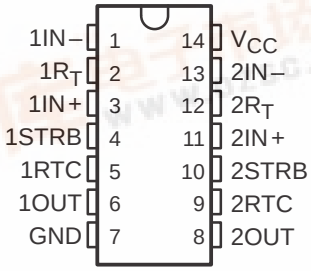
DS8820A, SN55182, SN75182
DUAL DIFFERENTIAL LINE RECEIVERS

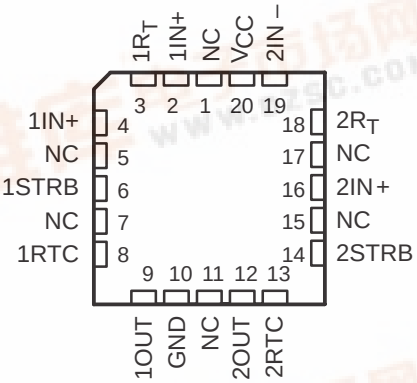
SLLS092B – OCTOBER 1972 – REVISED MAY 1995

- Single 5-V Supply
- Differential Line Operation
- Dual Channels
- TTL Compatibility
- ±15-V Common-Mode Input Voltage Range
- ±15-V Differential Input Voltage Range
- Individual Channel Strobes
- Built-In Optional Line-Termination Resistor
- Individual Frequency Response Controls
- Designed for Use With Dual Differential Drivers SN55183 and SN75183
- Designed to Be Interchangeable With National Semiconductor DS7820A and DS8820A

SN55182 . . . J OR W PACKAGE
DS8820A, SN75182 . . . D OR N PACKAGE
(TOP VIEW)



SN55182 . . . FK PACKAGE
(TOP VIEW)



NC – No internal connection

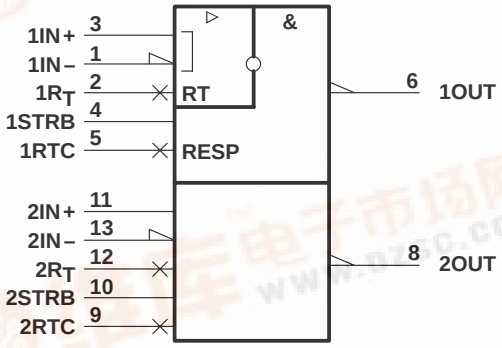
description

The DS8820A, SN55182, and SN75182 dual differential line receivers are designed to sense small differential signals in the presence of large common-mode noise. These devices give TTL-compatible output signals as a function of the polarity of the differential input voltage. The frequency response of each channel may be easily controlled by a single external capacitor to provide immunity to differential noise spikes. The output goes to a high level when the inputs are open circuited. A strobe input is provided which, when in the low level, disables the receiver and forces the output to a high level.

The receiver is of monolithic single-chip construction, and both halves of the dual circuits use common power supply and ground terminals.

The SN55182 is characterized for operation over the full military temperature range of –55°C to 125°C. The DS8820A and SN75182 are characterized for operation from 0°C to 70°C.

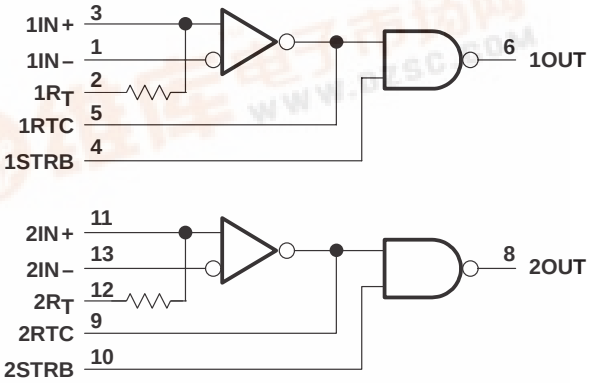
logic symbol†



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

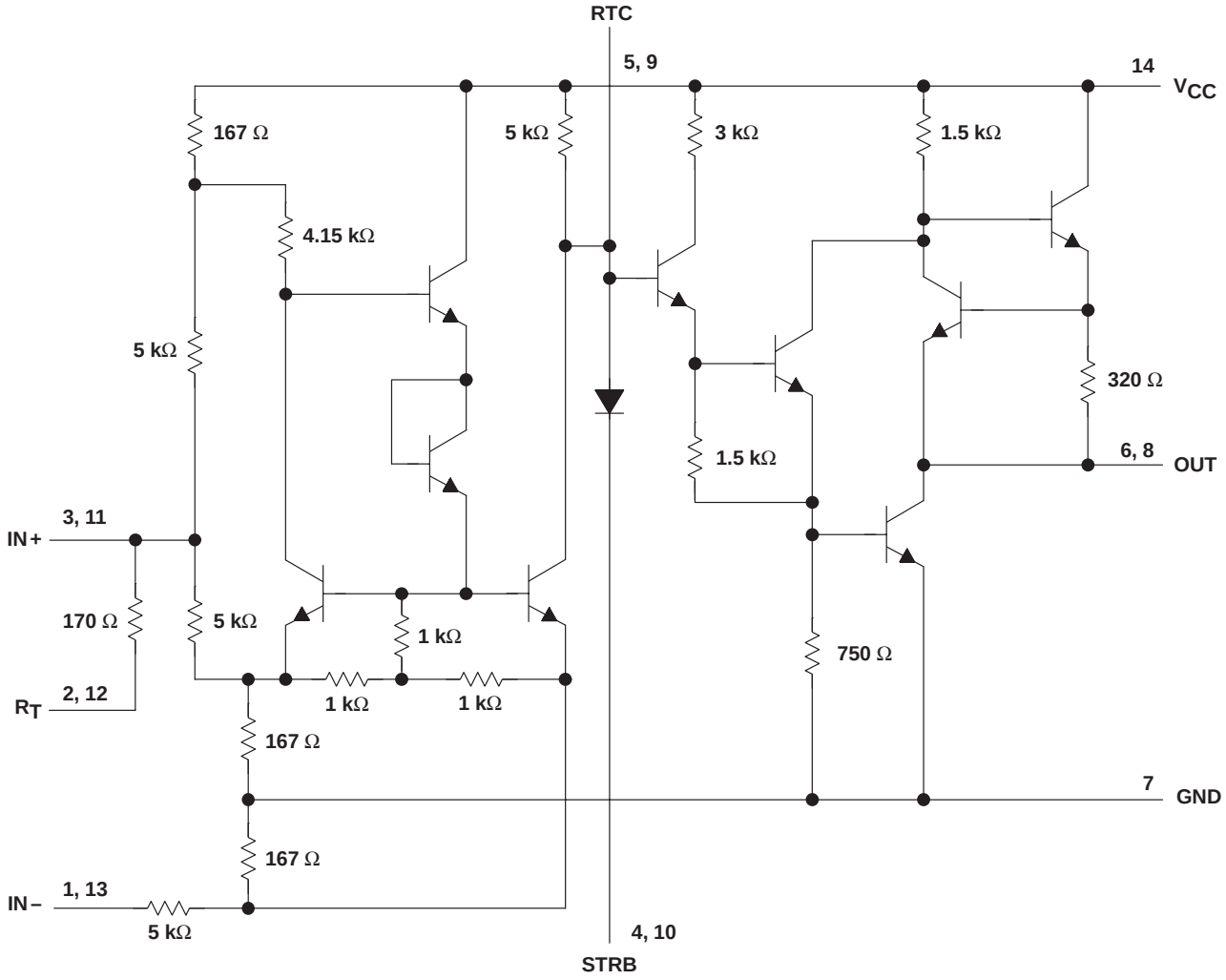
Pin numbers shown are for the D, J, N, and W packages.

logic diagram (positive logic)



TEXAS INSTRUMENTS

schematic (each receiver)



Resistor values shown are nominal.
Pin numbers shown are for the D, J, N, and W packages.

FUNCTION TABLE

STRB	V_{ID}	OUT
L	X	H
H	H	H
H	L	L

H = $V_I \geq V_{IH}$ min or V_{ID} more positive than V_{TH} max
L = $V_I \leq V_{IL}$ max or V_{ID} more negative than V_{TL} max
X = irrelevant

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

	SN55182	DS8820A SN75182	UNIT
Supply voltage, V_{CC} (see Note 1)	8	8	V
Common-mode input voltage, V_{IC}	±20	±20	V
Differential input voltage, V_{ID} (see Note 2)	±20	±20	V
Strobe input voltage, $V_{I(STROB)}$	8	8	V
Output sink current	50	50	mA
Continuous total power dissipation	See Dissipation Rating Table		
Operating free-air temperature range, T_A	–55 to 125	0 to 70	°C
Storage temperature range, T_{stg}	–65 to 150	–65 to 150	°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds: D or N package		260	°C
Case temperature for 60 seconds, T_c: FK package	260		°C
Lead temperature 1,6 mm (1/16 inch) from case for 60 seconds: J or W package	300	300	°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, except differential voltages, are with respect to network ground terminal.
2. Differential voltage values are at the noninverting terminal with respect to the inverting 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	—
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	—
W‡	1000 mW	8.0 mW/°C	640 mW	200 mW

‡ In the FK, J, and W packages, SN55182 chips are alloy mounted.

recommended operating conditions

	SN55182			DS8820A, SN75182			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
Supply voltage, V_{CC}	4.5	5	5.5	4.5	5	5.5	V
Common-mode input voltage, V_{IC}			±15			±15	V
High-level strobe input voltage, $V_{IH(STRB)}$	2.1		5.5	2.1		5.5	V
Low-level strobe input voltage, $V_{IL(STRB)}$	0		0.9	0		0.9	V
High-level output current, I_{OH}			–400			–400	μA
Low-level output current, I_{OL}			16			16	mA
Operating free-air temperature, T_A	–55		125	0		70	°C

electrical characteristics over recommended ranges of V_{CC}, V_{IC}, and operating free-air temperature (unless otherwise noted)

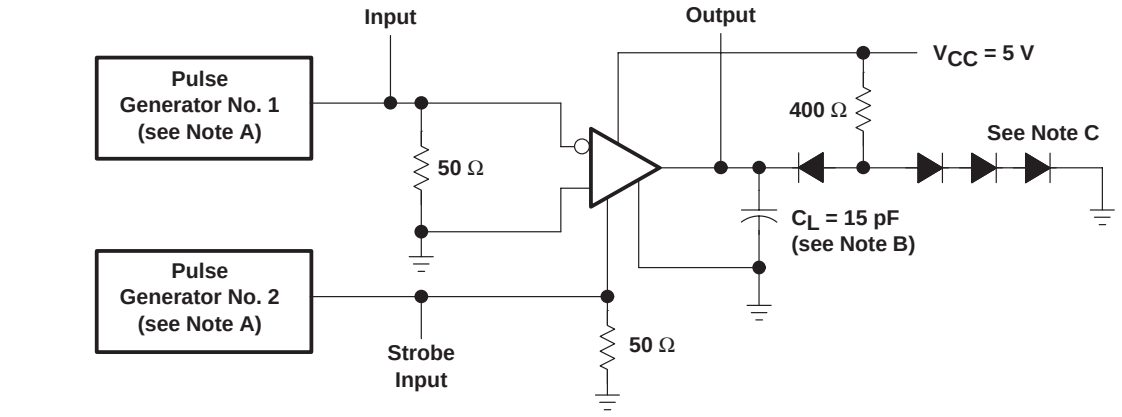
PARAMETER			TEST CONDITIONS†		MIN	TYP‡	MAX	UNIT
V_{IT+}	Positive-going input threshold voltage		V_O = 2.5 V, I_{OH} = –400 µA	V_{IC} = –3 V to 3 V			0.5	V
				V_{IC} = –15 V to 15 V			1	
$V_{IT–}$	Negative-going input threshold voltage		V_O = 0.4 V, I_{OL} = 16 mA	V_{IC} = –3 V to 3 V			–0.5	V
				V_{IC} = –15 V to 15 V			–1	
V_{OH}	High-level output voltage		V_{ID} = 1 V, I_{OH} = –400 µA	$V_{(STRB)}$ = 2.1 V,	2.5	4.2	5.5	V
			V_{ID} = –1 V, I_{OH} = –400 µA	$V_{(STRB)}$ = 0.4 V,	2.5	4.2	5.5	
V_{OL}	Low-level output voltage		V_{ID} = –1 V, I_{OL} = 16 mA	$V_{(STRB)}$ = 2.1 V,		0.25	0.4	V
I_I	Input current	Inverting input	V_{IC} = 15 V			3	4.2	mA
			V_{IC} = 0			0	–0.5	
			V_{IC} = –15 V			–3	–4.2	
		Noninverting input	V_{IC} = 15 V			5	7	mA
			V_{IC} = 0			–1	–1.4	
			V_{IC} = –15 V			–7	–9.8	
$I_{IH(STRB)}$	High-level strobe input current		$V_{(STRB)}$ = 5.5 V				5	µA
$I_{IL(STRB)}$	Low-level strobe input current		$V_{(STRB)}$ = 0			–1	–1.4	mA
r_i	Input resistance	Inverting input			3.6	5		kΩ
		Noninverting input			1.8	2.5		kΩ
	Line terminating resistance		T_A = 25°C		120	170	250	Ω
I_{OS}	Short-circuit output current		V_{CC} = 5.5 V,	V_O = 0	–2.8	–4.5	–6.7	mA
I_{CC}	Supply current (average per receiver)		V_{IC} = 15 V,	V_{ID} = –1 V		4.2	6	mA
			V_{IC} = 0,	V_{ID} = –0.5 V		6.8	10.2	
			V_{IC} = –15 V,	V_{ID} = –1 V		9.4	14	

† Unless otherwise noted, $V_{(STRB)} \geq 2.1$ V or open.
‡ All typical values are at V_{CC} = 5 V, V_{IC} = 0, and T_A = 25°C.

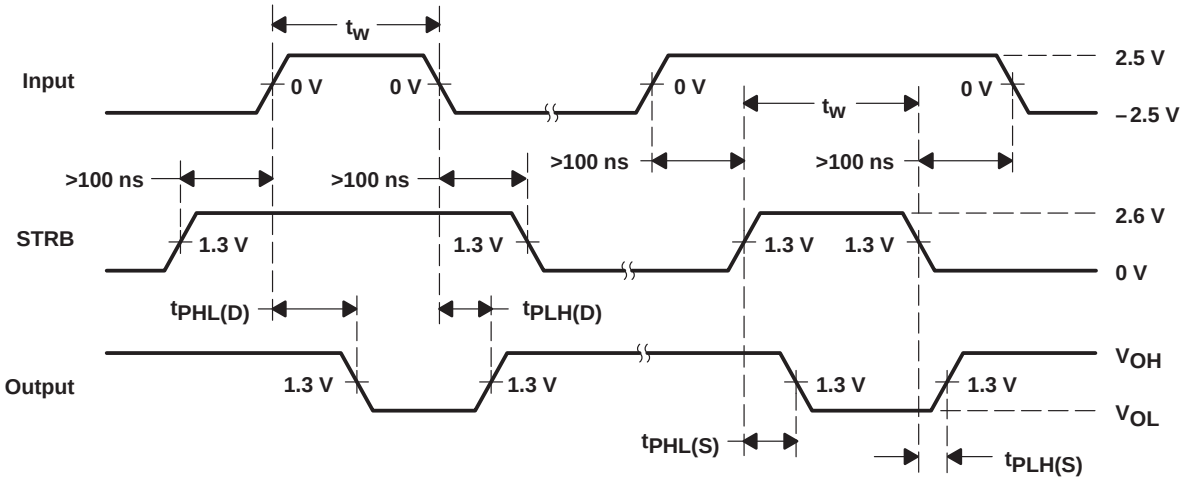
switching characteristics, V_{CC} = 5 V, T_A = 25°C

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
$t_{PLH(D)}$	Propagation delay time, low- to high-level output from differential input	R_L = 400 Ω, C_L = 15 pF, See Figure 1		18	40	ns
$t_{PHL(D)}$	Propagation delay time, high- to low-level output from differential input			31	45	ns
$t_{PLH(S)}$	Propagation delay time, low- to high-level output from STRB input			9	30	ns
$t_{PHL(S)}$	Propagation delay time, high- to low-level output from STRB input			15	25	ns

PARAMETER MEASUREMENT INFORMATION



TEST CIRCUIT



VOLTAGE WAVEFORMS

NOTES: A. The pulse generators have the following characteristics: Z_O = 50 Ω, $t_r \le 10$ ns, $t_f \le 10$ ns, t_w = 0.5 ±0.1 µs, PRR ≤ 1 MHz.
B. C_L includes probe and jig capacitance.
C. All diodes are 1N3064 or equivalent.

Figure 1. Test Circuit and Voltage Waveforms

TYPICAL CHARACTERISTICS†

DIFFERENTIAL INPUT THRESHOLD VOLTAGE vs SUPPLY VOLTAGE

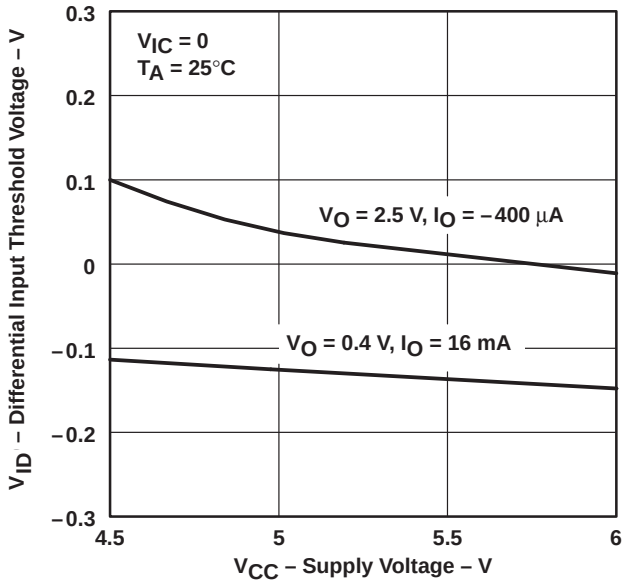


Figure 2

DIFFERENTIAL INPUT THRESHOLD VOLTAGE vs COMMON-MODE INPUT VOLTAGE

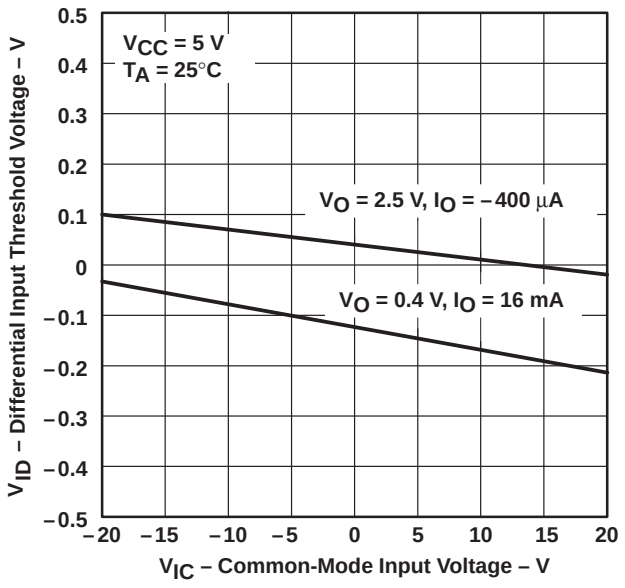


Figure 3

DIFFERENTIAL INPUT THRESHOLD VOLTAGE vs FREE-AIR TEMPERATURE

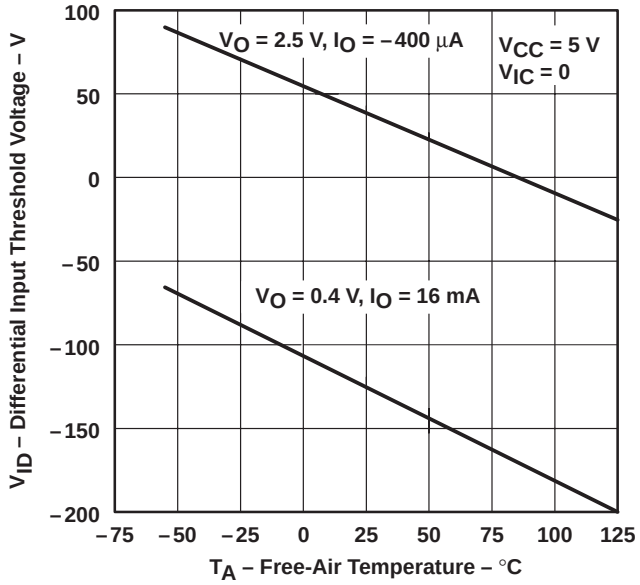


Figure 4

† Data for temperatures below 0°C and above 70°C are applicable to SN55182 circuits only.

TYPICAL CHARACTERISTICS†

OUTPUT VOLTAGE vs FREE-AIR TEMPERATURE

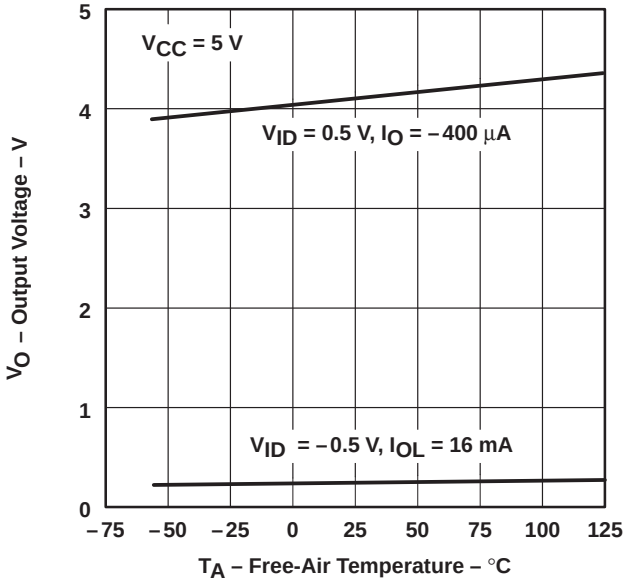


Figure 5

VOLTAGE TRANSFER CHARACTERISTICS

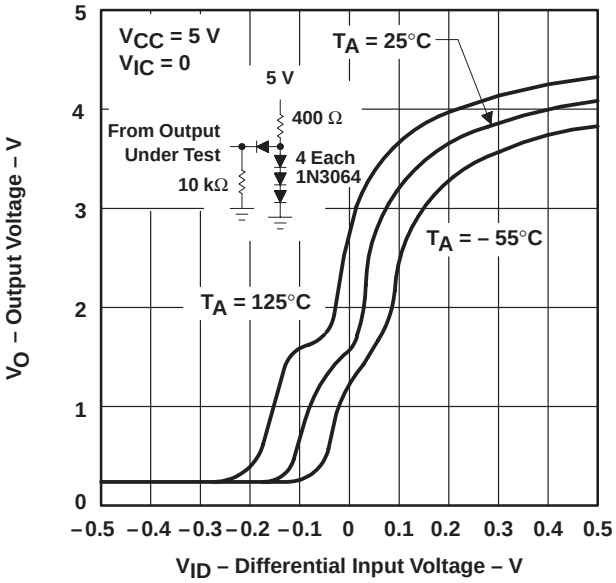


Figure 6

INPUT CURRENT vs INPUT VOLTAGE

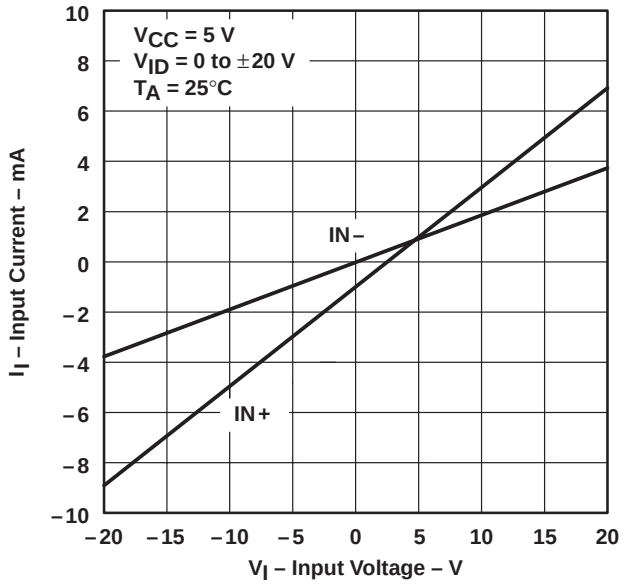


Figure 7

TERMINATING RESISTANCE vs FREE-AIR TEMPERATURE

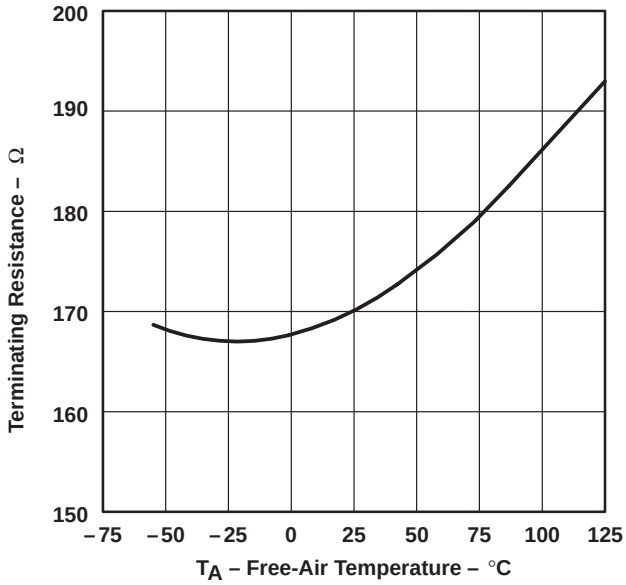


Figure 8

† Data for temperatures below 0°C and above 70°C are applicable to SN55182 circuits only.

TYPICAL CHARACTERISTICS†

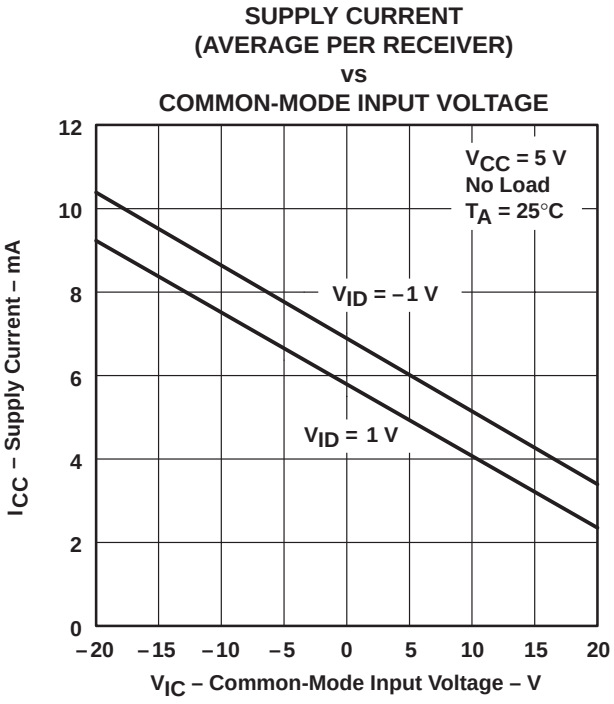


Figure 9

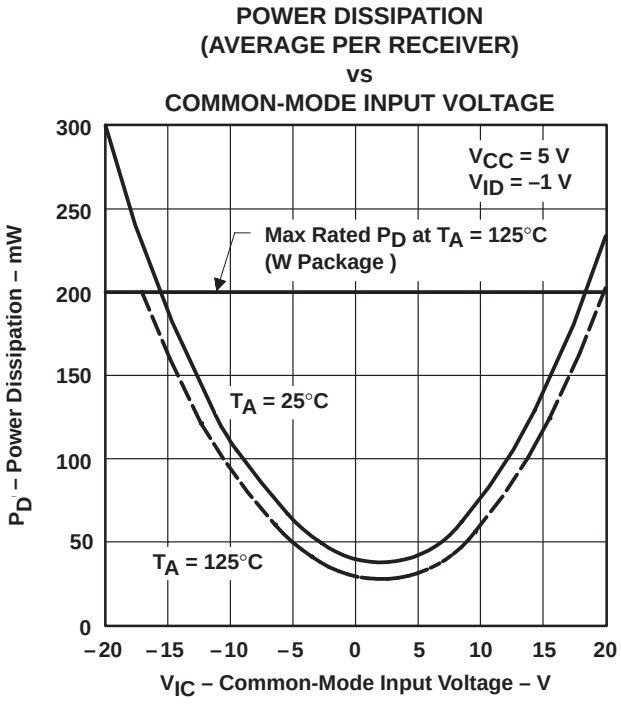
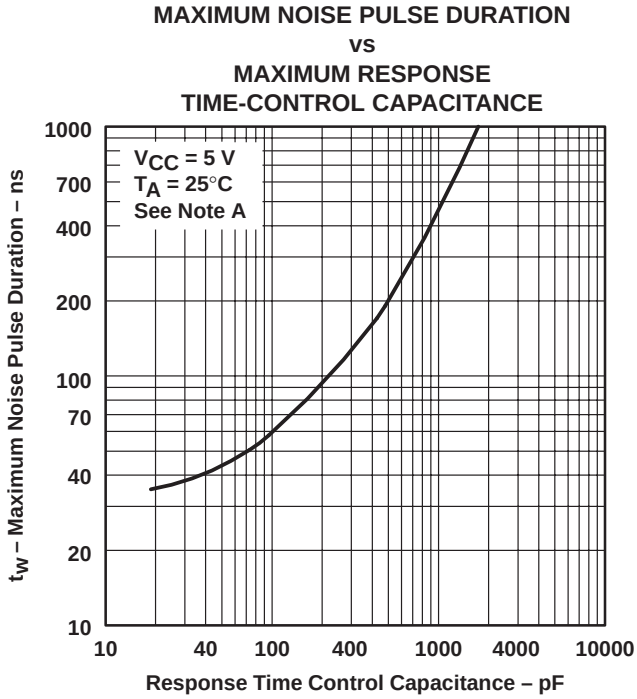
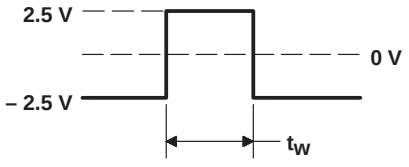


Figure 10





INPUT PULSE

NOTE A: Figure 11 shows the maximum duration of the illustrated pulse that can be applied differently without the output changing from the low to high level.

Figure 11

† Data for temperatures below 0°C and above 70°C are applicable to SN55182 circuits only.

TYPICAL CHARACTERISTICS†

PROPAGATION DELAY TIME FROM DIFFERENTIAL INPUT VS FREE-AIR TEMPERATURE

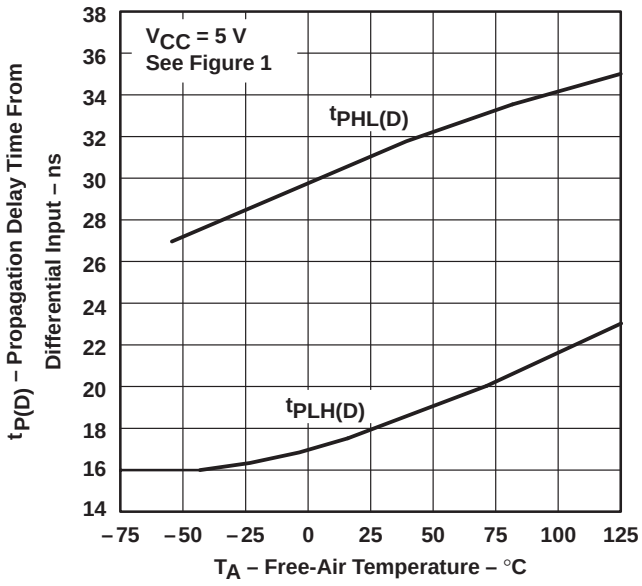


Figure 12

PROPAGATION DELAY TIME FROM STROBE INPUT VS FREE-AIR TEMPERATURE

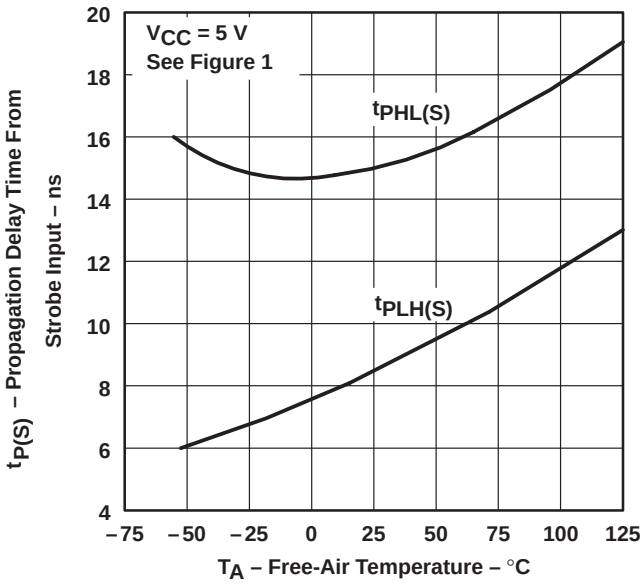
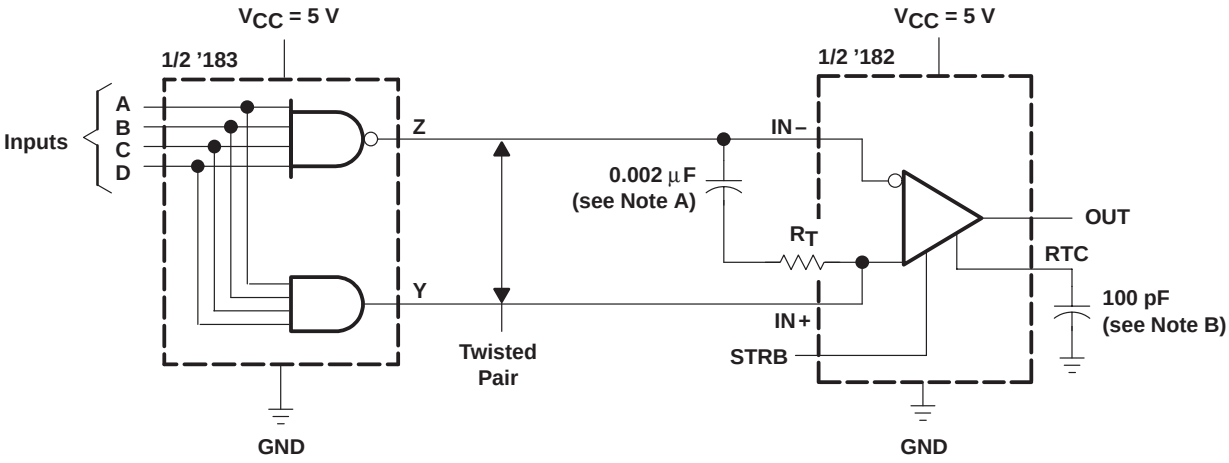


Figure 13

† Data for temperatures below 0°C and above 70°C are applicable to SN55182 circuits only.

APPLICATION INFORMATION



NOTES: A. When the inputs are open circuited, the output is high. A capacitor may be used for dc isolation of the line-terminating resistor. At the frequency of operation, the impedance of the capacitor should be relatively small.

Example: let f = 5 MHz
C = 0.002 μF

$$Z_{(C)} = \frac{1}{2\pi fC} = \frac{1}{2\pi\ (5 \times 10^{6})\ (0.002 \times 10^{-6})}$$

$$Z_{(C)} \approx 16\ \Omega$$

B. Use of a capacitor to control response time is optional.

Figure 14. Transmission of Digital Data Over Twisted-Pair Line

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