

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

December 1993

Features

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

Applications

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

Description

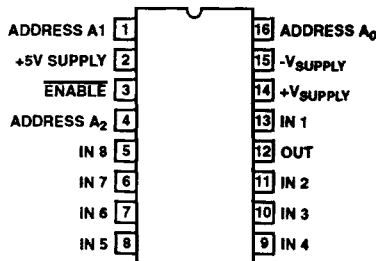
The HI-1818A and HI-1828A are monolithic high performance CMOS analog multiplexers offering built-in channel selection decoding plus an inhibit (enable) input for disabling all channels. Dielectric Isolation (DI) processing is used for enhanced reliability and performance (see Application Note 521). 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.

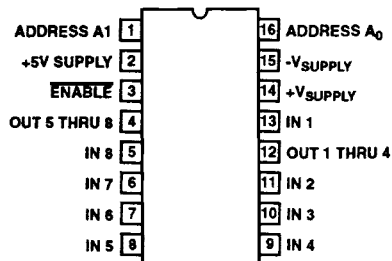
For MIL-STD-883 compliant parts, request the HI-1818A/883; HI-1828A/883 data sheet.

Pinouts

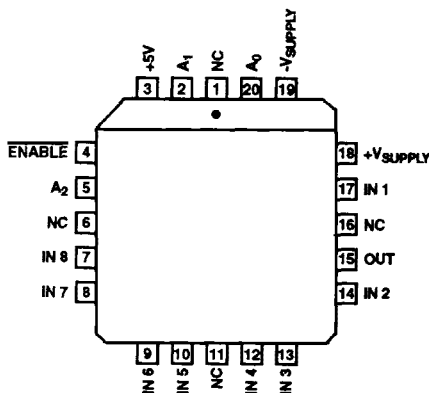
HI-1818A (CDIP, PDIP)
TOP VIEW



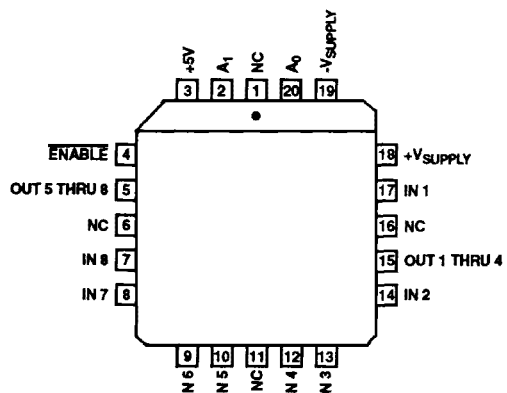
HI-1828A (CDIP, PDIP)
TOP VIEW



HI-1818A (PLCC)
TOP VIEW



HI-1828A (CLCC, PLCC)
TOP VIEW



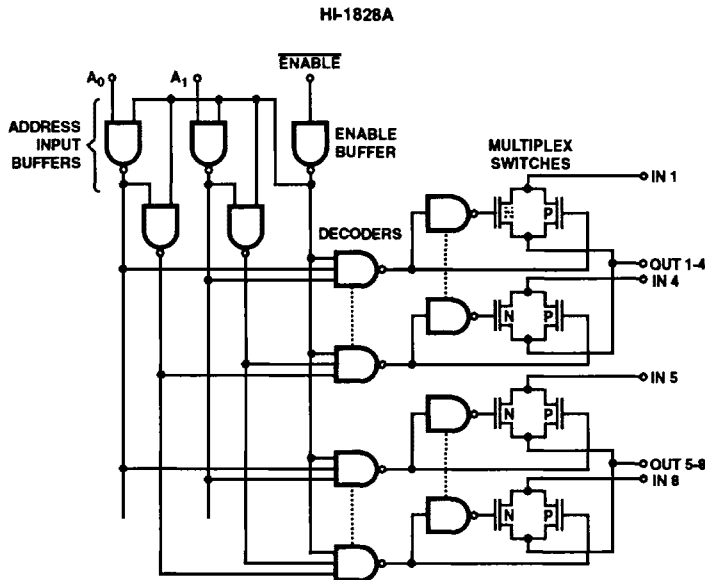
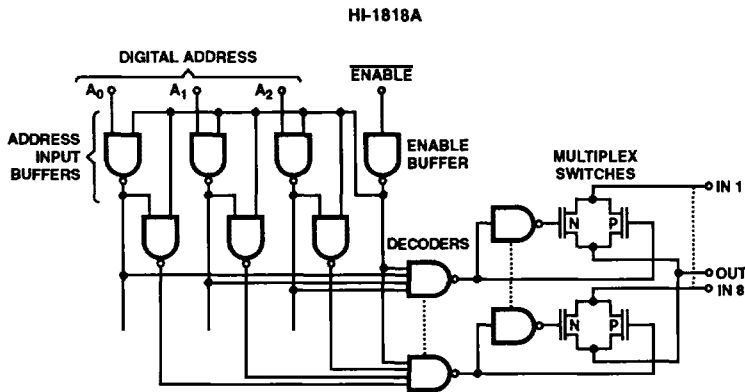
HI-1818A, HI-1828A

Ordering Information

PART NUMBER	TEMPERATURE RANGE	PACKAGE
HI3-1818A-5	0°C to +75°C	16 Lead Plastic DIP
HI1-1818A-2	-55°C to +125°C	16 Lead Ceramic DIP
HI1-1818A-5	0°C to +75°C	16 Lead Ceramic DIP
HI1-1818A-7	0°C to +75°C + 96 Hour Burn-In	16 Lead Ceramic DIP
HI4P1818A-5	0°C to +75°C	20 Lead PLCC
HI1-1818A/883	-55°C to +125°C	16 Lead Ceramic DIP
HI1-1828A-5	0°C to +75°C	16 Lead Ceramic DIP

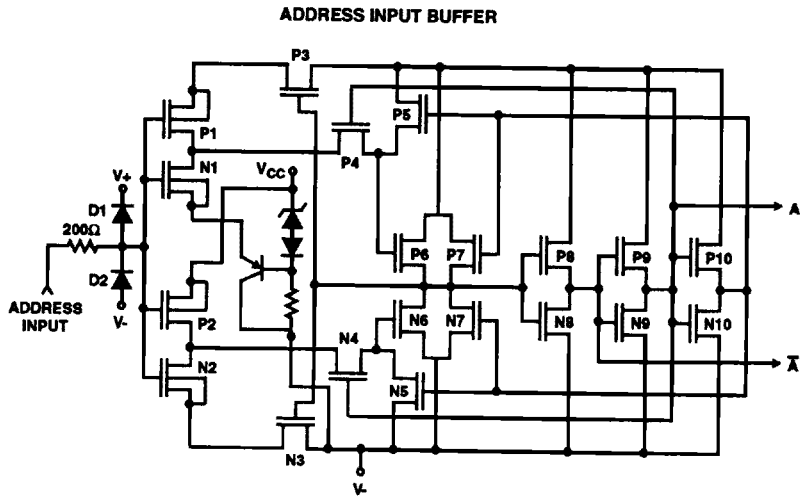
PART NUMBER	TEMPERATURE RANGE	PACKAGE
HI1-1828A-7	0°C to +75°C + 96 Hour Burn-In	16 Lead Ceramic DIP
HI3-1828A-5	0°C to +75°C	16 Lead Plastic DIP
HI4P1828A-5	0°C to +75°C	20 Lead PLCC
HI1-1828A-2	-55°C to +125°C	16 Lead Ceramic DIP
HI1-1828A/883	-55°C to +125°C	16 Lead Ceramic DIP
HI4-1828A/883	-55°C to +125°C	20 Lead CLCC
HI4-1828A-8	-55°C to +125°C	20 Lead CLCC

Functional Diagrams

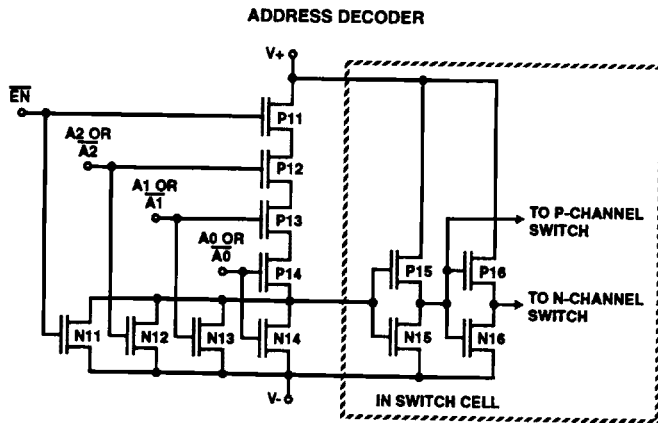


Schematic Diagrams

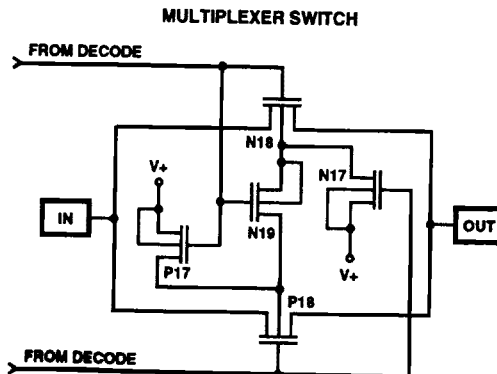
All N-Channel Bodies to V-
All P-Channel Bodies to V+
Unless Otherwise Specified



All N-Channel Bodies to V-
All P-Channel Bodies to V+
A2 or $\bar{A}2$ not used for
HI-1828A



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



Specifications HI-1818A, HI-1828A

Absolute Maximum Ratings (Note 1)

Voltage Between Supply Pins	40.0V
Logic Supply Voltage	30.0V
Analog Input Voltage:	
+V _{IN}	+V _{SUPPLY} +2V
-V _{IN}	-V _{SUPPLY} -2V
Digital Input Voltage	-V _{SUPPLY} to +V _{SUPPLY}
Storage Temperature	
PDIP, PLCC	-65°C to +150°C

Thermal Information

Thermal Resistance	θ_{JA}	θ_{JC}
Ceramic DIP Package	77°C/W	23°C/W
Ceramic LCC Package	75°C/W	20°C/W
Plastic DIP Package	100°C/W	-
Plastic PLCC Package	80°C/W	-
Operating Temperature Ranges		
HI-1818A/HI-1828A-2, -8	-55°C to +125°C	
HI-1818A/HI-1828A-5, -7	0°C to +75°C	
Junction Temperature		
CDIP, CLCC	+175°C	
PDIP, PLCC	+150°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.

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

PARAMETER	TEST CONDITIONS	TEMP	HI-1818A/1828A -2, -8			HI-1818A/1828A -5, -7			UNITS
			MIN	TYP	MAX	MIN	TYP	MAX	
SWITCHING CHARACTERISTICS									
Access Time, T _A	(Note 4)	+25°C	-	350	500	-	350	-	ns
		Full	-	-	1000	-	-	1000	ns
Break-Before-Make Delay		+25°C	-	25	-	-	100	-	ns
Settling Time									
	0.1%	+25°C	-	1.08	-	-	1.08	-	μs
0.025 %	+25°C	-	2.8	-	-	2.8	-	μs	
Channel Input Capacitance, C _{IN}		+25°C	-	4	-	-	4	-	pF
Channel Output Capacitance, C _{OUT}									
	HI-1818A	+25°C	-	20	-	-	20	-	pF
	HI-1828A	+25°C	-	10	-	-	10	-	pF
Drain-To-Source Capacitance, C _{DS(OFF)}		+25°C	-	0.6	-	-	0.6	-	pF
Digital Input Capacitance, C _D		+25°C	-	5	-	-	5	-	pF
Enable Delay (ON), t _{ON(EN)}		+25°C	-	300	500	-	300	-	ns
	Full		-	-	1000	-	-	1000	ns
Enable Delay (OFF), t _{OFF(EN)}		+25°C	-	300	500	-	300	-	ns
	Full		-	-	1000	-	-	1000	ns
DIGITAL INPUT CHARACTERISTICS									
Input Low Threshold, V _{AL}		Full	-	-	0.4	-	-	0.4	V
Input High Threshold, V _{AH}	(Note 3)	Full	4.0	-	-	4.0	-	-	V
Input Leakage Current, I _A		Full	-	-	1	-	-	1	μA
ANALOG CHANNEL CHARACTERISTICS									
Analog Signal Range, V _{IN}		Full	-15	-	+15	-15	-	+15	V
ON Resistance, R _{ON}	(Note 2)	+25°C	-	250	400	-	250	400	Ω
		Full	-	-	500	-	-	500	Ω
Input Leakage Current, I _{S(OFF)}		Full	-	-	50	-	-	50	nA
On Channel Leakage Current, I _{D(ON)}									
	HI-1818A	Full	-	-	250	-	-	250	nA
HI-1828A	Full	-	-	125	-	-	125	nA	
Output Leakage Current, I _{D(OFF)}									
	HI-1818A	Full	-	-	250	-	-	250	nA
HI-1828A	Full	-	-	125	-	-	125	nA	

Specifications HI-1818A, HI-1828A

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

PARAMETER	TEST CONDITIONS	TEMP	HI-1818A/1828A -2, -8			HI-1818A/1828A -5, -7			UNITS
			MIN	TYP	MAX	MIN	TYP	MAX	
POWER SUPPLY CHARACTERISTICS									
Power Dissipation, P_D		Full	-	-	27.5	-	-	27.5	mW
Current, I_+		Full	-	-	0.5	-	-	0.5	mA
Current, I_-		Full	-	-	1	-	-	1	mA
Current, I_L		Full	-	-	1	-	-	1	mA

NOTES:

1. Absolute maximum ratings are limiting values, applied individually, beyond which the serviceability of the circuit may be impaired. Functional operation under any of these conditions is not necessarily implied.
2. $V_{OUT} = \pm 10V$, $I_{OUT} = \mp 1mA$.
3. To drive from DTL/TTL circuits, $1k\Omega$ pull-up resistors to +5.0V supply are recommended.
4. Time measured to 90% of final output level; $V_{OUT} = -5.0V$ to +5.0V, Digital inputs = 0V to +4.0V.

Switching Waveforms

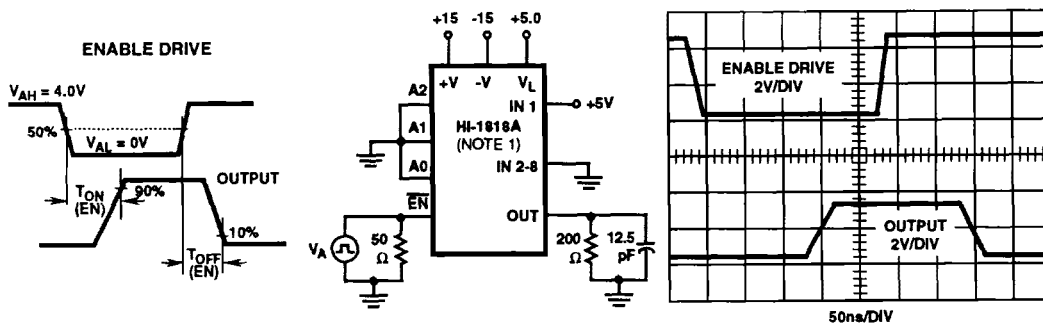


FIGURE 1A.

FIGURE 1B.

FIGURE 1C.

FIGURE 1. ENABLE DELAY, $t_{ON(EN)}$, $t_{OFF(EN)}$

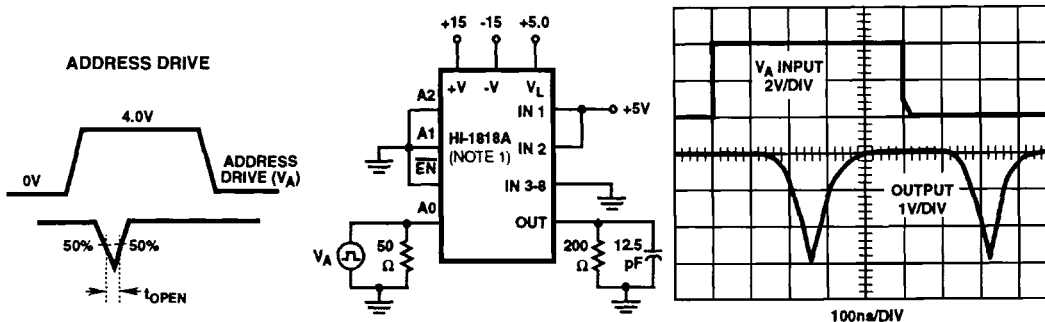


FIGURE 2A.

FIGURE 2B.

FIGURE 2C.

NOTE: 1. Similar connections for HI-1828A

FIGURE 2. BREAK-BEFORE-MAKE DELAY, t_{OPEN}

Typical Performance Curves

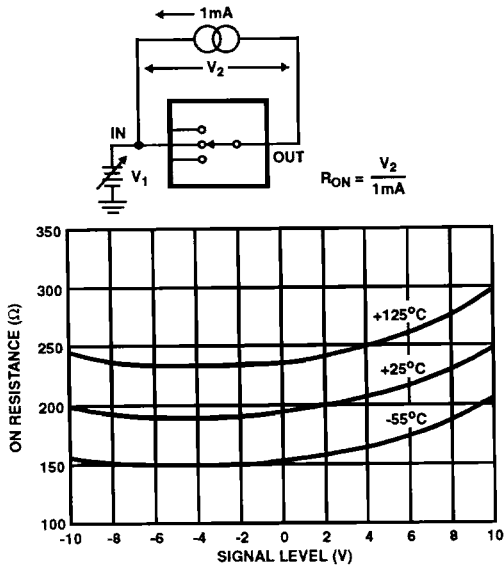


FIGURE 3. ON RESISTANCE vs ANALOG SIGNAL LEVEL

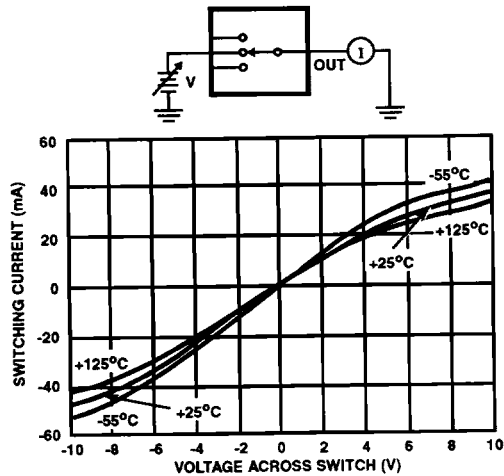


FIGURE 4. ON CHANNEL CURRENT vs VOLTAGE

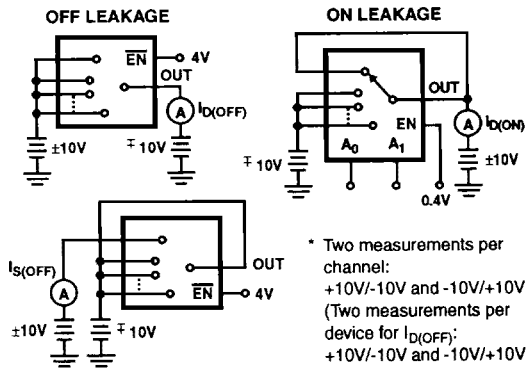


FIGURE 5. LEAKAGE CURRENTS vs TEMPERATURE*

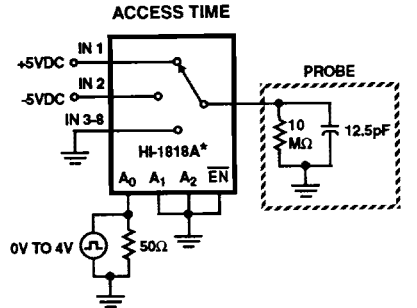


FIGURE 6. ACCESS TIME

* Similar connection for HI-1828A.

HI-1818A, HI-1828A

HI-1818A TRUTH TABLE

ADDRESS				"ON" CHANNEL
A ₂	A ₁	A ₀	\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 ₁	A ₀	\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

HI-1818A, HI-1828A

Die Characteristics

DIE DIMENSIONS:

67.7x 103.5 mils

METALLIZATION:

Type: Cu/Al

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

GLASSIVATION:

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

