

RELIABILITY REPORT
FOR
MAX7328Axx
PLASTIC ENCAPSULATED DEVICES

July 13, 2006

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.
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Written by

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Conclusion

The MAX7328 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 MAX7328 is a 2-wire serial-interfaced peripheral with eight I/O ports. Any port can be used as a logic input or an open-drain output.

All input ports are continuously monitored for state changes (transition detection). Transitions are alerted through the open-drain, 5.5V-tolerant INT-bar output.

The MAX7328 has a slave ID range of 0100xxx (0x20 to 0x27).

For a similar part with overvoltage-protected I/Os and a bus RST-bar input that clears the I2C* serial interface, refer to the MAX7321 data sheet. The MAX7328 is a member of a family of pin-compatible port expanders with a choice of input ports, open-drain I/O ports, and push-pull output ports (see the Selector Guide).

B. Absolute Maximum Ratings

<u>Item</u>	<u>Rating</u>
(Voltage with respect to GND.)	
V+, SCL, SDA, AD0, AD1, AD2, INT	-0.3V to +6V
P0–P7	-0.3V to (V+ + 0.3V)
P0–P7, SDA, INT Output Sink Current	25mA
SCL, SDA, AD0, AD1, AD2, INT, P0–P7 Input Current	20mA
Total V+ Current	100mA
Total GND Current	100mA
Continuous Power Dissipation (TA = +70°C)	
16-Pin Wide SO (derate 9.5mW/°C over +70°C)	762mW
20-Pin SSOP (derate 8mW/°C over +70°C)	640mW
20-Pin TSSOP (derate 11mW/°C over +70°C)	879mW
Operating Temperature Range	-40°C to +125°C
Junction Temperature	+150°C
Storage Temperature Range	-65°C to +150°C
Lead Temperature (soldering, 10s)	+300°C

II. Manufacturing Information

- A. Description/Function: I2C Port Expanders with Eight I/O Ports
- B. Process: B6
- C. Number of Device Transistors: 8,507
- D. Fabrication Location: California, USA
- E. Assembly Location: Malaysia or Philippines
- F. Date of Initial Production: October, 2005

III. Packaging Information

- | | | |
|---------------------------------------------------------------------------|--------------------------------|--------------------------------|
| A. Package Type: | 16-pin Wide SO | 20-pin SSOP |
| B. Lead Frame: | Copper | Copper |
| C. Lead Finish: | Solder Plate or 100% Matte Tin | Solder Plate or 100% Matte Tin |
| D. Die Attach: | Silver-filled Epoxy | Silver-filled Epoxy |
| E. Bondwire: | Gold (1 mil dia.) | Gold (1 mil dia.) |
| F. Mold Material: | Epoxy with silica filler | Epoxy with silica filler |
| G. Assembly Diagram: | # 05-9000-1806 | # 05-9000-1808 |
| H. Flammability Rating: | Class UL94-V0 | Class UL94-V0 |
| I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C: | Level 1 | Level 1 |

IV. Die Information

- A. Dimensions: 57 x 57 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: 0.6 microns (as drawn)
- F. Minimum Metal Spacing: 0.6 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 (Managing Director of QA)
- 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:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 48 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

△ Temperature Acceleration factor assuming an activation energy of 0.8eV

$$\lambda = 22.91 \times 10^{-9}$$

$$\lambda = 22.91 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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. Attached Burn-In Schematic (Spec. # 06-6518) shows the static Burn-In circuit. Maxim performs failure analysis on any lot that exceeds this reliability control level. Maxim also performs quarterly 1000 hour life test monitors. This data is published in the Product Reliability Report (**RR-1N**). Current monitor data for the B6/S6 Process results in a FIT rate of 0.28 @ 25°C and 4.88 @ 55°C (eV = 0.8, UCL = 60%).

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 DW90-2 die type has been found to have all pins able to withstand a transient pulse of $\pm 2500\text{V}$, per JEDEC JESD22-A114-D. Latch-Up testing has shown that this device withstands a current of $\pm 250\text{mA}$.

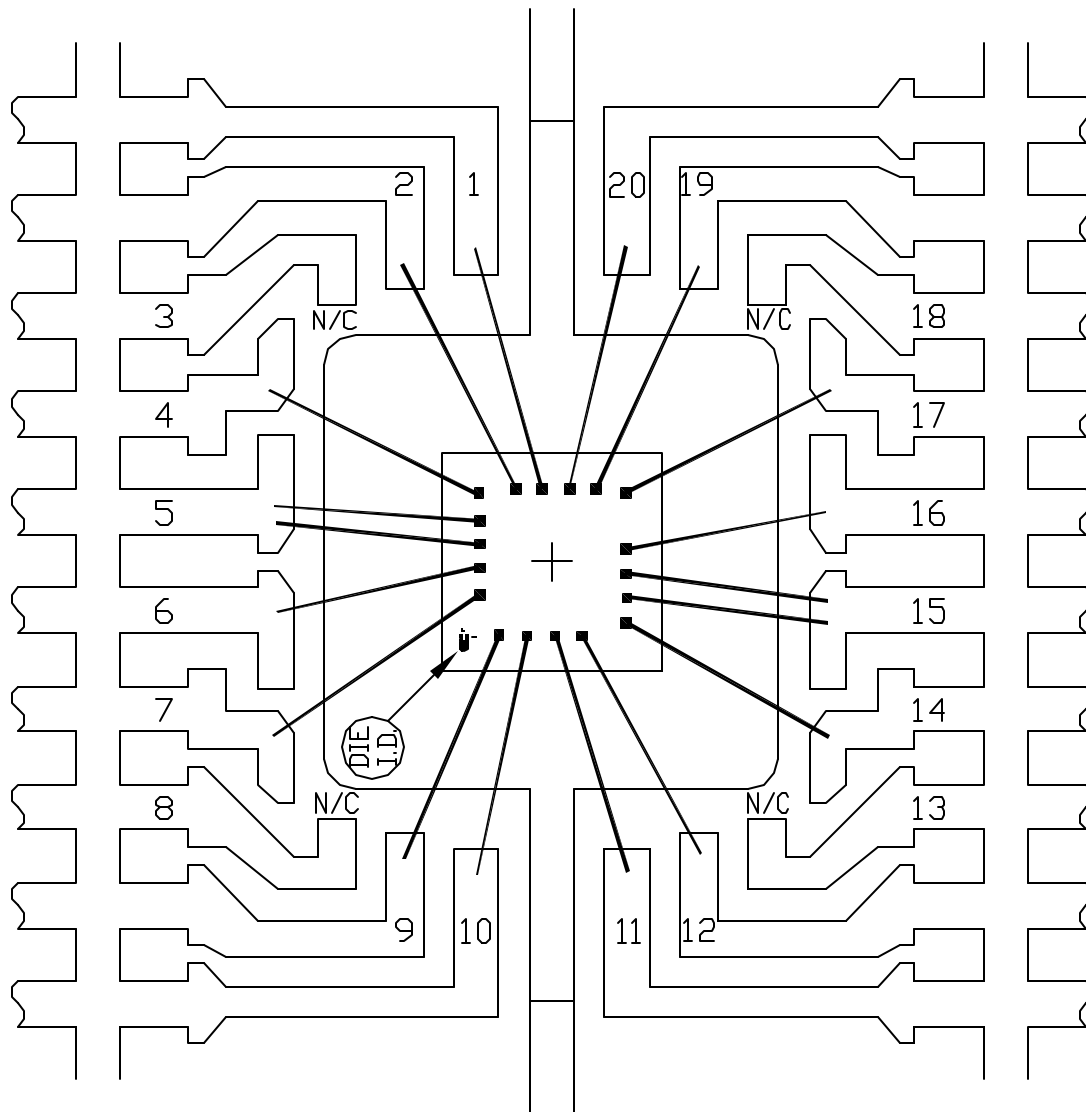
Table 1
Reliability Evaluation Test Results

MAX7328Axx

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		48	0
Moisture Testing (Note 2)					
Pressure Pot	Ta = 121°C P = 15 psi. RH= 100% Time = 168hrs.	DC Parameters & functionality	SSOP	77	0
			Wide SO	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



PKG. CODE:
A20-5

SIGNATURES

DATE

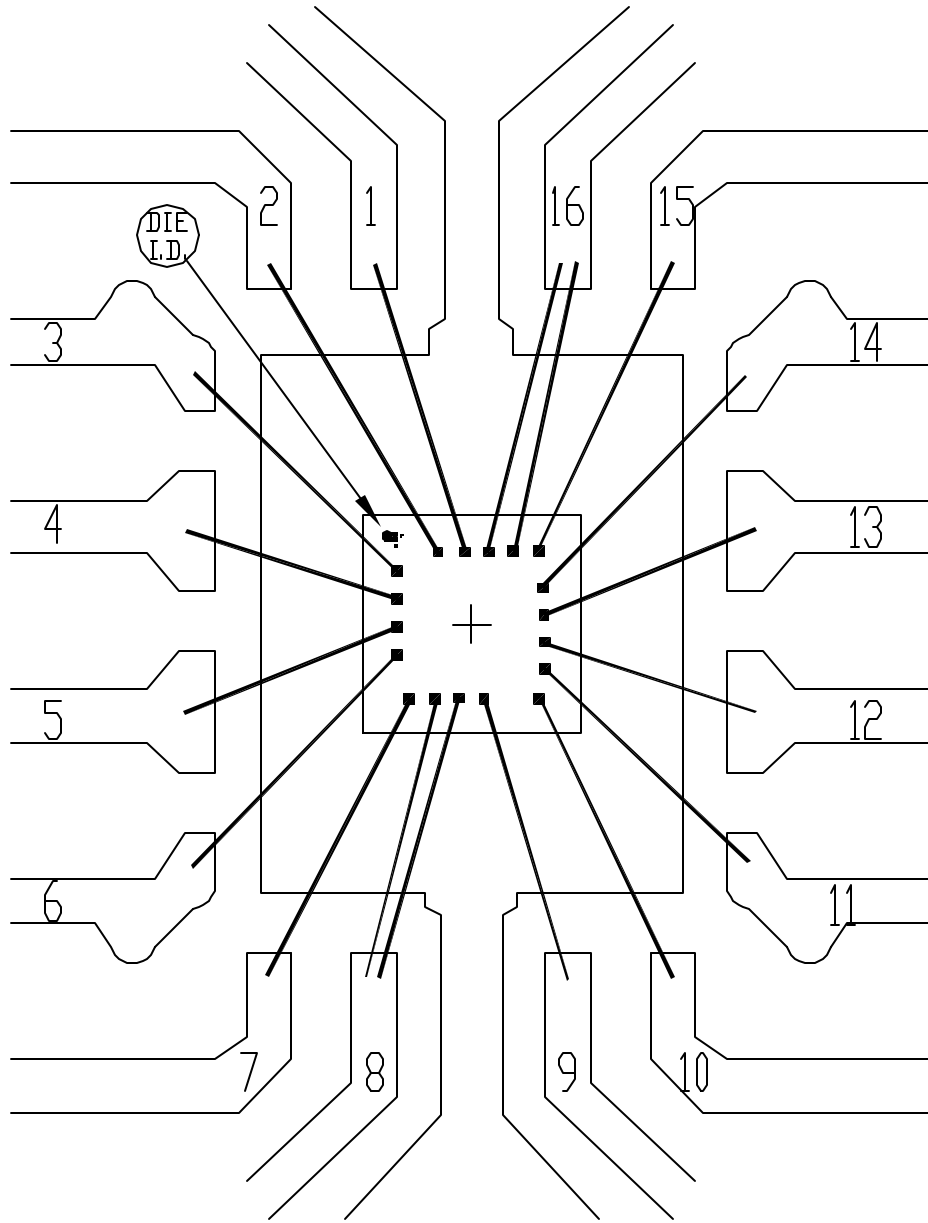
MAXIM
CONFIDENTIAL & PROPRIETARY

CAV./PAD SIZE:
118X118

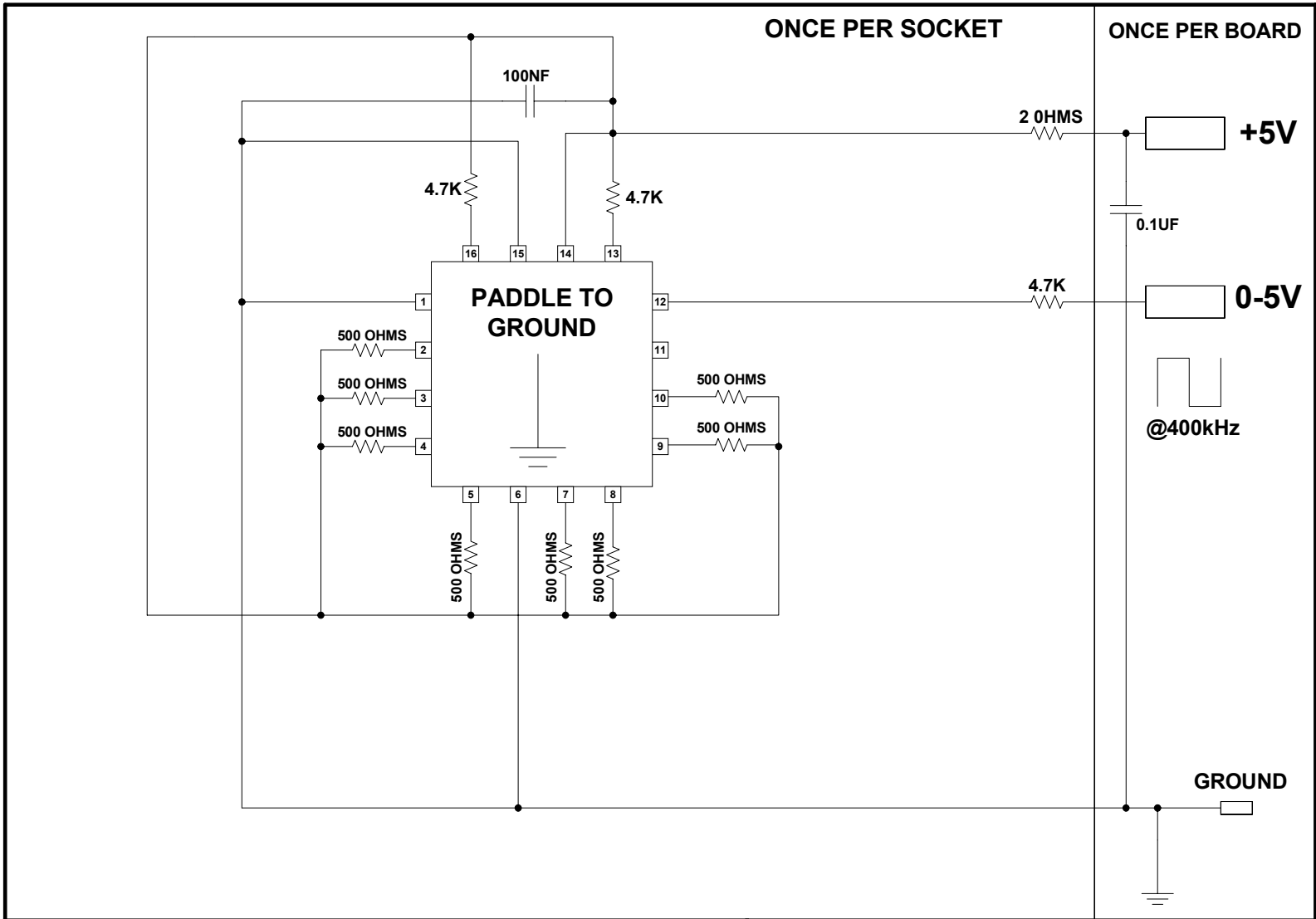
PKG.
DESIGN

BOND DIAGRAM #:
05-9000-1808

REV:
A



PKG. CODE: W16-1		SIGNATURES	DATE	 CONFIDENTIAL & PROPRIETARY	
CAV./PAD SIZE: 110 X 140	PKG. DESIGN			BOND DIAGRAM #: 05-9000-1806	REV: A



DEVICE: MAX7230 (DW90)
PACKAGE: 16-TQFN 3x3
MAX EXPECTED CURRENT: 85mA

NOTES: ALL RESISTORS ARE ¼ W.