RELIABILITY REPORT

FOR

MAX1953EUB

PLASTIC ENCAPSULATED DEVICES

October 29, 2002

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Written by

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Conclusion

The MAX1953 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 MAX1953 is a versatile, economical, synchronous current-mode, pulse-width modulation (PWM) buck controllers. This step-down controller is targeted for applications where cost and size are critical.

The MAX1953 operates at a fixed 1MHz switching frequency, thus significantly reducing external component size and cost. Additionally, excellent transient response is obtained using less output capacitance. The MAX1953 operates from low 3V to 5.5V input voltage and can supply up to 10A of output current. Selectable current limit is provided to tailor to the external MOSFETs' on-resistance for optimum cost and performance. The output voltage is adjustable from 0.8V to $0.86V_{IN}$.

The MAX1953 provides a COMP pin that can be pulled low to shut down the converter in addition to providing compensation to the error amplifier. An input undervoltage lockout (ULVO) is provided to ensure proper operation under power-sag conditions to prevent the external power MOSFETs from overheating. Internal digital soft-start is included to reduce inrush current. The MAX1953 is available in tiny 10-pin µMAX packages.

B. Absolute Maximum Ratings

Item	Rating
IN, FB to GND	-0.3V to +6V
LX to BST	-6V to +0.3V
BST to GND	-0.3V to +20V
DH to LX	-0.3V to (VBST + 0.3V)
DL, COMP to GND	-0.3V to (VIN + 0.3V)
HSD, ILIM, REFIN to GND	-0.3V to 14V
PGND to GND	-0.3V to +0.3V
IDH, IDL	±100mA (RMS)
Operating Temperature Range	-40°C to +85°C
Junction Temperature	+150°C
Storage Temperature Range	-65°C to +150°C
Lead Temperature (soldering, 10s)	+300°
Continuous Power Dissipation (TA = +70°C)	
10-Pin uMAX	444mW
Derates above +70°C	
10-Pin uMAX	5.6mW/°C

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II. Manufacturing Information

A. Description/Function:	Low-Cost, High-Frequency, Current-Mode PWM Buck Controller
B. Process:	S8 - Standard 8 micron silicon gate CMOS
C. Number of Device Transistors:	2930
D. Fabrication Location:	California, USA
E. Assembly Location:	Philippines, Malaysia or Thailand
F. Date of Initial Production:	April, 2002

III. Packaging Information

A. Package Type:	**10-Lead uMAX**
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:	Buildsheet # 05-3501-0028
H. Flammability Rating:	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard JESD22-A112:	Level 1

IV. Die Information

A. Dimensions:	62 X 82 mils
B. Passivation:	Si_3N_4/SiO_2 (Silicon nitride/ Silicon dioxide)
C. Interconnect:	TiW/ AlCu/ TiWN
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:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4389 \times 44 \times 2}$$

(Chi square value for MTTF upper limit)

Temperature Acceleration factor assuming an activation energy of 0.8eV

$\lambda = 24.68 \times 10^{-9}$ $\lambda = 24.68$ 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 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 rejects from lots exceeding this level. The Burn-In Schematic (Spec.# 06-6012) 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**) located on the Maxim website at http://www.maxim-ic.com .

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 PM42 die type has been found to have all pins able to withstand a transient pulse of ±1500V, 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

MAX1953EUB

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	44	0
Moisture Testing (Note 2)				
Pressure Pot	Ta = 121°C P = 15 psi. RH= 100% Time = 168hrs.	DC Parameters & functionality	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	77	0

Note 1: Life Test Data may represent plastic D.I.P. 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

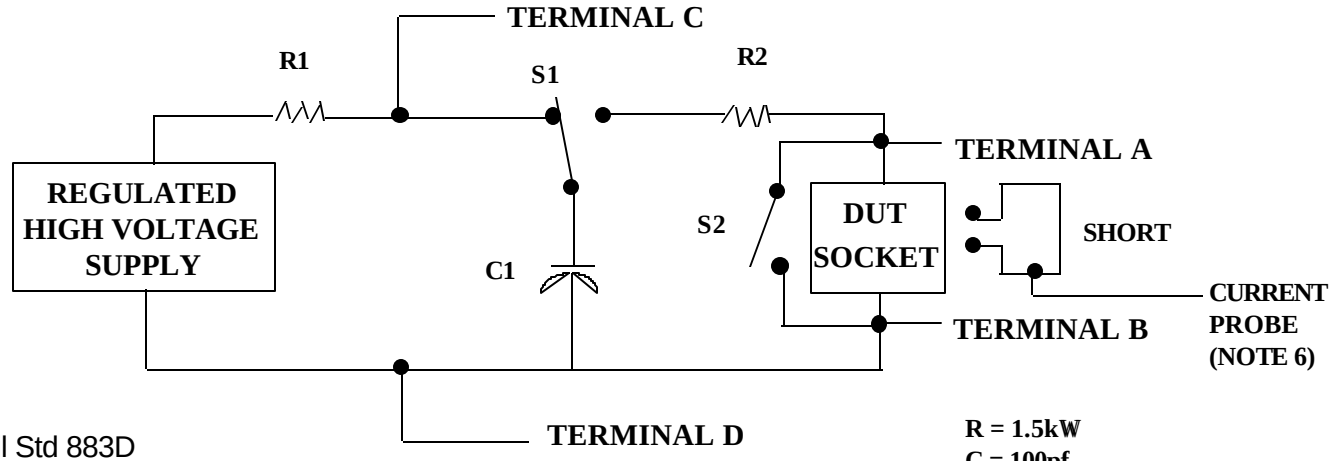
(e.g., where V_{PS1} is V_{DD}, V_{CC}, V_{SS}, V_{BB}, GND, $+V_S$, $-V_S$, V_{REF}, etc).

3.4 Pin combinations to be tested.

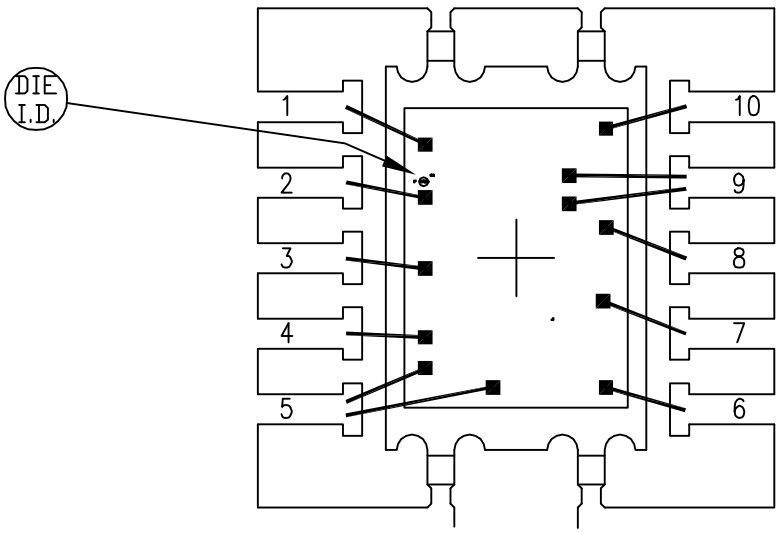
a. Each pin individually connected to terminal A with respect to the device ground pin(s) connected to terminal B. All pins except the one being tested and the ground pin(s) shall be open.

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.



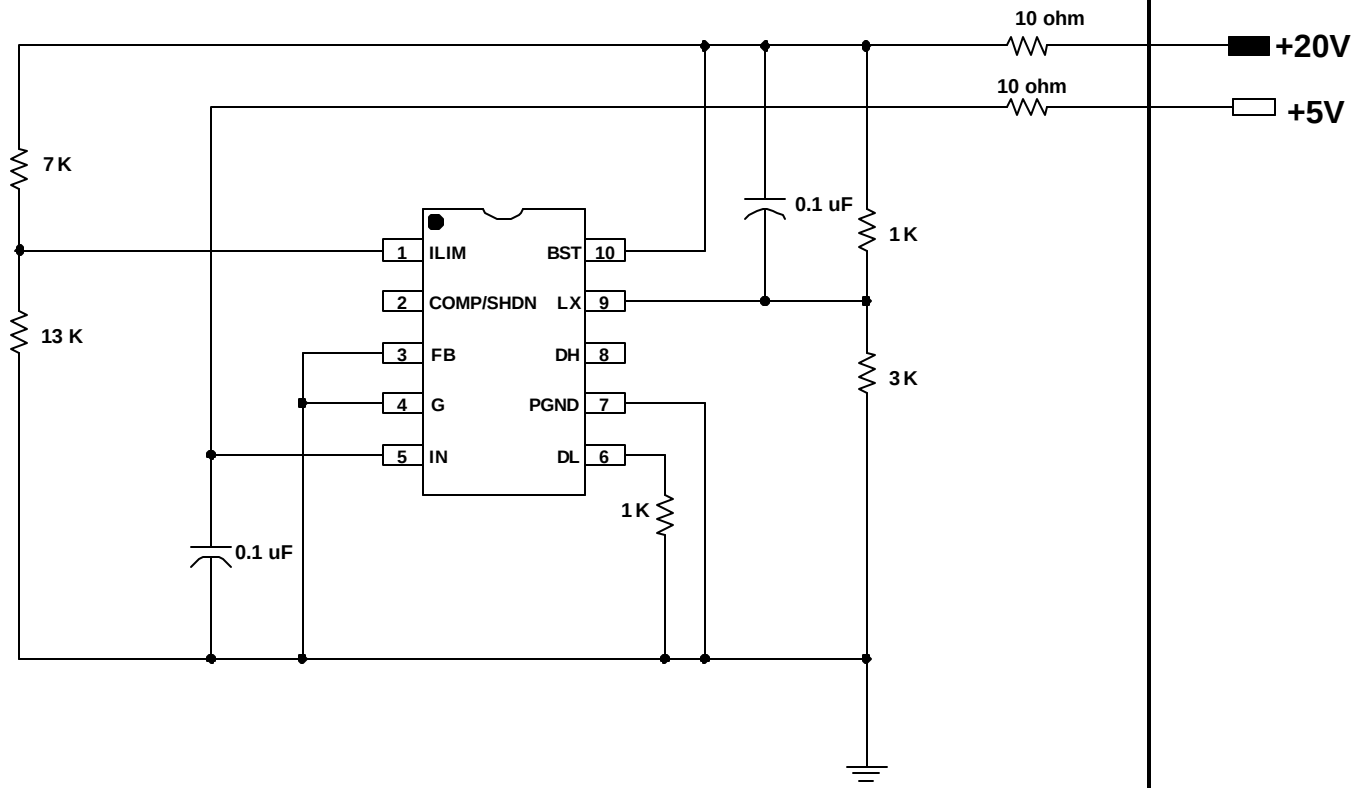
Mil Std 883D
Method 3015.7
Notice 8



PKG. CODE: U10-2		SIGNATURES	DATE	MAXIM CONFIDENTIAL & PROPRIETARY	
CAV./PAD SIZE: 68x94	PKG.			BOND DIAGRAM #: 05-3501-0028	REV: A
	DESIGN				

ONCE PER SOCKET

ONCE PER BOARD



DEVICES: MAX 1953/54/57
PACKAGE: 10-uMAX
MAX. EXPECTED CURRENT = 8mA (20V), 2mA (5V).

DRAWN BY: TEK / HAK TAN

NOTES: