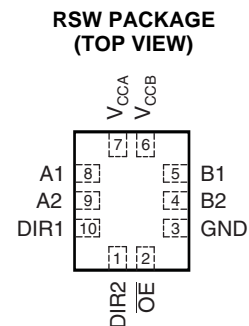


DUAL-BIT DUAL-SUPPLY BUS TRANSCEIVER WITH CONFIGURABLE VOLTAGE TRANSLATION AND 3-STATE OUTPUTS

FEATURES

- Each Channel Has Independent Direction Control
- Control Inputs V_{IH}/V_{IL} Levels Are Referenced to V_{CCA} Voltage
- Fully Configurable Dual-Rail Design Allows Each Port to Operate Over the Full 1.2-V to 3.6-V Power-Supply Range
- I/Os Are 4.6-V Tolerant
- I_{off} Supports Partial-Power-Down Mode Operation
- Typical Data Rates
 - 500 Mbps (1.8-V to 3.3-V Translation)
 - 320 Mbps (<1.8-V to 3.3-V Translation)
 - 320 Mbps (Translate to 2.5 V or 1.8 V)
 - 280 Mbps (Translate to 1.5 V)
 - 240 Mbps (Translate to 1.2 V)
- Latch-Up Performance Exceeds 100 mA Per JESD 78, Class II
- ESD Protection Exceeds JESD 22
 - 5000-V Human-Body Model (A114-A)
 - 200-V Machine Model (A115-A)
 - 1500-V Charged-Device Model (C101)



DESCRIPTION/ORDERING INFORMATION

This dual-bit noninverting bus transceiver uses two separate configurable power-supply rails. The A port is designed to track V_{CCA} . V_{CCA} accepts any supply voltage from 1.2 V to 3.6 V. The B port is designed to track V_{CCB} . V_{CCB} accepts any supply voltage from 1.2 V to 3.6 V. This allows for universal low-voltage bidirectional translation between any of the 1.2-V, 1.5-V, 1.8-V, 2.5-V, and 3.3-V voltage nodes.

ORDERING INFORMATION

| T_A | PACKAGE ⁽¹⁾⁽²⁾ | | ORDERABLE PART NUMBER | TOP-SIDE MARKING |
|---------------|---------------------------|---------------|-----------------------|------------------|
| –40°C to 85°C | QFN – RSW | Tape and reel | SN74AVC2T245RSWR | TLO |

(1) Package drawings, thermal data, and symbolization are available at www.ti.com/packaging.

(2) For the most current package and ordering information, see the Package Option Addendum at the end of this document, or see the TI website at www.ti.com.



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

DESCRIPTION/ORDERING INFORMATION (CONTINUED)

The SN74AVC2T245 is designed for asynchronous communication between two data buses. The logic levels of the direction-control (DIR) input and the output-enable (\overline{OE}) activate either the B-port outputs or the A-port outputs or place both output ports into the high-impedance mode. The device transmits data from the A bus to the B bus when the B-port outputs are activated and from the B bus to the A bus when the A-port outputs are activated. The input circuitry on both A and B ports always is active and must have a logic HIGH or LOW level applied to prevent excess I_{CC} and I_{CCZ} .

The SN74AVC2T245 is designed so that the control pins (DIR1, DIR2, and $\overline{\text{OE}}$) are supplied by V_{CCA} .

This device is fully specified for partial-power-down applications using I_{off} . The I_{off} circuitry disables the outputs, preventing damaging current backflow through the device when it is powered down.

The V_{CC} isolation feature ensures that if either V_{CC} input is at GND, both ports are in the high-impedance state.

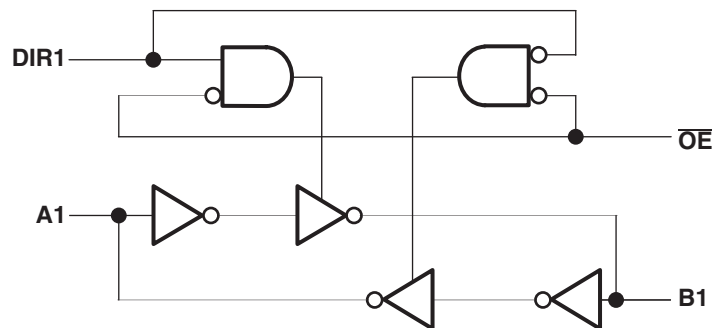
To ensure the high-impedance state during power up or power down, $\overline{\text{OE}}$ must be connected to V_{CC} through a pull-up resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver.

FUNCTION TABLE⁽¹⁾
(EACH TRANSCEIVER)

| CONTROL INPUTS | | OUTPUT CIRCUITS | | OPERATION |
|-----------------|------|-----------------|---------|------------------|
| \overline{OE} | DIR1 | A PORT | B PORT | |
| L | L | Enabled | Hi-Z | B data to A data |
| L | H | Hi-Z | Enabled | A data to B data |
| H | X | Hi-Z | Hi-Z | Isolation |

(1) Input circuits of the data I/Os are always active.

LOGIC DIAGRAM (POSITIVE LOGIC)⁽¹⁾



(1) Shown for a single channel

TYPICAL APPLICATION

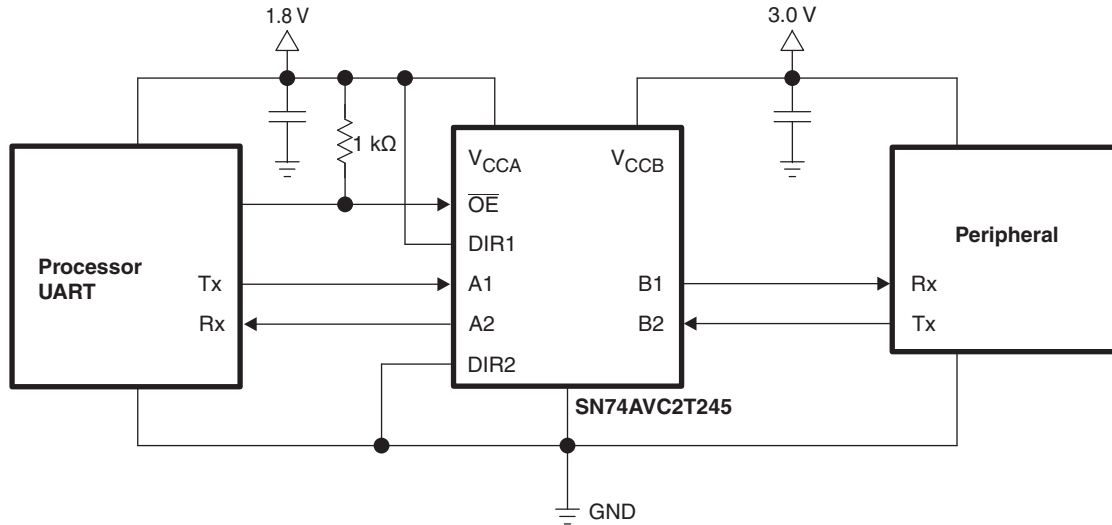


Figure 1. Typical Application of the SN74AVC2T245

ABSOLUTE MAXIMUM RATINGS⁽¹⁾

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

| | | | MIN | MAX | UNIT |
|---|---|----------------------------|------|-----------------|------|
| V_{CCA} V_{CCB} | Supply voltage range | | −0.5 | 4.6 | V |
| V_I | Input voltage range ⁽²⁾ | I/O ports (A port) | −0.5 | 4.6 | V |
| | | I/O ports (B port) | −0.5 | 4.6 | |
| | | Control inputs | −0.5 | 4.6 | |
| V_O | Voltage range applied to any output in the high-impedance or power-off state ⁽²⁾ | A port | −0.5 | 4.6 | V |
| | | B port | −0.5 | 4.6 | |
| V_O | Voltage range applied to any output in the high or low state ⁽²⁾⁽³⁾ | A port | −0.5 | $V_{CCA} + 0.5$ | V |
| | | B port | −0.5 | $V_{CCB} + 0.5$ | |
| I_{IK} | Input clamp current | $V_I < 0$ | | −50 | mA |
| I_{OK} | Output clamp current | $V_O < 0$ | | −50 | mA |
| I_O | Continuous output current | | | ±50 | mA |
| Continuous current through V_{CCA} , V_{CCB} , or GND | | | | ±100 | mA |
| θ_{JA} | Package thermal impedance | D package ⁽⁴⁾ | | 73 | °C/W |
| | | DB package ⁽⁴⁾ | | 82 | |
| | | DGV package ⁽⁴⁾ | | 120 | |
| | | PW package ⁽⁴⁾ | | 108 | |
| | | RGY package ⁽⁵⁾ | | 39 | |
| 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 voltage and output negative-voltage ratings may be exceeded if the input and output current ratings are observed.
- (3) The output positive-voltage rating may be exceeded up to 4.6 V maximum if the output current rating is observed.
- (4) The package thermal impedance is calculated in accordance with JESD 51-7.
- (5) The package thermal impedance is calculated in accordance with JESD 51-5.

RECOMMENDED OPERATING CONDITIONS⁽¹⁾⁽²⁾⁽³⁾

| | | | V _{CCI} | V _{CCO} | MIN | MAX | UNIT |
|------------------|------------------------------------|---|------------------|------------------|-------------------------|------------------|------|
| V _{CCA} | Supply voltage | | | | 1.2 | 3.6 | V |
| V _{CCB} | Supply voltage | | | | 1.2 | 3.6 | V |
| V _{IH} | High-level input voltage | Data inputs ⁽⁴⁾ | 1.2 V to 1.95 V | | V _{CCI} × 0.65 | | V |
| | | | 1.95 V to 2.7 V | | 1.6 | | |
| | | | 2.7 V to 3.6 V | | 2 | | |
| V _{IL} | Low-level input voltage | Data inputs ⁽⁴⁾ | 1.2 V to 1.95 V | | V _{CCI} × 0.35 | | V |
| | | | 1.95 V to 2.7 V | | 0.7 | | |
| | | | 2.7 V to 3.6 V | | 0.8 | | |
| V _{IH} | High-level input voltage | DIR (referenced to V _{CCA}) ⁽⁵⁾ | 1.2 V to 1.95 V | | V _{CCA} × 0.65 | | V |
| | | | 1.95 V to 2.7 V | | 1.6 | | |
| | | | 2.7 V to 3.6 V | | 2 | | |
| V _{IL} | Low-level input voltage | DIR (referenced to V _{CCA}) ⁽⁵⁾ | 1.2 V to 1.95 V | | V _{CCA} × 0.35 | | V |
| | | | 1.95 V to 2.7 V | | 0.7 | | |
| | | | 2.7 V to 3.6 V | | 0.8 | | |
| V _I | Input voltage | | | | 0 | 3.6 | V |
| V _O | Output voltage | Active state | | | 0 | V _{CCO} | V |
| | | 3-state | | | 0 | 3.6 | |
| I _{OH} | High-level output current | | | 1.1 V to 1.2 V | | –3 | mA |
| | | | | 1.4 V to 1.6 V | | –6 | |
| | | | | 1.65 V to 1.95 V | | –8 | |
| | | | | 2.3 V to 2.7 V | | –9 | |
| | | | | 3 V to 3.6 V | | –12 | |
| I _{OL} | Low-level output current | | | 1.1 V to 1.2 V | | 3 | mA |
| | | | | 1.4 V to 1.6 V | | 6 | |
| | | | | 1.65 V to 1.95 V | | 8 | |
| | | | | 2.3 V to 2.7 V | | 9 | |
| | | | | 3 V to 3.6 V | | 12 | |
| Δt/Δv | Input transition rise or fall rate | | | | | 5 | ns/V |
| T _A | Operating free-air temperature | | | | –40 | 85 | °C |

(1) V_{CCI} is the V_{CC} associated with the input port.(2) V_{CCO} is the V_{CC} associated with the output port.(3) All unused data inputs of the device must be held at V_{CCI} or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.(4) For V_{CCI} values not specified in the data sheet, V_{IH} min = V_{CCI} × 0.7 V, V_{IL} max = V_{CCI} × 0.3 V(5) For V_{CCI} values not specified in the data sheet, V_{IH} min = V_{CCA} × 0.7 V, V_{IL} max = V_{CCA} × 0.3 V

ELECTRICAL CHARACTERISTICS⁽¹⁾⁽²⁾

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

| PARAMETER | | TEST CONDITIONS | | V _{CCA} | V _{CCB} | T _A = 25°C | | | −40°C to 85°C | | UNIT |
|-------------------------------------|----------------|--|----------------------------------|------------------|------------------|-----------------------|-----|-----|------------------------|-----|------|
| | | | | | | MIN | TYP | MAX | MIN | MAX | |
| V _{OH} | | I _{OH} = −100 μA | V _I = V _{IH} | 1.2 V to 3.6 V | 1.2 V to 3.6 V | | | | V _{CCO} − 0.2 | V | |
| | | I _{OH} = −3 mA | | 1.2 V | 1.2 V | 0.95 | | | | | |
| | | I _{OH} = −6 mA | | 1.4 V | 1.4 V | 1.05 | | | | | |
| | | I _{OH} = −8 mA | | 1.65 V | 1.65 V | 1.2 | | | | | |
| | | I _{OH} = −9 mA | | 2.3 V | 2.3 V | 1.75 | | | | | |
| | | I _{OH} = −12 mA | | 3 V | 3 V | 2.3 | | | | | |
| V _{OL} | | I _{OL} = 100 μA | V _I = V _{IL} | 1.2 V to 3.6 V | 1.2 V to 3.6 V | | | | 0.2 | V | |
| | | I _{OL} = 3 mA | | 1.2 V | 1.2 V | 0.25 | | | | | |
| | | I _{OL} = 6 mA | | 1.4 V | 1.4 V | 0.35 | | | | | |
| | | I _{OL} = 8 mA | | 1.65 V | 1.65 V | 0.45 | | | | | |
| | | I _{OL} = 9 mA | | 2.3 V | 2.3 V | 0.55 | | | | | |
| | | I _{OL} = 12 mA | | 3 V | 3 V | 0.7 | | | | | |
| I _I | Control inputs | V _I = V _{CCA} or GND | 1.2 V to 3.6 V | 1.2 V to 3.6 V | ±0.025 | ±0.25 | | | ±1 | μA | |
| I _{off} | A or B port | V _I or V _O = 0 to 3.6 V | 0 V | 0 V to 3.6 V | ±0.1 | ±1 | | | ±5 | μA | |
| | | | 0 V to 3.6 V | 0 V | ±0.1 | ±1 | | | ±5 | | |
| I _{OZ} | A or B port | V _O = V _{CCO} or GND, V _I = V _{CCI} or GND, \overline{OE} = V _{IH} | 3.6 V | 3.6 V | ±0.5 | ±2.5 | | | ±5 | μA | |
| I _{CCA} | | V _I = V _{CCI} or GND, I _O = 0 | 1.2 V to 3.6 V | 1.2 V to 3.6 V | | | | 8 | μA | | |
| | | | 0 V | 0 V to 3.6 V | | | | −2 | | | |
| | | | 0 V to 3.6 V | 0 V | | | | 8 | | | |
| I _{CCB} | | V _I = V _{CCI} or GND, I _O = 0 | 1.2 V to 3.6 V | 1.2 V to 3.6 V | | | | 8 | μA | | |
| | | | 0 V | 0 V to 3.6 V | | | | 8 | | | |
| | | | 0 V to 3.6 V | 0 V | | | | −2 | | | |
| I _{CCA} + I _{CCB} | | V _I = V _{CCI} or GND, I _O = 0 | 1.2 V to 3.6 V | 1.2 V to 3.6 V | | | | 16 | μA | | |
| C _i | Control inputs | V _I = 3.3 V or GND | 3.3 V | 3.3 V | 3.5 | | | 4.5 | pF | | |
| C _{io} | A or B port | V _O = 3.3 V or GND | 3.3 V | 3.3 V | 6 | | | 7 | pF | | |

(1) V_{CCO} is the V_{CC} associated with the output port.

(2) V_{CCI} is the V_{CC} associated with the input port.

SWITCHING CHARACTERISTICS

over recommended operating free-air temperature range, $V_{CCA} = 1.2\text{ V}$ (unless otherwise noted) (see [Figure 2](#))

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | $V_{CCB} = 1.2\text{ V}$ | $V_{CCB} = 1.5\text{ V} \pm 0.1\text{ V}$ | $V_{CCB} = 1.8\text{ V} \pm 0.15\text{ V}$ | $V_{CCB} = 2.5\text{ V} \pm 0.2\text{ V}$ | $V_{CCB} = 3.3\text{ V} \pm 0.3\text{ V}$ | UNIT |
|-----------|-----------------|----------------|--------------------------|---|--|---|---|------|
| | | | TYP | TYP | TYP | TYP | TYP | |
| t_{PLH} | A | B | 2.5 | 2.1 | 1.9 | 1.9 | 1.9 | ns |
| t_{PHL} | | | 2.5 | 2.1 | 1.9 | 1.9 | 1.9 | |
| t_{PLH} | B | A | 2.5 | 2.2 | 2 | 1.8 | 1.7 | ns |
| t_{PHL} | | | 2.5 | 2.2 | 2 | 1.8 | 1.7 | |
| t_{PZH} | \overline{OE} | A | 3.8 | 3.1 | 2.7 | 2.6 | 3 | ns |
| t_{PZL} | | | 3.8 | 3.1 | 2.7 | 2.6 | 3 | |
| t_{PZH} | \overline{OE} | B | 3.7 | 3.7 | 3.7 | 3.7 | 3.7 | ns |
| t_{PZL} | | | 3.7 | 3.7 | 3.7 | 3.7 | 3.7 | |
| t_{PHZ} | \overline{OE} | A | 4.4 | 3.6 | 3.5 | 3.3 | 4.1 | ns |
| t_{PLZ} | | | 4.4 | 3.6 | 3.5 | 3.3 | 4.1 | |
| t_{PHZ} | \overline{OE} | B | 4.2 | 4.2 | 4.3 | 4.1 | 4.2 | ns |
| t_{PLZ} | | | 4.2 | 4.2 | 4.3 | 4.1 | 4.2 | |

SWITCHING CHARACTERISTICS

over recommended operating free-air temperature range, $V_{CCA} = 1.5\text{ V} \pm 0.1\text{ V}$ (see [Figure 2](#))

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | $V_{CCB} = 1.2\text{ V}$ | $V_{CCB} = 1.5\text{ V} \pm 0.1\text{ V}$ | | $V_{CCB} = 1.8\text{ V} \pm 0.15\text{ V}$ | | $V_{CCB} = 2.5\text{ V} \pm 0.2\text{ V}$ | | $V_{CCB} = 3.3\text{ V} \pm 0.3\text{ V}$ | | UNIT |
|-----------|-----------------|----------------|--------------------------|---|-----|--|-----|---|-----|---|-----|------|
| | | | TYP | MIN | MAX | MIN | MAX | MIN | MAX | MIN | MAX | |
| t_{PLH} | A | B | 2.2 | 0.3 | 4.4 | 0.2 | 3.9 | 0.1 | 3.6 | 0.1 | 3.9 | ns |
| t_{PHL} | | | 2.2 | 0.3 | 4.4 | 0.2 | 3.9 | 0.1 | 3.6 | 0.1 | 3.9 | |
| t_{PLH} | B | A | 2 | 0.6 | 5.1 | 0.4 | 4.9 | 0.2 | 4.6 | 0.1 | 4.5 | ns |
| t_{PHL} | | | 2 | 0.6 | 5.1 | 0.4 | 4.9 | 0.2 | 4.6 | 0.1 | 4.5 | |
| t_{PZH} | \overline{OE} | A | 3.4 | 1.1 | 7.1 | 0.9 | 6.2 | 0.7 | 5.5 | 0.1 | 6.4 | ns |
| t_{PZL} | | | 3.4 | 1.1 | 7.1 | 0.9 | 6.2 | 0.7 | 5.5 | 0.1 | 6.4 | |
| t_{PZH} | \overline{OE} | B | 2.5 | 1.1 | 8.2 | 1.1 | 8.2 | 1.1 | 8.2 | 1.1 | 8.2 | ns |
| t_{PZL} | | | 2.5 | 1.1 | 8.2 | 1.1 | 8.2 | 1.1 | 8.2 | 1.1 | 8.2 | |
| t_{PHZ} | \overline{OE} | A | 4.1 | 1.2 | 7.1 | 0.8 | 6.7 | 0.4 | 5.6 | 1 | 7.4 | ns |
| t_{PLZ} | | | 4.1 | 1.2 | 7.1 | 0.8 | 6.7 | 0.4 | 5.6 | 1 | 7.4 | |
| t_{PHZ} | \overline{OE} | B | 3.3 | 0.3 | 7.4 | 0.2 | 5.7 | 0.3 | 5.6 | 0.3 | 5.6 | ns |
| t_{PLZ} | | | 3.3 | 0.3 | 7.4 | 0.2 | 5.7 | 0.3 | 5.6 | 0.3 | 5.6 | |

SWITCHING CHARACTERISTICS

over recommended operating free-air temperature range, $V_{CCA} = 1.8 \text{ V} \pm 0.15 \text{ V}$ (see [Figure 2](#))

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | $V_{CCB} = 1.2 \text{ V}$ | $V_{CCB} = 1.5 \text{ V} \pm 0.1 \text{ V}$ | | $V_{CCB} = 1.8 \text{ V} \pm 0.15 \text{ V}$ | | $V_{CCB} = 2.5 \text{ V} \pm 0.2 \text{ V}$ | | $V_{CCB} = 3.3 \text{ V} \pm 0.3 \text{ V}$ | | UNIT |
|-----------|-----------------|----------------|---------------------------|---|-----|--|-----|---|-----|---|-----|------|
| | | | TYP | MIN | MAX | MIN | MAX | MIN | MAX | MIN | MAX | |
| t_{PLH} | A | B | 2 | 0.1 | 4.1 | 0.1 | 3.6 | 0.1 | 3.1 | 0.1 | 3.3 | ns |
| t_{PHL} | | | 2 | 0.1 | 4.1 | 0.1 | 3.6 | 0.1 | 3.1 | 0.1 | 3.3 | |
| t_{PLH} | B | A | 1.9 | 0.4 | 4.3 | 0.1 | 4.1 | 0.1 | 3.8 | 0.1 | 3.7 | ns |
| t_{PHL} | | | 1.9 | 0.4 | 4.3 | 0.1 | 4.1 | 0.1 | 3.8 | 0.1 | 3.7 | |
| t_{PZH} | \overline{OE} | A | 3.2 | 0.8 | 6.7 | 0.4 | 5.8 | 0.4 | 4.8 | 0.3 | 4.6 | ns |
| t_{PZL} | | | 3.2 | 0.8 | 6.7 | 0.4 | 5.8 | 0.4 | 4.8 | 0.3 | 4.6 | |
| t_{PZH} | \overline{OE} | B | 1.9 | 0.2 | 6.7 | 0.2 | 6.6 | 0.2 | 6.7 | 0.2 | 6.7 | ns |
| t_{PZL} | | | 1.9 | 0.2 | 6.7 | 0.2 | 6.6 | 0.2 | 6.7 | 0.2 | 6.7 | |
| t_{PHZ} | \overline{OE} | A | 3.8 | 0.7 | 6.2 | 0.3 | 6.5 | 0.1 | 5.2 | 0.8 | 6.5 | ns |
| t_{PLZ} | | | 3.8 | 0.7 | 6.2 | 0.3 | 6.5 | 0.1 | 5.2 | 0.8 | 6.5 | |
| t_{PHZ} | \overline{OE} | B | 3.4 | 0.1 | 6.8 | 0.1 | 6.8 | 0.1 | 6.7 | 0.1 | 6.7 | ns |
| t_{PLZ} | | | 3.4 | 0.1 | 6.8 | 0.1 | 6.8 | 0.1 | 6.7 | 0.1 | 6.7 | |

SWITCHING CHARACTERISTICS

over recommended operating free-air temperature range, $V_{CCA} = 2.5 \text{ V} \pm 0.2 \text{ V}$ (see [Figure 2](#))

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | $V_{CCB} = 1.2 \text{ V}$ | $V_{CCB} = 1.5 \text{ V} \pm 0.1 \text{ V}$ | | $V_{CCB} = 1.8 \text{ V} \pm 0.15 \text{ V}$ | | $V_{CCB} = 2.5 \text{ V} \pm 0.2 \text{ V}$ | | $V_{CCB} = 3.3 \text{ V} \pm 0.3 \text{ V}$ | | UNIT |
|-----------|-----------------|----------------|---------------------------|---|-----|--|-----|---|-----|---|-----|------|
| | | | TYP | MIN | MAX | MIN | MAX | MIN | MAX | MIN | MAX | |
| t_{PLH} | A | B | 1.9 | 0.1 | 3.8 | 0.1 | 3.2 | 0.1 | 2.7 | 0.1 | 2.6 | ns |
| t_{PHL} | | | 1.9 | 0.1 | 3.8 | 0.1 | 3.2 | 0.1 | 2.7 | 0.1 | 2.6 | |
| t_{PLH} | B | A | 1.8 | 0.5 | 3.4 | 0.2 | 3.1 | 0.1 | 2.8 | 0.1 | 2.6 | ns |
| t_{PHL} | | | 1.8 | 0.5 | 3.4 | 0.2 | 3.1 | 0.1 | 2.8 | 0.1 | 2.6 | |
| t_{PZH} | \overline{OE} | A | 3.1 | 0.7 | 6.2 | 0.5 | 5.2 | 0.3 | 4.1 | 0.3 | 3.6 | ns |
| t_{PZL} | | | 3.1 | 0.7 | 6.2 | 0.5 | 5.2 | 0.3 | 4.1 | 0.3 | 3.6 | |
| t_{PZH} | \overline{OE} | B | 1.4 | 0.4 | 4.5 | 0.4 | 4.5 | 0.4 | 4.5 | 0.4 | 4.5 | ns |
| t_{PZL} | | | 1.4 | 0.4 | 4.5 | 0.4 | 4.5 | 0.4 | 4.5 | 0.4 | 4.5 | |
| t_{PHZ} | \overline{OE} | A | 3.6 | 0.2 | 5.2 | 0.1 | 5.4 | 0.1 | 4.5 | 0.7 | 6 | ns |
| t_{PLZ} | | | 3.6 | 0.2 | 5.2 | 0.1 | 5.4 | 0.1 | 4.5 | 0.7 | 6 | |
| t_{PHZ} | \overline{OE} | B | 2.1 | 0.1 | 4.7 | 0.1 | 4.6 | 0.1 | 4.7 | 0.1 | 4.7 | ns |
| t_{PLZ} | | | 2.1 | 0.1 | 4.7 | 0.1 | 4.6 | 0.1 | 4.7 | 0.1 | 4.7 | |

SWITCHING CHARACTERISTICS

over recommended operating free-air temperature range, $V_{CCA} = 3.3 \text{ V} \pm 0.3 \text{ V}$ (see [Figure 2](#))

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | $V_{CCB} = 1.2 \text{ V}$ | $V_{CCB} = 1.5 \text{ V} \pm 0.1 \text{ V}$ | | $V_{CCB} = 1.8 \text{ V} \pm 0.15 \text{ V}$ | | $V_{CCB} = 2.5 \text{ V} \pm 0.2 \text{ V}$ | | $V_{CCB} = 3.3 \text{ V} \pm 0.3 \text{ V}$ | | UNIT |
|-----------|-----------------|----------------|---------------------------|---|-----|--|-----|---|-----|---|-----|------|
| | | | TYP | MIN | MAX | MIN | MAX | MIN | MAX | MIN | MAX | |
| t_{PLH} | A | B | 1.8 | 0.1 | 3.6 | 0.1 | 3 | 0.1 | 2.6 | 0.1 | 2.4 | ns |
| t_{PHL} | | | 1.8 | 0.1 | 3.6 | 0.1 | 3 | 0.1 | 2.6 | 0.1 | 2.4 | |
| t_{PLH} | B | A | 1.9 | 0.5 | 3.4 | 0.2 | 2.9 | 0.1 | 2.5 | 0.1 | 2.3 | ns |
| t_{PHL} | | | 1.9 | 0.5 | 3.4 | 0.2 | 2.9 | 0.1 | 2.5 | 0.1 | 2.3 | |
| t_{PZH} | \overline{OE} | A | 3.1 | 0.9 | 5.9 | 0.5 | 5 | 0.3 | 3.8 | 0.3 | 3.3 | ns |
| t_{PZL} | | | 3.1 | 0.9 | 5.9 | 0.5 | 5 | 0.3 | 3.8 | 0.3 | 3.3 | |
| t_{PZH} | \overline{OE} | B | 1.2 | 0.4 | 3.6 | 0.4 | 3.6 | 0.4 | 3.6 | 0.4 | 3.6 | ns |
| t_{PZL} | | | 1.2 | 0.4 | 3.6 | 0.4 | 3.6 | 0.4 | 3.6 | 0.4 | 3.6 | |
| t_{PHZ} | \overline{OE} | A | 3.4 | 0.1 | 4.6 | 0.1 | 4.7 | 0.3 | 4.8 | 0.7 | 4.5 | ns |
| t_{PLZ} | | | 3.4 | 0.1 | 4.6 | 0.1 | 4.7 | 0.3 | 4.8 | 0.7 | 4.5 | |
| t_{PHZ} | \overline{OE} | B | 2.9 | 0.1 | 5.4 | 0.1 | 5.3 | 0.1 | 5.3 | 0.1 | 5.3 | ns |
| t_{PLZ} | | | 2.9 | 0.1 | 5.4 | 0.1 | 5.3 | 0.1 | 5.3 | 0.1 | 5.3 | |

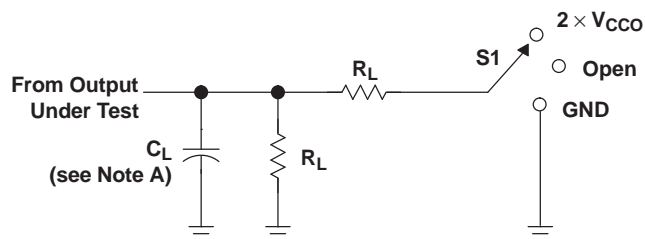
OPERATING CHARACTERISTICS

$T_A = 25^\circ\text{C}$

| PARAMETER | | | TEST CONDITIONS | $V_{CCA} =$ $V_{CCB} = 1.2 \text{ V}$ | $V_{CCA} =$ $V_{CCB} = 1.5 \text{ V}$ | $V_{CCA} =$ $V_{CCB} = 1.8 \text{ V}$ | $V_{CCA} =$ $V_{CCB} = 2.5 \text{ V}$ | $V_{CCA} =$ $V_{CCB} = 3.3 \text{ V}$ | UNIT |
|-----------------|--------|------------------|---|--|--|--|--|--|------|
| | | | | TYP | TYP | TYP | TYP | TYP | |
| $C_{pdA}^{(1)}$ | A to B | Outputs enabled | $C_L = 0,$ $f = 10 \text{ MHz},$ $t_r = t_f = 1 \text{ ns}$ | 3 | 3 | 3 | 3 | 4 | pF |
| | | Outputs disabled | | 1 | 1 | 1 | 2 | 2 | |
| | B to A | Outputs enabled | | 12 | 13 | 13 | 15 | 15 | |
| | | Outputs disabled | | 1 | 2 | 2 | 2 | 2 | |
| $C_{pdB}^{(1)}$ | A to B | Outputs enabled | $C_L = 0,$ $f = 10 \text{ MHz},$ $t_r = t_f = 1 \text{ ns}$ | 12 | 13 | 13 | 14 | 16 | pF |
| | | Outputs disabled | | 1 | 2 | 2 | 2 | 2 | |
| | B to A | Outputs enabled | | 3 | 3 | 3 | 4 | 4 | |
| | | Outputs disabled | | 1 | 1 | 1 | 2 | 2 | |

(1) Power dissipation capacitance per transceiver

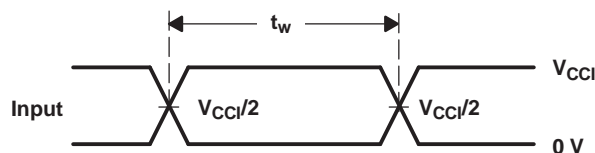
PARAMETER MEASUREMENT INFORMATION



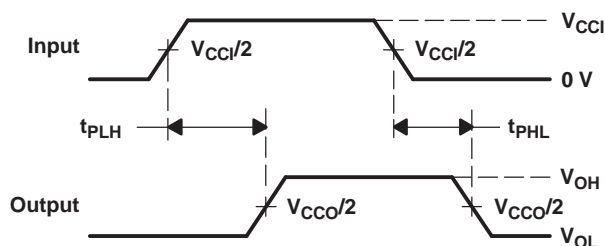
LOAD CIRCUIT

| V_{CCO} | C_L | R_L | V_{TP} |
|--------------------|-------|--------------|----------|
| 1.2 V | 15 pF | 2 k Ω | 0.1 V |
| 1.5 V \pm 0.1 V | 15 pF | 2 k Ω | 0.1 V |
| 1.8 V \pm 0.15 V | 15 pF | 2 k Ω | 0.15 V |
| 2.5 V \pm 0.2 V | 15 pF | 2 k Ω | 0.15 V |
| 3.3 V \pm 0.3 V | 15 pF | 2 k Ω | 0.3 V |

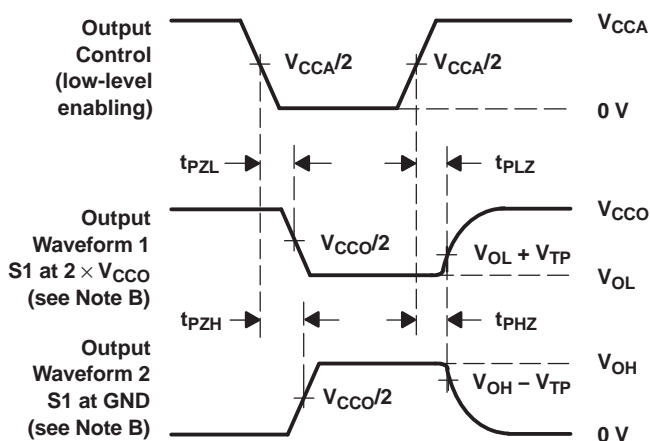
| TEST | S1 |
|-------------------|--------------------|
| t_{pd} | Open |
| t_{PLZ}/t_{PZL} | $2 \times V_{CCO}$ |
| t_{PHZ}/t_{PZH} | GND |



VOLTAGE WAVEFORMS
PULSE DURATION



VOLTAGE WAVEFORMS
PROPAGATION DELAY TIMES



VOLTAGE WAVEFORMS
ENABLE AND DISABLE TIMES

- 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 \leq 10 MHz, $Z_O = 50 \Omega$, $dv/dt \geq 1$ V/ns.
 - D. The outputs are measured one at a time, with one transition per measurement.
 - E. t_{PLZ} and t_{PHZ} are the same as t_{dis} .
 - F. t_{PZL} and t_{PZH} are the same as t_{en} .
 - G. t_{PLH} and t_{PHL} are the same as t_{pd} .
 - H. V_{CCI} is the V_{CC} associated with the input port.
 - I. V_{CCO} is the V_{CC} associated with the output port.

Figure 2. Load and Circuit and Voltage Waveforms

PACKAGING INFORMATION

| Orderable Device | Status ⁽¹⁾ | Package Type | Package Drawing | Pins | Package Qty | Eco Plan ⁽²⁾ | Lead/Ball Finish | MSL Peak Temp ⁽³⁾ |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| SN74AVC2T245RSWR | ACTIVE | UQFN | RSW | 10 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-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 - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

TBD: The Pb-Free/Green conversion plan has not been defined.

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.

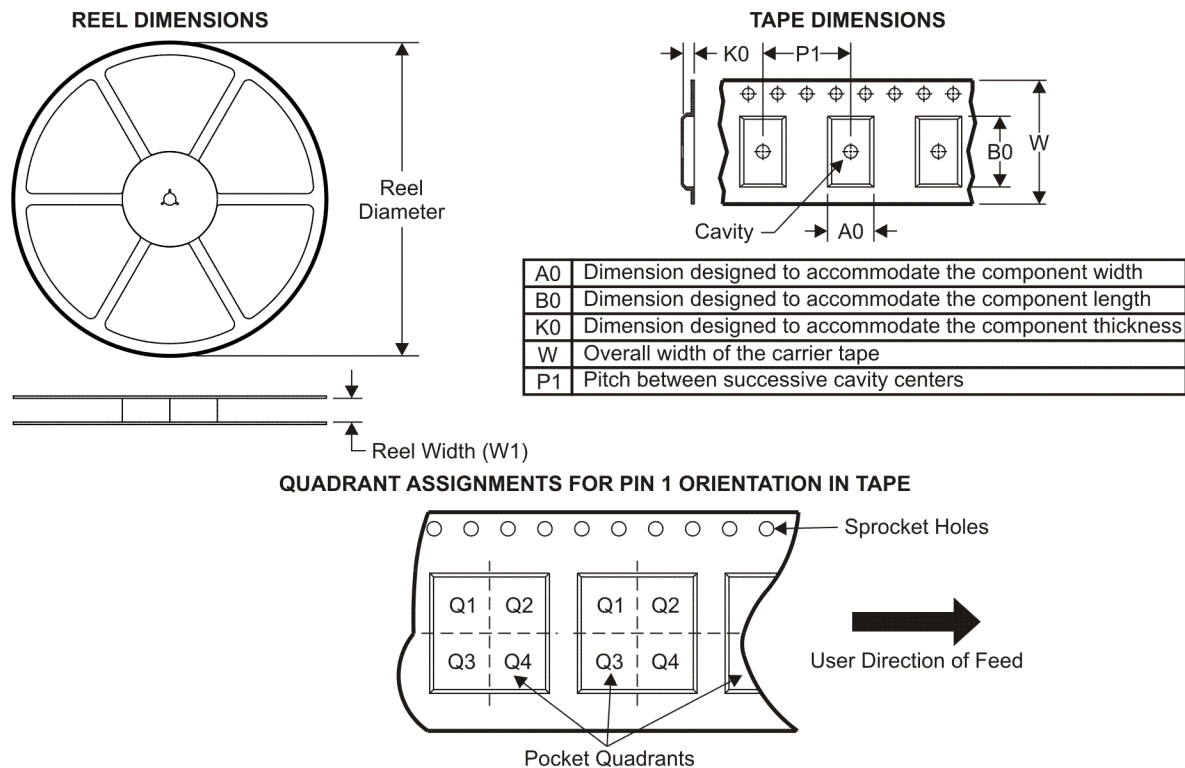
Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

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

Important Information and Disclaimer: The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

TAPE AND REEL INFORMATION


*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 |
|------------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN74AVC2T245RSWR | UQFN | RSW | 10 | 3000 | 179.0 | 8.4 | 1.7 | 2.1 | 0.7 | 4.0 | 8.0 | Q1 |

TAPE AND REEL BOX DIMENSIONS

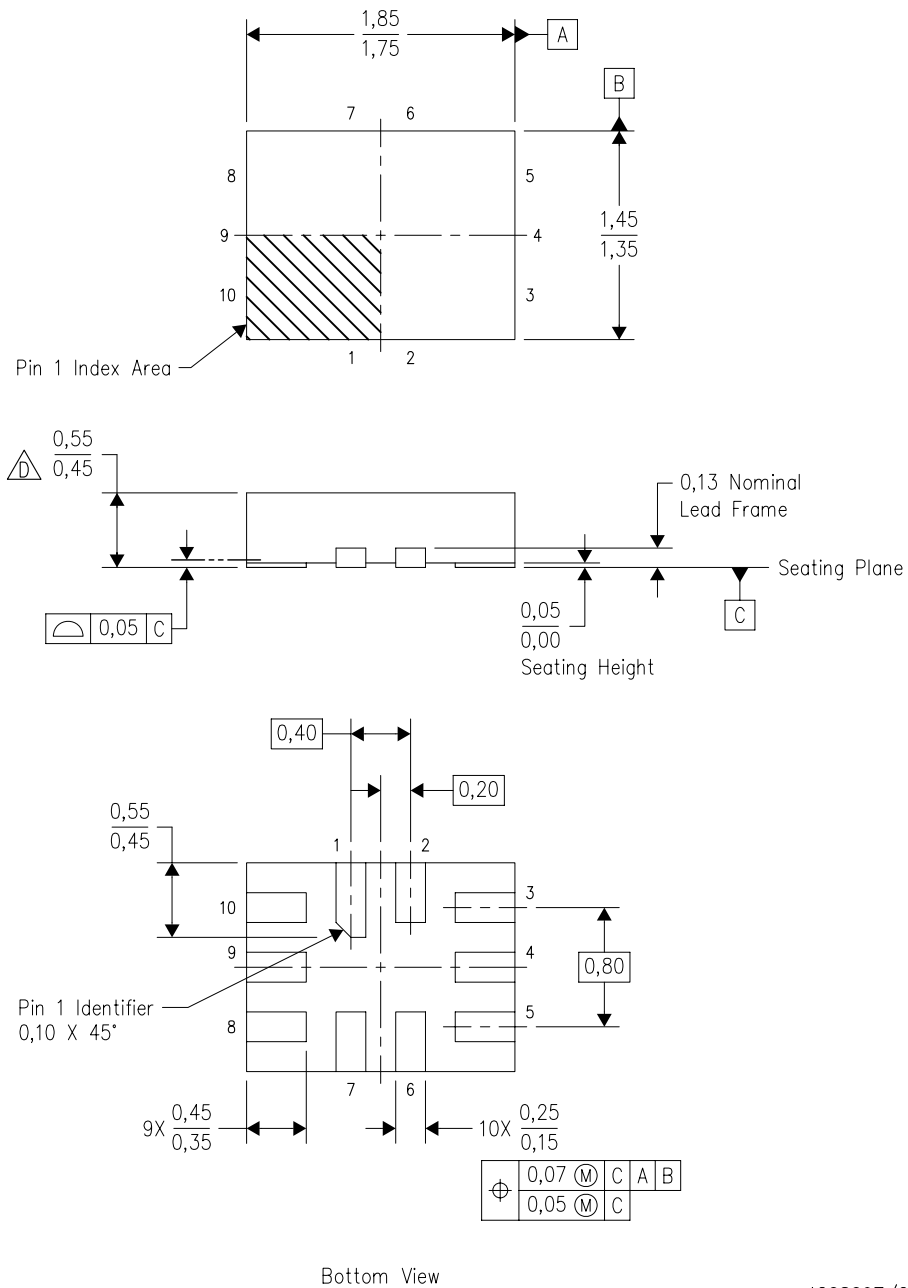


*All dimensions are nominal

| Device | Package Type | Package Drawing | Pins | SPQ | Length (mm) | Width (mm) | Height (mm) |
|------------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN74AVC2T245RSWR | UQFN | RSW | 10 | 3000 | 220.0 | 205.0 | 50.0 |

RSW (R-PUQFN-N10)

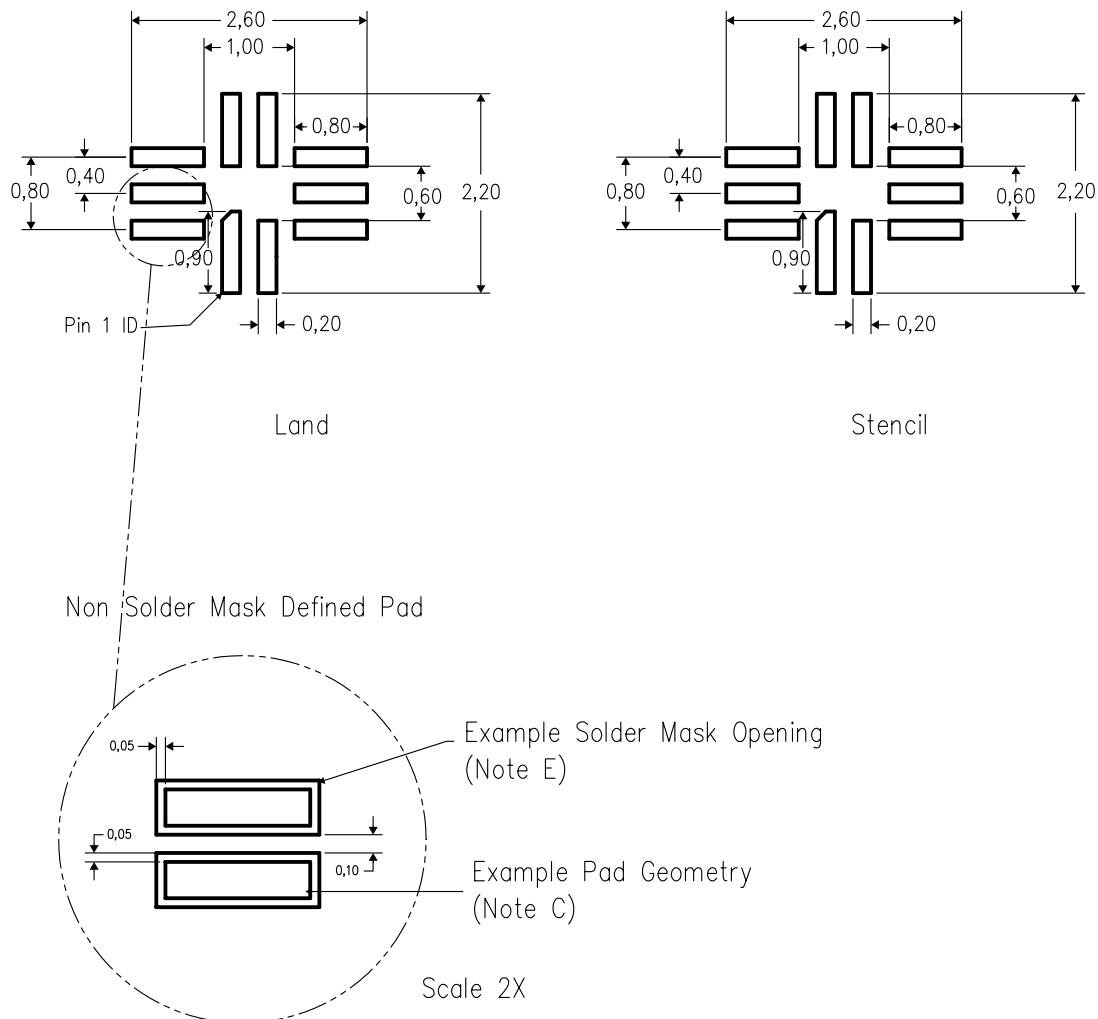
PLASTIC QUAD FLATPACK NO-LEAD



4208097/C 07/2008

- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
 - B. This drawing is subject to change without notice.
 - C. QFN (Quad Flatpack No-lead) package configuration.
 - This package complies to JEDEC MO-288 variation UDEE, except minimum package height.

RSW (R-PQFP-N10)



4208245/A 10/06

- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Publication IPC-7351 is recommended for alternate designs.
 - D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC 7525 for stencil design considerations.
 - E. Customers should contact their board fabrication site for minimum solder mask web tolerances between signal pads.

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

TI products are not authorized for use in safety-critical applications (such as life support) where a failure of the TI product would reasonably be expected to cause severe personal injury or death, unless officers of the parties have executed an agreement specifically governing such use. Buyers represent that they have all necessary expertise in the safety and regulatory ramifications of their applications, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of TI products in such safety-critical applications, notwithstanding any applications-related information or support that may be provided by TI. Further, Buyers must fully indemnify TI and its representatives against any damages arising out of the use of TI products in such safety-critical applications.

TI products are neither designed nor intended for use in military/aerospace applications or environments unless the TI products are specifically designated by TI as military-grade or "enhanced plastic." Only products designated by TI as military-grade meet military specifications. Buyers acknowledge and agree that any such use of TI products which TI has not designated as military-grade is solely at the Buyer's risk, and that they are solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI products are neither designed nor intended for use in automotive applications or environments unless the specific TI products are designated by TI as compliant with ISO/TS 16949 requirements. Buyers acknowledge and agree that, if they use any non-designated products in automotive applications, TI will not be responsible for any failure to meet such requirements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

Products

| | |
|-----------------------------|--|
| Amplifiers | amplifier.ti.com |
| Data Converters | dataconverter.ti.com |
| DLP® Products | www.dlp.com |
| DSP | dsp.ti.com |
| Clocks and Timers | www.ti.com/clocks |
| Interface | interface.ti.com |
| Logic | logic.ti.com |
| Power Mgmt | power.ti.com |
| Microcontrollers | microcontroller.ti.com |
| RFID | www.ti-rfid.com |
| RF/IF and ZigBee® Solutions | www.ti.com/lprf |

Applications

| | |
|--------------------|--|
| Audio | www.ti.com/audio |
| Automotive | www.ti.com/automotive |
| Broadband | www.ti.com/broadband |
| Digital Control | www.ti.com/digitalcontrol |
| Medical | www.ti.com/medical |
| Military | www.ti.com/military |
| Optical Networking | www.ti.com/opticalnetwork |
| Security | www.ti.com/security |
| Telephony | www.ti.com/telephony |
| Video & Imaging | www.ti.com/video |
| Wireless | www.ti.com/wireless |

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2009, Texas Instruments Incorporated