

April 1999

8-Channel CMOS Analog Multiplexer

Features

- Ultra Low Leakage - $I_{D(OFF)} \leq 100\text{pA}$ (Typ)
- $r_{DS(ON)} < 400\Omega$ Over Full Signal and Temperature Range
- Power Supply Quiescent Current Less Than $100\mu\text{A}$
- $\pm 14\text{V}$ Analog Signal Range
- No SCR Latchup
- Break-Before-Make Switching
- Binary Address Control (3 Address Inputs Control 8 Channels)
- TTL and CMOS Compatible Strobe Control
- Pin Compatible with DG508A, HI-508 and ADG508A
- Internal Diode in Series with V_+ for Fault Protection

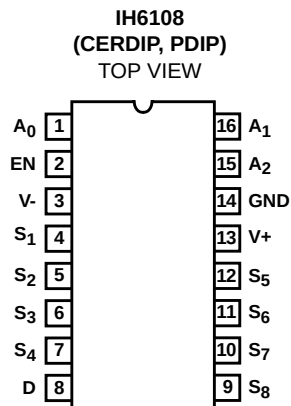
Description

The IH6108 is a CMOS 1-of-8 multiplexer. The part is a plug-in replacement for the DG508A. Three-line decoding is used so that the 8 channels can be controlled by 3 Address inputs; additionally a fourth input is provided for use as a system enable. When the ENABLE input is high (5V), a channel is selected by the three Address inputs, and when low (0V) all channels are off. The 3 Address inputs are TTL and CMOS logic compatible, with a "1" corresponding to any voltage greater than 2.4V.

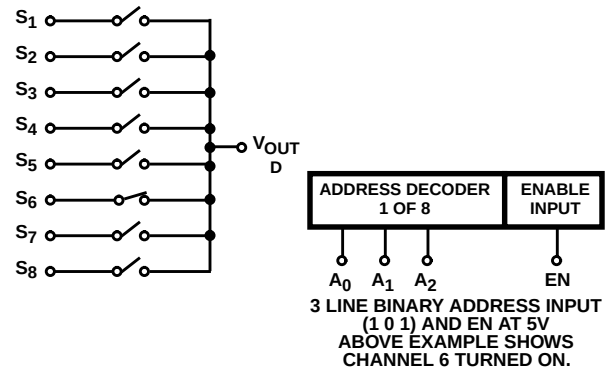
Part Number Information

PART NUMBER	TEMP. RANGE (°C)	PACKAGE	PKG. NO.
IH6108MJE	-55 to 125	16 Ld Cerdip	F16.3
IH6108MJE/883B	-55 to 125	16 Ld Cerdip	F16.3
IH6108CJE	0 to 70	16 Ld Cerdip	F16.3
IH6108CPE	0 to 70	16 Ld PDIP	E16.3

Pinout



Functional Diagram



TRUTH TABLE

A ₂	A ₁	A ₀	EN	ON SWITCH
x	x	x	0	None
0	0	0	1	1
0	0	1	1	2
0	1	0	1	3
0	1	1	1	4
1	0	0	1	5
1	0	1	1	6
1	1	0	1	7
1	1	1	1	8

NOTE: A₀, A₁, A₂
 Logic "1" = $V_{AH} \geq 2.4\text{V}$, $V_{ENH} \geq 4.5\text{V}$
 Logic "0" = $V_{AL} \leq 0.8\text{V}$.

Absolute Maximum Ratings

V_{IN} (A, EN) to Ground	-15V to 15V
V_S or V_D to V_+	0V, -36V
V_S to V_D to V_-	0V, 36V
V_+ to Ground	18V
V_- to Ground	-18V
Current (Any Terminal)	30mA
Current (Analog Source or Drain)	20mA

Thermal Information

Thermal Resistance (Typical, Note 1)	θ_{JA} (°C/W)	θ_{JC} (°C/W)
PDIP Package	100	N/A
CERDIP Package	75	20
Maximum Junction Temperature (Hermetic Package)	175°C	
Maximum Junction Temperature (Plastic Package)	150°C	
Maximum Storage Temperature Range	-65°C to 150°C	
Maximum Lead Temperature (Soldering 10s)	300°C	

Operating Conditions

Temperature Range

C Suffix 0°C to 70°C

M Suffix -55°C to 125°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:

1. θ_{JA} is measured with the component mounted on an evaluation PC board in free air.

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 $V_+ = 15V$, $V_- = -15V$, $V_{EN} = +5V$, Ground = 0V, Unless Otherwise Specified, (Note 4)

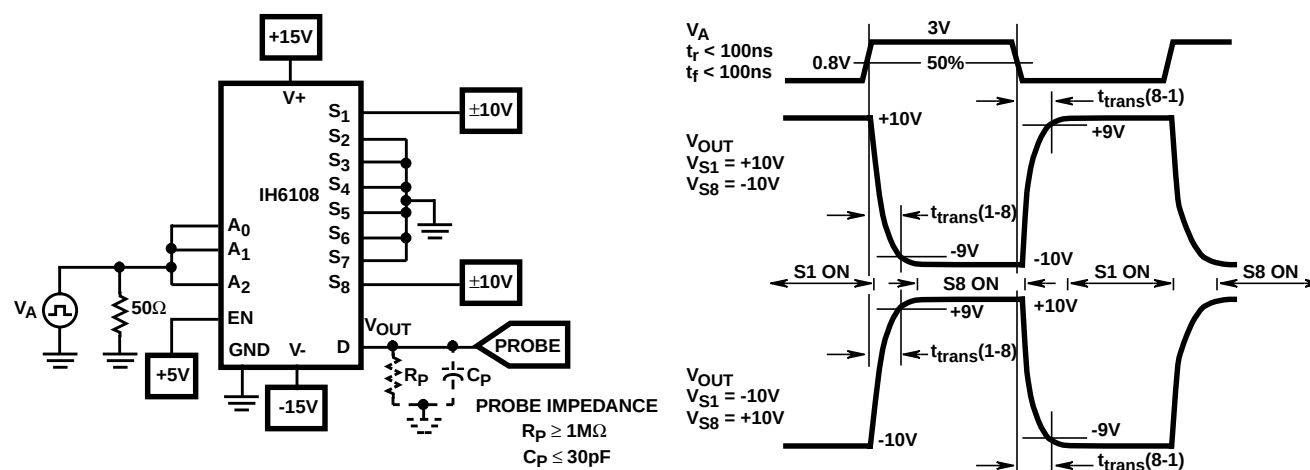
PARAMETER	MEASURED TERMINAL	NO TESTS PER TEMP	TYP 25°C	TEST CONDITIONS	M SUFFIX (°C)			C SUFFIX (°C)			UNITS
					-55	25	125	0	25	70	
SWITCH											
r _{DS(ON)}	S to D	8	180	V _D = +10V, I _S = -1.0mA Sequence Each Switch On V _{AL} = 0.8V, V _{AH} = 2.4V	300	300	400	350	350	450	Ω
		8	150	V _D = -10V, I _S = -1.0mA Sequence Each Switch On V _{AL} = 0.8V, V _{AH} = 2.4V	300	300	400	350	350	450	Ω
Δr _{DS(ON)}			20	Δr _{DS(ON)} = $\frac{r_{DS(ON)MAX}-r_{DS(ON)MIN}}{r_{DS(ON)AVG}}$, V _S = ±10V	-	-	-	-	-	-	%
I _{S(OFF)}	S	8	0.002	V _S = 10V, V _D = -10V	-	±0.5	±50	-	±1	±50	nA
		8	0.002	V _S = -10V, V _D = 10V, V _{EN} = 0.8V	-	±0.5	±50	-	±1	±50	nA
I _{D(OFF)}	D	1	0.03	V _D = 10V, V _S = -10V, V _{EN} = 0.8V	-	±2	±100	-	±5	±100	nA
		1	0.03	V _D = -10V, V _S = 10V, V _{EN} = 0.8V	-	±2	±100	-	±5	±100	nA
I _{D(ON)}	D	8	0.1	V _{S(ALL)} = V _D = 10V, Sequence Each Switch On V _{AL} = 0.8V, V _{AH} = 2.4V	-	±2	±100	-	±5	±100	nA
		8	0.1	V _{S(ALL)} = V _D = -10V, Sequence Each Switch On V _{AL} = 0.8V, V _{AH} = 2.4V	-	±2	±100	-	±5	±100	nA
INPUT											
I _{AN(ON)} or I _{A(on)}	A ₀ , A ₁ , or A ₂ Inputs A ₀ , A ₁ , A ₂	3	0.01	V _A = 0V	-	-10	-30	-	-10	-30	μA
I _{AN(OFF)} I _{A(off)}		3	0.01	V _A = 14V	-	10	30	-	10	30	μA
I _A		3	0.01	V _{EN} = 5V, All V _A = 0V (Address Pins)	-	-10	-30	-	-10	-30	μA
	EN	1	0.01	V _{EN} = 0V, All V _A = 0V (Address Pins)	-	-10	-30	-	-10	-30	μA

Electrical Specifications $V_+ = 15V$, $V_- = -15V$, $V_{EN} = +5V$, Ground = 0V, Unless Otherwise Specified, (Note 4) (Continued)

PARAMETER	MEASURED TERMINAL	NO TESTS PER TEMP	TYP 25°C	TEST CONDITIONS	M SUFFIX (°C)			C SUFFIX (°C)			UNITS
					-55	25	125	0	25	70	
DYNAMIC											
t _{TRANSITION}	D		0.3	See Figure 1	-	1	-	-	-	-	μs
t _{OPEN}	D		0.2	See Figure 2	-	-	-	-	-	-	μs
t _{ON(EN)}	D		0.6	See Figure 3	-	1.5	-	-	-	-	μs
t _{OFF(EN)}	D		0.4	See Figure 3	-	1	-	-	-	-	μs
“OFF” Isolation	D		60	V _{EN} = 0V, R _L = 200Ω, C _L = 3pF, V _S = 3V _{RMS} , f = 500kHz	-	-	-	-	-	-	dB
C _{S(OFF)}	S		5	V _S = 0V, V _{EN} = 0V, f = 140kHz to 1MHz	-	-	-	-	-	-	pF
C _{D(OFF)}	D		25	V _D = 0V,V _{EN} = 0V, f = 140kHz to 1MHz	-	-	-	-	-	-	pF
C _{DS(OFF)}	D to S		1	V _S = 0V, V _D = 0V, V _{EN} = 0V, f = 140kHz to 1MHz	-	-	-	-	-	-	pF
SUPPLY											
Positive Supply Current	V+	1	40	V _{EN} = 5V, All V _A = 0V or 5V	-	-	200	-	-	1000	μA
Negative Supply Current	V-	1	2	V _{EN} = 5V, All V _A = 0V or 5V	-	-	100	-	-	1000	μA
Positive Standby Current	V+	1	1	V _{EN} = 0V, All V _A = 0V or 5V	-	-	100	-	-	1000	μA
Negative Standby Current	V-	1	1	V _{EN} = 0V, All V _A = 0V or 5V	-	-	100	-	-	1000	μA

NOTE:

- See "Enable Input Strobing Levels", in Application Section.

Switching InformationFIGURE 1. $t_{\text{TRANSITION}}$ SWITCHING TEST CIRCUIT AND WAVEFORMS

Switching Information

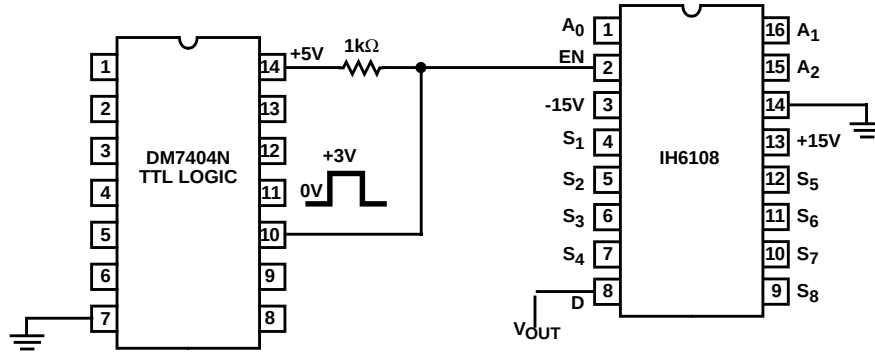


FIGURE 4. ENABLE INPUT STROBING FROM TTL LOGIC

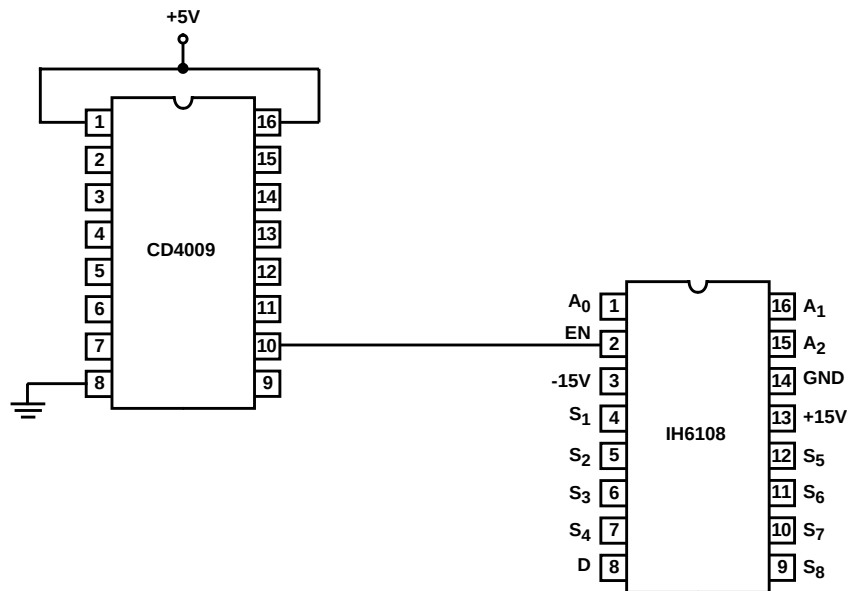


FIGURE 5. ENABLE INPUT DRIVEN FROM CMOS LOGIC

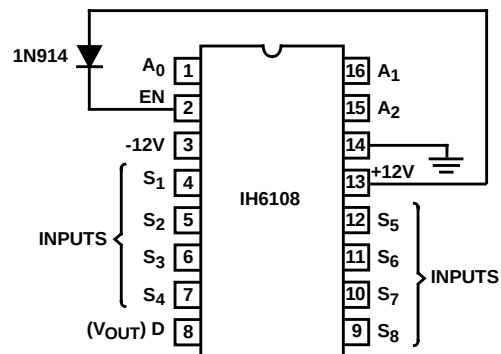


FIGURE 6. IH6108 CONNECTION DIAGRAM FOR LESS THAN $\pm 15V$ SUPPLY OPERATION

Switching Information (Continued)

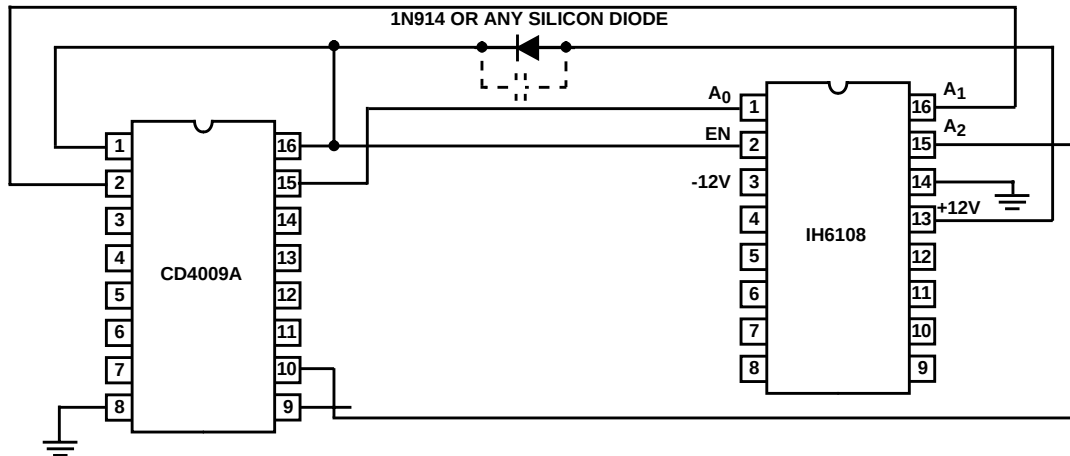


FIGURE 7. IH6108 CONNECTION DIAGRAM WITH ENABLE INPUT STROBING FOR LESS THAN $\pm 15\text{V}$ SUPPLY OPERATION

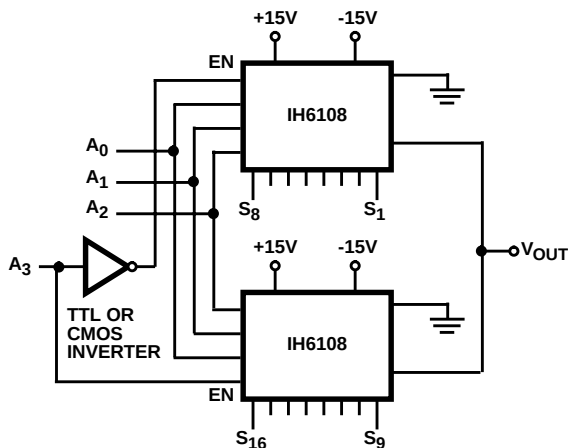
Peak-to-Peak Signal Handling Capability

The IH6108 can handle input signals up to $\pm 14\text{V}$ (actually -15V to $+14.3\text{V}$ because of the input protection diode) when using the $\pm 15\text{V}$ supplies.

The electrical specifications of the IH6108 are guaranteed for $\pm 10\text{V}$ signals, but the specifications have very minor changes for $\pm 14\text{V}$ signals. The notable changes are slightly lower $r_{DS(ON)}$ and slightly higher leakages.

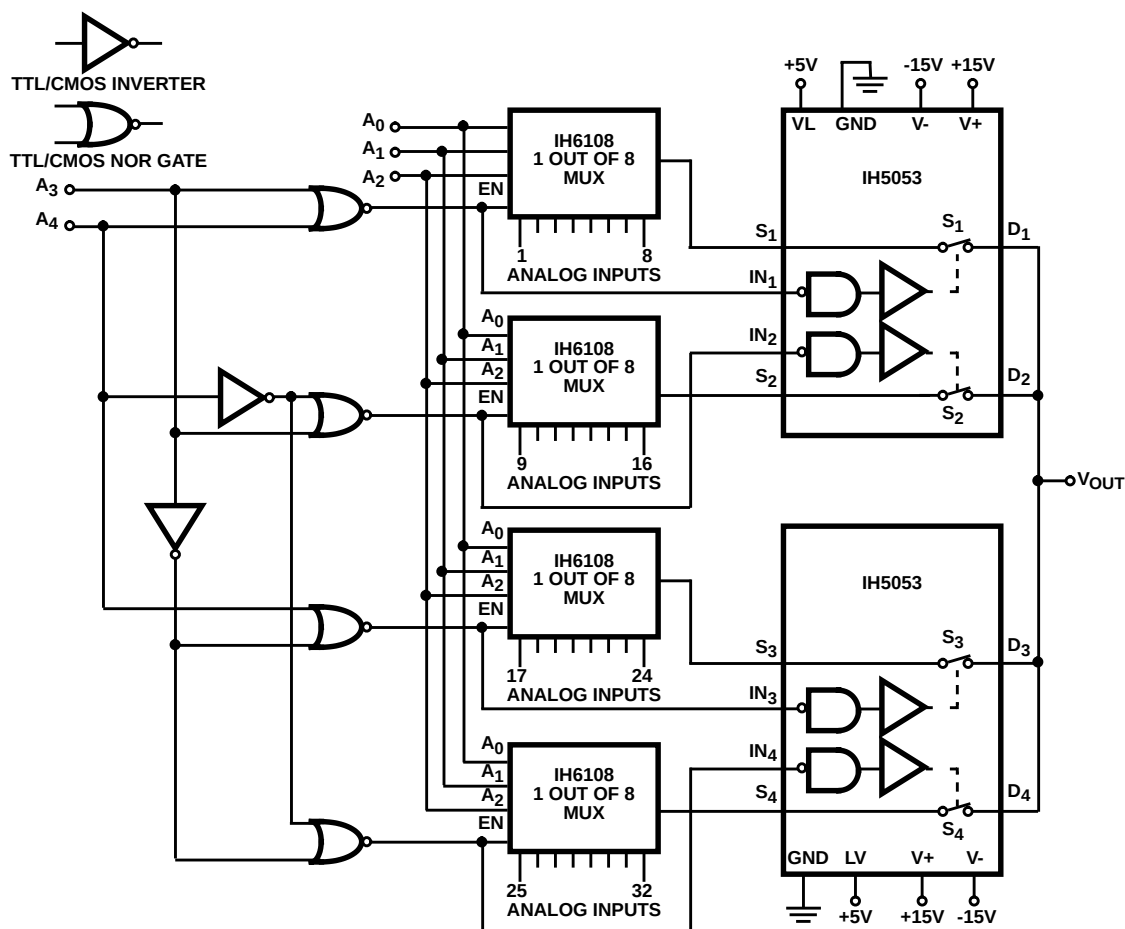
TRUTH TABLE

A ₃	A ₂	A ₁	A ₀	ON SWITCH
0	0	0	0	S1
0	0	0	1	S2
0	0	1	0	S3
0	0	1	1	S4
0	1	0	0	S5
0	1	0	1	S6
0	1	1	0	S7
0	1	1	1	S8
1	0	0	0	S9
1	0	0	1	S10
1	0	1	0	S11
1	0	1	1	S12
1	1	0	0	S13
1	1	0	1	S14
1	1	1	0	S15
1	1	1	1	S16



NOTE: TTL inverter must have pullup resistor to $+5\text{V}$ to drive EN input.

FIGURE 8. 1 OF 16 CHANNEL MULTIPLEXER USING TWO IH6108s. OVERVOLTAGE PROTECTION IS MAINTAINED BETWEEN ALL CHANNELS, AS IS BREAK-BEFORE-MAKE SWITCHING.



TRUTH TABLE

A ₄	A ₃	A ₂	A ₁	A ₀	ON SWITCH
0	0	0	0	0	S1
0	0	0	0	1	S2
0	0	0	1	0	S3
0	0	0	1	1	S4
0	0	1	0	0	S5
0	0	1	0	1	S6
0	0	1	1	0	S7
0	0	1	1	1	S8
0	1	0	0	0	S9
0	1	0	0	1	S10
0	1	0	1	0	S11
0	1	0	1	1	S12
0	1	1	0	0	S13
0	1	1	0	1	S14
0	1	1	1	0	S15
0	1	1	1	1	S16

TRUTH TABLE

A ₄	A ₃	A ₂	A ₁	A ₀	ON SWITCH
1	0	0	0	0	S17
1	0	0	0	1	S18
1	0	0	1	0	S19
1	0	0	1	1	S20
1	0	1	0	0	S21
1	0	1	0	1	S22
1	0	1	1	0	S23
1	0	1	1	1	S24
1	1	0	0	0	S25
1	1	0	0	1	S26
1	1	0	1	0	S27
1	1	0	1	1	S28
1	1	1	0	0	S29
1	1	1	0	1	S30
1	1	1	1	0	S31
1	1	1	1	1	S32

NOTE: TTL inverter must have pullup resistor to +5V to drive EN input.

FIGURE 9. 1 OF 32 CHANNEL MULTIPLEXER USING FOUR IH6108s, AND TWO IH5053s AS A SUBMULTIPLEXER

Schematic Diagram

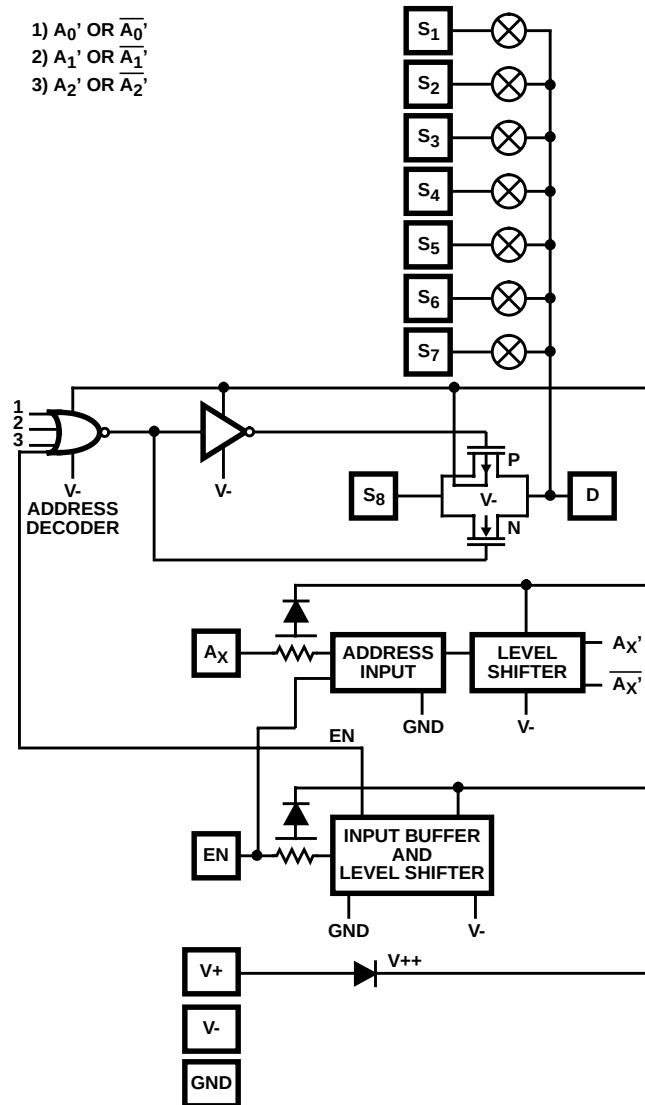


FIGURE 10. IH6108 SCHEMATIC DIAGRAM

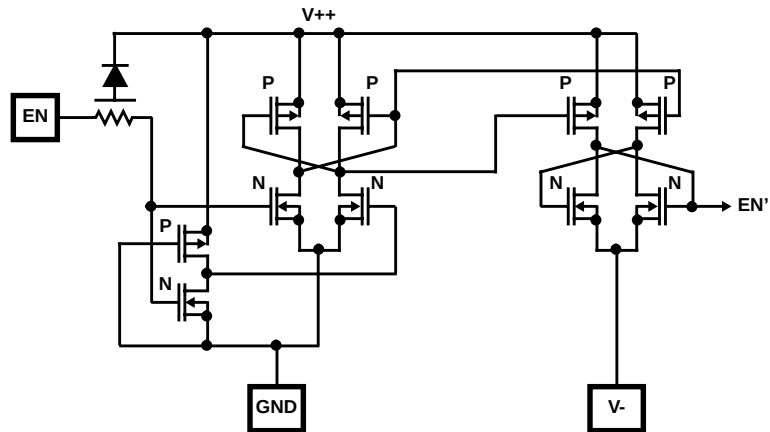


FIGURE 11. ENABLE INPUT AND LEVEL SHIFTER

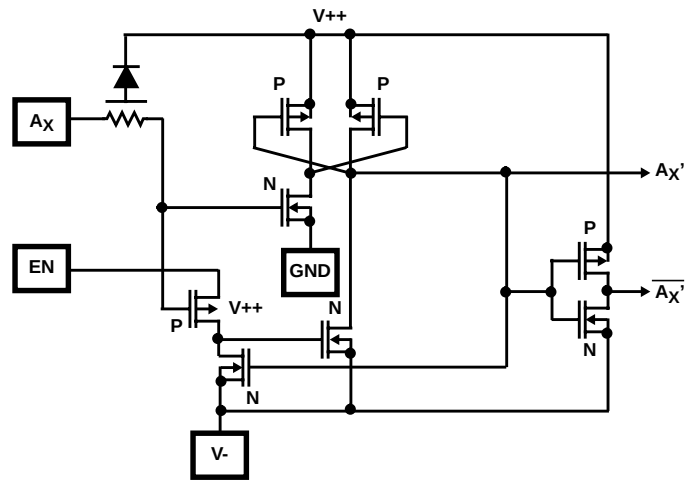


FIGURE 12. ADDRESS INPUT AND LEVEL SHIFTER