

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 |

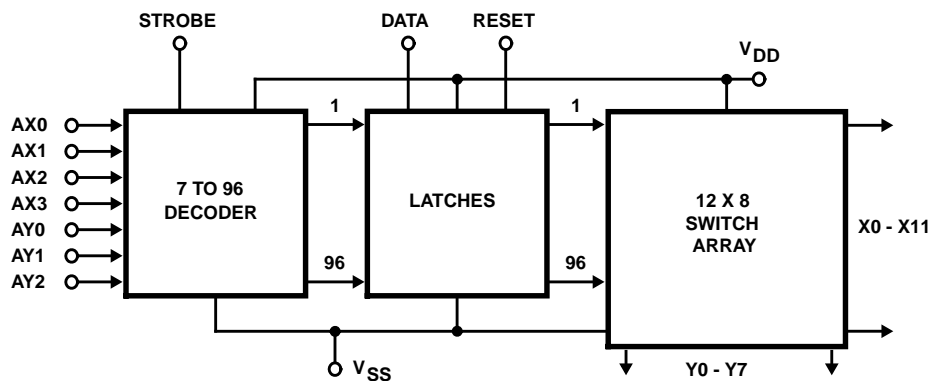
Features

- 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) θ_{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:

- θ_{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) | - | - | ± 10 (Note 3) | μA |

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 | |
|--|-----------------|---|----------------|-----|----------------------|----------|----------|
| 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 | 70 | Ω |
| | | | $V_{DD} = 14V$ | - | 22 | 45 | 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 $f = 20\log(V_X/V_Y) = -3\text{dB}$ | | $C_L = 3\text{pF}$, $R_L = 75\Omega$, $V_{IN} = 2V_{P-P}$ | - | 50 | - | MHz |
| Total Harmonic, THD | | $V_{IN} = 2V_{P-P}$, $f = 1\text{kHz}$ | - | 0.01 | - | % |
| Feedthrough Channel OFF Feedthrough = $20\log(V_X/V_Y) = F_{DT}$ | | $V_{IN} = 2V_{P-P}$, $f = 1\text{kHz}$ | - | -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 _{PEAK} |

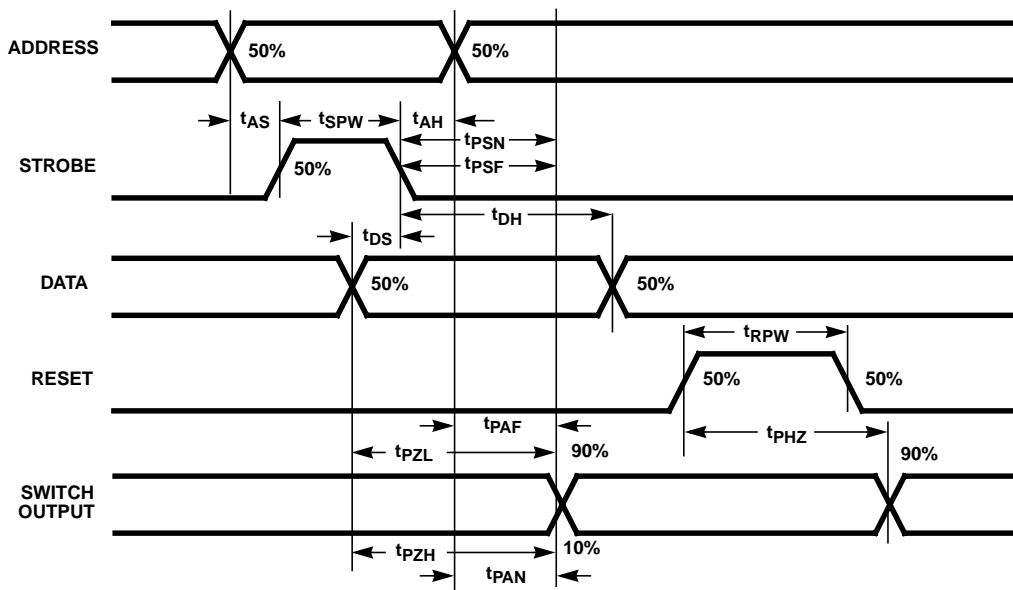
Electrical Specifications $T_A = 25^\circ\text{C}$, $V_{SS} = 0\text{V}$, $V_{DD} = 14\text{V}$, $R_L = 1\text{k}\Omega \parallel 50\text{pF}$, Unless Otherwise Specified

| 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:

2. Reset $I_{IH} < 2\text{mA}$, Reset = $V_{DD} = 16\text{V}$.
3. At 25°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:

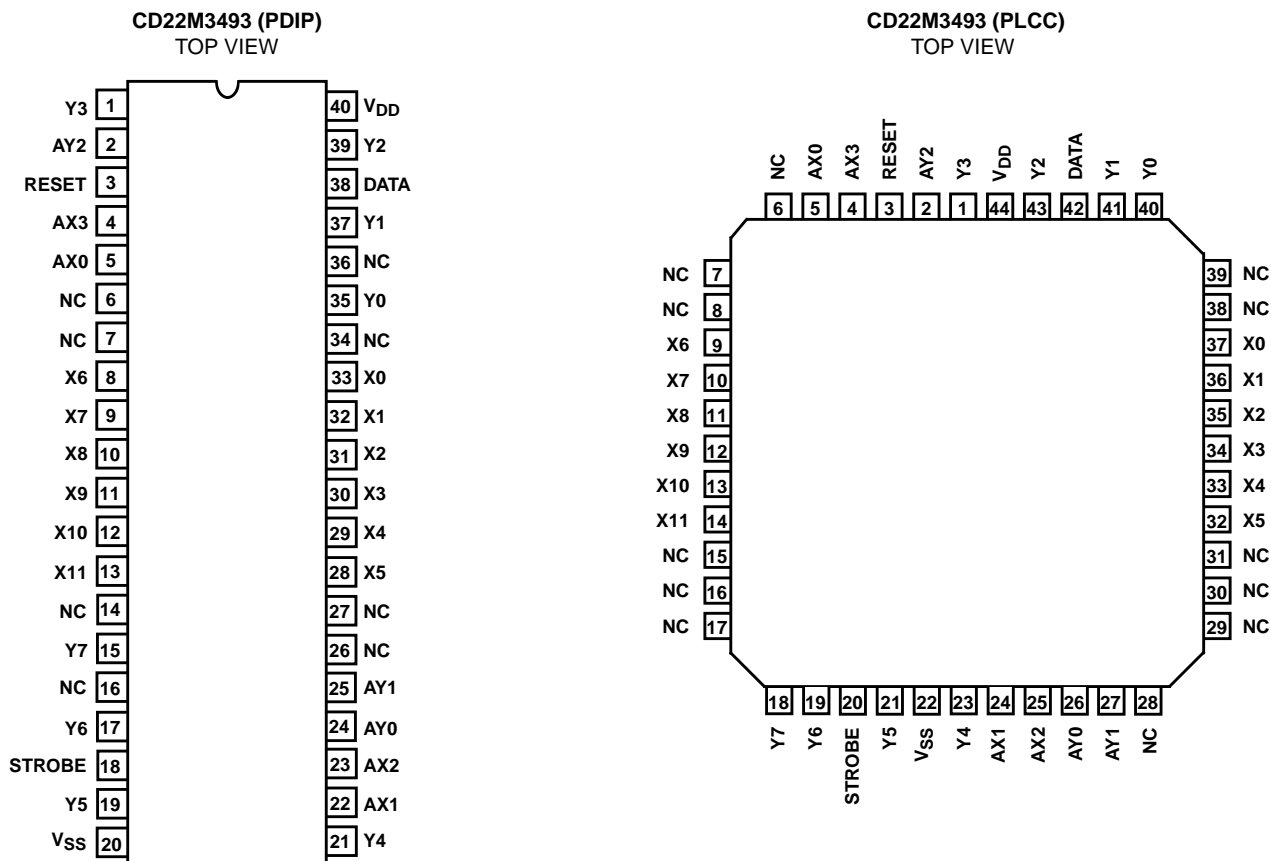
| DATA | X ADDRESS | | | | Y ADDRESS | | |
|------|-----------|-----|-----|-----|-----------|-----|-----|
| | AX3 | AX2 | AX1 | AX0 | AY2 | AY1 | AY0 |
| 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 |
| 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 |
| 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 |

CD22M3493

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. |

Pinouts



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

Intersil semiconductor products are sold by description only. Intersil Corporation reserves the right to make changes in circuit design and/or specifications at any time without notice. Accordingly, the reader is cautioned to verify that data sheets are current before placing orders. Information furnished by Intersil is believed to be accurate and reliable. However, no responsibility is assumed by Intersil or its subsidiaries for its use; nor for any infringements of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of Intersil or its subsidiaries.

For information regarding Intersil Corporation and its products, see web site **www.intersil.com**

Sales Office Headquarters

NORTH AMERICA

Intersil Corporation
P. O. Box 883, Mail Stop 53-204
Melbourne, FL 32902
TEL: (321) 724-7000
FAX: (321) 724-7240

EUROPE

Intersil SA
Mercure Center
100, Rue de la Fusee
1130 Brussels, Belgium
TEL: (32) 2.724.2111
FAX: (32) 2.724.22.05

ASIA

Intersil (Taiwan) Ltd.
7F-6, No. 101 Fu Hsing North Road
Taipei, Taiwan
Republic of China
TEL: (886) 2 2716 9310
FAX: (886) 2 2715 3029