

- Single-Chip Interface Solution for the 9-Pin GeoPort™ Peripheral Data Circuit-Terminating Equipment (DCE) for the Intelligent Network Port
- Designed to Operate up to 4-Mbits/s Full Duplex
- Single 5-V Supply Operation
- 10-kV ESD Protection on Bus Terminals
- Backward Compatible with AppleTalk™ and LocalTalk™ LANs
- Combines Multiple Components into a Single Chip Solution
- Complements the SN75LBC776 9-Terminal GeoPort Host Data Terminal Equipment (DTE) Interface Device
- LinBiCMOS™ Process Technology

description

The SN75LBC777 is a low-power LinBiCMOS device that incorporate the drivers and receivers for a 9-pin GeoPort peripheral interface. GeoPort combines hybrid EIA/TIA-422-B and EIA/TIA-423-B drivers and receivers to transmit data up to four-Mbit/s full duplex. GeoPort is a serial communications standard that is intended to replace the RS-232, AppleTalk, and printer ports all in one connector in addition to providing real-time data transfer capability. The SN75LBC777 provides point-to-point connections between GeoPort-compatible devices with data transmission rates up to 4-Mbit/s full duplex over a 4-foot cable. Applications include connection to telephone, integrated services digital network (ISDN), digital sound and imaging, fax-data modems, and other traditional serial and parallel connections. The GeoPort is backwardly compatible to both LocalTalk and AppleTalk LANs.

While the SN75LBC777 is powered off ($V_{CC} = 0$) the outputs are in a high-impedance state. When the shutdown (SHDN) terminal is high, the charge pump is powered down and the outputs are in a high-impedance state. When high, the driver enable (DEN) terminal puts the outputs of the differential driver into a high-impedance state.

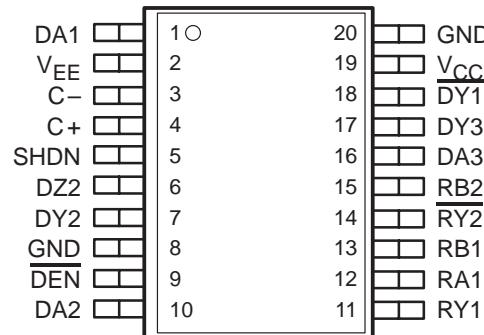


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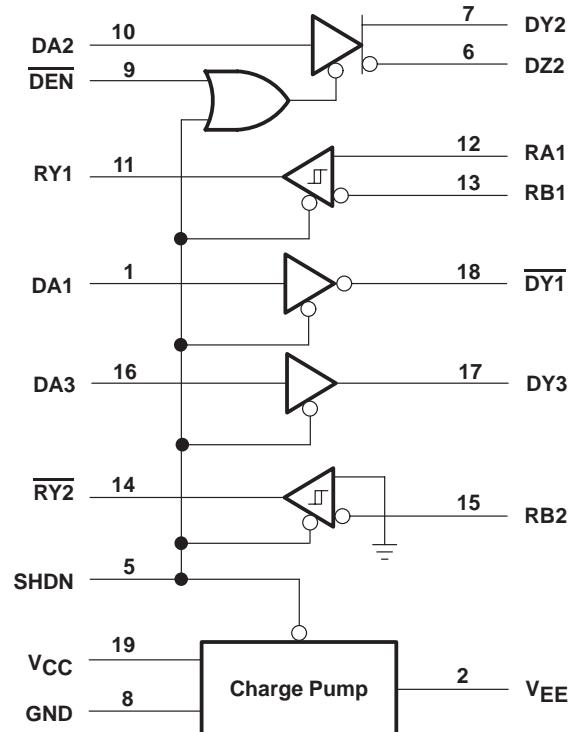
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testing of all parameters.

DW PACKAGE
(TOP VIEW)



logic diagram (positive logic)



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SINGLE CHIP GEOPORT™/AppleTalk™ TRANSCEIVER

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description (continued)

A switched-capacitor voltage converter generates the negative voltage required from a single 5-V supply using two 0.33- μ F capacitors. One capacitor is between the C+ and C- terminals and the other is between V_{EE} and ground.

The SN75LBC777 is characterized for operation over the 0°C to 70°C temperature range.

DRIVER FUNCTION TABLE

INPUTS			ENABLE		OUTPUTS			
DA1	DA2	DA3	SHDN	DEN	DY1	DY2	DZ2	DY3
H	X	H	L	X	L	X	X	H
L	X	L	L	X	H	X	X	L
X	H	X	L	L	X	H	L	X
X	L	X	L	L	X	L	H	X
OPEN	OPEN	OPEN	L	L	L	H	L	H
X	X	X	H	X	Z	Z	Z	Z
X	X	X	X	H	X	Z	Z	X
X	X	X	OPEN	OPEN	Z	Z	Z	Z

H = high level, L = low level, X = irrelevant, ? = indeterminate, Z = high impedance (off)

RECEIVER FUNCTION TABLE

INPUTS			ENABLE		OUTPUTS	
RA1	RB1	RB2	SHDN		RY1	RY2
H	L	H	L		H	L
L	H	L	L		L	H
OPEN	OPEN	L	H		H	H
SHORT [†]	SHORT [†]	L	?		?	?
X	X	X	H		Z	Z
X	X	X	OPEN		Z	Z

[†]–0.2 V < V_{ID} < 0.2 V

H = high level, L = low level, X = irrelevant, ? = indeterminate, Z = high impedance (off)

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

Positive supply voltage range, V_{CC} , (see Note 1)	−0.5 to 7 V
Negative supply voltage range, V_{EE} , (see Note 1)	−7 to 0.5 V
Receiver input voltage range (RA1, RB1, RB2)	−15 V to 15 V
Receiver differential input voltage range, V_{ID}	−12 V to 12 V
Receiver output voltage range (RY1, RY2)	−0.5 V to 5.5 V
Driver output voltage range (Power Off)(DY1, DY2, DZ2, DY3)	−15 V to 15 V
Driver output voltage range (Power On)(DY1, DY2, DZ2, DY3)	−11 V to 11 V
Driver input voltage range (DA, SHDN, \overline{DEN})	−0.5 V to V_{CC} +0.4 V
Electrostatic discharge (see Note 2)	
Bus Pins (Class 3 A)	10 kV
Bus Pins (Class 3 B)	600 V
All Pins (Class 3, A)	2 kV
All Pins (Class 3 B)	200 V
Continuous total power dissipation	See Dissipation Rating Table
Operating free-air temperature range, T_A	0°C to 70°C
Storage temperature range, T_{stg}	−65°C to 150 °C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds	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 voltages values are with respect to the network ground terminal unless otherwise noted.
2. This rating is measured using MIL-STD-883C Method, 3015.7.

DISSIPATION RATING TABLE

PACKAGE	$T_A \leq 25^\circ\text{C}$ POWER RATING	DERATE FACTOR ABOVE $T_A = 25^\circ\text{C}$	$T_A = 70^\circ\text{C}$ POWER RATING
DW	1125 mW	9.0°C	720 mW

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recommended operating conditions

	MIN	NOM	MAX	UNIT
Supply voltage, V_{CC}	4.75	5	5.25	V
High-level input voltage, V_{IH} (DA, SHDN, \overline{DEN})	2		5.25	V
Low-level input voltage, V_{IL} (DA, SHDN, \overline{DEN})			0.8	V
Receiver common-mode input voltage, V_{IC}	-7		7	V
Receiver differential input voltage, V_{ID}	-12		12	V
Voltage converter filter capacitance	0.33			μ F
Voltage converter filter capacitor equivalent series resistance (ESR)	0		0.2	Ω
Operating free-air temperature, T_A			70	°C

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

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
V_{OH} High-level output voltage	$R_L = 12 \text{ k}\Omega$	3.6	4.5		V
	$R_L = 120 \Omega$	2	3.6		V
V_{OL} Low-level output voltage	$R_L = 12 \text{ k}\Omega$		-4.5	-3.6	V
	$R_L = 120 \Omega$		-2.7	-1.8	V
$ V_{ODI} $ $ V_{DY} - V_{DZ} $	$R_L = 120 \Omega$, See Figure 2	4			V
$\Delta V_{ODI} $ Change in differential voltage magnitude			250		mV
V_{OC} Common-mode output voltage	See Figure 3	-1	3		V
$ \Delta V_{OC(SS)} $ Magnitude of change, common-mode steady-state output voltage			200		mV
$ \Delta V_{OC(PP)} $ Magnitude of change, common-mode peak-to-peak output voltage			700		mV
I_{CC} Supply current	$\text{SHDN} = \overline{DEN} = 0 \text{ V}$, No Load	7	15		mA
	$\text{SHDN} = \overline{DEN} = 5 \text{ V}$, No Load		100		μ A
I_{OZ} High-impedance output current	$V_{CC} = 0 \text{ or } 5 \text{ V}$, $-10 \leq V_O \leq 10 \text{ V}$			± 100	μ A
I_{OS} Short-circuit output current	$V_{CC} = 5.25 \text{ V}$, See Note 3		± 170	± 450	mA

NOTE 3: Not more than one output should be shorted at one time.

driver switching characteristics over recommended operating conditions (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PHL}	Propagation delay time, high-to-low level output	Single-ended, $R_L = 120 \Omega$, See Figure 4	40	75	ns	
t_{PLH}	Propagation delay time, low-to-high level output		40	75	ns	
t_{PZL}	Driver output enable time to low-level output		25	100	μ s	
t_{PZH}	Driver output enable time to high-level output		25	100	μ s	
t_{PLZ}	Driver output disable time from low-level output		30	100	ns	
t_{PHZ}	Driver output disable time from high-level output		30	100	ns	
t_r	Rise time		10	25	75	ns
t_f	Fall time		10	25	75	ns
t_{PHL}	Propagation delay time, high-to-low level output		40	75	ns	
t_{PLH}	Propagation delay time, low-to-high level output		40	75	ns	
t_{PZL}	Driver output enable time to low-level output	Differential, $R_L = 120 \Omega$, See Figure 5	25	100	μ s	
t_{PZH}	Driver output enable time to high-level output		35	100	μ s	
t_{PLZ}	Driver output disable time from low-level output		30	100	ns	
t_{PHZ}	Driver output disable time from high-level output		30	100	ns	
t_r	Rise time		35	100	ns	
t_f	Fall time		35	100	ns	
$t_{SK(P)}$	Pulse skew, $ t_{PLH} - t_{PHL} $		10	25	75	ns
			10	25	75	ns
			22			ns

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

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
V_{IT+}	Positive-going input threshold voltage				200	mV
V_{IT-}	Negative-going input threshold voltage				-200	mV
V_{hys}	Differential input voltage hysteresis ($V_{IT+} - V_{IT-}$)				50	mV
V_{OH}	High-level output voltage (see Note 4)	$I_{OH} = 2 \text{ mA}$, $V_{IC} = 0$	2	4.9		V
V_{OL}	Low-level output voltage	$I_{OL} = -2 \text{ mA}$, $V_{IC} = 0$	0.2	0.8		V
I_{OS}	Short-circuit output current	$V_O = 0$	-85	-45		mA
R_I	Input resistance	$V_{CC} = 0 \text{ or } 5.25 \text{ V}$, $-12 \text{ V} \leq V_I \leq 12 \text{ V}$	6	30		k Ω
		$V_O = 5.25 \text{ V}$	45	85		mA

NOTE 4: If the inputs are left unconnected, RA1 interprets this as a high-level input and RB1 and RB2 interpret this as a low-level input so that all outputs are at the high level.

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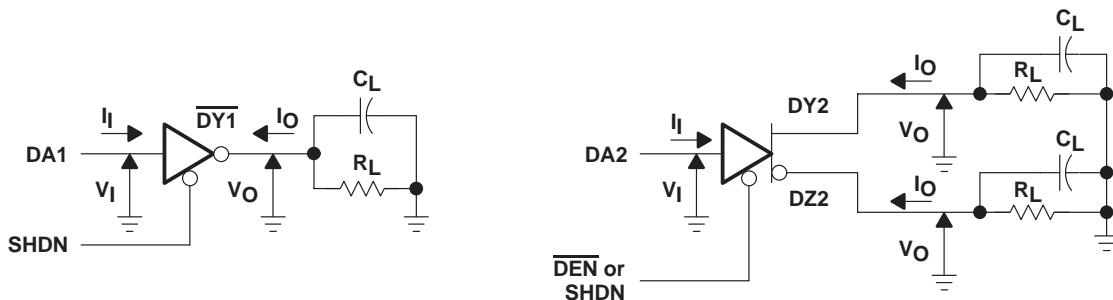
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receiver switching characteristics over free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PHL}	$R_L = 2 \text{ k}\Omega$, $C_L = 15 \text{ pF}$, See Figure 6		30	75	ns
t_{PLH}			30	75	ns
t_r			15	30	ns
t_f			15	30	ns
$t_{sk(p)}$			20		ns
t_{PZL}	Differential, $C_L = 50 \text{ pF}$, See Figure 7		35	100	ns
t_{PZH}			35	100	ns
t_{PLZ}			21	100	ns
t_{PHZ}			21	100	ns
t_{PZL}	Single-ended, $C_L = 50 \text{ pF}$, See Figure 7		12	25	μs
t_{PZH}			12	25	μs
t_{PLZ}			25	100	ns
t_{PHZ}			125	400	ns

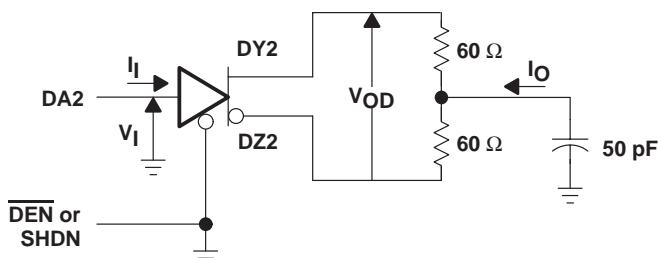
PARAMETER MEASUREMENT INFORMATION



TEST CIRCUIT

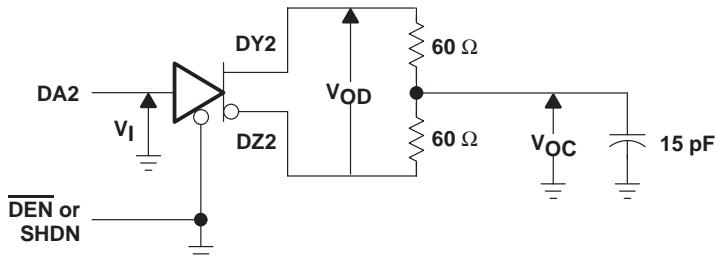
NOTES: A. $C_L = 50 \text{ pF}$
B. Driver 3 is a noninverting version of driver 1.

Figure 1. Single-Ended Driver DC Parameter Test Circuits

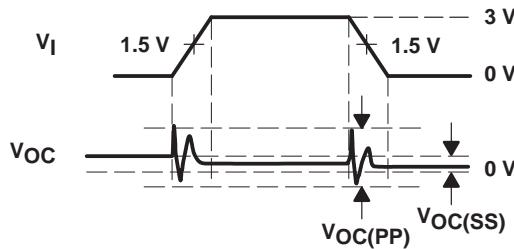


TEST CIRCUIT

Figure 2. Differential Driver DC Parameter Test Circuit



TEST CIRCUIT (see Note A)

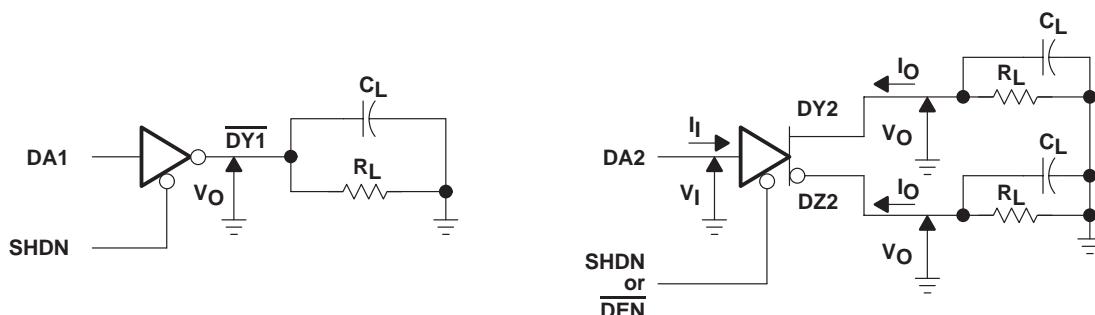


VOLTAGE WAVEFORM

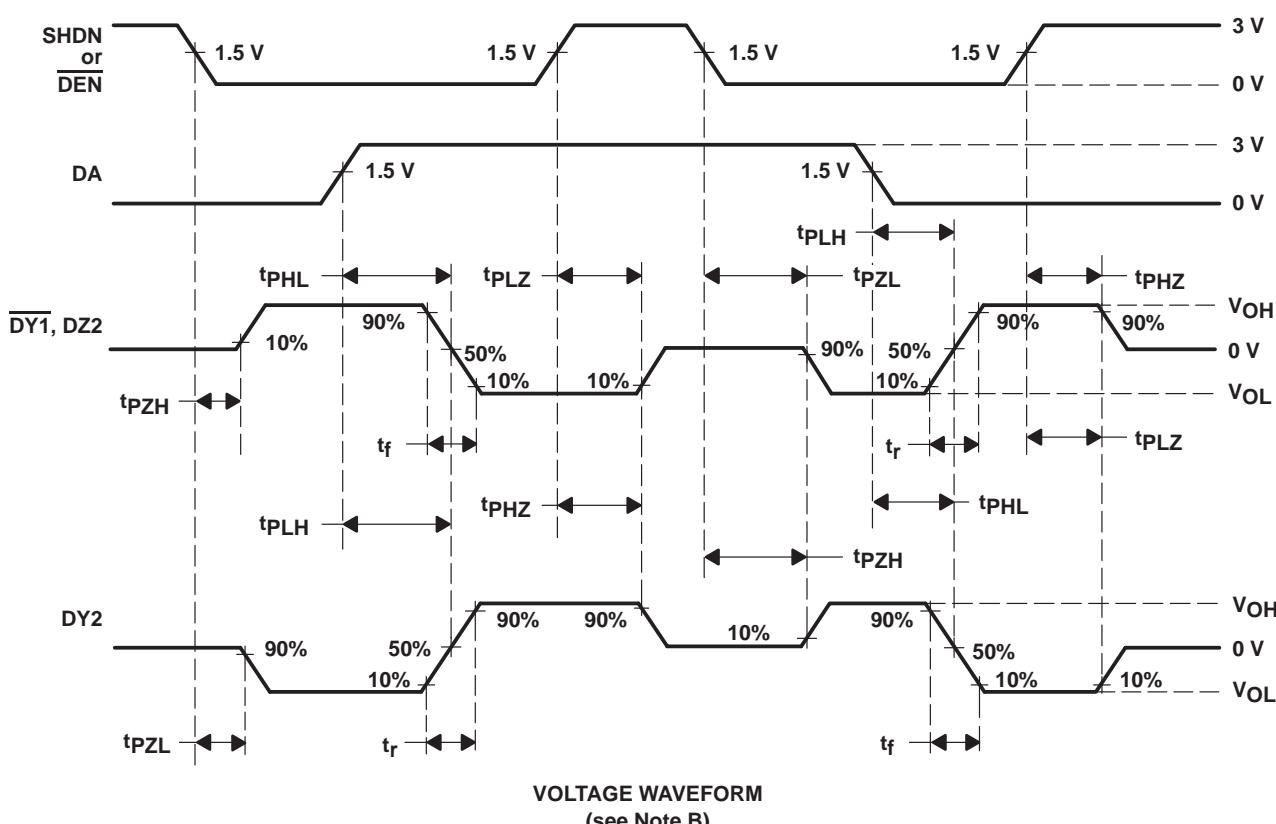
NOTE A. Measured 3dB Bandwidth = 300 MHz

Figure 3. Differential Driver Common-Mode Output Voltage Test Circuit and Waveform

PARAMETER MEASUREMENT INFORMATION



TEST CIRCUIT (see Note A)



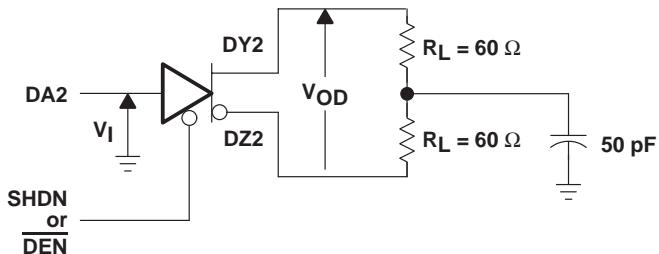
NOTES: A $C_L = 50 \text{ pF}$ $R_L = 120 \Omega$

B. The input waveform $t_r - t_f \leq 10 \text{ ns}$

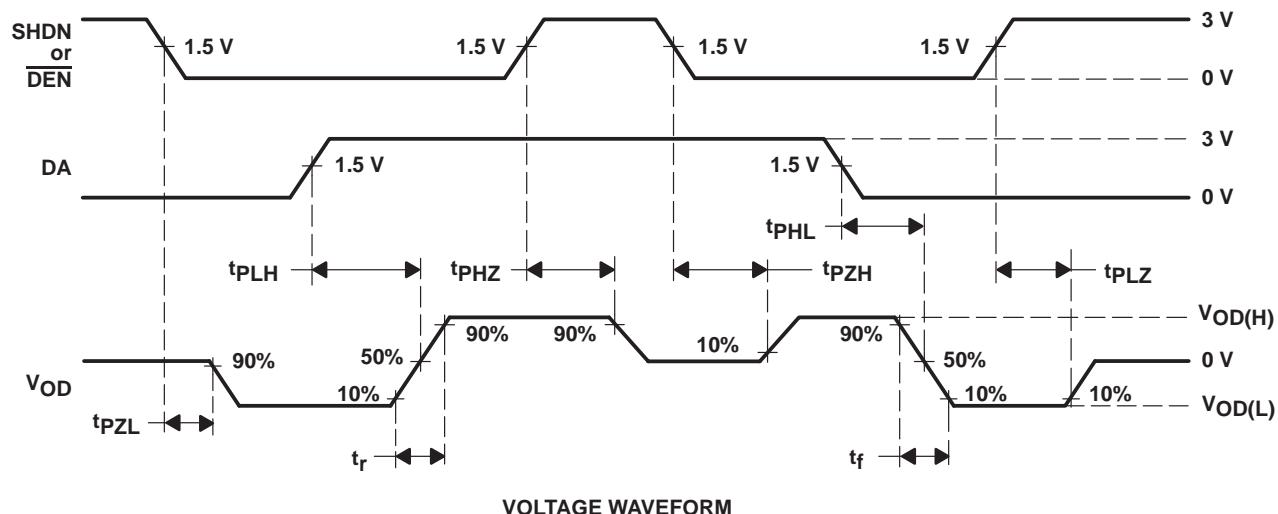
- C. Driver 3 is a noninverting version of driver 1.

Figure 4. Single-Ended Driver Propagation and Transition Times Test Circuits and Waveform

PARAMETER MEASUREMENT INFORMATION



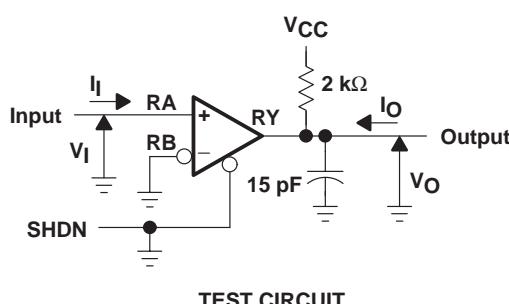
TEST CIRCUIT



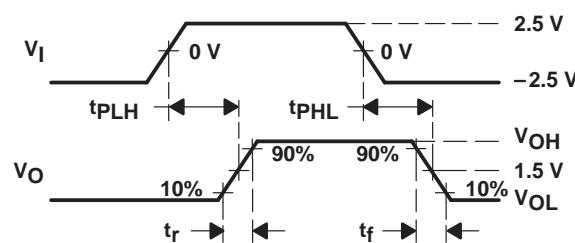
VOLTAGE WAVEFORM

NOTE A: For the input waveform $t_r, t_f \leq 10$ ns

Figure 5. Differential Driver Propagation and Transition Times Test Circuit and Waveforms



TEST CIRCUIT



VOLTAGE WAVEFORM

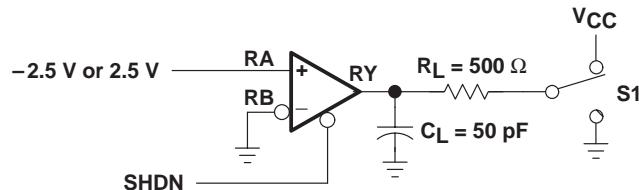
NOTE A: For the input waveform $t_r, t_f \leq 10$ ns

Figure 6. Receiver Propagation and Transition Times Test Circuit and Waveform

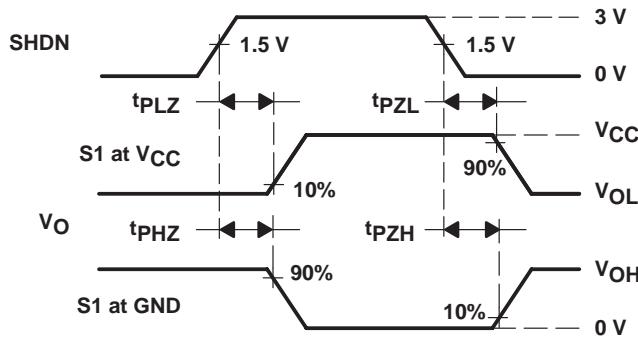
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PARAMETER MEASUREMENT INFORMATION



TEST CIRCUIT

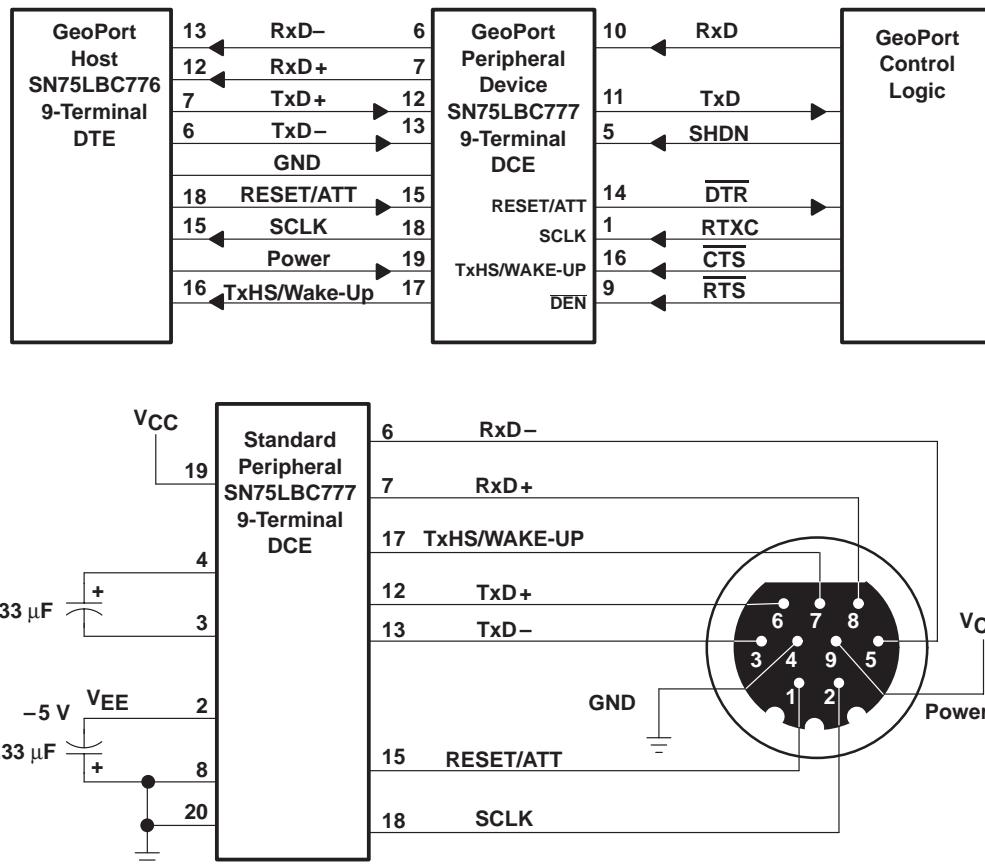


VOLTAGE WAVEFORM

NOTE A: For the input waveform $t_r, t_f \leq 10$ ns

Figure 7. Receiver Enable and Disable Test Circuit and Waveforms

APPLICATION INFORMATION



NOTE A: A potential charge pump capacitor is the AVX 0805YC334MATXA or an equivalent.

Figure 8. GeoPort 9-terminal DCE Connection Application

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generator characteristics

PARAMETER	TEST CONDITIONS	232/V.28		423/V.10		562		UNIT
		MIN	MAX	MIN	MAX	MIN	MAX	
V _O	Open circuit		25	4	6		13.2	V
	3 kΩ ≤ R _L ≤ 7 kΩ	5	15	NA		3.7		V
	R _L = 450 Ω	NA		3.6		NA		V
I _{OS}	Short-circuit output current	V _O = 0		100		150		mA
R _{O(OFF)}	Power-off source resistance	V _{CC} = 0, V _O < 2 V		300		NA	300	Ω
I _{O(OFF)}	Power-off output current	V _{CC} = 0, V _O < 6 V		NA		±100	NA	μA
SR	Output voltage slew rate			30	NA	4	30	V/μs
t _t	±3.3 V to ±3.3 V		NA	NA		0.22	2.1	μs
	±3 V to ±3 V		0.04	NA		NA		ui [†]
	10% to 90%		NA		0.3	NA		ui [†]
V _{O(RING)}	Output voltage ringing		NA		10%		5%	

[†] ui is the unit interval and is the inverse of the signaling rate (a.k.a. bit time).

receiver characteristics

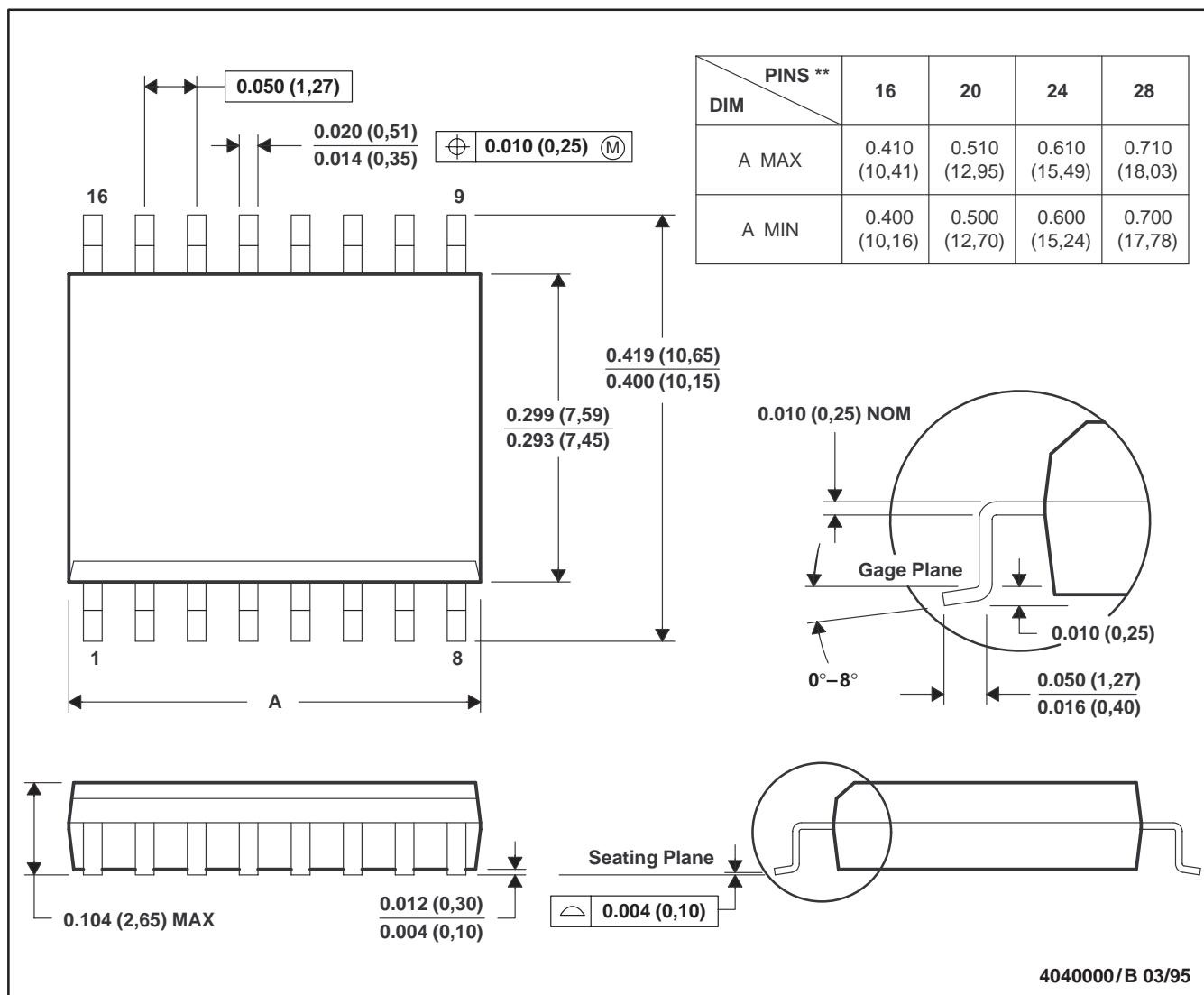
PARAMETER	TEST CONDITIONS	232/V.28		423/V.10		562		UNIT
		MIN	MAX	MIN	MAX	MIN	MAX	
V _I	Input voltage		25		10		25	V
V _{IT}	V _I < 15 V	-3	3	NA		-3	3	V
	V _I < 10 V	NA		-0.2	0.2	NA		V
R _I	3 V < V _I < 15 V	3	7	NA		3	7	kΩ
	V _I < 10 V	NA		4		NA		kΩ

MECHANICAL INFORMATION

DW (R-PDSO-G**)

16 PIN SHOWN

PLASTIC SMALL-OUTLINE PACKAGE



NOTES: A. All linear dimensions are in inches (millimeters).
 B. This drawing is subject to change without notice.
 C. Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0.15).
 D. Falls within JEDEC MS-013

PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
SN75LBC777DW	ACTIVE	SOIC	DW	20	25	Pb-Free (RoHS)	CU NIPDAU	Level-2-250C-1YEAR/Level-1-220C-UNLIM
SN75LBC777DWR	ACTIVE	SOIC	DW	20	2000	Pb-Free (RoHS)	CU NIPDAU	Level-2-250C-1YEAR/Level-1-220C-UNLIM

⁽¹⁾ The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.

LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

PREVIEW: Device has been announced but is not in production. Samples may or may not be available.

OBSOLETE: TI has discontinued the production of the device.

⁽²⁾ Eco Plan - May not be currently available - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

None: Not yet available Lead (Pb-Free).

Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

Green (RoHS & no Sb/Br): TI defines "Green" to mean "Pb-Free" and in addition, uses package materials that do not contain halogens, including bromine (Br) or antimony (Sb) above 0.1% of total product weight.

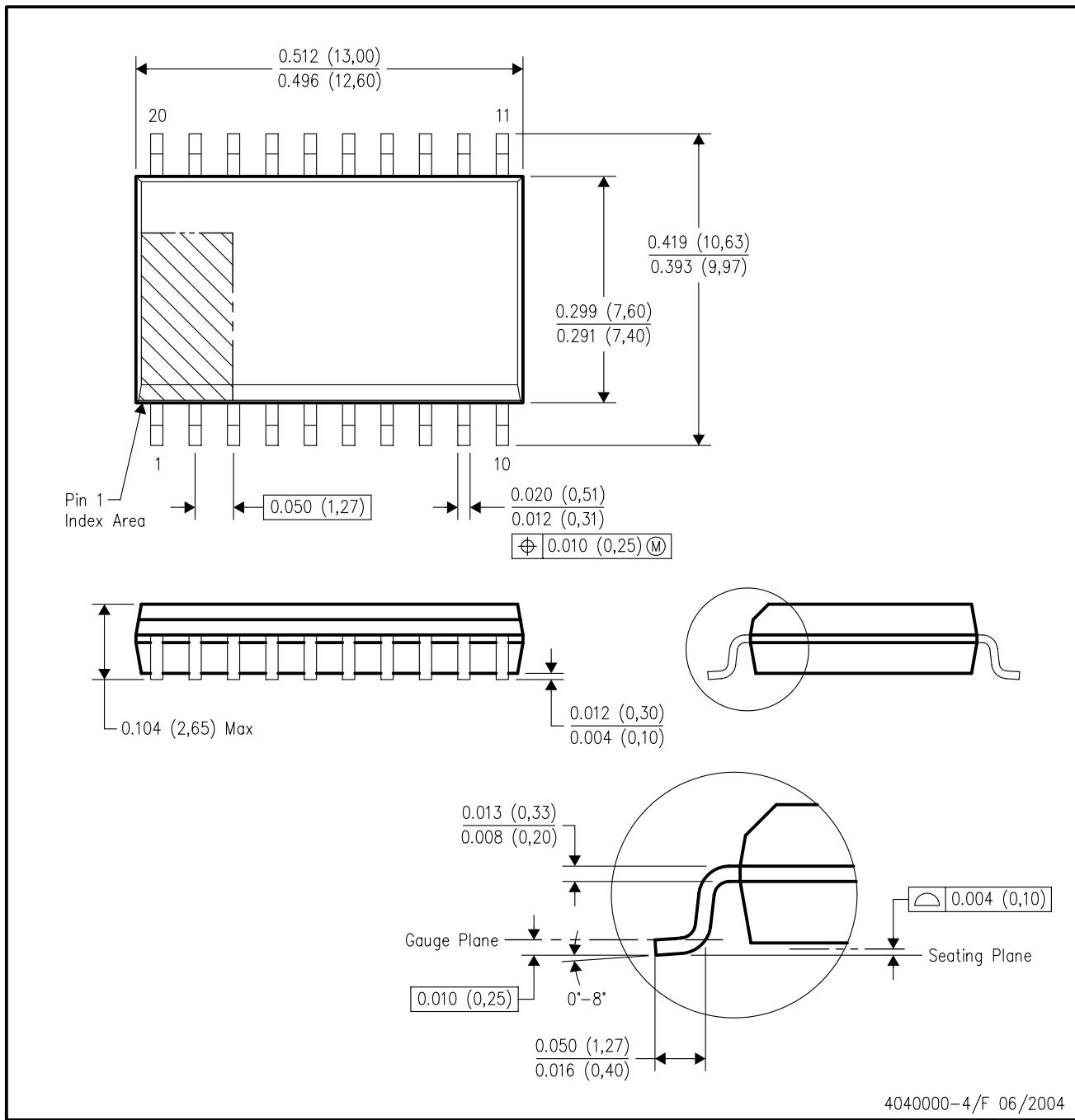
⁽³⁾ MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDECindustry standard classifications, and peak solder temperature.

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