AT&T

Preliminary

DATA SHEET

LB1018AD Crosspoint Array

DESCRIPTION

The LB1018AD Crosspoint Array integrated circuit is a high-density, high-performance bipolar switch. It is organized as a 4 × 8 array with crosspoints consisting of 32 SCR devices. At each crosspoint is a nearly ideal switch capable of switching analog signals, with an intersection impedance of less than 13 ohms. The device is capable of handling infrequent fault currents of 100 mAdc for periods of up to one hour, and continuous forward current up to 42 mAdc. It is useful as a high-reliability replacement for metallic relays in switching networks. This device is available in an 18-pin plastic DIP.

BENEFITS

- Junction isolation for low cost
- 40 mAdc current capability
- 30 volt off-state capability

FEATURES

- Low signal loss to substrate > −48 dB
- Low on-state resistance < 13 ohms
- High off-state resistance > 200 megohms
- Excellent transient immunity: 300 V/μs

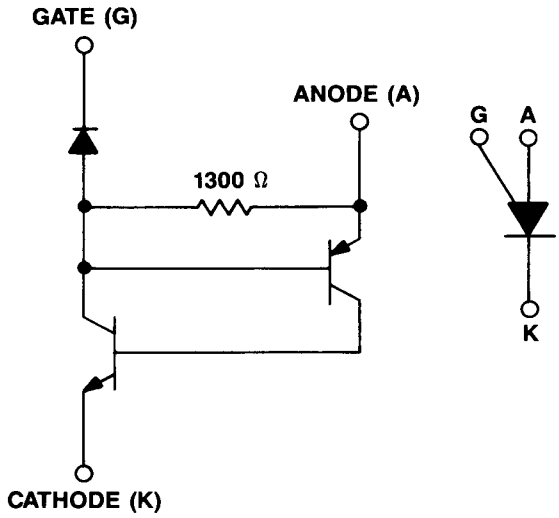


Figure 1. LB1018AD Functional Diagram

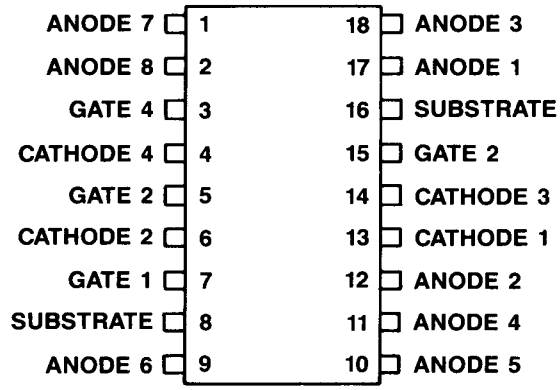


Figure 2. 18-Pin Plastic DIP

November 1986

MAXIMUM RATINGS

(at 25°C unless otherwise specified)

Rating	Value	Unit
Ambient Operating Temperature Range	0 to 70	°C
Storage Temperature Range	−40 to +125	°C
Pin Temperature (Soldering, 15 sec)	300	°C
Voltage, Anode to Cathode	±30	V
Voltage, Cathode to Substrate	30	V
Voltage, Anode to Substrate	30	V

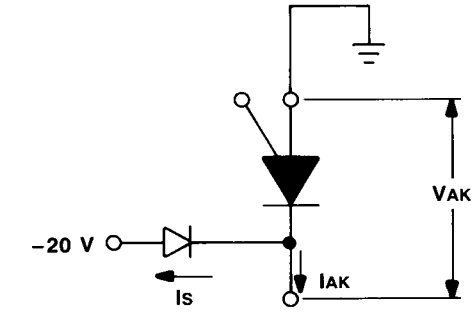
CHARACTERISTICS

Electrical Characteristics

(T_A = 25°C)

Parameter	Min	Typ	Max	Unit
Forward Voltage, I_{AK} = 10 mA (Figure 1)	0.7	0.9	1.1	V
Substrate Crosstalk, I_{AK} = 10 mA, I_{AK} = 10 mAp-p V_{AS} = 20 V (Figure 1)	—	—	4	μA/mA
On Resistance, I_{AK} = 10 mA (Figure 1)	6.4	—	12.4	Ω
Cathode-Substrate Leakage Current, V_{KS} = 30 V (Figure 2)	—	0.22	1.7	μA
Enable Current (Figure 3)	0.3	—	0.9	mA
Enable Voltage (Figure 3)	−0.8	—	−1.7	V
Forward Leakage Current, V_{AK} = 30 V (Figure 4)	—	0.004	1.7	μA
Reverse Leakage Current, V_{KA} = 30 V (Figure 4)	—	0.012	1.7	μA
Gate-Anode Leakage Current, V_{GA} = 30 V (Figure 5)	—	—	.15	μA
Holding Current (Figure 6)	0.4	—	1.66	mA
Transient Immunity, 0−30 Volt Ramp	—	300	—	V/μs
Step Voltage Immunity	—	5.0	—	V
Anode Line to Cathode Line Capacitance, V_{AK} = 30 V	—	1.0	2.0	pF

TEST CIRCUITS



$$R_{ON} = \frac{\Delta V_{AK}}{\Delta I_{AK}} = \frac{V_{AK}|I_{AK} = 15\ mA - V_{AK}|I_{AK} = 5\ mA}{15\ mA - 5\ mA}$$

$$\frac{dis}{diak} = \frac{\Delta I_S}{\Delta I_{AK}} = \frac{I_S|I_{AK} = 15\ mA - I_S|I_{AK} = 5\ mA}{15\ mA - 5\ mA}$$

Figure 3

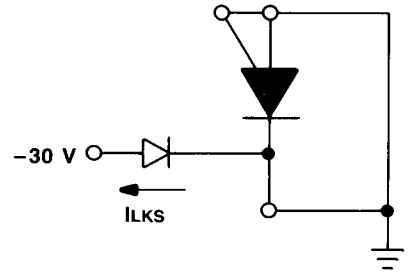


Figure 4

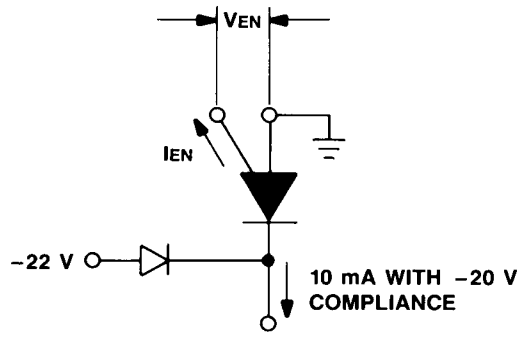


Figure 5

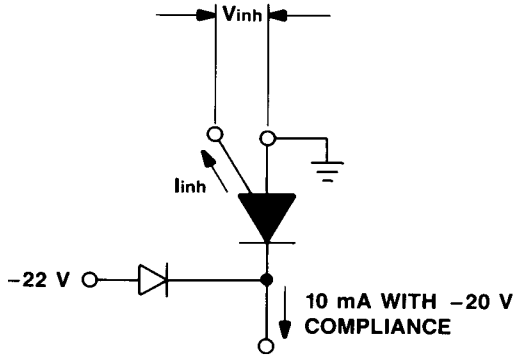


Figure 6

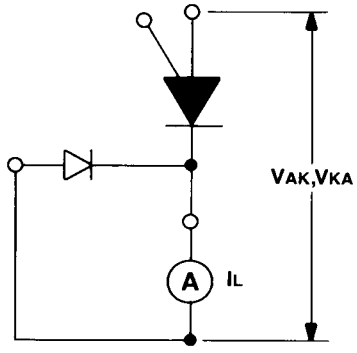


Figure 7

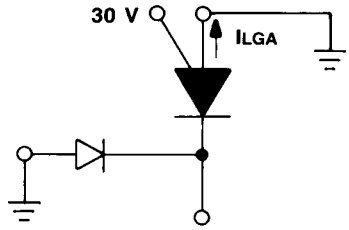


Figure 8

CHARACTERISTIC CURVES

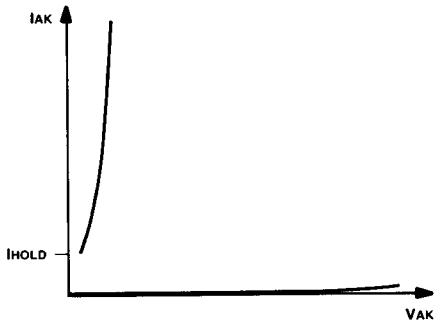


Figure 9. Current Hold Characteristics

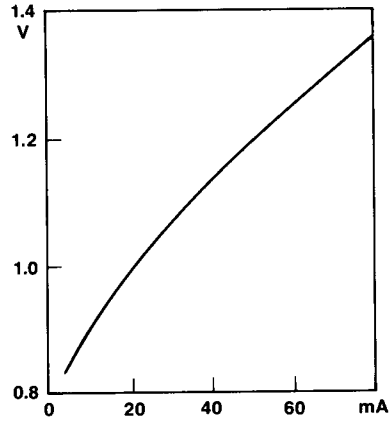


Figure 10. Typical Forward Characteristics

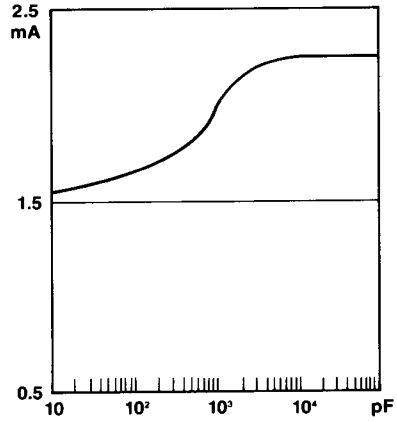


Figure 11. Variation of Holding Current with Anode-Cathode Capacitance

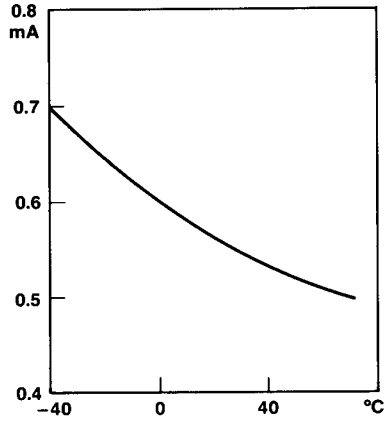


Figure 12. Typical Gate Trigger Current vs. Ambient Temperature

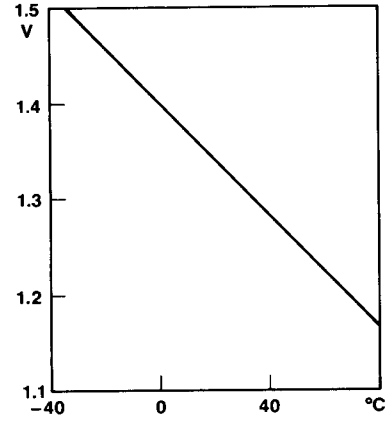


Figure 13. Typical Gate Trigger Voltage vs. Ambient Temperature

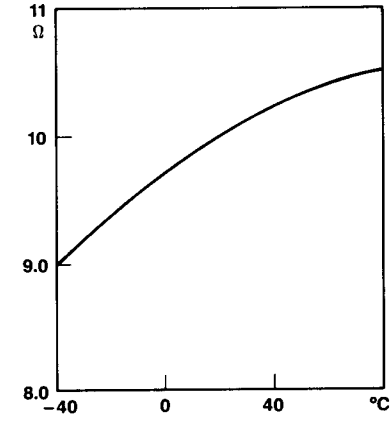


Figure 14. Typical On Resistance vs. Ambient Temperature

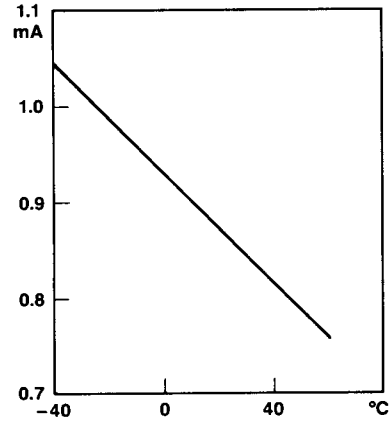


Figure 15. Typical Holding Current vs. Ambient Temperature

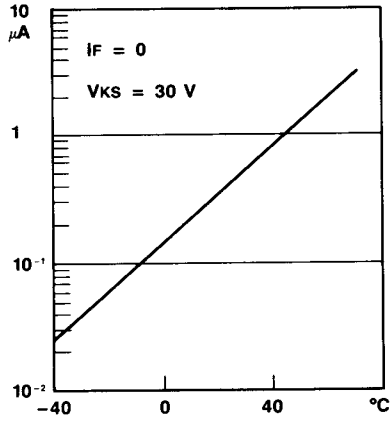


Figure 16. Cathode-Substrate Leakage Current vs. Ambient Temperature

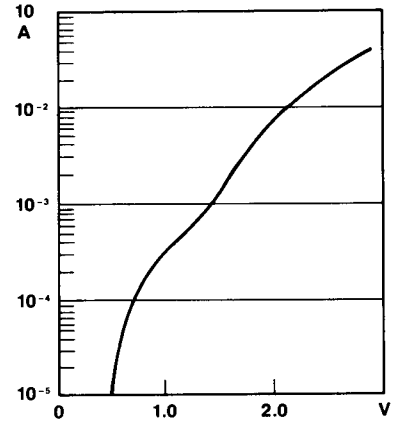


Figure 17. Anode-Gate Current vs. Anode-Gate Voltage

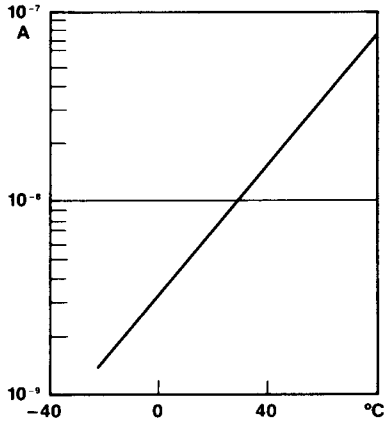


Figure 18. Typical Gate Leakage Current vs. Ambient Temperature

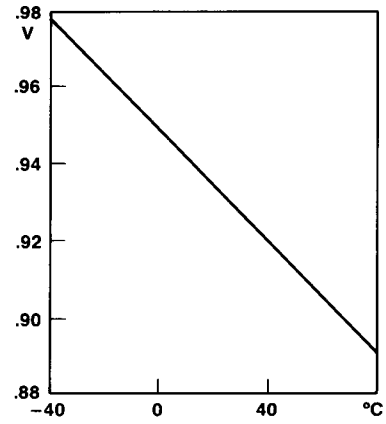


Figure 19. Typical Forward Voltage vs. Ambient Temperature

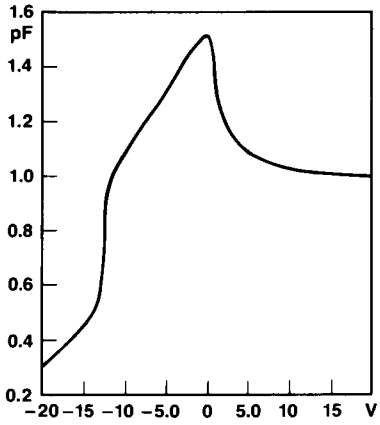


Figure 20. Typical Anode-Cathode Capacitance

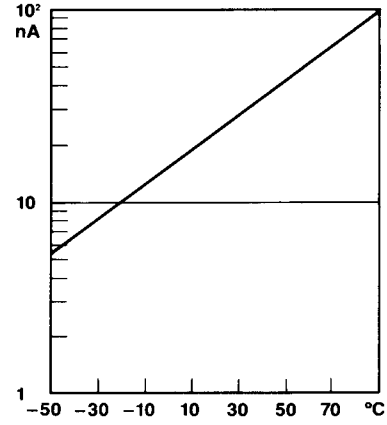


Figure 21. Typical Forward Leakage Current vs. Ambient Temperature

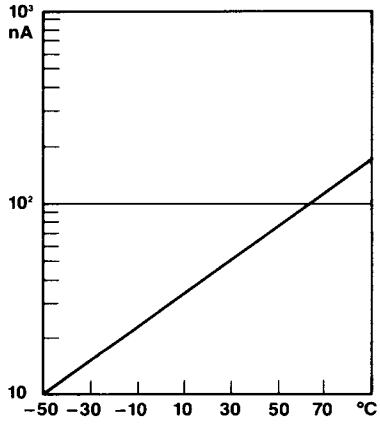


Figure 22. Typical Reverse Leakage Current vs. Ambient Temperature

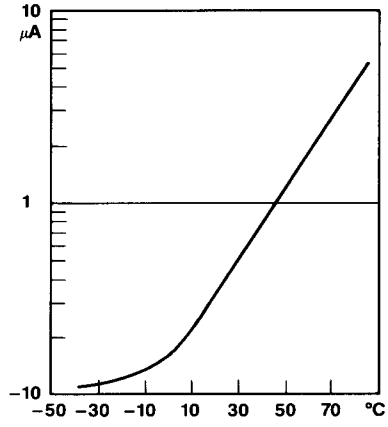


Figure 23. Typical dc Substrate Leakage Current vs. Ambient Temperature

APPLICATIONS

The LB1018AD Crosspoint Array is designed to provide a low-loss analog switching element for telephony signals.

Applications indicate that the minimum holding current is a function of the anode-cathode capacitance placed in parallel with a PNPN element. The form of the variation is shown in Figure 2. When the device is placed in a circuit where active inductance is present, the holding current may be depressed slightly. The values of holding current given in the electrical characteristics table correspond to measurements made with very small anode-cathode capacitance, such as when the device is connected to a curve tracer with short wires.

The ON resistance of PNPN elements varies for different paths through the matrix. A total variation of ±1 ohm may occur around the mean value.

The forward and reverse leakages given in the electrical characteristics are measured from anode to cathode with the substrate held at the same potential as the cathode. Leakage to the substrate (via all the other parts of the device not under test) will be diverted into the voltage source controlling the substrate potential. If the substrate is allowed to float, the leakage is collected by the cathode of the PNPN element under test. Thus, the leakage measured at the one cathode is greatly increased (typically to 350 nA at room temperature).

The device is designed to conduct continuous forward current up to 42 mAdc, provided that the junction temperature is not greater than 120°C. It is also designed to be able to survive infrequent fault conditions where up to 100 mAdc flows for intervals up to 1 hour. Typical devices have been observed to be destroyed by forward current surges of 750 mA.

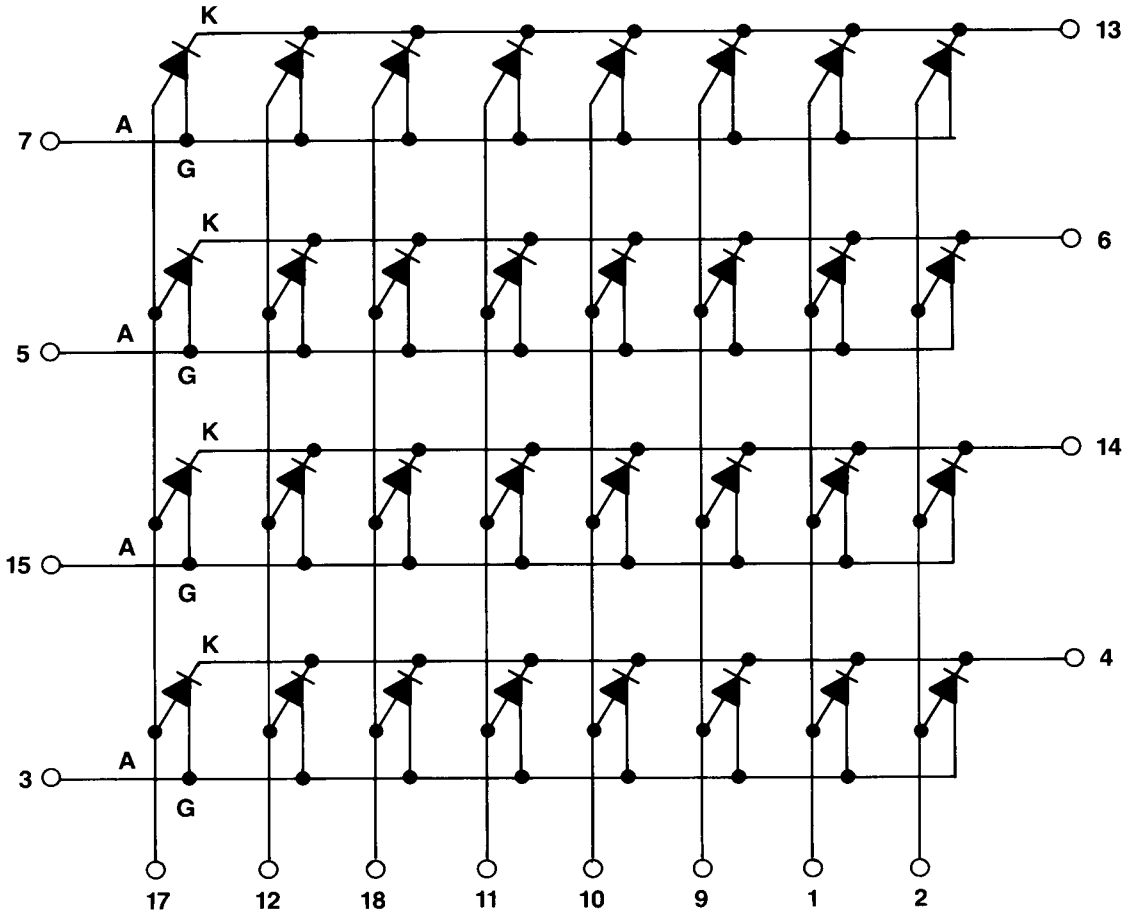
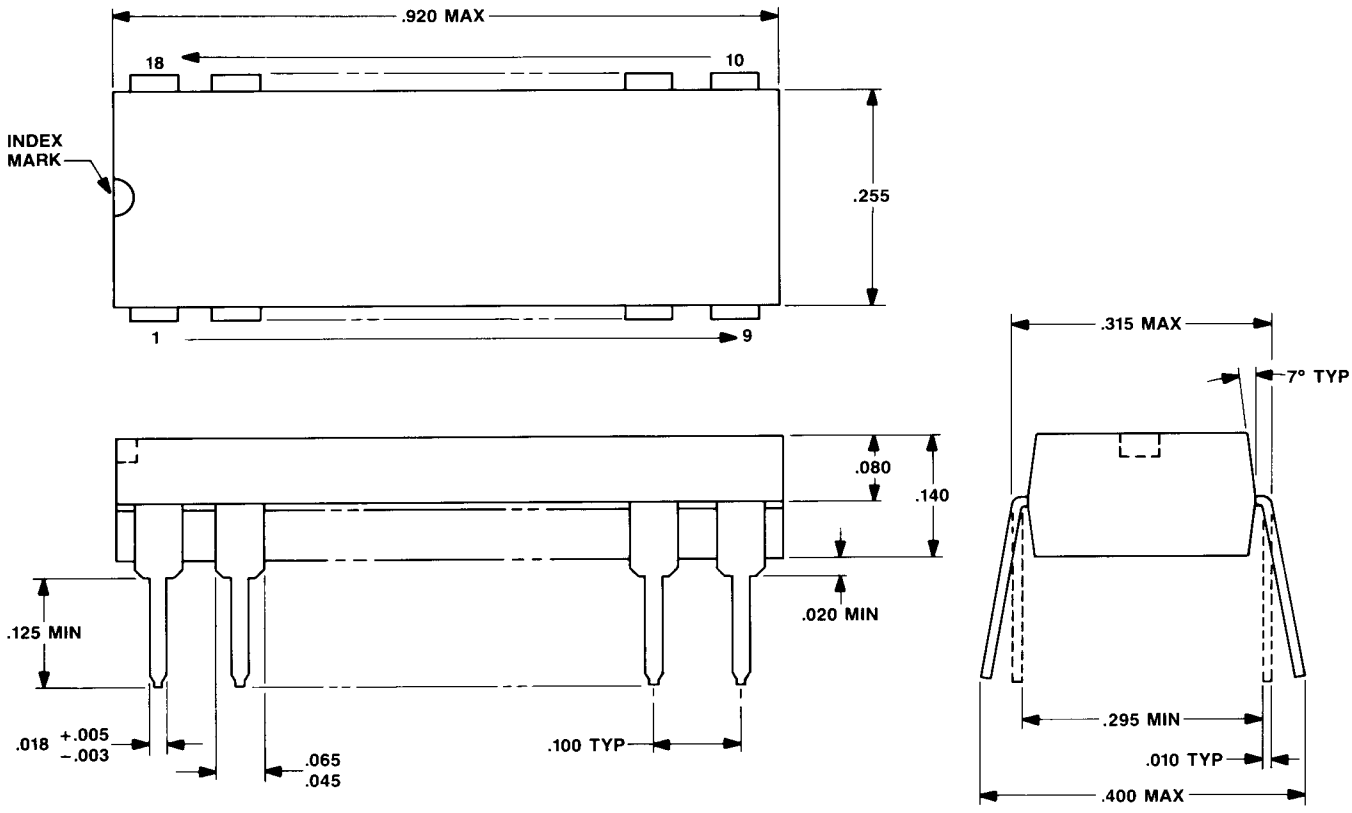


Figure 24. Crosspoint Array Schematic

OUTLINE DRAWINGS

(Dimensions in Inches)



NOTE: PIN NUMBERS ARE FOR REFERENCE ONLY

ORDERING INFORMATION

Device Code Number	COMCODE
LB1018AD	104208871