RELIABILITY REPORT

FOR

MAX1674EUA

PLASTIC ENCAPSULATED DEVICES

May 16, 2003

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Written by

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Conclusion

The MAX1674 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.

Table of Contents

I. Device Description

A. General

The MAX1674 compact, high-efficiency, step-up DC-DC converter fits in a small μMAX package. It features a built-in synchronous rectifier, which improves efficiency and reduces size and cost by eliminating the need for an external Schottky diode. Quiescent supply current is only 16μA.

The input voltage ranges from 0.7V to V_{OUT}, where V_{OUT} can be set from 2V to 5.5V. Start-up is guaranteed from 1.1V inputs. The MAX1674 has a preset, pin-selectable output for 5V or 3.3V. The output can also be adjusted to other voltages using two external resistors.

The MAX1674 has a 0.3Ω N-channel MOSFET power switch. This device also has a 1A current limit.

B. Absolute Maximum Ratings

Item	Rating
Supply Voltage (OUT to GND)	-0.3V to +6.0V
Switch Voltage (LX to GND)	-0.3V to (V_{OUT} + 0.3V)
Battery Voltage (BATT to GND)	-0.3V to +6.0V
/SHDN, /LBO to GND	-0.3V to +6.0V
LBI, REF, FB, CLSEL to GND	-0.3V to (V_{OUT} + 0.3V)
Switch Current (LX)	-1.5A to +1.5A
Output Current (OUT)	-1.5A to +1.5A
Storage Temp.	-65°C to +165°C
Lead Temp. (10 sec.)	+300°C
Continuous Power Dissipation (TA = +70°C)	
8-Pin uMAX	330mW
Derates above +70°C	
8-Pin uMAX	4.10mW/°C

II. Manufacturing Information

A. Description/Function:	High-Efficiency, Low-Supply-Current, Compact, Step-Up DC-DC Converter
B. Process:	S12 (SG1.2) - Standard 1.2 micron silicon gate CMOS
C. Number of Device Transistors:	751
D. Fabrication Location:	California or Oregon, USA
E. Assembly Location:	Malaysia
F. Date of Initial Production:	July, 1998

III. Packaging Information

A. Package Type:	8-Lead µMAX
B. Lead Frame:	Copper
C. Lead Finish:	Solder Plate
D. Die Attach:	Silver-filled Epoxy
E. Bondwire:	Gold (1.3 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	# 05-1101-0059
H. Flammability Rating:	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard JESD22-A112:	Level 1

IV. Die Information

A. Dimensions:	61 x 87 mils
B. Passivation:	Si_3N_4/SiO_2 (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Aluminum/Copper/Si
D. Backside Metallization:	None
E. Minimum Metal Width:	1.2 microns (as drawn)
F. Minimum Metal Spacing:	1.2 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	(Manager, Reliability Operations)
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:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times \underbrace{4389}_{} \times 479 \times 2} \text{(Chi square value for MTTF upper limit)}$$

Thermal acceleration factor assuming a 0.8eV activation energy

$\lambda = 2.27 \times 10^{-9}$ $\lambda = 2.27$ 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. # 06-5321) 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-1M**).

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 PX12 die type has been found to have all pins able to withstand a transient pulse of ±2000V, per Mil-Std-883 Method 3015 (reference attached ESD Test Circuit). Latch-Up testing has shown that this device withstands a current of ±250mA.

Table 1

Reliability Evaluation Test Results

MAX1674EUA

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	PACKAGE	SAMPLE SIZE	NUMBER OF FAILURES
Static Life Test (Note 1)					
	Ta = 150°C Biased Time = 192 hrs.	DC Parameters & functionality		479	0
Moisture Testing (Note 2)					
Pressure Pot	Ta = 121°C P = 15 psi. RH= 100% Time = 168hrs.	DC Parameters & functionality	uMAX	77	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 & functionality		77	0

Note 1: Life Test Data may represent plastic DIP qualification lots.
Note 2: Generic process/package 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

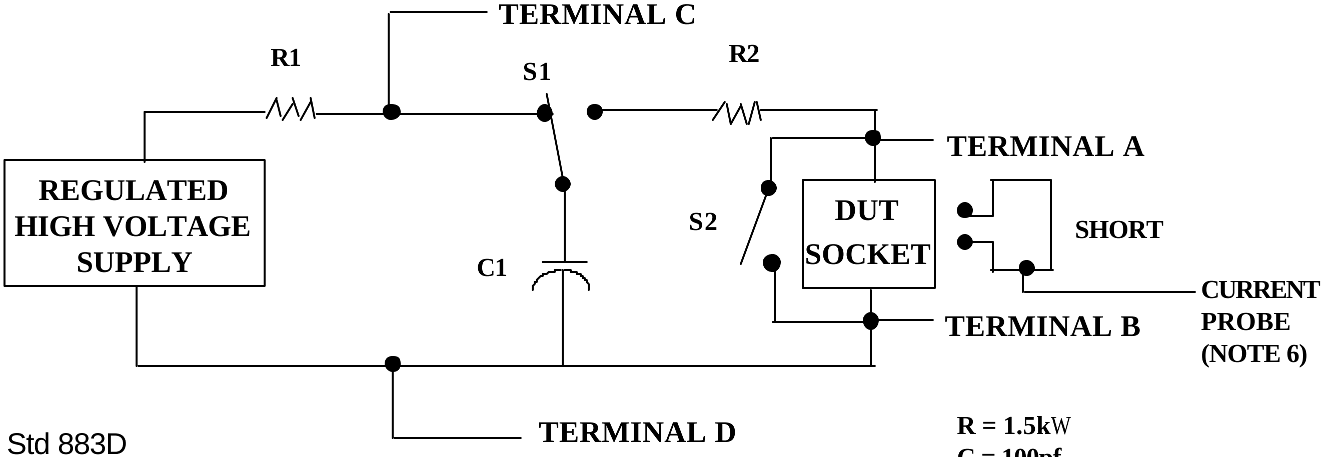
(e.g., where V_{PS1} is V_{DD}, V_{CC}, V_{SS}, V_{BB}, GND, $+V_{S,}$ $-V_S$, V_{REF}, etc).

3.4 Pin combinations to be tested.

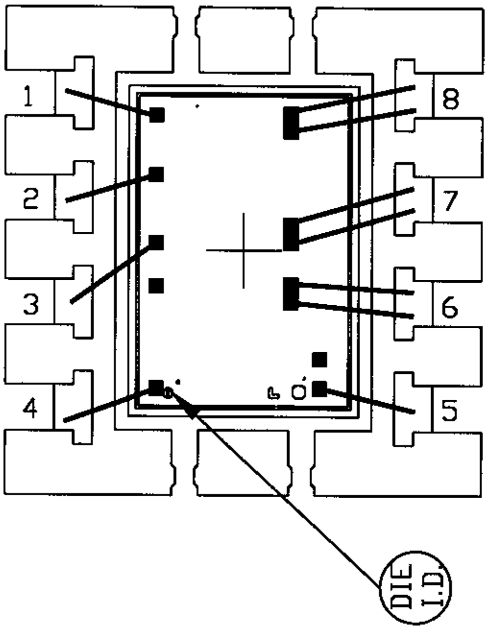
a. Each pin individually connected to terminal A with respect to the device ground pin(s) connected to terminal B. All pins except the one being tested and the ground pin(s) shall be open.

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.

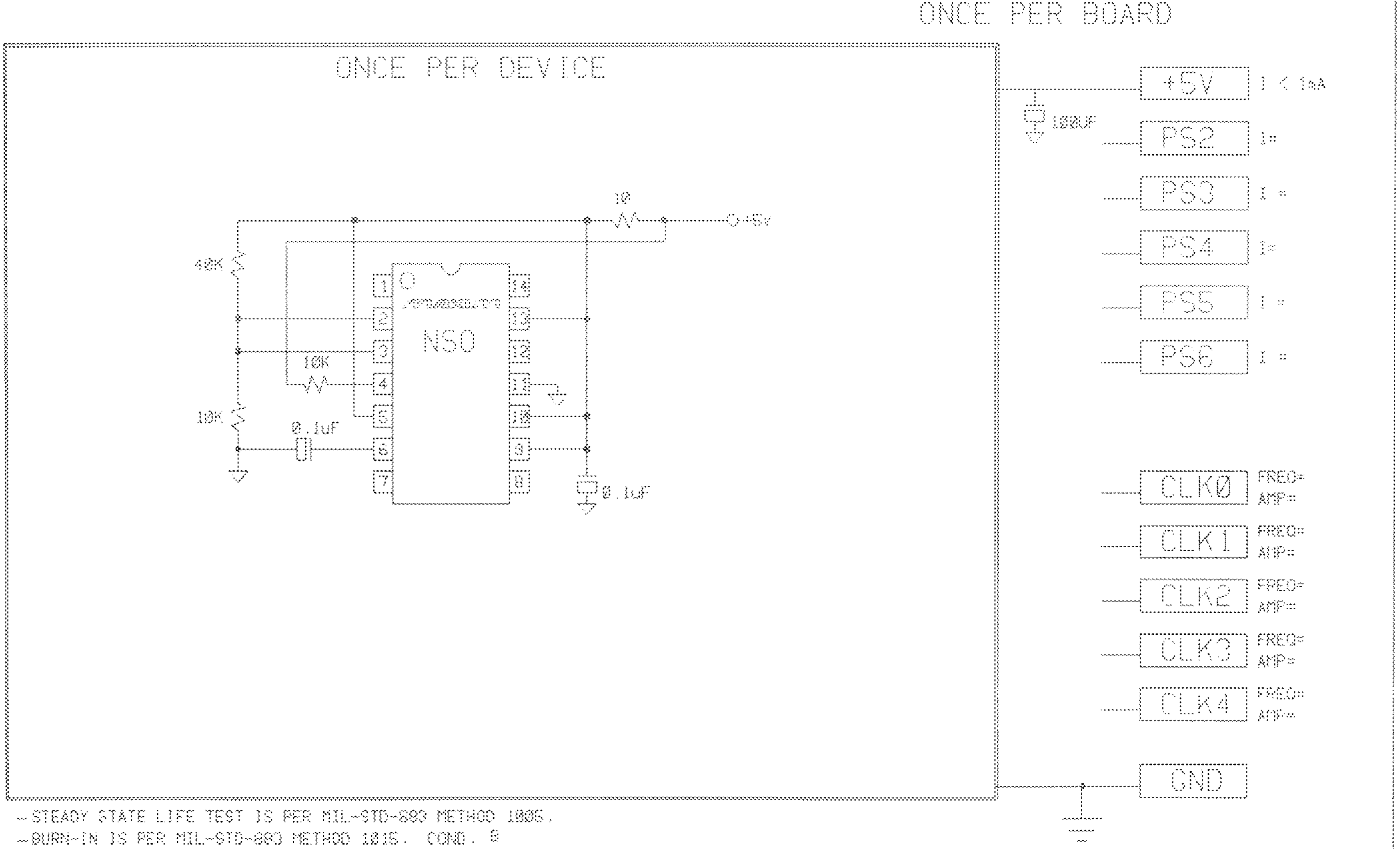
c. Each input and each output individually connected to terminal A with respect to a combination of all the other input and output pins connected to terminal B. All pins except the input or output pin being tested and the combination of all the other input and output pins shall be open.



R = 1.5kW
C = 100pf



PKG.CODE: U8-1		APPROVALS	DATE	MAXIM	
CAV./PAD SIZE: 68X94	PKG. DESIGN			BUILDSHEET NUMBER: 05-1101-0059	REV.: B



~STEADY STATE LIFE TEST IS PER MIL-STD-883 METHOD 1005.
~BURN-IN IS PER MIL-STD-883 METHOD 1015. COND. B

NOTES:

1. TEMPERATURE: 125C OR EQUIVALENT
2. TIME: 160 HOURS MIN. OR EQUIVALENT
3. ALL COMPONENTS AND MATERIAL MUST STAND
150C CONTINUOUS
4. APPROVED FOR [X] COMMERCIAL
[X] HR/883

SPEC. NO. 06-5321 REV: A

DATE: 10/23/97

DRAWN BY: R.

MAXIM BURN-IN SCHEMATIC

DEVICE TYPE(S):

MAX1674/5/6