

SN55116, SN75116, SN75118 DIFFERENTIAL LINE TRANSCEIVERS

SLLS073C – MAY 1976 – REVISED MARCH 1997

features common to all types

- Single 5-V Supply
- 3-State Driver Output Circuitry
- TTL-Compatible Driver Inputs
- TTL-Compatible Receiver Output
- Differential Line Operation
- Receiver Output Strobe (SN55116, SN75116) or Enable (SN75118)
- Designed for Party-Line (Data-Bus) Applications

additional features of the SN55116/SN75116

- Choice of Ceramic or Plastic Packages
- Independent Driver and Receiver
- Choice of Open-Collector or Totem-Pole Outputs on Both Driver and Receiver
- Dual Data Inputs on Driver
- Optional Line-Termination Resistor in Receiver
- ± 15 -V Receiver Common-Mode Capability
- Receiver Frequency Response Control

The SN75118 is an SN75116 With 3-State Receiver Output Circuitry

description

These integrated circuits are designed for use in interfacing between TTL-type digital systems and differential data-transmission lines. They are especially useful for party-line (data-bus) applications. Each of these circuit types combine in one package a 3-state differential line driver and a differential input line receiver, both of which operate from a single 5-V power supply. The driver inputs and the receiver outputs are TTL compatible. The driver employed is similar to the SN55113/SN75113 3-state line driver, and the receiver is similar to the SN55115/SN75115 line receiver.

The SN55116/SN75116 and SN75118 circuits offer all the features of the SN55113/SN75113 driver and the SN55115/SN75115 receiver combined. The driver performs the dual input AND and NAND functions when enabled or presents a high impedance to the load when in the disabled state. The driver output stages are similar to TTL totem-pole outputs, but have the current-sink portion separated from the current-sourcing portion and both are brought out to adjacent package terminals. This feature allows the user the option of using the driver in the open-collector output configuration, or, by connecting the adjacent source and sink terminals together, of using the driver in the normal totem-pole output configuration.

The receiver portion of the SN55116/SN75116 and SN75118 features a differential input circuit having a common-mode voltage range of ± 15 V. An internal $130\text{-}\Omega$ resistor is also provided, which may optionally be used for terminating the transmission line. A frequency response control terminal allows the user to reduce the speed of the receiver or to improve differential noise immunity. The receiver of the SN55116/SN75116 also has an output strobe and a split totem-pole output. The receiver of the SN75118 has an output-enable for the 3-state split totem-pole output. The receiver section of either circuit is independent of the driver section except for the V_{CC} and ground terminals.

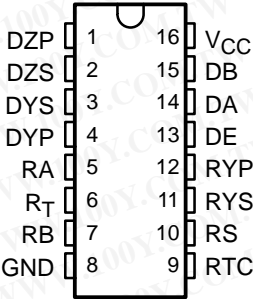
The SN55116 is characterized for operation over the full military temperature range of -55°C to 125°C . The SN75116 and SN75118 are characterized for operation from 0°C to 70°C .

勝特力材料 886-3-5753170
勝特力电子(上海) 86-21-54151736
勝特力电子(深圳) 86-755-83298787
[Http://www.100y.com.tw](http://www.100y.com.tw)

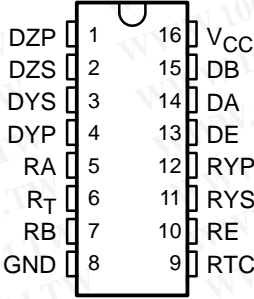
SN55116, SN75116, SN75118
DIFFERENTIAL LINE TRANSCEIVERS

SLLS073C – MAY 1976 – REVISED MARCH 1997

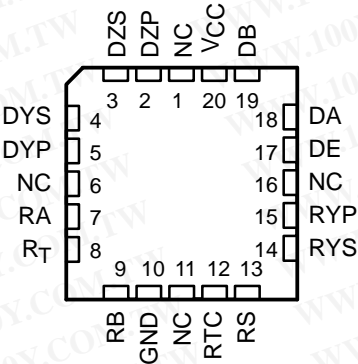
SN55116 . . . J PACKAGE
SN75116 . . . N PACKAGE
(TOP VIEW)



SN75118 . . . N PACKAGE
(TOP VIEW)



SN55116 . . . FK PACKAGE
(TOP VIEW)



NC – No internal connection

勝特力材料 886-3-5753170
勝特力电子(上海) 86-21-54151736
勝特力电子(深圳) 86-755-83298787
[Http://www.100y.com.tw](http://www.100y.com.tw)

Function Tables

SN55116, SN75116, SN75118
DRIVER

INPUTS			OUTPUTS	
DE	DA	DB	DY	DZ
L	X	X	Z	Z
H	L	X	L	H
H	X	L	L	H
H	H	H	H	L

SN55116, SN75116, SN75118
RECEIVER

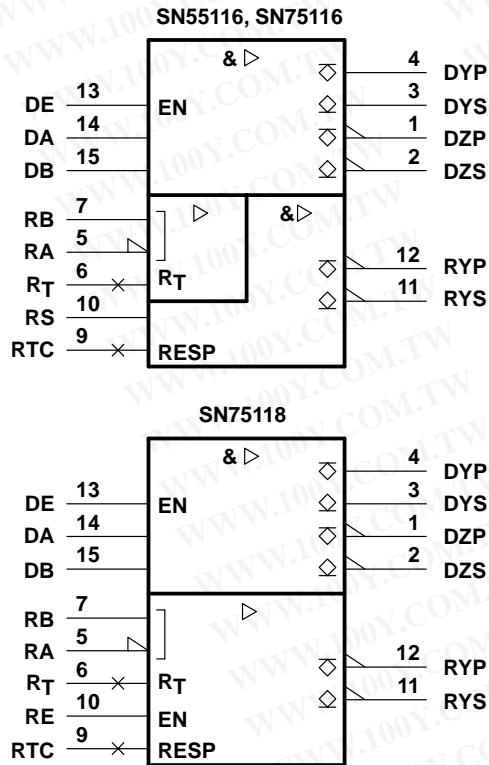
RS/RE	DIFF INPUT	OUTPUTS RY	
		'116	SN75118
L	X	H	Z
H	L	H	H
H	H	L	L

H = high level ($V_I \geq V_{IH}$ min or V_{ID} more positive than V_{TH} max)
L = low level ($V_I \leq V_{IL}$ max or V_{ID} more negative than V_{TL} max)
X = irrelevant
Z = high impedance (off)

SN55116, SN75116, SN75118 DIFFERENTIAL LINE TRANSCEIVERS

SLLS073C – MAY 1976 – REVISED MARCH 1997

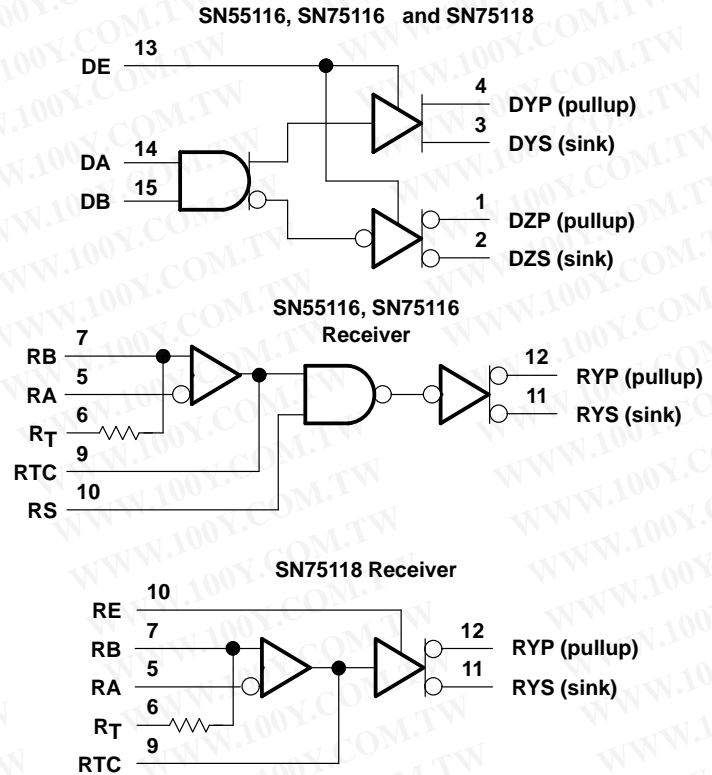
logic symbol†



†These symbols are in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

NOTE: Pin numbers shown for the SN55116 are for the J package, and those shown for the SN75118 are for the N package.

logic diagram (positive logic)



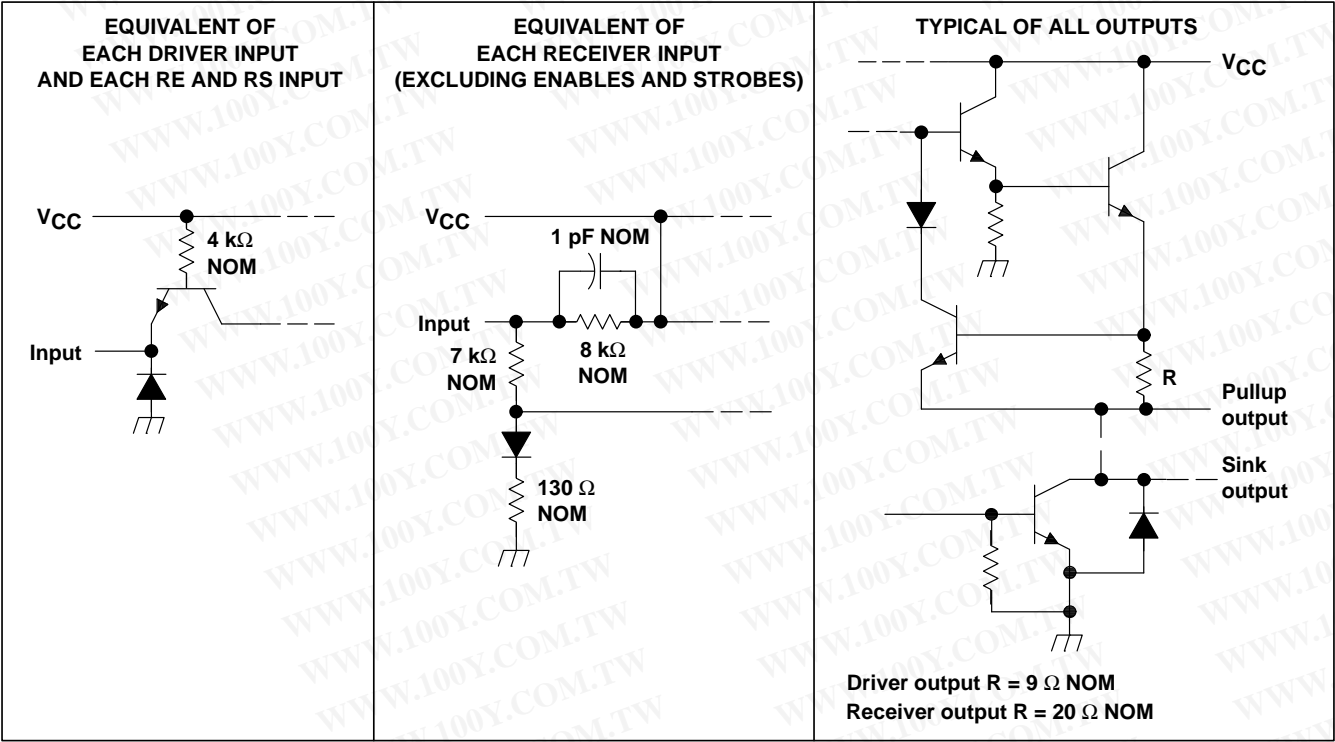
勝特力材料 886-3-5753170
勝特力电子(上海) 86-21-54151736
勝特力电子(深圳) 86-755-83298787
[Http://www.100y.com.tw](http://www.100y.com.tw)

SN55116, SN75116, SN75118
DIFFERENTIAL LINE TRANSCEIVERS

SLLS073C – MAY 1976 – REVISED MARCH 1997

勝特力材料 886-3-5753170
勝特力电子(上海) 86-21-54151736
勝特力电子(深圳) 86-755-83298787
[Http://www.100y.com.tw](http://www.100y.com.tw)

schematics of inputs and outputs



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

	SN55116, SN75116, SN75118	UNIT
Supply voltage, V_{CC} (see Note 1)	7	V
Input voltage, V_I	DA, DB, DE, DI, RE, RS	5.5
	RA, RB, RT	± 25
	A and B	
Off-state voltage applied to open-collector outputs	12	V

	SN55116	SN75116 and SN75118	UNIT
Continuous total power dissipation (see Note 2)	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 50	-65 to 50	°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 package	300	300	°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds: D, N, or P 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 network ground terminal.
 2. In the FK and J packages, SN55116 chip is alloy mounted. The SN75116 and SN75118 chips are glass mounted.

DISSIPATION RATING TABLE

PACKAGE	$T_A \leq 25^\circ\text{C}$ POWER RATING	DERATING FACTOR ABOVE $T_A = 25^\circ\text{C}$	$T_A = 70^\circ\text{C}$ POWER RATING	$T_A = 125^\circ\text{C}$ POWER RATING
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	—

recommended operating conditions

PARAMETER		SN55116			SN75116 and SN75118			UNIT	
		MIN	NOM	MAX	MIN	NOM	MAX		
Supply voltage, V _{CC}		4.5	5	5.5	4.5	5	5.5	V	
High-level input voltage, V _{IH}	All inputs except differential inputs	2			2			V	
Low-level input voltage, V _{IL}		0.8			0.8			V	
High-level output current, I _{OH}	Drivers	−40			−40			mA	
	Receivers	−5			−5				
Low-level output current, I _{OL}	Drivers	40			40			mA	
	Receivers	15			15				
Receiver input voltage, V _I		±15			±15			V	
Common-mode receiver input voltage, V _{ICR}		±15			±15			V	
Operating free-air temperature, T _A		−55			0			70	°C

SN55116, SN75116, SN75118 DIFFERENTIAL LINE TRANSCEIVERS

SLLS073C – MAY 1976 – REVISED MARCH 1997

勝特力材料 886-3-5753170
勝特力电子(上海) 86-21-54151736
勝特力电子(深圳) 86-755-83298787
[Http://www.100y.com.tw](http://www.100y.com.tw)

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

driver section

PARAMETER		TEST CONDITION [†]		SN55116, SN75116, SN75118		UNIT
				MIN	TYP [‡] MAX	
V _{IK}	Input clamp voltage	V _{CC} = MIN, I _I = –12 mA		–0.9	–1.5	V
V _{OH}	High-level output voltage	V _{CC} = MIN, V _{IL} = 0.8 V, I _{IH} = 2 V	T _A = 25°C (SN55116), T _A = 0°C to 70°C (SN75116, SN75118)	I _{OH} = –10 mA	2.4 3.4	V
				I _{OH} = –40 mA	2 3	
			T _A = –55°C to 125°C (SN55116)	I _{OH} = –10 mA	2	
				I _{OH} = –40 mA	1.8	
V _{OL}	Low-level output voltage	V _{CC} = MIN, V _{IH} = 2 V, V _{IL} = 0.8 V, I _{OL} = 40 mA			0.4	V
V _{OK}	Output clamp voltage	V _{CC} = MAX, I _O = –40 mA, DE at 0.8 V			–1.5	V
I _{O(off)}	Off-state open-collector output current	V _{CC} = MAX, V _O = 12 V	T _A = 25°C		1 10	μA
			SN55116		200	
			SN75116, SN75118		20	
I _{OZ}	Off-state (high-impedance-state) output current	V _{CC} = MAX, V _O = 0 to V _{CC} , DE at 0.8 V, T _A = 25°C			±10	μA
			V _O = 0	SN55116	–300	
			V _O = 0.4 V to V _{CC}	SN55116	±150	
			V _O = 0 to V _{CC}	SN75116	±20	
I _I	Input current at maximum input voltage	V _{CC} = MAX, V _I = 5.5 V			1	mA
I _{IH}	High-level input current				40	μA
I _{IL}	Low-level input current				–1.6	mA
I _{OS}	Short-circuit output current [§]	V _{CC} = MAX, V _O = 0, T _A = 25°C		–40	–120	mA
I _{CC}	Supply current (driver and receiver combined)	V _{CC} = MAX, T _A = 25°C		42	60	mA

[†] All parameters with the exception of off-state open-collector output current are measured with the active pullup connected to the sink output. For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

[‡] All typical values are at V_{CC} = 5 V and T_A = 25°C.

[§] Not more than one output should be shorted at a time, and duration of the short circuit should not exceed one second.

switching characteristics, V_{CC} = 5 V, C_L = 30 pF, T_A = 25°C

driver section

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t _{PLH}	Propagation delay time, low-to-high level output	See Figure 13	14	30	ns
t _{PHL}	Propagation delay time, high-to-low level output		12	30	
t _{pZH}	Output enable time to high level	R _L = 180 Ω, See Figure 14	8	20	ns
t _{pZL}	Output enable time to low level	R _L = 250 Ω, See Figure 15	17	40	ns
t _{PHZ}	Output disable time from high level	R _L = 180 Ω, See Figure 14	16	30	ns
t _{PLZ}	Output disable time from low level	R _L = 250 Ω, See Figure 15	20	35	ns



electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

receiver section

PARAMETER	TEST CONDITION [†]	SN55116, SN75116, SN75118			UNIT
		MIN	TYP [‡]	MAX	
V_{IT+} Positive-going threshold voltage [§]	$V_O = 0.4$ V, $I_{OL} = 15$ mA,	$V_{CC} = \text{MIN}, V_{ICR} = 0,$ See Note 3		0.5	V
		$V_{CC} = 5$ V, $V_{ICR} = \text{MAX},$ See Note 4		1	
V_{IT-} Negative-going threshold voltage [§]	$V_O = 2.4$ V, $I_{OL} = -5$ mA,	$V_{CC} = \text{MIN}, V_{ICR} = 0,$ See Note 3		-0.5 [¶]	V
		$V_{CC} = 5$ V, $V_{ICR} = \text{MAX},$ See Note 4		-1 [¶]	
V_I Input voltage range [#]	$V_{CC} = 5$ V, $V_{ID} = -1$ V or 1 V,	15 to -15			V
V_{OH} High-level output voltage	$I_{OH} = -5$ mA,	$V_{CC} = \text{MIN}, V_{ID} = -0.5$ V, See Notes 3 and 5		2.4	V
		$V_{CC} = 5$ V, $V_{ID} = -1$ V, See Note 4		2.4	
V_{OL} Low-level output voltage	$I_{OL} = 15$ mA,	$V_{CC} = \text{MIN}, V_{ID} = 0.5$ V, See Notes 3 and 6		0.4	V
		$V_{CC} = 5$ V, $V_{ID} = 1$ V, See Note 4		0.4	
$I_{I(\text{rec})}$ Receiver input current	$V_{CC} = \text{MAX},$	$V_I = 0,$ Other input at 0 V	-0.5	-0.9	mA
		$V_I = 0.4$ V, Other input at 2.4 V	-0.4	-0.7	
		$V_I = 2.4$ V, Other input at 0.4 V	0.1	0.3	
I_I Input current at maximum input voltage	Strobe	$V_{CC} = \text{MIN}, V_{\text{strobe}} = 4.5$ V	$V_{ID} = -0.5$ V, SN55116, SN75116	5	μA
	Enable	$V_{CC} = \text{MAX}, V_I = 5.5$ V	SN75118	1	mA

[†] Unless otherwise noted, $V_{\text{strobe}} = 2.4$ V. All parameters with the exception of off-state open-collector output current are measured with the active pullup connected to the sink output. For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

[‡] All typical values are at $V_{CC} = 5$ V, $T_A = 25^\circ\text{C}$, and $V_{IC} = 0$.

[§] Differential voltages are at the B input terminal with respect to the A input terminal.

[¶] The algebraic convention, where the less positive (more negative) limit is designated as minimum, is used in this data sheet for threshold voltages only.

[#] Input voltage range is the voltage range that, if exceeded at either input, will cause the receiver to cease functioning properly.

NOTES: 3. This applies with the less positive receiver input grounded.

4. For SN55116, SN75116 and SN75118, this applies with the more positive receiver input at 15 V or the more negative receiver input at -15 V.

5. For SN55116, $V_{ID} = -1$ V

6. For SN55116, $V_{ID} = 1$ V

SN55116, SN75116, SN75118 DIFFERENTIAL LINE TRANSCEIVERS

SLLS073C – MAY 1976 – REVISED MARCH 1997

勝特力材料 886-3-5753170
勝特力电子(上海) 86-21-54151736
勝特力电子(深圳) 86-755-83298787
[Http://www.100y.com.tw](http://www.100y.com.tw)

receiver section (continued)

PARAMETER			TEST CONDITION†			'116, SN75118			UNIT
						MIN	TYP‡	MAX	
I _{IH}	High-level input current	Enable	V _{CC} = MAX, V _I = 2.4 V	SN75118				40	μA
I _I	Low-level input current	Strobe	V _{CC} = MAX, V _{ID} = 0.5 V, V _{strobe} = 0.4 V, See Notes 3 and 6	SN55116, SN75118				–2.4	mA
		Enable	V _{CC} = MAX, V _I = 0.4 V	SN75118				–1.6	
I _(RTC)	Response-time-control current (RTC)		V _{CC} = MAX, RC at 0 V, V _{ID} = 0.5 V, See Notes 3 and 6	T _A = 25°C				–1.2	mA
I _{O(off)}	Off-state open-collector output current		V _{CC} = MAX, V _O = 12 V, V _{ID} = –1 V	T _A = 25°C			1	10	μA
				SN55116				200	
				SN75116, SN75118				20	
I _{OZ}	Off-state (high-impedance-state) output current		V _{CC} = MAX, V _O = 0 to V _{CC} , RE at 0.4 V	T _A = 25°C	SN75118			±10	μA
				T _A = MAX	SN75118			±20	
R _T	Line-terminating resistance		V _{CC} = 5 V	T _A = 25°C			77	167	Ω
I _{OS}	Short-circuit output current§		V _{CC} = MAX, V _{ID} = –0.5 V, V _O = 0, See Notes 3 and 5	T _A = 25°C			–15	–80	mA
I _{CC}	Short current (driver and receiver combined)		V _{CC} = MAX, V _{ID} = 0.5 V, See Notes 3 and 6	T _A = 25°C			42	60	mA

† Unless otherwise noted V_{strobe} = 2.4 V. All parameters with the exception of off-state open-collector output current are measured with the active pullup connected to the sink output. For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

‡ All typical values are at V_{CC} = 5 V, T_A = 25°C, and V_{IC} = 0.

§ Not more than one output should be shorted at a time.

NOTES: 3. This applies with the less positive receiver input grounded.

5. For SN55116, V_{ID} = –1 V

6. For SN55116, V_{ID} = 1 V

switching characteristics, V_{CC} = 5 V, C_L = 30 pF, T_A = 25°C

receiver section

PARAMETER		TEST CONDITIONS		MIN	TYP	MAX	UNIT
t _{PLH}	Propagation delay time, low-to-high-level output	R _L = 400 Ω, See Figure 16			20	75	ns
t _{PHL}	Propagation delay time, high-to-low-level output				17	75	ns
t _{PZH}	Output enable time to high level	R _L = 480 Ω, See Figure 14	SN75118		9	20	ns
t _{PZL}	Output enable time to low level	R _L = 250 Ω, See Figure 15			16	35	ns
t _{PHZ}	Output disable time from high level	R _L = 480 Ω, See Figure 14			12	30	ns
t _{PLZ}	Output disable time from low level	R _L = 250 Ω, See Figure 15			17	35	ns



TYPICAL CHARACTERISTICS

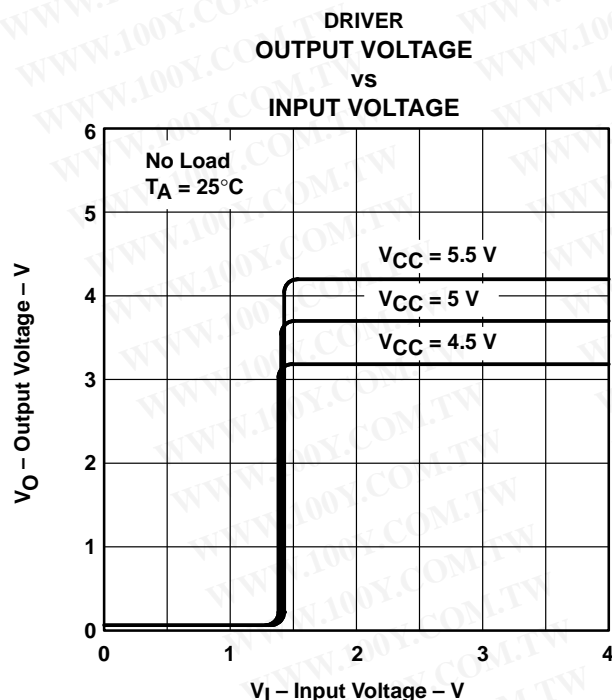
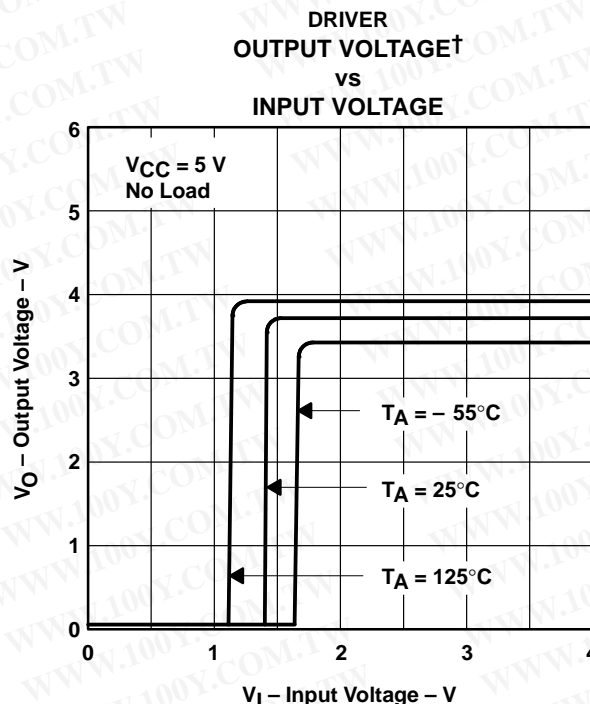


Figure 1



† Data for temperatures below 0°C and above 70°C are only applicable to SN55116.

Figure 2

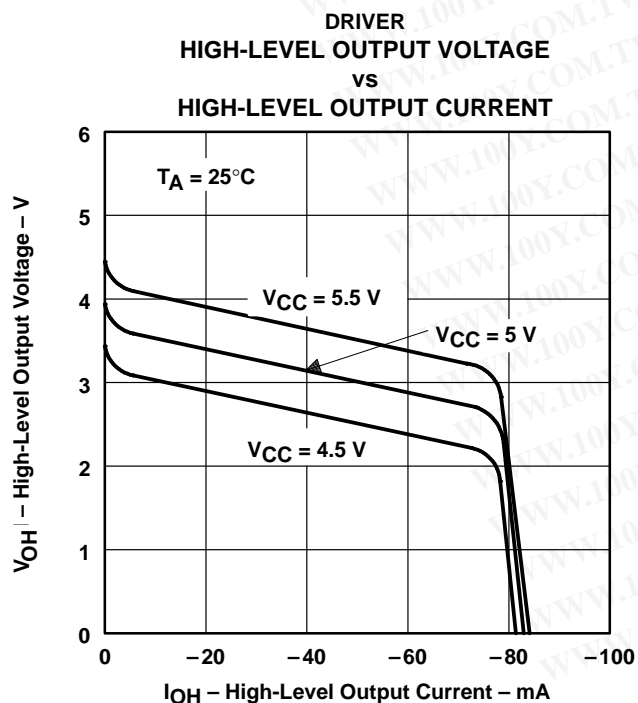


Figure 3

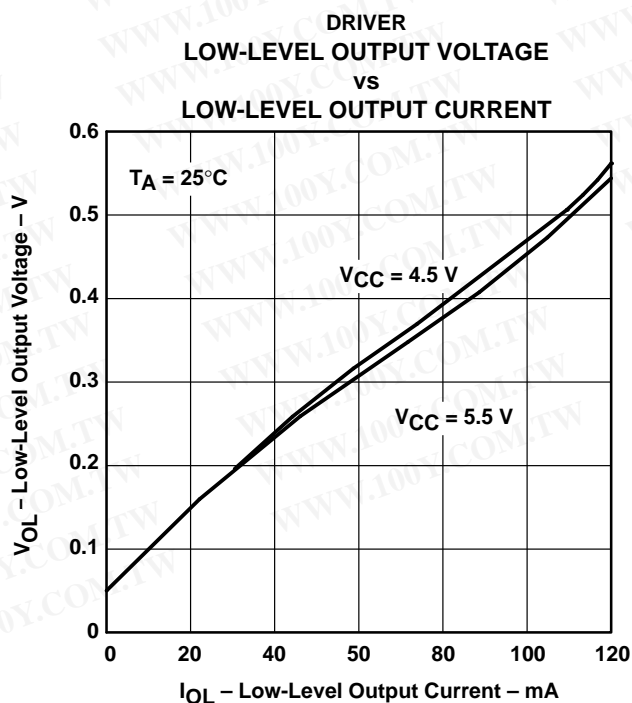


Figure 4

TYPICAL CHARACTERISTICS

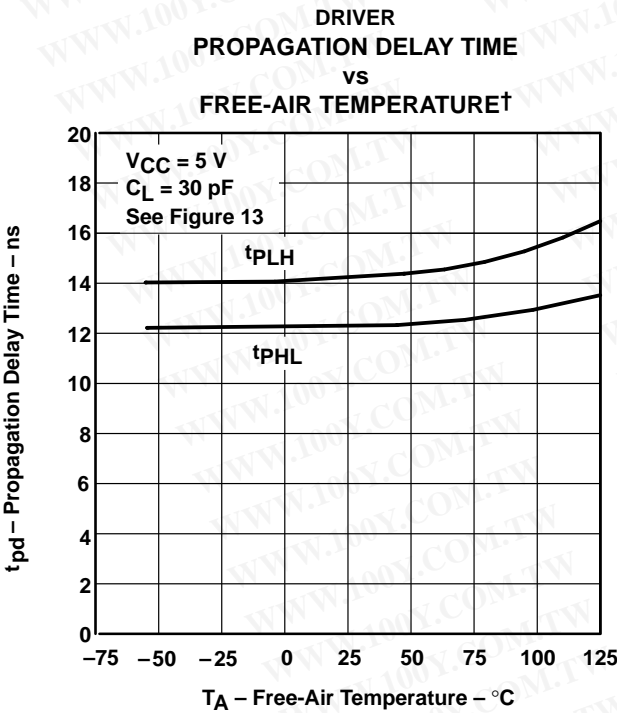
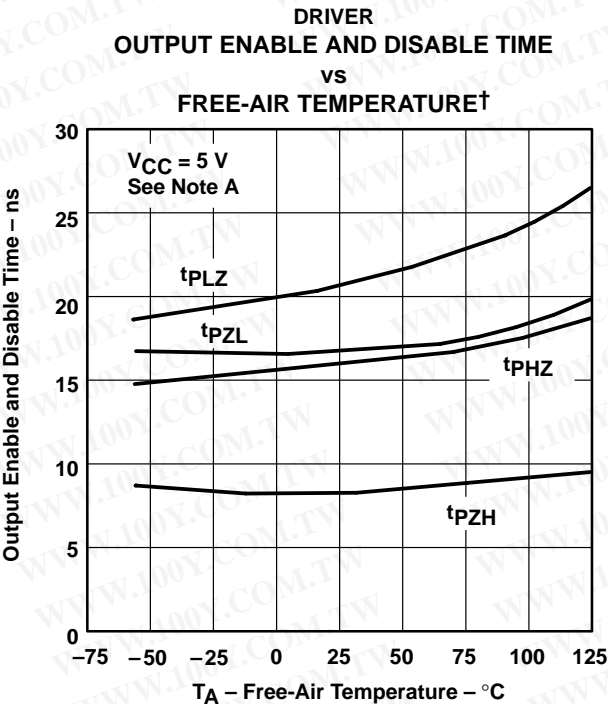


Figure 5



NOTE A: For t_{PZH} and t_{PHZ} : $R_L = 480\ \Omega$, see Figure 14. For t_{PZL} and t_{PLZ} : $R_L = 250\ \Omega$, see Figure 15.

Figure 6

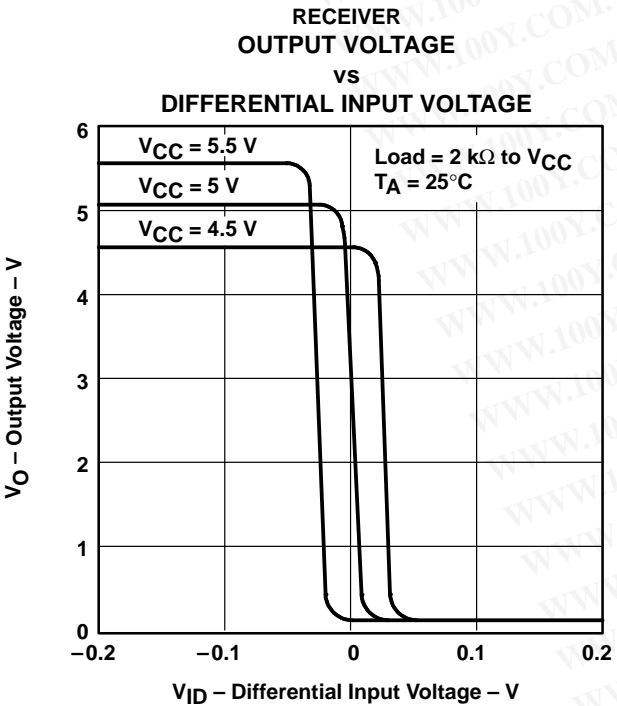


Figure 7

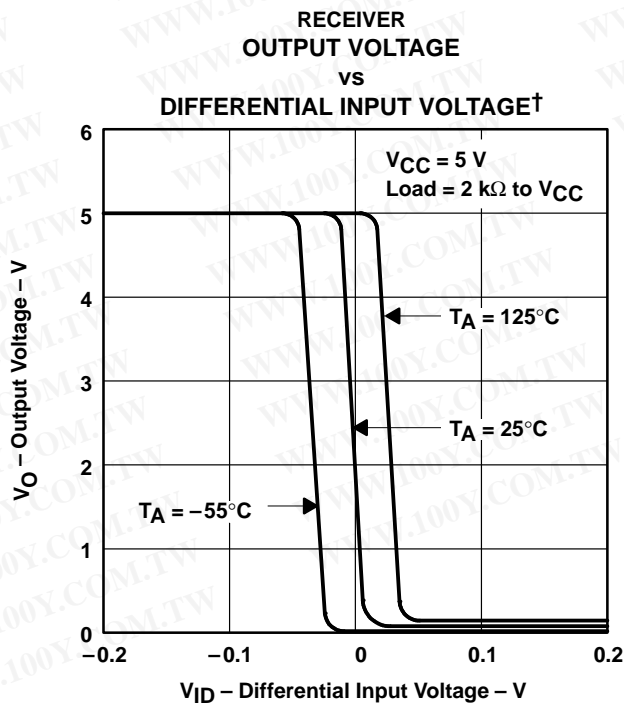


Figure 8

† Data for temperatures below 0°C and above 70°C are only applicable to SN55116.

TYPICAL CHARACTERISTICS

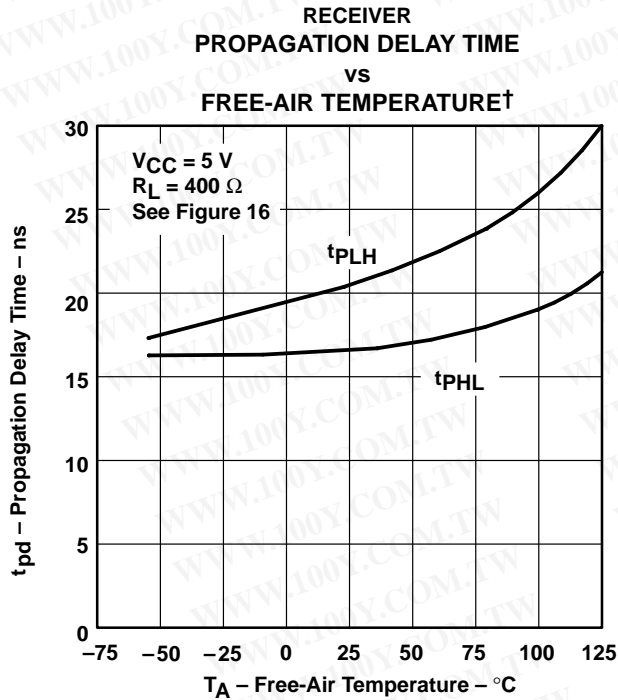
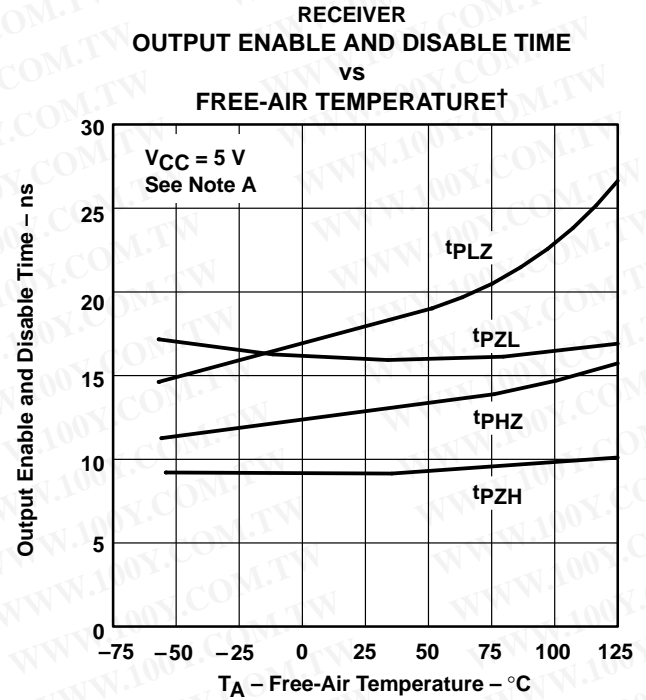


Figure 9



NOTE A: For t_{PZH} and t_{PHZ} : $R_L = 480\ \Omega$, see Figure 14. For t_{PZL} and t_{PLZ} : $R_L = 250\ \Omega$, see Figure 15.

Figure 10

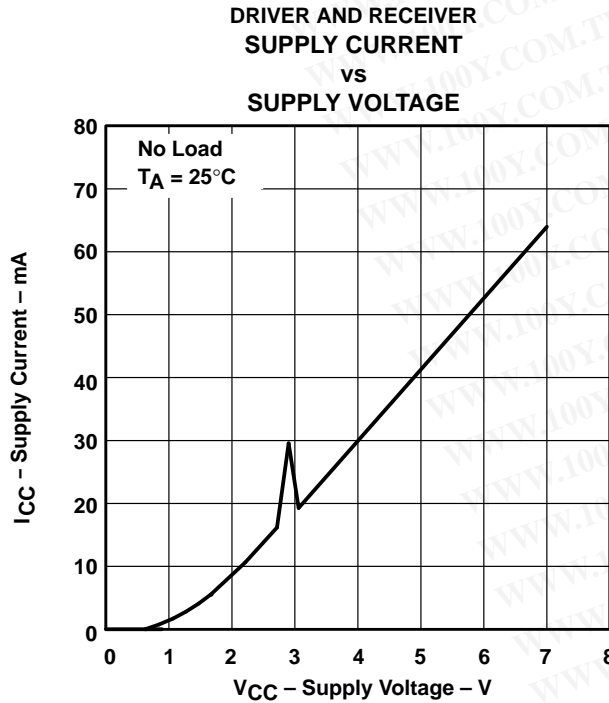


Figure 11

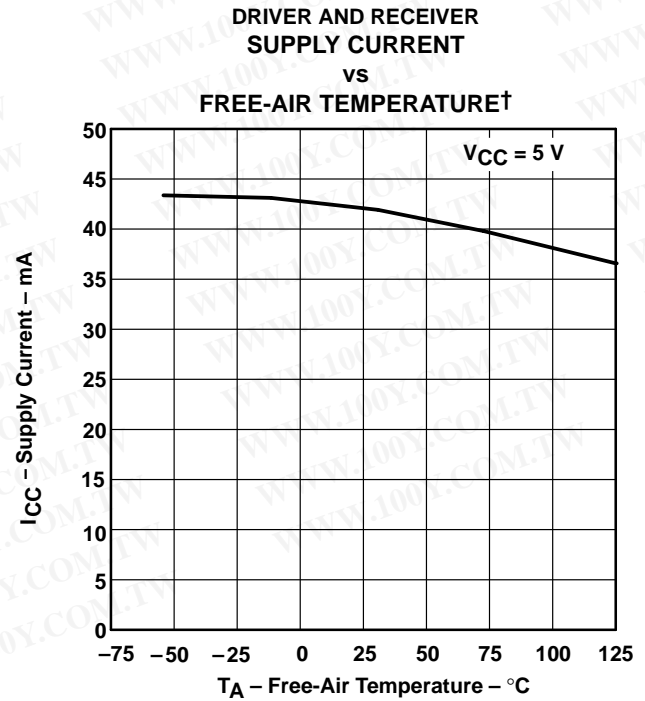


Figure 12

† Data for temperatures below 0°C and above 70°C are only applicable to SN55116.

PARAMETER MEASUREMENT INFORMATION

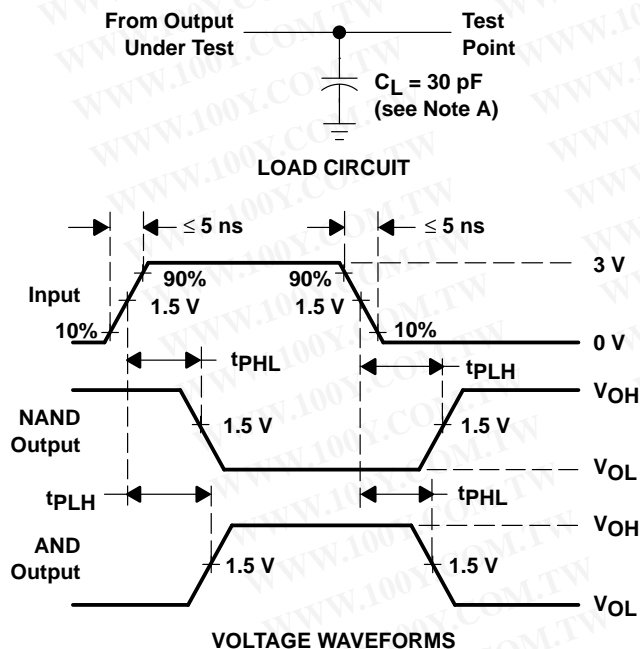


Figure 13. t_{PLH} and t_{PHL} (drivers only)

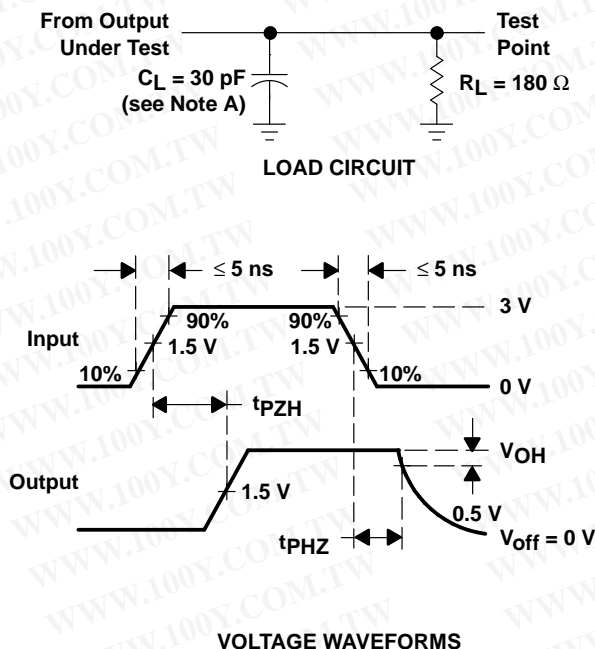


Figure 14. t_{PZH} and t_{PHZ}

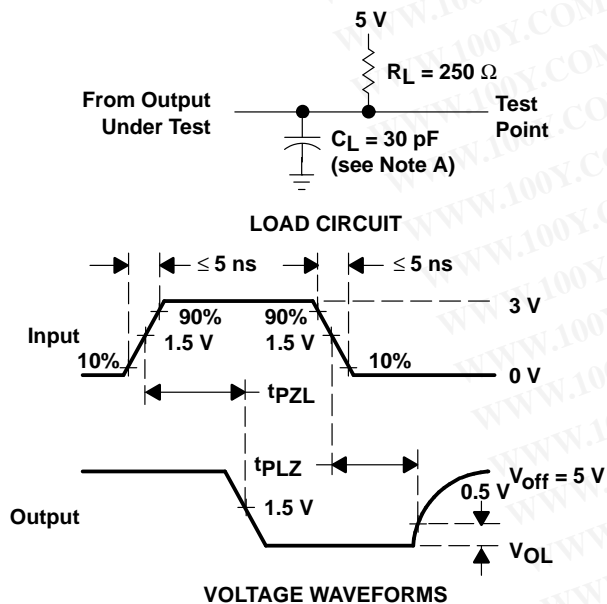


Figure 15. t_{PZL} and t_{PLZ}
(SN75118 receiver only)

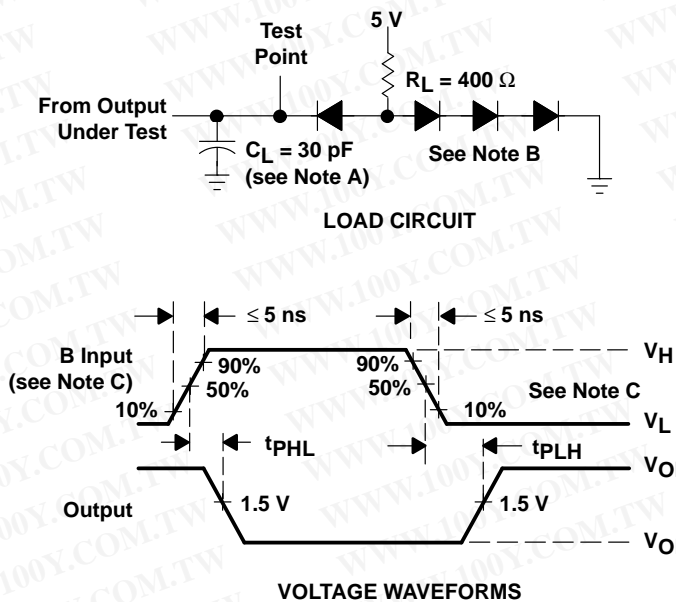


Figure 16. t_{PLH} and t_{PHL} (receivers only)

NOTES: A: C_L includes probe and jig capacitance.

B: All diodes are 1N3064 or equivalent.

C: For SN55116, SN75116, and SN75118, $V_H = 3 \text{ V}$, $V_L = -3 \text{ V}$, the A input is at 0 V.

D: When testing the SN55116, SN75116, and SN75118 receiver sections, the response-time control and the termination resistor pins are left open.

勝特力材料 886-3-5753170
勝特力电子(上海) 86-21-54151736
勝特力电子(深圳) 86-755-83298787
[Http://www.100y.com.tw](http://www.100y.com.tw)

IMPORTANT NOTICE

Texas Instruments (TI) reserves the right to make changes to its products or to discontinue any semiconductor product or service without notice, and advises its customers to obtain the latest version of relevant information to verify, before placing orders, that the information being relied on is current.

TI warrants performance of its semiconductor products and related software to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are utilized to the extent TI deems necessary to support this warranty. Specific testing of all parameters of each device is not necessarily performed, except those mandated by government requirements.

Certain applications using semiconductor products may involve potential risks of death, personal injury, or severe property or environmental damage ("Critical Applications").

TI SEMICONDUCTOR PRODUCTS ARE NOT DESIGNED, INTENDED, AUTHORIZED, OR WARRANTED TO BE SUITABLE FOR USE IN LIFE-SUPPORT APPLICATIONS, DEVICES OR SYSTEMS OR OTHER CRITICAL APPLICATIONS.

Inclusion of TI products in such applications is understood to be fully at the risk of the customer. Use of TI products in such applications requires the written approval of an appropriate TI officer. Questions concerning potential risk applications should be directed to TI through a local SC sales office.

In order to minimize risks associated with the customer's applications, adequate design and operating safeguards should be provided by the customer to minimize inherent or procedural hazards.

TI assumes no liability for applications assistance, customer product design, software performance, or infringement of patents or services described herein. Nor does TI warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right of TI covering or relating to any combination, machine, or process in which such semiconductor products or services might be or are used.

Copyright © 1996, Texas Instruments Incorporated