

RELIABILITY REPORT
FOR
MAX3041xxE
PLASTIC ENCAPSULATED DEVICES

July 25, 2002

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Written by



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Conclusion

The MAX3223 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 MAX3041 is a 5V quad RS-485/RS-422 transmitter designed for digital data transmission over twisted-pair balanced lines. All transmitter outputs are protected to $\pm 10\text{kV}$ using the Human Body Model. The MAX3041 (2.5Mbps) is a slew-rate limited transmitter that minimizes EMI and reduces reflections caused by improperly terminated cables, thus allowing error-free transmission.

The MAX3041 features a hot-swap capability that eliminates false transitions on the data cable during power-up or hot insertion. The MAX3041 is optimized for data transfer rates up to 2.5Mbps. The MAX3041 offers optimum performance when used with the MAX3093E or MAX3095 5V quad differential line receivers or MAX3094E/MAX3096 3V quad differential line receivers.

The MAX3041 is an ESD-protected pin-compatible, low-power upgrade to the industry-standard 'SN75174 and 'DS26LS31C. They are available in space-saving TSSOP, narrow SO, and wide SO packages.

B. Absolute Maximum Ratings

<u>Item</u>	<u>Rating</u>
All voltages referenced to ground (GND).	
Supply Voltage (VCC)	+7V
Control Input Voltage (EN, EN ₁ , EN ₂)	-0.3V to (VCC + 0.3V)
Driver Input Voltage (T _{IN})	-0.3V to (VCC + 0.3V)
Driver Output Voltage (Y ₋ , Z ₋) (Driver Disabled)	-7.5V to +12.5V
Driver Output Voltage (Y ₋ , Z ₋) (Driver Enabled)	-7.5V to +10V
Operating Temperature Range	
MAX3041C_E	0°C to +70°C
MAX3041E_E	-40°C to +85°C
Maximum Junction Temperature	+150°C
Storage Temperature Range	-65°C to +150°C
Lead Temperature (soldering, 10s)	+300°C
Continuous Power Dissipation (TA = +70°C)	
16-Pin TSSOP	755mW
16-Pin NSO	696mW
16-Pin WSO	762mW
Derates above +70°C	
16-Pin TSSOP	11.11mW/°C
16-Pin NSO	8.00mW/°C
16-Pin WSO	7.00mW/°C

II. Manufacturing Information

- A. Description/Function: 1 μ A Supply Current, True +3V to +5.5V RS-232 Transceiver with AutoShutdown™
- B. Process: S3 (Standard 3 micron silicon gate CMOS)
- C. Number of Device Transistors: 545
- D. Fabrication Location: Oregon, USA
- E. Assembly Location: Philippines, Thailand, Korea or Malaysia
- F. Date of Initial Production: July, 2001

III. Packaging Information

- | A. Package Type: | 16-Lead TSSOP | 16-Lead NSO | 16-Lead WSO |
|---|--------------------------|--------------------------|--------------------------|
| B. Lead Frame: | Copper | Copper | Copper |
| C. Lead Finish: | Solder Plate | Solder Plate | Solder Plate |
| D. Die Attach: | Silver-filled Epoxy | Silver-filled Epoxy | Silver-filled Epoxy |
| E. Bondwire: | Gold (1.0 mil dia.) | Gold (1.0 mil dia.) | Gold (1.0 mil dia.) |
| F. Mold Material: | Epoxy with silica filler | Epoxy with silica filler | Epoxy with silica filler |
| G. Assembly Diagram: | # 05-2601-0047 | # 05-2601-0046 | # 05-2601-0071 |
| H. Flammability Rating: | Class UL94-V0 | Class UL94-V0 | Class UL94-V0 |
| I. Classification of Moisture Sensitivity per JEDEC standard JESD22-A112: | Level 1 | | |

IV. Die Information

- A. Dimensions: 91 x 144 mils
- B. Passivation: Si₃N₄/SiO₂ (Silicon nitride/ Silicon dioxide)
- 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)
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. # 06-5895) 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 RS26-1 die type has been found to have all pins able to withstand a transient pulse of $\pm 2500\text{V}$, 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

MAX3041xxE

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	TSSOP	77	0
			NSO	77	0
			WSO	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		77	0

Note 1: Life Test Data may represent plastic D.I.P. qualification lots for the Shrink Small Outline package.

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

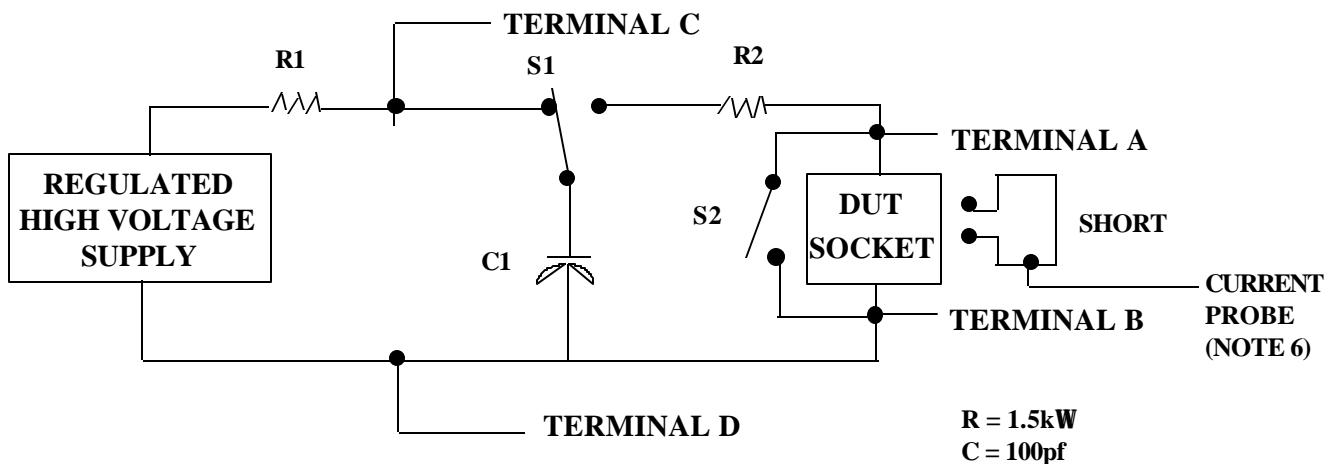
1/ Table II is restated in narrative form in 3.4 below.

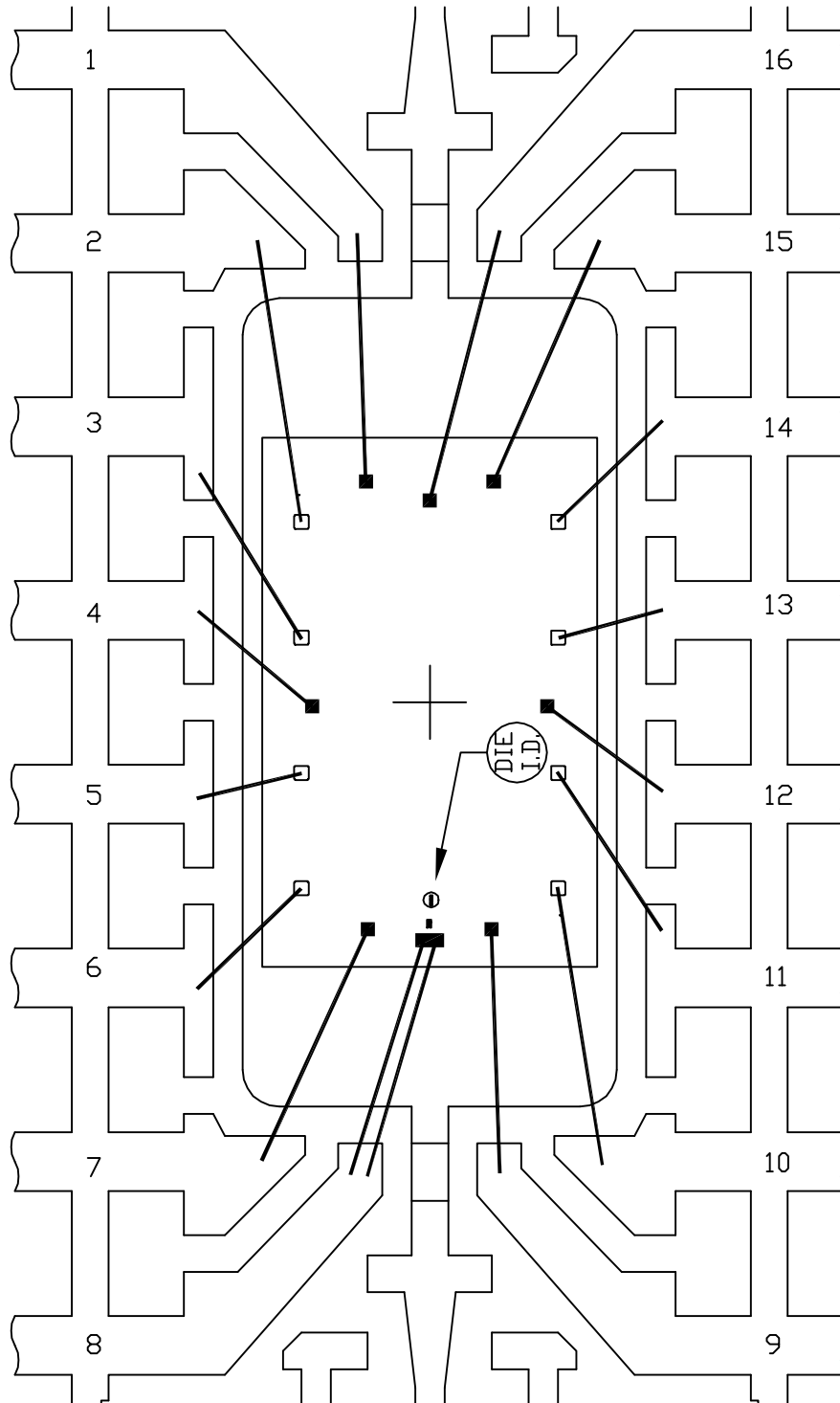
2/ No connects are not to be tested.

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).

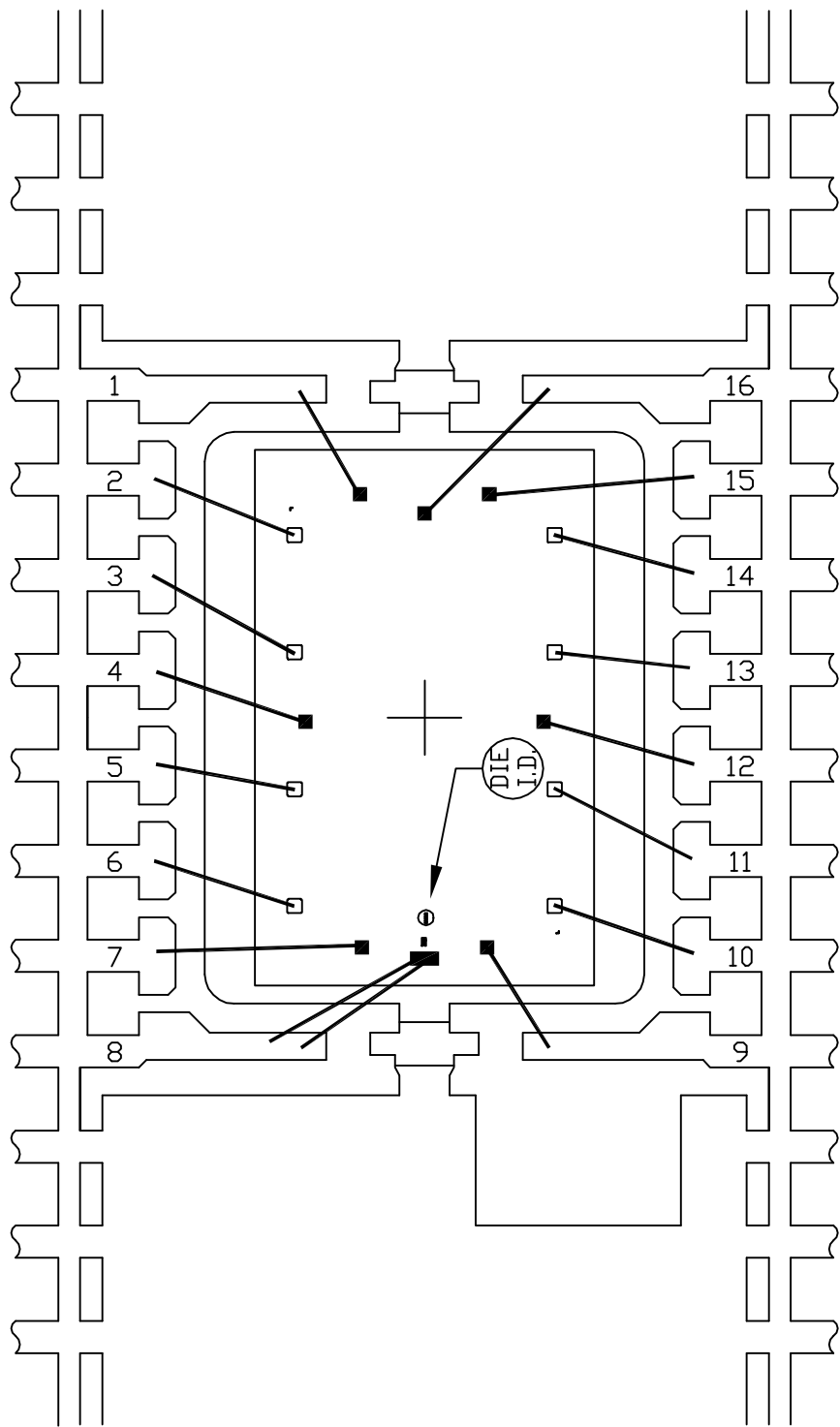
3.4 Pin combinations to be tested.

- 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.

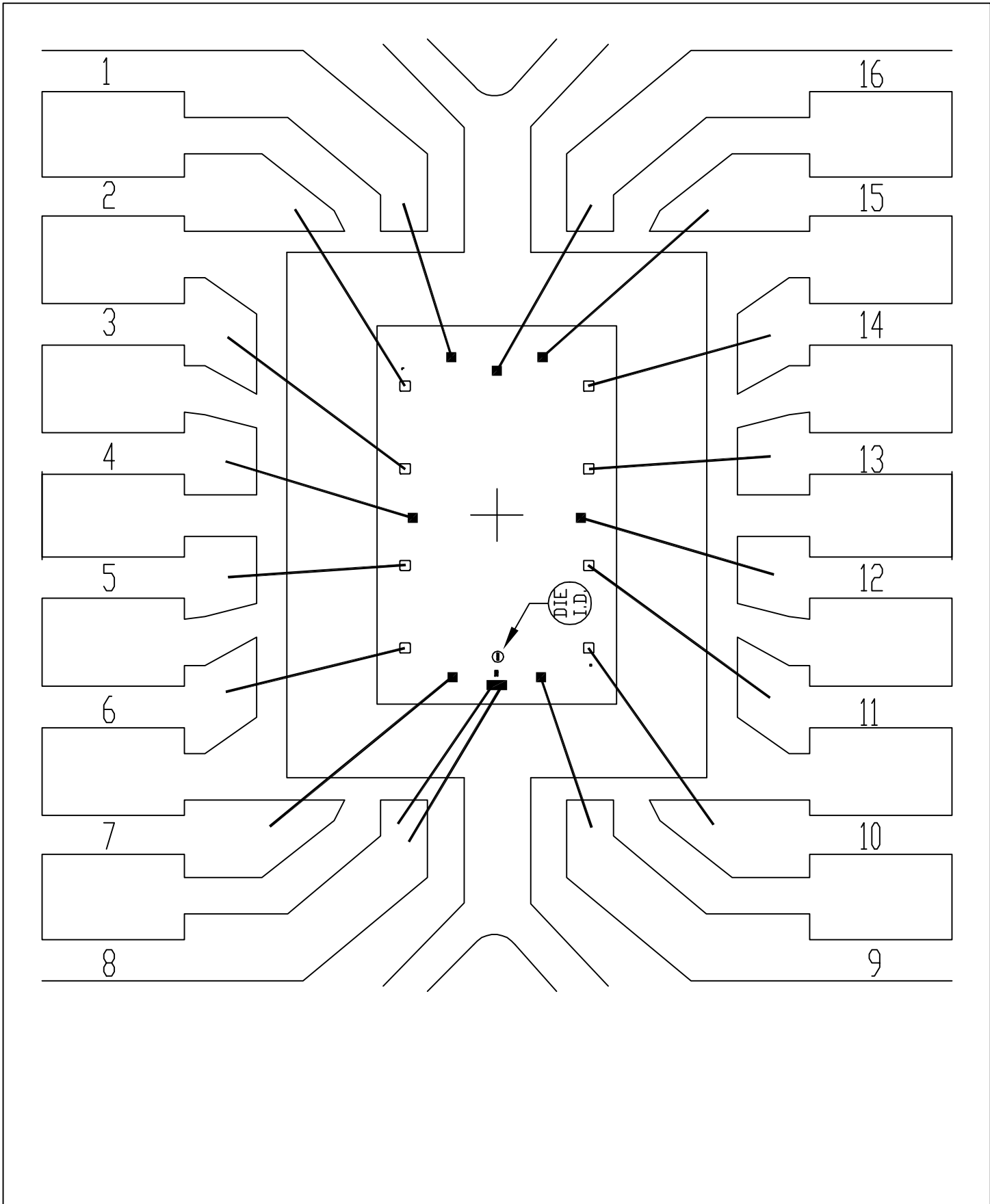




PKG. CODE: S16-8		SIGNATURES	DATE	 CONFIDENTIAL & PROPRIETARY	
CAV./PAD SIZE: 102X220	PKG. DESIGN		2/9/01 2/27/01	BOND DIAGRAM #: 05-2601-0046	REV: A



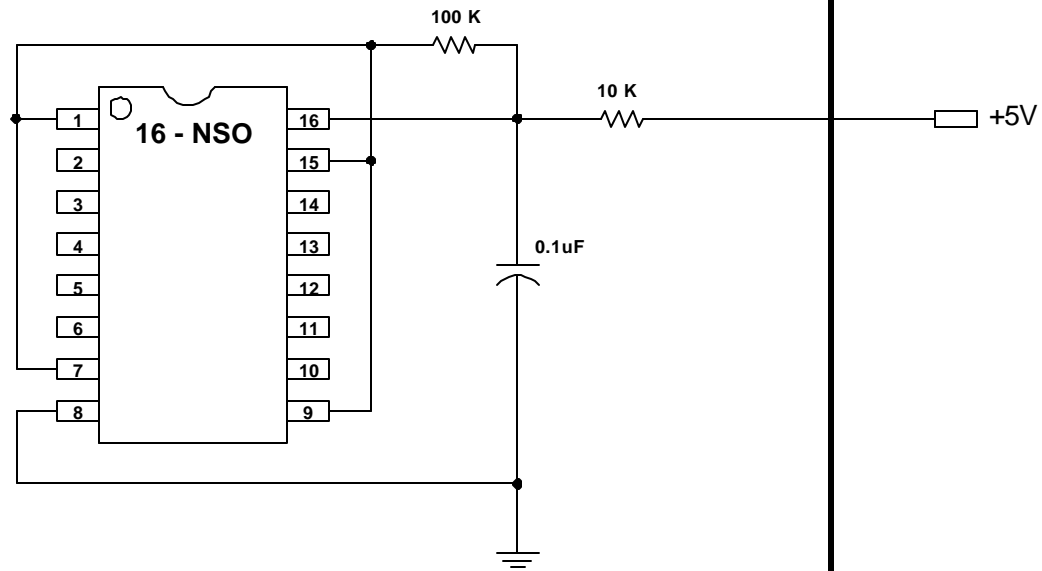
PKG. CODE: U16-1		SIGNATURES	DATE	 CONFIDENTIAL & PROPRIETARY	
CAV./PAD SIZE: 118X154	PKG. DESIGN			BOND DIAGRAM #: 05-2601-0047	REV: A



PKG. CODE: W16-3		SIGNATURES	DATE	 CONFIDENTIAL & PROPRIETARY	
CAV./PAD SIZE: 160 X 200	PKG. DESIGN			BOND DIAGRAM #: 05-2601-0071	REV: A

ONCE PER SOCKET

ONCE PER BOARD



DEVICES: MAX 3040E - 3045E

DRAWN BY: HAK TAN

MAX. EXPECTED CURRENT = 10 uA

NOTES: