

February 1999

**OBSOLETE PRODUCT**  
**NO RECOMMENDED REPLACEMENT**  
Call Central Applications 1-800-442-7747  
or email: centapp@harris.com

## CMOS 4 x 4 x 2 Crosspoint Switch with Control Memory

### Features

- Low ON Resistance . . . . .  $75\Omega$  (Typ) at  $V_{DD} = 12V$
- "Built - In" Latched Inputs
- Large Analog Signal Capability . . . . .  $\pm V_{DD}/2$
- Switch Bandwidth . . . . . 10MHz
- Matched Switch Characteristics  
 $\Delta R_{ON} = 8\Omega$  (Typ) at  $V_{DD} = 12V$
- High Linearity - 0.25% Distortion (Typ) at  $f = 1kHz$ ,  
 $V_{IN} = 5V_{P-P}$ ,  $V_{DD} - V_{SS} = 10V$ , and  $R_L = 1k\Omega$
- Standard CMOS Noise Immunity

### Applications

- Telephone Systems
- PBX
- Studio Audio Switching
- Multisystem Bus Interconnect

### Ordering Information

| PART NUMBER | TEMP. RANGE (°C) | PACKAGE      | PKG. NO. |
|-------------|------------------|--------------|----------|
| CD22101E    | -40 to 85        | 24 Ld PDIP   | E24.6    |
| CD22101F    | -55 to 125       | 24 Ld Cerdip | F24.6    |
| CD22102E    | -40 to 85        | 24 Ld PDIP   | E24.6    |

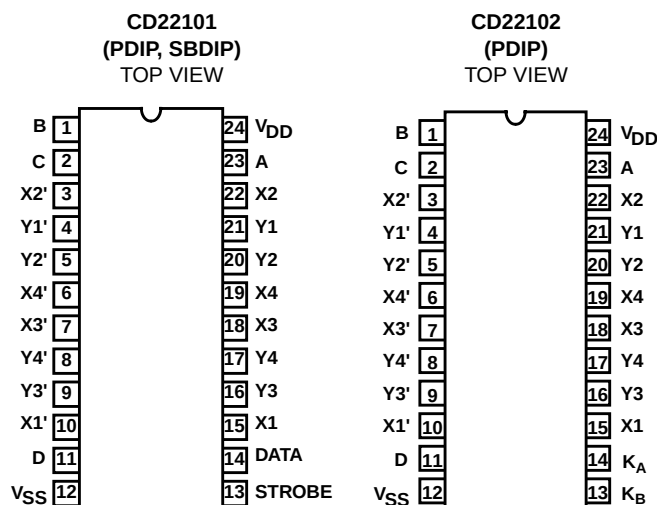
### Description

CD22101 and CD22102 crosspoint switches consist of 4 x 4 x 2 arrays of crosspoints (transmission gates) with a 4-line to 16-line decoder and 16 latch circuits. Any one of the sixteen crosspoint pairs can be selected by applying the appropriate four-line address, corresponding crosspoints in each array are turned on and off simultaneously. Any number of crosspoints can be turned on simultaneously.

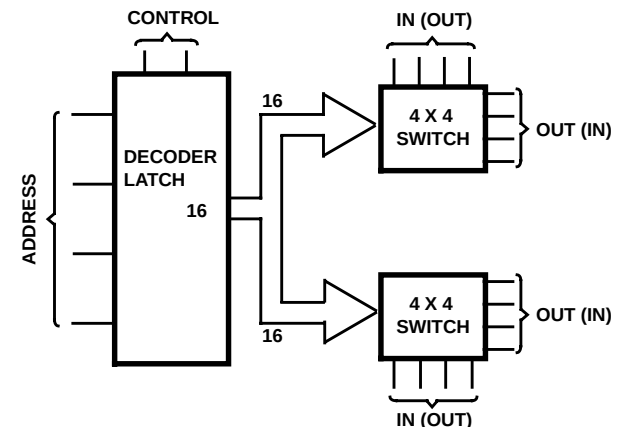
In the CD22101, the selected crosspoint pair can be turned on or off by applying a logic ONE or ZERO, respectively, to the data input, and applying a ONE to the strobe input. When the device is "powered up", the states of the 16 switches are indeterminate. Therefore, all switches must be turned off by putting the strobe high, data-in low, and then addressing all switches in succession.

The selected pair of crosspoints in the CD22102 is turned on by applying a logic ONE to the  $K_A$  (set) input while a logic ZERO is on the  $K_B$  input, and turned off by applying a logic ONE to the  $K_B$  (reset) input while a logic ZERO is on the  $K_A$  input. In this respect, the control latches of the CD22102 are similar to SET/RESET flip-flops. They differ, however, in that the simultaneous application of ONES to the  $K_A$  and  $K_B$  inputs turns off (resets) all crosspoints. All crosspoints in both devices must be turned off as  $V_{DD}$  is applied.

### Pinouts



### Functional Diagram



**Absolute Maximum Ratings**

Supply Voltage ( $V_{DD}$ ) (Referenced to  $V_{SS}$  Terminal) . . . . -0.5 to 20V  
 Input Voltage (All Inputs) . . . . . -0.5 to  $V_{DD} + 0.5V$   
 Supply Voltage Range

For  $T_A$  = Full Package Temperature Range . . . . . 3V to 18V  
 Input Current (Any One Input) (Note 1) . . . . .  $\pm 10mA$

**Power Dissipation**

For  $T_A$  = -40°C to 60°C (Package Type E) . . . . . 500mW  
 For  $T_A$  = 60°C to 85°C

Package Type E) . . . . . Derate Linearly 12mW/°C to 200mW  
 For  $T_A$  = -55°C to 100°C (Package Type D, F) . . . . . 500mW

For  $T_A$  = 100°C to 125°C

(Package Type D, F) . . . . . Derate Linearly 12mW/°C to 200mW

**Device Dissipation per Output Transistor**

For  $T_A$  = Full Package Temperature Range (All Types) . . . . . 100mW

**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.

**Thermal Information**

Maximum Junction Temperature . . . . . 175°C

Maximum Junction Temperature (Plastic Package) . . . . . 150°C

Maximum Storage Temperature Range . . . . . -65°C  $\leq T_A \leq$  150°C

Maximum Lead Temperature (Soldering 10s) . . . . . 300°C

**Operating Conditions****Temperature Range**

Package Type D, F. . . . . -55°C  $\leq T_A \leq$  125°C

Package Type E. . . . . -40°C  $\leq T_A \leq$  85°C

**Electrical Specifications**

Values at -55°C, 25°C, 125°C Apply to D, F, H Packages

Values at -40°C, 25°C, 85°C Apply to E Package

| PARAMETER                  | SYMBOL                | TEST CONDITIONS                                         |                     |     | -55°C | -40°C | 85°C | 125°C | 25°C |                   |      | UNITS |
|----------------------------|-----------------------|---------------------------------------------------------|---------------------|-----|-------|-------|------|-------|------|-------------------|------|-------|
|                            |                       | FIGURE                                                  | V <sub>DD</sub> (V) | MAX | MAX   | MAX   | MAX  | MIN   | TYP  | MAX               |      |       |
| STATIC CROSSPOINTS         |                       |                                                         |                     |     |       |       |      |       |      |                   |      |       |
| Quiescent Device Current   | I <sub>DD</sub> (Max) |                                                         | 1                   | 5   | 5     | 5     | 150  | 150   | -    | 0.04              | 5    | μA    |
|                            |                       |                                                         | 1                   | 10  | 10    | 10    | 300  | 300   | -    | 0.04              | 10   | μA    |
|                            |                       |                                                         | 1                   | 15  | 20    | 20    | 600  | 600   | -    | 0.04              | 20   | μA    |
|                            |                       |                                                         | 1                   | 20  | 100   | 100   | 3000 | 3000  | -    | 0.08              | 100  | μA    |
| On Resistance              | R <sub>ON</sub> (Max) | Any Switch<br>V <sub>IS</sub> = 0 to<br>V <sub>DD</sub> | 14                  | 5   | 475   | 500   | 725  | 800   | -    | 225               | 600  | Ω     |
|                            |                       |                                                         | 15                  | 10  | 135   | 145   | 205  | 230   | -    | 85                | 180  | Ω     |
|                            |                       |                                                         | -                   | 12  | 100   | 110   | 155  | 175   | -    | 75                | 135  | Ω     |
|                            |                       |                                                         | 16                  | 15  | 70    | 75    | 110  | 125   | -    | 65                | 95   | Ω     |
| Δ <sub>ON</sub> Resistance | ΔR <sub>ON</sub>      | Between Any Two<br>Switches                             | 5                   | -   | -     | -     | -    | -     | -    | 25                | -    | Ω     |
|                            |                       |                                                         | 10                  | -   | -     | -     | -    | -     | -    | 10                | -    | Ω     |
|                            |                       |                                                         | 12                  | -   | -     | -     | -    | -     | -    | 8                 | -    | Ω     |
|                            |                       |                                                         | 15                  | -   | -     | -     | -    | -     | -    | 5                 | -    | Ω     |
| OFF Leakage Current        | I <sub>L</sub> (Max)  | All Switches<br>OFF, V <sub>IS</sub> = 18V              | 4                   | 18  | ±1000 |       |      | -     | ±1   | ±100<br>(Note 2)  | nA   |       |
| STATIC CONTROLS            |                       |                                                         |                     |     |       |       |      |       |      |                   |      |       |
| Input Low Voltage          | V <sub>IL</sub> (Max) | OFF Switch I <sub>L</sub> < 0.2μA                       | 5                   | 1.5 |       |       |      | -     | -    | 1.5               | V    |       |
|                            |                       |                                                         | 10                  | 3   |       |       |      | -     | -    | 3                 | V    |       |
|                            |                       |                                                         | 15                  | 4   |       |       |      | -     | -    | 4                 | V    |       |
| Input High Voltage         | V <sub>IH</sub> (Min) | ON Switch See R <sub>ON</sub><br>Characteristic         | 5                   | 3.5 |       |       |      | 3.5   | -    | -                 | V    |       |
|                            |                       |                                                         | 10                  | 7   |       |       |      | 7     | -    | -                 | V    |       |
|                            |                       |                                                         | 15                  | 11  |       |       |      | 11    | -    | -                 | V    |       |
| Input Current              | I <sub>IN</sub> (Max) | Any Control<br>V <sub>IN</sub> = 0, 18V                 | 2                   | 18  | ±0.1  | ±0.1  | ±1   | ±1    | -    | ±10 <sup>-5</sup> | ±0.1 | μA    |

**NOTES:**

- Maximum current through transmission gates (switches) = 25mA.
- Determined by minimum feasible leakage measurement for automatic testing.

# CD22101, CD22102

## Electrical Specifications $T_A = 25^\circ\text{C}$

| PARAMETER                                                                                          | SYMBOL                              | TEST CONDITIONS |                                                                                        |                        |                                 |                        | MIN | TYP  | MAX  | UNITS |
|----------------------------------------------------------------------------------------------------|-------------------------------------|-----------------|----------------------------------------------------------------------------------------|------------------------|---------------------------------|------------------------|-----|------|------|-------|
|                                                                                                    |                                     | FIGURE          | f <sub>IS</sub><br>(kHz)                                                               | R <sub>L</sub><br>(kΩ) | V <sub>IS</sub> (V)<br>(Note 3) | V <sub>DD</sub><br>(V) |     |      |      |       |
| DYNAMIC CROSSPOINTS                                                                                |                                     |                 |                                                                                        |                        |                                 |                        |     |      |      |       |
| Propagation Delay Time,<br>(Switch ON) Signal Input to Output                                      | t <sub>PHL</sub> , t <sub>PLH</sub> | 5               | -                                                                                      | -                      | 5                               | 5                      | -   | 30   | 60   | ns    |
|                                                                                                    |                                     |                 | -                                                                                      | 10                     | 10                              | 10                     | -   | 15   | 30   | ns    |
|                                                                                                    |                                     |                 |                                                                                        |                        | 15                              | 15                     | -   | 10   | 20   | ns    |
|                                                                                                    |                                     |                 | C <sub>L</sub> = 50pF; t <sub>R</sub> , t <sub>F</sub> = 20ns                          |                        |                                 |                        |     |      |      |       |
| Frequency Response (Any Switch ON)                                                                 | f <sub>3dB</sub>                    | 19              | 1                                                                                      | 1                      | 5                               | 10                     | -   | 40   | -    | MHz   |
|                                                                                                    |                                     |                 | Sine Wave Input, 20log $\frac{V_{OS}}{V_{IS}}$ = -3dB                                  |                        |                                 |                        |     |      |      |       |
| Sine Wave Response (Distortion)                                                                    | THD                                 | -               | 1                                                                                      | 1                      | 2.5                             | 5                      | -   | 1    | -    | %     |
|                                                                                                    |                                     |                 | 1                                                                                      | 1                      | 5                               | 10                     | -   | 0.25 | -    | %     |
|                                                                                                    |                                     |                 | 1                                                                                      | 1                      | 7.5                             | 15                     | -   | 0.15 | -    | %     |
| Feedthrough (All Switches OFF)                                                                     | F <sub>DT</sub>                     | 13              | 1.6                                                                                    | 0.6                    | 2 (Note 4)                      | 10                     | -   | -96  | -    | dB    |
|                                                                                                    |                                     |                 | Sine Wave Input                                                                        |                        |                                 |                        |     |      |      |       |
| Frequency for Signal Crosstalk<br>Attenuation of 40dB                                              | F <sub>CT</sub>                     | 12              | -                                                                                      | 0.6                    | 1 (Note 4)                      | 10                     | -   | 2.5  | -    | MHz   |
|                                                                                                    |                                     |                 | Sine Wave Input                                                                        |                        |                                 |                        |     | 0.1  |      | kHz   |
| Capacitance:                                                                                       |                                     |                 |                                                                                        |                        |                                 |                        |     |      |      |       |
| X <sub>N</sub> to Ground                                                                           | C <sub>IS</sub>                     |                 |                                                                                        | -                      | -                               | -                      | -   | 25   | -    | pF    |
| Y <sub>N</sub> to Ground                                                                           |                                     |                 |                                                                                        | -                      | -                               | -                      | -   | 60   | -    | pF    |
| Feedthrough                                                                                        | C <sub>IOS</sub>                    |                 |                                                                                        |                        | -                               | -                      | -   | -    | 0.6  | -     |
| DYNAMIC CONTROLS                                                                                   |                                     |                 |                                                                                        |                        |                                 |                        |     |      |      |       |
| Propagation Delay Time: High Impedance to High Level or Low Level<br><br>Strobe to Output, CD22101 | t <sub>PZH</sub> , t <sub>PZL</sub> | 6               | R <sub>L</sub> = 1kΩ, C <sub>L</sub> = 50pF,<br>t <sub>R</sub> , t <sub>F</sub> = 20ns |                        |                                 | 5                      | -   | 500  | 1000 | ns    |
|                                                                                                    |                                     |                 |                                                                                        |                        |                                 | 10                     | -   | 230  | 460  | ns    |
|                                                                                                    |                                     |                 |                                                                                        |                        |                                 | 15                     | -   | 170  | 340  | ns    |
| Data-In to Output, CD22101                                                                         | t <sub>PZH</sub> , t <sub>PZL</sub> | 7               | R <sub>L</sub> = 1kΩ, C <sub>L</sub> = 50pF,<br>t <sub>R</sub> , t <sub>F</sub> = 20ns |                        |                                 | 5                      | -   | 515  | 1000 | ns    |
|                                                                                                    |                                     |                 |                                                                                        |                        |                                 | 10                     | -   | 220  | 440  | ns    |
|                                                                                                    |                                     |                 |                                                                                        |                        |                                 | 15                     | -   | 170  | 340  | ns    |
| K <sub>A</sub> to Output, CD22102                                                                  | t <sub>PZH</sub> , t <sub>PZL</sub> | -               | R <sub>L</sub> = 1kΩ, C <sub>L</sub> = 50pF,<br>t <sub>R</sub> , t <sub>F</sub> = 20ns |                        |                                 | 5                      | -   | 500  | 1000 | ns    |
|                                                                                                    |                                     |                 |                                                                                        |                        |                                 | 10                     | -   | 215  | 430  | ns    |
|                                                                                                    |                                     |                 |                                                                                        |                        |                                 | 15                     | -   | 160  | 320  | ns    |
| Address to Output<br>CD22101, CD22102                                                              | t <sub>PZH</sub> , t <sub>PZL</sub> | 8               | R <sub>L</sub> = 1kΩ, C <sub>L</sub> = 50pF,<br>t <sub>R</sub> , t <sub>F</sub> = 20ns |                        |                                 | 5                      | -   | 480  | 960  | ns    |
|                                                                                                    |                                     |                 |                                                                                        |                        |                                 | 10                     | -   | 225  | 450  | ns    |
|                                                                                                    |                                     |                 |                                                                                        |                        |                                 | 15                     | -   | 155  | 300  | ns    |

# CD22101, CD22102

## Electrical Specifications $T_A = 25^\circ\text{C}$ (Continued)

| PARAMETER                                                                                      | SYMBOL                              | TEST CONDITIONS |                                                                                        |                        |                                 |                        | MIN | TYP | MAX | UNITS |
|------------------------------------------------------------------------------------------------|-------------------------------------|-----------------|----------------------------------------------------------------------------------------|------------------------|---------------------------------|------------------------|-----|-----|-----|-------|
|                                                                                                |                                     | FIGURE          | f <sub>IS</sub><br>(kHz)                                                               | R <sub>L</sub><br>(kΩ) | V <sub>IS</sub> (V)<br>(Note 3) | V <sub>DD</sub><br>(V) |     |     |     |       |
| Propagation Delay Time: High Level or Low Level to High Impedance<br>Strobe to Output, CD22101 | t <sub>PHZ</sub> , t <sub>PLZ</sub> | 6               | R <sub>L</sub> = 1kΩ, C <sub>L</sub> = 50pF,<br>t <sub>R</sub> , t <sub>F</sub> = 20ns | 5                      | -                               | 450                    | 900 | ns  |     |       |
|                                                                                                |                                     |                 |                                                                                        | 10                     | -                               | 200                    | 400 | ns  |     |       |
|                                                                                                |                                     |                 |                                                                                        | 15                     | -                               | 135                    | 270 | ns  |     |       |
| K <sub>B</sub> to Output, CD22102                                                              | t <sub>PHZ</sub> , t <sub>PLZ</sub> | -               | R <sub>L</sub> = 1kΩ, C <sub>L</sub> = 50pF,<br>t <sub>R</sub> , t <sub>F</sub> = 20ns | 5                      | -                               | 450                    | 900 | ns  |     |       |
|                                                                                                |                                     |                 |                                                                                        | 10                     | -                               | 200                    | 400 | ns  |     |       |
|                                                                                                |                                     |                 |                                                                                        | 15                     | -                               | 130                    | 260 | ns  |     |       |
| Data-In to Output, CD22101                                                                     | t <sub>PHZ</sub> , t <sub>PLZ</sub> | -               | R <sub>L</sub> = 1kΩ, C <sub>L</sub> = 50pF,<br>t <sub>R</sub> , t <sub>F</sub> = 20ns | 5                      | -                               | 450                    | 900 | ns  |     |       |
|                                                                                                |                                     |                 |                                                                                        | 10                     | -                               | 165                    | 330 | ns  |     |       |
|                                                                                                |                                     |                 |                                                                                        | 15                     | -                               | 110                    | 220 | ns  |     |       |
| K <sub>A</sub> • K <sub>B</sub> to Output, CD22102                                             | t <sub>PHZ</sub> , t <sub>PLZ</sub> | -               | R <sub>L</sub> = 1kΩ, C <sub>L</sub> = 50pF,<br>t <sub>R</sub> , t <sub>F</sub> = 20ns | 5                      | -                               | 280                    | 560 | ns  |     |       |
|                                                                                                |                                     |                 |                                                                                        | 10                     | -                               | 130                    | 260 | ns  |     |       |
|                                                                                                |                                     |                 |                                                                                        | 15                     | -                               | 90                     | 180 | ns  |     |       |
| Address to Output<br>CD22101, CD22102                                                          | t <sub>PHZ</sub> , t <sub>PLZ</sub> | 8               | R <sub>L</sub> = 1kΩ, C <sub>L</sub> = 50pF,<br>t <sub>R</sub> , t <sub>F</sub> = 20ns | 5                      | -                               | 425                    | 850 | ns  |     |       |
|                                                                                                |                                     |                 |                                                                                        | 10                     | -                               | 190                    | 380 | ns  |     |       |
|                                                                                                |                                     |                 |                                                                                        | 15                     | -                               | 130                    | 260 | ns  |     |       |
| Minimum Strobe Pulse Width,<br>CD22101                                                         | t <sub>W</sub>                      | 6               | R <sub>L</sub> = 1kΩ, C <sub>L</sub> = 50pF,<br>t <sub>R</sub> , t <sub>F</sub> = 20ns | 5                      | -                               | 260                    | 500 | ns  |     |       |
|                                                                                                |                                     |                 |                                                                                        | 10                     | -                               | 120                    | 240 | ns  |     |       |
|                                                                                                |                                     |                 |                                                                                        | 15                     | -                               | 80                     | 160 | ns  |     |       |
| Address to Strobe Setup or Hold<br>Times, CD22101                                              | t <sub>SU</sub> , t <sub>H</sub>    | 9               | R <sub>L</sub> = 1kΩ, C <sub>L</sub> = 50pF,<br>t <sub>R</sub> , t <sub>F</sub> = 20ns | 5                      | -                               | -160                   | 0   | ns  |     |       |
|                                                                                                |                                     |                 |                                                                                        | 10                     | -                               | -70                    | 0   | ns  |     |       |
|                                                                                                |                                     |                 |                                                                                        | 15                     | -                               | -50                    | 0   | ns  |     |       |
| Strobe to Data-In Hold Time,<br>CD22101                                                        | t <sub>HHL</sub> , t <sub>HLH</sub> | 10              | R <sub>L</sub> = 1kΩ, C <sub>L</sub> = 50pF,<br>t <sub>R</sub> , t <sub>F</sub> = 20ns | 5                      | -                               | 200                    | 400 | ns  |     |       |
|                                                                                                |                                     |                 |                                                                                        | 10                     | -                               | 80                     | 160 | ns  |     |       |
|                                                                                                |                                     |                 |                                                                                        | 15                     | -                               | 60                     | 120 | ns  |     |       |
| Address to K <sub>A</sub> and K <sub>B</sub> Setup or Hold<br>Times, CD22102                   | t <sub>SU</sub> , t <sub>H</sub>    | -               | R <sub>L</sub> = 1kΩ, C <sub>L</sub> = 50pF,<br>t <sub>R</sub> , t <sub>F</sub> = 20ns | 5                      | -                               | -160                   | 0   | ns  |     |       |
|                                                                                                |                                     |                 |                                                                                        | 10                     | -                               | -70                    | 0   | ns  |     |       |
|                                                                                                |                                     |                 |                                                                                        | 15                     | -                               | -50                    | 0   | ns  |     |       |
| Minimum K <sub>A</sub> • K <sub>B</sub> Pulse Width,<br>CD22102                                | t <sub>W</sub>                      | -               | R <sub>L</sub> = 1kΩ, C <sub>L</sub> = 50pF,<br>t <sub>R</sub> , t <sub>F</sub> = 20ns | 5                      | -                               | 375                    | 750 | ns  |     |       |
|                                                                                                |                                     |                 |                                                                                        | 10                     | -                               | 160                    | 320 | ns  |     |       |
|                                                                                                |                                     |                 |                                                                                        | 15                     | -                               | 110                    | 220 | ns  |     |       |
| Minimum K <sub>A</sub> Pulse Width, CD22102                                                    | t <sub>W</sub>                      | -               | R <sub>L</sub> = 1kΩ, C <sub>L</sub> = 50pF,<br>t <sub>R</sub> , t <sub>F</sub> = 20ns | 5                      | -                               | 425                    | 850 | ns  |     |       |
|                                                                                                |                                     |                 |                                                                                        | 10                     | -                               | 175                    | 350 | ns  |     |       |
|                                                                                                |                                     |                 |                                                                                        | 15                     | -                               | 120                    | 240 | ns  |     |       |

# CD22101, CD22102

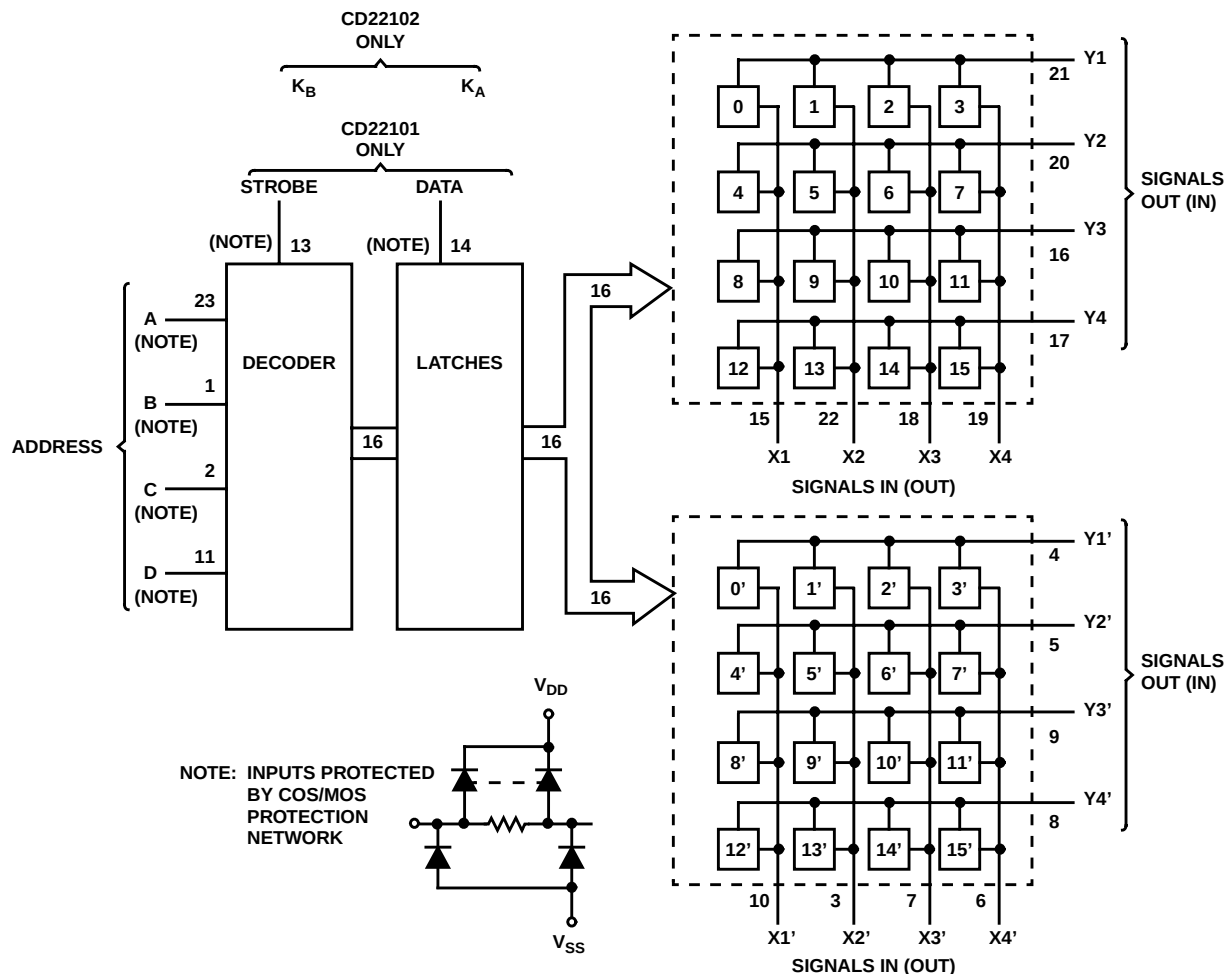
## Electrical Specifications $T_A = 25^\circ\text{C}$ (Continued)

| PARAMETER                                               | SYMBOL          | TEST CONDITIONS |                                                                                         |                        |                                 |                        | MIN | TYP | MAX | UNITS              |
|---------------------------------------------------------|-----------------|-----------------|-----------------------------------------------------------------------------------------|------------------------|---------------------------------|------------------------|-----|-----|-----|--------------------|
|                                                         |                 | FIGURE          | f <sub>IS</sub><br>(kHz)                                                                | R <sub>L</sub><br>(kΩ) | V <sub>IS</sub> (V)<br>(Note 3) | V <sub>DD</sub><br>(V) |     |     |     |                    |
| Minimum K <sub>B</sub> Pulse Width, CD22102             | t <sub>W</sub>  | -               | R <sub>L</sub> = 1kΩ, C <sub>L</sub> = 50pF,<br>t <sub>R</sub> , t <sub>F</sub> = 20ns  |                        |                                 | 5                      | -   | 200 | 400 | ns                 |
|                                                         |                 |                 |                                                                                         |                        |                                 | 10                     | -   | 90  | 180 | ns                 |
|                                                         |                 |                 |                                                                                         |                        |                                 | 15                     | -   | 70  | 140 | ns                 |
| Control Crosstalk, Data-In, Address or Strobe to Output |                 | 11              | 100                                                                                     | 10                     |                                 | 5                      | -   | 75  | -   | mV <sub>PEAK</sub> |
|                                                         |                 |                 | Square Wave Input = 5V,<br>t <sub>R</sub> , t <sub>F</sub> = 20ns, R <sub>S</sub> = 1kΩ |                        |                                 |                        |     |     |     |                    |
| Input Capacitance                                       | C <sub>IN</sub> |                 | Any Control Input                                                                       |                        |                                 | -                      | -   | 5   | 7.5 | pF                 |

NOTES:

3. Peak-to-peak voltage symmetrical about  $\frac{V_{DD}}{2}$ , unless otherwise specified.
4. RMS.

## Functional Block Diagram





## CD22101, CD22102

CONTROL TRUTH TABLE FOR CD22101

| FUNCTION   | ADDRESS |   |   |   | STROBE | DATA | SELECT                     |
|------------|---------|---|---|---|--------|------|----------------------------|
|            | A       | B | C | D |        |      |                            |
| Switch ON  | 1       | 1 | 1 | 1 | 1      | 1    | 15 (X4Y4) and 15' (X4'Y4') |
| Switch OFF | 1       | 1 | 1 | 1 | 1      | 0    | 15 (X4Y4) and 15' (X4'Y4') |
| No Change  | X       | X | X | X | 0      | X    | X X X X                    |

1 = High Level

0 = Low Level

X = Don't Care

CONTROL TRUTH TABLE FOR CD22102

| FUNCTION                  | ADDRESS |   |   |   | K <sub>A</sub> | K <sub>B</sub> | SELECT                     |
|---------------------------|---------|---|---|---|----------------|----------------|----------------------------|
|                           | A       | B | C | D |                |                |                            |
| Switch ON                 | 1       | 1 | 1 | 1 | 1              | 0              | 15 (X4Y4) and 15' (X4'Y4') |
| Switch OFF                | 1       | 1 | 1 | 1 | 0              | 1              | 15 (X4Y4) and 15' (X4'Y4') |
| All Switches OFF (Note 5) | X       | X | X | X | 1              | 1              | All                        |
| No Change                 | X       | X | X | X | 0              | 0              | X X X X                    |

1 = High Level

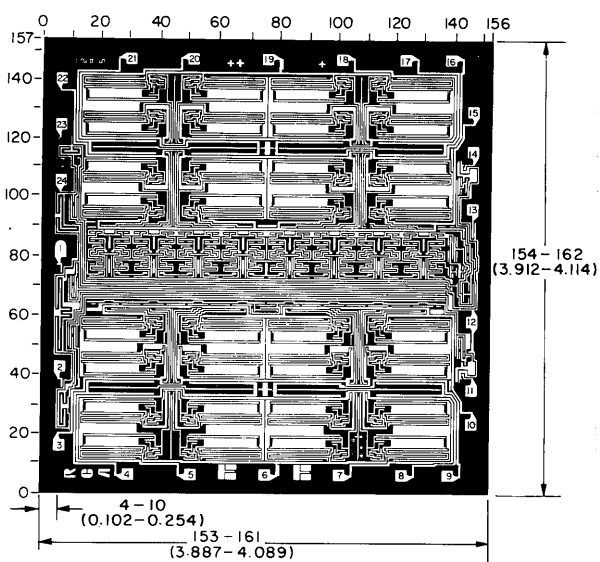
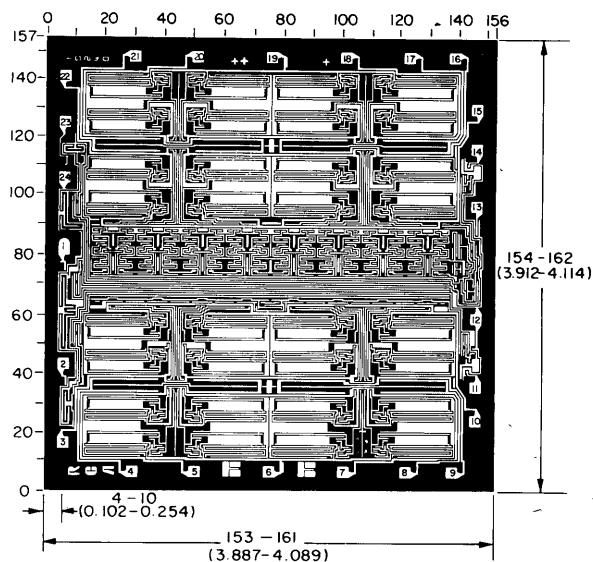
0 = Low Level

X = Don't Care

NOTE:

- In the event that K<sub>A</sub> and K<sub>B</sub> are changed from levels 1, 1 to 0, 0 K<sub>B</sub> should not be allowed to go to 0 before K<sub>A</sub>, otherwise a switch which was off will inadvertently be turned on.

### Metallization Mask Layout



Dimensions in parenthesis are in millimeters and are derived from the basic inch dimensions as indicated. Grid graduations are in mils ( $10^{-3}$  inch).

# Test Circuits and Waveforms

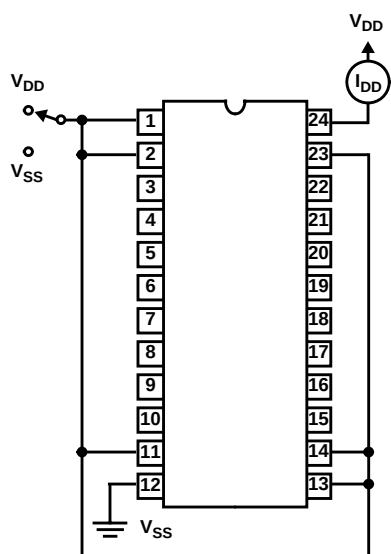
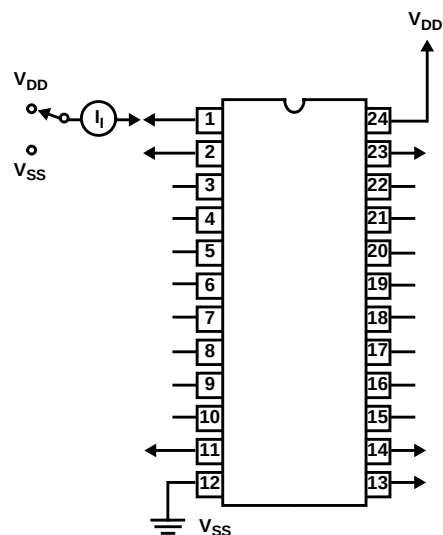
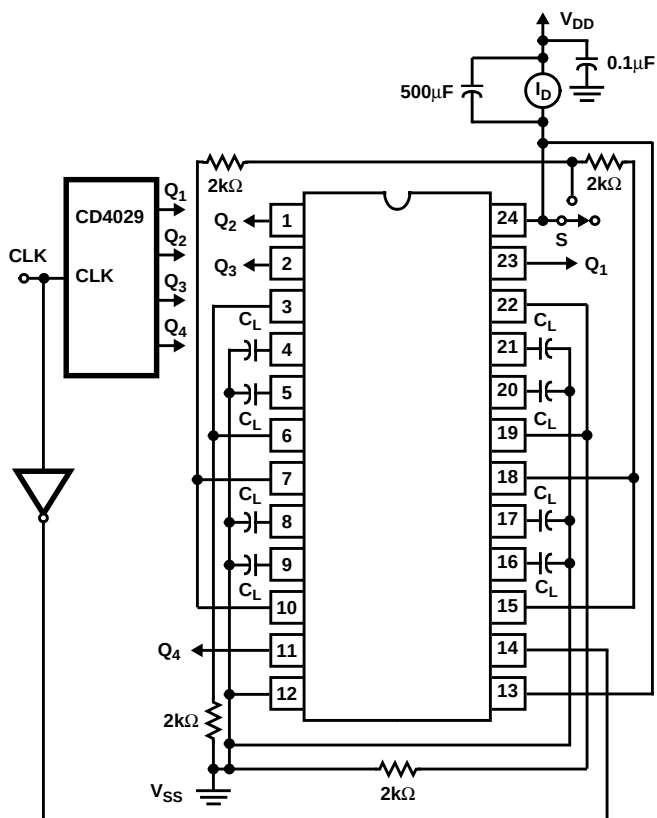


FIGURE 1. QUIESCENT CURRENT TEST CIRCUIT



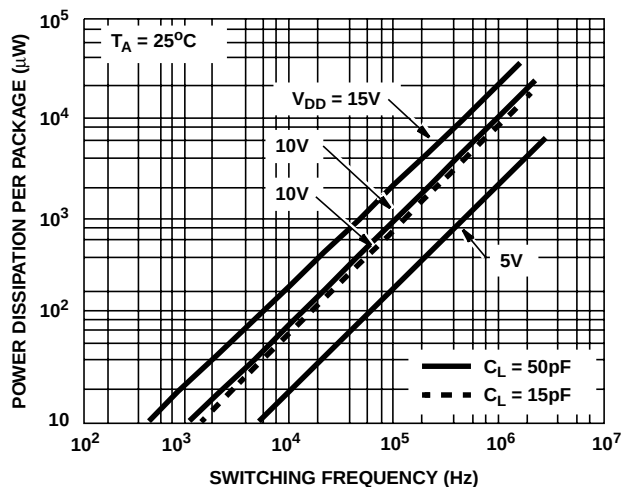
MEASURE INPUTS SEQUENTIALLY TO BOTH  $V_{DD}$  AND  $V_{SS}$   
CONNECT ALL UNUSED INPUTS TO EITHER  $V_{DD}$  OR  $V_{SS}$

FIGURE 2. INPUT CURRENT TEST CIRCUIT



CLOSE SWITCH S AFTER APPLYING  $V_{DD}$

FIGURE 3. DYNAMIC POWER DISSIPATION TEST CIRCUIT FOR CD22101AND TYPICAL DYNAMIC POWER DISSIPATION AS A FUNCTION OF SWITCHING FREQUENCY





**Test Circuits and Waveforms** (Continued)

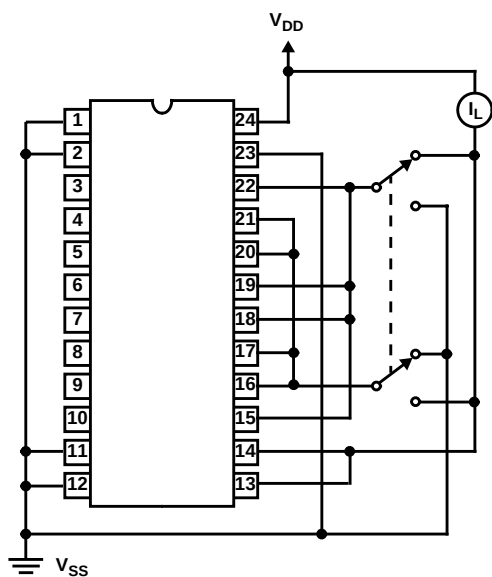
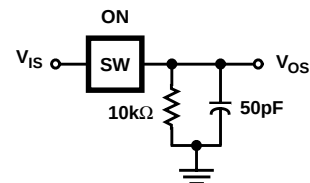


FIGURE 4. OFF SWITCH INPUT OR OUTPUT LEAKAGE CURRENT TEST CIRCUIT (16 OF 32 SWITCHES)



SW = ANY CROSSPOINT  
STROBE = DATA - IN =  $V_{DD}$

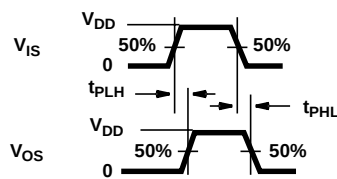


FIGURE 5. PROPAGATION DELAY TIME TEST CIRCUIT AND WAVEFORMS (SIGNAL INPUT TO SIGNAL OUTPUT, SWITCH ON)

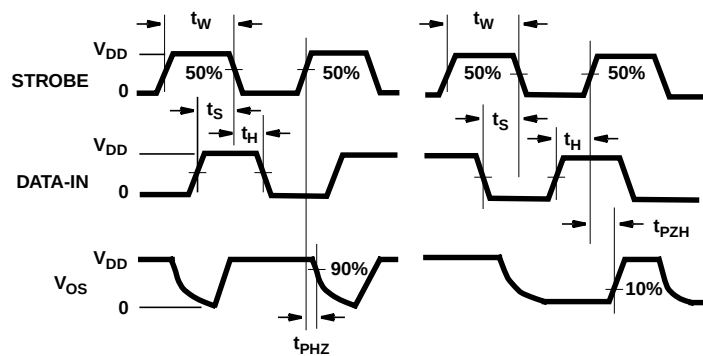
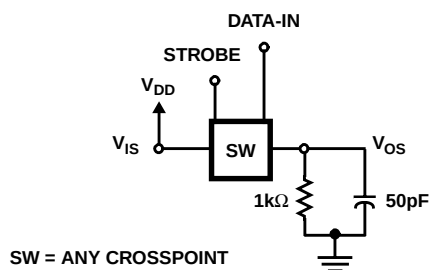


FIGURE 6. PROPAGATION DELAY TIME TEST CIRCUIT AND WAVEFORMS (STROBE TO SIGNAL OUTPUT, SWITCH TURN-ON OR TURN-OFF)

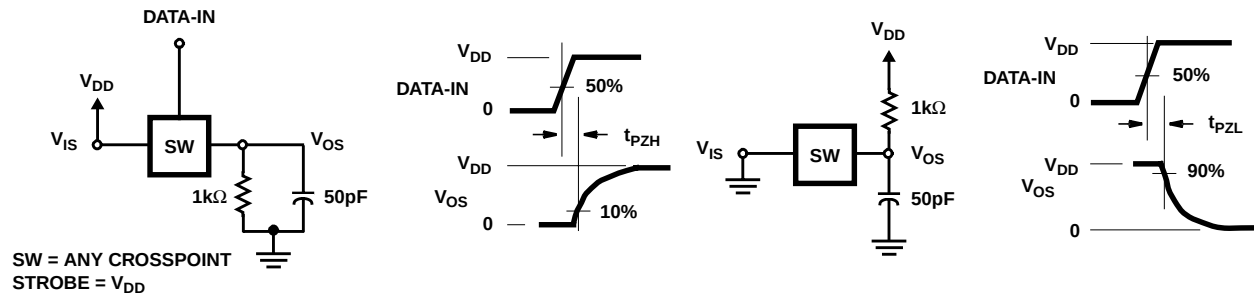
**Test Circuits and Waveforms** (Continued)

FIGURE 7. PROPAGATION DELAY TIME TEST CIRCUIT AND WAVEFORMS  
(DATA-IN TO SIGNAL OUTPUT, SWITCH TURN-ON TO HIGH OR LOW LEVEL)

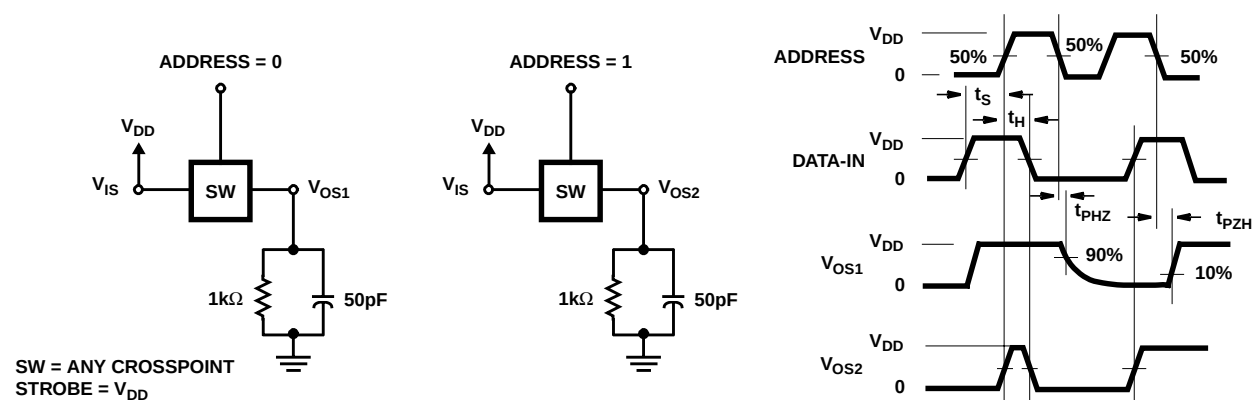
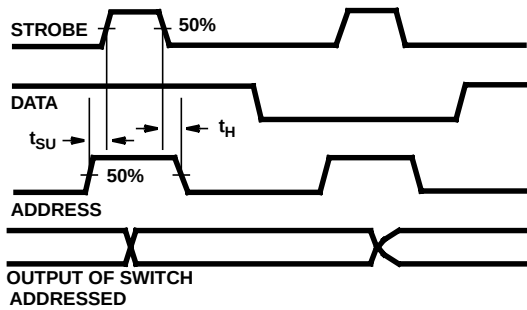
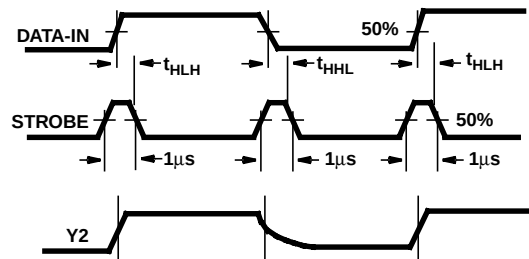


FIGURE 8. PROPAGATION DELAY TIME TEST CIRCUIT AND WAVEFORMS  
(ADDRESS TO SIGNAL OUTPUT, SWITCH TURN-ON OR TURN-OFF)

# Test Circuits and Waveforms (Continued)



IF SETUP AND HOLD TIMES PROVIDED ARE TOO SHORT, AN UNADDRESSED SWITCH MAY BE TURNED ON OR OFF SIMULTANEOUSLY WITH THE ADDRESSED SWITCH



SET ALL SWITCHES TO OFF INITIALLY APPLY VDD TO ALL X INPUTS AND RETURN ALL Y OUTPUTS TO VSS THROUGH 1kΩ ADDRESS X1Y2 (ABCD) WITH  $f_{IN} = 10\text{kHz}$

FIGURE 9. ADDRESS TO STROBE SETUP AND HOLD TIMES

FIGURE 10. STROBE TO DATA-IN HOLD TIME  $t_H$ , FOR CD22101

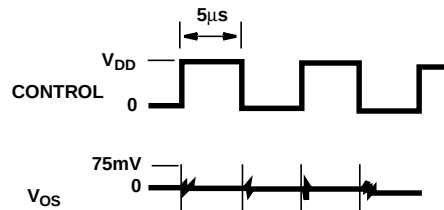
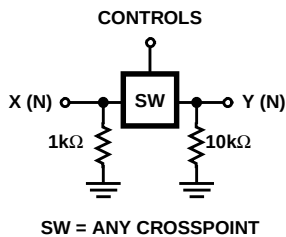


FIGURE 11. TEST CIRCUIT AND WAVEFORMS FOR CROSSTALK (CONTROL INPUT TO SIGNAL OUTPUT)

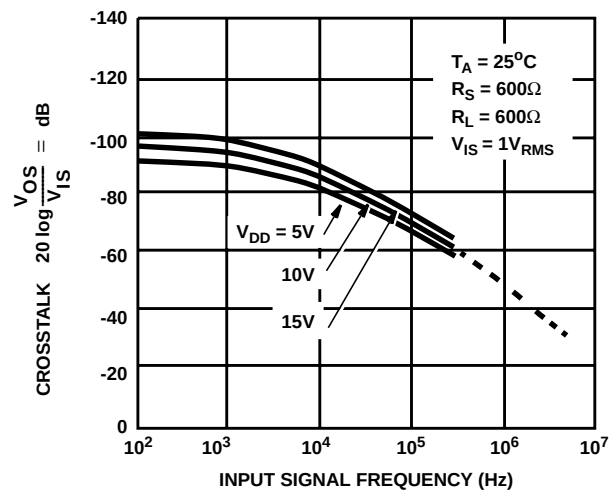
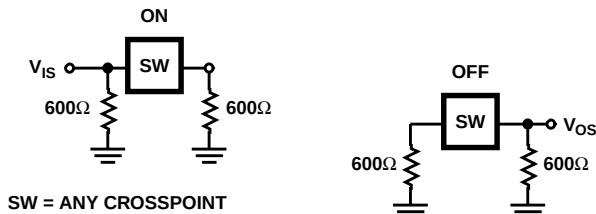


FIGURE 12. TEST CIRCUIT AND TYPICAL CROSSTALK AS A FUNCTION OF FREQUENCY BETWEEN SWITCH CIRCUITS IN THE SAME PACKAGE

### Test Circuits and Waveforms (Continued)

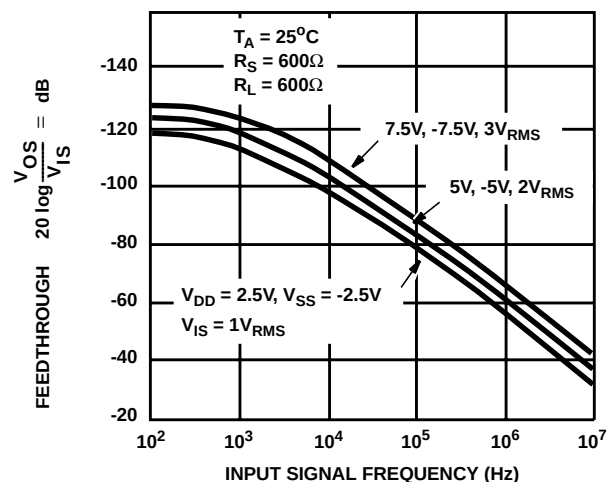
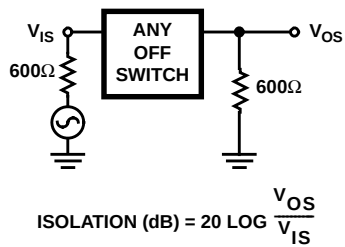


FIGURE 13. TEST CIRCUIT AND TYPICAL FEEDTHROUGH AS A FUNCTION OF FREQUENCY (ANY OFF SWITCH)

### Typical Performance Curves

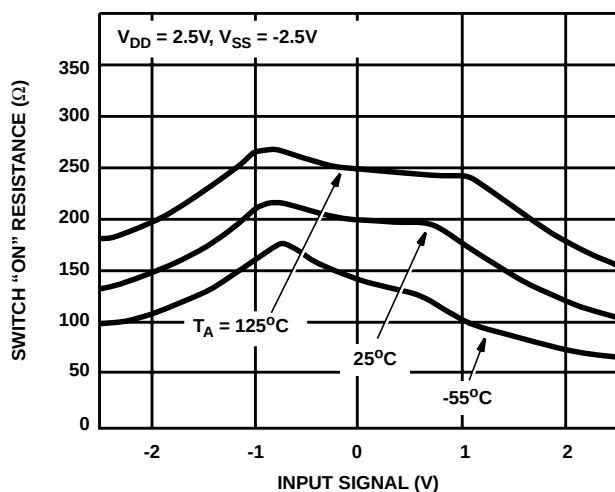


FIGURE 14. TYPICAL ON RESISTANCE AS A FUNCTION OF INPUT SIGNAL VOLTAGE AT  $V_{DD} = -V_{SS} = 2.5\text{V}$

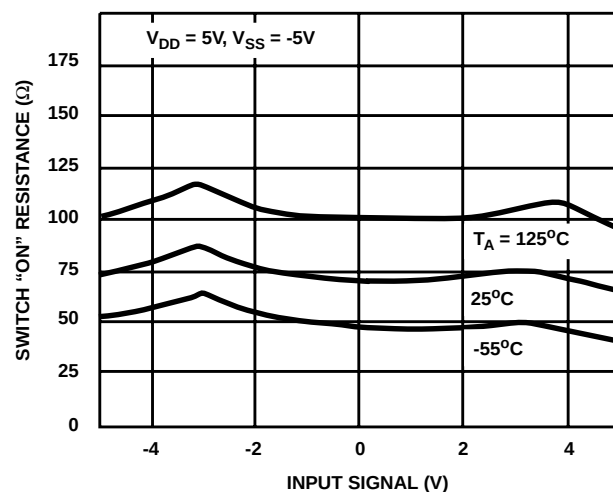


FIGURE 15. TYPICAL ON RESISTANCE AS A FUNCTION OF INPUT SIGNAL VOLTAGE AT  $V_{DD} = -V_{SS} = 5\text{V}$

## Typical Performance Curves (Continued)

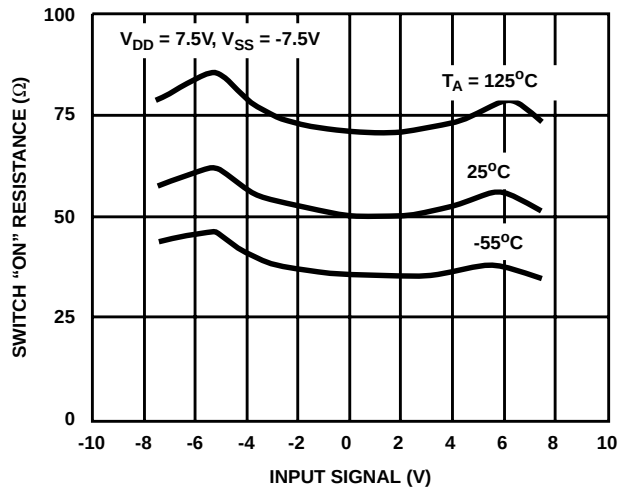


FIGURE 16. TYPICAL ON RESISTANCE AS A FUNCTION OF INPUT SIGNAL VOLTAGE AT  $V_{DD} = -V_{SS} = 7.5V$

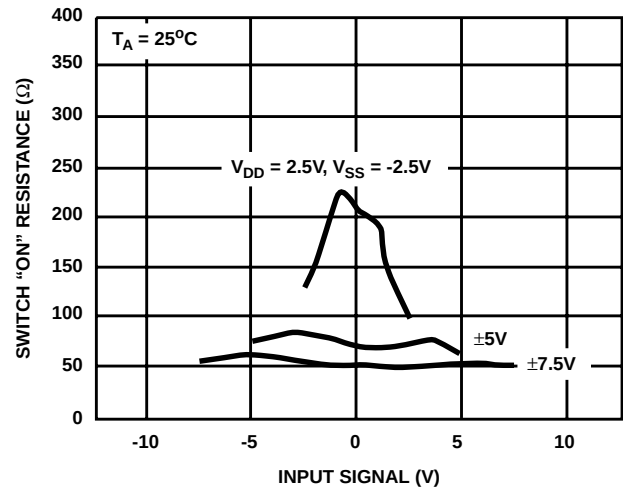


FIGURE 17. TYPICAL ON RESISTANCE AS A FUNCTION OF INPUT SIGNAL VOLTAGE AT  $T_A = 25^\circ C$

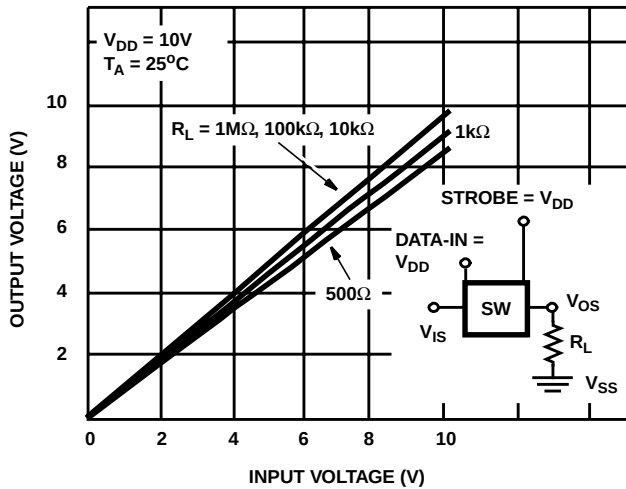


FIGURE 18. TYPICAL SWITCH ON TRANSFER CHARACTERISTICS (1 OF 16 SWITCHES)

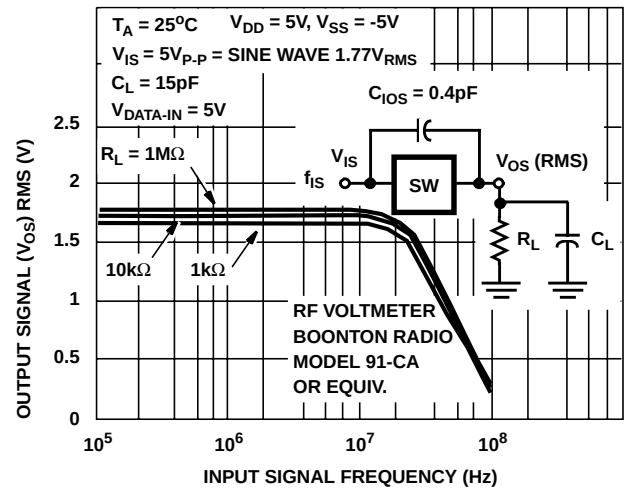


FIGURE 19. TYPICAL SWITCH ON FREQUENCY RESPONSE CHARACTERISTICS