MAX1920EUT
Rev. A

RELIABILITY REPORT

FOR

MAX1920EUT

PLASTIC ENCAPSULATED DEVICES

January 15, 2004

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Written by

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Conclusion

The MAX1920 sucessfully 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 MAX1920 step-down converter delivers over 400mA to outputs as low as 1.25V. This converter uses a unique proprietary current-limited control scheme that achieves over 90% efficiency. This device maintains extremely low quiescent supply current (50µA), and it's high 1.2MHz (max) operating frequency permits small, low-cost external components. This combination makes the MAX1921 an excellent high-efficiency alternative to linear regulators in space-constrained applications.

Internal synchronous rectification greatly improves efficiency and eliminates the external Schottky diode required in conventional step-down converters. The device also includes internal digital soft-start to limit input current upon startup and reduce input capacitor requirements.

The MAX1920 provides an adjustable output voltage (1.25V to 4V) and is available in space-saving 6-pin SOT23 packages

B. Absolute Maximum Ratings

Item	Rating
IN, FB, SHDN to AGND	-0.3V to +6V
OUT to AGND, LX to PGND	-0.3V to (IN + 0.3V)
AGND to PGND	-0.3V to +0.3V
OUT Short Circuit to GND	10s
Operating Temperature Range	-40°C to +85°C
Junction Temperature	+150°C
Storage Temperature	-65°C to +150°C
Lead Temperature (soldering 10s)	+300°C
Continuous Power Dissipation (TA = +70°C)	
6-Pin SOT23	696mW
Derates above +70°C	
6-Pin SOT23	8.7mW/°C

II. Manufacturing Information

A. Description/Function:	Low-Voltage, 400mA Step-Down DC-DC Converters in SOT23
B. Process:	B8 (Standard 0.8 micron silicon gate CMOS)
C. Number of Device Transistors:	1467
D. Fabrication Location:	California, USA
E. Assembly Location:	Malaysia or Thailand
F. Date of Initial Production:	January, 2002

III. Packaging Information

A. Package Type:	**6-Lead SOT23**
B. Lead Frame:	Copper
C. Lead Finish:	Solder Plate
D. Die Attach:	Non-Conductive Epoxy
E. Bondwire:	Gold (1.3 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	# 05-3501-0020
H. Flammability Rating:	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard JESD22-A112:	Level 1

IV. Die Information

A. Dimensions:	60 x 41 mils
B. Passivation:	Si_3N_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	(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:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4389 \times 134 \times 2}$$

(Chi square value for MTTF upper limit)

Thermal acceleration factor assuming a 0.8eV activation energy

$\lambda = 8.10 \times 10^{-9}$ $\lambda = 8.10$ 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. #06-5924) 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 PM02-5 die type has been found to have all pins able to withstand a transient pulse of +/-1000V, 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

MAX1920EUT

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	PACKAGE	SAMPLE SIZE	NUMBER OF FAILURES
Static Life Test (Note 1)					
	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality		134	0
Moisture Testing (Note 2)					
Pressure Pot	Ta = 121°C P = 15 psi. RH= 100% Time = 168hrs.	DC Parameters & functionality	SOT	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 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

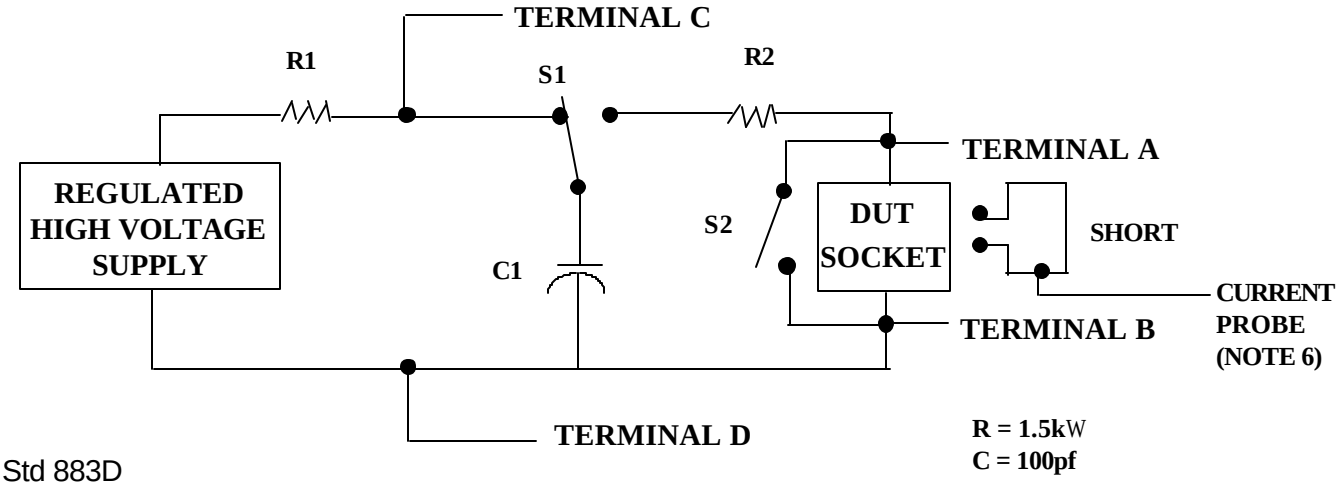
(e.g., where V_{PS1} is V_{DD}, V_{CC}, V_{SS}, V_{BB}, GND, $+V_S$, $-V_S$, V_{REF}, etc).

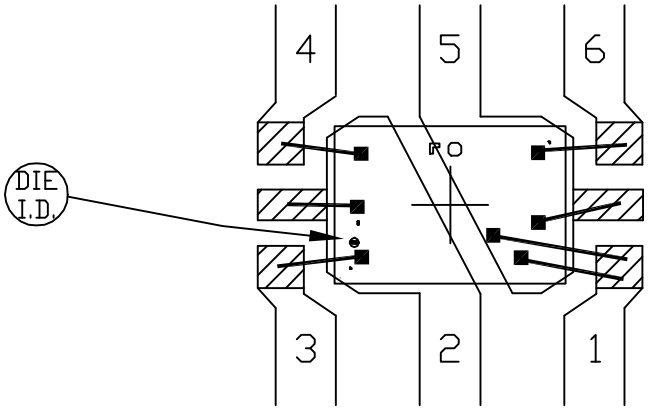
3.4 Pin combinations to be tested.

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.





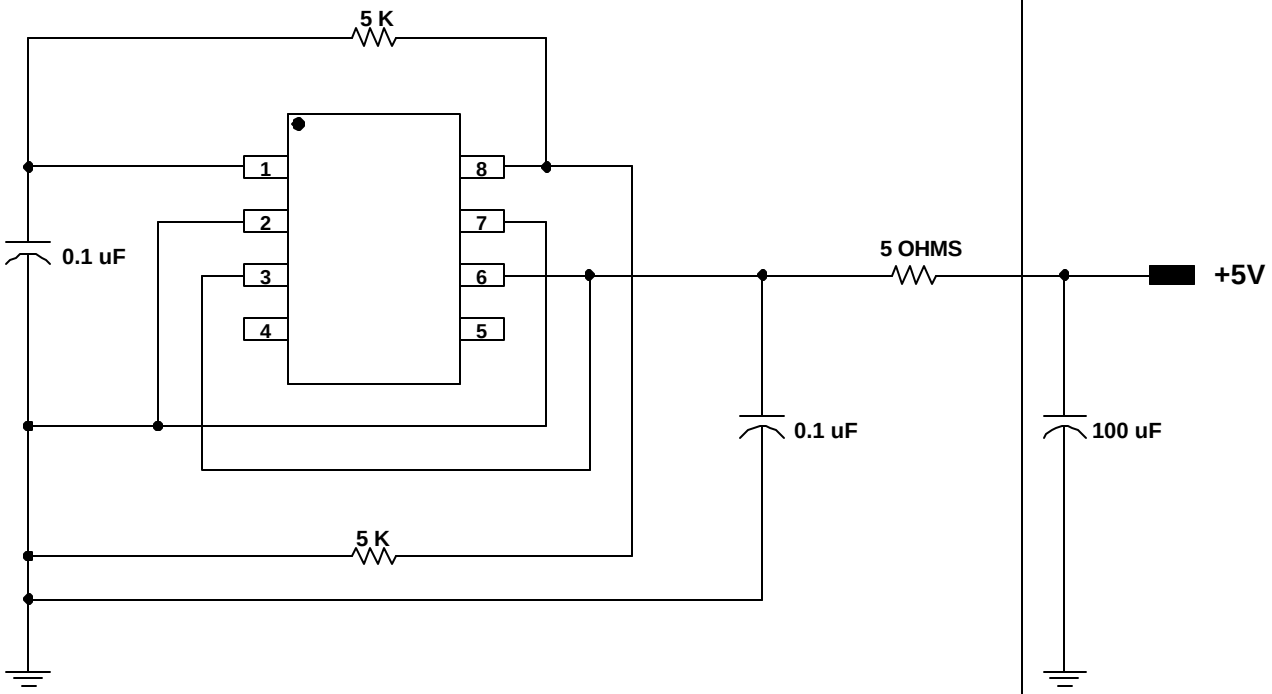
NOTE: USE NON-CONDUCTIVE EPOXY ONLY

BONDABLE AREA

PKG. CODE: U6S-3		SIGNATURES	DATE	MAXIM CONFIDENTIAL & PROPRIETARY	
CAV./PAD SIZE: 64x46	PKG.			BOND DIAGRAM #: 05-3501-0020	REV: A
	DESIGN				

ONCE PER SOCKET

ONCE PER BOARD



DEVICES: MAX1920/1921
PACKAGE: 8-uMAX
MAX. EXPECTED CURRENT = 1.5mA

DRAWN BY: TEK TAN
NOTES: