



**THE DATASHEET OF
SN75LBC771DW**



- Supports a 9-Pin GeoPort™ Host Interface Standard for the Intelligent Network Port
- Designed to Operate up to 4-Mbit/s Full Duplex
- ±5 V Supply Operation
- Provides 6 kV ESD Protection
- Has Driver Short-Circuit Protection
- Includes Failsafe Mechanism for Open Inputs
- Is Backward Compatible with AppleTalk™ and LocalTalk™
- Combines Multiple Components into a Single Chip Solution
- Complements the SN75LBC772 9-Pin GeoPort Peripheral (DCE) Interface Device
- Uses LinBiCMOS™ Process Technology

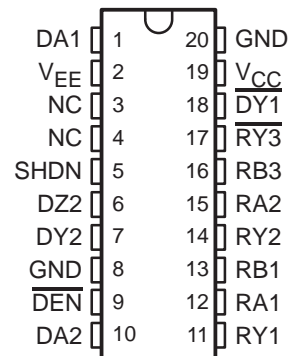
description

The SN75LBC771 is a low-power LinBiCMOS™ device that incorporates the drivers and receivers for a 9-pin GeoPort host 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 SN75LBC771 provides point-to-point connections between GeoPort-compatible devices with data transmission rates up to 4-Mbit/s full duplex featuring a hot-plug capability. Applications include connection to telephone, 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.

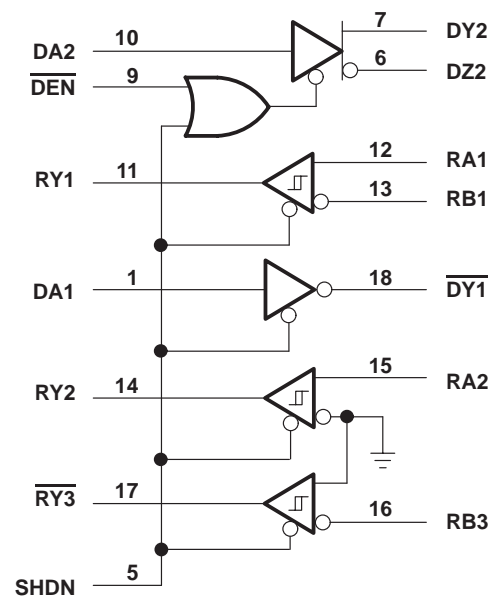
While the SN75LBC771 is powered off (V_{CC} and $V_{EE} = 0$), the outputs are in a high-impedance state. Also, when the shutdown (SHDN) terminal is high, all outputs go into a high-impedance state. A logic high on the driver enable (\overline{DEN}) terminal places the outputs of the differential driver into a high-impedance state. All drivers and receivers have fail-safe mechanisms that ensure a high output state when the inputs are left open.

The SN75LBC771 is characterized for operation over the 0°C to 70°C temperature range.

**DW PACKAGE
(TOP VIEW)**



logic diagram (positive logic)



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**TEXAS
INSTRUMENTS**

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SN75LBC771 GEOPORT™ TRANSCEIVER

SLLS226A – APRIL 1996 – REVISED NOVEMBER 1997

FUNCTION TABLES†

| SINGLE-ENDED DRIVER | | |
|---------------------|---------------|--------------|
| INPUT (DA1) | ENABLE (SHDN) | OUTPUT (DY1) |
| H | L | L |
| L | L | H |
| OPEN | L | L |
| X | H | Z |
| X | OPEN | Z |

| DIFFERENTIAL DRIVER | | | | |
|---------------------|---|------|--------------------|---|
| INPUT (DA2) | ENABLE (SHDN) ($\overline{\text{DEN}}$) | | OUTPUT (DY2) (DZ2) | |
| H | L | L | H | L |
| L | L | L | L | H |
| OPEN | L | L | H | L |
| X | H | X | Z | Z |
| X | OPEN | X | Z | Z |
| X | X | H | Z | Z |
| X | X | OPEN | Z | Z |

| SINGLED-ENDED RECEIVER | | | |
|------------------------|---------------|--------------------|---|
| INPUT (RA2, RA3) | ENABLE (SHDN) | OUTPUT (RY2) (RY3) | |
| H | L | H | L |
| L | L | L | H |
| OPEN | L | H | H |
| SHORT‡ | L | ? | ? |
| X | H | Z | Z |
| X | OPEN | Z | Z |

| DIFFERENTIAL RECEIVER | | | |
|-----------------------|---|---------------|--------------|
| INPUT (RA1) (RB1) | | ENABLE (SHDN) | OUTPUT (RY1) |
| H | L | L | H |
| L | H | L | L |
| OPEN | | L | H |
| SHORT‡ | | L | ? |
| X | X | H | Z |
| X | X | OPEN | Z |

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

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

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 (RA, RB) | –15 V to 15 V |
| Receiver differential input voltage range, V_{ID} | –12 V to 12 V |
| Receiver output voltage range (RY) | –0.5 V to 5.5 V |
| Driver output voltage range (Power Off) ($\overline{\text{DY1}}$, DY2, DZ2) | –15 V to 15 V |
| Driver output voltage range (Power On) ($\overline{\text{DY1}}$, DY2, DZ2) | –11 V to 11 V |
| Driver input voltage range (DA, SHDN, $\overline{\text{DEN}}$) | –0.5 V to $V_{\text{CC}} + 0.4 \text{ V}$ |
| Electrostatic Discharge (see Note 2) | |
| (All pins) Class 3, A | 6 kV |
| (All pins) Class 3, B | 500 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 voltage values are with respect to network ground terminal unless otherwise noted.
2. This rating is per MIL-STD-883C, Method 3015.7.



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 |
|---------|---|---|--|
| DW | 1125 mW | 9.0 mW/°C | 720 mW |

recommended operating conditions

| | MIN | NOM | MAX | UNIT |
|--|-------|-----|-------|------|
| Positive supply voltage, V_{CC} | 4.75 | 5 | 5.25 | V |
| Negative supply voltage, V_{EE} | -5.25 | -5 | -4.75 | V |
| High-level input voltage, V_{IH} (DA, SHDN, \overline{DEN}) | 2 | | | V |
| Low-level input voltage, V_{IL} (DA, SHDN, \overline{DEN}) | | | | 0.8 |
| Receiver common-mode input voltage, V_{IC} | -7 | | | 7 |
| Receiver differential input voltage, V_{ID} | -12 | | 12 | V |
| Operating free-air temperature, T_A | 0 | | 70 | °C |

driver electrical characteristics over recommended 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 |
| | | | $R_L = 120\ \Omega$ | | -3.6 -2 | | 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 | | -2 | | 2 | V | |
| $ \Delta V_{OC(SS)} $ | Magnitude of change, common-mode steady-state output voltage | See Figure 3 | 200 | | mV | | |
| $ \Delta V_{OC(PP)} $ | Magnitude of change, common-mode peak-to-peak output voltage | | 700 | | mV | | |
| I_{CC} | Positive supply current | SHDN = $\overline{DEN} = 0\text{ V}$, No Load | 4 | | 10 | mA | |
| I_{EE} | Negative supply current | | -2 | | -5 | mA | |
| I_{CC} | Positive supply current | SHDN = $\overline{DEN} = 5\text{ V}$, No Load | 100 | | μA | | |
| I_{EE} | Negative supply current | | -100 | | μA | | |
| I_{OZ} | High-impedance output current | $V_{CC} = 0\text{ or }5\text{ V}$, $-10\text{ V} \leq V_O \leq 10\text{ V}$ | ± 100 | | μA | | |
| I_{OS} | Short-circuit output current | $V_{CC} = 5.25\text{ V}$, See Note 3 | ± 170 | | ± 450 | | |

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

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driver switching characteristics over operating free-air temperature range

| PARAMETER | | TEST CONDITIONS | MIN | TYP | MAX | UNIT | |
|--------------------|---|-------------------------------|-------------------------------|-----|-----|------|----|
| t _{PHL} | Propagation delay time, high-to-low level output | Single ended, See Figure 4 | | 42 | 75 | ns | |
| t _{PLH} | Propagation delay time, low-to-high level output | | | 41 | 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 | | | | 25 | 100 | μs |
| t _{PLZ} | Driver output disable time from low-level output | | | | 28 | 100 | ns |
| t _{PHZ} | Driver output disable time from high-level output | | | | 37 | 100 | ns |
| t _r | Rise time | | | | 10 | 25 | 75 |
| t _f | Fall time | | | 10 | 23 | 75 | ns |
| t _{PHL} | Propagation delay time, high-to-low level output | | Differential, See Figure 5 | | 40 | 75 | ns |
| t _{PLH} | Propagation delay time, low-to-high level output | | | | 42 | 75 | ns |
| t _{PZL} | Driver output enable time to low-level output | SHDN | | | 25 | 100 | μs |
| | | $\overline{\text{DEN}}$ | | | 29 | 150 | 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 | | | 28 | 100 | ns |
| | | $\overline{\text{DEN}}$ | | | 34 | 100 | ns |
| t _{PHZ} | Driver output disable time from high-level output | SHDN | | | 37 | 100 | ns |
| | | $\overline{\text{DEN}}$ | | | 34 | 100 | ns |
| t _r | Rise time | | | 10 | 27 | 75 | ns |
| t _f | Fall time | | | 10 | 26 | 75 | ns |
| t _{SK(p)} | Pulse skew, t _{PLH} - t _{PHL} | | | | | 22 | ns |



receiver electrical characteristics over recommended operating conditions (unless otherwise noted)

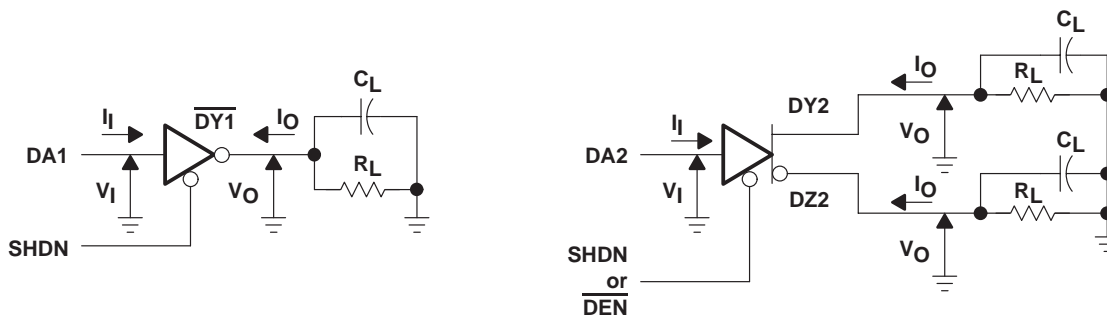
| PARAMETER | | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|-----------|---|--|-------------------|-----|-----|------------|
| V_{IT+} | Positive-going input threshold voltage | See Figure 6 | | | 200 | mV |
| V_{IT-} | Negative-going input threshold voltage | | -200 | | | mV |
| V_{hys} | Differential input voltage hysteresis ($V_{IT+} - V_{IT-}$) | | | 50 | | mV |
| V_{OH} | High-level output voltage (see Note 4) | $V_{IC} = 0$, See Figure 6 | $I_{OH} = -2$ mA, | 2 | 4.5 | V |
| V_{OL} | Low-level output voltage | $V_{IC} = 0$, See Figure 6 | $I_{OL} = 2$ mA, | 0.4 | 0.8 | V |
| I_{OS} | Short-circuit output current | $V_O = 0$ | | -45 | -85 | mA |
| | | $V_O = 5.25$ V | | 45 | 85 | mA |
| R_{IN} | Input resistance | $V_{CC} = 0$ or 5.25 V, -12 V $\leq V_I \leq 12$ V | 6 | 30 | | k Ω |

NOTE 4: If the inputs are left unconnected, receivers one and two interpret this as a high-level input and receiver three interprets this as a low-level input so that all outputs are at the high level.

receiver switching characteristics over recommended conditions (unless otherwise noted)

| PARAMETER | | TEST CONDITIONS | MIN | TYP | MAX | UNIT | | |
|-------------|---|---|--------------|-----|-----|------|---------|---------|
| t_{PHL} | Propagation delay time, high-to-low level output | $R_L = 2$ k Ω , $C_L = 15$ 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 | $C_L = 50$ 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 | | Differential | | 20 | 100 | ns | |
| t_{PHZ} | Receiver output disable time from high-level output | | | | 20 | 100 | ns | |
| t_{PZL} | Receiver output enable time to low-level output | | Single-ended | | 12 | 25 | ns | |
| t_{PZH} | Receiver output enable time to high-level output | | | | 12 | 25 | μ s | |
| t_{PLZ} | Receiver output disable time from low-level output | | | | | 25 | 100 | μ s |
| t_{PHZ} | Receiver output disable time from high-level output | | | | 125 | 400 | ns | |

PARAMETER MEASUREMENT INFORMATION



NOTE A: $C_L = 50 \text{ pF}$

Figure 1. Single-Ended Driver DC Parameter Test Circuits

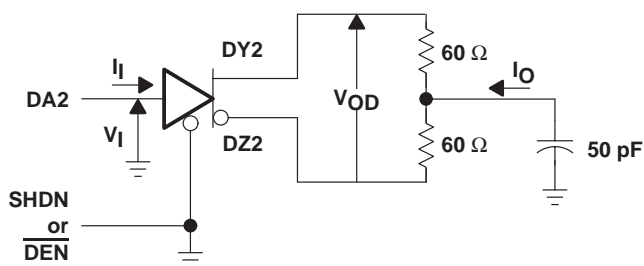
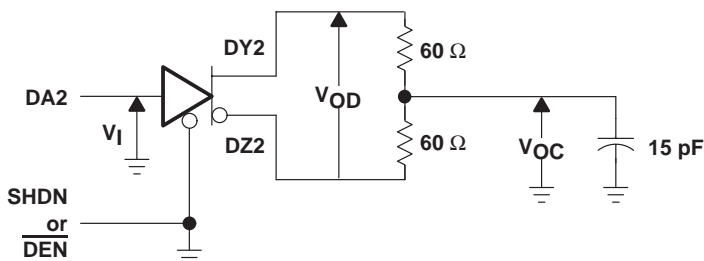
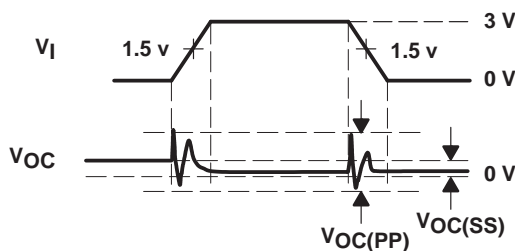


Figure 2. Differential Driver DC Parameter Test Circuit



TEST CIRCUIT

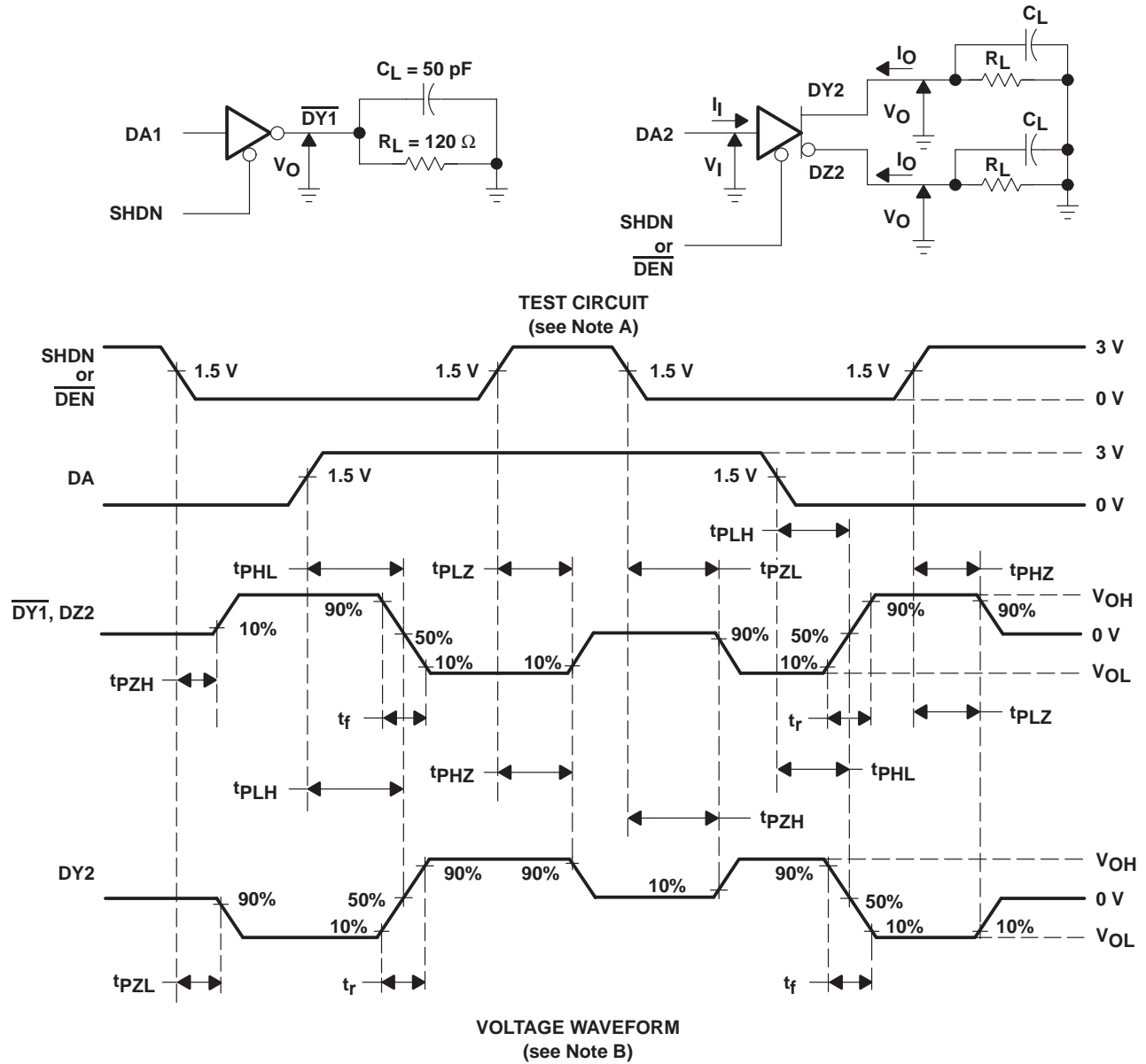


VOLTAGE WAVEFORM

NOTE A: Measured 3dB Bandwidth = 300 MHz

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

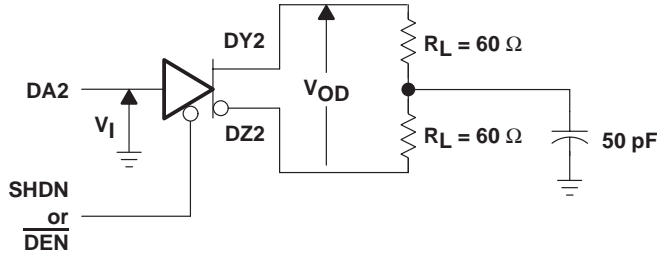
PARAMETER MEASUREMENT INFORMATION



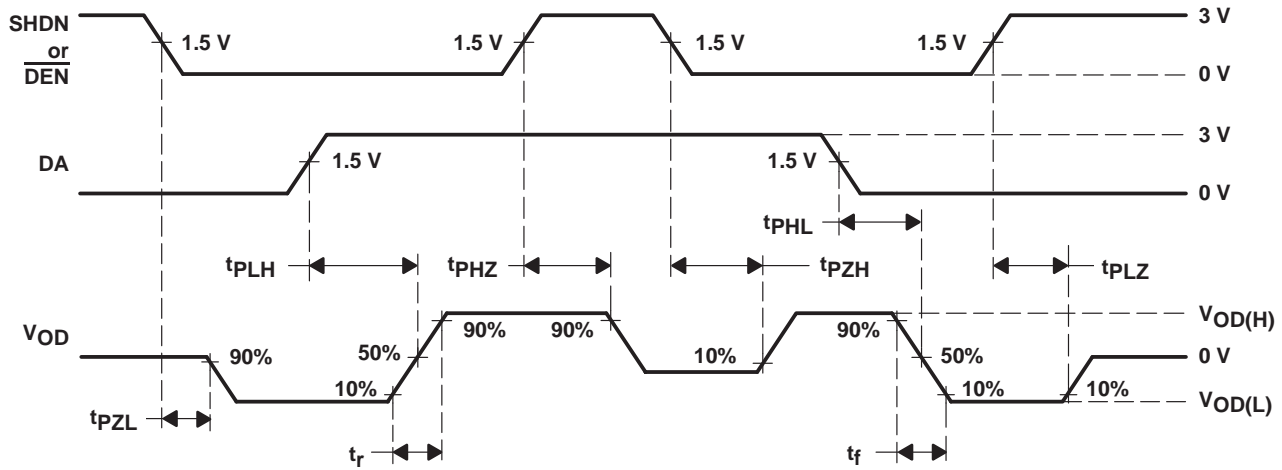
NOTES: A. $C_L = 50 \text{ pF}$, $R_L = 120 \Omega$
B. The input waveform t_r , $t_f \leq 10 \text{ ns}$.

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

PARAMETER MEASUREMENT INFORMATION



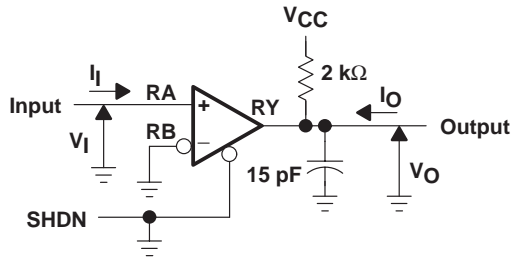
TEST CIRCUIT



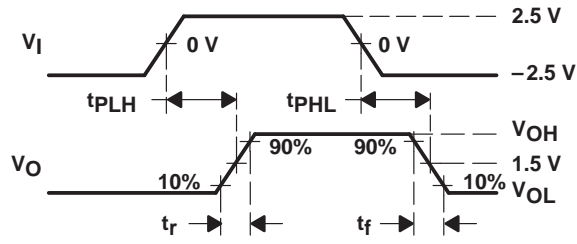
VOLTAGE WAVEFORM
 (see Note A)

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

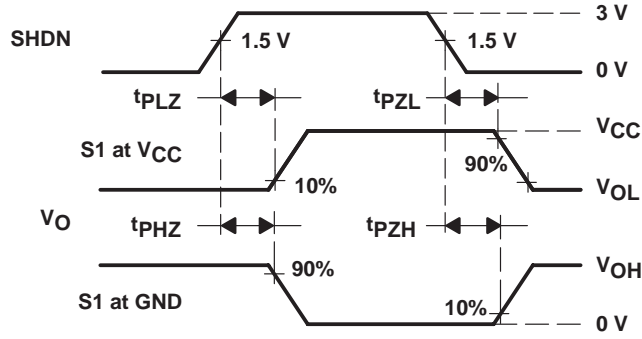
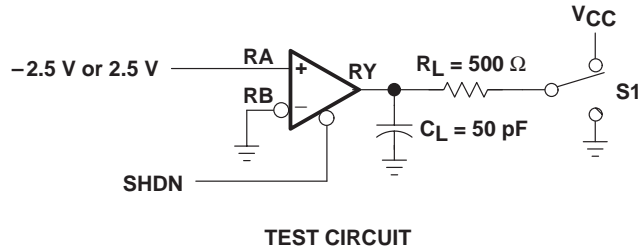


VOLTAGE WAVEFORM
 (see Note A)

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

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

PARAMETER MEASUREMENT INFORMATION



VOLTAGE WAVEFORM
 (see Note A)

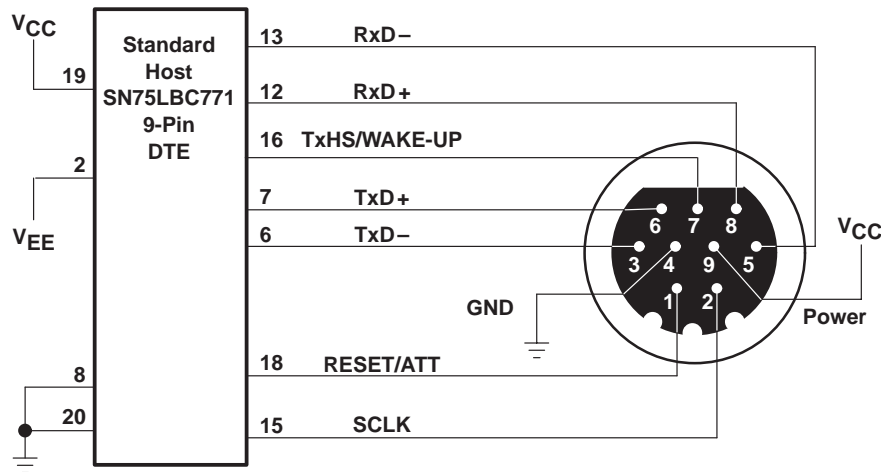
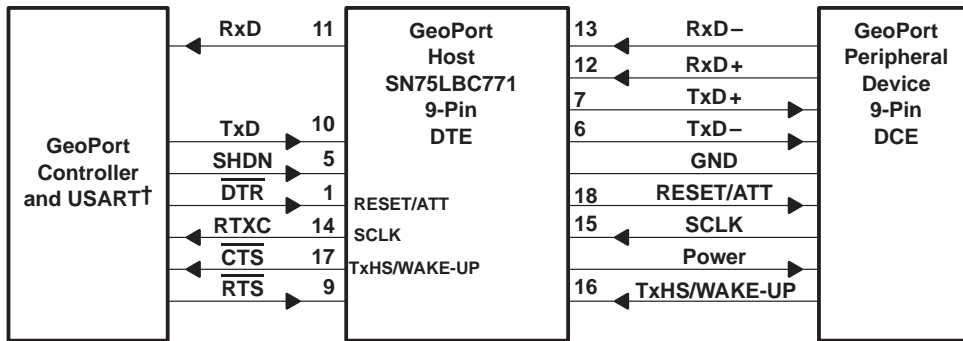
NOTE A: For the input waveform $t_r, t_f \leq 10$ ns

Figure 7. Receiver Enable and Disable Test Circuit and Waveforms

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APPLICATION INFORMATION



† USART = universal synchronous asynchronous receiver transmitter

Figure 8. GeoPort 9-Pin DTE Connection Application

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 | | 4 | 6 | 13.2 | | V |
| | | 3 kΩ ≤ R _L ≤ 7 kΩ | | 5 | 15 | 3.7 | | V |
| | | R _L = 450 Ω | | NA | 3.6 | NA | | V |
| I _{OS} | Short-circuit output current | V _O = 0 | | 100 | | 150 | | 60 mA |
| R _(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 | | 0.22 2.1 | | μs |
| | | ±3 V to ±3 V | | 0.04 | | NA | | ui‡ |
| | | 10% to 90% | | NA | | 0.3 | | NA ui‡ |
| V _{O(RING)} | Output voltage ring | | | NA | | 10% | | 5% |

‡ ui is the unit interval and is the inverse of the signaling rate (bit time).

APPLICATION INFORMATION

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 |

SN75LBC771 GEOPORT™ TRANSCEIVER

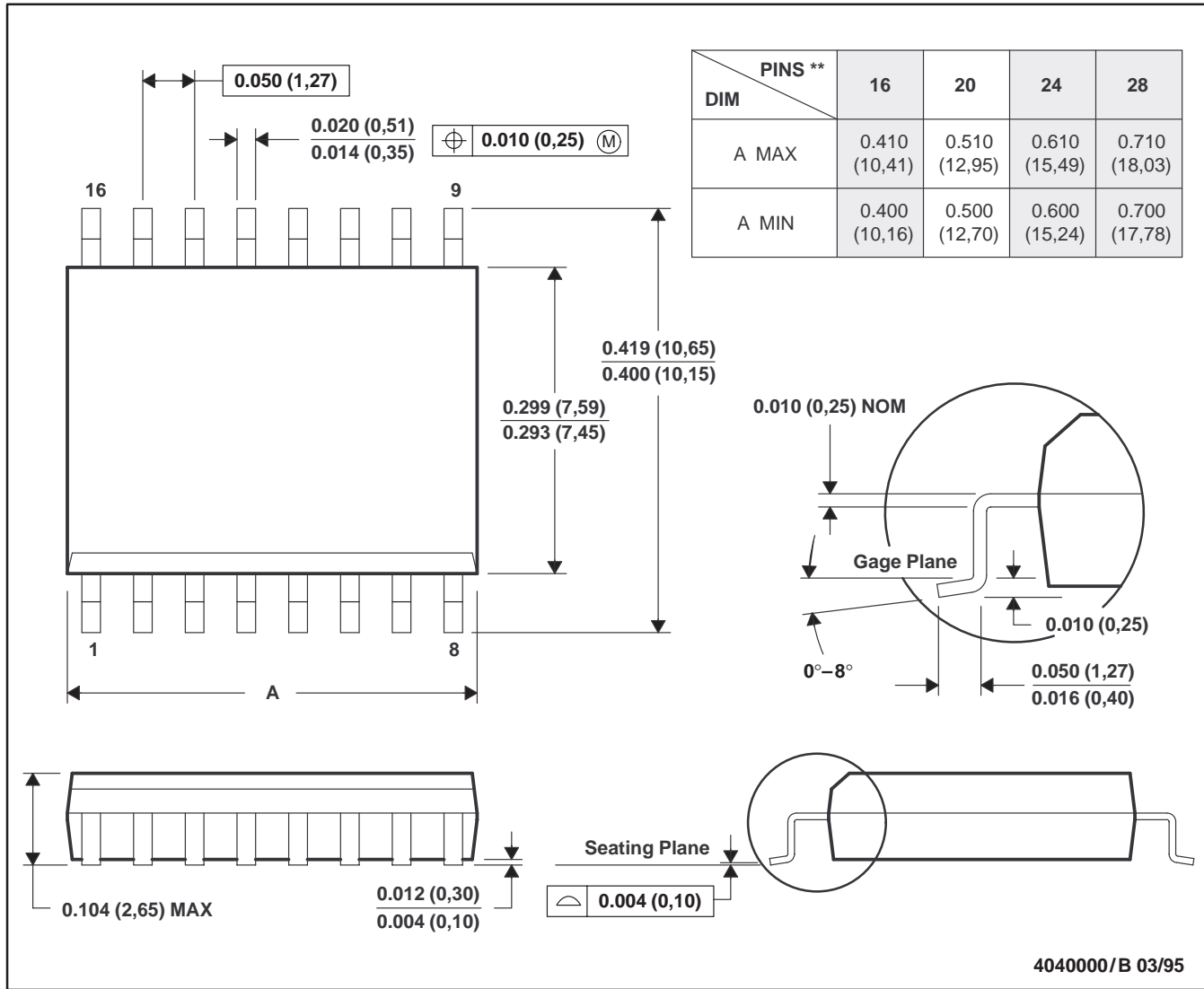
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MECHANICAL INFORMATION

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

4040000/B 03/95

PACKAGING INFORMATION

| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead finish/ Ball material (6) | MSL Peak Temp (3) | Op Temp (°C) | Device Marking (4/5) | Samples |
|------------------|---------------|--------------|-----------------|------|-------------|-----------------|--------------------------------------|----------------------|--------------|-------------------------|---------|
| SN75LBC771DW | ACTIVE | SOIC | DW | 20 | 25 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | SN75LBC771 | Samples |

(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.

OBSELETE: TI has discontinued the production of the device.

(2) **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".

RoHS Exempt: TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.

Green: TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

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

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

(6) Lead finish/Ball material - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

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TUBE


*All dimensions are nominal

| Device | Package Name | Package Type | Pins | SPQ | L (mm) | W (mm) | T (μm) | B (mm) |
|--------------|--------------|--------------|------|-----|--------|--------|--------|--------|
| SN75LBC771DW | DW | SOIC | 20 | 25 | 506.98 | 12.7 | 4826 | 6.6 |
| SN75LBC771DW | DW | SOIC | 20 | 25 | 507 | 12.83 | 5080 | 6.6 |

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