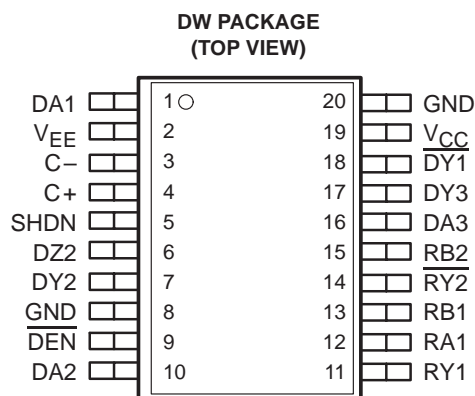


# SN75LBC777 SINGLE CHIP GEOPORT™/AppleTalk™ TRANSCIEVER

SLLS227 – SEPTEMBER 1996

- **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**

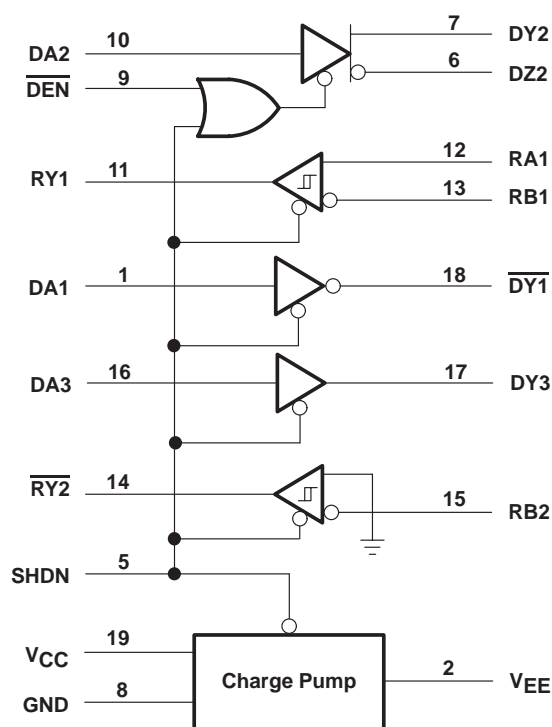


## description

The SN75LBC777 is a low-power LinBiCMOS device that incorporates 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.

## logic diagram (positive logic)



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PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

**TEXAS  
INSTRUMENTS**

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# SN75LBC777 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- $\mu$ F capacitors. One capacitor is between the C+ and C- terminals and the other is between V<sub>EE</sub> 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	$\overline{\text{DEN}}$	$\overline{\text{DY1}}$	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
	SHORT†	SHORT†	L	?	?
X	X	X	H	Z	Z
X	X	X	OPEN	Z	Z

†  $-0.2 \text{ V} < V_{\text{ID}} < 0.2 \text{ V}$

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

# SN75LBC777

## SINGLE CHIP GEOPORT™/AppleTalk™ TRANSCEIVER

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### 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, 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



# SN75LBC777

## SINGLE CHIP GEOPORT™/AppleTalk™ TRANSCEIVER

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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			$\mu$ F
Voltage converter filter capacitor equivalent series resistance (ESR)	0		0.2	$\Omega$
Operating free-air temperature, $T_A$			70	$^{\circ}$ 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	Single ended, See Figure 1	$R_L = 12\text{ k}\Omega$	3.6	4.5	V
			$R_L = 120\ \Omega$	2	3.6	V
$V_{OL}$	Low-level output voltage	Single ended, See Figure 1	$R_L = 12\text{ k}\Omega$	-4.5	-3.6	V
			$R_L = 120\ \Omega$	-2.7	-1.8	V
$ V_{OD} $	Magnitude of differential output voltage $ V_{DY} - V_{DZ} $	$R_L = 120\ \Omega$ , See Figure 2		4		V
$\Delta V_{OD} $	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	SHDN = $\overline{DEN} = 0\text{ V}$ , No Load		7	15	mA
		SHDN = $\overline{DEN} = 5\text{ V}$ , No Load			100	$\mu$ A
$I_{OZ}$	High-impedance output current	$V_{CC} = 0\text{ or }5\text{ V}$ , $-10\text{ V} \leq V_O \leq 10\text{ V}$			$\pm 100$	$\mu$ A
$I_{OS}$	Short-circuit output current	$V_{CC} = 5.25\text{ V}$ , See Note 3 $-5\text{ V} \leq V_O \leq 5\text{ V}$		$\pm 170$	$\pm 450$	mA

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



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## SINGLE CHIP GEOPORT™/AppleTalk™ TRANSCEIVER

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

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT	
t <sub>PHL</sub>	Propagation delay time, high-to-low level output	Single-ended, R <sub>L</sub> = 120 Ω, See Figure 4		40	75	ns	
t <sub>PLH</sub>	Propagation delay time, low-to-high level output			40	75	ns	
t <sub>PZL</sub>	Driver output enable time to low-level output		SHDN	25	100	μs	
t <sub>PZH</sub>	Driver output enable time to high-level output		SHDN	25	100	μs	
t <sub>PLZ</sub>	Driver output disable time from low-level output		SHDN	30	100	ns	
t <sub>PHZ</sub>	Driver output disable time from high-level output		SHDN	30	100	ns	
t <sub>r</sub>	Rise time			10	25	75	ns
t <sub>f</sub>	Fall time			10	25	75	ns
t <sub>PHL</sub>	Propagation delay time, high-to-low level output		Differential, R <sub>L</sub> = 120 Ω, See Figure 5		40	75	ns
t <sub>PLH</sub>	Propagation delay time, low-to-high level output			40	75	ns	
t <sub>PZL</sub>	Driver output enable time to low-level output	SHDN		25	100	μs	
		DEN		35	100	ns	
t <sub>PZH</sub>	Driver output enable time to high-level output	SHDN		25	100	μs	
		DEN		35	150	ns	
t <sub>PLZ</sub>	Driver output disable time from low-level output	SHDN		30	100	ns	
		DEN		30	100	ns	
t <sub>PHZ</sub>	Driver output disable time from high-level output	SHDN		35	100	ns	
		DEN		35	100	ns	
t <sub>r</sub>	Rise time			10	25	75	ns
t <sub>f</sub>	Fall time			10	25	75	ns
t <sub>SK(P)</sub>	Pulse skew,  t <sub>PLH</sub> - t <sub>PHL</sub>					22	ns

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

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT	
V <sub>IT+</sub>	Positive-going input threshold voltage			200	mV	
V <sub>IT-</sub>	Negative-going input threshold voltage	-200			mV	
V <sub>hys</sub>	Differential input voltage hysteresis (V <sub>IT+</sub> - V <sub>IT-</sub> )		50		mV	
V <sub>OH</sub>	High-level output voltage (see Note 4)	I <sub>OH</sub> = 2 mA, V <sub>IC</sub> = 0	2	4.9	V	
V <sub>OL</sub>	Low-level output voltage	I <sub>OL</sub> = -2 mA, V <sub>IC</sub> = 0		0.2	0.8	V
I <sub>OS</sub>	Short-circuit output current	V <sub>O</sub> = 0	-85	-45		mA
		V <sub>O</sub> = 5.25 V		45	85	mA
R <sub>I</sub>	Input resistance	V <sub>CC</sub> = 0 or 5.25 V, -12 V ≤ V <sub>I</sub> ≤ 12 V	6	30		kΩ

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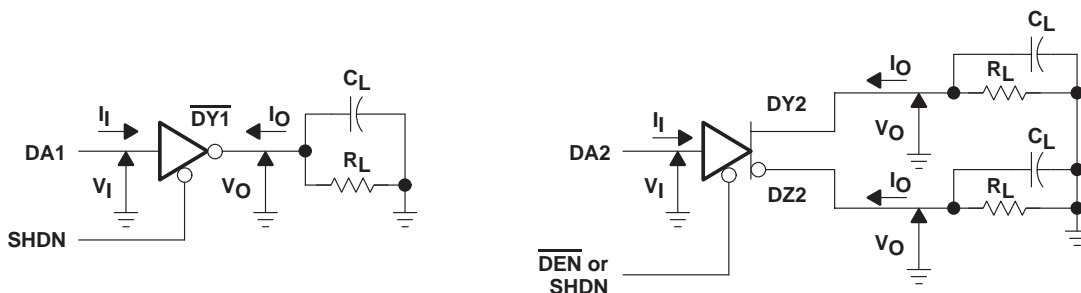
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## receiver switching characteristics over free-air temperature range (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
t <sub>PHL</sub>	Propagation delay time, high-to-low level output	R <sub>L</sub> = 2 kΩ, C <sub>L</sub> = 15 pF, See Figure 6		30	75	ns
t <sub>PLH</sub>	Propagation delay time, low-to-high level output			30	75	ns
t <sub>r</sub>	Rise time			15	30	ns
t <sub>f</sub>	Fall time			15	30	ns
t <sub>sk(p)</sub>	Pulse skew  t <sub>PLH</sub> -t <sub>PHL</sub>				20	ns
t <sub>PZL</sub>	Receiver output enable time to low-level output	Differential, See Figure 7		35	100	ns
t <sub>PZH</sub>	Receiver output enable time to high-level output			35	100	ns
t <sub>PLZ</sub>	Receiver output disable time from low-level output			21	100	ns
t <sub>PHZ</sub>	Receiver output disable time from high-level output			21	100	ns
t <sub>PZL</sub>	Receiver output enable time to low-level output	Single-ended, See Figure 7		12	25	μs
t <sub>PZH</sub>	Receiver output enable time to high-level output			12	25	μs
t <sub>PLZ</sub>	Receiver output disable time from low-level output			25	100	ns
t <sub>PHZ</sub>	Receiver output disable time from high-level output			125	400	ns



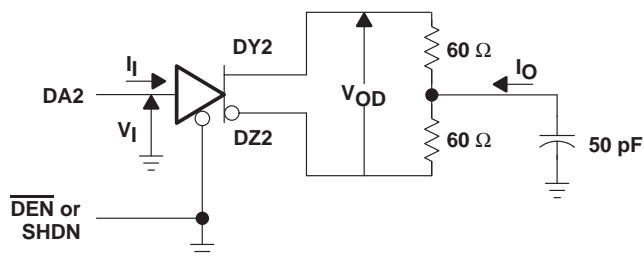
PARAMETER MEASUREMENT INFORMATION



TEST CIRCUIT

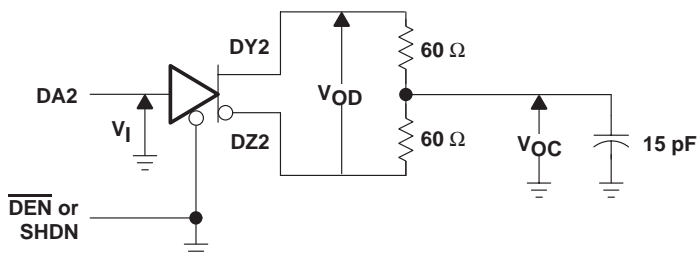
- NOTES: A.  $C_L = 50 \text{ pF}$   
B. Driver 3 is a noninverting version of driver 1.

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

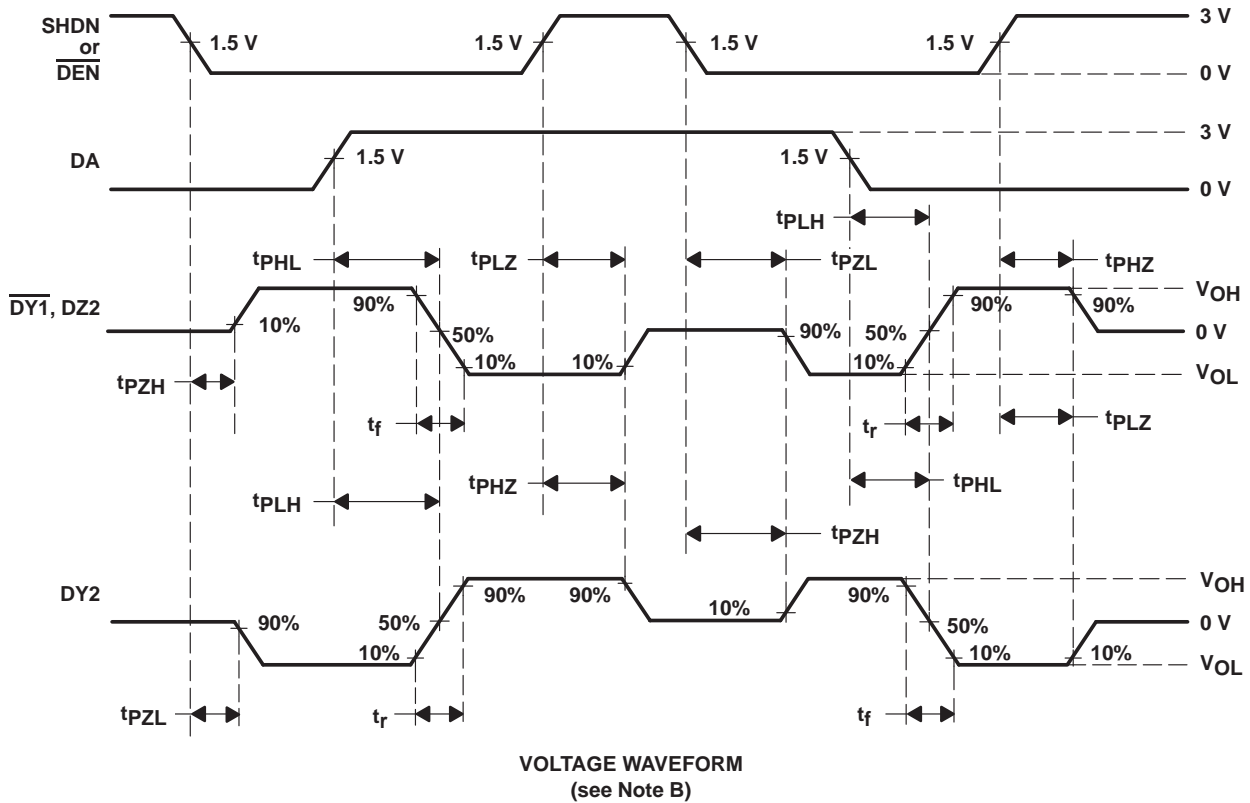
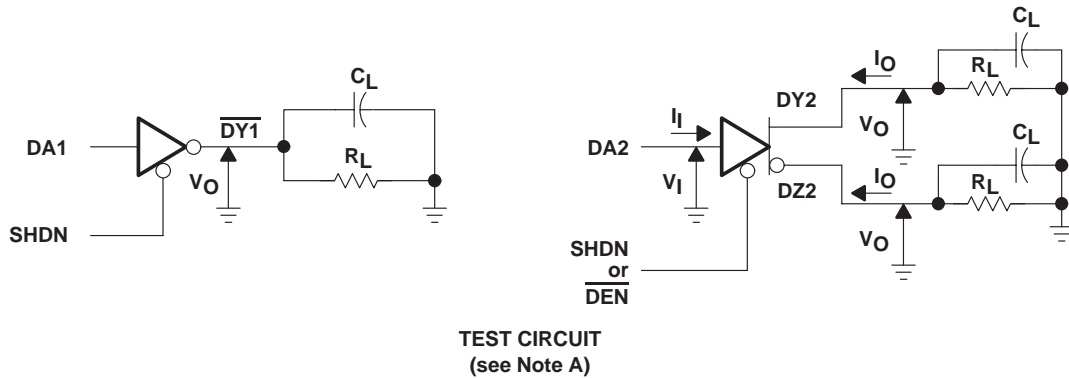
NOTE A. Measured 3dB Bandwidth = 300 MHz

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

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## PARAMETER MEASUREMENT INFORMATION

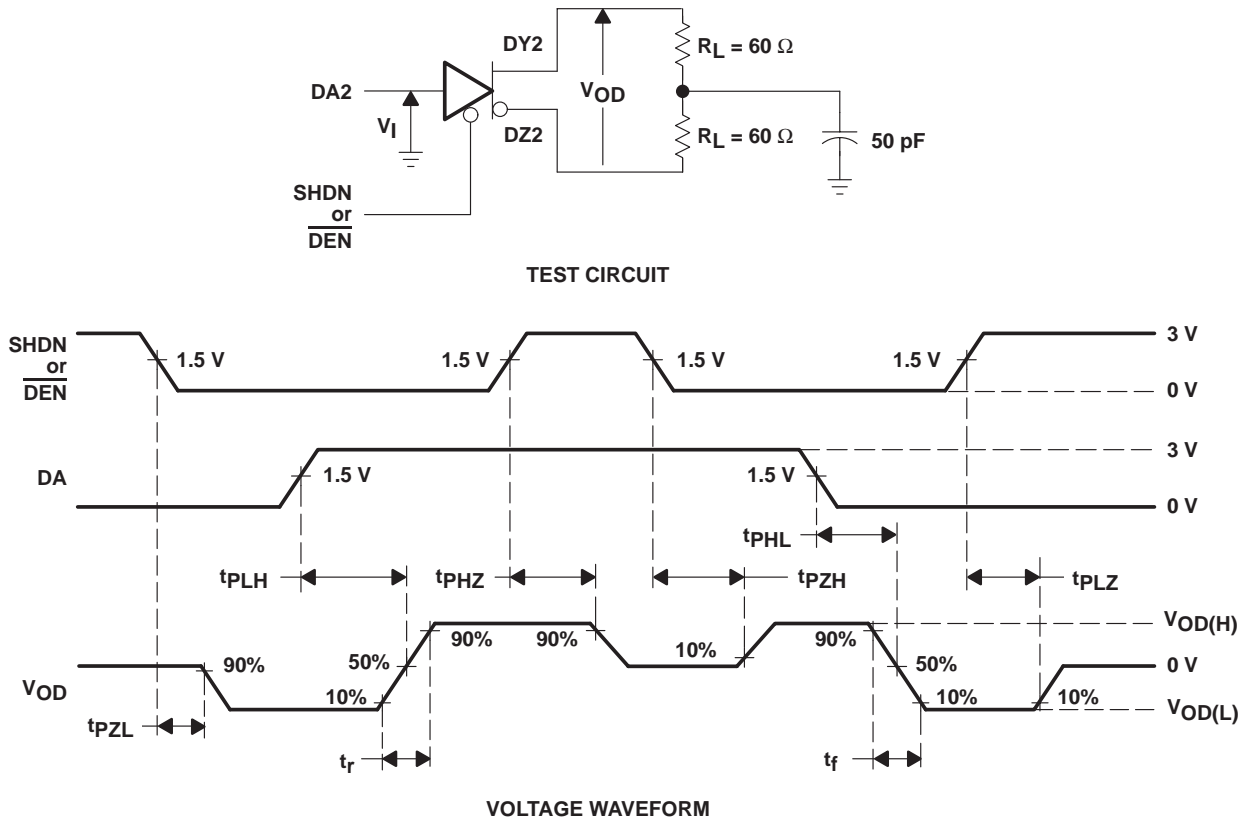


- NOTES: A.  $C_L = 50 \text{ pF}$ ,  $R_L = 120 \Omega$   
 B. The input waveform  $t_r$ ,  $t_f \leq 10 \text{ ns}$ .  
 C. Driver 3 is a noninverting version of driver 1.

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

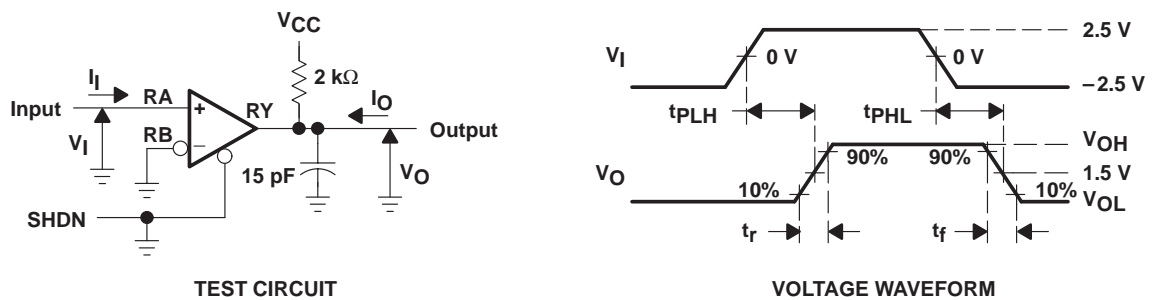


PARAMETER MEASUREMENT INFORMATION



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



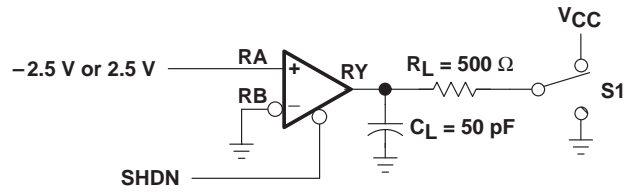
NOTE A: For the input waveform  $t_r, t_f \leq 10$  ns

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

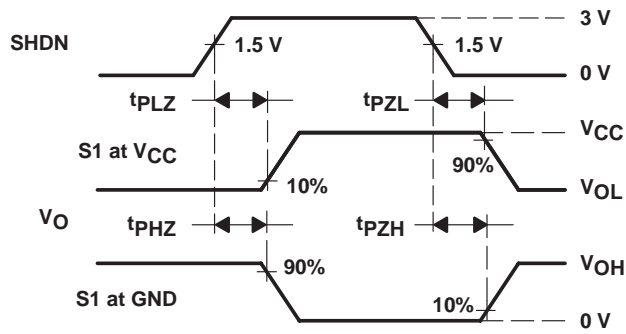
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## PARAMETER MEASUREMENT INFORMATION



TEST CIRCUIT

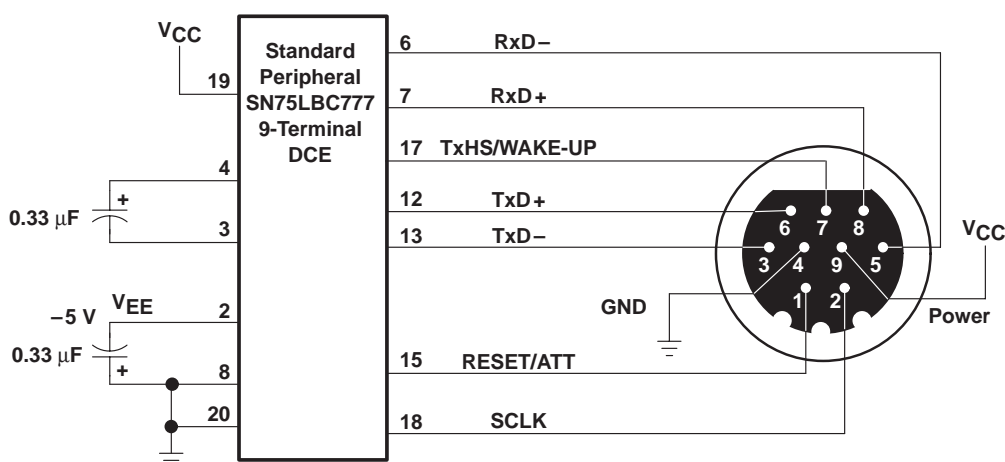
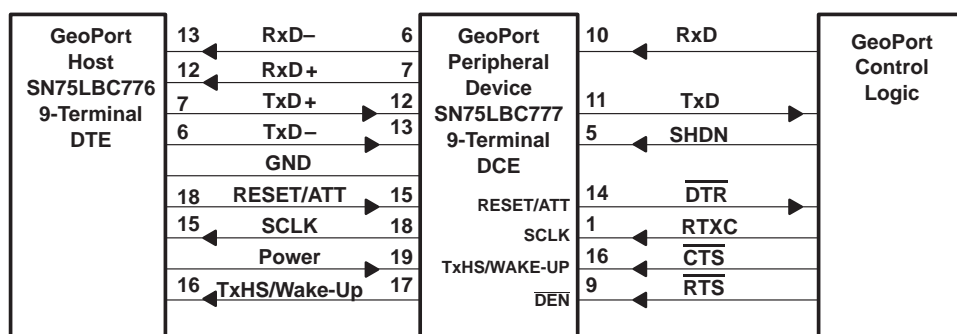


VOLTAGE WAVEFORM

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

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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## SINGLE CHIP GEOPORT™/AppleTalk™ TRANSCEIVER

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### generator characteristics

PARAMETER	TEST CONDITIONS	232/V.28		423/V.10		562		UNIT	
		MIN	MAX	MIN	MAX	MIN	MAX		
V <sub>O</sub>	Output voltage magnitude	Open circuit		25		4 6		13.2	V
		3 kΩ ≤ R <sub>L</sub> ≤ 7 kΩ		5 15		NA		3.7	V
		R <sub>L</sub> = 450 Ω		NA		3.6		NA	V
I <sub>OS</sub>	Short-circuit output current	V <sub>O</sub> = 0		100		150		60	mA
R <sub>O(OFF)</sub>	Power-off source resistance	V <sub>CC</sub> = 0,  V <sub>O</sub>   < 2 V		300		NA		300	Ω
I <sub>O(OFF)</sub>	Power-off output current	V <sub>CC</sub> = 0,  V <sub>O</sub>   < 6 V		NA		±100		NA	μA
SR	Output voltage slew rate			30		NA		4 30	V/μs
t <sub>t</sub>	Output transition time	±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 <sub>O(RING)</sub>	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 <sub>I</sub>	Input voltage	25		10		25		V	
V <sub>I(T)</sub>	Input voltage threshold	V <sub>I</sub>   < 15 V		-3 3		NA		-3 3	V
		V <sub>I</sub>   < 10 V		NA		-0.2 0.2		NA	V
R <sub>I</sub>	Input resistance	3 V <  V <sub>I</sub>   < 15 V		3 7		NA		3 7	kΩ
		V <sub>I</sub>   < 10 V		NA		4		NA	kΩ



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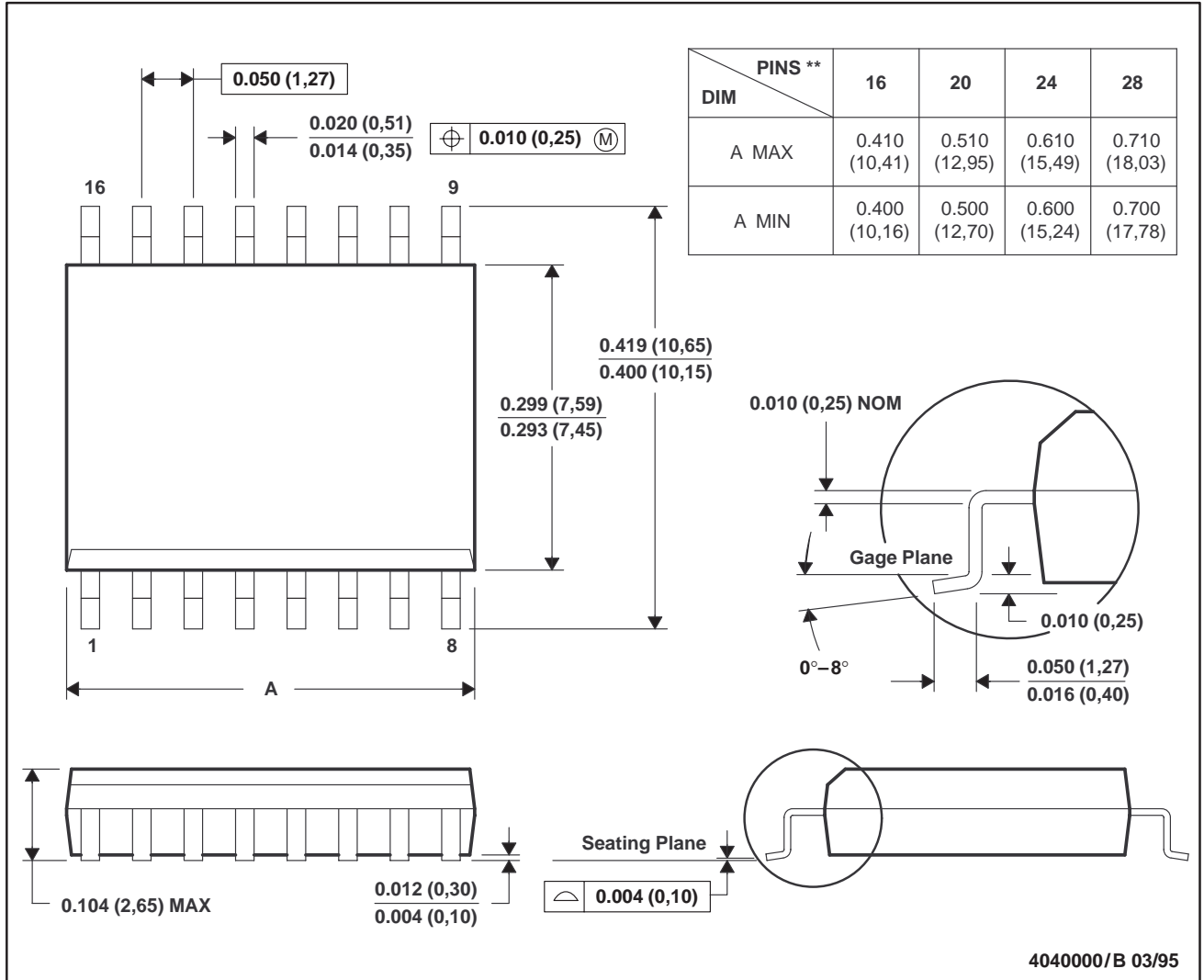
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## MECHANICAL INFORMATION

DW (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE PACKAGE

16 PIN SHOWN



- 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

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