

**12 x 8 x 1 BiMOS-E Crosspoint Switch**

The Intersil CD22M3493 is an array of 96 analog switches capable of handling signals from DC to video. Because of the switch structure, input signals may swing through the total supply voltage range,  $V_{DD}$  to  $V_{SS}$ . Each of the 96 switches may be addressed via the ADDRESS input to the 7 to 96 line decoder. The state of the addressed switch is established by the signal to the DATA input. A low or logic zero input will open the switch, while a high logic level or a one will result in closure of the addressed switch when the STROBE input goes high from its normally low state. Any number or combination of connections may be active at one time. Each connection, however, must be made or broken individually in the manner previously described. All switches may be reset by taking the RESET input from a zero state to a one state and then returning it to its normal low state.

**Ordering Information**

PART NUMBER	TEMP. RANGE (°C)	PACKAGE	PKG. NO.
CD22M3493E	-40 to 85	40 Ld PDIP	E40.6
CD22M3493Q	-40 to 85	44 Ld PLCC	N44.65

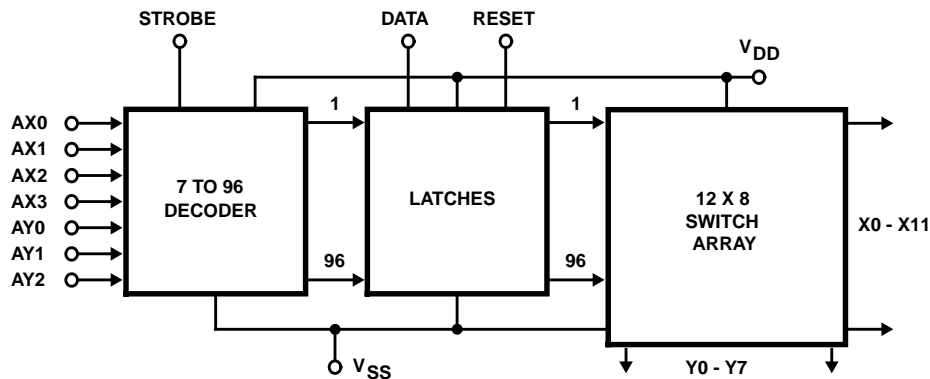
**Features**

- 96 Analog Switches
- Low  $R_{ON}$
- Guaranteed  $R_{ON}$  Matching
- Analog Signal Input Voltage Equal to the Supply Voltage
- Wide Operating Voltage . . . . . 4V to 16V
- Parallel Input Addressing
- High Latch Up Current . . . . . 50mA (Min)
- Very Low Crosstalk
- Pin and Functionally Compatible with the Following Types: SGS M3493, SGS M093, SSI 78A093A, and Mitel MT8812

**Applications**

- PBX Systems
- Instrumentation
- Analog and Digital Multiplexers
- Video Switching Networks

**Block Diagram**



**Absolute Maximum Ratings**

DC Supply Voltage ( $V_{DD}$ ) (Referenced to  $V_{SS}$  . . . . . -0.5V to 17V  
 Supply Voltage Range  
 For  $T_A$  = Full Package Temperature Range  
 $V_{SS} = 0V$ ,  $V_{DD} = 4V$  to 16V  
 DC Input Diode Current,  $I_{IN}$   
 For  $V_I < V_{SS} - 0.5V$  or  $V_I > V_{DD} + 0.5V$  . . . . .  $\pm 20mA$   
 DC Output Diode Current,  $I_{OK}$   
 For  $V_O < V_{SS} - 0.5V$  or  $V_O > V_{DD} + 0.5V$  . . . . .  $\pm 20mA$   
 DC Transmission Gate Current . . . . .  $\pm 25mA$   
 Power Dissipation Per Package ( $P_o$ )  
 For  $T_A = -40^\circ C$  to  $85^\circ C$  (PDIP) . . . . . 500mW  
 For  $T_A = -40^\circ C$  to  $85^\circ C$  (PLCC) . . . . . 600mW

**Thermal Information**

Thermal Resistance (Typical, Note 1)  $\theta_{JA}$  ( $^\circ C/W$ )  
 Plastic DIP Package . . . . . 55  
 PLCC Package . . . . . 43  
 Maximum Junction Temperature Plastic . . . . .  $150^\circ C$   
 Maximum Storage Temperature Range ( $T_{STG}$ ) . . . . .  $-65^\circ C$  to  $150^\circ C$   
 Maximum Lead Temperature (Soldering 10s) . . . . .  $300^\circ C$   
 (PLCC - Lead Tips Only)

**Operating Conditions**

Temperature Range ( $T_A$ )  
 Package Type E and Q . . . . .  $-40^\circ C$  to  $85^\circ C$   
 DC Input or Output Voltage . . . . . Min =  $V_{SS}$ , Max =  $V_{DD}$   
 Digital Input Voltage . . . . . Min =  $V_{SS}$ , Max =  $V_{DD}$

*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 an evaluation PC board in free air.

**Electrical Specifications**  $T_A = -40^\circ C$  to  $85^\circ C$ ,  $V_{SS} = 0V$ ,  $V_{DD} = 14V$ , Unless Otherwise Specified

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Supply Current	$I_{DD}$	$V_{DD} = 5V$ , Logic Inputs = $V_{DD}$	-	-	2	mA
		$V_{DD} = 16V$ , Logic Inputs = $V_{DD}$	-	-	5	mA
High-Level Input Voltage	$V_{IH}$		2.4	-	-	V
Low-Level Input Voltage	$V_{IL}$		-	-	0.8	V
Input Leakage Current, Digital	$I_{IN}$	Reset = Low (Note 2)	-	-	$\pm 10$ (Note 3)	$\mu A$

**Electrical Specifications**  $T_A = -40^\circ C$  to  $85^\circ C$ ,  $V_{SS} = 0V$ ,  $V_{DD} = 14V$ , Unless Otherwise Specified

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNITS
<b>STATIC CROSSPOINTS</b>						
ON Resistance	$R_{ON}$	$T_A = 25^\circ C$ , $V_{IN} = V_{DD}/2$ , $V_{DD} = 5V$	-	40	70	$\Omega$
		$V_X - V_Y = 0.25V$ , $V_{DD} = 14V$	-	22	45	$\Omega$
ON Resistance	$R_{ON}$	$T_A = -40^\circ C$ to $85^\circ C$ , $V_{IN} = V_{DD}/2$ , $V_{DD} = 5V$	-	-	80	$\Omega$
		$V_X - V_Y = 0.25V$ , $V_{DD} = 14V$	-	-	55	$\Omega$
Difference in ON Resistance Between Any Two Switches	$\Delta R_{ON}$	$T_A = 25^\circ C$ , $V_{IN} = V_{DD}/2$ , $V_X - V_Y = 0.25V$ , $V_{DD} = 14V$	-	4	10	$\Omega$
Difference in ON Resistance Between Any Two Switches	$\Delta R_{ON}$	$T_A = -40^\circ C$ to $85^\circ C$ , $V_{IN} = V_{DD}/2$ , $V_X - V_Y = 0.25V$ , $V_{DD} = 14V$	-	-	10	$\Omega$
OFF-State Leakage Current	$I_L$	$ V_X - V_Y  = 14V$	-	-	$\pm 10$ (Note 3)	$\mu A$

**Electrical Specifications**  $T_A = 25^\circ C$ ,  $V_{SS} = 0V$ ,  $V_{DD} = 14V$ ,  $C_L = 50pF$ , Unless Otherwise Specified

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNITS
<b>DYNAMIC CROSSPOINTS</b>					
Switch I/O Capacitance	$V_{IN} = 7V$ , $f = 1MHz$	-	20	-	pF
Switch Feedthrough Capacitance	$V_{IN} = 7V$ , $f = 1MHz$	-	0.2	-	pF
Propagation Delay Time (Switch ON) Signal Input to Output, $t_{PHL}$ or $t_{PLH}$		-	30	100	ns

## CD22M3493

### Electrical Specifications $T_A = 25^\circ\text{C}$ , $V_{SS} = 0\text{V}$ , $V_{DD} = 14\text{V}$ , $C_L = 50\text{pF}$ , Unless Otherwise Specified (Continued)

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNITS	
Frequency Response Channel ON $f = 20\log(VX/VY) = -3\text{dB}$	$C_L = 3\text{pF}$ , $R_L = 75\Omega$ , $V_{IN} = 2V_{P-P}$	-	50	-	MHz	
Total Harmonic, THD	$V_{IN} = 2V_{P-P}$ , $f = 1\text{kHz}$	-	0.01	-	%	
Feedthrough Channel OFF Feedthrough = $20\log(VX/VY) = F_{DT}$	$V_{IN} = 2V_{P-P}$ , $f = 1\text{kHz}$	-	-95	-	dB	
Frequency for Signal Crosstalk, $f_{CT}$ Attenuation of:	40dB	$V_{IN} = 2V_{P-P}$ , $R_L = 75\Omega$	-	10	-	MHz
	110dB	$V_{IN} = 2V_{P-P}$ , $R_L = 1\text{k}\Omega \parallel 10\text{pF}$	-	5	-	kHz
Control Crosstalk DATA-Input, ADDRESS, or STROBE to Output	Control Input = $3V_{P-P}$ Square Wave, $t_R = t_F = 10\text{ns}$ $R_{IN} = 1\text{K}$ , $R_{OUT} = 10\text{k}\Omega \parallel 10\text{pF}$	-	75	-	mV <sub>PEAK</sub>	

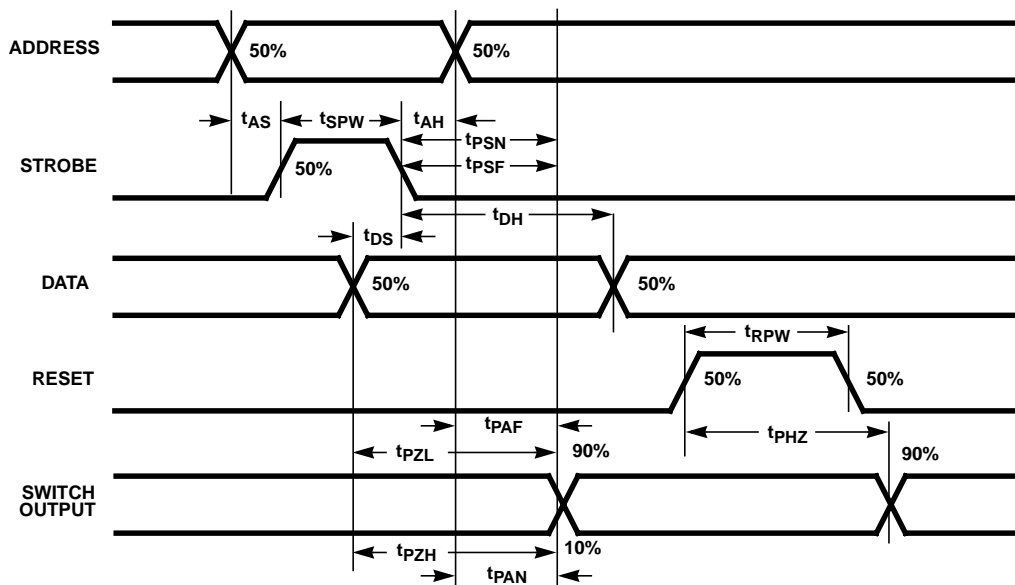
### Electrical Specifications $T_A = 25^\circ\text{C}$ , $V_{SS} = 0\text{V}$ , $V_{DD} = 14\text{V}$ , $R_L = 1\text{k}\Omega \parallel 50\text{pF}$ , Unless Otherwise Specified

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNITS
<b>DYNAMIC CONTROLS</b>						
Digital Input Capacitance	$C_{IN}$	$V_{IN} = 5\text{V}$ , $f = 1\text{MHz}$	-	5	-	pF
Propagation Delay Time STROBE to Output	Switch Turn-ON	$t_{PSN}$	-	30	100	ns
			Switch Turn-OFF	$t_{PSF}$	-	40
DATA-IN to Output	Turn-ON to High Level	$t_{PZH}$	-	30	100	ns
			Turn-ON to Low Level	$t_{PZL}$	-	30
ADDRESS to Output	Turn-ON to High Level	$t_{PAN}$	-	30	100	ns
			Turn-OFF to Low Level	$t_{PAF}$	-	25
Setup Time	DATA-IN to STROBE	$t_{DS}$	20	-	-	ns
			ADDRESS to STROBE	$t_{AS}$	20	-
Hold Time	STROBE to DATA-IN	$t_{DH}$	20	-	-	ns
			STROBE to ADDRESS	$t_{AH}$	10	-
Pulse Width	STROBE	$t_{SPW}$	30	-	-	ns
			RESET	$t_{RPW}$	50	-
RESET Turn-OFF to Output Delay	$t_{PHZ}$		-	100	200	ns

NOTES:

2. Reset  $I_{IH} < 2\text{mA}$ , Reset =  $V_{DD} = 16\text{V}$ .
3. At  $25^\circ\text{C}$  Limit is  $\pm 100\text{nA}$ .

Timing Diagram



TRUTH TABLE X AXIS

X ADDRESS				NOTE	X SWITCH
AX3	AX2	AX1	AX0		
0	0	0	0		X0
0	0	0	1		X1
0	0	1	0		X2
0	0	1	1		X3
0	1	0	0		X4
0	1	0	1		X5
0	1	1	0	4	No Connect
0	1	1	1	4	No Connect
1	0	0	0		X6
1	0	0	1		X7
1	0	1	0		X8
1	0	1	1		X9
1	1	0	0		X10
1	1	0	1		X11
1	1	1	0	4	No Connect
1	1	1	1	4	No Connect

TRUTH TABLE Y AXIS

Y ADDRESS				Y SWITCH
AY2	AY1	AY0		
0	0	0		Y0
0	0	1		Y1
0	1	0		Y2
0	1	1		Y3
1	0	0		Y4
1	0	1		Y5
1	1	0		Y6
1	1	1		Y7

NOTE: 4. When X switch addresses are in these states, no change in status will occur in switches between any X and Y points.

To make a connection (close switch) between any two points, specify an "X" address, a "Y" address, set "DATA" high, and switch "Strobe" from low to high. To break a connection, follow this same procedure with "DATA" low.:

Example:

To connect switch X3 to switch Y4:

To connect switch X6 to switch Y7:

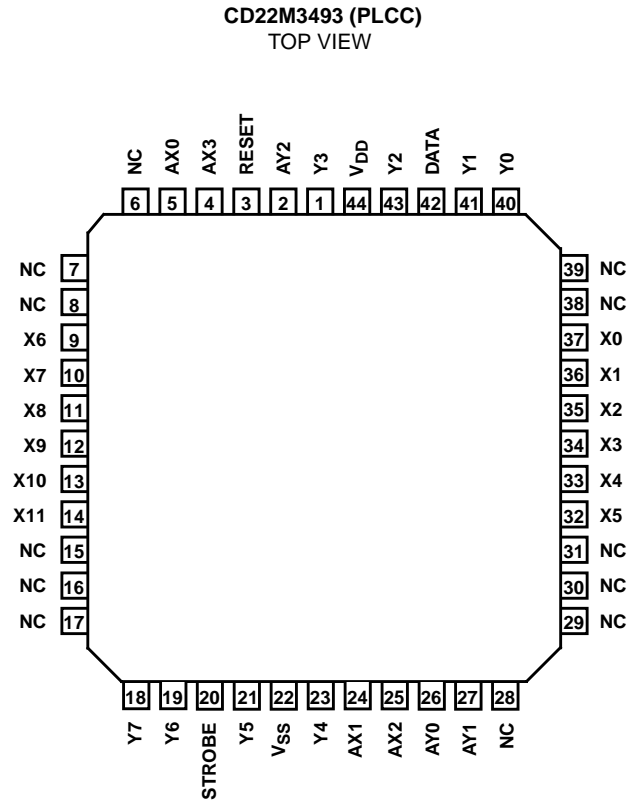
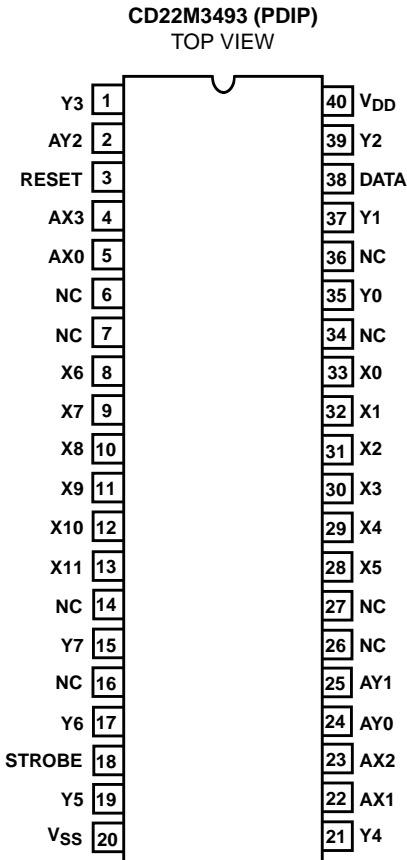
To break connection from X3 to Y4:

DATA	X ADDRESS				Y ADDRESS		
	AX3	AX2	AX1	AX0	AY2	AY1	AY0
1	0	0	1	1	1	0	0
1	1	0	0	0	1	1	1
0	0	0	1	1	1	0	0

**Pin Descriptions**

SYMBOL	40 LEAD PDIP PIN NO.	44 LEAD PLCC PIN NO.	DESCRIPTION
<b>POWER SUPPLIES</b>			
V <sub>DD</sub>	40	44	Positive Supply
V <sub>SS</sub>	20	22	Negative Supply
<b>ADDRESS</b>			
AX0 - AX3	5, 22, 23 and 4	5, 24, 25 and 4	X Address Lines. These pins select one of the 12 rows of switches. See the Truth Table for the valid addresses.
AY0 - AY2	24, 25 and 2	26, 27 and 2	Y Address Lines. These pins select one of the 8 columns of switches. See the Truth Table for the valid addresses.
<b>CONTROL</b>			
DATA	38	42	DATA Input determines the state of the addressed switch. A high or one will close the switch. A low or zero will open the switch.
STROBE	18	20	STROBE Input enables the action defined by the DATA and ADDRESS Inputs. A low or zero results in no action. The ADDRESS Input must be stable before the STROBE Input goes to the active high level. The DATA Input must be stable on the falling edge of the STROBE.
RESET	3	3	MASTER RESET. A high or one on this line opens all switches.
<b>INPUTS/OUTPUTS</b>			
X0 - X5 I/O X6 - X11	33 - 28 8 - 13	37 - 32 9 - 14	Analog or Digital Inputs/Outputs. These pins are the rows X0 - X11.
Y0 - Y7 I/O	35, 37, 39, 1, 21, 19, 17 and 15	40, 41, 43, 1, 23, 21, 19 and 18	Analog or Digital Inputs/Outputs. These pins are the columns Y0 - Y7.

**Pinouts**



All Intersil semiconductor products are manufactured, assembled and tested under **ISO9000** quality systems certification.

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