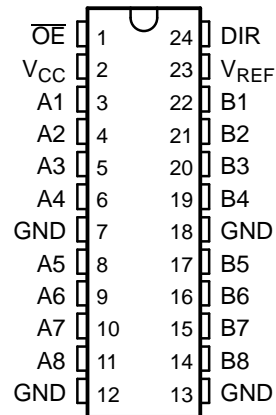


FEATURES

- **TI-OPC™ Circuitry Limits Ringing on Unevenly Loaded Backplanes**
- **OEC™ Circuitry Improves Signal Integrity and Reduces Electromagnetic Interference**
- **Bidirectional Interface Between GTLP Signal Levels and LVTTTL Logic Levels**
- **LVTTTL Interfaces Are 5-V Tolerant**
- **Medium-Drive GTLP Outputs (50 mA)**
- **LVTTTL Outputs (–24 mA/24 mA)**
- **GTLP Rise and Fall Times Designed for Optimal Data-Transfer Rate and Signal Integrity in Distributed Loads**
- **I_{off} and Power-Up 3-State Support Hot Insertion**
- **Bus Hold on A-Port Data Inputs**
- **Latch-Up Performance Exceeds 100 mA Per JESD 78, Class II**
- **ESD Protection Exceeds JESD 22**
 - 2000-V Human-Body Model (A114-A)
 - 200-V Machine Model (A115-A)
 - 1000-V Charged-Device Model (C101)

DG, DW, OR PW PACKAGE
(TOP VIEW)



DESCRIPTION/ORDERING INFORMATION

The SN74GTLPH306 is a medium-drive, 8-bit bus transceiver that provides LVTTTL-to-GTLP and GTLP-to-LVTTTL signal-level translation. The device provides a high-speed interface between cards operating at LVTTTL logic levels and a backplane operating at GTLP signal levels. High-speed (about three times faster than standard LVTTTL or TTL) backplane operation is a direct result of GTLP's reduced output swing (<1 V), reduced input threshold levels, improved differential input, OEC™ circuitry, and TI-OPC™ circuitry. Improved GTLP OEC and TI-OPC circuits minimize bus-settling time and have been designed and tested using several backplane models. The medium drive allows incident-wave switching in heavily loaded backplanes with equivalent load impedance down to 19 Ω.

GTLP is the Texas Instruments (TI™) derivative of the Gunning Transceiver Logic (GTL) JEDEC standard JESD 8-3. The ac specification of the SN74GTLPH306 is given only at the preferred higher-noise-margin GTLP, but the user has the flexibility of using this device at either GTL ($V_{TT} = 1.2$ V and $V_{REF} = 0.8$ V) or GTLP ($V_{TT} = 1.5$ V and $V_{REF} = 1$ V) signal levels.

Normally, the B port operates at GTLP signal levels. The A-port and control inputs operate at LVTTTL logic levels, but are 5-V tolerant and are compatible with TTL and 5-V CMOS inputs. V_{REF} is the B-port differential input reference voltage.

This device is fully specified for hot-insertion applications using I_{off} and power-up 3-state. The I_{off} circuitry disables the outputs, preventing damaging current backflow through the device when it is powered down. The power-up 3-state circuitry places the outputs in the high-impedance state during power up and power down, which prevents driver conflict.



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SN74GTLPH306
8-BIT LVTTTL-TO-GTLP BUS TRANSCEIVER

SCES284E—OCTOBER 1999—REVISED APRIL 2005

DESCRIPTION/ORDERING INFORMATION (CONTINUED)

This GTLP device features TI-OPC circuitry, which actively limits overshoot caused by improperly terminated backplanes, unevenly distributed cards, or empty slots during low-to-high signal transitions. This improves signal integrity, which allows adequate noise margin to be maintained at higher frequencies.

Active bus-hold circuitry holds unused or undriven LVTTTL data inputs at a valid logic state. Use of pullup or pulldown resistors with the bus-hold circuitry is not recommended.

When V_{CC} is between 0 and 1.5 V, the device is in the high-impedance state during power up or power down. However, to ensure the high-impedance state above 1.5 V, the output-enable (\overline{OE}) input should be tied to V_{CC} through a pullup resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver.

ORDERING INFORMATION

| T_A | PACKAGE ⁽¹⁾ | | ORDERABLE PART NUMBER | TOP-SIDE MARKING |
|---------------|------------------------|---------------|-----------------------|------------------|
| -40°C to 85°C | SOIC – DW | Tube | SN74GTLPH306DW | GTLPH306 |
| | | Tape and reel | SN74GTLPH306DWR | |
| | TSSOP – PW | Tape and reel | SN74GTLPH306PWR | GH306 |
| | TVSOP – DGV | Tape and reel | SN74GTLPH306DGVR | GH306 |

(1) Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.

FUNCTIONAL DESCRIPTION

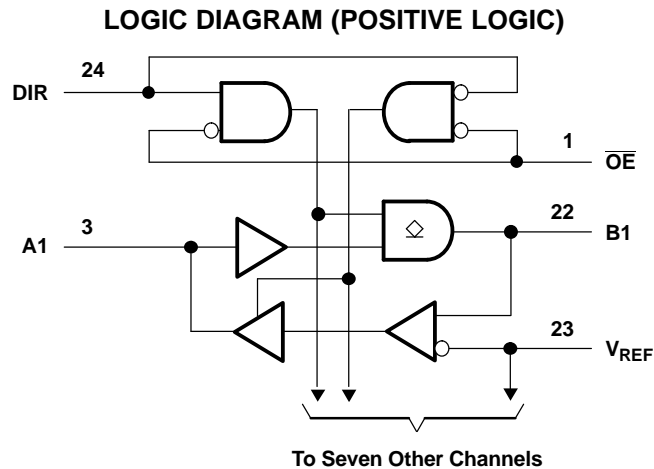
The SN74GTLPH306 is an 8-bit bus transceiver and is designed for asynchronous communication between data buses. The device transmits data from the A port to the B port or from the B port to the A port, depending on the logic level at the direction-control (DIR) input. \overline{OE} can be used to disable the device so the buses are effectively isolated. Data polarity is noninverting.

For A-to-B data flow, when \overline{OE} is low and DIR is high, the B outputs take on the logic value of the A inputs. When \overline{OE} is high, the outputs are in the high-impedance state.

The data flow for B to A is similar to A to B, except \overline{OE} and DIR are low.

FUNCTION TABLE

| INPUTS | | OUTPUT | MODE |
|-----------------|-----|------------------|------------------|
| \overline{OE} | DIR | | |
| H | X | Z | Isolation |
| L | L | B data to A port | True transparent |
| L | H | A data to B port | |



Absolute Maximum Ratings⁽¹⁾

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

| | | MIN | MAX | UNIT |
|---------------|---|---------------------------|-----------|------|
| V_{CC} | Supply voltage range | -0.5 | 4.6 | V |
| V_I | Input voltage range ⁽²⁾ | A port and control inputs | | V |
| | | B port and V_{REF} | | |
| V_O | Voltage range applied to any output in the high-impedance or power-off state ⁽²⁾ | A port | | V |
| | | B port | | |
| I_O | Current into any output in the low state | A port | | mA |
| | | B port | | |
| I_O | Current into any A port output in the high state ⁽³⁾ | | 48 | mA |
| | Continuous current through each V_{CC} or GND | | ± 100 | mA |
| I_{IK} | Input clamp current | $V_I < 0$ | -50 | mA |
| I_{OK} | Output clamp current | $V_O < 0$ | -50 | mA |
| θ_{JA} | Package thermal impedance ⁽⁴⁾ | DGV package | | °C/W |
| | | DW package | | |
| | | PW package | | |
| T_{stg} | Storage temperature range | -65 | 150 | °C |

- (1) 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.
- (2) The input and output negative-voltage ratings may be exceeded if the input and output clamp-current ratings are observed.
- (3) This current flows only when the output is in the high state and $V_O > V_{CC}$.
- (4) The package thermal impedance is calculated in accordance with JESD 51-7.

SN74GTLPH306

8-BIT LVTTTL-TO-GTLP BUS TRANSCEIVER

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Recommended Operating Conditions⁽¹⁾⁽²⁾⁽³⁾⁽⁴⁾

| | | MIN | NOM | MAX | UNIT | |
|--------------------------|------------------------------------|-----------------|------------------|----------|--------------|---|
| V_{CC} | Supply voltage | 3.15 | 3.3 | 3.45 | V | |
| V_{TT} | Termination voltage | GTL | 1.14 | 1.2 | 1.26 | V |
| | | GTLP | 1.35 | 1.5 | 1.65 | |
| V_{REF} | Reference voltage | GTL | 0.74 | 0.8 | 0.87 | V |
| | | GTLP | 0.87 | 1 | 1.1 | |
| V_I | Input voltage | B port | | V_{TT} | V | |
| | | Except B port | | V_{CC} | | |
| V_{IH} | High-level input voltage | B port | $V_{REF} + 0.05$ | | V | |
| | | Except B port | 2 | | | |
| V_{IL} | Low-level input voltage | B port | $V_{REF} - 0.05$ | | V | |
| | | Except B port | 0.8 | | | |
| I_{IK} | Input clamp current | | | -18 | mA | |
| I_{OH} | High-level output current | A port | | -24 | mA | |
| I_{OL} | Low-level output current | A port | | 24 | mA | |
| | | B port | | 50 | | |
| $\Delta t/\Delta v$ | Input transition rise or fall rate | Outputs enabled | | 10 | ns/V | |
| $\Delta t/\Delta V_{CC}$ | Power-up ramp rate | 20 | | | μ s/V | |
| T_A | Operating free-air temperature | -40 | | 85 | $^{\circ}$ C | |

- (1) All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.
- (2) Proper connection sequence for use of the B-port I/O precharge feature is GND and BIAS $V_{CC} = 3.3$ V first, I/O second, and $V_{CC} = 3.3$ V last, because the BIAS V_{CC} precharge circuitry is disabled when any V_{CC} pin is connected. The control and V_{REF} inputs can be connected anytime, but normally are connected during the I/O stage. If B-port precharge is not required, any connection sequence is acceptable, but generally, GND is connected first.
- (3) V_{TT} and R_{TT} can be adjusted to accommodate backplane impedances if the dc recommended I_{OL} ratings are not exceeded.
- (4) V_{REF} can be adjusted to optimize noise margins, but normally is two-thirds V_{TT} . TI-OPC circuitry is enabled in the A-to-B direction and is activated when $V_{TT} > 0.7$ V above V_{REF} . If operated in the A-to-B direction, V_{REF} should be set to within 0.6 V of V_{TT} to minimize current drain.

Electrical Characteristics

over recommended operating free-air temperature range for GTLP (unless otherwise noted)

| PARAMETER | | TEST CONDITIONS | | MIN | TYP ⁽¹⁾ | MAX | UNIT | |
|-----------------------|---------------------------|--|------------------------------------|----------------|--------------------|----------|---------------|----|
| V_{IK} | | $V_{CC} = 3.15\text{ V}$, | $I_I = -18\text{ mA}$ | | | -1.2 | V | |
| V_{OH} | A port | $V_{CC} = 3.15\text{ V to }3.45\text{ V}$, | $I_{OH} = -100\text{ }\mu\text{A}$ | $V_{CC} - 0.2$ | | | V | |
| | | $V_{CC} = 3.15\text{ V}$ | $I_{OH} = -12\text{ mA}$ | 2.4 | | | | |
| | | | $I_{OH} = -24\text{ mA}$ | 2 | | | | |
| V_{OL} | A port | $V_{CC} = 3.15\text{ V to }3.45\text{ V}$, | $I_{OL} = 100\text{ }\mu\text{A}$ | | | 0.2 | V | |
| | | | $I_{OL} = 12\text{ mA}$ | | | 0.4 | | |
| | | $V_{CC} = 3.15\text{ V}$ | $I_{OL} = 24\text{ mA}$ | | | 0.5 | | |
| | B port | $V_{CC} = 3.15\text{ V}$ | $I_{OL} = 40\text{ mA}$ | | | 0.4 | | |
| | | | $I_{OL} = 50\text{ mA}$ | | | 0.55 | | |
| $I_I^{(2)}$ | A-port and control inputs | $V_{CC} = 3.45\text{ V}$ | $V_I = 0\text{ or }V_{CC}$ | | | ± 5 | μA | |
| | B port | | $V_I = 5.5\text{ V}$ | | | ± 20 | | |
| | | | $V_I = 0\text{ to }1.5\text{ V}$ | | | ± 5 | | |
| $I_{BHL}^{(3)}$ | A port | $V_{CC} = 3.15\text{ V}$, | $V_I = 0.8\text{ V}$ | | | 75 | μA | |
| $I_{BHH}^{(4)}$ | A port | $V_{CC} = 3.15\text{ V}$, | $V_I = 2\text{ V}$ | | | -75 | μA | |
| $I_{BHLO}^{(5)}$ | A port | $V_{CC} = 3.45\text{ V}$, | $V_I = 0\text{ to }V_{CC}$ | | | 500 | μA | |
| $I_{BHHO}^{(6)}$ | A port | $V_{CC} = 3.45\text{ V}$, | $V_I = 0\text{ to }V_{CC}$ | | | -500 | μA | |
| I_{CC} | A or B port | $V_{CC} = 3.45\text{ V}$, $I_O = 0$, V_I (A-port or control input) = V_{CC} or GND, V_I (B port) = V_{TT} or GND | Outputs high | | | 20 | mA | |
| | | | Outputs low | | | 20 | | |
| | | | Outputs disabled | | | 20 | | |
| $\Delta I_{CC}^{(7)}$ | | $V_{CC} = 3.45\text{ V}$, One A-port or control input at $V_{CC} - 0.6\text{ V}$, Other A-port or control inputs at V_{CC} or GND | | | | 1.5 | mA | |
| C_i | Control inputs | $V_I = 3.15\text{ V or }0$ | | | | 4.5 | 5 | pF |
| C_{io} | A port | $V_O = 3.15\text{ V or }0$ | | | | 7.5 | 9 | pF |
| | B port | $V_O = 1.5\text{ V or }0$ | | | | 7.5 | 9 | |

(1) All typical values are at $V_{CC} = 3.3\text{ V}$, $T_A = 25^\circ\text{C}$.

(2) For I/O ports, the parameter I_I includes the off-state output leakage current.

(3) The bus-hold circuit can sink at least the minimum low sustaining current at V_{ILmax} . I_{BHL} should be measured after lowering V_{IN} to GND and then raising it to V_{ILmax} .

(4) The bus-hold circuit can source at least the minimum high sustaining current at V_{IHmin} . I_{BHH} should be measured after raising V_{IN} to V_{CC} and then lowering it to V_{IHmin} .

(5) An external driver must source at least I_{BHLO} to switch this node from low to high.

(6) An external driver must sink at least I_{BHHO} to switch this node from high to low.

(7) This is the increase in supply current for each input that is at the specified TTL voltage level, rather than V_{CC} or GND.

Hot-Insertion Specifications for A Port

over recommended operating free-air temperature range

| PARAMETER | TEST CONDITIONS | | MIN | MAX | UNIT |
|------------|---------------------------------------|---|-----|----------|---------------|
| I_{off} | $V_{CC} = 0$, | V_I or $V_O = 0\text{ to }5.5\text{ V}$ | | 10 | μA |
| I_{OZPU} | $V_{CC} = 0\text{ to }1.5\text{ V}$, | $V_O = 0.5\text{ V to }3\text{ V}$, $\overline{OE} = 0$ | | ± 30 | μA |
| I_{OZPD} | $V_{CC} = 1.5\text{ V to }0$, | $V_O = 0.5\text{ V to }3\text{ V}$, $\overline{OE} = 0$ | | ± 30 | μA |

Hot-Insertion Specifications for B Port

over recommended operating free-air temperature range

| PARAMETER | TEST CONDITIONS | | MIN | MAX | UNIT |
|------------|---------------------------------------|---|-----|----------|---------------|
| I_{off} | $V_{CC} = 0$, | V_I or $V_O = 0\text{ to }1.5\text{ V}$ | | 10 | μA |
| I_{OZPU} | $V_{CC} = 0\text{ to }1.5\text{ V}$, | $V_O = 0.5\text{ V to }1.5\text{ V}$, $\overline{OE} = 0$ | | ± 30 | μA |
| I_{OZPD} | $V_{CC} = 1.5\text{ V to }0$, | $V_O = 0.5\text{ V to }1.5\text{ V}$, $\overline{OE} = 0$ | | ± 30 | μA |

SN74GTLPH306

8-BIT LVTTTL-TO-GTLP BUS TRANSCEIVER

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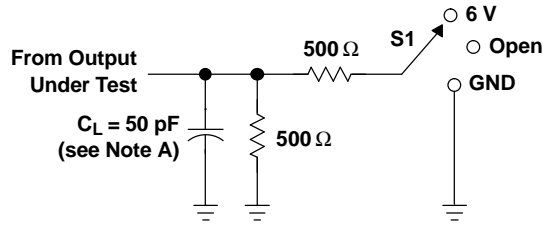
Switching Characteristics

over recommended ranges of supply voltage and operating free-air temperature,
 $V_{TT} = 1.5\text{ V}$ and $V_{REF} = 1\text{ V}$ for GTLP (see Figure 1)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | MIN | TYP ⁽¹⁾ | MAX | UNIT |
|-----------|-----------------------------------|----------------|-----|--------------------|-----|------|
| t_{PLH} | A | B | 1 | | 7.5 | ns |
| t_{PHL} | | | 1 | | 7.5 | |
| t_{en} | \overline{OE} | B | 1 | | 8 | ns |
| t_{dis} | | | 1 | | 8 | |
| t_r | Rise time, B outputs (20% to 80%) | | 2.2 | | | ns |
| t_f | Fall time, B outputs (80% to 20%) | | 2.1 | | | ns |
| t_r | Rise time, A outputs (10% to 90%) | | 4.1 | | | ns |
| t_f | Fall time, A outputs (90% to 10%) | | 3.3 | | | ns |
| t_{PLH} | B | A | 1 | | 7 | ns |
| t_{PHL} | | | 1 | | 7 | |
| t_{en} | \overline{OE} | A | 1 | | 8 | ns |
| t_{dis} | | | 1 | | 8 | |

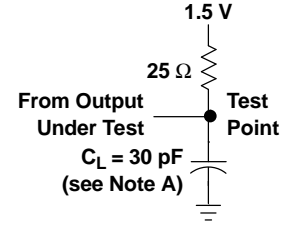
(1) All typical values are at $V_{CC} = 3.3\text{ V}$, $T_A = 25^\circ\text{C}$.

PARAMETER MEASUREMENT INFORMATION

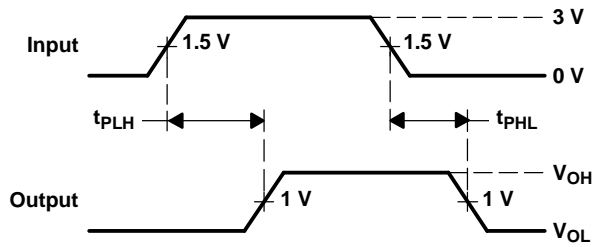


LOAD CIRCUIT FOR A OUTPUTS

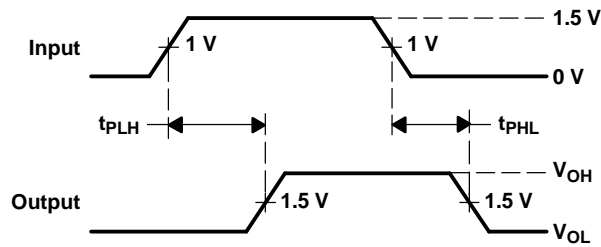
| TEST | S1 |
|-------------------|------|
| t_{PLH}/t_{PHL} | Open |
| t_{PLZ}/t_{PZL} | 6 V |
| t_{PHZ}/t_{PZH} | GND |



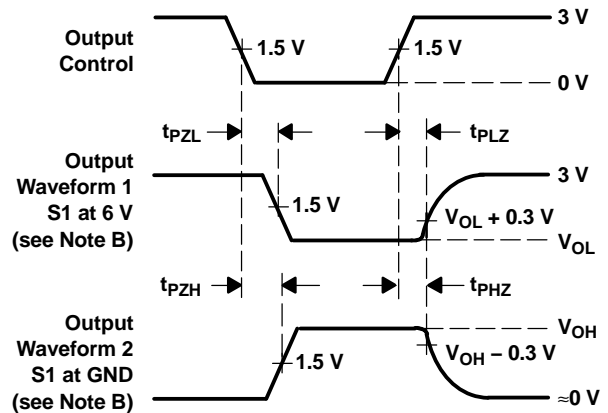
LOAD CIRCUIT FOR B OUTPUTS



VOLTAGE WAVEFORMS
PROPAGATION DELAY TIMES
(A port to B port)



VOLTAGE WAVEFORMS
PROPAGATION DELAY TIMES
(B port to A port)



VOLTAGE WAVEFORMS
ENABLE AND DISABLE TIMES
(A port)

- NOTES: A. C_L includes probe and jig capacitance.
 B. Waveform 1 is for an output with internal conditions such that the output is low, except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high, except when disabled by the output control.
 C. All input pulses are supplied by generators having the following characteristics: $PRR \approx 10$ MHz, $Z_O = 50 \Omega$, $t_r \approx 2$ ns, $t_f \approx 2$ ns.
 D. The outputs are measured one at a time, with one transition per measurement.

Figure 1. Load Circuits and Voltage Waveforms

Distributed-Load Backplane Switching Characteristics

The preceding switching characteristics table shows the switching characteristics of the device into a lumped load (Figure 1). However, the designer's backplane application probably is a distributed load. The physical representation is shown in Figure 2. This backplane, or distributed load, can be approximated closely to a resistor inductance capacitance (RLC) circuit, as shown in Figure 3. This device has been designed for optimum performance in this RLC circuit. The following switching characteristics table shows the switching characteristics of the device into the RLC load, to help the designer better understand the performance of the GTLP device in this typical backplane. See www.ti.com/sc/gtlp for more information.

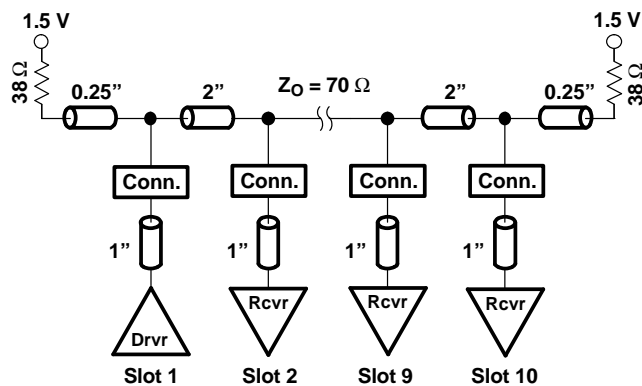


Figure 2. Medium-Drive Test Backplane

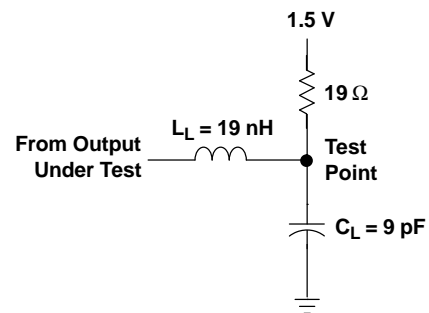


Figure 3. Medium-Drive RLC Network

Switching Characteristics

over recommended ranges of supply voltage and operating free-air temperature, $V_{TT} = 1.5\text{ V}$ and $V_{REF} = 1\text{ V}$ for GTLP (see Figure 3)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | TYP ⁽¹⁾ | UNIT |
|-----------|-----------------------------------|-------------|--------------------|------|
| t_{PLH} | A | B | 3.6 | ns |
| t_{PHL} | | | 4.1 | |
| t_{en} | \overline{OE} | B | 4.4 | ns |
| t_{dis} | | | 4.6 | |
| t_r | Rise time, B outputs (20% to 80%) | | 1.2 | ns |
| t_f | Fall time, B outputs (80% to 20%) | | 2.2 | ns |

(1) All typical values are at $V_{CC} = 3.3\text{ V}$, $T_A = 25^\circ\text{C}$. All values are derived from TI-SPICE models.

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 |
|------------------|---------------|--------------|-----------------|------|-------------|-----------------|--------------------------------------|----------------------|--------------|-------------------------|-------------------------|
| SN74GTLPH306DGVR | ACTIVE | TVSOP | DGV | 24 | 2000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 85 | GH306 | Samples |
| SN74GTLPH306DW | ACTIVE | SOIC | DW | 24 | 25 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 85 | GTLPH306 | Samples |
| SN74GTLPH306DWR | ACTIVE | SOIC | DW | 24 | 2000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 85 | GTLPH306 | Samples |
| SN74GTLPH306PW | ACTIVE | TSSOP | PW | 24 | 60 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 85 | GH306 | Samples |
| SN74GTLPH306PWR | ACTIVE | TSSOP | PW | 24 | 2000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 85 | GH306 | 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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TAPE AND REEL INFORMATION

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE


*All dimensions are nominal

| Device | Package Type | Package Drawing | Pins | SPQ | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|------------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN74GTLPH306DGVR | TVSOP | DGV | 24 | 2000 | 330.0 | 12.4 | 6.9 | 5.6 | 1.6 | 8.0 | 12.0 | Q1 |
| SN74GTLPH306DWR | SOIC | DW | 24 | 2000 | 330.0 | 24.4 | 10.75 | 15.7 | 2.7 | 12.0 | 24.0 | Q1 |
| SN74GTLPH306PWR | TSSOP | PW | 24 | 2000 | 330.0 | 16.4 | 6.95 | 8.3 | 1.6 | 8.0 | 16.0 | Q1 |

TAPE AND REEL BOX DIMENSIONS


*All dimensions are nominal

| Device | Package Type | Package Drawing | Pins | SPQ | Length (mm) | Width (mm) | Height (mm) |
|------------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN74GTLPH306DGVR | TVSOP | DGV | 24 | 2000 | 356.0 | 356.0 | 35.0 |
| SN74GTLPH306DWR | SOIC | DW | 24 | 2000 | 350.0 | 350.0 | 43.0 |
| SN74GTLPH306PWR | TSSOP | PW | 24 | 2000 | 356.0 | 356.0 | 35.0 |

TUBE


*All dimensions are nominal

| Device | Package Name | Package Type | Pins | SPQ | L (mm) | W (mm) | T (μm) | B (mm) |
|----------------|--------------|--------------|------|-----|--------|--------|--------|--------|
| SN74GTLPH306DW | DW | SOIC | 24 | 25 | 506.98 | 12.7 | 4826 | 6.6 |
| SN74GTLPH306PW | PW | TSSOP | 24 | 60 | 530 | 10.2 | 3600 | 3.5 |

DGV (R-PDSO-G**)

PLASTIC SMALL-OUTLINE

24 PINS SHOWN



4073251/E 08/00

- NOTES: A. All linear dimensions are in millimeters.
 B. This drawing is subject to change without notice.
 C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15 per side.
 D. Falls within JEDEC: 24/48 Pins – MO-153
 14/16/20/56 Pins – MO-194

DW (R-PDSO-G24)

PLASTIC SMALL OUTLINE



- NOTES:
- All linear dimensions are in inches (millimeters). Dimensioning and tolerancing per ASME Y14.5M-1994.
 - This drawing is subject to change without notice.
 - Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
 - Falls within JEDEC MS-013 variation AD.

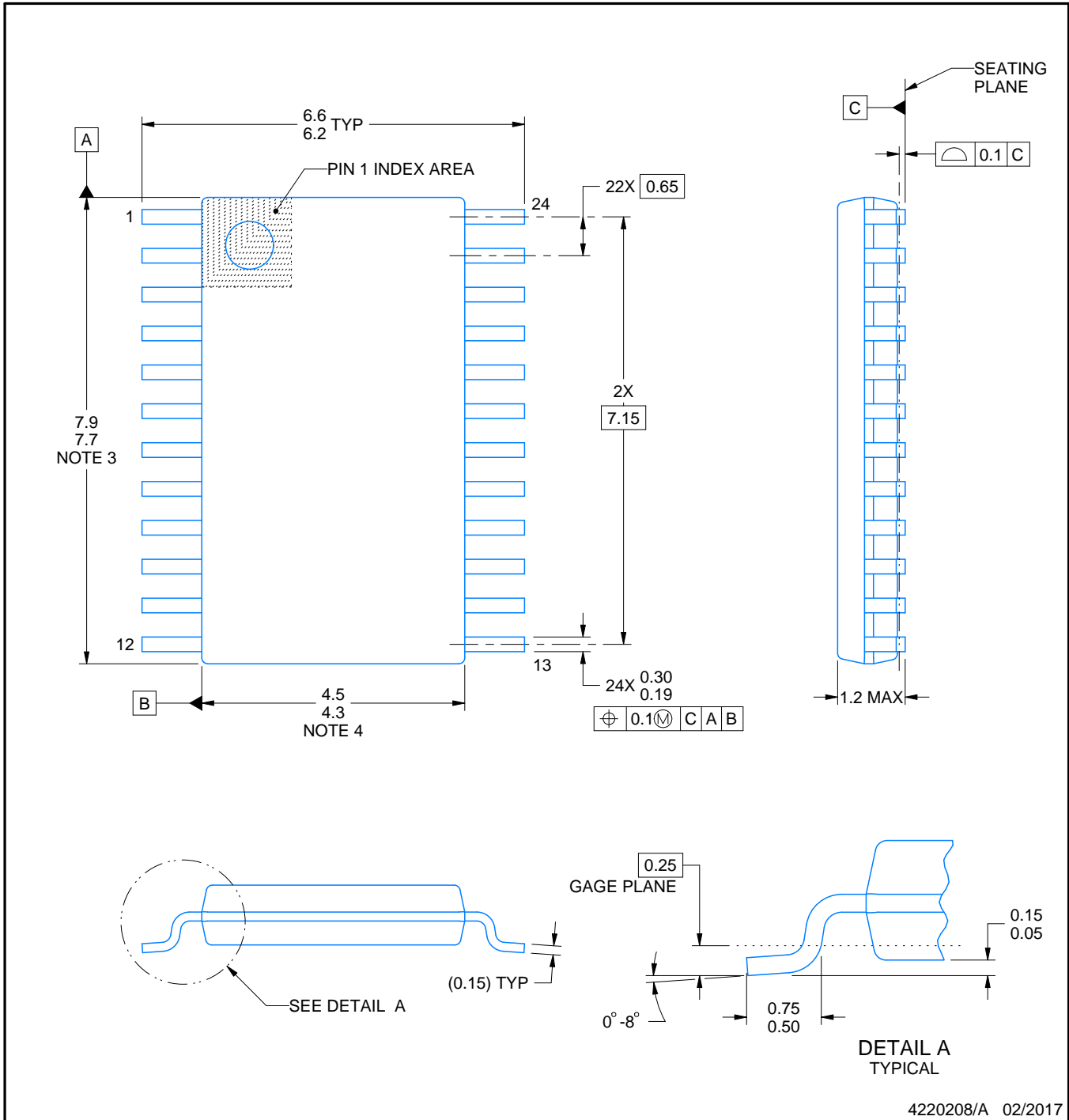
PW0024A



PACKAGE OUTLINE

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



4220208/A 02/2017

NOTES:

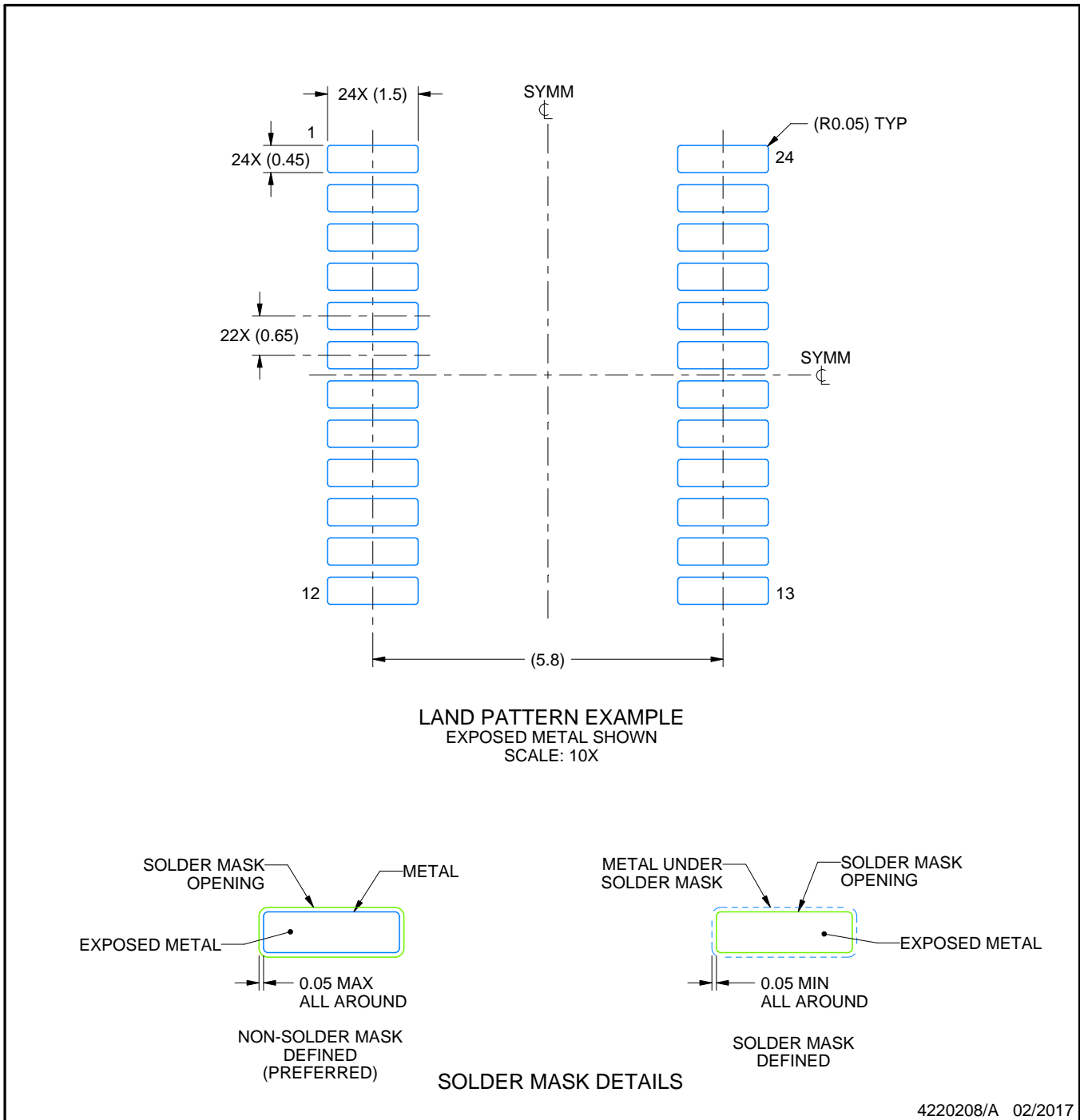
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm per side.
4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.25 mm per side.
5. Reference JEDEC registration MO-153.

EXAMPLE BOARD LAYOUT

PW0024A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



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NOTES: (continued)

- 6. Publication IPC-7351 may have alternate designs.
- 7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

EXAMPLE STENCIL DESIGN

PW0024A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



NOTES: (continued)

8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.

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