

# SN75C189, SN75C189A QUADRUPLE LOW-POWER LINE RECEIVERS

SLLS041G – OCTOBER 1988 – REVISED JANUARY 2000

- Meet or Exceed the Requirements of TIA/EIA-232-F and ITU Recommendation V.28
- Low Supply Current . . . 420  $\mu$ A Typ
- Preset On-Chip Input Noise Filter
- Built-in Input Hysteresis
- Response and Threshold Control Inputs
- Push-Pull Outputs
- Functionally Interchangeable and Pin-to-Pin Compatible With Texas Instruments SN75189/SN75189A and Motorola MC1489/MC1489A
- Package Options Include Plastic Small-Outline (D) and Shrink Small-Outline (DB) Packages, and Standard Plastic (N) DIP



## description

The SN75C189 and SN75C189A are low-power, bipolar, quadruple line receivers that are used to interface data terminal equipment (DTE) with data circuit-terminating equipment (DCE). These devices have been designed to conform to TIA/EIA-232-F.

The SN75C189 has a 0.33-V typical hysteresis, compared with 0.97 V for the SN75C189A. Each receiver has provision for adjustment of the overall input threshold levels. This is achieved by choosing external series resistors and voltages to provide bias levels for the response-control pins. The output is in the high logic state if the input is open circuit or shorted to ground.

These devices have an on-chip filter that rejects input pulses of less than 1- $\mu$ s duration. An external capacitor can be connected from the control pins to ground to provide further input noise filtering for each receiver.

The SN75C189 and SN75C189A have been designed using low-power techniques in a bipolar technology. In most applications, these receivers interface to single inputs of peripheral devices such as UARTs, ACEs, or microprocessors. By using sampling, such peripheral devices usually are insensitive to the transition times of the input signals. If this is not the case, or for other uses, it is recommended that the SN75C189 and SN75C189A outputs be buffered by single Schmitt input gates or single gates of the HCMOS, ALS, or 74F logic families.

The SN75C189 and SN75C189A are characterized for operation from 0°C to 70°C.



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INSTRUMENTS**

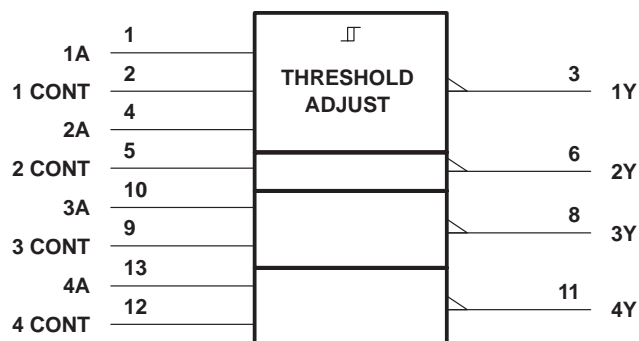
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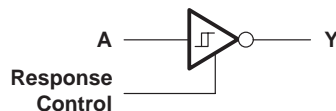
# SN75C189, SN75C189A QUADRUPLE LOW-POWER LINE RECEIVERS

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## logic symbol†

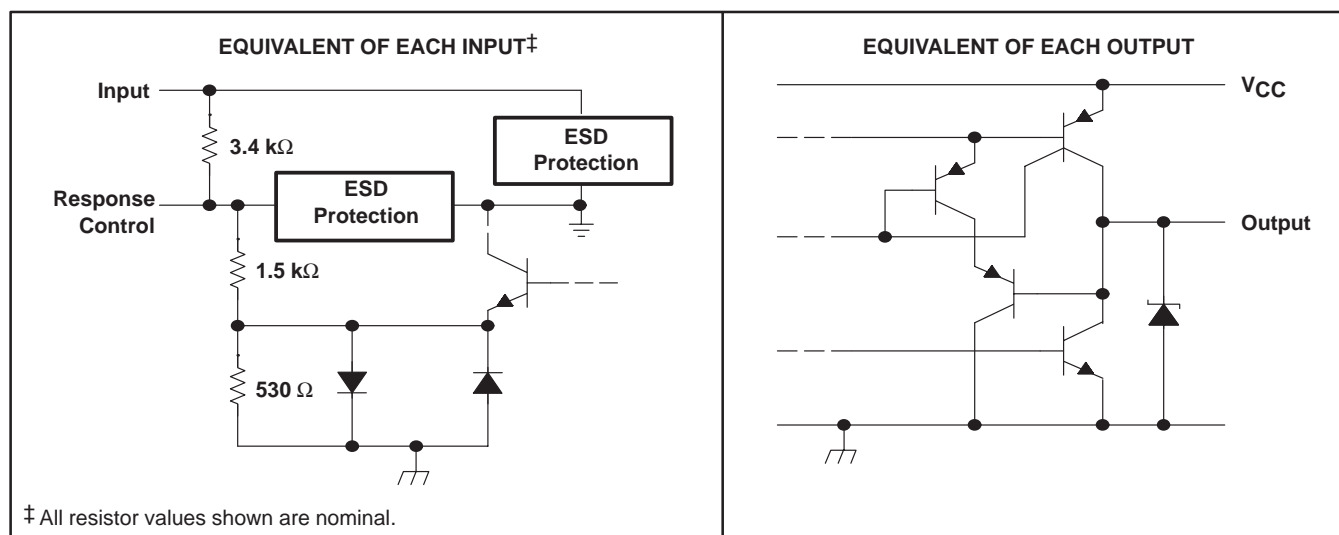


## logic diagram (each receiver)



† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

## schematic of inputs and outputs



‡ All resistor values shown are nominal.

## absolute maximum ratings over operating free-air temperature range (unless otherwise noted)§

Supply voltage, $V_{CC}$ (see Note 1)	7 V
Input voltage range, $V_I$	-30 V to 30 V
Output voltage range, $V_O$	-0.3 V to $V_{CC} + 0.3$ V
Package thermal impedance, $\theta_{JA}$ (see Note 2):	
D package	86°C/W
DB package	96°C/W
N package	80°C/W
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds	260°C
Storage temperature range, $T_{stg}$	-65°C to 150°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 voltages are with respect to network GND.

2. The package thermal impedance is calculated in accordance with JESD 51.



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## recommended operating conditions

	MIN	NOM	MAX	UNIT
V <sub>CC</sub> Supply voltage	4.5	5	6	V
V <sub>I</sub> Input voltage (see Note 3)	-25		25	V
I <sub>OH</sub> High-level output current			-3.2	mA
I <sub>OL</sub> Low-level output current			3.2	mA
Response-control current			±1	mA
T <sub>A</sub> Operating free-air temperature	0		70	°C

NOTE 3: The algebraic convention, where the more positive (less negative) limit is designated as maximum, is used in this data sheet for logic levels only, e.g., if -10 V is a maximum, the typical value is a more negative voltage.

## electrical characteristics over recommended free-air temperature range, V<sub>CC</sub> = 5 V ±10% (unless otherwise noted) (see Note 4)

PARAMETER		TEST CONDITIONS	MIN	TYP†	MAX	UNIT
V <sub>IT+</sub> Positive-going input threshold voltage	'C189	See Figure 1	1		1.5	V
	'C189A		1.6		2.25	
V <sub>IT-</sub> Negative-going input threshold voltage	'C189	See Figure 1	0.75		1.25	V
	'C189A		0.75	1	1.25	
V <sub>hys</sub> Input hysteresis voltage (V <sub>IT+</sub> - V <sub>IT-</sub> )	'C189	See Figure 1	0.15	0.33		V
	'C189A		0.65	0.97		
V <sub>OH</sub> High-level output voltage		V <sub>CC</sub> = 4.5 V to 6 V, V <sub>I</sub> = 0.75 V, I <sub>OH</sub> = -20 μA	3.5			V
		V <sub>CC</sub> = 4.5 V to 6 V, V <sub>I</sub> = 0.75 V, I <sub>OH</sub> = -3.2 mA	2.5			
V <sub>OL</sub> Low-level output voltage		V <sub>CC</sub> = 4.5 V to 6 V, V <sub>I</sub> = 3 V, I <sub>OL</sub> = 3.2 mA			0.4	V
I <sub>IH</sub> High-level input current		See Figure 2	V <sub>I</sub> = 25 V	3.6	8.3	mA
			V <sub>I</sub> = 3 V	0.43	1	
I <sub>IL</sub> Low-level input current		See Figure 2	V <sub>I</sub> = -25 V	-3.6	-8.3	mA
			V <sub>I</sub> = -3 V	-0.43	-1	
I <sub>OS</sub> Short-circuit output current		See Figure 3			-35	mA
I <sub>CC</sub> Supply current		V <sub>I</sub> = 5 V, No load, See Figure 2		420	700	μA

† All typical values are at T<sub>A</sub> = 25°C.

NOTE 4: All characteristics are measured with response-control terminal open.

## switching characteristics, V<sub>CC</sub> = 5 V ±10%, T<sub>A</sub> = 25°C

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t <sub>PLH</sub> Propagation delay time, low- to high-level output	R <sub>L</sub> = 5 kΩ, C <sub>L</sub> = 50 pF, See Figure 4			6	μs
t <sub>PHL</sub> Propagation delay time, high- to low-level output				6	μs
t <sub>TLH</sub> Transition time, low- to high-level output‡				500	ns
t <sub>THL</sub> Transition time, high- to low-level output‡				300	ns
t <sub>w(N)</sub> Duration of longest pulse rejected as noise§			1		6

‡ Measured between 10% and 90% points of output waveform

§ The receiver ignores any positive- or negative-going pulse that is less than the minimum value of t<sub>w(N)</sub> and accepts any positive- or negative-going pulse greater than the maximum of t<sub>w(N)</sub>.



# SN75C189, SN75C189A QUADRUPLE LOW-POWER LINE RECEIVERS

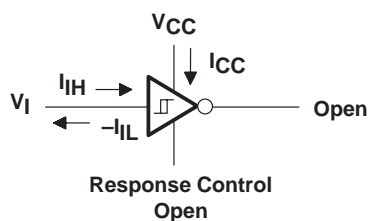
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## PARAMETER MEASUREMENT INFORMATION



NOTE A: Arrows indicate actual direction of current flow. Current into a terminal is a positive value.

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



NOTE A: Arrows indicate actual direction of current flow. Current into a terminal is a positive value.

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



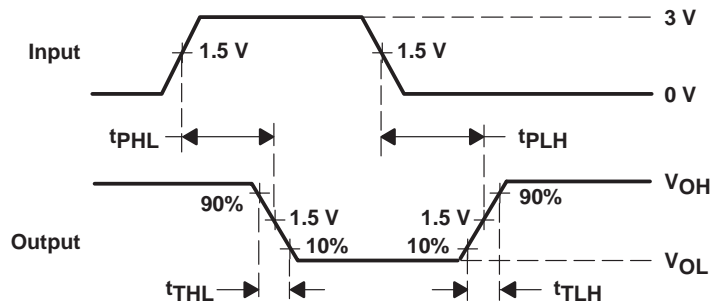
NOTE A: Arrows indicate actual direction of current flow. Current into a terminal is a positive value.

Figure 3.  $I_{OS}$

PARAMETER MEASUREMENT INFORMATION



TEST CIRCUIT



VOLTAGE WAVEFORMS

- NOTES: A.  $C_L$  includes probe and jig capacitances.  
 B. The pulse generator has the following characteristics:  $Z_O = 50\ \Omega$ ,  $t_w = 25\ \mu\text{s}$ .

Figure 4. Test Circuit and Voltage Waveforms

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## TYPICAL CHARACTERISTICS

**SN75C189**  
INPUT THRESHOLD VOLTAGE (POSITIVE GOING)  
vs  
FREE-AIR TEMPERATURE



Figure 5

**SN75C189A**  
INPUT THRESHOLD VOLTAGE (POSITIVE GOING)  
vs  
FREE-AIR TEMPERATURE



Figure 6

**SN75C189**  
INPUT THRESHOLD VOLTAGE (NEGATIVE GOING)  
vs  
FREE-AIR TEMPERATURE



Figure 7

**SN75C189A**  
INPUT THRESHOLD VOLTAGE (NEGATIVE GOING)  
vs  
FREE-AIR TEMPERATURE

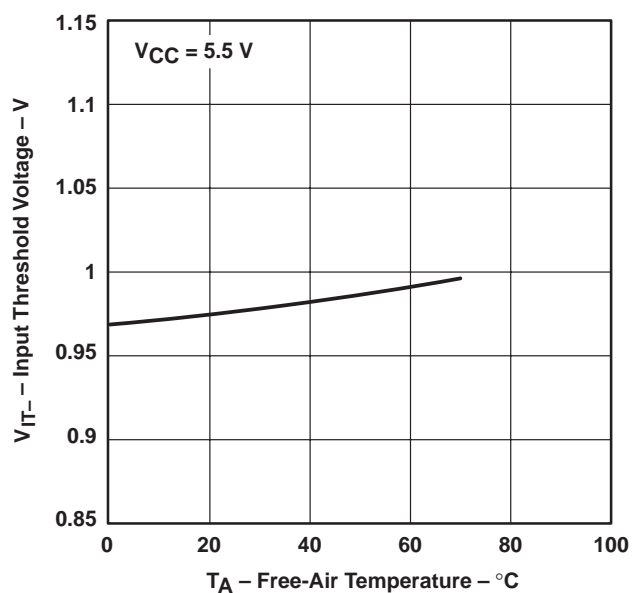


Figure 8



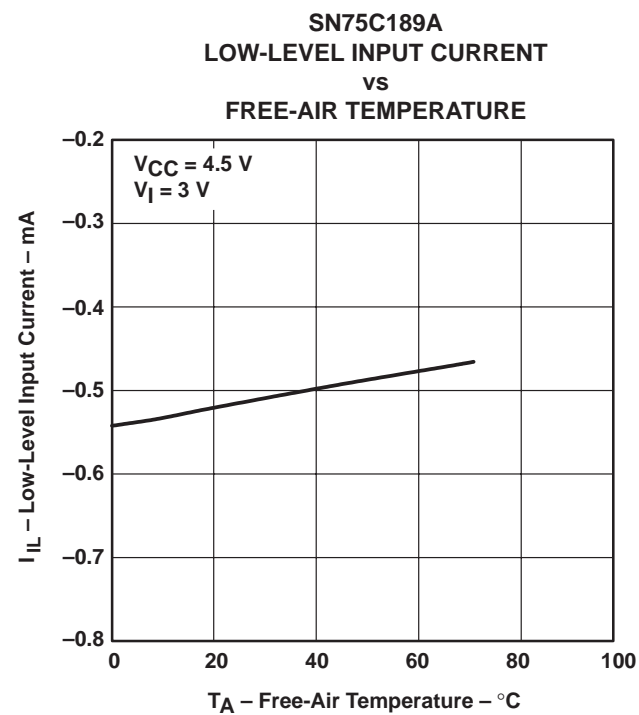
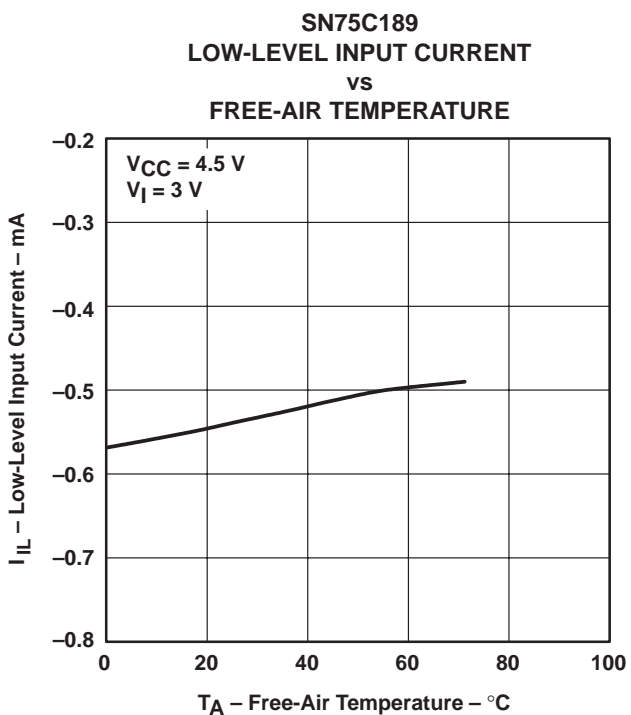
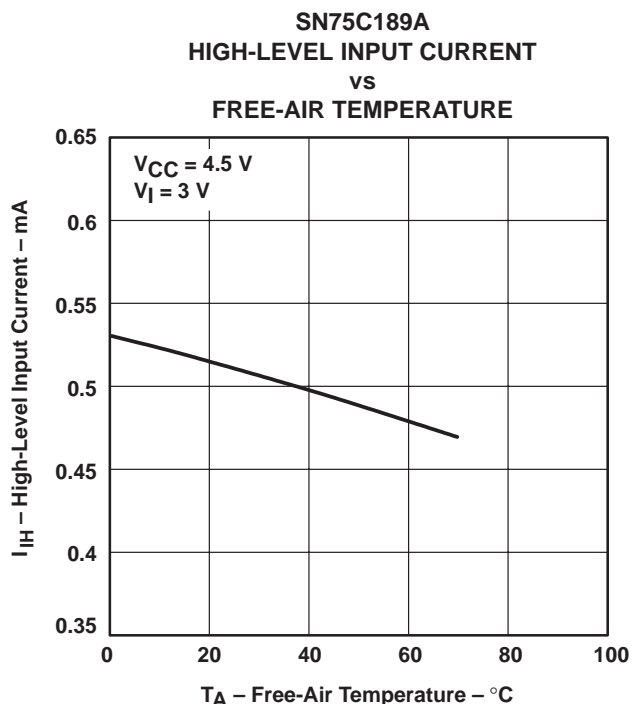
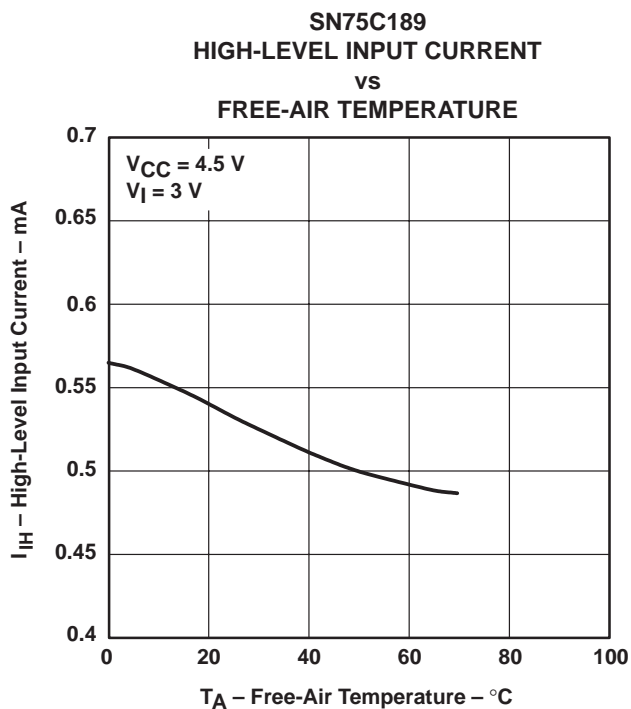
TYPICAL CHARACTERISTICS



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## TYPICAL CHARACTERISTICS





TYPICAL CHARACTERISTICS



Figure 17



Figure 18



Figure 19



Figure 20

# SN75C189, SN75C189A QUADRUPLE LOW-POWER LINE RECEIVERS

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## TYPICAL CHARACTERISTICS

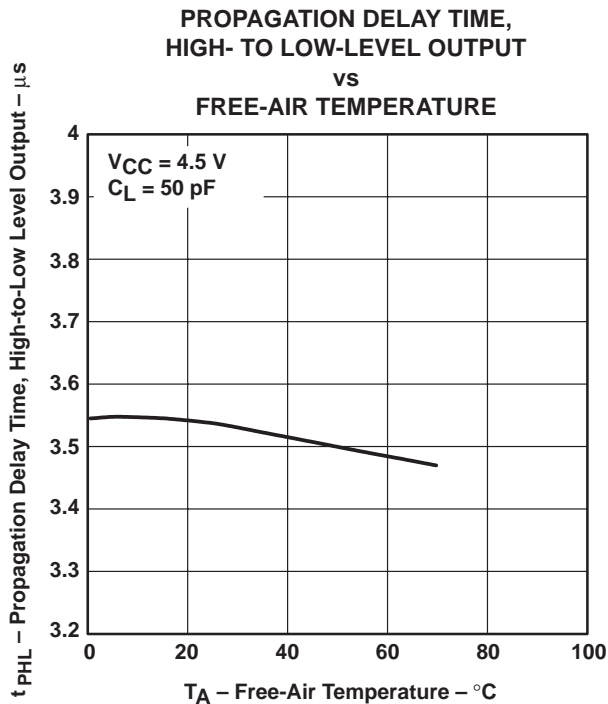


Figure 21

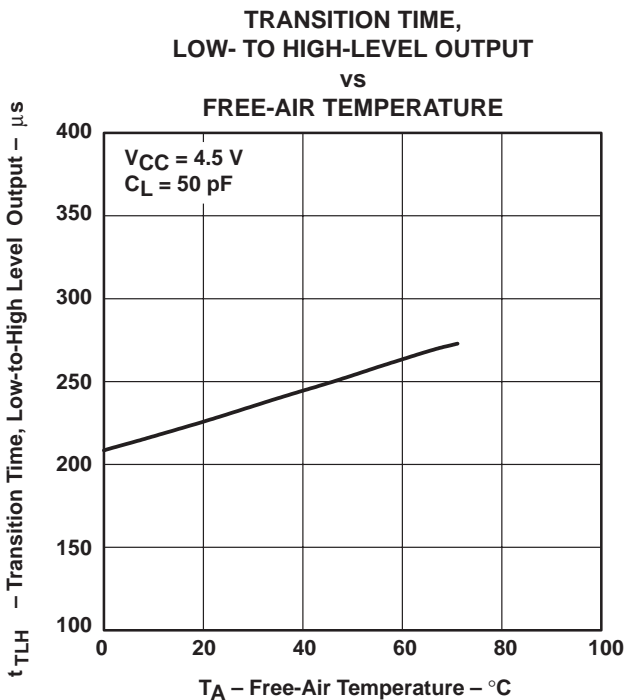


Figure 22

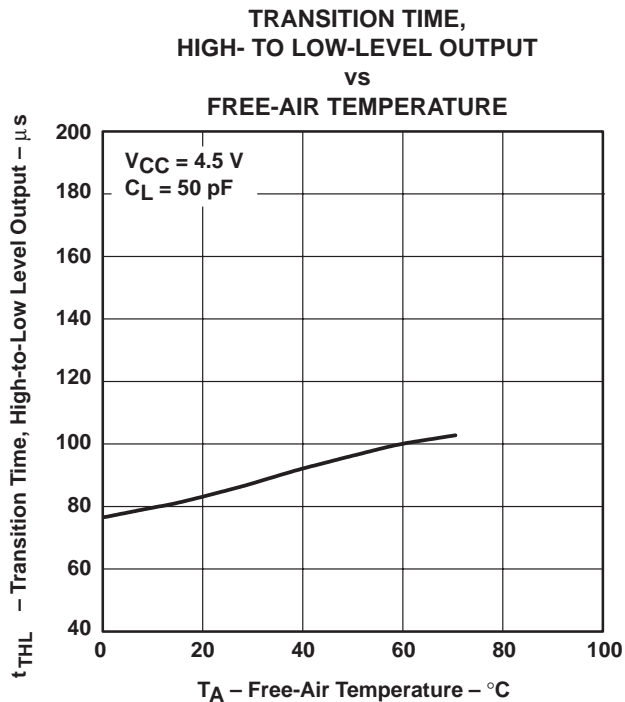


Figure 23



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## SN75C189A, Quadruple Low-Power Line Receiver

DEVICE STATUS: **ACTIVE**

PARAMETER NAME	SN75C189A
Receivers Per Package	4
Supply Voltage(s) (V)	5
Receiver tpd (ns)	6000
ICC (max) (mA)	0.7
Footprint	MC1489

### FEATURES

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- Meet or Exceed the Requirements of TIA/EIA-232-F and ITU Recommendation V.28
- Low Supply Current...420 uA Typ
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- Built-in Input Hysteresis
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### DESCRIPTION

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- [Live Insertion with Differential Interface Products](#) (SLLA107 - Updated: 01/28/2002)
- [Low-Voltage, Single-Supply 232-Standard Interface Solutions \(Rev. A\)](#) (SLLA083A - Updated: 09/19/2000)
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- [Military Semiconductors Selection Guide 2002 \(Rev. B\)](#) (SGYC003B, 1648 KB - Updated: 04/22/2002)
- [Standard Linear Products Cross Reference](#) (SLYT017, 586 KB - Updated: 05/03/2000)

**SAMPLES**[▲Back to Top](#)

ORDERABLE DEVICE	PACKAGE INDUSTRY (TI)	PINS	TEMP (°C)	STATUS	PRODUCT CONTENT	SAMPLES
SN75C189AD	<a href="#">SOP (D)</a>	14	0 TO 70	ACTIVE	<a href="#">View Product Content</a>	<a href="#">Request Samples</a>
SN75C189ADBR	<a href="#">SSOP (DB)</a>	14	0 TO 70	ACTIVE	<a href="#">View Product Content</a>	<a href="#">Request Samples</a>
SN75C189AN	<a href="#">PDIP (N)</a>	14	0 TO 70	ACTIVE	<a href="#">View Product Content</a>	<a href="#">Request Samples</a>


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DEVICE INFORMATION							TI INVENTORY STATUS AS OF 3:00 PM GMT, 26 Sep 2002			REPORTED DISTRIBUTOR INVENTORY AS OF 3:00 PM GMT, 26 Sep 2002		
ORDERABLE DEVICE	STATUS	PACKAGE TYPE PINS	TEMP (°C)	PRODUCT CONTENT	BUDGETARY PRICING QTY   SUS	STD PACK QTY	IN STOCK	IN PROGRESS QTY DATE	LEAD TIME	DISTRIBUTOR COMPANY REGION	IN STOCK	PURCHASE
SN75C189AD	ACTIVE	<a href="#">SOP (D)</a>   14	0 TO 70	<a href="#">View Contents</a>	1KU   0.56	50	<a href="#">N/A*</a>	4950   03 Oct	8 WKS	<a href="#">DigiKey</a>   AMERICA	639	<b>BUY NOW</b>
SN75C189ADBLE	OBSOLETE	<a href="#">SSOP (DB)</a>   14	0 TO 70	<a href="#">View Contents</a>	1KU		<a href="#">N/A*</a>		Not Available			
SN75C189ADBR	ACTIVE	<a href="#">SSOP (DB)</a>   14	0 TO 70	<a href="#">View Contents</a>	1KU   0.56	2000	<a href="#">N/A*</a>		8 WKS			
SN75C189ADR	ACTIVE	<a href="#">SOP (D)</a>   14	0 TO 70	<a href="#">View Contents</a>	1KU   0.56	2500	<a href="#">N/A*</a>	2153   24 Sep	8 WKS	<a href="#">Avnet</a>   AMERICA	> 1k	<b>BUY NOW</b>
								2500   03 Oct				
								> 10k   14 Nov				
SN75C189AN	ACTIVE	<a href="#">PDIP (N)</a>   14	0 TO 70	<a href="#">View Contents</a>	1KU   0.56	25	<a href="#">N/A*</a>	3500   03 Oct	5 WKS	<a href="#">DigiKey</a>   AMERICA	578	<b>BUY NOW</b>
										<a href="#">Avnet</a>   AMERICA	128	<b>BUY NOW</b>
SN75C189ANSR	ACTIVE	<a href="#">SOP (NS)</a>   14		<a href="#">View Contents</a>	1KU   0.70	2000	<a href="#">N/A*</a>		8 WKS			

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Receiver tpd (ns)	6000
ICC (max) (mA)	0.7
Footprint	MC1489

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- [Low-Voltage, Single-Supply 232-Standard Interface Solutions \(Rev. A\)](#) (SLLA083A - Updated: 09/19/2000)
- [Signaling Rate versus Transfer Rate](#) (SLLA098 - Updated: 03/01/2001)

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ORDERABLE DEVICE	PACKAGE INDUSTRY (TI)	PINS	TEMP (°C)	STATUS	PRODUCT CONTENT	SAMPLES
SN75C189D	<a href="#">SOP (D)</a>	14	0 TO 70	ACTIVE	<a href="#">View Product Content</a>	<a href="#">Request Samples</a>
SN75C189N	<a href="#">PDIP (N)</a>	14	0 TO 70	ACTIVE	<a href="#">View Product Content</a>	<a href="#">Request Samples</a>

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SN75C189D	ACTIVE	<a href="#">SOP (D)</a>   14	0 TO 70	<a href="#">View Contents</a>	1KU   0.56	50	N/A*	5265   03 Oct	8 WKS	<a href="#">Avnet</a>   AMERICA	894	<b>BUY NOW</b>
								3215   07 Oct				
SN75C189DR	ACTIVE	<a href="#">SOP (D)</a>   14	0 TO 70	<a href="#">View Contents</a>	1KU   0.56	2500	N/A*	6637   03 Oct	8 WKS			
								3215   04 Oct				
SN75C189N	ACTIVE	<a href="#">PDIP (N)</a>   14	0 TO 70	<a href="#">View Contents</a>	1KU   0.56	25	N/A*	1075   19 Sep	5 WKS	<a href="#">Avnet</a>   AMERICA	> 1k	<b>BUY NOW</b>
								5218   03 Oct				
SN75C189NSR	ACTIVE	<a href="#">SOP (NS)</a>   14		<a href="#">View Contents</a>	1KU   0.70	2000	N/A*	3216   04 Oct	8 WKS			

Table Data Updated on: 9/26/2002



