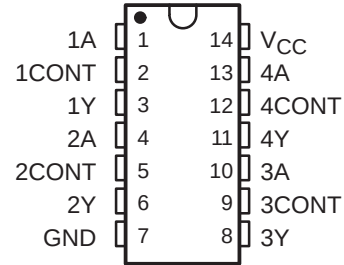


# MC1489, MC1489A, SN55189, SN55189A, SN75189, SN75189A QUADRUPLE LINE RECEIVERS

SLLS095D – SEPTEMBER 1973 – REVISED OCTOBER 1998

- Input Resistance . . . 3 k $\Omega$  to 7 k $\Omega$
- Input Signal Range . . .  $\pm 30$  V
- Operate From Single 5-V Supply
- Built-In Input Hysteresis (Double Thresholds)
- Response Control that Provides:  
Input Threshold Shifting  
Input Noise Filtering
- Meet or Exceed the Requirements of  
TIA/EIA-232-F and ITU Recommendation  
V.28
- Fully Interchangeable With Motorola™  
MC1489 and MC1489A

SN55189, SN55189A . . . J OR W PACKAGE  
MC1489, MC1489A, SN75189, SN75189A  
D, N, OR NS† PACKAGE  
(TOP VIEW)



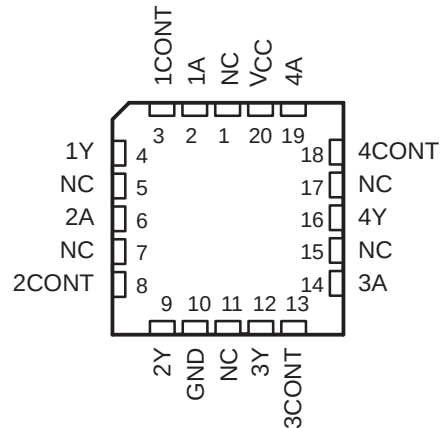
† The NS package is only available left-end taped and reeled.  
For SN75189, order SN75189NSR.

## description

These devices are monolithic low-power Schottky quadruple line receivers designed to satisfy the requirements of the standard interface between data-terminal equipment and data-communication equipment as defined by TIA/EIA-232-F. A separate response-control (CONT) terminal is provided for each receiver. A resistor or a resistor and bias-voltage source can be connected between this terminal and ground to shift the input threshold levels. An external capacitor can be connected between this terminal and ground to provide input noise filtering.

The SN55189 and SN55189A are characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The MC1489, MC1489A, SN75189, and SN75189A are characterized for operation from  $0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$ .

SN55189, SN55189A . . . FK PACKAGE  
(TOP VIEW)



NC – No internal connection



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PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

**TEXAS  
INSTRUMENTS**

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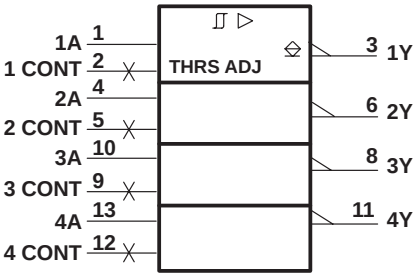
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On products compliant to MIL-PRF-38535, all parameters are tested unless otherwise noted. On all other products, production processing does not necessarily include testing of all parameters.

# MC1489, MC1489A, SN55189, SN55189A, SN75189, SN75189A

## QUADRUPLE LINE RECEIVERS

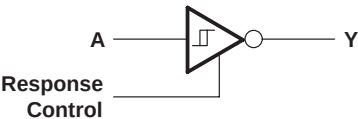
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### logic symbol†

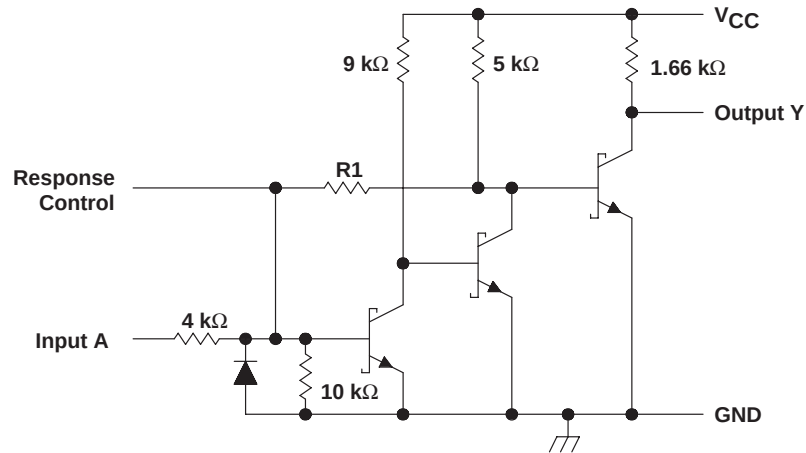


† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.  
Pin numbers shown are for the D, J, N, NS, and W packages.

### logic diagram (positive logic)



### schematic (each receiver)



|    |                              |                                 |
|----|------------------------------|---------------------------------|
|    | MC1489<br>SN55189<br>SN75189 | MC1489A<br>SN55189A<br>SN75189A |
| R1 | 8.4 kΩ                       | 1.84 kΩ                         |

Resistor values shown are nominal.

# MC1489, MC1489A, SN55189, SN55189A, SN75189, SN75189A QUADRUPLE LINE RECEIVERS

SLLS095D – SEPTEMBER 1973 – REVISED OCTOBER 1998

## absolute maximum ratings over operating free-air temperature (unless otherwise noted)<sup>†</sup>

|                                                                                   |                                                |
|-----------------------------------------------------------------------------------|------------------------------------------------|
| Supply voltage, $V_{CC}$ (see Note 1)                                             | 10 V                                           |
| Input voltage, $V_I$                                                              | $\pm 30$ V                                     |
| Output voltage, $V_O$                                                             | 20 mA                                          |
| Continuous total power dissipation                                                | See Dissipation Rating Table                   |
| Operating free-air temperature range, $T_A$ : SN55189, SN55189A                   | $-55^{\circ}\text{C}$ to $125^{\circ}\text{C}$ |
| MC1489, MC1489A, SN75189, SN75189A                                                | $0^{\circ}\text{C}$ to $70^{\circ}\text{C}$    |
| Storage temperature range, $T_{stg}$                                              | $-65^{\circ}\text{C}$ to $150^{\circ}\text{C}$ |
| Case temperature for 60 seconds, FK package                                       | $260^{\circ}\text{C}$                          |
| Lead temperature 1,6 mm (1/16 inch) from case for 60 seconds: J or W package      | $300^{\circ}\text{C}$                          |
| Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds: D, N, or NS package | $260^{\circ}\text{C}$                          |

<sup>†</sup> Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

NOTES: 1. All voltage values are with respect to the network ground terminal.

DISSIPATION RATING TABLE

| PACKAGE        | $T_A \leq 25^{\circ}\text{C}$<br>POWER RATING | DERATING FACTOR<br>ABOVE $T_A = 25^{\circ}\text{C}$ | $T_A = 70^{\circ}\text{C}$<br>POWER RATING | $T_A = 125^{\circ}\text{C}$<br>POWER RATING |
|----------------|-----------------------------------------------|-----------------------------------------------------|--------------------------------------------|---------------------------------------------|
| D              | 950 mW                                        | 7.6 mW/ $^{\circ}\text{C}$                          | 608 mW                                     | N/A                                         |
| FK             | 1375 mW                                       | 11.0 mW/ $^{\circ}\text{C}$                         | 880 mW                                     | 275 mW                                      |
| J <sup>‡</sup> | 1375 mW                                       | 11.0 mW/ $^{\circ}\text{C}$                         | 880 mW                                     | 275 mW                                      |
| N              | 1150 mW                                       | 9.2 mW/ $^{\circ}\text{C}$                          | 736 mW                                     | N/A                                         |
| NS             | 625 mW                                        | 4.0 mW/ $^{\circ}\text{C}$                          | 445 mW                                     | N/A                                         |
| W              | 1000 mW                                       | 8.0 mW/ $^{\circ}\text{C}$                          | 640 mW                                     | 200 mW                                      |

<sup>‡</sup> In the J package, SN55189 and SN55189A chips are either silver glass or alloy mounted.

## recommended operating conditions

|                                       | MIN | NOM | MAX  | UNIT               |
|---------------------------------------|-----|-----|------|--------------------|
| Supply voltage, $V_{CC}$              | 4.5 | 5   | 5.5  | V                  |
| Input voltage, $V_I$                  | -25 |     | 25   | V                  |
| High-level output current, $I_{OH}$   |     |     | -0.5 | mA                 |
| Low-level output current, $I_{OL}$    |     |     | 10   | mA                 |
| Operating free-air temperature, $T_A$ | 0   |     | 70   | $^{\circ}\text{C}$ |



# MC1489, MC1489A, SN55189, SN55189A, SN75189, SN75189A QUADRUPLE LINE RECEIVERS

SLLS095D – SEPTEMBER 1973 – REVISED OCTOBER 1998

electrical characteristics over operating free-air temperature range,  $V_{CC} = 5\text{ V} \pm 1\%$  (unless otherwise noted)

| PARAMETER                                        | TEST FIGURE | TEST CONDITIONS†                                  |                                                 | SN55189<br>SN55189A |      |      | MC1489, MC1489A<br>SN75189<br>SN75189A |      |      | UNIT |
|--------------------------------------------------|-------------|---------------------------------------------------|-------------------------------------------------|---------------------|------|------|----------------------------------------|------|------|------|
|                                                  |             |                                                   |                                                 | MIN                 | TYP‡ | MAX  | MIN                                    | TYP‡ | MAX  |      |
| $V_{IT+}$ Positive-going input threshold voltage | 1           | '89                                               | $T_A = 25^\circ\text{C}$                        | 1                   | 1.3  | 1.5  | 1                                      | 1.3  | 1.5  | V    |
|                                                  |             |                                                   | $T_A = 0^\circ\text{C to } 70^\circ\text{C}$    |                     |      |      | 0.9                                    |      | 1.6  |      |
|                                                  |             |                                                   | $T_A = -55^\circ\text{C to } 125^\circ\text{C}$ | 0.6                 |      | 1.9  |                                        |      |      |      |
|                                                  |             | '89A                                              | $T_A = 25^\circ\text{C}$                        | 1.75                | 1.9  | 2.25 | 1.75                                   | 1.9  | 2.25 |      |
|                                                  |             |                                                   | $T_A = 0^\circ\text{C to } 70^\circ\text{C}$    |                     |      |      | 1.55                                   |      | 2.25 |      |
|                                                  |             |                                                   | $T_A = -55^\circ\text{C to } 125^\circ\text{C}$ | 1.30                |      | 2.65 |                                        |      |      |      |
| $V_{IT-}$ Negative-going input threshold voltage | 1           | '89, '89A                                         | $T_A = 25^\circ\text{C}$                        | 0.75                | 1.0  | 1.25 | 0.75                                   | 1.0  | 1.25 | V    |
|                                                  |             |                                                   | $T_A = 0^\circ\text{C to } 70^\circ\text{C}$    |                     |      |      | 0.65                                   |      | 1.25 |      |
|                                                  |             |                                                   | $T_A = -55^\circ\text{C to } 125^\circ\text{C}$ | 0.35                |      | 1.6  |                                        |      |      |      |
| $V_{OH}$ High-level output voltage               | 1           | $V_I = 0.75\text{ V}$ , $I_{OH} = -0.5\text{ mA}$ |                                                 | 2.6                 | 4    | 5    | 2.6                                    | 4    | 5    | V    |
|                                                  |             | Input open, $I_{OH} = -0.5\text{ mA}$             |                                                 | 2.6                 | 4    | 5    | 2.6                                    | 4    | 5    |      |
| $V_{OL}$ Low-level output voltage                | 1           | $V_I = 3\text{ V}$ , $I_{OL} = 10\text{ mA}$      |                                                 |                     | 0.2  | 0.45 |                                        | 0.2  | 0.45 | V    |
| $I_{IH}$ High-level input current                | 2           | $V_I = 25\text{ V}$                               |                                                 | 3.6                 |      | 8.3  | 3.6                                    |      | 8.3  | mA   |
|                                                  |             | $V_I = 3\text{ V}$                                |                                                 | 0.43                |      |      | 0.43                                   |      |      |      |
| $I_{IL}$ Low-level input current                 | 2           | $V_I = -25\text{ V}$                              |                                                 | -3.6                |      | -8.3 | -3.6                                   |      | -8.3 | mA   |
|                                                  |             | $V_I = -3\text{ V}$                               |                                                 | -0.43               |      |      | -0.43                                  |      |      |      |
| $I_{OS}$ Short-circuit output current            | 3           |                                                   |                                                 |                     | -3   |      |                                        | -3   |      | mA   |
| $I_{CC}$ Supply current                          | 2           | $V_I = 5\text{ V}$ , Outputs open                 |                                                 |                     | 20   | 26   |                                        | 20   | 26   | mA   |

† All characteristics are measured with the response-control terminal open.

‡ All typical values are at  $V_{CC} = 5\text{ V}$ ,  $T_A = 25^\circ\text{C}$ .

switching characteristics,  $V_{CC} = 5\text{ V}$ ,  $C_L = 15\text{ pF}$ ,  $T_A = 25^\circ\text{C}$

| PARAMETER                                                   | TEST FIGURE | TEST CONDITIONS            | MIN | TYP | MAX | UNIT |
|-------------------------------------------------------------|-------------|----------------------------|-----|-----|-----|------|
| $t_{PLH}$ Propagation delay time, low- to high-level output | 4           | $R_L = 3.9\text{ k}\Omega$ |     | 25  | 85  | ns   |
| $t_{PHL}$ Propagation delay time, high- to low-level output |             | $R_L = 390\text{ }\Omega$  |     | 25  | 50  |      |
| $t_{TLH}$ Transition time, low- to high-level output        |             | $R_L = 3.9\text{ k}\Omega$ |     | 120 | 175 | ns   |
| $t_{THL}$ Transition time, high- to low-level output        |             | $R_L = 390\text{ }\Omega$  |     | 10  | 20  |      |



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PARAMETER MEASUREMENT INFORMATION†

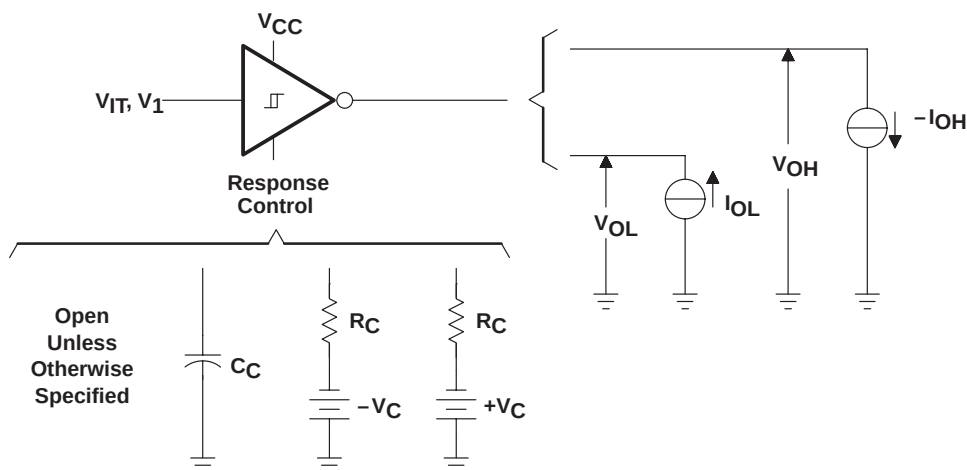
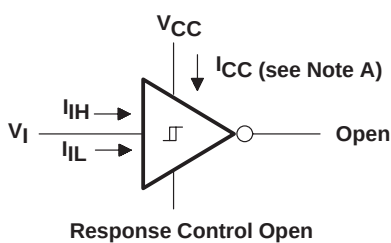


Figure 1.  $V_{IT+}$ ,  $V_{IT-}$ ,  $V_{OH}$ ,  $V_{OL}$



NOTE A:  $I_{CC}$  is tested for all four receivers simultaneously.

Figure 2.  $I_{iH}$ ,  $I_{iL}$ ,  $I_{CC}$

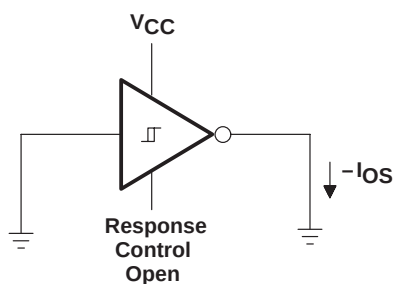


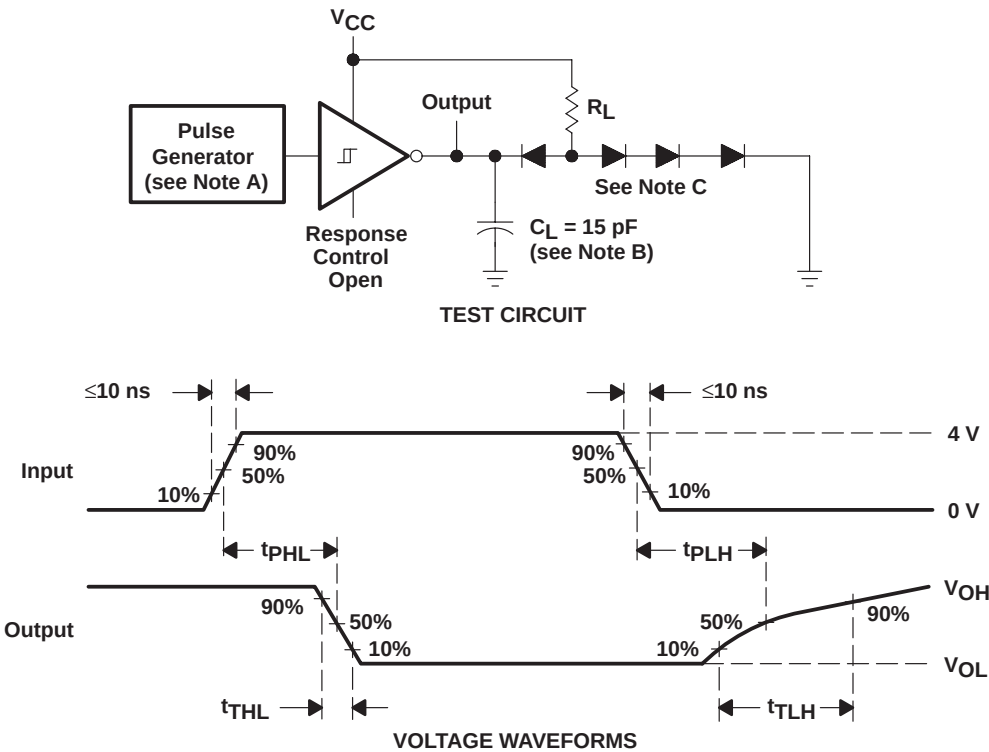
Figure 3.  $I_{OS}$

† Arrows indicate actual direction of current flow. Current into a terminal is a positive value.

MC1489, MC1489A, SN55189, SN55189A, SN75189, SN75189A  
QUADRUPLE LINE RECEIVERS

SLLS095D – SEPTEMBER 1973 – REVISED OCTOBER 1998

PARAMETER MEASUREMENT INFORMATION



- NOTES: A. The pulse generator has the following characteristics:  $Z_O = 50\ \Omega$ ,  $t_W = 500\ \text{ns}$ .  
B.  $C_L$  includes probe and jig capacitances.  
C. All diodes are 1N3064 or equivalent.

Figure 4. Test Circuit and Voltage Waveforms

# MC1489, MC1489A, SN55189, SN55189A, SN75189, SN75189A QUADRUPLE LINE RECEIVERS

SLLS095D – SEPTEMBER 1973 – REVISED OCTOBER 1998

## TYPICAL CHARACTERISTICS

SN65189, SN75189  
OUTPUT VOLTAGE  
vs  
INPUT VOLTAGE

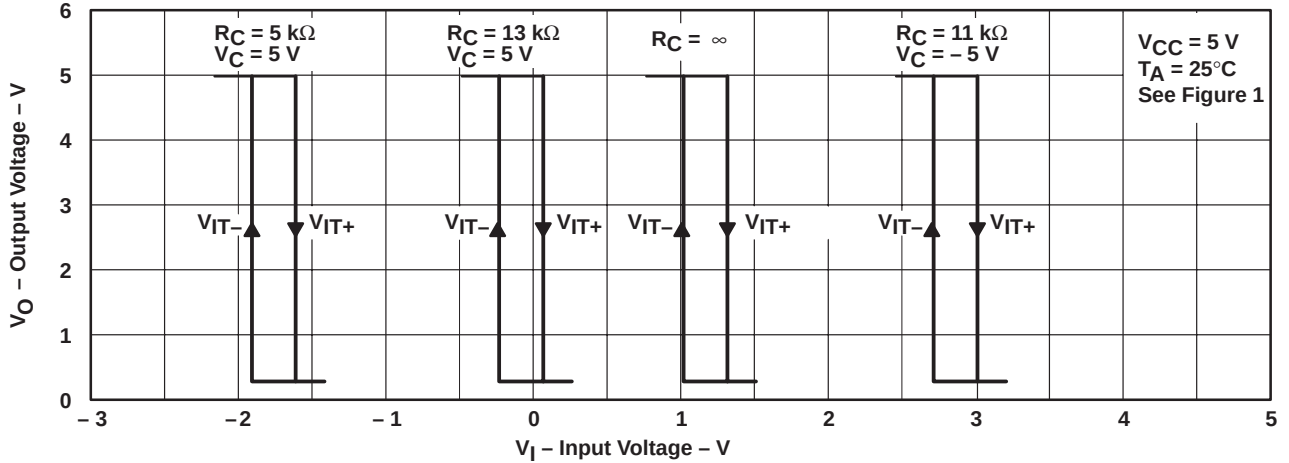


Figure 5

SN65189A, SN75189A  
OUTPUT VOLTAGE  
vs  
INPUT VOLTAGE

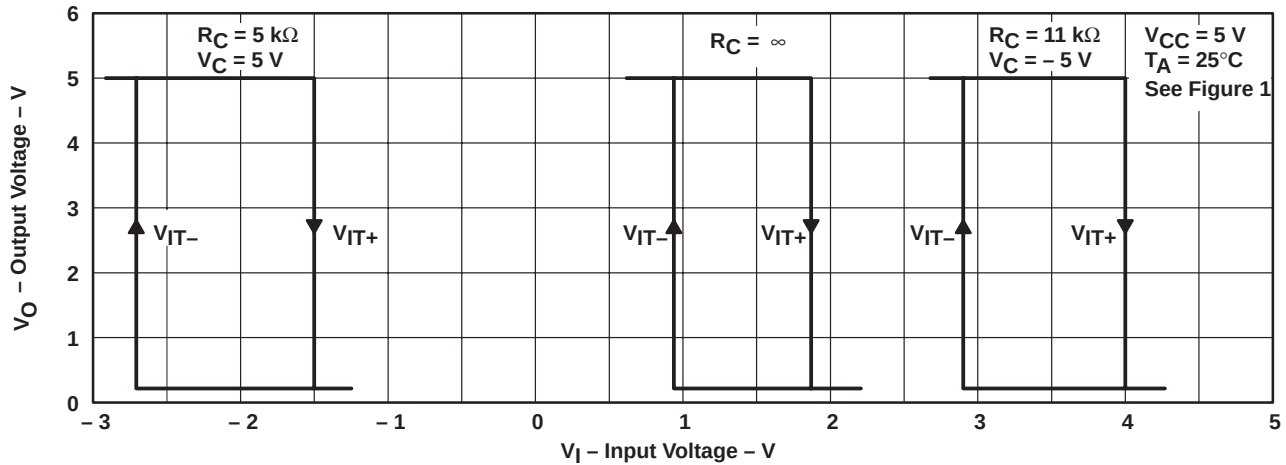


Figure 6

MC1489, MC1489A, SN55189, SN55189A, SN75189, SN75189A  
QUADRUPLE LINE RECEIVERS

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TYPICAL CHARACTERISTICS†

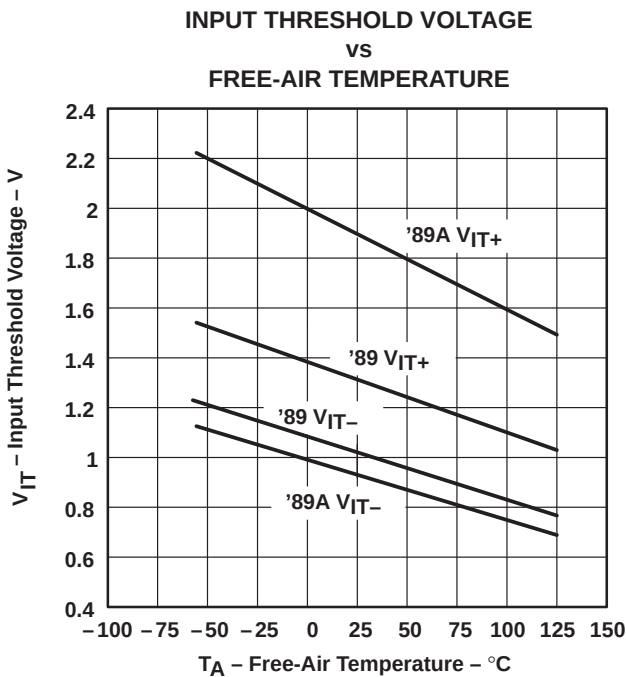


Figure 7

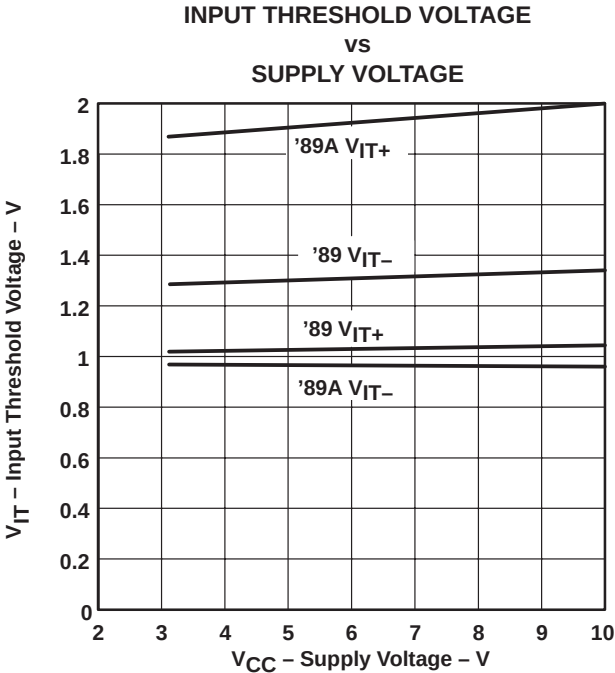
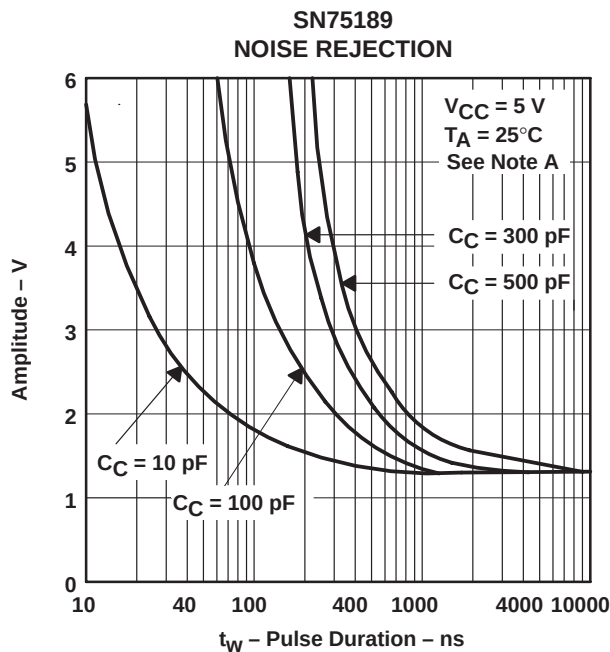
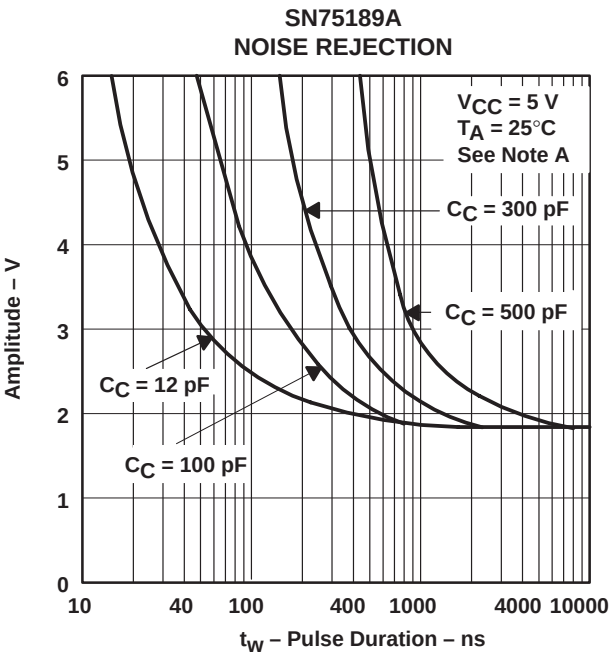


Figure 8



NOTE A: Maximum amplitude of a positive-going pulse that, starting from 0 V, will not cause a change in the output level.

Figure 9



NOTE A: Maximum amplitude of a positive-going pulse that, starting from 0 V, will not cause a change in the output level.

Figure 10

† Data for free-air temperatures below 0°C and above 70°C are applicable to SN55189 and SN55189A circuits only.



TYPICAL CHARACTERISTICS

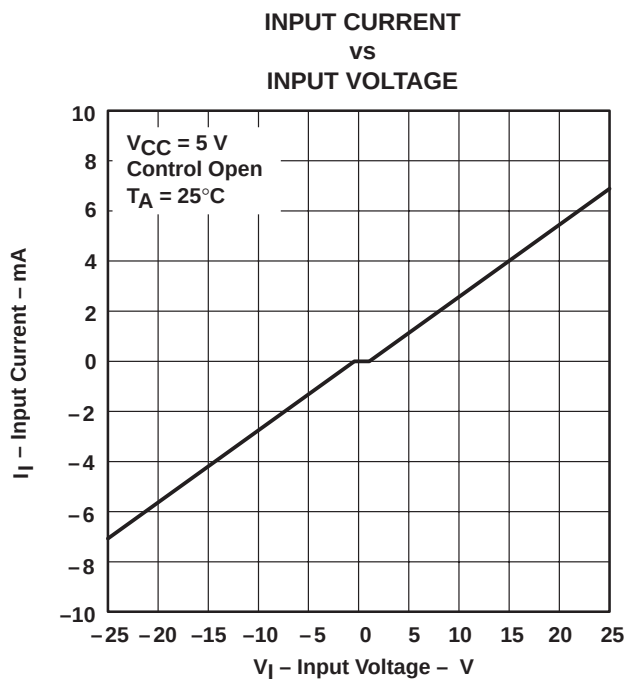


Figure 11

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