

**Low Resistance, Single 8-Channel, and Differential 4-Channel, CMOS Analog Multiplexers**

The HI-1818A and HI-1828A are monolithic, high performance CMOS analog multiplexers offering built-in channel selection decoding plus an inhibit (enable) input for disabling all channels. Dielectric Isolation (DI) processing is used for enhanced reliability and performance (see Application Note 521). Substrate leakage and parasitic capacitance are much lower, resulting in extremely low static errors and high throughput rates. Low output leakage (typically 0.1nA) and low channel ON resistance (250Ω) assure optimum performance in low level or current mode applications.

The HI-1818A is a single-ended, 8-Channel multiplexer, while the HI-1828A is a differential 4-Channel version. Either device is ideally suited for medical instrumentation, telemetry systems, and microprocessor based data acquisition systems.

For MIL-STD-883 compliant parts, request the HI-1818A/883.

**Features**

- Signal Range . . . . . +15V
- “ON” Resistance . . . . . 250Ω
- Input Leakage (Max) . . . . . 50nA
- Access Time . . . . . 350ns
- Power Consumption . . . . . 5mW
- DTL/TTL Compatible Address
- Operation . . . . . -55°C to 125°C

**Applications**

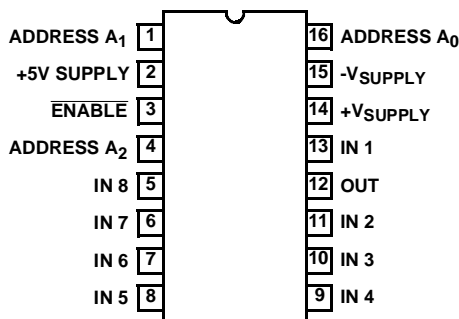
- Data Acquisition Systems
- Precision Instrumentation
- Demultiplexing
- Selector Switch

**Ordering Information**

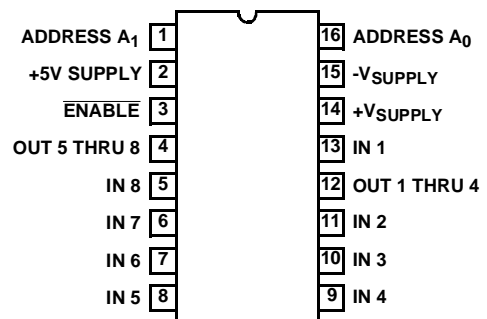
PART NUMBER	TEMP. RANGE (°C)	PACKAGE	PKG. NO.
HI1-1818A-2	-55 to 125	16 Ld CERDIP	F16.3
HI1-1828A-2	-55 to 125	16 Ld CERDIP	F16.3

**Pinouts**

**HI-1818A (CERDIP)  
TOP VIEW**



**HI-1828A (CERDIP)  
TOP VIEW**



Truth Tables

HI-1818A TRUTH TABLE

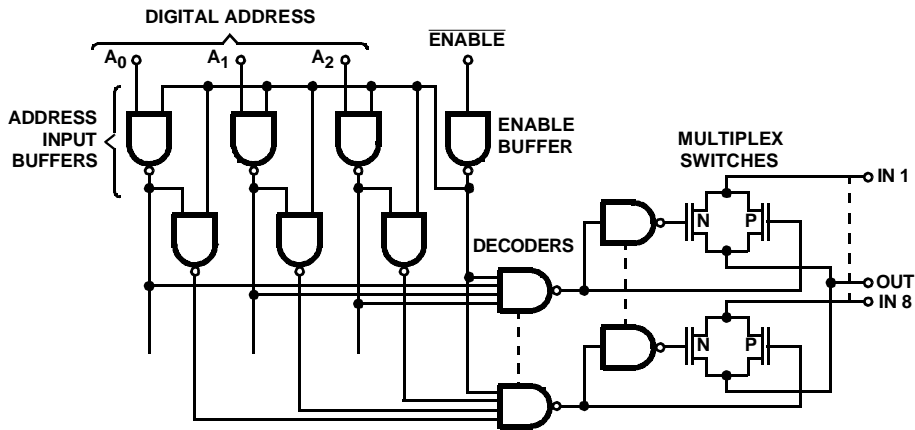
ADDRESS				"ON" CHANNEL
A <sub>2</sub>	A <sub>1</sub>	A <sub>0</sub>	$\overline{EN}$	
L	L	L	L	1
L	L	H	L	2
L	H	L	L	3
L	H	H	L	4
H	L	L	L	5
H	L	H	L	6
H	H	L	L	7
H	H	H	L	8
X	X	X	H	None

HI-1828A TRUTH TABLE

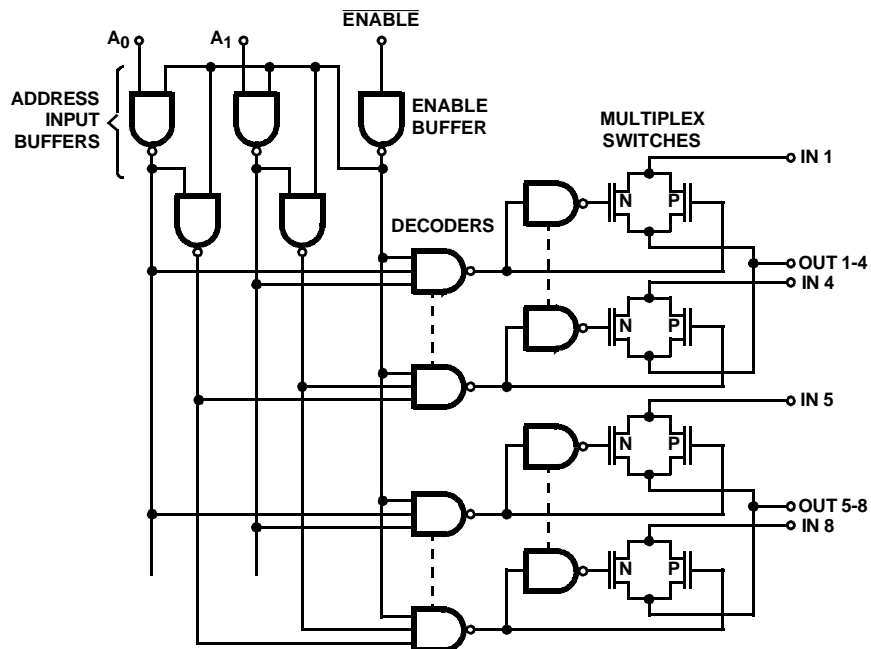
ADDRESS			"ON" CHANNEL
A <sub>1</sub>	A <sub>0</sub>	$\overline{EN}$	
L	L	L	1 and 5
L	H	L	2 and 6
H	L	L	3 and 7
H	H	L	4 and 8
X	X	H	None

Functional Block Diagrams

HI-1818A

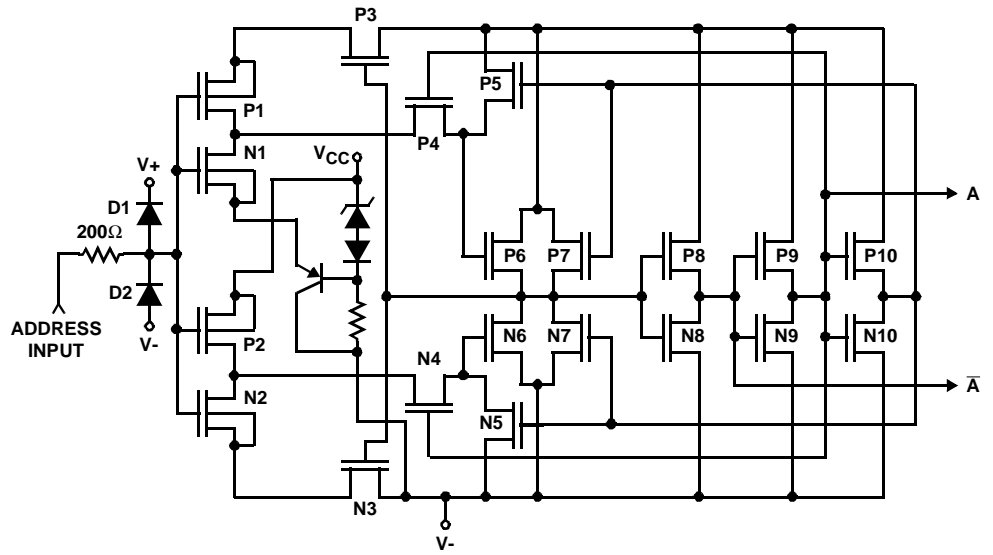


HI-1828A



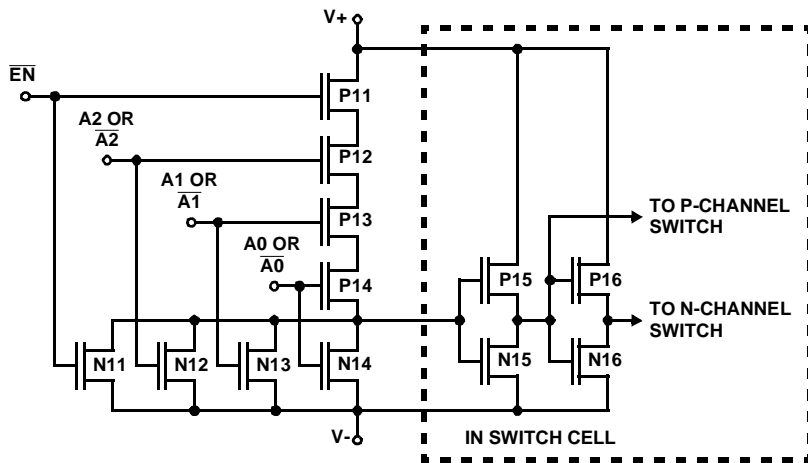
Schematic Diagrams

ADDRESS INPUT BUFFER



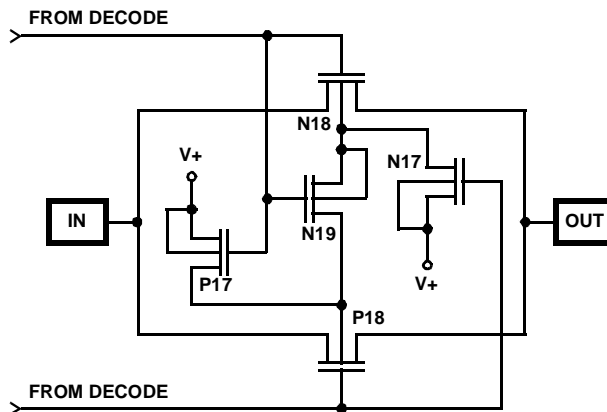
All N-Channel Bodies to V-  
All P-Channel Bodies to V+  
Unless Otherwise Specified

ADDRESS DECODER



All N-Channel Bodies to V-  
All P-Channel Bodies to V+  
A2 or A-bar A2 not used for HI-1828A

MULTIPLEXER SWITCH



All N-Channel Bodies to V-  
All P-Channel Bodies to V+  
Unless Otherwise Specified

# HI-1818A, HI-1828A

## Absolute Maximum Ratings

V+ to V- .....	40V
Logic Supply Voltage .....	30V
Analog Signal (V <sub>IN</sub> , V <sub>OUT</sub> ) .....	(V-) -2V to (V+) +2V
Digital Input Voltage (V <sub>EN</sub> , V <sub>A</sub> ) .....	(V-) to (V+)

## Operating Conditions

Temperature Ranges	
HI-18X8A-2 .....	-55°C to 125°C

## Thermal Information

Thermal Resistance (Typical, Note 1)	$\theta_{JA}$ (°C/W)	$\theta_{JC}$ (°C/W)
CERDIP Package .....	80	20
Maximum Junction Temperature		
Ceramic Package .....	175°C	
Maximum Storage Temperature Range .....	-65°C to 150°C	
Maximum Lead Temperature (Soldering 10s) .....	300°C	

**CAUTION:** Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

### NOTE:

- $\theta_{JA}$  is measured with the component mounted on a low effective thermal conductivity test board in free air. See Tech Brief 379 for details.

## Electrical Specifications

Supplies = +15V, -15V, +5V; V<sub>AL</sub> = 0.4V, V<sub>AH</sub> = 4.0V, Unless Otherwise Specified

PARAMETER	TEST CONDITIONS	TEMP (°C)	MIN	TYP	MAX	UNITS
<b>DYNAMIC CHARACTERISTICS</b>						
Access Time, t <sub>A</sub>	Note 4	25	-	350	500	ns
		Full	-	-	1000	ns
Break-Before-Make Delay, t <sub>OPEN</sub>		25	-	25	-	ns
Enable Delay (ON), t <sub>ON(EN)</sub>		25	-	300	500	ns
		Full	-	-	1000	ns
Enable Delay (OFF), t <sub>OFF(EN)</sub>		25	-	300	500	ns
		Full	-	-	1000	ns
Settling Time	To 0.1%	25	-	1.08	-	μs
	To 0.025%	25	-	2.8	-	μs
Channel Input Capacitance, C <sub>S(OFF)</sub>		25	-	4	-	pF
Channel Output Capacitance, C <sub>D(OFF)</sub>		25	-	20	-	pF
		HI-1828A	25	-	10	-
Input to Output Capacitance, C <sub>DS(OFF)</sub>		25	-	0.6	-	pF
Digital Input Capacitance, C <sub>A</sub>		25	-	5	-	pF
<b>DIGITAL INPUT CHARACTERISTICS</b>						
Input Low Threshold, V <sub>AL</sub>		Full	-	-	0.4	V
Input High Threshold, V <sub>AH</sub>	Note 3	Full	4.0	-	-	V
Input Leakage Current, I <sub>A</sub>		Full	-	-	1	μA
<b>ANALOG CHANNEL CHARACTERISTICS</b>						
Analog Signal Range, V <sub>IN</sub>		Full	-15	-	+15	V
ON Resistance, r <sub>ON</sub>	Note 2	25	-	250	400	Ω
		Full	-	-	500	Ω
OFF Input Leakage Current, I <sub>S(OFF)</sub>		Full	-	-	50	nA
ON Channel Leakage Current, I <sub>D(ON)</sub>		Full	-	-	250	nA
		HI-1828A	Full	-	-	125
OFF Output Leakage Current, I <sub>D(OFF)</sub>		Full	-	-	250	nA
		HI-1828A	Full	-	-	125

**Electrical Specifications** Supplies = +15V, -15V, +5V;  $V_{AL} = 0.4V$ ,  $V_{AH} = 4.0V$ , Unless Otherwise Specified (Continued)

PARAMETER	TEST CONDITIONS	TEMP (°C)	MIN	TYP	MAX	UNITS
<b>POWER SUPPLY CHARACTERISTICS</b>						
Power Dissipation, $P_D$		Full	-	-	27.5	mW
Current, $I_+$		Full	-	-	0.5	mA
Current, $I_-$		Full	-	-	1	mA
Current, $I_L$		Full	-	-	1	mA

NOTES:

- $V_{OUT} = \pm 10V$ ,  $I_{OUT} = \mp 1mA$ .
- To drive from DTL/TTL circuits, 1k $\Omega$  pull-up resistors to 5.0V supply are recommended.
- Time measured to 90% of final output level;  $V_{OUT} = -5.0V$  to  $5.0V$ , Digital Inputs = 0V to 4.0V.

**Test Circuits and Waveforms**

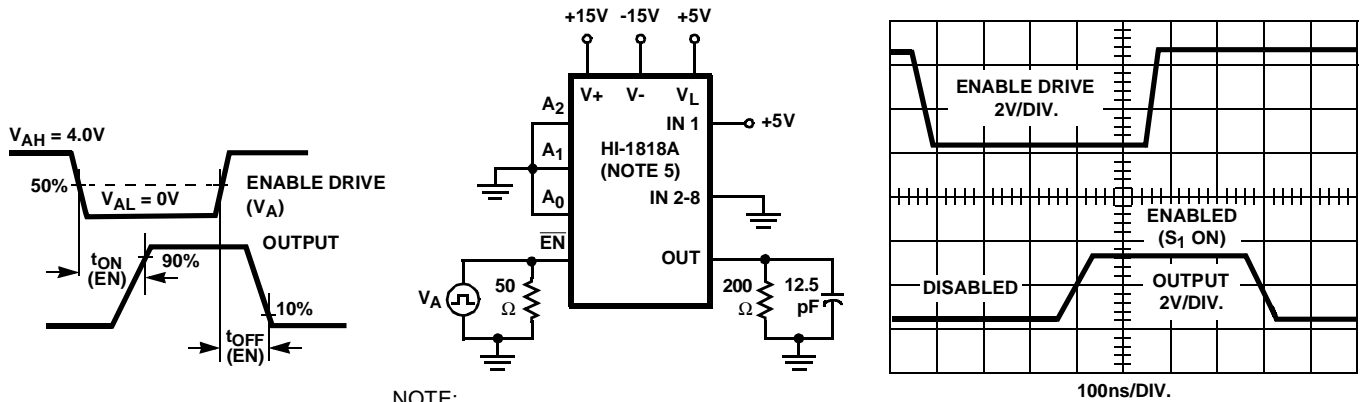


FIGURE 1A. MEASUREMENT POINTS

FIGURE 1B. TEST CIRCUIT

FIGURE 1C. WAVEFORMS

FIGURE 1. ENABLE DELAYS

NOTE:

- Similar connections for HI-1828A.

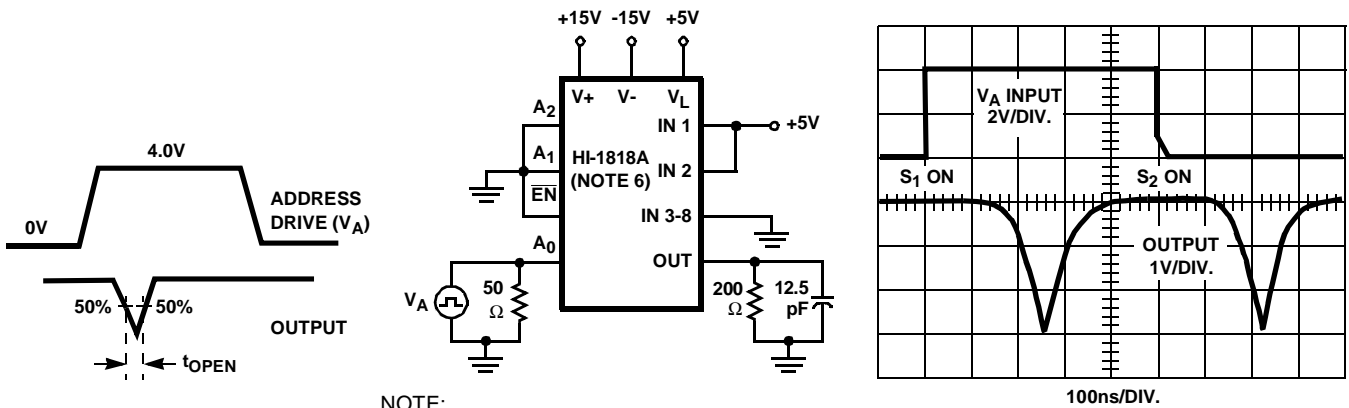


FIGURE 2A. MEASUREMENT POINTS

FIGURE 2B. TEST CIRCUIT

FIGURE 2C. WAVEFORMS

FIGURE 2. BREAK-BEFORE-MAKE DELAY

NOTE:

- Similar connections for HI-1828A.

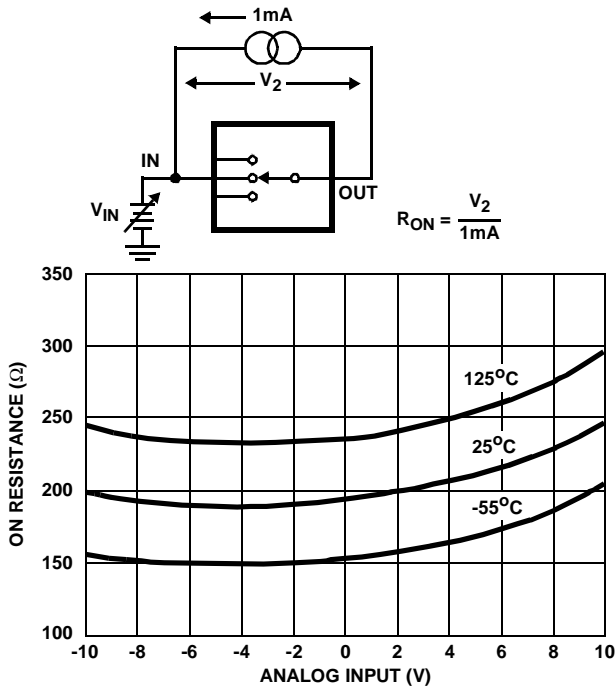


FIGURE 3. ON RESISTANCE vs ANALOG INPUT VOLTAGE

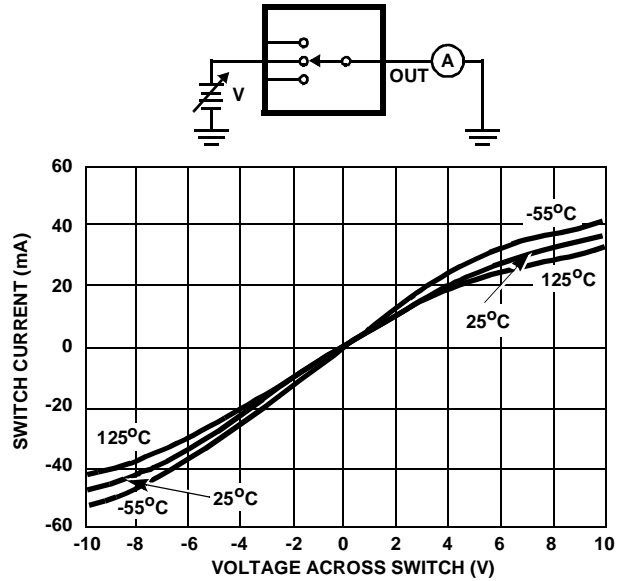


FIGURE 4. ON CHANNEL CURRENT vs VOLTAGE

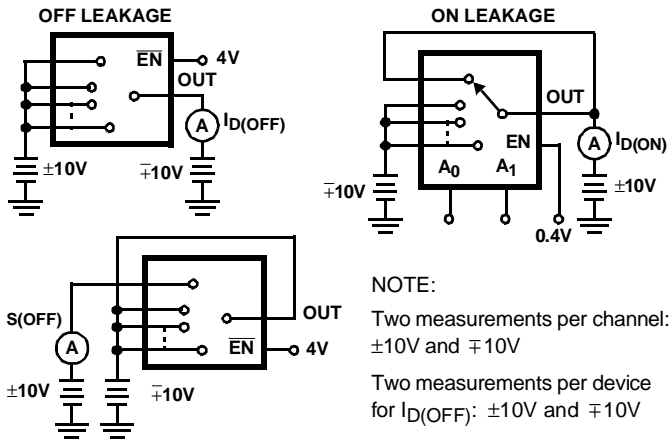


FIGURE 5. LEAKAGE CURRENTS vs TEMPERATURE

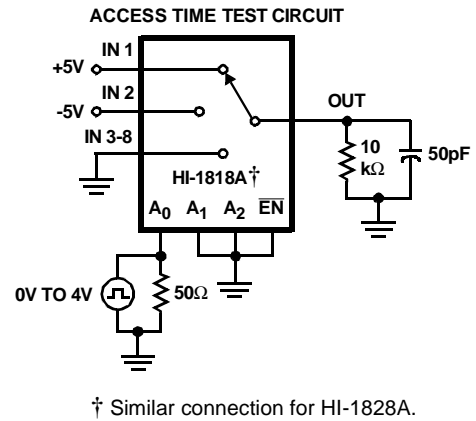


FIGURE 6. ACCESS TIME

**Die Characteristics**

**DIE DIMENSIONS:**

67.7 mils x 103.5 mils

**METALLIZATION:**

Type: CuAl

Thickness:  $16\text{k}\text{\AA} \pm 2\text{k}\text{\AA}$

**PASSIVATION:**

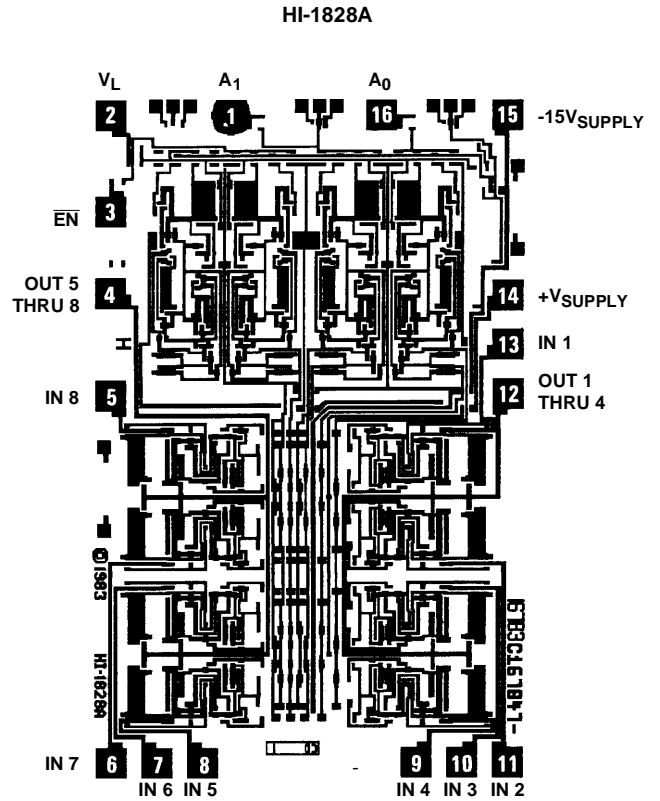
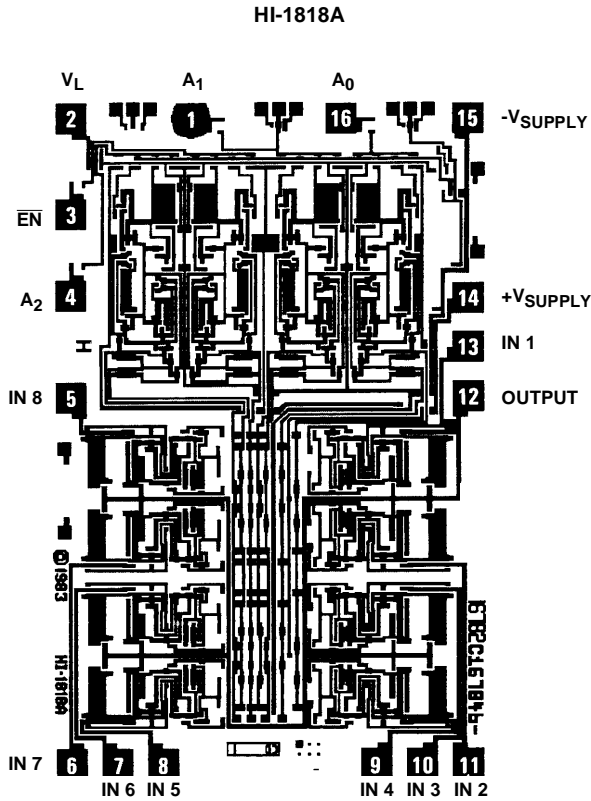
Type: Nitride/Silox

Thickness: Silox:  $12\text{k}\text{\AA} \pm 2\text{k}\text{\AA}$ , Nitride:  $3.5\text{k}\text{\AA} \pm 1\text{k}\text{\AA}$

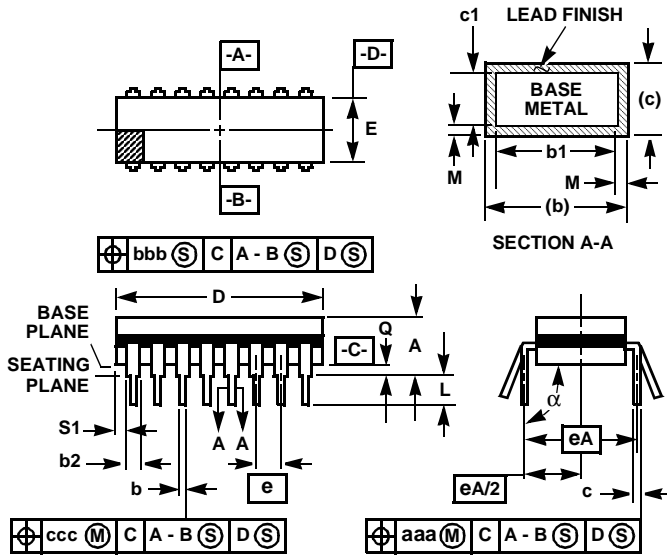
**WORST CASE CURRENT DENSITY:**

$1.43 \times 10^5 \text{ A/cm}^2$  at 25mA

**Metallization Mask Layout**



Ceramic Dual-In-Line Frit Seal Packages (CERDIP)



NOTES:

1. Index area: A notch or a pin one identification mark shall be located adjacent to pin one and shall be located within the shaded area shown. The manufacturer's identification shall not be used as a pin one identification mark.
2. The maximum limits of lead dimensions b and c or M shall be measured at the centroid of the finished lead surfaces, when solder dip or tin plate lead finish is applied.
3. Dimensions b1 and c1 apply to lead base metal only. Dimension M applies to lead plating and finish thickness.
4. Corner leads (1, N, N/2, and N/2+1) may be configured with a partial lead paddle. For this configuration dimension b3 replaces dimension b2.
5. This dimension allows for off-center lid, meniscus, and glass overrun.
6. Dimension Q shall be measured from the seating plane to the base plane.
7. Measure dimension S1 at all four corners.
8. N is the maximum number of terminal positions.
9. Dimensioning and tolerancing per ANSI Y14.5M - 1982.
10. Controlling dimension: INCH.

F16.3 MIL-STD-1835 GDIP1-T16 (D-2, CONFIGURATION A)  
16 LEAD CERAMIC DUAL-IN-LINE FRIT SEAL PACKAGE

SYMBOL	INCHES		MILLIMETERS		NOTES
	MIN	MAX	MIN	MAX	
A	-	0.200	-	5.08	-
b	0.014	0.026	0.36	0.66	2
b1	0.014	0.023	0.36	0.58	3
b2	0.045	0.065	1.14	1.65	-
b3	0.023	0.045	0.58	1.14	4
c	0.008	0.018	0.20	0.46	2
c1	0.008	0.015	0.20	0.38	3
D	-	0.840	-	21.34	5
E	0.220	0.310	5.59	7.87	5
e	0.100 BSC		2.54 BSC		-
eA	0.300 BSC		7.62 BSC		-
eA/2	0.150 BSC		3.81 BSC		-
L	0.125	0.200	3.18	5.08	-
Q	0.015	0.060	0.38	1.52	6
S1	0.005	-	0.13	-	7
α	90°	105°	90°	105°	-
aaa	-	0.015	-	0.38	-
bbb	-	0.030	-	0.76	-
ccc	-	0.010	-	0.25	-
M	-	0.0015	-	0.038	2, 3
N	16		16		8

Rev. 0 4/94

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