RELIABILITY REPORT

FOR

MAX9123ExE

PLASTIC ENCAPSULATED DEVICES

March 5, 2003

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Written by

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Reviewed by

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Conclusion

The MAX9123 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 MAX9123 quad low-voltage differential signaling (LVDS) differential line driver is ideal for applications requiring high data rates, low power, and low noise. The MAX9123 is guaranteed to transmit data at speeds up to 800Mbps (400MHz) over controlled impedance media of approximately 100Ω. The transmission media may be printed circuit (PC) board traces, backplanes, or cables.

The MAX9123 accepts four LVTTL/LVCMOS input levels and translates them to LVDS output signals. Moreover, the MAX9123 is capable of setting all four outputs to a high-impedance state through two enable inputs, EN and EN-bar, thus dropping the device to an ultra-low-power state of 16mW (typ) during high impedance. The enables are common to all four transmitters. Outputs conform to the ANSI TIA/EIA-644 LVDS standard. Flow-through pinout simplifies PC board layout and reduces crosstalk by separating the LVTTL/LVCMOS inputs and LVDS outputs.

The MAX9123 operates from a single +3.3V supply and is specified for operation from -40°C to +85°C. It is available in 16-pin TSSOP and SO packages.

B. Absolute Maximum Ratings

Item	Rating
VCC to GND	-0.3V to +4.0V
IN_, EN, EN to GND	-0.3V to (VCC + 0.3V)
OUT_+, OUT_- to GND	-0.3V to +3.9V
Short-Circuit Duration (OUT_+, OUT_-)	Continuous
Storage Temperature Range	-65°C to +150°C
Maximum Junction Temperature	+150°C
Operating Temperature Range	-40°C to +85°C
Lead Temperature (soldering, 10s)	+300°C
ESD Protection Human Body Model, IN_, OUT_+, OUT_-	±4kV
Continuous Power Dissipation (TA = +70°C)	
16-Pin TSSOP	755mW
16-Pin SO	696mW
Derates above +70°C	
16-Pin TSSOP	9.4mW/°C
16-Pin SO	8.7mW/°C

II. Manufacturing Information

A. Description/Function:	Quad LVDS Line Driver with Flow-Through Pinout
B. Process:	TC35
C. Number of Device Transistors:	1246
D. Fabrication Location:	Taiwan
E. Assembly Location:	Philippines, Malaysia or Thailand
F. Date of Initial Production:	January, 2001

III. Packaging Information

A. Package Type:	16-**Pin TSSOP**	**16-Pin SO**
B. Lead Frame:	Copper	Copper
C. Lead Finish:	Solder Plate	Solder Plate
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:	# 05-2801-0015	# 05-2801-0016
H. Flammability Rating:	Class UL94-V0	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard JESD22-112:	Level 1	Level 1

IV. Die Information

A. Dimensions:	49 x 60 mils
B. Passivation:	Si_3N_4/SiO_2 (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Aluminum/Si (Si = 1%)
D. Backside Metallization:	None
E. Minimum Metal Width:	Metal1 = 0.5 / Metal2 = 0.6 / Metal3 = 0.6 microns (as drawn)
F. Minimum Metal Spacing:	Metal1 = 0.45 / Metal2 = 0.5 / Metal3 = 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 (Reliability Lab Manager)
Bryan Preeshl (Executive Director)
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:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4389 \times 79 \times 2}$$ (Chi square value for MTTF upper limit)

Temperature Acceleration factor assuming an activation energy of 0.8eV

$\lambda = 13.75 \times 10^{-9}$

$\lambda = 13.75$ 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. # 06-5724) 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 HS09 die type has been found to have all pins able to withstand a transient pulse of ±2500V 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

MAX9123ExE

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		79	0
Moisture Testing (Note 2)					
Pressure Pot	Ta = 121°C P = 15 psi. RH= 100% Time = 168hrs.	DC Parameters & functionality	TSSOP SO	77 77	0 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 I for each named Power supply and for ground

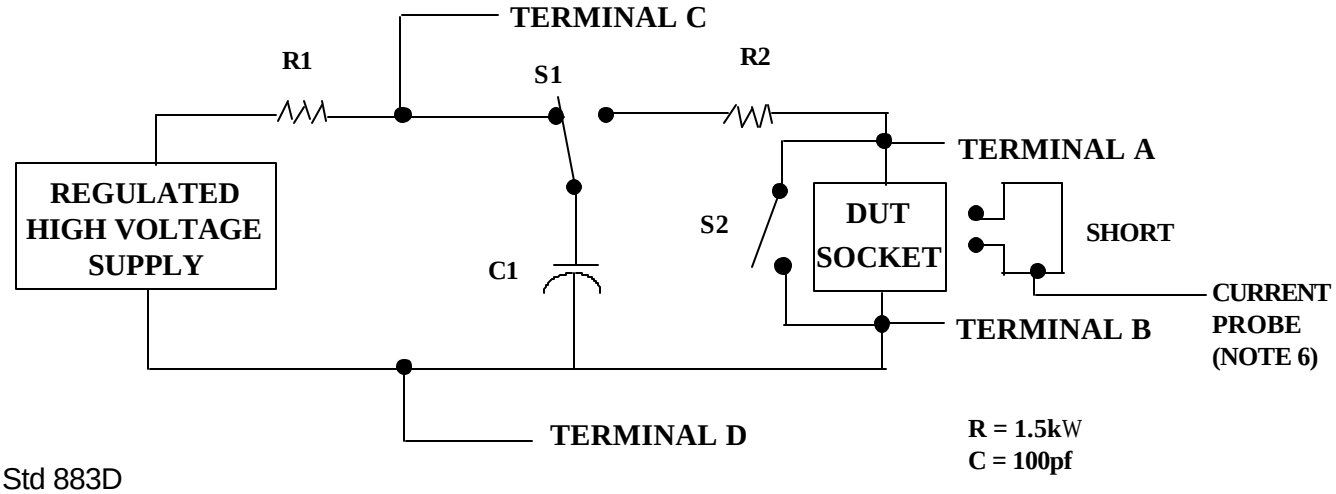
(e.g., where V_{PS1} is V_{DD}, V_{CC}, V_{SS}, V_{BB}, GND, $+V_S$, $-V_S$, V_{REF}, etc).

3.4 Pin combinations to be tested.

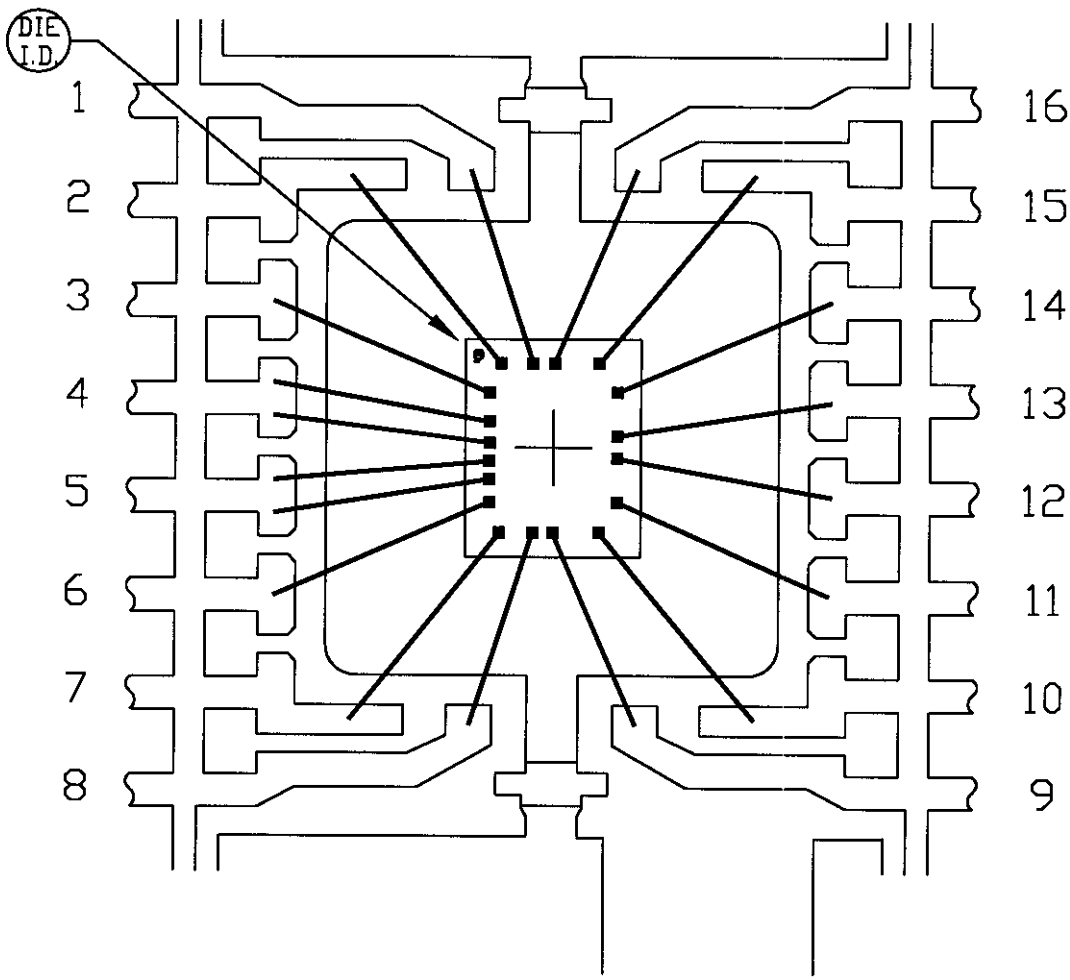
a. Each pin individually connected to terminal A with respect to the device ground pin(s) connected to terminal B. All pins except the one being tested and the ground pin(s) shall be open.

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.

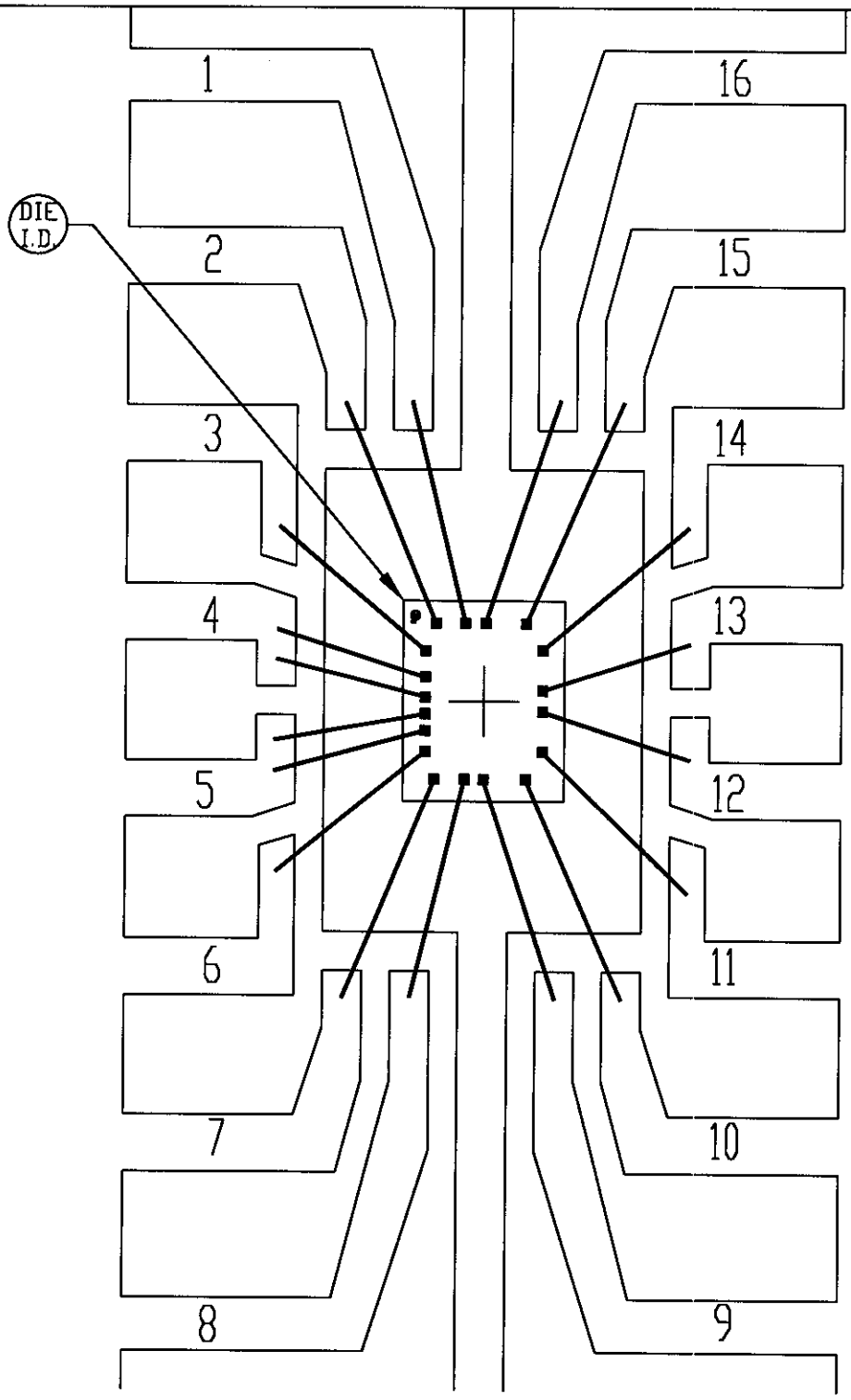
c. Each input and each output individually connected to terminal A with respect to a combination of all the other input and output pins connected to terminal B. All pins except the input or output pin being tested and the combination of all the other input and output pins shall be open.



Mil Std 883D
Method 3015.7
Notice 8



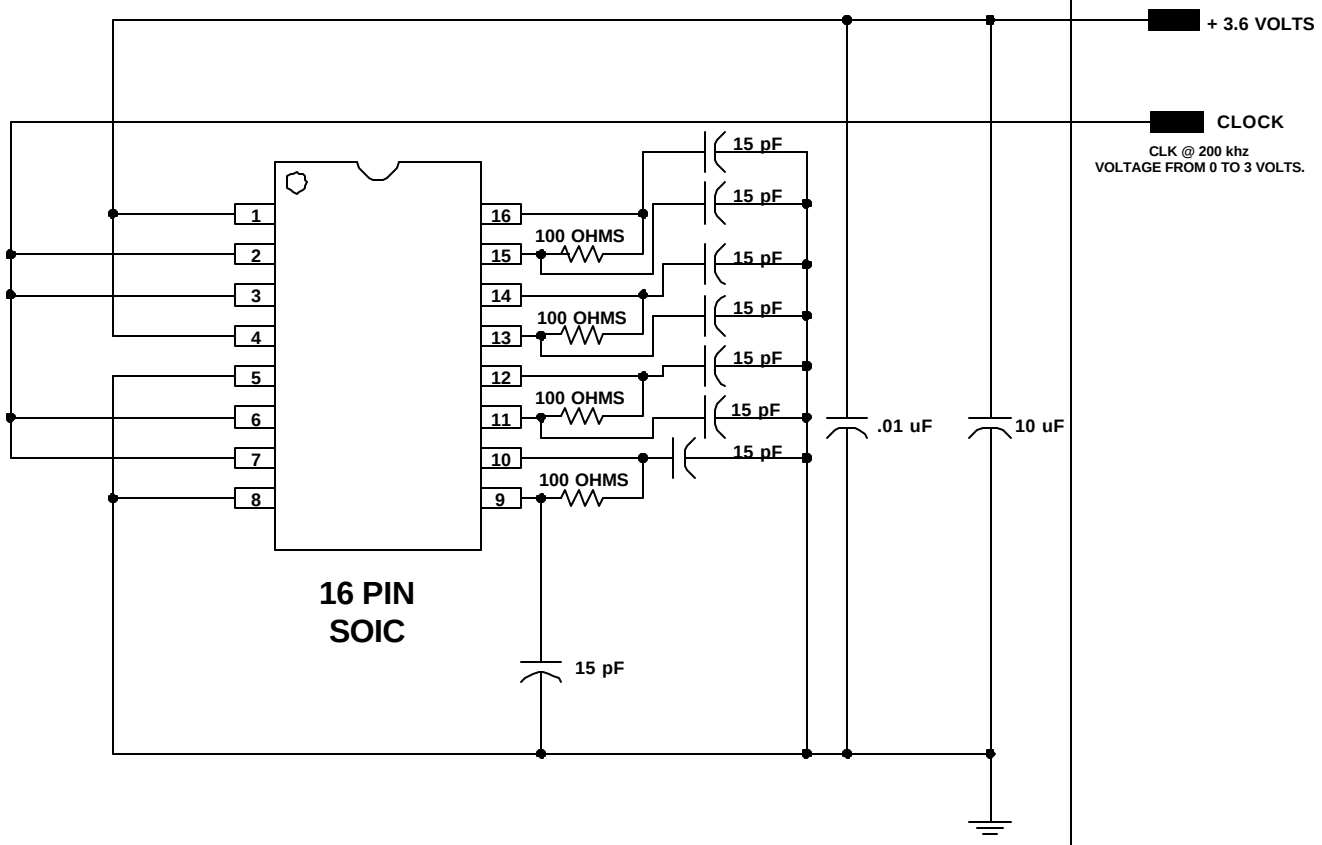
PKG. CODE: U16-2		SIGNATURES	DATE	MAXIM CONFIDENTIAL & PROPRIETARY
CAV./PAD SIZE: 118X118	PKG. DESIGN			BOND DIAGRAM #: 05-2801-0015 / REV: A



PKG. CODE: S16-2		SIGNATURES	DATE	MAXIM CONFIDENTIAL & PROPRIETARY
CAV./PAD SIZE: 90 X 130	PKG. / DESIGN			BOND DIAGRAM #: 05-2801-0016 / REV: A

ONCE PER SOCKET

ONCE PER BOARD



DEVICES: MAX 9123

MAX. EXPECTED CURRENT = 30 mA

DRAWN BY: HAK/TEK TAN

NOTES: