

RELIABILITY REPORT
FOR
MAX3349EEExE
PLASTIC ENCAPSULATED DEVICES

July 18, 2006

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.
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Written by

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Conclusion

The MAX3349E 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 MAX3349E $\pm 15\text{kV}$ ESD-protected, USB transceiver provides a full-speed USB interface to a lower voltage microprocessor or ASIC. The device supports enumeration, suspend, and VBUS detection. A special UART multiplexing mode routes external UART signals (Rx and Tx) to D+ and D-, allowing the use of a shared connector to reduce cost and part count for mobile devices.

The UART interface allows mobile devices such as PDAs, cellular phones, and digital cameras to use either UART or USB signaling through the same connector. The MAX3349E features a separate UART voltage supply input to support legacy devices using +2.75V signaling. The MAX3349E supports a maximum UART baud rate of 921kbaud.

Upon connection to a USB host, the MAX3349E enters USB mode and provides a full-speed USB 2.0 compliant interface through VP, VM, RCV, and OE-bar. The MAX3349E features internal series termination resistors on D+ and D-, and an internal $1.5\text{k}\Omega$ pullup resistor to D+ to allow the device to logically connect and disconnect from the USB while plugged in. A suspend mode is provided for low-power operation. D+ and D- are protected from electrostatic discharge (ESD) up to $\pm 15\text{kV}$.

The MAX3349E is available in 16-pin TQFN and 16 UCSP™ (2mm x 2mm) packages, and is specified over the -40°C to $+85^\circ\text{C}$ extended temperature range.

B. Absolute Maximum Ratings

<u>Item</u>	<u>Rating</u>
(All voltages referenced to GND, unless otherwise noted.)	
VUART, VL, VBUS, D+, D-	-0.3V to +6V
VTRM	-0.3V to (VBUS + 0.3V)
VP, VM, SUS, RX, TX, ENUM, RCV, OE, BD,	-0.3V to (VL + 0.3V)
Short Circuit Current (D+ and D-)	$\pm 150\text{mA}$
Maximum Continuous Current (all other pins)	$\pm 15\text{mA}$
Continuous Power Dissipation (TA = +70°C)	
16-Bump UCSP (derate 8.2mW/°C above +70°C)	659.5mW
16-Pin 4mm x 4mm TQFN (derate 25.0mW/°C above +70°C)	2000mW
Operating Temperature Range	-40°C to $+85^\circ\text{C}$
Junction Temperature	$+150^\circ\text{C}$
Storage Temperature Range	-65°C to $+150^\circ\text{C}$
Lead Temperature (soldering, 10s)	$+300^\circ\text{C}$
Bump Temperature (soldering, reflow)	$+235^\circ\text{C}$

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. # 06-6525) 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 B8/S8 Process results in a FIT rate of 0.17 @ 25°C and 2.92 @ 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 RU11 die type has been found to have all pins able to withstand a transient pulse of $\pm 1500\text{V}$, 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

MAX3349EEExE

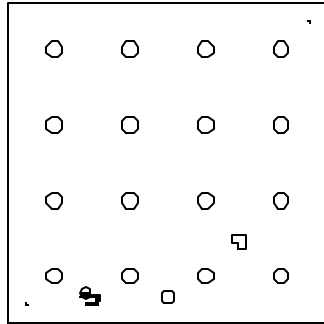
TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	PACKAGE	SAMPLE SIZE	NUMBER OF FAILURES
Static Life Test (Note 1)					
	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality		48	0
Moisture Testing (Note 2)					
Pressure Pot	Ta = 121°C P = 15 psi. RH= 100% Time = 168hrs.	DC Parameters & functionality	TQFN	77	0
			UCSP	77	0
85/85	Ta = 85°C RH = 85% Biased Time = 1000hrs.	DC Parameters & functionality	TQFN UCSP	77 N/A	0 N/A
Mechanical Stress (Note 2)					
Temperature Cycle	-65°C/150°C 1000 Cycles Method 1010	DC Parameters & functionality	TQFN	77	0
			UCSP	77	0

Note 1: Life Test Data may represent plastic DIP qualification lots.

Note 2: Generic Package/Process data

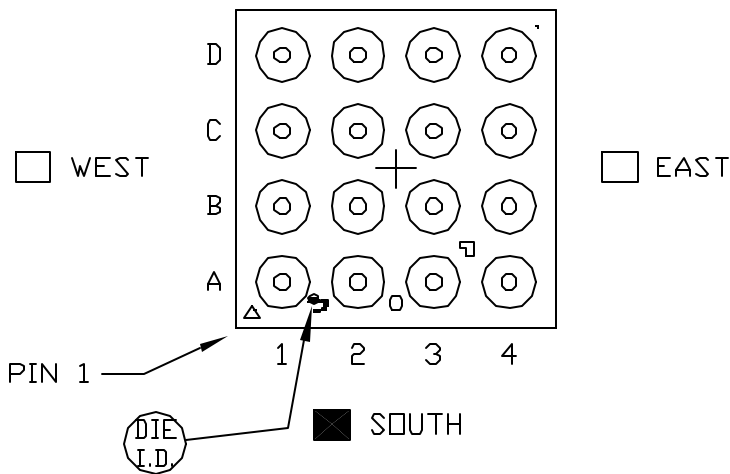
Note 3: UCSP Temperature Cycle performed at -40°C/125°C, 1000 Cycles, ramp rate 11°C/minute, dwell=15 minutes, One cycle.hour.

ORIGINAL CHIP

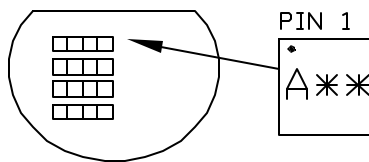


NORTH

AFTER BUMP



SELECT THE BOX INDICATING THE WAFER FLAT SIDE WITH RESPECT TO PIN 1.

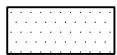
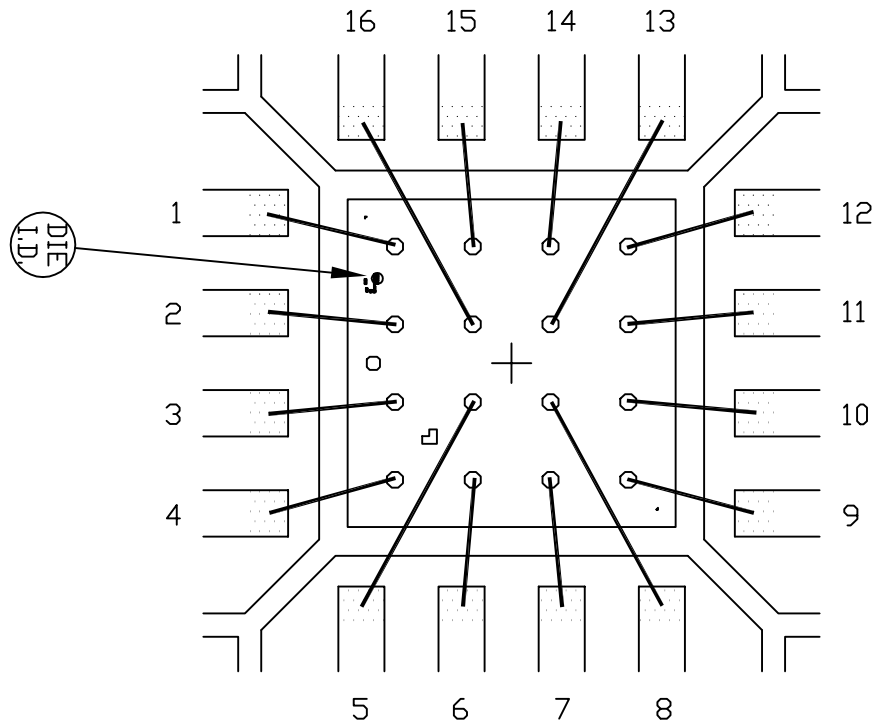


PART MARKING ORIENTATION
IN REFERENCE TO WAFER FLAT
(MARK IS ON WAFER BACKSIDE)

PKG. CODE: B16-1		SIGNATURES	DATE	MAXIM CONFIDENTIAL & PROPRIETARY	
CAV./PAD SIZE: N/A	PKG. DESIGN			BOND DIAGRAM #: 05-9000-1839	REV: A

4x4x0.8mm THIN QFN PKG.

EXPOSED PAD PKG.



BONDABLE AREA

PKG. CODE: T1644-4

CAV./PAD SIZE:
98x98

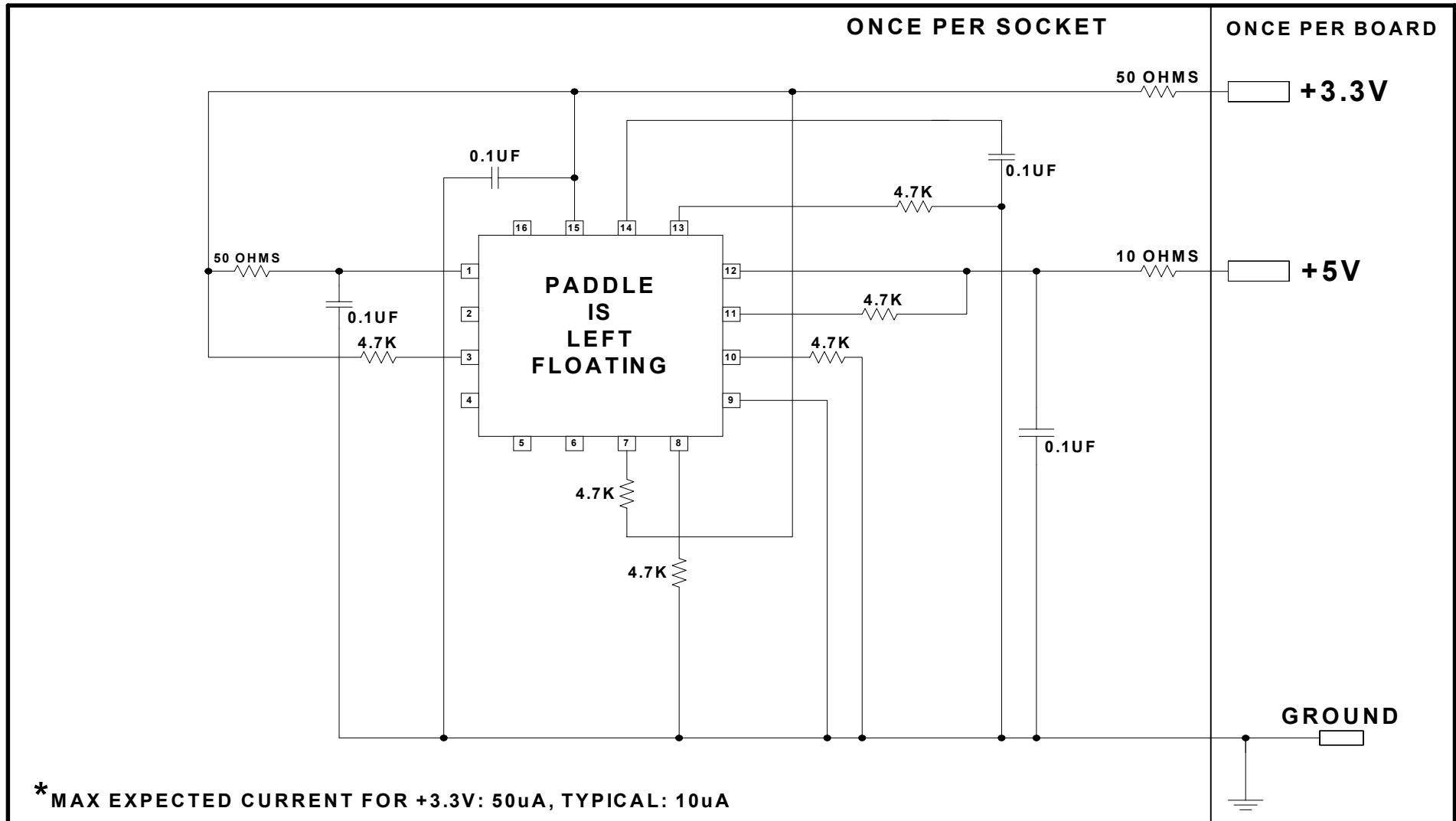
SIGNATURES

DATE

MAXIM
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BOND DIAGRAM #:
05-9000-1840

REV:
C



DEVICE: MAX3349 (RU11)/MAX3349E (RU30)
PACKAGE: 16-TQFN 4x4
MAX EXPECTED CURRENT: 800uA, TYPICAL: 500uA (+5V)

NOTES: