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

SLLS095D – SEPTEMBER 1973 – REVISED OCTOBER 1998

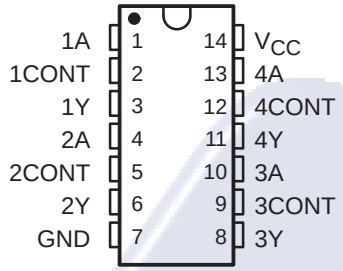
- **Input Resistance . . . 3 kΩ to 7 kΩ**
- **Input Signal Range . . . ±30 V**
- **Operate From Single 5-V Supply**
- **Built-In Input Hysteresis (Double Thresholds)**
- **Response Control that Provides:**
  - **Input Threshold Shifting**
  - **Input Noise Filtering**
- **Meet or Exceed the Requirements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

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.

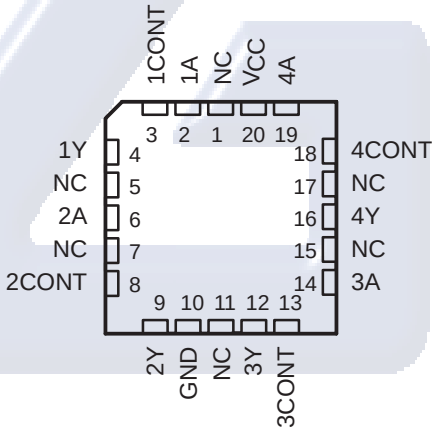
The SN55189 and SN55189A are characterized for operation over the full military temperature range of −55°C to 125°C. The MC1489, MC1489A, SN75189, and SN75189A are characterized for operation from 0°C to 70°C.

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.

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



NC – No internal connection

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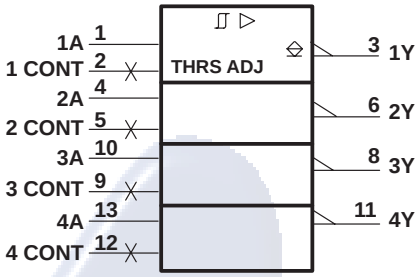
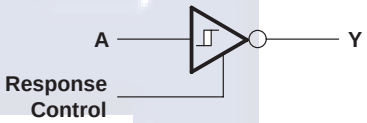
logic symbol†

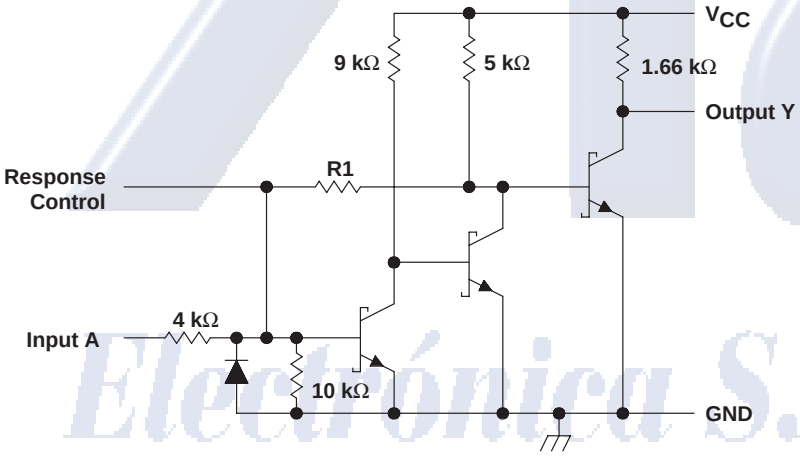


† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.
Pin numbers shown are for the D, J, N, NS, and W packages.

logic diagram (positive logic)



schematic (each receiver)



	MC1489 SN55189 SN75189	MC1489A SN55189A SN75189A
R1	8.4 kΩ	1.84 kΩ

Resistor values shown are nominal.

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absolute maximum ratings over operating free-air temperature (unless otherwise noted)†

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

† 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	$T_A \le 25°C$ POWER RATING	DERATING FACTOR ABOVE $T_A = 25°C$	$T_A = 70°C$ POWER RATING	$T_A = 125°C$ POWER RATING
D	950 mW	7.6 mW/°C	608 mW	N/A
FK	1375 mW	11.0 mW/°C	880 mW	275 mW
J‡	1375 mW	11.0 mW/°C	880 mW	275 mW
N	1150 mW	9.2 mW/°C	736 mW	N/A
NS	625 mW	4.0 mW/°C	445 mW	N/A
W	1000 mW	8.0 mW/°C	640 mW	200 mW

‡ 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	°C

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

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

switching characteristics, V_{CC} = 5 V, C_L = 15 pF, T_A = 25°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 kΩ		25	85	ns
t_{PHL}	Propagation delay time, high- to low-level output		R_L = 390 Ω		25	50	
t_{TLH}	Transition time, low- to high-level output		R_L = 3.9 kΩ		120	175	ns
t_{THL}	Transition time, high- to low-level output		R_L = 390 Ω		10	20	

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PARAMETER MEASUREMENT INFORMATION†

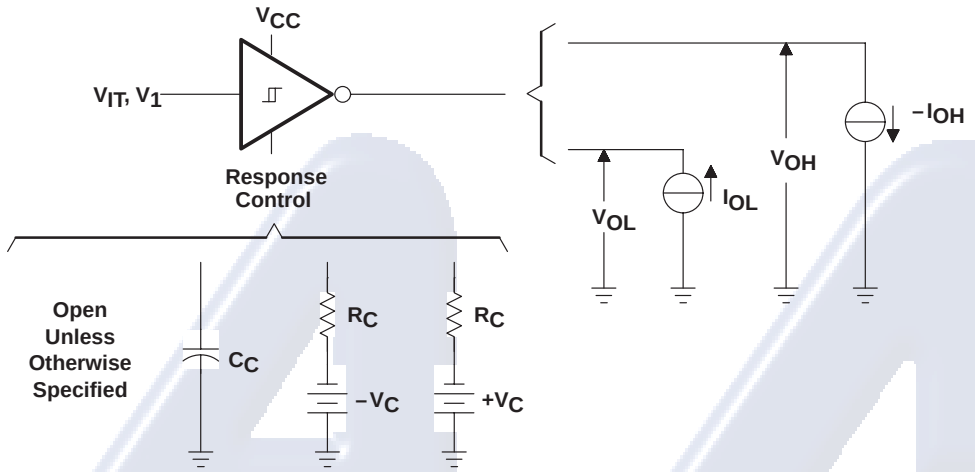
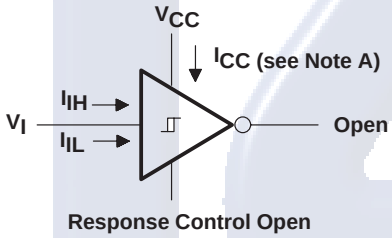


Figure 1. V_{IT+} , V_{IT-} , V_{OH} , V_{OL}



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

Figure 2. I_{IH} , I_{IL} , I_{CC}

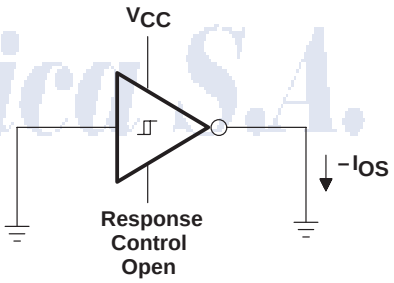


Figure 3. I_{OS}

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

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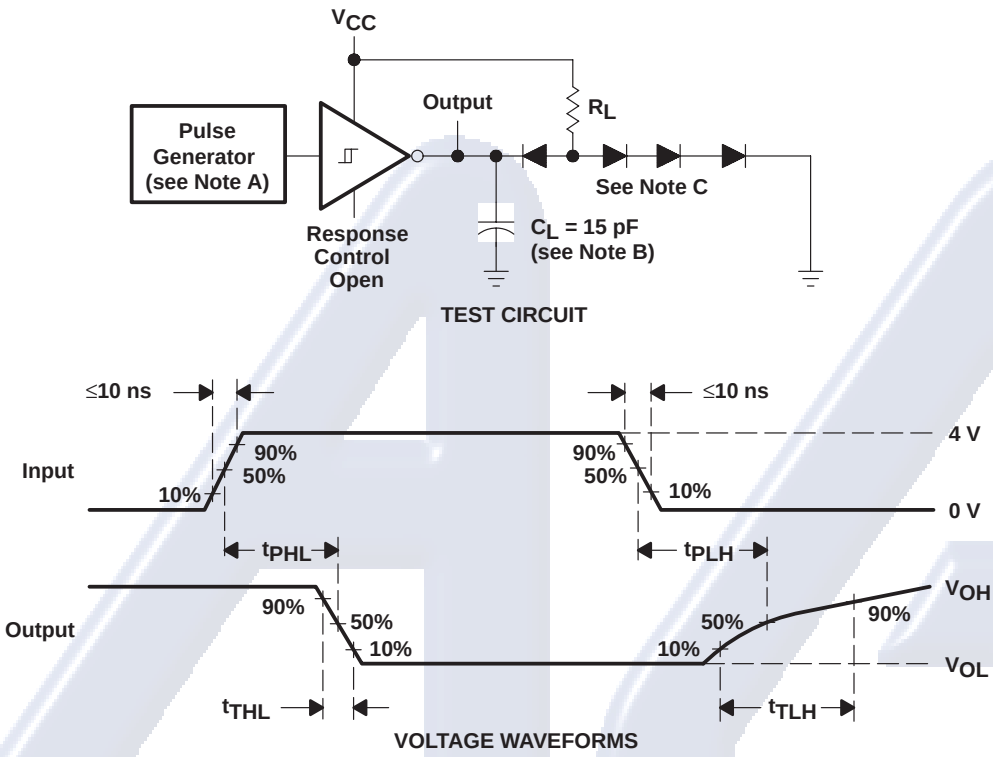
PARAMETER MEASUREMENT INFORMATION



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

Figure 4. Test Circuit and Voltage Waveforms

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TYPICAL CHARACTERISTICS

**SN65189, SN75189
OUTPUT VOLTAGE
vs
INPUT VOLTAGE**

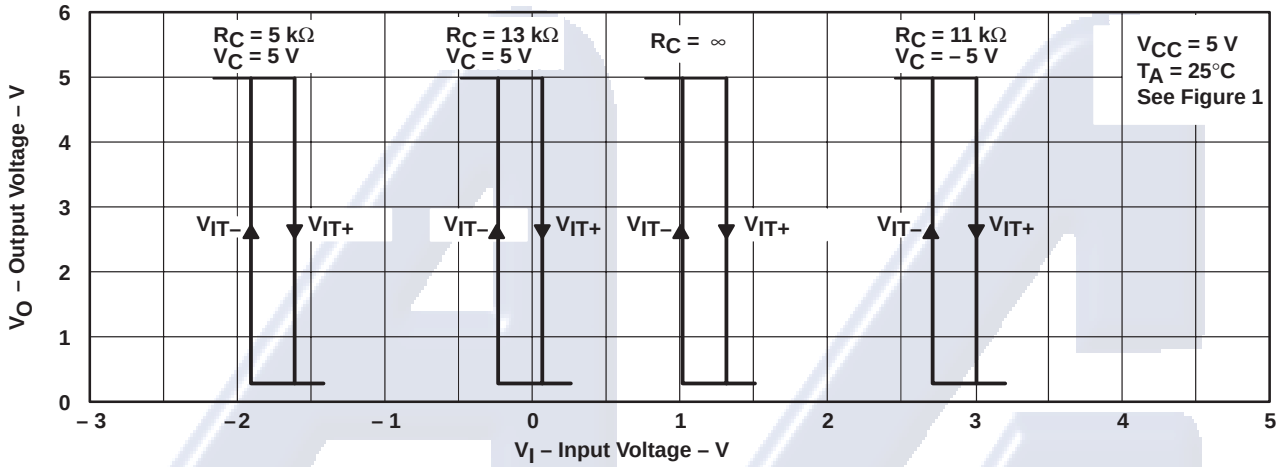

Figure 5

**SN65189A, SN75189A
OUTPUT VOLTAGE
vs
INPUT VOLTAGE**

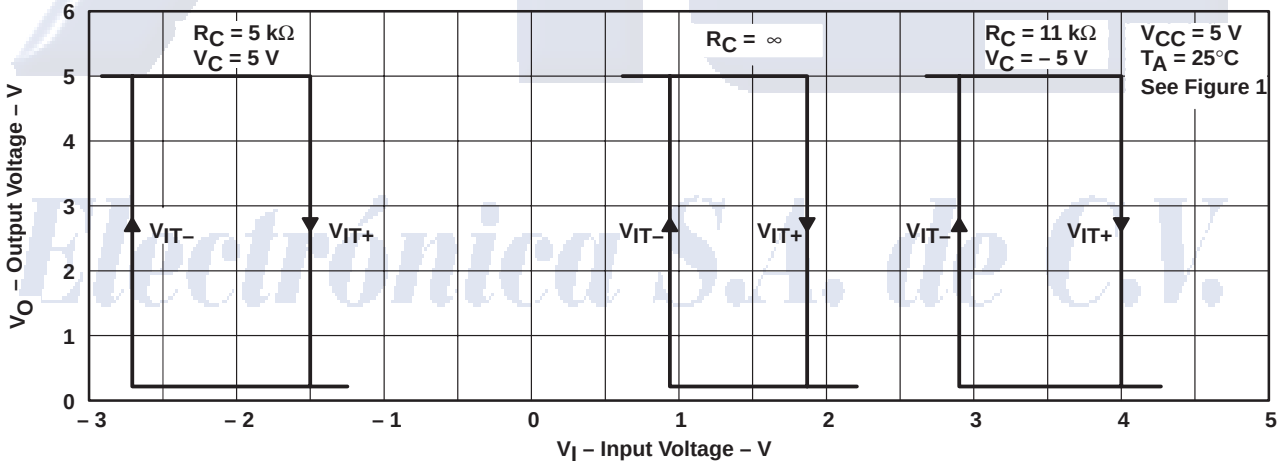

Figure 6

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TYPICAL CHARACTERISTICS†

INPUT THRESHOLD VOLTAGE
vs
FREE-AIR TEMPERATURE

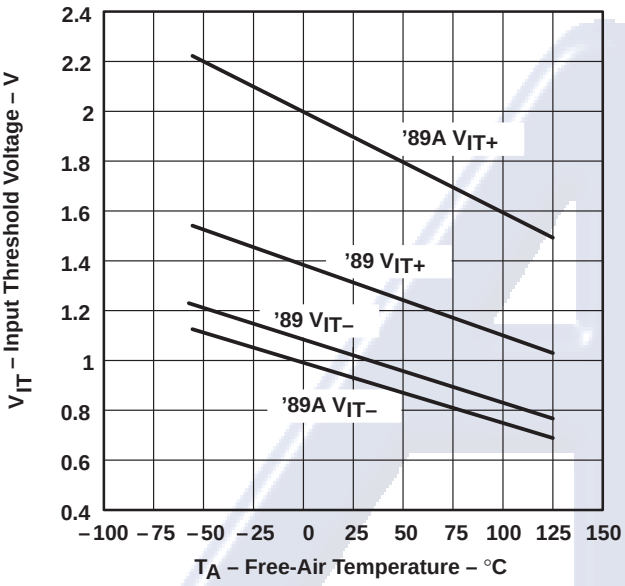


Figure 7

INPUT THRESHOLD VOLTAGE
vs
SUPPLY VOLTAGE

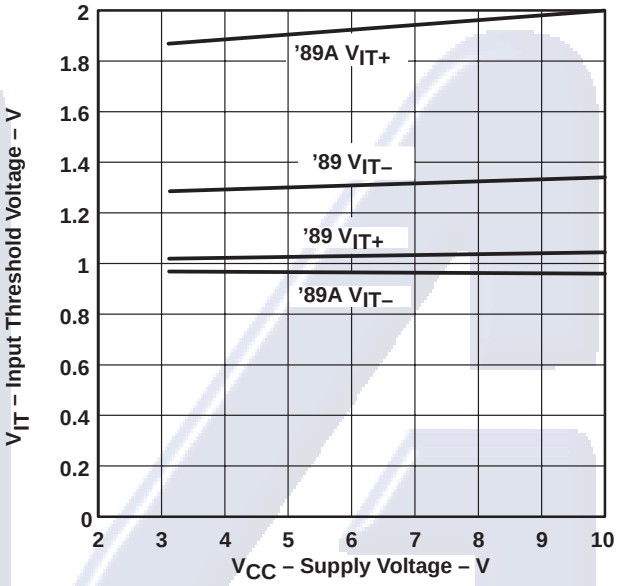
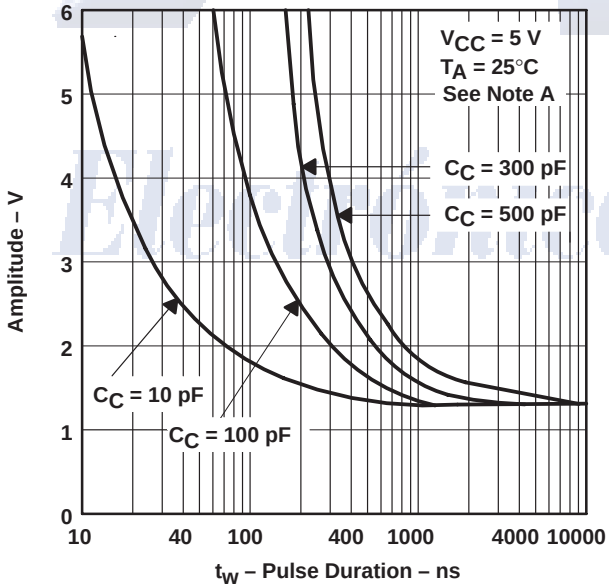


Figure 8

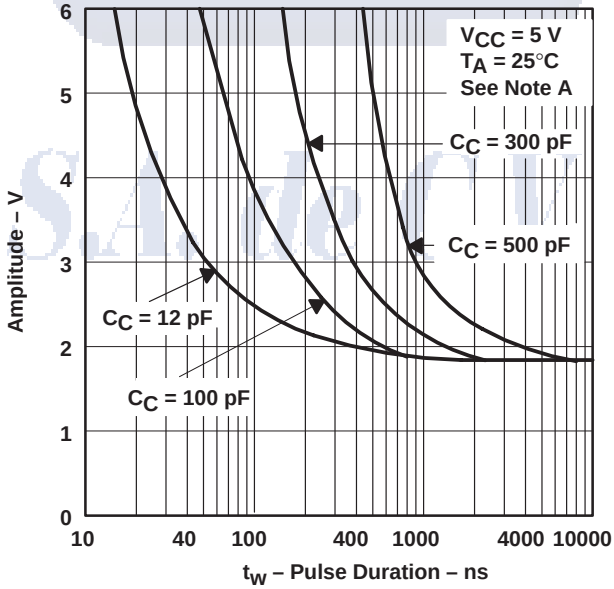
SN75189
NOISE REJECTION



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

SN75189A
NOISE REJECTION



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.

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TYPICAL CHARACTERISTICS

**INPUT CURRENT
vs
INPUT VOLTAGE**

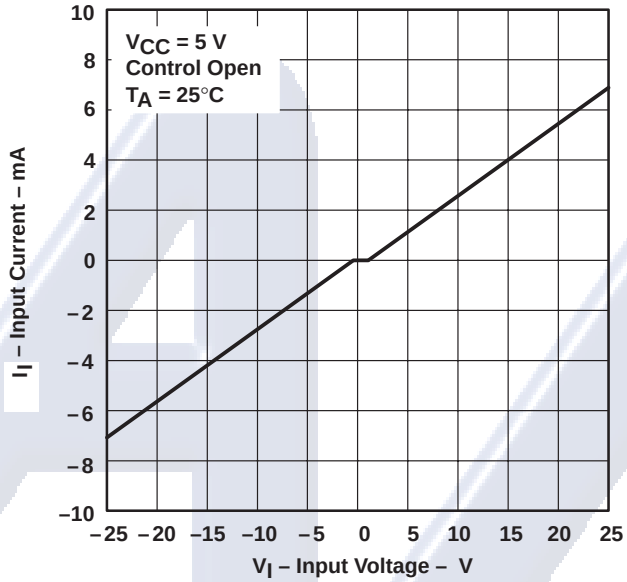

Figure 11

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