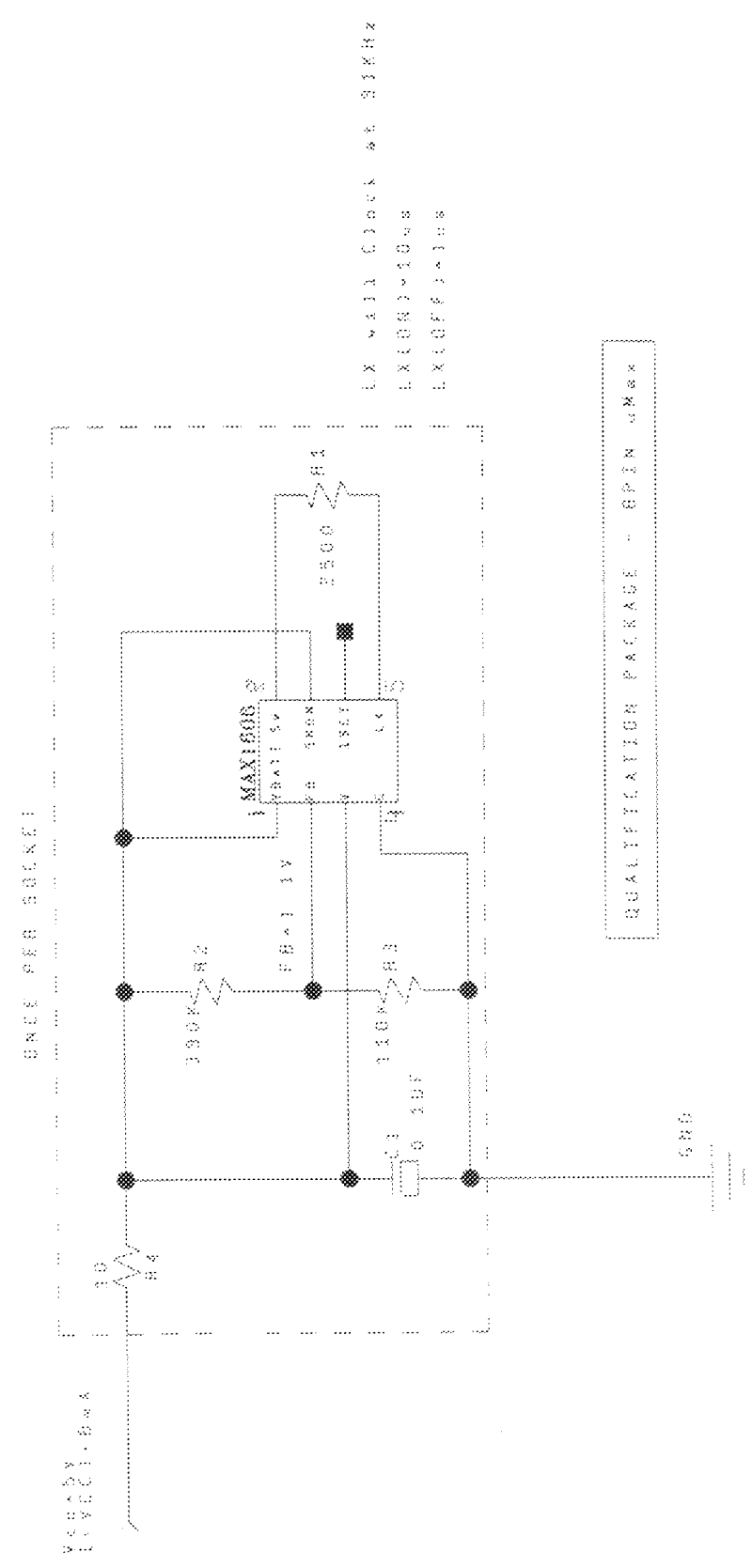
3/ Repeat pin combination I for each named Power supply and for ground (e.g., where V_{PS1} is V_{DD} , V_{CC} , V_{SS} , V_{BB} , GND, $+V_S$, $-V_S$, V_{REF} , etc).

3.4 Pin combinations to be tested.

- a. Each pin individually connected to terminal A with respect to the device ground pin(s) connected to terminal B. All pins except the one being tested and the ground pin(s) shall be open.
- b. Each pin individually connected to terminal A with respect to each different set of a combination of all named power supply pins (e.g., V_{SS1} , or V_{SS2} or V_{SS3} or V_{CC1} , or V_{CC2}) connected to terminal B. All pins except the one being tested and the power supply pin or set of pins shall be open.
- c. Each input and each output individually connected to terminal A with respect to a combination of all the other input and output pins connected to terminal B. All pins except the input or output pin being tested and the combination of all the other input and output pins shall be open.



PY32Z BURN IN SCHEMATIC MAX1606



MAXIM CONFIDENTIAL	CHECKED: 00/00/00 BY: CM	ENG1	ENG2
PY32-BI	LAST SAVED: 2-15-2000-15-30	SIZE A	REV A
	PROJECT: PY32Z	FILE: PY32BI	ENG NO - 06-5594
	BESC BURN IN SCHEMATIC		SHEET 1 OF 1