

# GM62093A

## 12×8 CROSSPOINT SWITCH WITH CONTROL MEMORY

### Description

The GM62093A contains a 12×8 array of crosspoint together with a 7 to 96 Line decoder and latch circuits. The GM62093A employs LG's advanced high voltage CMOS process technology. It provides extra low operating current and low power dissipation.

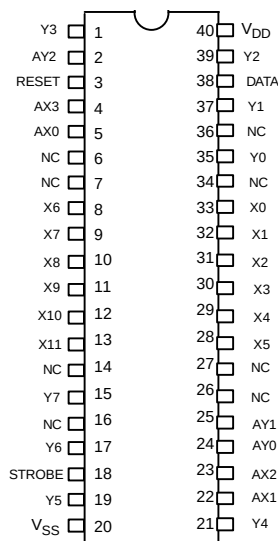
Anyone of the 96 switches can be addressed by selecting the appropriate 7 input bits. The selected turned on or off by applying a logical one or zero to the data in and the strobe input at logical one. A reset signal can be used to turn off all the switches together when is switched at logical one. The GM62093A is available in a 40 lead dual in-line plastic and ceramic package.

### Feature

- CMOS 12×8 Cross Point Switch with Control Memory
- Low On Resistance
- Internal Control Latches
- $DR_{on}$  15  $\Omega$  Max
- Less Than 1% Total Distortion at 0 dbm
- Extra Low Operating Current
- Extra Low Cross-Talk Between Any Two Switches
- Standard CMOS Noise Immunity
- TTL Compatible Input

### Pin Configuration

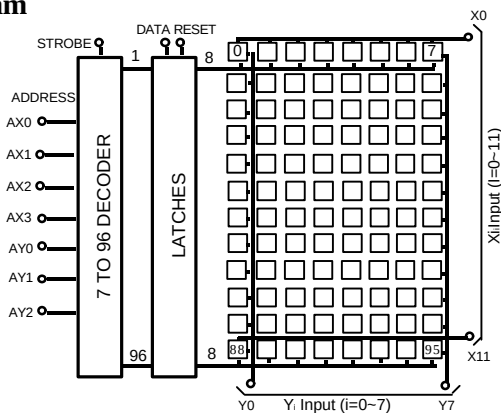
(Top View)



### Application

- PBX Systems
- Mobile Radio
- Test Equipment Instrumentation
- Analog/ Digital Multiplexer

### Block Diagram



### Absolute Maximum Rating

| SYMBOL              | PARAMETER                   | MIN  | MAX      | UNIT |
|---------------------|-----------------------------|------|----------|------|
| $V_{DD}$            | DC Supply Voltage           | -0.5 | 18       | V    |
| $V_{IN}$            | Input Voltage Range         | -0.5 | $V+0.5$  | V    |
| $I_{IN}$            | DC Input current            |      | $\pm 10$ | mA   |
| P(P-DIP)<br>(C-DIP) | Power Dissipation           |      | 0.6<br>1 | W    |
| $T_{OPR}$           | Operation Temperature Range | 0    | 70       | °C   |
| $T_{STG}$           | Storage Temperature Range   | -65  | 150      | °C   |

### Recommended Operating Range

| SYMBOL    | PARAMETER                   | MIN | MAX      | UNIT |
|-----------|-----------------------------|-----|----------|------|
| $V_{DD}$  | DC Supply                   | 8   | 16       | V    |
| $V_{IN}$  | Input Voltage Range         | 0   | $V_{DD}$ | V    |
| $T_{OPR}$ | Operation Temperature Range | 0   | 70       | °C   |

### Static Electrical Characteristics: ( $T_A = 0^\circ\text{C}$ to $70^\circ\text{C}$ , $V_{CC} = 14\text{V}$ )

| SYMBOL      | PARAMETER                              | TEST CONDITION                                                                                             | MIN   | TYP | MAX       | UNIT          |
|-------------|----------------------------------------|------------------------------------------------------------------------------------------------------------|-------|-----|-----------|---------------|
| CROSS POINT |                                        |                                                                                                            |       |     |           |               |
| $I_{DD}$    | Quiescent Supply Current               | All Digital Input at $V_{SS}$ or $V_{DD}$                                                                  |       |     | 100       | $\mu\text{A}$ |
|             |                                        | All Digital Input at 2.4 V                                                                                 |       | 7   | 15        | mA            |
| Ron         | On Resistance                          | $V_{DD} = 3.5\text{V}$ and $I(\text{thru S/W})=10\text{mA}$                                                |       |     | 65        | $\Omega$      |
| Ron         | Ron Difference Between Any Two Switchs |                                                                                                            |       |     | 15        | $\Omega$      |
| Asc         | Analog Signal Capability               | $V_{DD} = 14\text{V}$ All Switchs On<br>$V_{is} = 14\text{V}$ and<br>$I(\text{thru S/W})= -100\mu\text{A}$ | 13.96 |     | 14.0      | V             |
| $I_{LOFF}$  | Off Leakage                            | All Switch off $V=V=0$ to V                                                                                |       |     | $\pm 500$ | nA            |
| CONTROLS    |                                        |                                                                                                            |       |     |           |               |
| $V_{IL}$    | Input Low Voltage                      |                                                                                                            |       |     | 0.8       | V             |
| $V_{IH}$    | Input High Voltage                     |                                                                                                            | 2.4   |     |           | V             |
| $I_{LEAK}$  | Input Leakage                          | $V_{IN} = 0$ to $V_{DD}$                                                                                   |       |     | $\pm 500$ | nA            |

**Dynamic Electrical Characteristics : (  $T_A = 25^\circ\text{C}$  ,  $C_L = 50\text{pF}$  ,  $V_{DD} = 14\text{V}$  )**

| SYMBOL               | PARAMETER                                                        | TEST CONDITION                                                                            | MIN | TYP  | MAX | UNIT |
|----------------------|------------------------------------------------------------------|-------------------------------------------------------------------------------------------|-----|------|-----|------|
| CROSS POINT          |                                                                  |                                                                                           |     |      |     |      |
| $t_p$                | Propagation Delay Time                                           | $R_L = 1\text{k}\Omega$ , $V_{DC} = 5\text{V}$<br>$V_{IS} = 2V_{PP}$                      |     |      | 30  | NS   |
| $f_{RES}$            | Frequency Response<br>[ $20\log(V_{OUT}/V_{IN}) = -3\text{dB}$ ] | $R_L = 1\text{k}\Omega$ , $V_{DC} = 5\text{V}$<br>$V_{IS} = 2V_{PP}$ , $C_L = 3\text{pF}$ |     | 40   |     | MHz  |
|                      | Sine Wave Response(Distortion)                                   | $R_L = 1\text{k}\Omega$ , $V_{DC} = 5\text{V}$ , $V_{IS} = 2V_{PP}$ , $f = 1\text{MHz}$   |     |      | 1   | %    |
|                      | Feedthrough (All S/W's Off)                                      | $R_L = 1\text{k}\Omega$ , $V_{DC} = 5\text{V}$ $V_{IS} = 2V_{PP}$ , $f = 10\text{KHz}$    |     |      | -80 | dB   |
|                      | Crosstalk Between Any Two Channels                               | $R_S = 50\Omega$ , $R_L = 1\text{k}\Omega$ , $V_{IS} = 2V_{PP}$ , $f = 1\text{KHz}$       |     | -110 | -95 | dB   |
| $C_X$                | Capacitance (XN to Ground)                                       | Switch Off                                                                                |     |      | 20  | pF   |
| $C_Y$                | Capacitance (YN to Ground)                                       | Switch Off                                                                                |     |      | 30  | pF   |
| $C_{DI}$             | Digital Input Capacitance                                        |                                                                                           |     | 5    |     | pF   |
| CONTROL              |                                                                  |                                                                                           |     |      |     |      |
| $t_{DS}$             | Strobe to Switch Delay                                           | $R_L = 1\text{k}\Omega$ , $t_r = t_f = 20\text{nS}$                                       |     |      | 160 | nS   |
| $t_{DD}$             | Data to Switch Delay                                             | $R_L = 1\text{k}\Omega$ , $t_r = t_f = 20\text{nS}$                                       |     |      | 180 | nS   |
| $t_{DA}$             | Address to Switch Delay                                          | $R_L = 1\text{k}\Omega$ , $t_r = t_f = 20\text{nS}$                                       |     |      | 200 | nS   |
| $t_{DR}$             | Reset to Switch Delay                                            | $R_L = 1\text{k}\Omega$ , $t_r = t_f = 20\text{nS}$                                       |     |      | 200 | nS   |
| $t_{SD}$<br>$t_{SA}$ | Data Setup Time<br>Address Setup Time                            | $R_L = 1\text{k}\Omega$ , $t_r = t_f = 20\text{nS}$                                       | 30  |      |     | nS   |
| $t_{HD}$<br>$t_{HA}$ | Data Hold Time<br>Address Hold Time                              | $R_L = 1\text{k}\Omega$ , $t_r = t_f = 20\text{nS}$                                       | 30  |      |     | nS   |
| $t_{SW}$<br>$t_{RW}$ | Minimum Strobe Pulse Width<br>Minimum Reset Pulse Width          | $R_L = 1\text{k}\Omega$ , $t_r = t_f = 20\text{nS}$                                       | 200 |      |     | nS   |

**Functional Description**

The GM62093A contains a  $12 \times 8$  array of analog switches, each with a latch to maintain its on(closed) or off(opened) state.

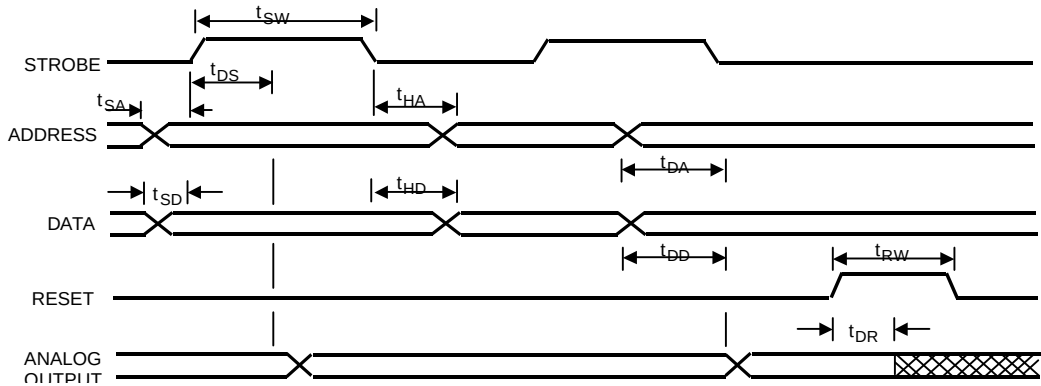
Seven ADDRESS lines (AX0~AX3, AY0~AY2) are provided to address any one of the 96 switches.

After any one of the switches is selected, the

DATA pin may be held high to turn the switch on, or low to turn it off.

Finally a positive pulse to the STROBE pin initiates the action determined by the ADDRESS and DATA pins. All 96 switches can be turned off by forcing the RESET pin high.

## Timing Diagram



## Truth Table

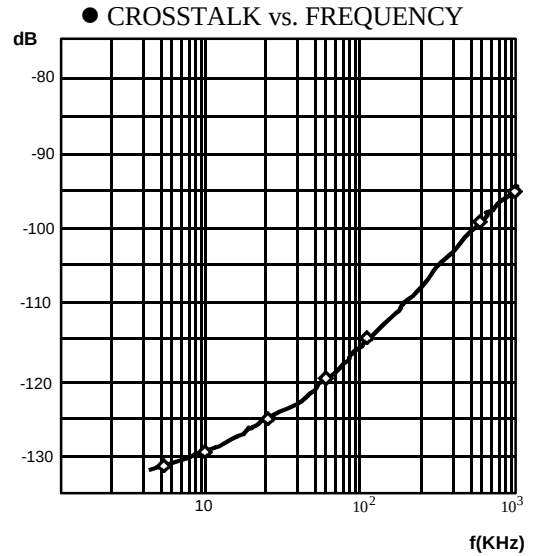
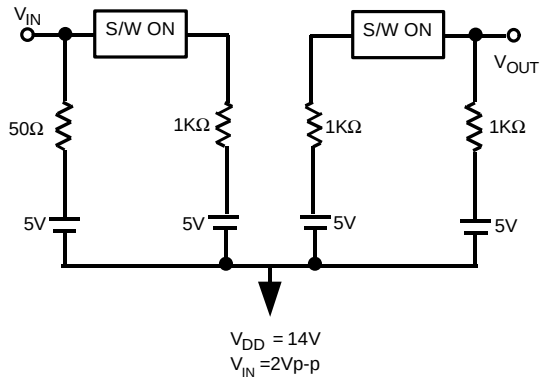
| Address |     |     |     |     |     |     | Connections |
|---------|-----|-----|-----|-----|-----|-----|-------------|
| AX0     | AX1 | AX2 | AX3 | AY0 | AY1 | AY2 |             |
| 0       | 0   | 0   | 0   | 0   | 0   | 0   | X0-Y0       |
| 1       | 0   | 0   | 0   | 0   | 0   | 0   | X1-Y0       |
| 0       | 1   | 0   | 0   | 0   | 0   | 0   | X2-Y0       |
| 1       | 1   | 0   | 0   | 0   | 0   | 0   | X3-Y0       |
| 0       | 0   | 1   | 0   | 0   | 0   | 0   | X4-Y0       |
| 1       | 0   | 1   | 0   | 0   | 0   | 0   | X5-Y0       |
| 0       | 0   | 0   | 1   | 0   | 0   | 0   | X6-Y0       |
| 1       | 0   | 0   | 1   | 0   | 0   | 0   | X7-Y0       |
| 0       | 1   | 0   | 1   | 0   | 0   | 0   | X8-Y0       |
| 1       | 1   | 0   | 1   | 0   | 0   | 0   | X9-Y0       |
| 0       | 0   | 1   | 1   | 0   | 0   | 0   | X10-Y0      |
| 1       | 0   | 1   | 1   | 0   | 0   | 0   | X11-Y0      |
| 0       | 0   | 0   | 0   | 1   | 0   | 0   | X0-Y1       |
| ↓       | ↓   | ↓   | ↓   | ↓   | ↓   | ↓   | ↓           |
| 1       | 0   | 1   | 1   | 1   | 0   | 0   | X11-Y1      |
| 0       | 0   | 0   | 0   | 0   | 1   | 0   | X0-Y2       |
| ↓       | ↓   | ↓   | ↓   | ↓   | ↓   | ↓   | ↓           |
| 1       | 0   | 1   | 1   | 0   | 1   | 0   | X11-Y2      |
| 0       | 0   | 0   | 0   | 1   | 1   | 0   | X0-Y3       |
| ↓       | ↓   | ↓   | ↓   | ↓   | ↓   | ↓   | ↓           |
| 1       | 0   | 1   | 1   | 1   | 1   | 0   | X11-Y3      |
| 0       | 0   | 0   | 0   | 0   | 0   | 1   | X0-Y4       |
| ↓       | ↓   | ↓   | ↓   | ↓   | ↓   | ↓   | ↓           |
| 1       | 0   | 1   | 1   | 0   | 0   | 1   | X11-Y4      |
| 0       | 0   | 0   | 0   | 1   | 0   | 1   | X0-Y5       |
| ↓       | ↓   | ↓   | ↓   | ↓   | ↓   | ↓   | ↓           |
| 1       | 0   | 1   | 1   | 1   | 0   | 1   | X11-Y5      |
| 0       | 0   | 0   | 0   | 0   | 1   | 1   | X0-Y6       |
| ↓       | ↓   | ↓   | ↓   | ↓   | ↓   | ↓   | ↓           |
| 1       | 0   | 1   | 1   | 0   | 1   | 1   | X11-Y6      |
| 0       | 0   | 0   | 0   | 1   | 1   | 1   | X0-Y7       |
| ↓       | ↓   | ↓   | ↓   | ↓   | ↓   | ↓   | ↓           |
| 1       | 0   | 1   | 1   | 1   | 1   | 1   | X11-Y7      |

$A_x = 0110, 1110, 0111$  and  $1111$  and not allowed

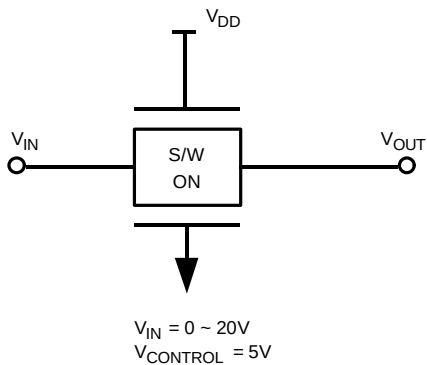
## Test circuit and Characteristics.

Fig.1-Crosstalk

### ● TEST CIRCUIT

Fig.2 –analog signal capability( $V_{IN}$  vs.  $V_{OUT}$ )

### ● TEST CIRCUIT



### ● RESULT

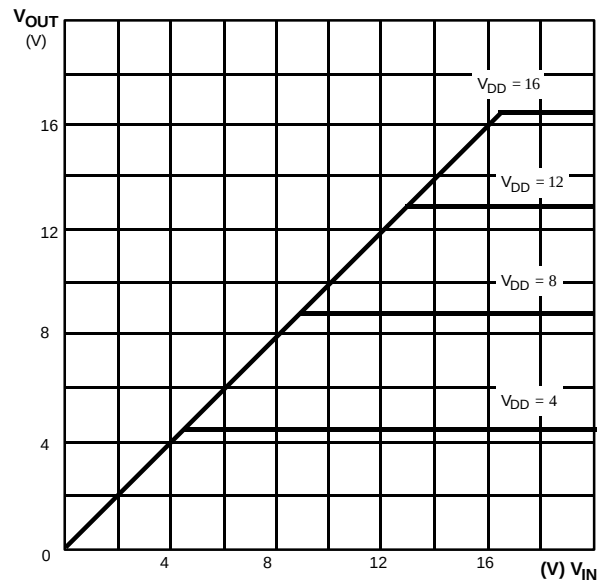
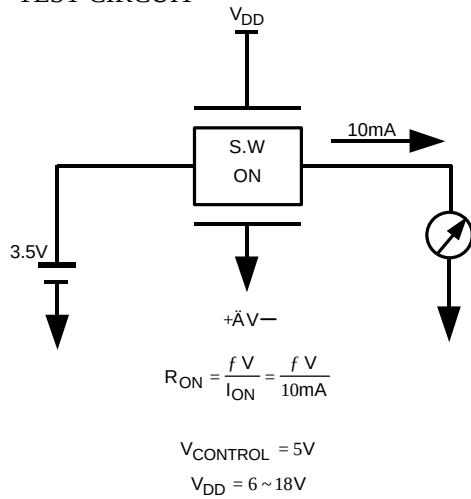


Fig.3-Ron measurement

## ● TEST CIRCUIT



## ● RESULT

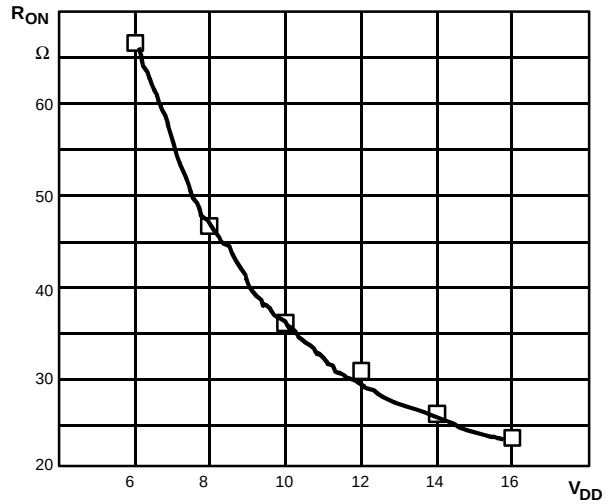
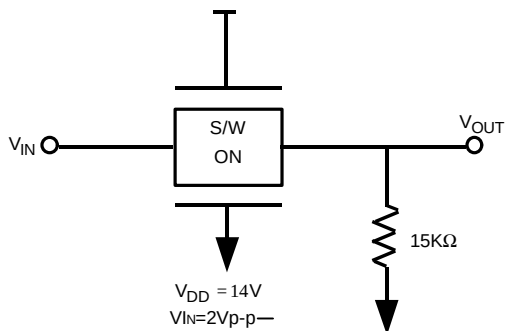


Fig.4-Frequency response.

## ● TEST CIRCUIT



## ● BANDWIDTH

(-3dB point: ABOUT 45MHz)

