

12 x 8 x 1 BiMOS-E Crosspoint Switch

January 1997

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

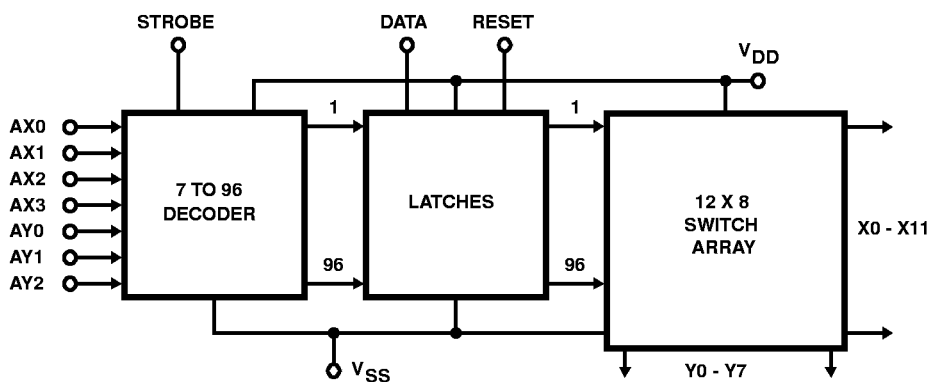
Description

The Harris 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

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 ± 20 mA
 DC Output Diode Current, I_{OK}
 For $V_O < V_{SS}$ -0.5V or $V_O > V_{DD}$ +0.5V ± 20 mA
 DC Transmission Gate Current ± 25 mA
 Power Dissipation Per Package (P_o)
 For T_A = -40°C to 85°C (PDIP) 500mW
 For T_A = -40°C to 85°C (PLCC) 600mW

Thermal Information

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

Operating Conditions

Temperature Range (T_A)
 Package Type E and Q -40°C to 85°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:

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

Electrical Specifications T_A = -40°C to 85°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)	-	-	± 10 (Note 3)	μA

Electrical Specifications T_A = -40°C to 85°C, V_{SS} = 0V, V_{DD} = 14V, Unless Otherwise Specified

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

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
DYNAMIC CROSSPOINTS					
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)

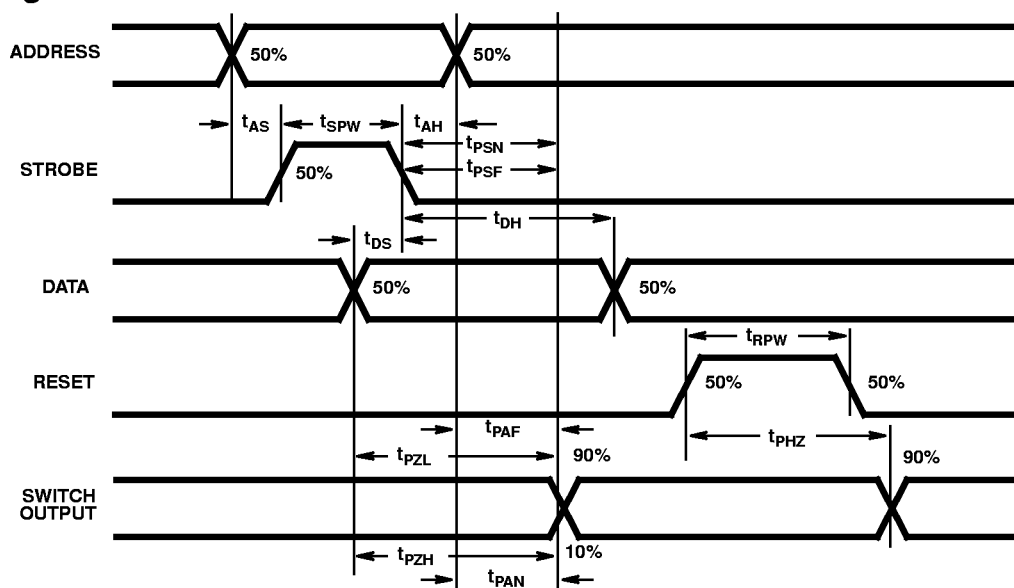
PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Frequency Response Channel ON $f = 20\log(VX/VY) = -3\text{dB}$	$C_L = 3\text{pF}$, $R_L = 75\Omega$, $V_{IN} = 2V_{P-P}$	-	50	-	MHz
Total Harmonic, THD	$V_{IN} = 2V_{P-P}$, $f = 1\text{kHz}$	-	0.01	-	%
Feedthrough Channel OFF Feedthrough = $20\log(VX/VY) = F_{DT}$	$V_{IN} = 2V_{P-P}$, $f = 1\text{kHz}$	-	-95	-	dB
Frequency for Signal Crosstalk, f_{CT}	$V_{IN} = 2V_{P-P}$, $R_L = 75\Omega$	-	10	-	MHz
Attenuation of:	$V_{IN} = 2V_{P-P}$, $R_L = 1\text{k}\Omega \parallel 10\text{pF}$	-	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 _{PEAK}

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
DYNAMIC CONTROLS						
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	100	ns
DATA-IN to Output						
Turn-ON to High Level	t_{PZH}		-	30	100	ns
Turn-ON to Low Level	t_{PZL}		-	30	100	ns
ADDRESS to Output						
Turn-ON to High Level	t_{PAN}		-	30	100	ns
Turn-OFF to Low Level	t_{PAF}		-	25	100	ns
Setup Time						
DATA-IN to STROBE	t_{DS}		20	-	-	ns
ADDRESS to STROBE	t_{AS}		20	-	-	ns
Hold Time						
STROBE to DATA-IN	t_{DH}		20	-	-	ns
STROBE to ADDRESS	t_{AH}		10	-	-	ns
Pulse Width						
STROBE	t_{SPW}		30	-	-	ns
RESET	t_{RPW}		50	-	-	ns
RESET Turn-OFF to Output Delay	t_{PHZ}		-	100	200	ns

NOTES:

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

Timing Diagram**TRUTH TABLE X AXIS**

X ADDRESS					
AX3	AX2	AX1	AX0	NOTE	X SWITCH
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			
AY2	AY1	AY0	Y SWITCH
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:

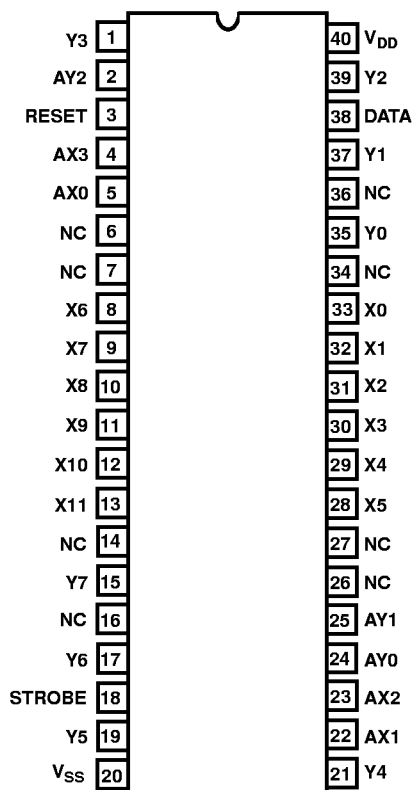
To connect switch X6 to switch Y7:

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
POWER SUPPLIES			
V _{DD}	40	44	Positive Supply
V _{SS}	20	22	Negative Supply
ADDRESS			
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.
CONTROL			
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.
INPUTS/OUTPUTS			
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.

PinoutsCD22M3493 (PDIP)
TOP VIEWCD22M3493 (PLCC)
TOP VIEW