

RELIABILITY REPORT
FOR
MAX5015xSA
PLASTIC ENCAPSULATED DEVICES

February 14, 2003

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Written by



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Conclusion

The MAX5015 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 MAX5015 integrates all the building blocks necessary for implementing DC-DC fixed-frequency isolated power supplies. This device is a current-mode controllers with an integrated high-voltage startup circuit suitable for isolated telecom/industrial voltage range power supplies. The MAX5015 limits the operating duty cycle to less than 50% and can be used in single-ended forward converters. A high-voltage startup circuit allows this device to draw power directly from the 18V to 110V input supply during startup. The switching frequency is internally trimmed to 275kHz $\pm 10\%$, thus reducing magnetics and filter component costs.

The MAX5015 is available in 8-pin SO packages.

B. Absolute Maximum Ratings

<u>Item</u>	<u>Rating</u>
V+ to GND	-0.3V to +120V
VDD to GND	-0.3V to +40V
VCC to GND	-0.3V to +12.5V
OPTO, NDRV, SS_SHDN , CS to GND	-0.3V to VCC + 0.3V
VDD and VCC Current	20mA
NDRV Current Continuous	25mA
NDRV Current for Less than 1 μ s	± 1 A
Operating Temperature Range	-40°C to +85°C
Storage Temperature Range	-65°C to +150°C
Lead Temperature (soldering, 10s)	+300°C
Continuous Power Dissipation (TA = +70°C)	
8-Pin SO	471mW
Derates above +70°C	
8-Pin SO	5.88mW/°C

II. Manufacturing Information

- A. Description/Function: Current-Mode PWM Controllers with Integrated Startup Circuit for Isolated Power Supplies
- B. Process: SG3 (Standard 3 micron silicon gate CMOS)
- C. Number of Device Transistors: 589
- D. Fabrication Location: Oregon, USA
- E. Assembly Location: Philippines, Thailand or Malaysia
- F. Date of Initial Production: July, 2001

III. Packaging Information

- A. Package Type: **8-Pin NSO**
- 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: # 05-1301-0019
- H. Flammability Rating: Class UL94-V0
- I. Classification of Moisture Sensitivity per JEDEC standard JESD22-A112: Level 1

IV. Die Information

- A. Dimensions: 82 x 121 mils
- B. Passivation: SiN/SiO (nitride/oxide)
- C. Interconnect: Aluminum/Si (Si = 1%)
- D. Backside Metallization: None
- E. Minimum Metal Width: 3 microns (as drawn)
- F. Minimum Metal Spacing: 3 microns (as drawn)
- G. Bondpad Dimensions: 5 mil. Sq.
- H. Isolation Dielectric: SiO₂
- 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:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4389 \times 80 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

└ Temperature Acceleration factor assuming an activation energy of 0.8eV

$$\lambda = 13.57 \times 10^{-9}$$

$$\lambda = 13.57 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

This low failure rate represents data collected from Maxim's reliability monitor program. In addition to routine production Burn-In, Maxim pulls a sample from every fabrication process three times per week and subjects it to an extended Burn-In prior to shipment to ensure its reliability. The reliability control level for each lot to be shipped as standard product 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 any lot that exceeds this reliability control level. Attached Burn-In Schematic (Spec. #06-5700) shows the static Burn-In circuit. Maxim also performs quarterly 1000 hour life test monitors. This data is published in the Product Reliability Report (**RR-1M**).

B. Moisture Resistance Tests

Maxim pulls pressure pot samples from every assembly process three times per week. Each lot sample must meet an LTPD = 20 or less before shipment as standard product. Additionally, the industry standard 85°C/85%RH testing is done per generic device/package family once a quarter.

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

The NP16-1 die type has been found to have all pins able to withstand a transient pulse of $\pm 1000\text{V}$, per Mil-Std-883 Method 3015 (reference attached ESD Test Circuit). Latch-Up testing has shown that this device withstands a current of $\pm 250\text{mA}$.

Table 1
 Reliability Evaluation Test Results
MAX5015xSA

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		80	0
Moisture Testing (Note 2)					
Pressure Pot	Ta = 121°C P = 15 psi. RH= 100% Time = 96hrs.	DC Parameters & functionality	NSO	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 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} <u>3/</u>	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.

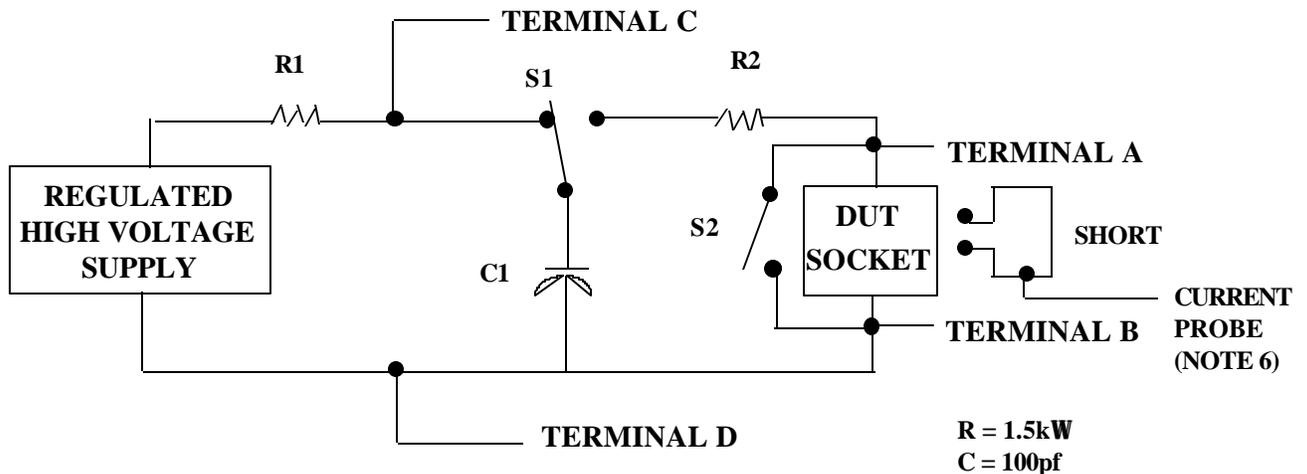
2/ No connects are not to be tested.

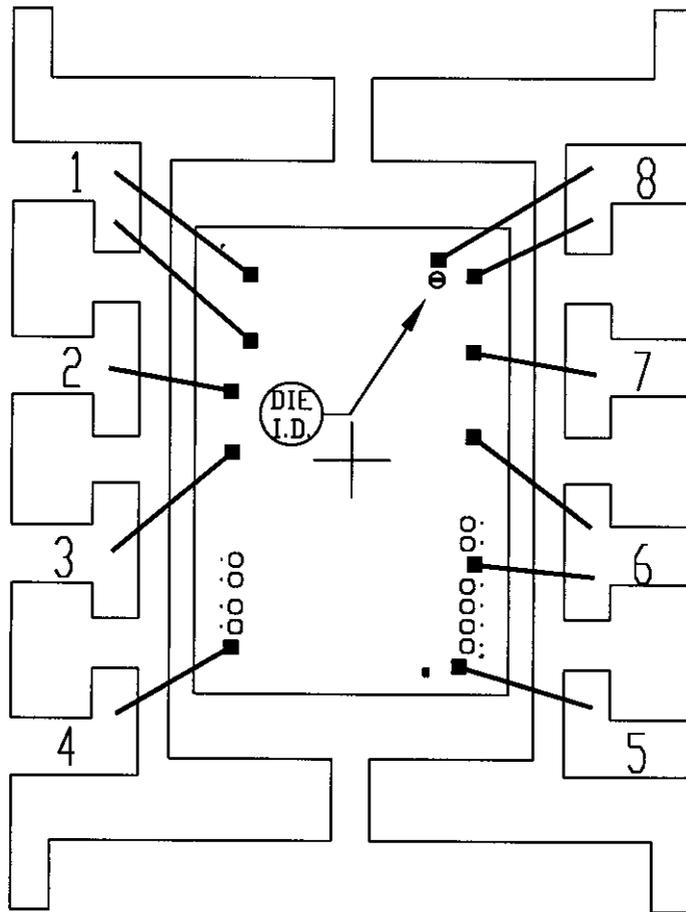
3/ Repeat pin combination I for each named Power supply and for ground

(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.





PKG. CODE:

S8-5

SIGNATURES

DATE

MAXIM
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CAV./PAD SIZE:

95 X 155

PKG.

DESIGN

BOND DIAGRAM #:

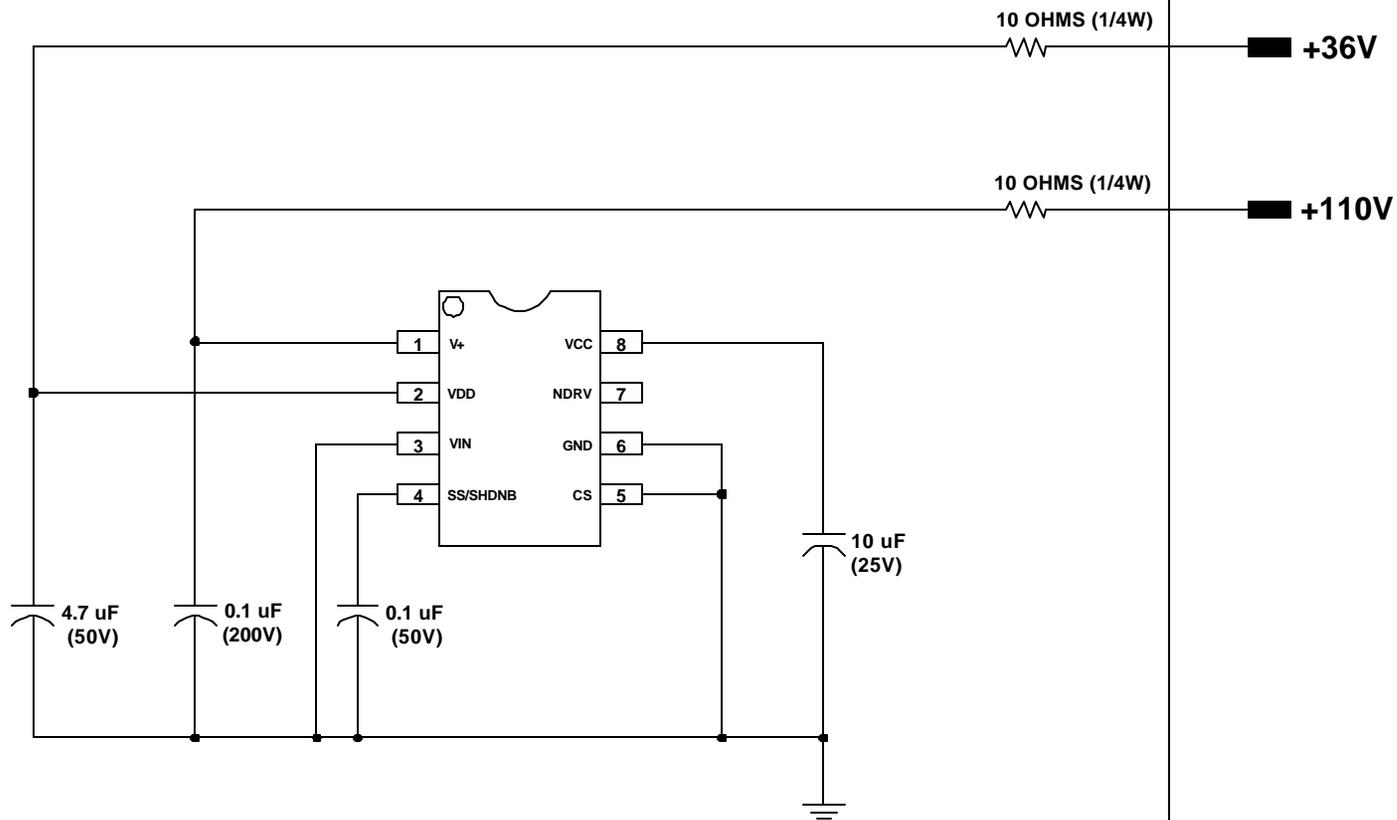
05-1301-0019

REV:

A

ONCE PER SOCKET

ONCE PER BOARD



DEVICES: MAX 5019/5020
PACKAGE: 8-NSO
MAX. EXPECTED CURRENT = 10mA for each supply.

DRAWN BY: TEK TAN
NOTES: