

**HS-0548RH, HS-0549RH**

Radiation Hardened Single 8/Differential 4 Channel CMOS Analog Multiplexers with Active Overvoltage Protection

FN3543  
Rev 4.00  
August 2001

The HS-0548RH and HS-0549RH are radiation hardened analog multiplexers with Active Overvoltage Protection and guaranteed  $r_{ON}$  matching. Analog input levels may greatly exceed either power supply without damaging the device or disturbing the signal path of other channels. Active protection circuitry assures that signal fidelity is maintained even under fault conditions that would destroy other multiplexers. Analog inputs can withstand constant 70V peak-to-peak levels with  $\pm 15V$  supplies and digital inputs will sustain continuous faults up to 4V greater than either supply. In addition, signal sources are protected from short circuiting should multiplexer supply loss occur: each input presents 1k $\Omega$  of resistance under this condition. These features make the HS-0548RH and HS-0549RH ideal for use in systems where the analog inputs originate from external equipment or separately powered circuitry. Both devices are fabricated with 44V dielectrically isolated CMOS technology. The HS-0548 is an 8 channel device and the HS-0549 is a 4 channel differential version. If input overvoltage protection is not needed, the HS-0508 and HS-509 multiplexers are recommended.

**Specifications for Rad Hard QML devices are controlled by the Defense Supply Center in Columbus (DSCC). The SMD numbers listed here must be used when ordering.**

Detailed Electrical Specifications for these devices are contained in SMD 5962-95694. A "hot-link" is provided on our homepage for downloading.  
<http://www.intersil.com>

**Ordering Information**

ORDERING NUMBER	INTERNAL MKT. NUMBER	TEMP. RANGE (°C)
5962D9569401VEA	HS1-0548RH-Q	-55 to 125
5962D9569401VEC	HS1B-0548RH-Q	-55 to 125
5962D9569402VEA	HS1-0549RH-Q	-55 to 125
5962D9569402VEC	HS1B-0549RH-Q	-55 to 125

**Features**

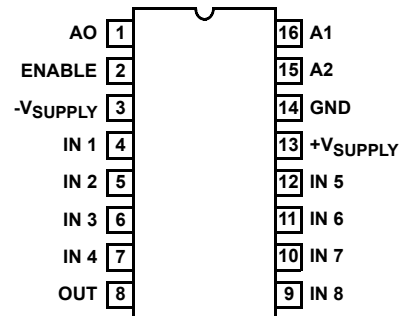
- Electrically Screened to SMD # 5962-95694
- QML Qualified per MIL-PRF-38535 Requirements
- Gamma Dose . . . . . 1 x 10<sup>4</sup>RAD(Si)
- No Latch-Up
- No Channel Interaction During Overvoltage
- Guaranteed  $r_{ON}$  Matching
- Maximum Power Supply . . . . . 44V
- Break-Before-Make Switching
- Analog Signal Range . . . . .  $\pm 15V$
- Access Time . . . . . 1.0 $\mu$ s

**Applications**

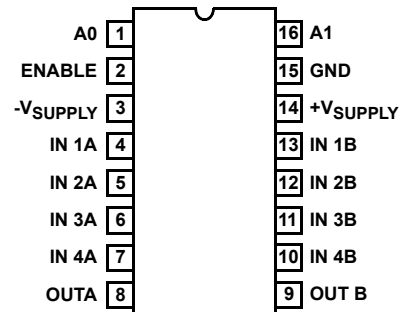
- Data Acquisition Systems
- Control Systems
- Telemetry

**Pinouts**

**HS-0548RH GDIP1-T16 (CERDIP)  
OR CDIP2-T16 (SBDIP)  
TOP VIEW**

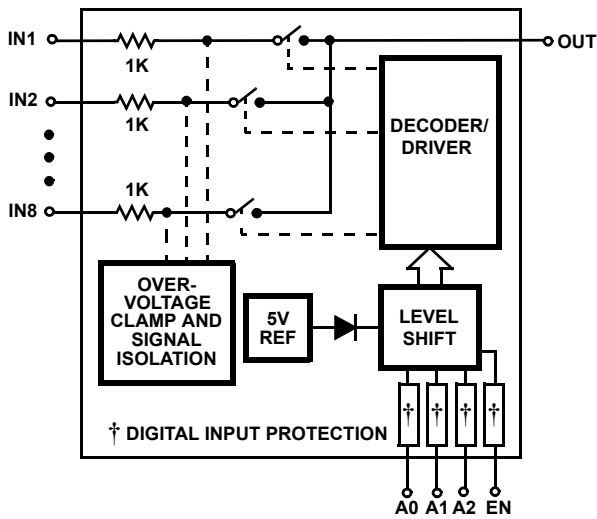


**HS-0549RH GDIP1-T16 (CERDIP)  
OR CDIP2-T16 (SBDIP)  
TOP VIEW**

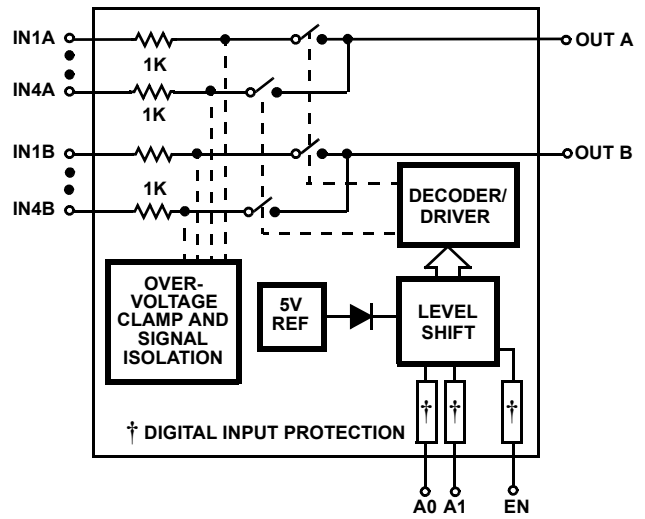


**Functional Diagrams**

HS-0548



HS-0549



HS-0548 TRUTH TABLE

A2	A1	A0	EN	"ON" CHANNEL
X	X	X	L	NONE
L	L	L	H	1
L	L	H	H	2
L	H	L	H	3
L	H	H	H	4
H	L	L	H	5
H	L	H	H	6
H	H	L	H	7
H	H	H	H	8

HS-0549 TRUTH TABLE

A1	A0	EN	"ON" CHANNEL PAIR
X	X	L	NONE
L	L	H	1
L	H	H	2
H	L	H	3
H	H	H	4

**Switching Waveforms**

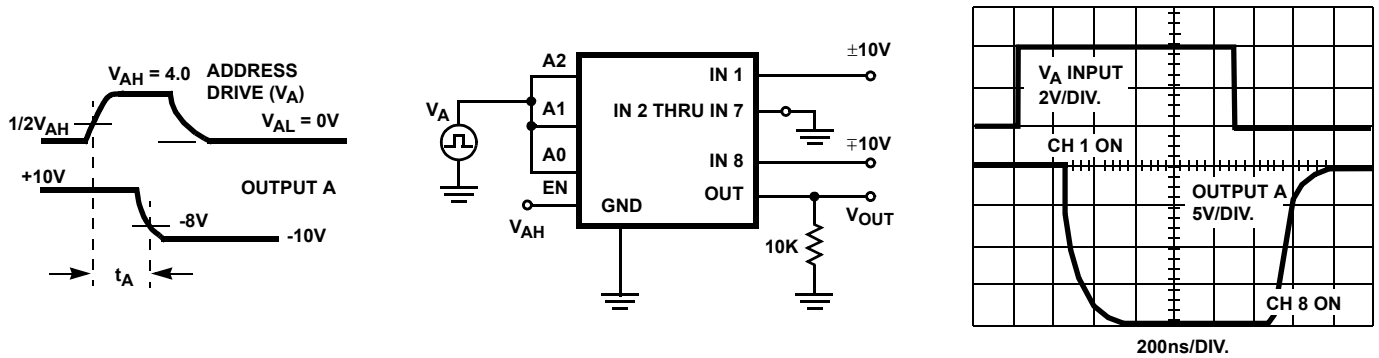


FIGURE 1. ACCESS TIME

**Switching Waveforms** (Continued)

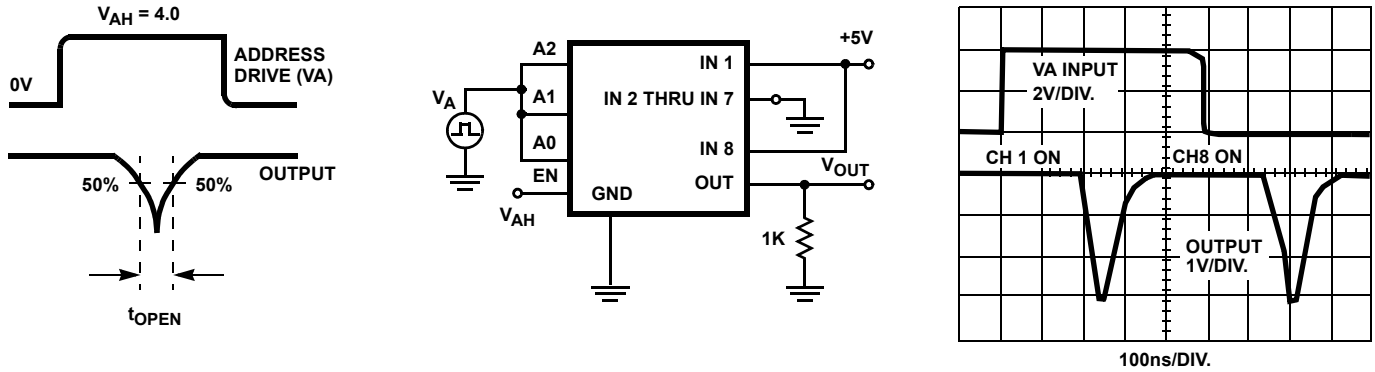


FIGURE 2. BREAK-BEFORE-MAKE DELAY ( $t_{OPEN}$ )

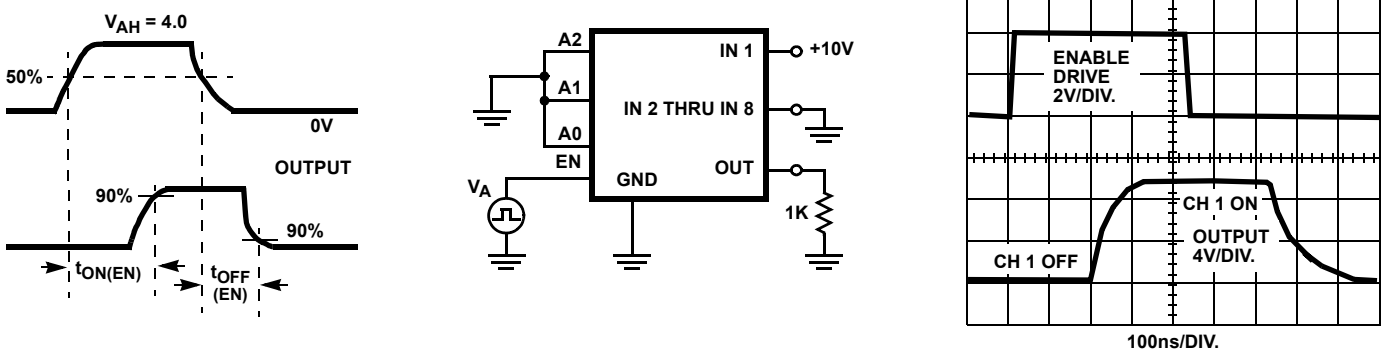


FIGURE 3. ENABLE DELAY  $t_{ON(EN)}$ ,  $t_{OFF(EN)}$

**Schematic Diagrams**

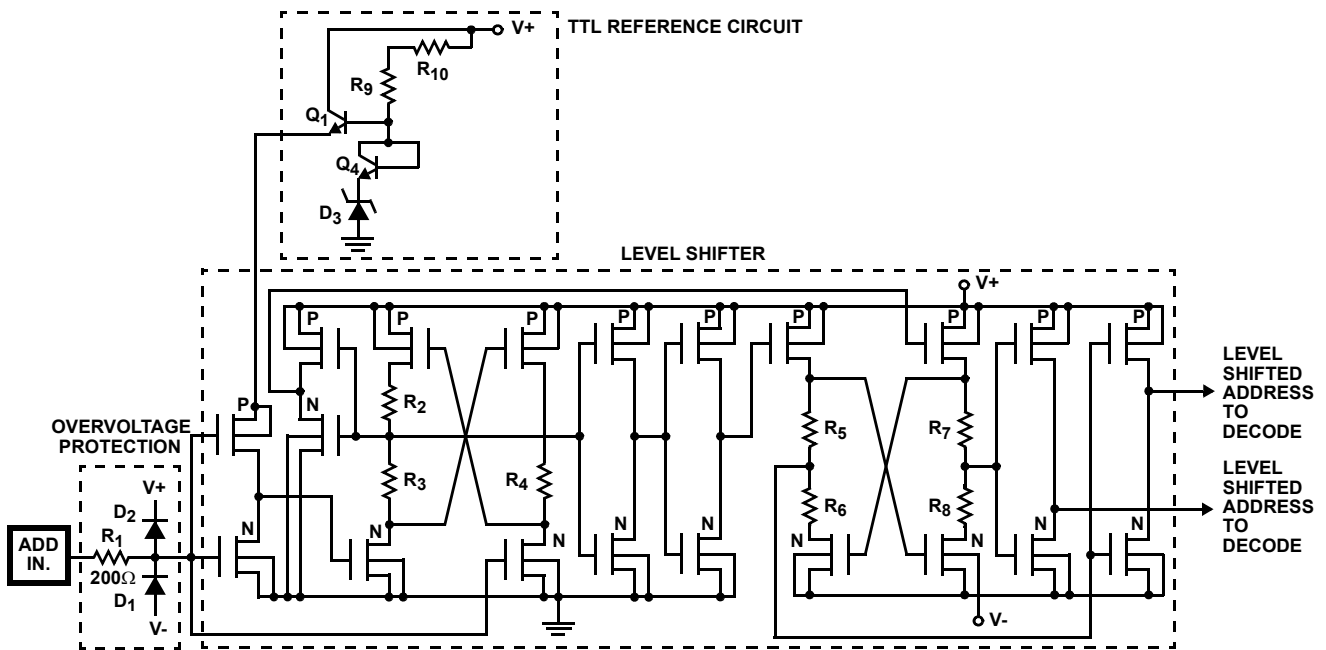


FIGURE 4. ADDRESS INPUT BUFFER AND LEVEL SHIFTER

**Schematic Diagrams** (Continued)

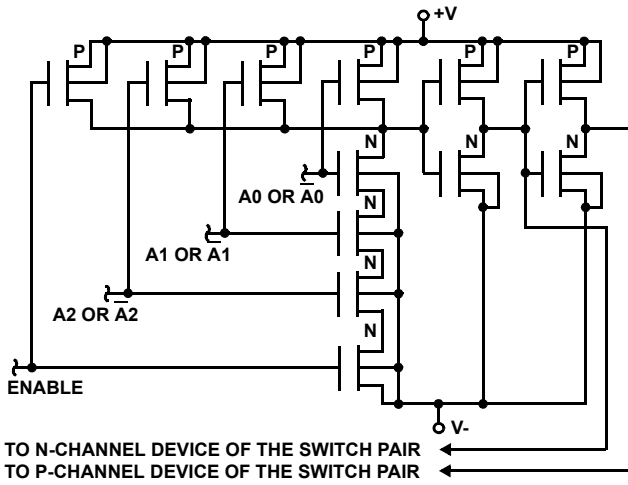


FIGURE 5. ADDRESS DECODER

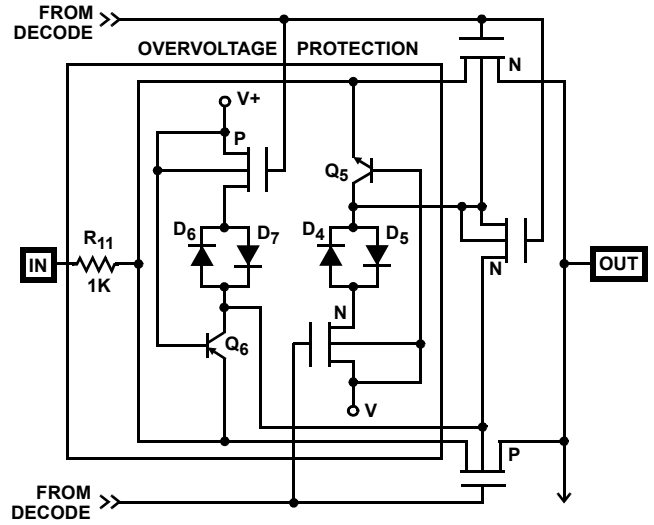
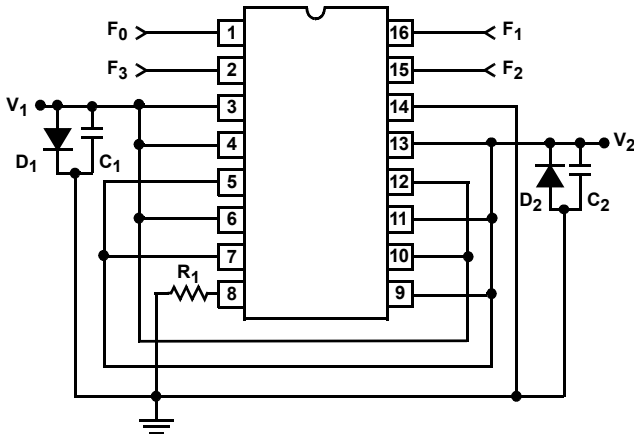


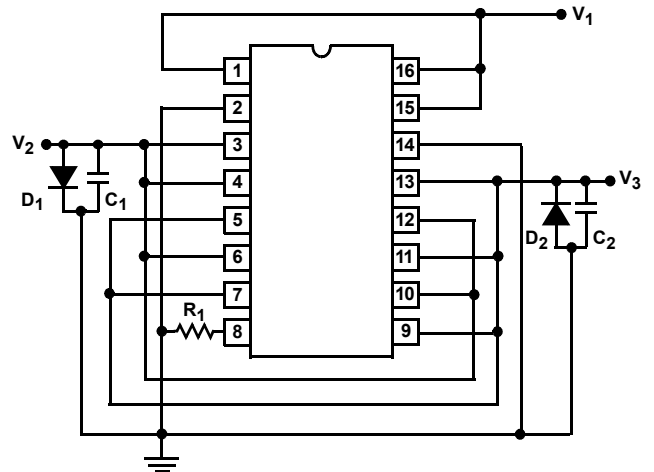
FIGURE 6. MULTIPLEX SWITCH

**Burn-In/Life Test Circuits**



**HS-0548RH**  
**DYNAMIC BURN-IN AND LIFE TEST CIRCUIT**

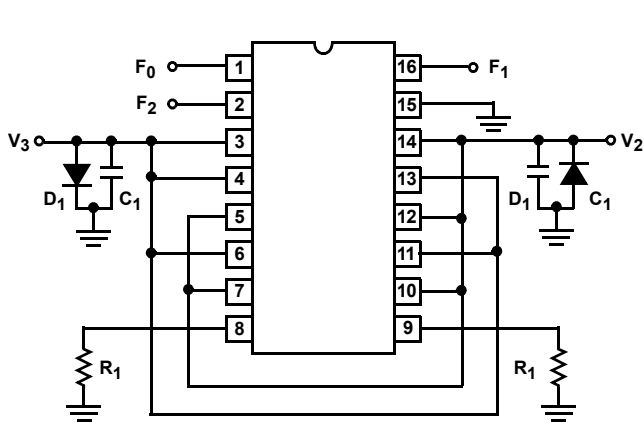
- V<sub>1</sub> = -15V maximum, -16V minimum
- V<sub>2</sub> = +15V minimum, +16V maximum
- R<sub>1</sub> = 10kΩ ±5% 1/4W
- C<sub>1</sub> = C<sub>2</sub> = 0.01μF minimum (per socket) or 0.1μF minimum (per row)
- D<sub>1</sub> = D<sub>2</sub> = 1N4002 (or equivalent)
- F<sub>0</sub> = 100kHz 50% duty cycle; V<sub>IL</sub> = 0.8V Max; V<sub>IH</sub> = 4.0V Min.
- F<sub>1</sub> = F<sub>0</sub>/2
- F<sub>2</sub> = F<sub>1</sub>/2
- F<sub>3</sub> = F<sub>2</sub>/2



**HS-0548RH**  
**STATIC BURN-IN TEST CIRCUIT**

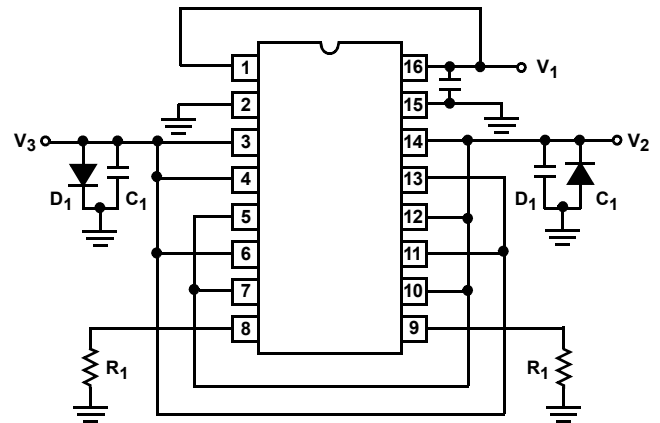
- V<sub>1</sub> = 5V minimum, 6V maximum
- V<sub>2</sub> = -15V maximum, -16V minimum
- V<sub>3</sub> = +15V minimum, +16V maximum
- R<sub>1</sub> = 10kΩ ±5% 1/4W
- C<sub>1</sub> = C<sub>2</sub> = 0.01μF minimum (per socket) or 0.1μF minimum (per row)
- D<sub>1</sub> = D<sub>2</sub> = 1N4002 (or equivalent)

**Burn-In/Life Test Circuits** (Continued)



**HS-0549RH**  
**DYNAMIC BURN-IN AND LIFE TEST CIRCUIT**

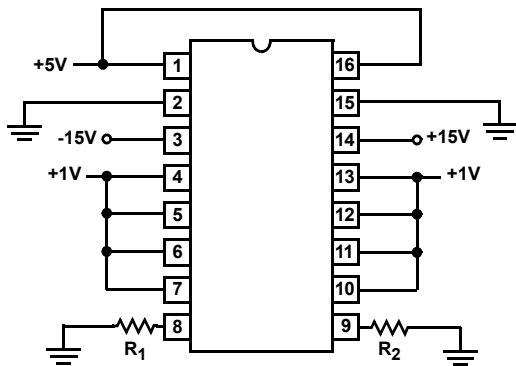
- $V_2 = +15.5V, \pm 0.5V$
- $V_3 = -15.5V, \pm 0.5V$
- $R_1 = 10k\Omega, \pm 5\%$
- $C_1 = 0.01\mu F$  minimum (per socket)
- $D_1 = 1N4002$  or equivalent (per board)
- $F_0 = 100kHz, \pm 10\%$ ;  $F_1 = F_0/2$ ;  $F_2 = F_1/2$ ,  
50% duty cycle,  $V_{IL} = 0.8V$  Max;  $V_{IH} = 4.0V$  Min



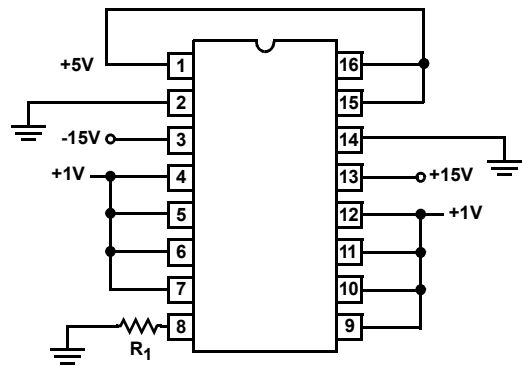
**HS-0549RH**  
**STATIC BURN-IN TEST CIRCUIT**

- $V_1 = +5.5V, \pm 0.5V$
- $V_2 = +15.5V, \pm 0.5V$
- $V_3 = -15.5V, \pm 0.5V$
- $R_1 = 10k\Omega, \pm 10\%$
- $C_1 = 0.01\mu F$  minimum (per socket)
- $D_1 = 1N4002$  or equivalent (per board)

**Irradiation Circuits**



**HS-0549RH**  
 $R_1 = R_2 = 10k\Omega \pm 5\%$



**HS-0548RH**  
 $R_1 = 10k\Omega \pm 5\%$

## Die Characteristics

### DIE DIMENSIONS:

83 mils x 108 mils x 19 mils

### INTERFACE MATERIALS:

#### Glassivation:

Type: Nitride  
 Thickness:  $7k\text{\AA} \pm 0.7k\text{\AA}$

#### Top Metallization:

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

### Substrate:

CMOS, DI

### ASSEMBLY RELATED INFORMATION:

#### Substrate Potential:

Floating

### ADDITIONAL INFORMATION:

#### Worst Case Current Density:

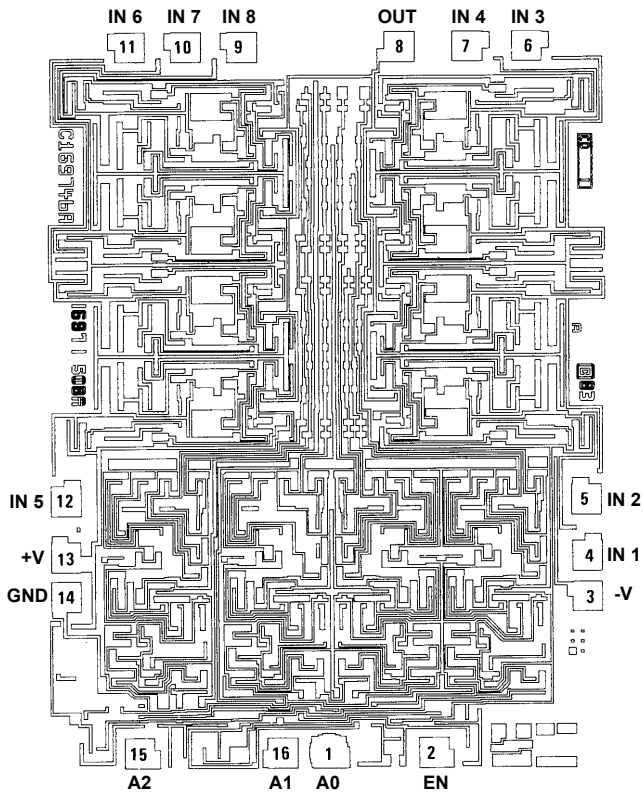
$1.4 \times 10^5 \text{ A/cm}^2$

#### Transistor Count:

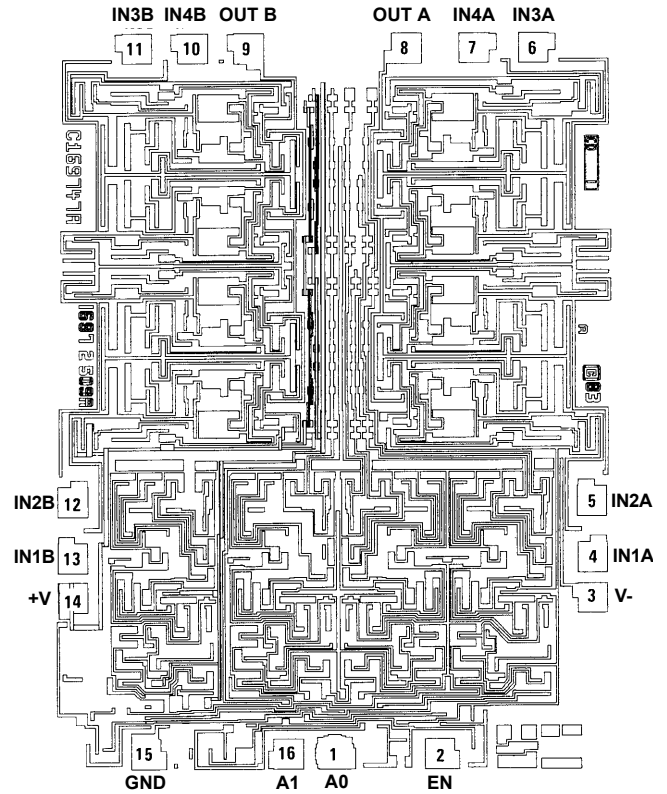
253

## Metallization Mask Layout

HS-0548RH



HS-0549RH



NOTE: Pad Numbers Correspond to DIP Pin Numbers Only

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