

RELIABILITY REPORT
FOR
MAX6356xxUT
PLASTIC ENCAPSULATED DEVICES

September 25, 2003

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Written by



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Conclusion

The MAX6356 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 MAX6356 microprocessor (μ P) supervisor with multiple reset voltages significantly improve system reliability and accuracy compared to separate ICs or discrete components. If any input supply voltage drops below its associated preset threshold, all reset outputs are asserted. In addition, the outputs are valid as long as either input supply voltage remains greater than +1.0V.

The device has an additional voltage monitor input to monitor a third voltage.

The device is offered with a wide variety of voltage threshold levels, as shown in the Voltage Threshold Levels table. It is available in 6-pin SOT23 packages and operate over the extended (-40°C to +85°C) temperature range.

B. Absolute Maximum Ratings

<u>Item</u>	<u>Rating</u>
VCC1, VCC2 to GND	0.3V to +6V
RST, RST1,WDI,MR,RSTIN	-0.3V to (VCC1 + 0.3V)
Input/Output Current, All Pins	0mA
Operating Temperature Range	40°C to +85°C
Junction Temperature	150°C
Storage Temperature Range	65°C to +150°C
Continuous Power Dissipation (TA = +70°C)	
6-Pin SOT23	695mW
Derates above +70°C	
6-Pin SOT23	8.7 mW/°C

II. Manufacturing Information

A. Description/Function:	Triple Voltage μ P Supervisory Circuits
B. Process:	S12 (Standard 1.2 micron silicon gate CMOS)
C. Number of Device Transistors:	855
D. Fabrication Location:	Oregon or California, USA
E. Assembly Location:	Malaysia or Thailand
F. Date of Initial Production:	October, 1999

III. Packaging Information

A. Package Type:	6-Pin SOT23
B. Lead Frame:	Copper
C. Lead Finish:	Solder Plate
D. Die Attach:	Silver-filled Epoxy
E. Bondwire:	Gold (1.0 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	# 05-1601-0070
H. Flammability Rating:	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard JESD22-A112:	Level 1

IV. Die Information

A. Dimensions:	35 x 55 mils
B. Passivation:	$\text{Si}_3\text{N}_4/\text{SiO}_2$ (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Aluminum/Si (Si = 1%)
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:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4389 \times 150 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

└ Temperature Acceleration factor assuming an activation energy of 0.8eV

$$\lambda = 7.24 \times 10^{-9} \quad \lambda = 7.24 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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 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 attached Burn-In Schematic (Spec. # 06-5449) 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 MS19-5 die type has been found to have all pins able to withstand a transient pulse of ± 1000 , per Mil-Std-883 Method 3015 (reference attached ESD Test Circuit). Latch-Up testing has shown that this device withstands a current of ± 250 mA.

Table 1
Reliability Evaluation Test Results

MAX6356xxUT

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		150	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.

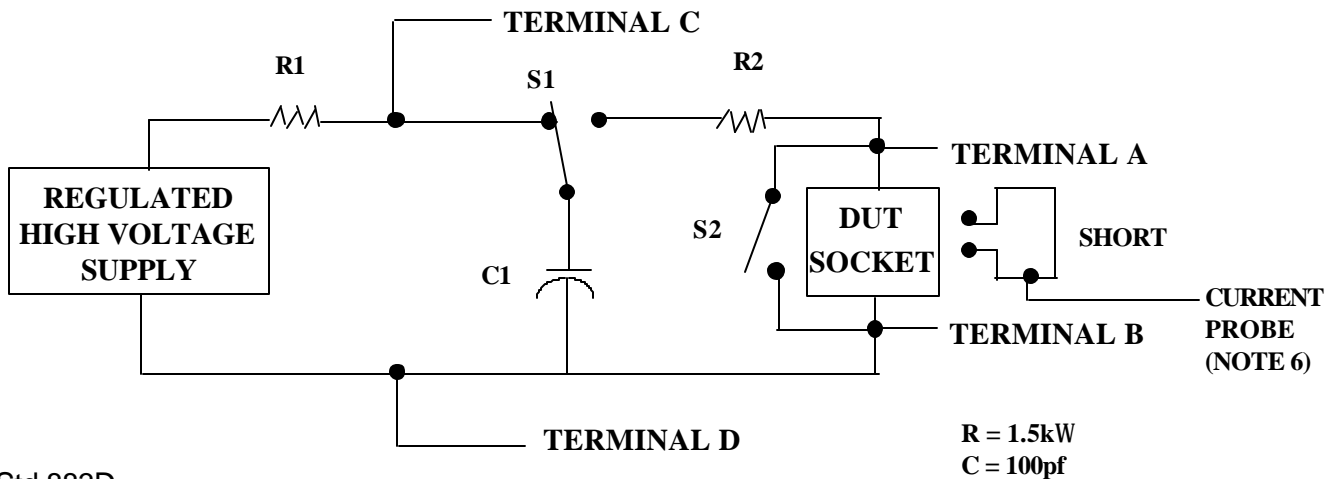
2/ No connects are not to be tested.

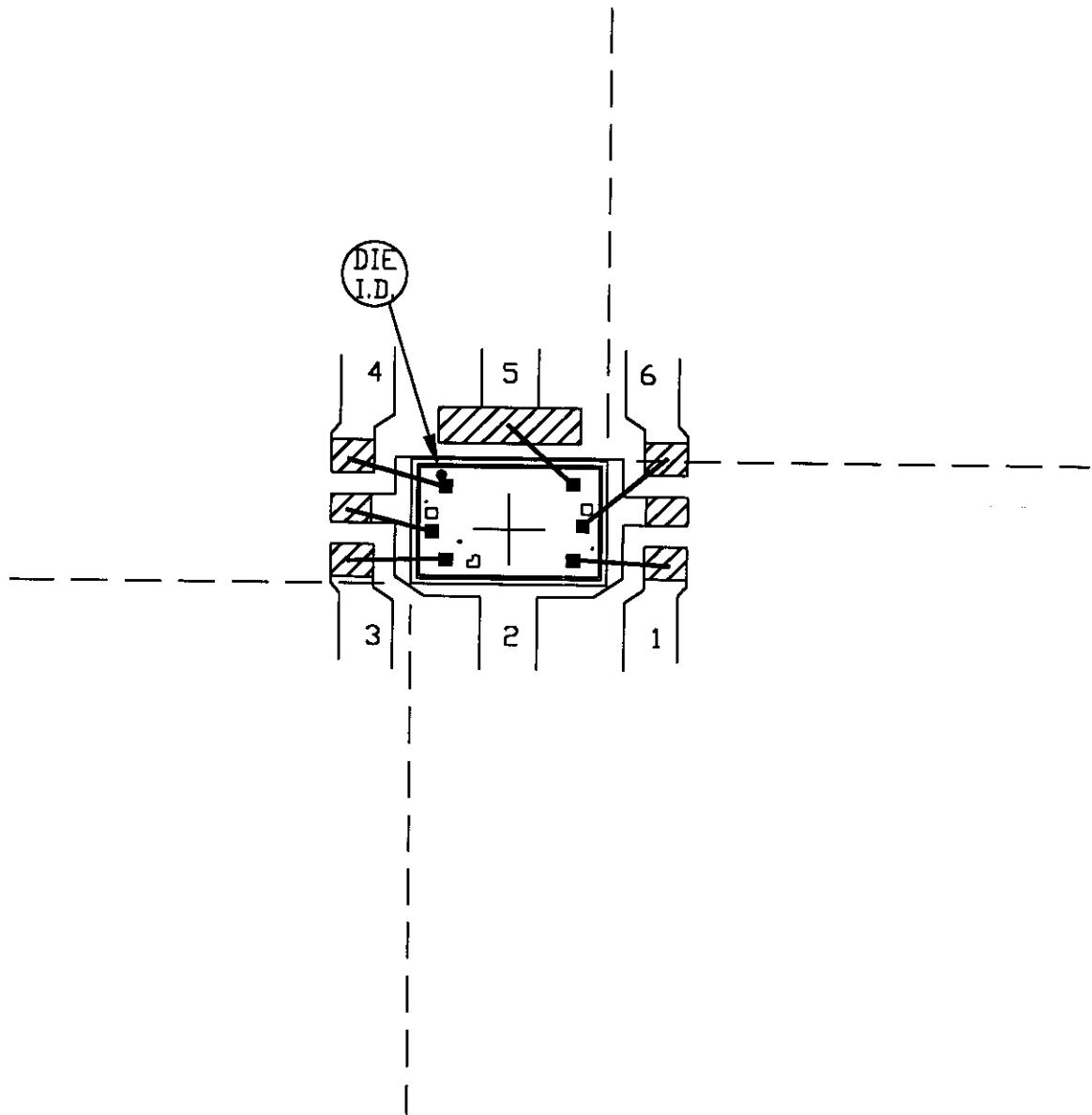
3/ Repeat pin combination 1 for each named Power supply and for ground

(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.

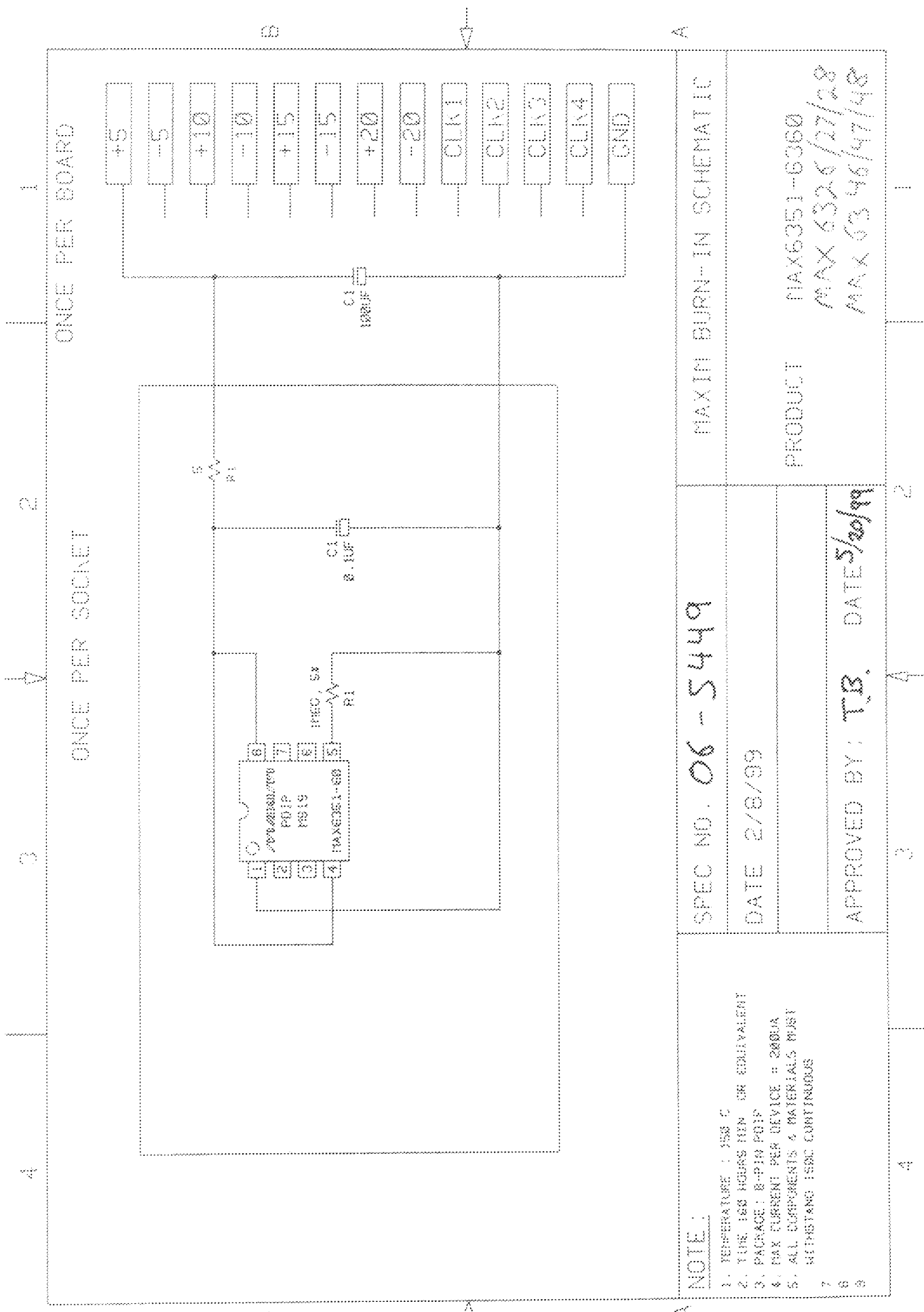
- a. Each pin individually connected to terminal A with respect to the device ground pin(s) connected to terminal B. All pins except the one being tested and the ground pin(s) shall be open.
- b. Each pin individually connected to terminal A with respect to each different set of a combination of all 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: CAVITY DOWN

PKG.CODE:	U6-1	APPROVALS	DATE		
CAV./PAD SIZE:	64x39				
				05-1601-0070	A



NOTE:
 1. TEMPERATURE : 155 C
 2. TIME: 100 HOURS MIN OR EQUIVALENT
 3. PACKAGE : 8-PIN PDIP
 4. MAX CURRENT PER DEVICE = 200UA
 5. ALL COMPONENTS & MATERIALS MUST WITHSTAND 155C CONTINUOUS

SPEC NO. 06 - 5449
 DATE 2/8/99
 APPROVED BY: T.B. DATE 5/20/99

MAXIM BURN-IN SCHEMATIC
 PRODUCT MAX6351-6360
 MAX 6328/27/28
 MAX 6346/47/48

ONCE PER SOCKET ONCE PER BOARD

4 3 2 1

1 2 3 4

4 3 2 1

1 2 3 4

4 3 2 1

1 2 3 4

4 3 2 1

1 2 3 4

4 3 2 1

1 2 3 4

4 3 2 1

1 2 3 4

4 3 2 1

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