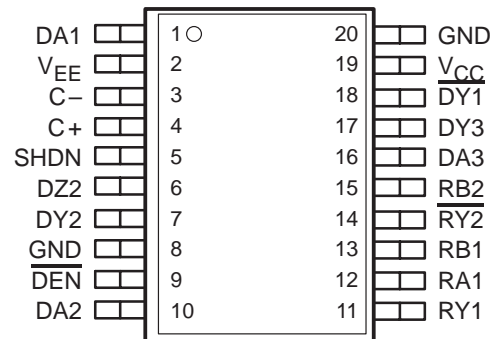


- **Single-Chip Interface Solution for the 9-Pin GeoPort™ Peripheral Data Circuit-Terminating Equipment (DCE) for the Intelligent Network Port**
- **Designed to Operate up to 4-Mbits/s Full Duplex**
- **Single 5-V Supply Operation**
- **10-kV ESD Protection on Bus Terminals**
- **Backward Compatible 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**

**DW PACKAGE
(TOP VIEW)**

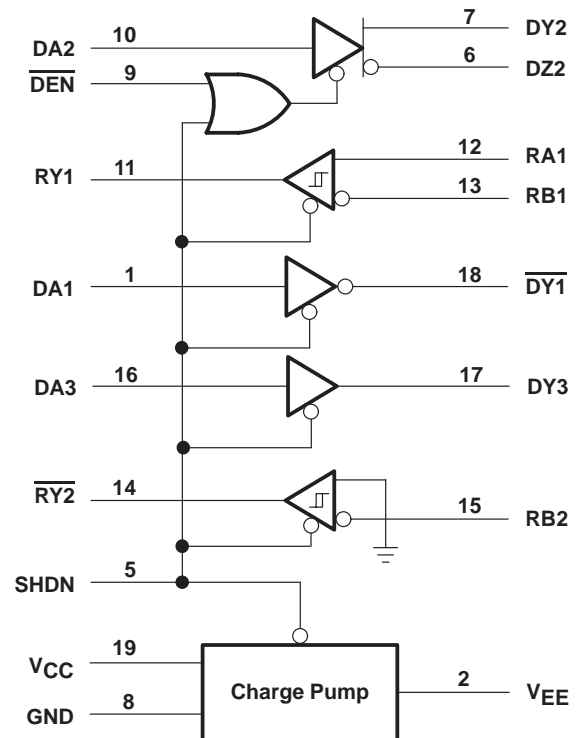


description

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 (\overline{DEN}) terminal puts the outputs of the differential driver into a high-impedance state.

logic diagram (positive logic)



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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-μF 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	$\overline{\text{DEN}}$	$\overline{\text{DY1}}$	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	$\overline{\text{RY2}}$
H	L	H	L	H	L
L	H	L	L	L	H
OPEN	OPEN	OPEN	L	H	H
SHORT†	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)

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

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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			μF
Voltage converter filter capacitor equivalent series resistance (ESR)	0		0.2	Ω
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 kΩ	3.6	4.5		V
			R _L = 120 Ω	2	3.6		V
V _{OL}	Low-level output voltage		R _L = 12 kΩ	−4.5	−3.6		V
			R _L = 120 Ω	−2.7	−1.8		V
V _{OD}	Magnitude of differential output voltage V _{DY} − V _{DZ}	R _L = 120 Ω,	See Figure 2	4			V
Δ V _{OD}	Change in differential voltage magnitude					250	
V _{OC}	Common-mode output voltage	See Figure 3		−1	3		V
ΔV _{OC(SS)}	Magnitude of change, common-mode steady-state output voltage			200			mV
ΔV _{OC(PP)}	Magnitude of change, common-mode peak-to-peak output voltage			700			mV
I _{CC}	Supply current	SHDN = $\overline{\text{DEN}}$ = 0 V,	No Load	7		15	mA
		SHDN = $\overline{\text{DEN}}$ = 5 V,	No Load			100	μA
I _{OZ}	High-impedance output current	V _{CC} = 0 or 5 V,	−10 ≤ V _O ≤ 10 V			±100	μA
I _{OS}	Short-circuit output current	V _{CC} = 5.25 V, See Note 3	−5 V ≤ V _O ≤ 5 V,	±170		±450	mA

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



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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 Ω, 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	SHDN			25	100	μs	
t _{PZH}	Driver output enable time to high-level output	SHDN			25	100	μs	
t _{PLZ}	Driver output disable time from low-level output	SHDN			30	100	ns	
t _{PHZ}	Driver output disable time from high-level output	SHDN			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		Differential, R _L = 120 Ω, See Figure 5		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	SHDN			25	100	μs	
		$\overline{\text{DEN}}$			35	100	ns	
t _{PZH}	Driver output enable time to high-level output	SHDN			25	100	μs	
		$\overline{\text{DEN}}$			35	150	ns	
t _{PLZ}	Driver output disable time from low-level output	SHDN			30	100	ns	
		$\overline{\text{DEN}}$			30	100	ns	
t _{PHZ}	Driver output disable time from high-level output	SHDN			35	100	ns	
		$\overline{\text{DEN}}$			35	100	ns	
t _r	Rise time				10	25	75	ns
t _f	Fall time				10	25	75	ns
t _{SK(P)}	Pulse skew, t _{PLH} – t _{PHL}					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 mA, V _{IC} = 0	2	4.9		V
V _{OL}	Low-level output voltage	I _{OL} = –2 mA, V _{IC} = 0		0.2	0.8	V
I _{OS}	Short-circuit output current	V _O = 0	–85	–45		mA
		V _O = 5.25 V		45	85	mA
R _I	Input resistance	V _{CC} = 0 or 5.25 V, –12 V ≤ V _I ≤ 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.

SN75LBC777

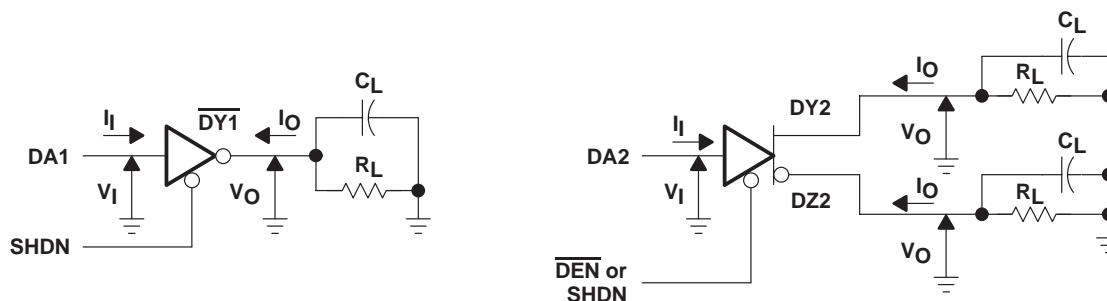
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receiver switching characteristics over free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t _{PHL} Propagation delay time, high-to-low level output	R _L = 2 kΩ, C _L = 15 pF, See Figure 6		30	75	ns
t _{PLH} Propagation delay time, low-to-high level output			30	75	ns
t _r Rise time			15	30	ns
t _f Fall time			15	30	ns
t _{sk(p)} Pulse skew t _{PLH} -t _{PHL}				20	ns
t _{PZL} Receiver output enable time to low-level output	Differential, C _L = 50 pF, See Figure 7		35	100	ns
t _{PZH} Receiver output enable time to high-level output			35	100	ns
t _{PLZ} Receiver output disable time from low-level output			21	100	ns
t _{PHZ} Receiver output disable time from high-level output			21	100	ns
t _{PZL} Receiver output enable time to low-level output	Single-ended, C _L = 50 pF, See Figure 7		12	25	μs
t _{PZH} Receiver output enable time to high-level output			12	25	μs
t _{PLZ} Receiver output disable time from low-level output			25	100	ns
t _{PHZ} Receiver output disable time from high-level output			125	400	ns

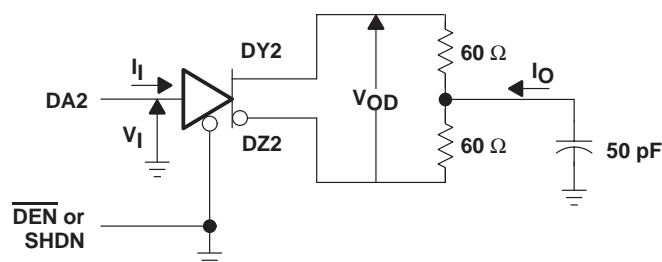
PARAMETER MEASUREMENT INFORMATION



TEST CIRCUIT

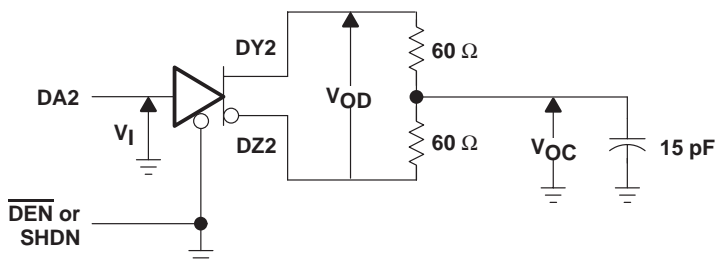
NOTES: A. $C_L = 50 \text{ pF}$
B. Driver 3 is a noninverting version of driver 1.

Figure 1. Single-Ended Driver DC Parameter Test Circuits

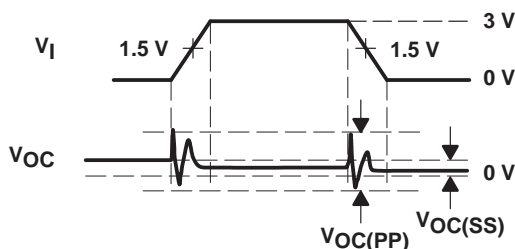


TEST CIRCUIT

Figure 2. Differential Driver DC Parameter Test Circuit



TEST CIRCUIT (see Note A)

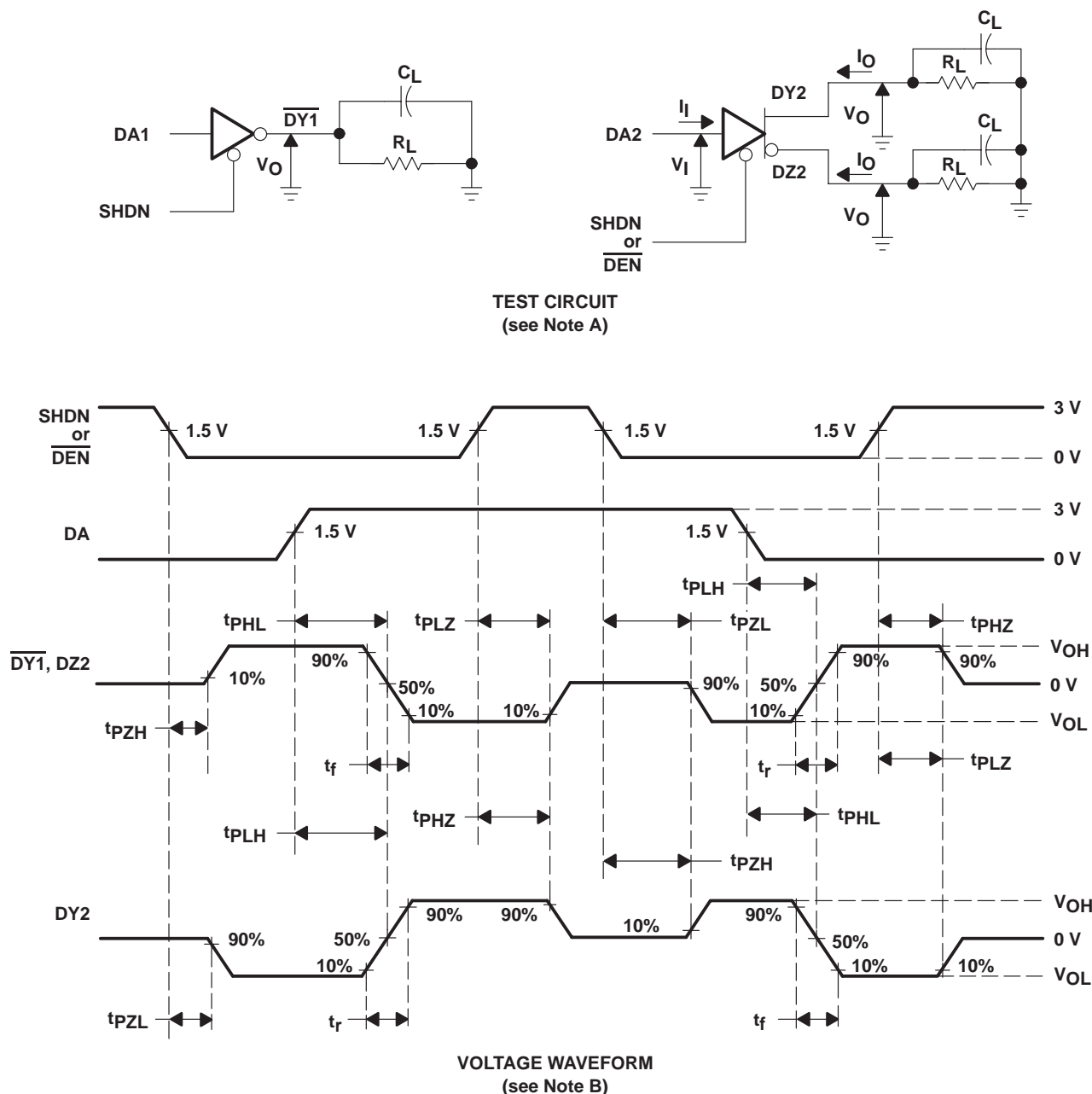


VOLTAGE WAVEFORM

NOTE A. Measured 3dB Bandwidth = 300 MHz

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

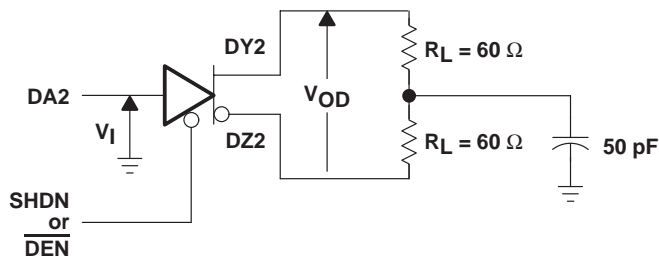
PARAMETER MEASUREMENT INFORMATION



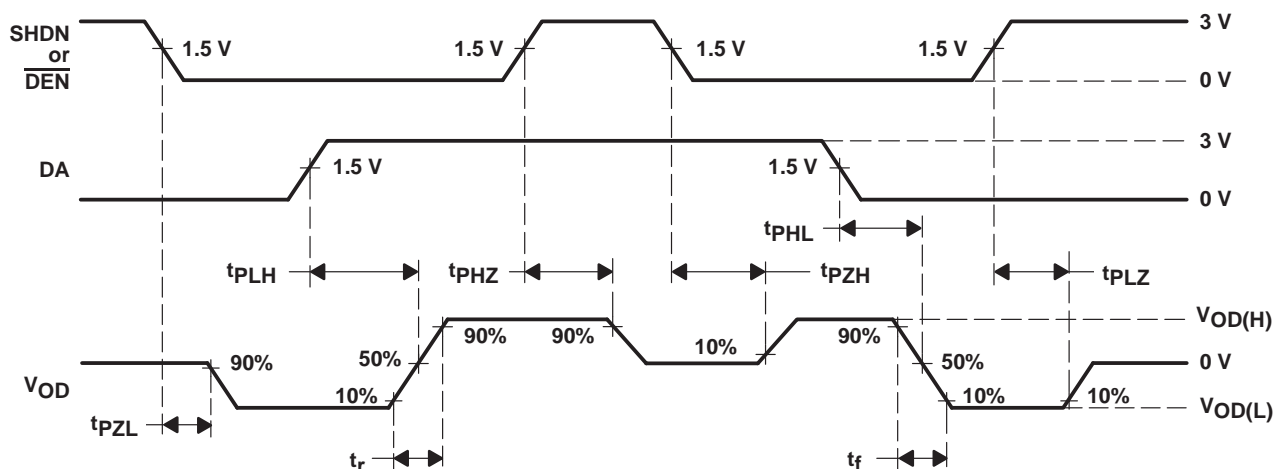
- NOTES: A. $C_L = 50 \text{ pF}$, $R_L = 120 \Omega$
 B. The input waveform t_r , $t_f \leq 10 \text{ ns}$.
 C. Driver 3 is a noninverting version of driver 1.

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

PARAMETER MEASUREMENT INFORMATION



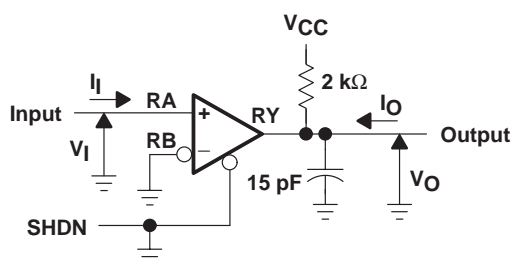
TEST CIRCUIT



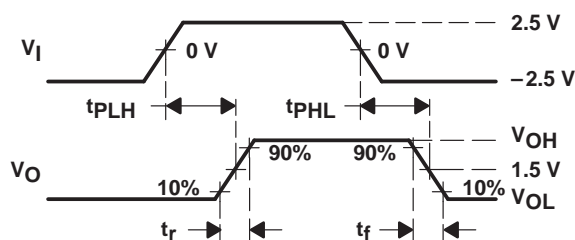
VOLTAGE WAVEFORM

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

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



TEST CIRCUIT

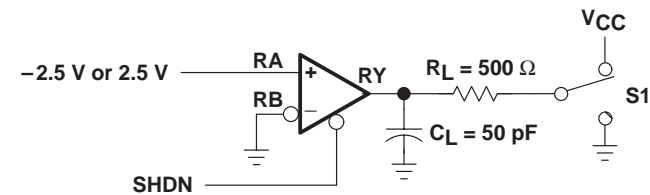


VOLTAGE WAVEFORM

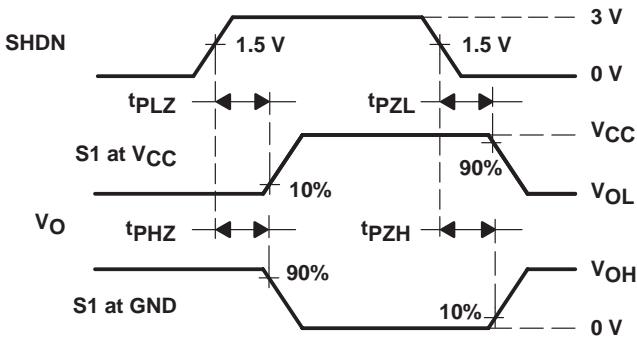
NOTE A: For the input waveform $t_r, t_f \leq 10 \text{ ns}$

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

PARAMETER MEASUREMENT INFORMATION



TEST CIRCUIT

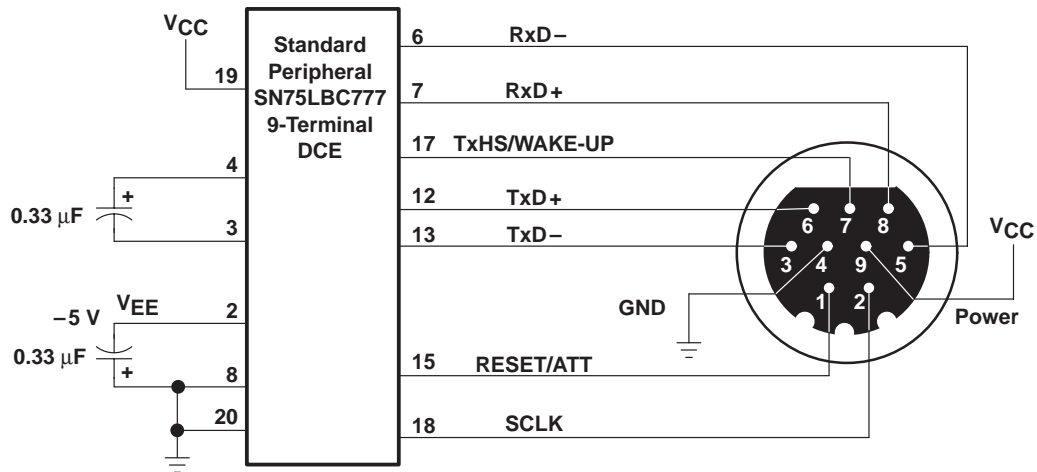
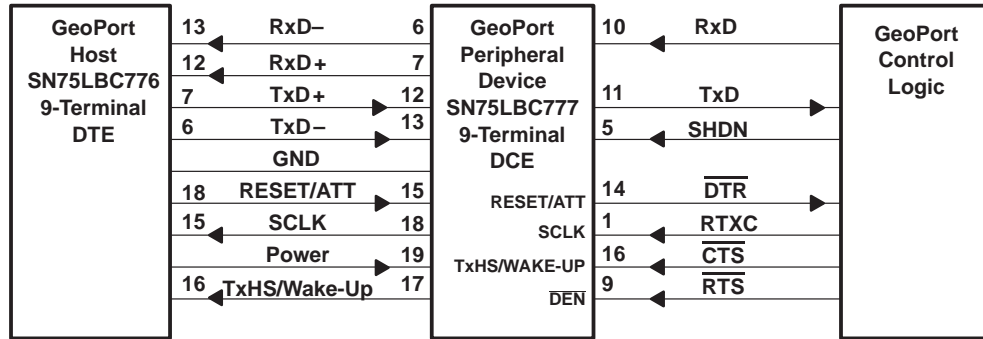


VOLTAGE WAVEFORM

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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generator characteristics

PARAMETER	TEST CONDITIONS	232/V.28		423/V.10		562		UNIT
		MIN	MAX	MIN	MAX	MIN	MAX	
V _O Output voltage magnitude	Open circuit		25	4	6		13.2	V
	$3 \text{ k}\Omega \leq R_L \leq 7 \text{ k}\Omega$	5	15	NA		3.7		V
	$R_L = 450 \Omega$	NA		3.6		NA		V
I _{OS} Short-circuit output current	V _O = 0		100		150		60	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 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 _{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} Input voltage threshold	V _I < 15 V	–3	3	NA		–3	3	V
	V _I < 10 V	NA		–0.2	0.2	NA		V
R _I Input resistance	3 V < V _I < 15 V	3	7	NA		3	7	kΩ
	V _I < 10 V	NA		4		NA		kΩ

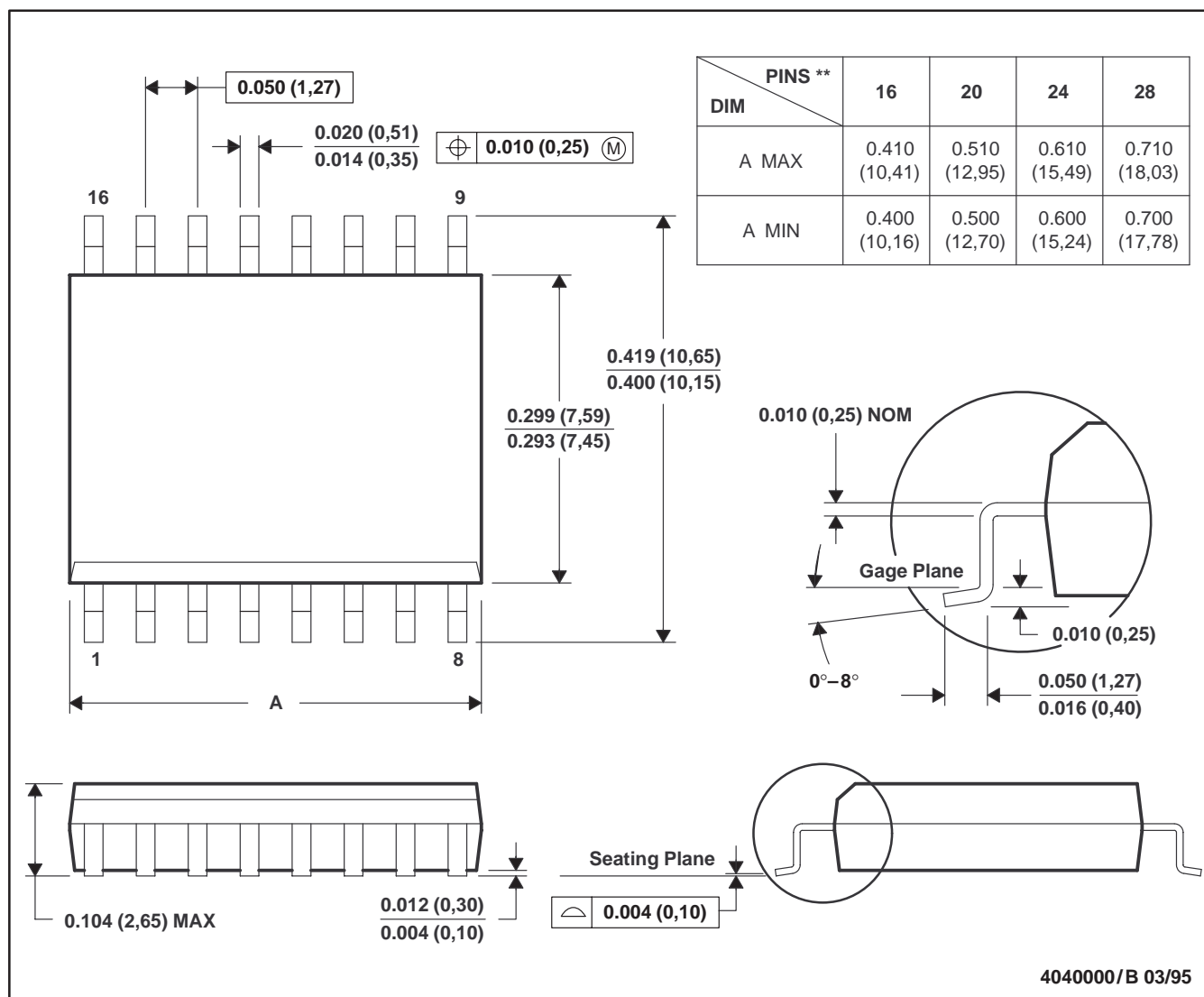


MECHANICAL INFORMATION

DW (R-PDSO-G**)

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

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.

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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 JEDEC industry standard classifications, and peak solder temperature.

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DW (R-PDSO-G20)

PLASTIC SMALL-OUTLINE PACKAGE



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