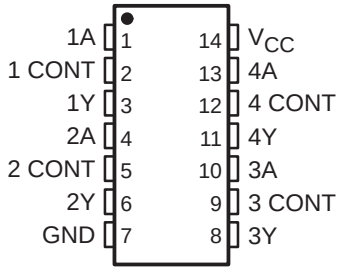
- **Meet or Exceed the Requirements of TIA/EIA-232-F and ITU Recommendation V.28**
- **Low Supply Current . . . 420 μA Typ**
- **Preset On-Chip Input Noise Filter**
- **Built-in Input Hysteresis**
- **Response and Threshold Control Inputs**
- **Push-Pull Outputs**
- **Functionally Interchangeable and 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**

D, DB, OR N PACKAGE
(TOP VIEW)



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.

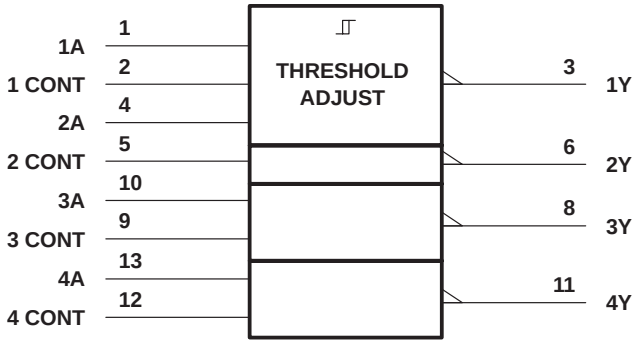
The SN75C189 has a 0.33-V typical hysteresis, compared with 0.97 V for the SN75C189A. Each receiver has provision for adjustment of the overall input threshold levels. This is achieved by choosing external series resistors and voltages to provide bias levels for the response-control pins. The output 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-μs 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.

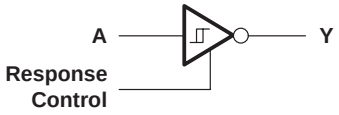
The SN75C189 and SN75C189A are characterized for operation from 0°C to 70°C.

logic symbol†



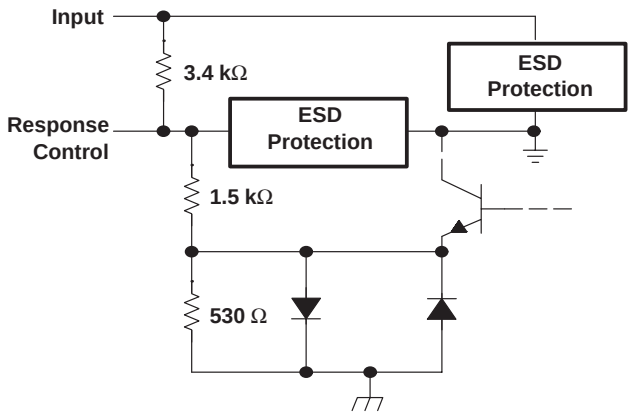
† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

logic diagram (each receiver)

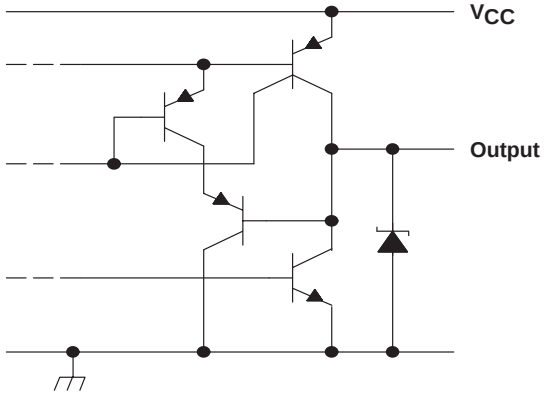


schematic of inputs and outputs

EQUIVALENT OF EACH INPUT‡



EQUIVALENT OF EACH OUTPUT



‡ 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, θ_{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.

recommended operating conditions

		MIN	NOM	MAX	UNIT
V_{CC}	Supply voltage	4.5	5	6	V
V_I	Input voltage (see Note 3)	–25		25	V
I_{OH}	High-level output current			–3.2	mA
I_{OL}	Low-level output current			3.2	mA
	Response-control current			±1	mA
T_A	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_{CC} = 5 V ±10% (unless otherwise noted) (see Note 4)

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

† All typical values are at T_A = 25°C.

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

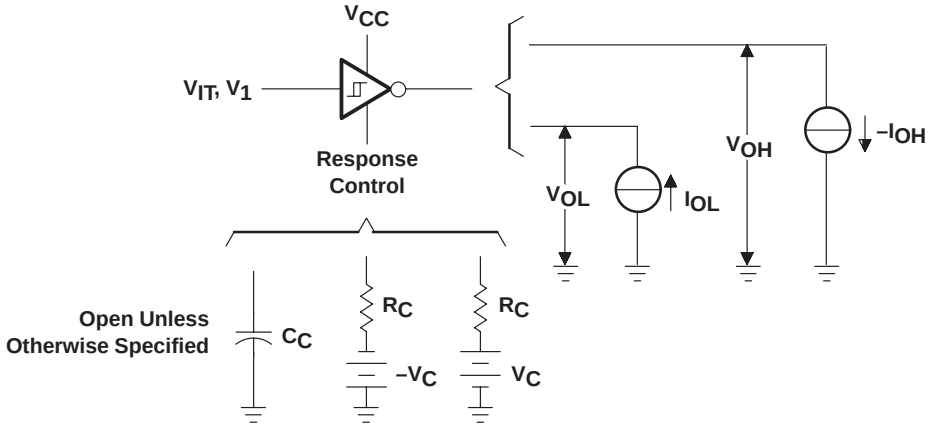
switching characteristics, V_{CC} = 5 V ±10%, T_A = 25°C

PARAMETER		TEST CONDITIONS			MIN	TYP	MAX	UNIT
t_{PLH}	Propagation delay time, low- to high-level output	R_L = 5 kΩ,	C_L = 50 pF,	See Figure 4			6	µs
t_{PHL}	Propagation delay time, high- to low-level output						6	µs
t_{TLH}	Transition time, low- to high-level output‡						500	ns
t_{THL}	Transition time, high- to low-level output‡						300	ns
$t_{w(N)}$	Duration of longest pulse rejected as noise§				1		6	µs

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

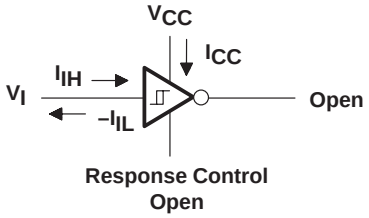
§ The receiver ignores any positive- or negative-going pulse that is less than the minimum value of $t_{w(N)}$ and accepts any postive- or negative-going pulse greater than the maximum of $t_{w(N)}$.

PARAMETER MEASUREMENT INFORMATION



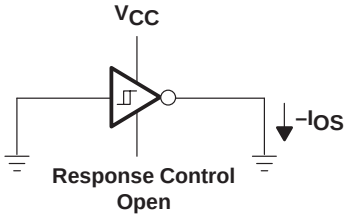
NOTE A: Arrows indicate actual direction of current flow. Current into a terminal is a positive value.

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.

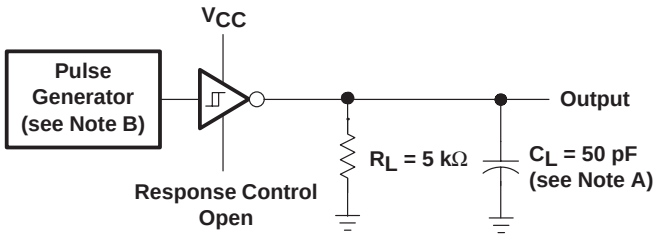
Figure 2. I_{IH}, I_{IL}, I_{CC}



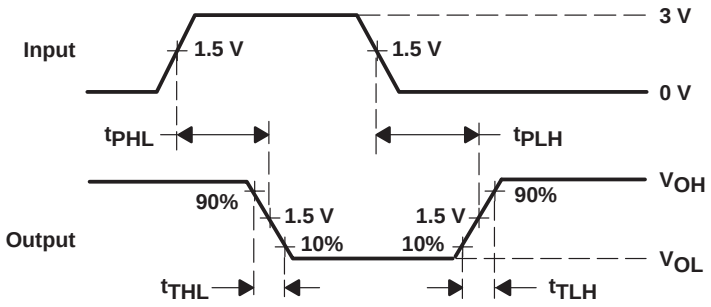
NOTE A: Arrows indicate actual direction of current flow. Current into a terminal is a positive value.

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 Ω, t_W = 25 μs.

Figure 4. Test Circuit and Voltage Waveforms

TYPICAL CHARACTERISTICS

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

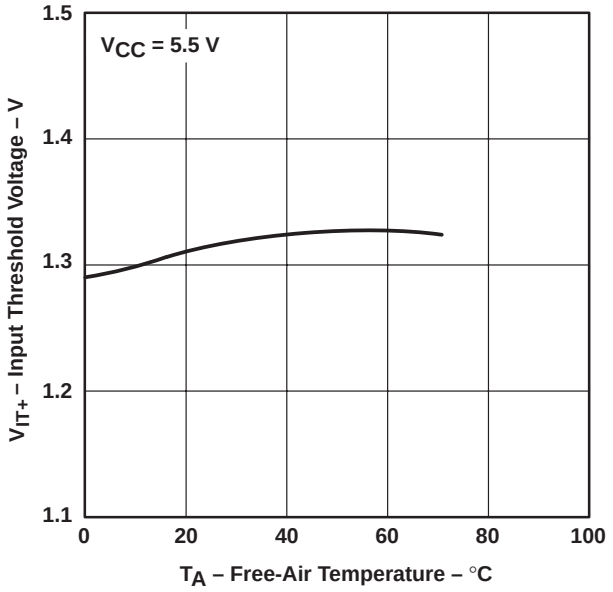


Figure 5

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

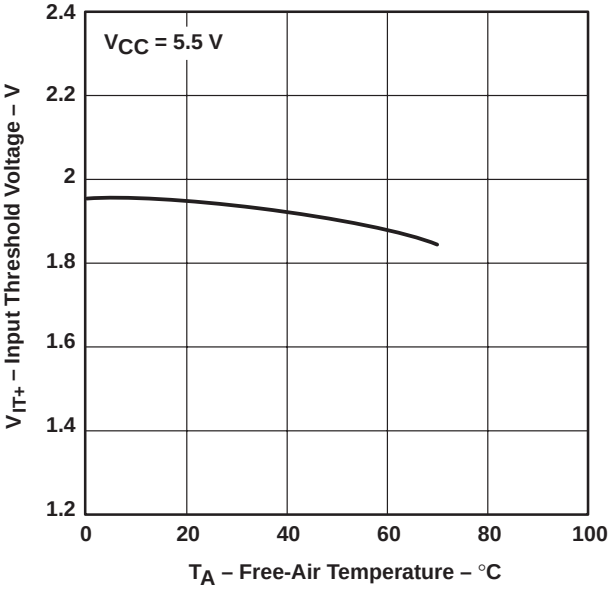


Figure 6

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

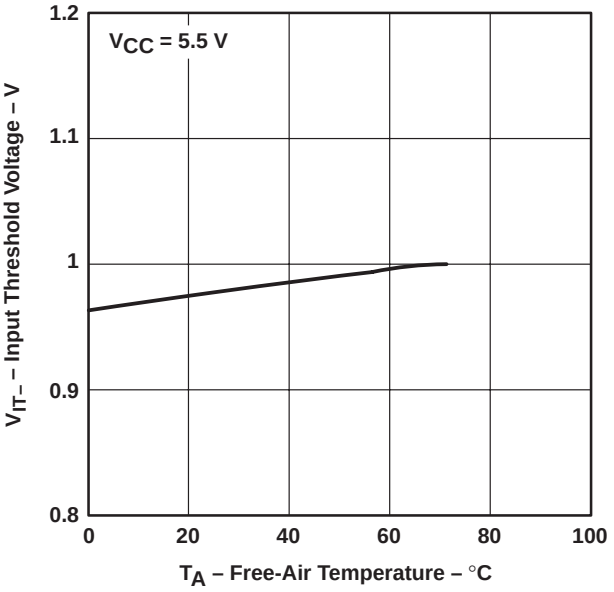


Figure 7

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

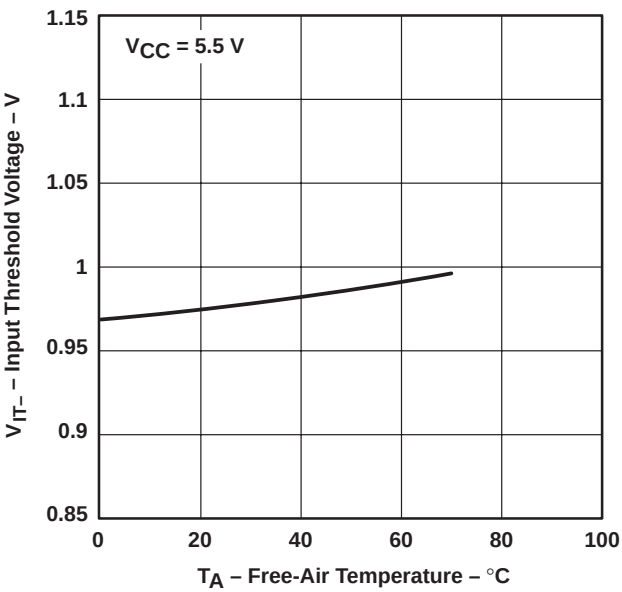


Figure 8

TYPICAL CHARACTERISTICS

**SN75C189
INPUT HYSTERESIS
vs
FREE-AIR TEMPERATURE**

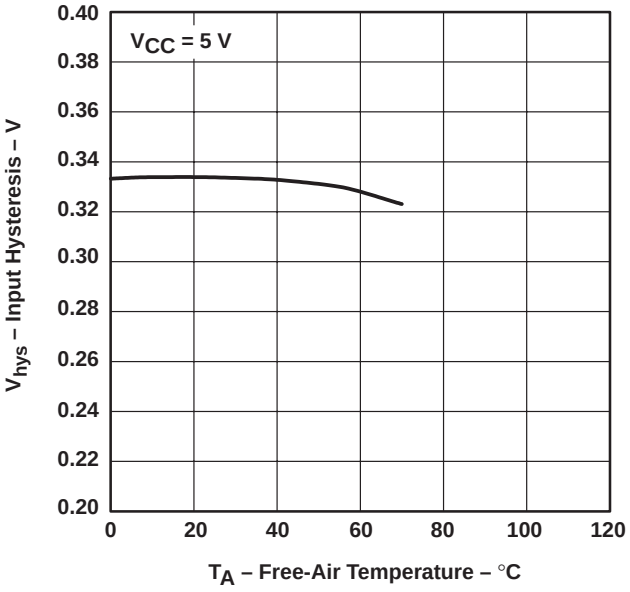


Figure 9

**SN75C189A
INPUT HYSTERESIS
vs
FREE-AIR TEMPERATURE**

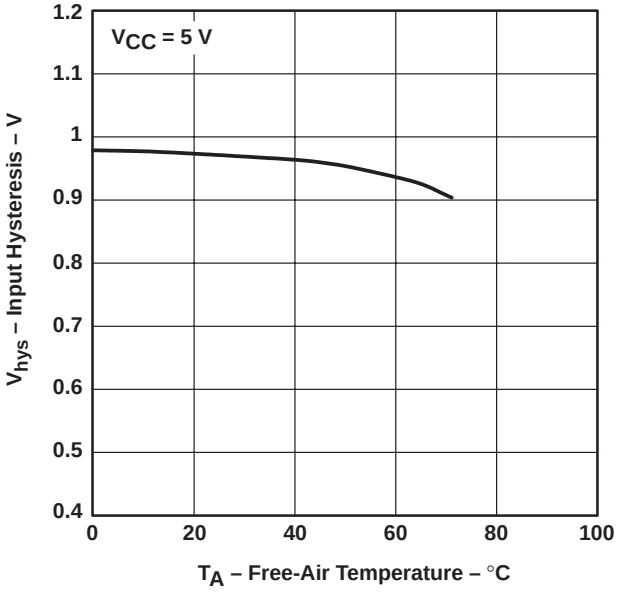


Figure 10

**HIGH-LEVEL OUTPUT VOLTAGE
vs
FREE-AIR TEMPERATURE**

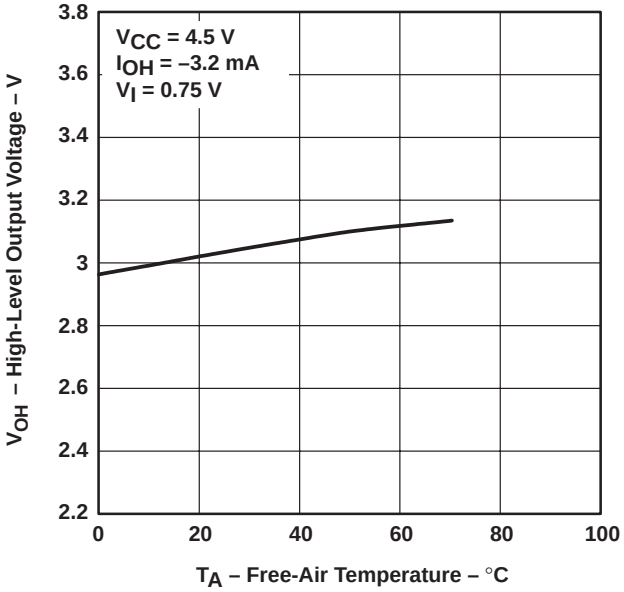


Figure 11

**LOW-LEVEL OUTPUT VOLTAGE
vs
FREE-AIR TEMPERATURE**

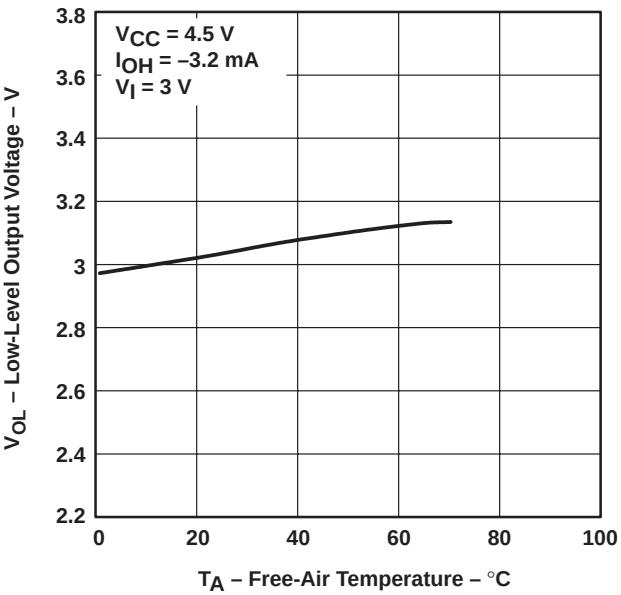


Figure 12

TYPICAL CHARACTERISTICS

**SN75C189
HIGH-LEVEL INPUT CURRENT
vs
FREE-AIR TEMPERATURE**

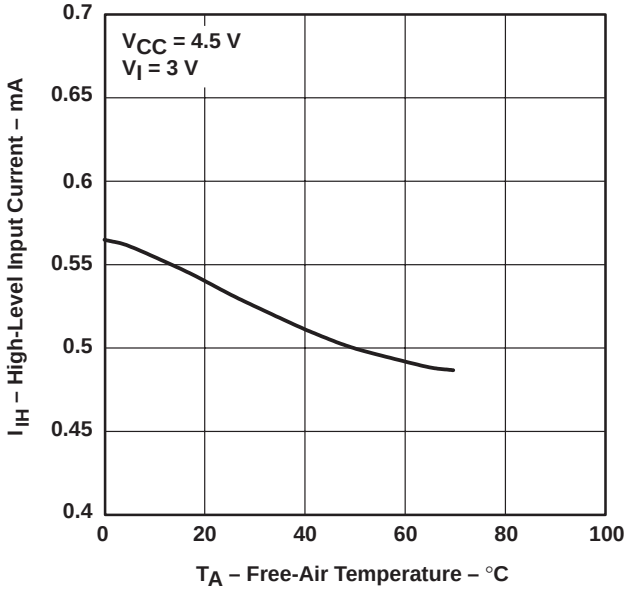


Figure 13

**SN75C189A
HIGH-LEVEL INPUT CURRENT
vs
FREE-AIR TEMPERATURE**

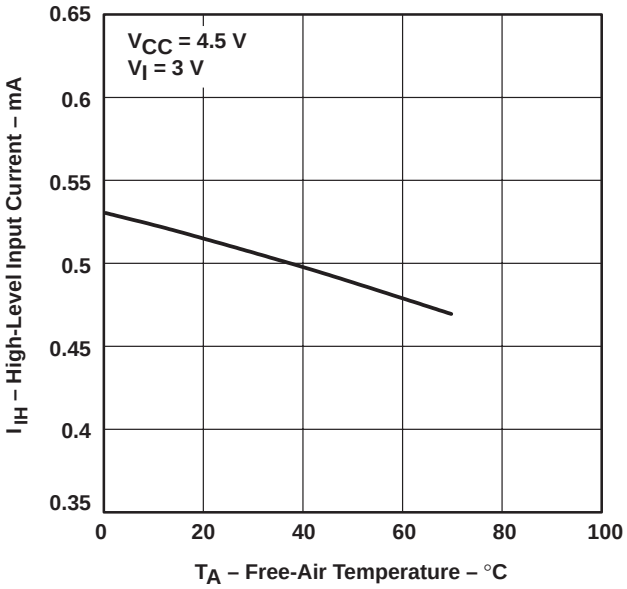


Figure 14

**SN75C189
LOW-LEVEL INPUT CURRENT
vs
FREE-AIR TEMPERATURE**

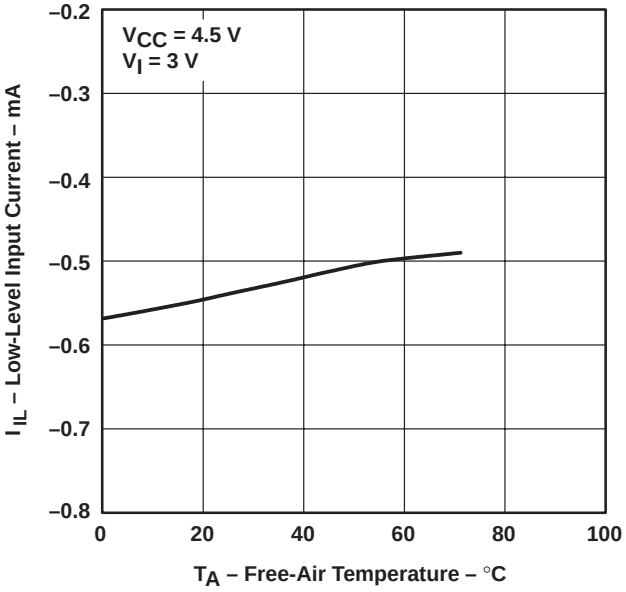


Figure 15

**SN75C189A
LOW-LEVEL INPUT CURRENT
vs
FREE-AIR TEMPERATURE**

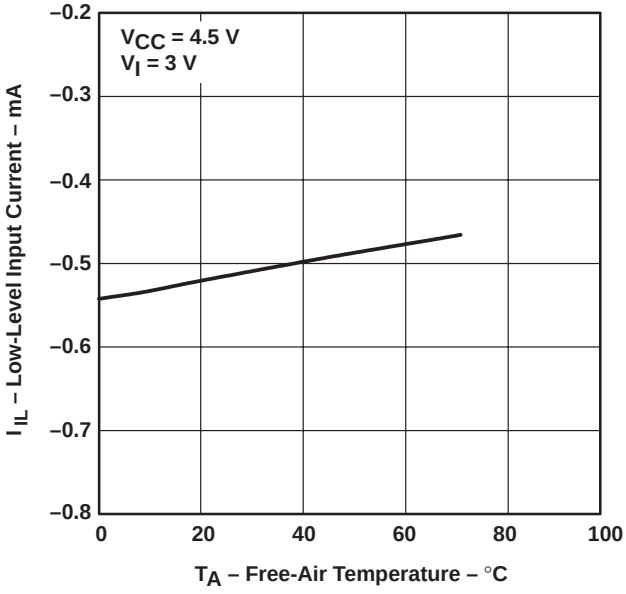


Figure 16

TYPICAL CHARACTERISTICS

HIGH-LEVEL SHORT-CIRCUIT OUTPUT CURRENT vs FREE-AIR TEMPERATURE

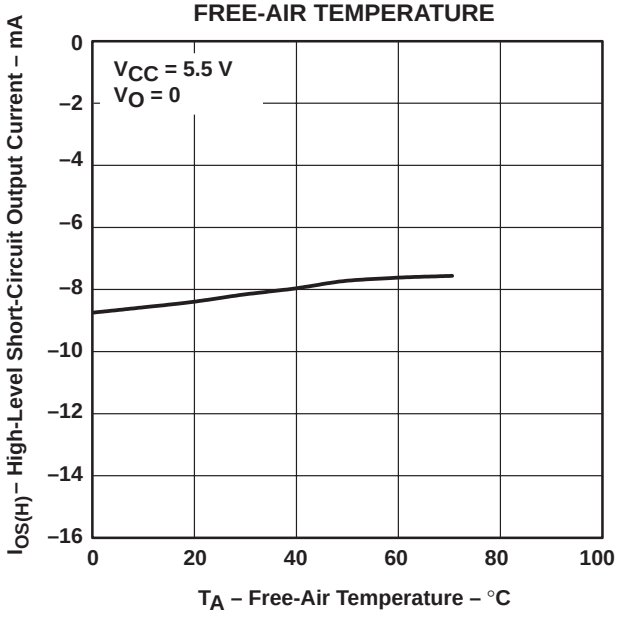


Figure 17

LOW-LEVEL SHORT-CIRCUIT OUTPUT CURRENT vs FREE-AIR TEMPERATURE

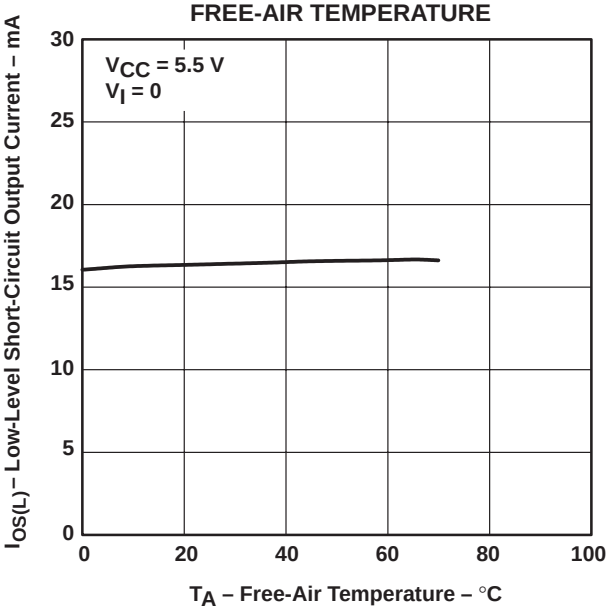


Figure 18

SUPPLY CURRENT vs FREE-AIR TEMPERATURE

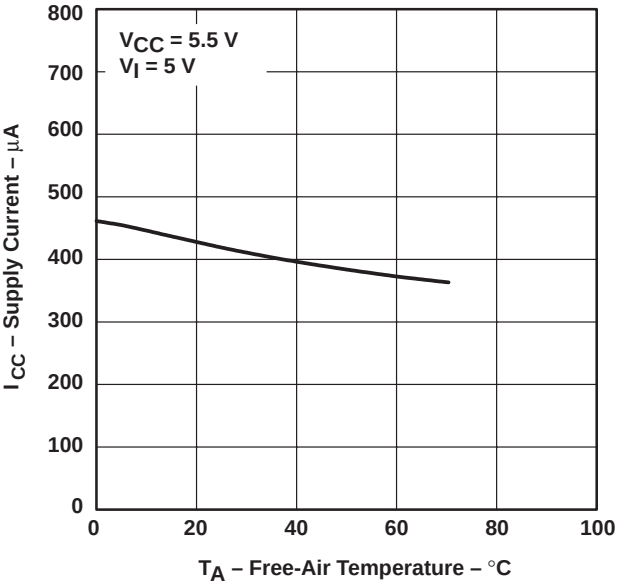


Figure 19

PROPAGATION DELAY TIME, LOW- TO HIGH-LEVEL OUTPUT vs FREE-AIR TEMPERATURE

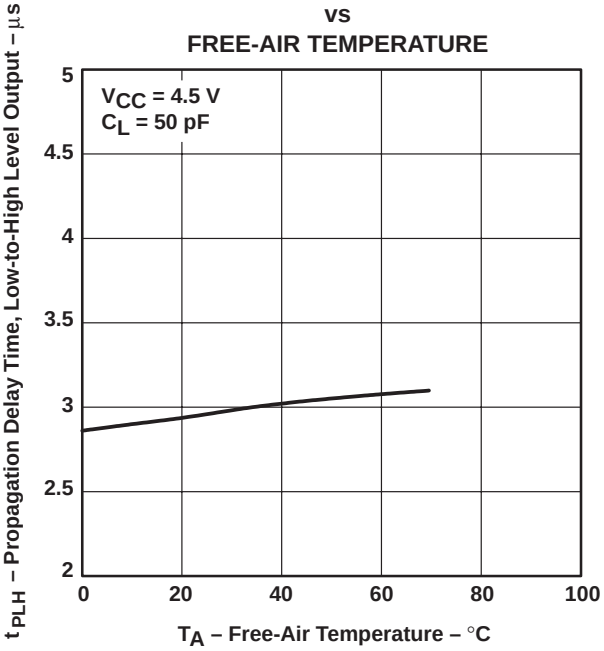


Figure 20

TYPICAL CHARACTERISTICS

PROPAGATION DELAY TIME,
HIGH- TO LOW-LEVEL OUTPUT
vs
FREE-AIR TEMPERATURE

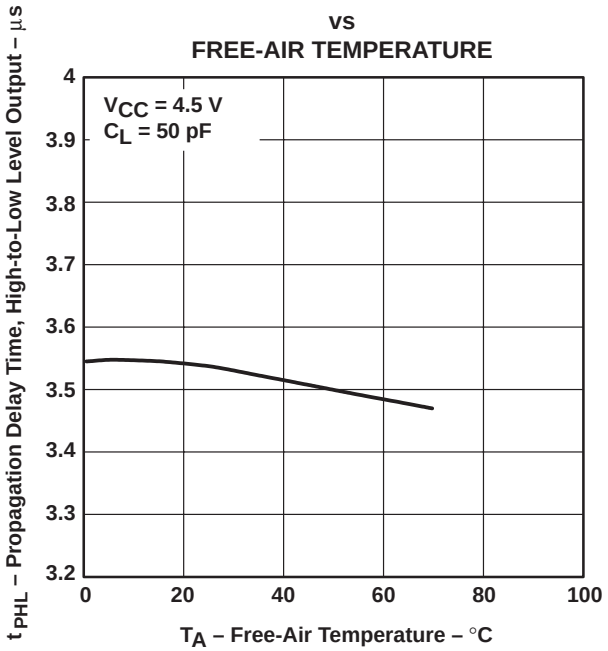


Figure 21

TRANSITION TIME,
LOW- TO HIGH-LEVEL OUTPUT
vs
FREE-AIR TEMPERATURE

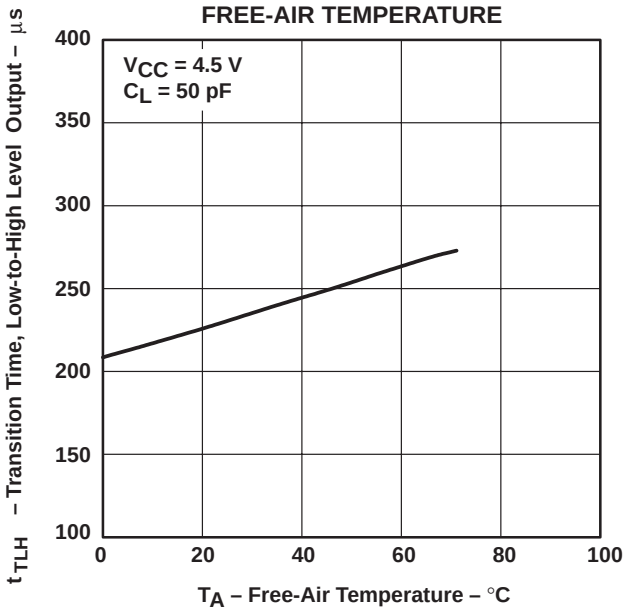


Figure 22

TRANSITION TIME,
HIGH- TO LOW-LEVEL OUTPUT
vs
FREE-AIR TEMPERATURE

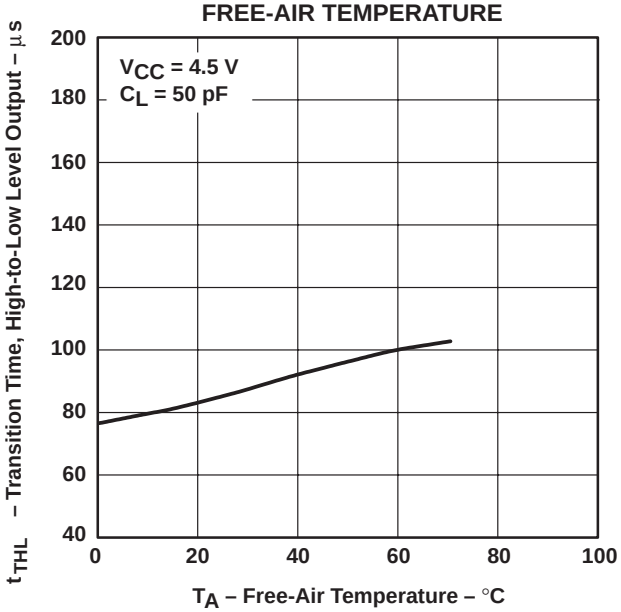


Figure 23

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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
- 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

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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-us 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.

TECHNICAL DOCUMENTS

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To view the following documents, Acrobat Reader 4.0 is required.

To download a document to your hard drive, right-click on the link and choose 'Save'.

DATASHEET

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Full datasheet in Acrobat PDF: sn75c189a.pdf (150 KB,Rev.G) (Updated: 01/20/2000)

APPLICATION NOTES

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- Interface Circuits for TIA/EIA-232-F (Rev. A) (SLLA037A - Updated: 09/19/2002)
- 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)
- Signaling Rate versus Transfer Rate (SLLA098 - Updated: 03/01/2001)

RELATED DOCUMENTS

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- Enhanced Plastic Portfolio Brochure (SGZB004, 385 KB - Updated: 08/19/2002)
- Military Analog Selection Guide (SGLB002, 318 KB - Updated: 11/09/2000)
- 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

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

PRICING/AVAILABILITY/PKG

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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 | $US	STD PACK QTY	IN STOCK	IN PROGRESS QTY|DATE	LEAD TIME	DISTRIBUTOR COMPANY|REGION	IN STOCK	PURCHASE
SN75C189AD	ACTIVE	SOP (D) | 14	0 TO 70	View Contents	1KU | 0.56	50	N/A*	4950 | 03 Oct	8 WKS	DigiKey | AMERICA	639	BUY NOW
SN75C189ADBLE	OBSOLETE	SSOP (DB) | 14	0 TO 70	View Contents	1KU |		N/A*		Not Available			
SN75C189ADBR	ACTIVE	SSOP (DB) | 14	0 TO 70	View Contents	1KU | 0.56	2000	N/A*		8 WKS			
SN75C189ADR	ACTIVE	SOP (D) | 14	0 TO 70	View Contents	1KU | 0.56	2500	N/A*	2153 | 24 Sep	8 WKS	Avnet | AMERICA	>1k	BUY NOW
								2500 | 03 Oct				
								>10k | 14 Nov				
SN75C189AN	ACTIVE	PDIP (N) | 14	0 TO 70	View Contents	1KU | 0.56	25	N/A*	3500 | 03 Oct	5 WKS	DigiKey | AMERICA	578	BUY NOW
										Avnet | AMERICA	128	BUY NOW
SN75C189ANSR	ACTIVE	SOP (NS) | 14		View Contents	1KU | 0.70	2000	N/A*		8 WKS			

Table Data Updated on: 9/26/2002

SN75C189, Quadruple Low-Power Line Receiver

DEVICE STATUS: **ACTIVE**

PARAMETER NAME	SN75C189
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
- 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

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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-us 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.

TECHNICAL DOCUMENTS

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To view the following documents, Acrobat Reader 4.0 is required.

To download a document to your hard drive, right-click on the link and choose 'Save'.

DATASHEET

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Full datasheet in Acrobat PDF: sn75c189.pdf (150 KB,Rev.G) (Updated: 01/20/2000)

APPLICATION NOTES

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- Interface Circuits for TIA/EIA-232-F (Rev. A) (SLLA037A - Updated: 09/19/2002)
- 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)
- Signaling Rate versus Transfer Rate (SLLA098 - Updated: 03/01/2001)

RELATED DOCUMENTS

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- Enhanced Plastic Portfolio Brochure (SGZB004, 385 KB - Updated: 08/19/2002)
- Military Analog Selection Guide (SGLB002, 318 KB - Updated: 11/09/2000)
- 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

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ORDERABLE DEVICE	PACKAGE INDUSTRY (TI)	PINS	TEMP (°C)	STATUS	PRODUCT CONTENT	SAMPLES
SN75C189D	SOP (D)	14	0 TO 70	ACTIVE	View Product Content	Request Samples
SN75C189N	PDIP (N)	14	0 TO 70	ACTIVE	View Product Content	Request Samples

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

Table Data Updated on: 9/26/2002