

# SN74AVC20T245

## 20-BIT DUAL-SUPPLY BUS TRANSCEIVER

### WITH CONFIGURABLE VOLTAGE TRANSLATION AND 3-STATE OUTPUTS

SCES566F – MAY 2004 – REVISED APRIL 2005

- Control Inputs  $V_{IH}/V_{IL}$  Levels are Referenced to  $V_{CCA}$  Voltage
- $V_{CC}$  Isolation Feature – If Either  $V_{CC}$  Input Is at GND, Both Ports Are in the High-Impedance State
- Overvoltage-Tolerant Inputs/Outputs Allow Mixed-Voltage-Mode Data Communications
- Fully Configurable Dual-Rail Design Allows Each Port to Operate Over the Full 1.2-V to 3.6-V Power-Supply Range
- $I_{off}$  Supports Partial-Power-Down Mode Operation
- I/Os Are 4.6-V Tolerant
- Max Data Rates
  - 380 Mbps (1.8-V to 3.3-V Translation)
  - 260 Mbps (< 1.8-V to 3.3-V Translation)
  - 260 Mbps (Translate to 2.5 V)
  - 210 Mbps (Translate to 1.8 V)
  - 120 Mbps (Translate to 1.5 V)
  - 100 Mbps (Translate to 1.2 V)
- Latch-Up Performance Exceeds 100 mA Per JESD 78, Class II
- ESD Protection Exceeds JESD 22
  - 8000-V Human-Body Model (A114-A)
  - 200-V Machine Model (A115-A)
  - 1000-V Charged-Device Model (C101)

#### description/ordering information

This 20-bit noninverting bus transceiver uses two separate configurable power-supply rails.

The SN74AVC20T245 is optimized to operate with  $V_{CCA}/V_{CCB}$  set at 1.4 V to 3.6 V. It is operational with  $V_{CCA}/V_{CCB}$  as low as 1.2 V. 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.

DGG OR DGV PACKAGE  
(TOP VIEW)

|           |    |    |           |
|-----------|----|----|-----------|
| 1DIR      | 1  | 56 | 1OE       |
| 1B1       | 2  | 55 | 1A1       |
| 1B2       | 3  | 54 | 1A2       |
| GND       | 4  | 53 | GND       |
| 1B3       | 5  | 52 | 1A3       |
| 1B4       | 6  | 51 | 1A4       |
| $V_{CCB}$ | 7  | 50 | $V_{CCA}$ |
| 1B5       | 8  | 49 | 1A5       |
| 1B6       | 9  | 48 | 1A6       |
| 1B7       | 10 | 47 | 1A7       |
| GND       | 11 | 46 | GND       |
| 1B8       | 12 | 45 | 1A8       |
| 1B9       | 13 | 44 | 1A9       |
| 1B10      | 14 | 43 | 1A10      |
| 2B1       | 15 | 42 | 2A1       |
| 2B2       | 16 | 41 | 2A2       |
| 2B3       | 17 | 40 | 2A3       |
| GND       | 18 | 39 | GND       |
| 2B4       | 19 | 38 | 2A4       |
| 2B5       | 20 | 37 | 2A5       |
| 2B6       | 21 | 36 | 2A6       |
| $V_{CCB}$ | 22 | 35 | $V_{CCA}$ |
| 2B7       | 23 | 34 | 2A7       |
| 2B8       | 24 | 33 | 2A8       |
| GND       | 25 | 32 | GND       |
| 2B9       | 26 | 31 | 2A9       |
| 2B10      | 27 | 30 | 2A10      |
| 2DIR      | 28 | 29 | 2OE       |

#### ORDERING INFORMATION

| $T_A$         | PACKAGE <sup>†</sup>  |               | ORDERABLE PART NUMBER | TOP-SIDE MARKING |
|---------------|-----------------------|---------------|-----------------------|------------------|
| –40°C to 85°C | TSSOP – DGG           | Tape and reel | SN74AVC20T245DGGR     | AVC20T245        |
|               | TVSOP – DGV           | Tape and reel | SN74AVC20T245DGVR     | WG245            |
|               | VFBGA – GQL           | Tape and reel | SN74AVC20T245GQLR     | WG245            |
|               | VFBGA – ZQL (Pb-free) |               | SN74AVC20T245ZQLR     |                  |

<sup>†</sup> Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at [www.ti.com/sc/package](http://www.ti.com/sc/package).



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# SN74AVC20T245

## 20-BIT DUAL-SUPPLY BUS TRANSCEIVER

### WITH CONFIGURABLE VOLTAGE TRANSLATION AND 3-STATE OUTPUTS

SCES566F – MAY 2004 – REVISED APRIL 2005

#### description/ordering information (continued)

The SN74AVC20T245 is designed for asynchronous communication between data buses. The device transmits data from the A bus to the B bus or from the B bus to the A bus, depending on the logic level at the direction-control (DIR) input. The output-enable ( $\overline{OE}$ ) input is used to disable the outputs so that the buses are isolated.

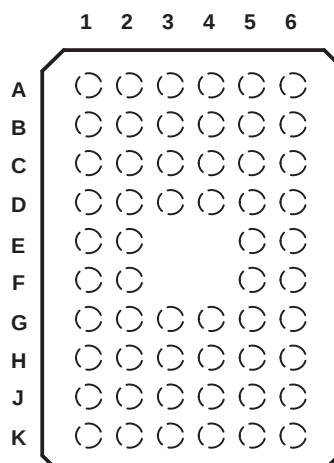
The SN74AVC20T245 is designed so that the control (1DIR, 2DIR,  $1\overline{OE}$ , and  $2\overline{OE}$ ) inputs are supplied by  $V_{CCA}$ .

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,  $\overline{OE}$  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.

#### GQL OR ZQL PACKAGE (TOP VIEW)



#### terminal assignments

|   | 1   | 2    | 3         | 4                | 5    | 6   |
|---|-----|------|-----------|------------------|------|-----|
| A | 1B1 | 1B2  | 1DIR      | $1\overline{OE}$ | 1A2  | 1A1 |
| B | 1B3 | 1B4  | GND       | GND              | 1A4  | 1A3 |
| C | 1B5 | 1B6  | $V_{CCB}$ | $V_{CCA}$        | 1A6  | 1A5 |
| D | 1B7 | 1B8  | GND       | GND              | 1A8  | 1A7 |
| E | 1B9 | 1B10 |           |                  | 1A10 | 1A9 |
| F | 2B1 | 2B2  |           |                  | 2A2  | 2A1 |
| G | 2B3 | 2B4  | GND       | GND              | 2A4  | 2A3 |
| H | 2B5 | 2B6  | $V_{CCB}$ | $V_{CCA}$        | 2A6  | 2A5 |
| J | 2B7 | 2B8  | GND       | GND              | 2A8  | 2A7 |
| K | 2B9 | 2B10 | 2DIR      | $2\overline{OE}$ | 2A10 | 2A9 |

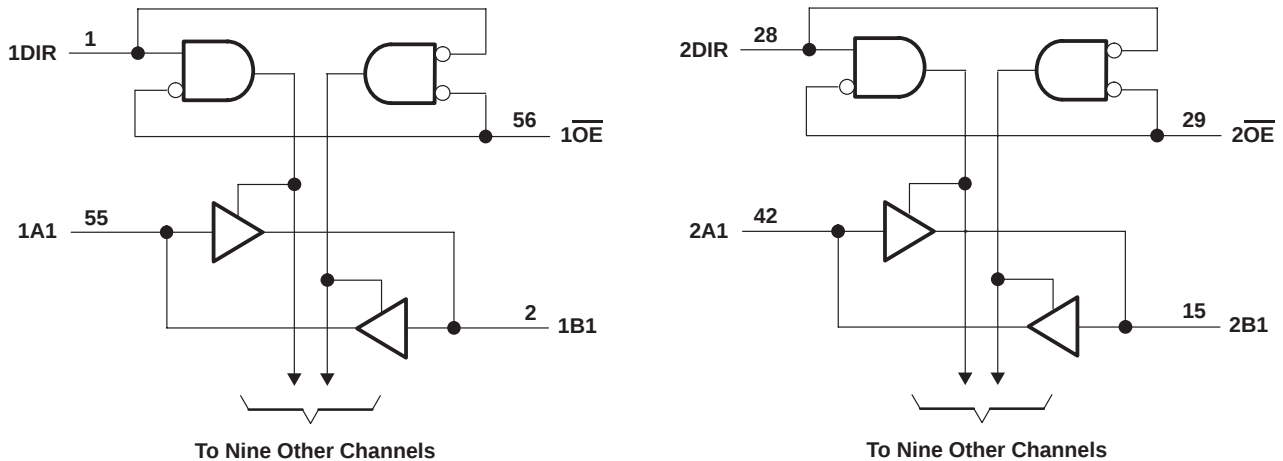
#### FUNCTION TABLE (each 10-bit section)

| INPUTS          |     | OPERATION       |
|-----------------|-----|-----------------|
| $\overline{OE}$ | DIR |                 |
| L               | L   | B data to A bus |
| L               | H   | A data to B bus |
| H               | X   | Isolation       |

**SN74AVC20T245**  
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SCES566F – MAY 2004 – REVISED APRIL 2005

**logic diagram (positive logic)**



Pin numbers shown are for the DGG and DGV packages.

**absolute maximum ratings over operating free-air temperature range (unless otherwise noted)<sup>†</sup>**

|                                                                                     |                             |
|-------------------------------------------------------------------------------------|-----------------------------|
| Supply voltage range, $V_{CCA}$ and $V_{CCB}$                                       | –0.5 V to 4.6 V             |
| Input voltage range, $V_I$ (see Note 1): I/O ports (A port)                         | –0.5 V to 4.6 V             |
| I/O ports (B port)                                                                  | –0.5 V to 4.6 V             |
| Control inputs                                                                      | –0.5 V to 4.6 V             |
| Voltage range applied to any output in the high-impedance or power-off state, $V_O$ |                             |
| (see Note 1): (A port)                                                              | –0.5 V to 4.6 V             |
| (B port)                                                                            | –0.5 V to 4.6 V             |
| Voltage range applied to any output in the high or low state, $V_O$                 |                             |
| (see Notes 1 and 2): (A port)                                                       | –0.5 V to $V_{CCA} + 0.5$ V |
| (B port)                                                                            | –0.5 V to $V_{CCB} + 0.5$ V |
| Input clamp current, $I_{IK}$ ( $V_I < 0$ )                                         | –50 mA                      |
| Output clamp current, $I_{OK}$ ( $V_O < 0$ )                                        | –50 mA                      |
| Continuous output current, $I_O$                                                    | ±50 mA                      |
| Continuous current through each $V_{CCA}$ , $V_{CCB}$ , and GND                     | ±100 mA                     |
| Package thermal impedance, $\theta_{JA}$ (see Note 3): DGG package                  | 64°C/W                      |
| DGV package                                                                         | 48°C/W                      |
| GQL/ZQL package                                                                     | 42°C/W                      |
| Storage temperature range, $T_{Stg}$                                                | –65°C to 150°C              |

<sup>†</sup> 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. The input voltage and output negative-voltage ratings may be exceeded if the input and output current ratings are observed.  
2. The output positive-voltage rating may be exceeded up to 4.6 V maximum if the output current rating is observed.  
3. The package thermal impedance is calculated in accordance with JESD 51-7.

## recommended operating conditions (see Notes 4 through 8)

|                  |                                    |                                                          | V <sub>CCI</sub> | V <sub>CCO</sub> | MIN                     | MAX              | UNIT |
|------------------|------------------------------------|----------------------------------------------------------|------------------|------------------|-------------------------|------------------|------|
| V <sub>CCA</sub> | Supply voltage                     |                                                          |                  |                  | 1.2                     | 3.6              | V    |
| V <sub>CCB</sub> | Supply voltage                     |                                                          |                  |                  | 1.2                     | 3.6              | V    |
| V <sub>IH</sub>  | High-level input voltage           | Data inputs<br>(see Note 7)                              | 1.2 V to 1.95 V  |                  | V <sub>CCI</sub> × 0.65 |                  | V    |
|                  |                                    |                                                          | 1.95 V to 2.7 V  |                  | 1.6                     |                  |      |
|                  |                                    |                                                          | 2.7 V to 3.6 V   |                  | 2                       |                  |      |
| V <sub>IL</sub>  | Low-level input voltage            | Data inputs<br>(see Note 7)                              | 1.2 V to 1.95 V  |                  | V <sub>CCI</sub> × 0.35 |                  | V    |
|                  |                                    |                                                          | 1.95 V to 2.7 V  |                  | 0.7                     |                  |      |
|                  |                                    |                                                          | 2.7 V to 3.6 V   |                  | 0.8                     |                  |      |
| V <sub>IH</sub>  | High-level input voltage           | DIR<br>(referenced to V <sub>CCA</sub> )<br>(see Note 8) | 1.2 V to 1.95 V  |                  | V <sub>CCA</sub> × 0.65 |                  | V    |
|                  |                                    |                                                          | 1.95 V to 2.7 V  |                  | 1.6                     |                  |      |
|                  |                                    |                                                          | 2.7 V to 3.6 V   |                  | 2                       |                  |      |
| V <sub>IL</sub>  | Low-level input voltage            | DIR<br>(referenced to V <sub>CCA</sub> )<br>(see Note 8) | 1.2 V to 1.95 V  |                  | V <sub>CCA</sub> × 0.35 |                  | V    |
|                  |                                    |                                                          | 1.95 V to 2.7 V  |                  | 0.7                     |                  |      |
|                  |                                    |                                                          | 2.7 V to 3.6 V   |                  | 0.8                     |                  |      |
| V <sub>I</sub>   | Input voltage                      |                                                          |                  |                  | 0                       | 3.6              | V    |
| V <sub>O</sub>   | Output voltage                     | Active state                                             |                  |                  | 0                       | V <sub>CCO</sub> | V    |
|                  |                                    | 3-state                                                  |                  |                  | 0                       | 3.6              |      |
| I <sub>OH</sub>  | High-level output current          |                                                          |                  | 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 <sub>OL</sub>  | Low-level output current           |                                                          |                  | 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 <sub>A</sub>   | Operating free-air temperature     |                                                          |                  |                  | −40                     | 85               | °C   |

NOTES: 4. V<sub>CCI</sub> is the V<sub>CC</sub> associated with the data input port.5. V<sub>CCO</sub> is the V<sub>CC</sub> associated with the output port.6. All unused data inputs of the device must be held at V<sub>CCI</sub> or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.7. For V<sub>CCI</sub> values not specified in the data sheet, V<sub>IH(min)</sub> = V<sub>CCI</sub> × 0.7 V, V<sub>IL(max)</sub> = V<sub>CCI</sub> × 0.3 V.8. For V<sub>CCI</sub> values not specified in the data sheet, V<sub>IH(min)</sub> = V<sub>CCA</sub> × 0.7 V, V<sub>IL(max)</sub> = V<sub>CCA</sub> × 0.3 V.

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SCES566F – MAY 2004 – REVISED APRIL 2005

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted) (see Notes 9 and 10)

| PARAMETER                           |                | TEST CONDITIONS                                                                       | V <sub>CCA</sub> | V <sub>CCB</sub> | T <sub>A</sub> = 25°C |        |       | –40°C to 85°C            |     | UNIT |
|-------------------------------------|----------------|---------------------------------------------------------------------------------------|------------------|------------------|-----------------------|--------|-------|--------------------------|-----|------|
|                                     |                |                                                                                       |                  |                  | MIN                   | TYP    | MAX   | MIN                      | MAX |      |
| V <sub>OH</sub>                     |                | I <sub>OH</sub> = –100 µA                                                             | 1.2 V to 3.6 V   | 1.2 V to 3.6 V   |                       |        |       | V <sub>CCO</sub> – 0.2 V |     | V    |
|                                     |                | I <sub>OH</sub> = –3 mA                                                               | 1.2 V            | 1.2 V            |                       | 0.95   |       |                          |     |      |
|                                     |                | I <sub>OH</sub> = –6 mA                                                               | 1.4 V            | 1.4 V            |                       |        |       | 1.05                     |     |      |
|                                     |                | I <sub>OH</sub> = –8 mA                                                               | 1.65 V           | 1.65 V           |                       |        |       | 1.2                      |     |      |
|                                     |                | I <sub>OH</sub> = –9 mA                                                               | 2.3 V            | 2.3 V            |                       |        |       | 1.75                     |     |      |
|                                     |                | I <sub>OH</sub> = –12 mA                                                              | 3 V              | 3 V              |                       |        |       | 2.3                      |     |      |
| V <sub>OL</sub>                     |                | I <sub>OL</sub> = 100 µA                                                              | 1.2 V to 3.6 V   | 1.2 V to 3.6 V   |                       |        |       | 0.2                      |     | V    |
|                                     |                | I <sub>OL</sub> = 3 mA                                                                | 1.2 V            | 1.2 V            |                       | 0.15   |       |                          |     |      |
|                                     |                | I <sub>OL</sub> = 6 mA                                                                | 1.4 V            | 1.4 V            |                       |        |       | 0.35                     |     |      |
|                                     |                | I <sub>OL</sub> = 8 mA                                                                | 1.65 V           | 1.65 V           |                       |        |       | 0.45                     |     |      |
|                                     |                | I <sub>OL</sub> = 9 mA                                                                | 2.3 V            | 2.3 V            |                       |        |       | 0.55                     |     |      |
|                                     |                | I <sub>OL</sub> = 12 mA                                                               | 3 V              | 3 V              |                       |        |       | 0.7                      |     |      |
| I <sub>I</sub>                      | Control inputs | V <sub>I</sub> = V <sub>CCA</sub> or GND                                              | 1.2 V to 3.6 V   | 1.2 V to 3.6 V   |                       | ±0.025 | ±0.25 |                          | ±1  | µA   |
| I <sub>off</sub>                    | A or B port    | V <sub>I</sub> or V <sub>O</sub> = 0 to 3.6 V                                         | 0 V              | 0 to 3.6 V       |                       | ±0.1   | ±1    |                          | ±5  | µA   |
|                                     | A or B port    |                                                                                       | 0 to 3.6 V       | 0 V              |                       | ±0.1   | ±1    |                          | ±5  |      |
| I <sub>OZ</sub> <sup>†</sup>        | A or B ports   | V <sub>O</sub> = V <sub>CCO</sub> or GND,<br>V <sub>I</sub> = V <sub>CCI</sub> or GND | 3.6 V            | 3.6 V            |                       | ±0.5   | ±2.5  |                          | ±5  | µA   |
| I <sub>CCA</sub>                    |                | V <sub>I</sub> = V <sub>CCI</sub> or GND, I <sub>O</sub> = 0                          | 1.2 V to 3.6 V   | 1.2 V to 3.6 V   |                       |        |       |                          | 35  | µA   |
|                                     |                |                                                                                       | 0 V              | 3.6 V            |                       |        |       |                          | –5  |      |
|                                     |                |                                                                                       | 3.6 V            | 0 V              |                       |        |       |                          | 35  |      |
| I <sub>CCB</sub>                    |                | V <sub>I</sub> = V <sub>CCI</sub> or GND, I <sub>O</sub> = 0                          | 1.2 V to 3.6 V   | 1.2 V to 3.6 V   |                       |        |       |                          | 35  | µA   |
|                                     |                |                                                                                       | 0 V              | 3.6 V            |                       |        |       |                          | 35  |      |
|                                     |                |                                                                                       | 3.6 V            | 0 V              |                       |        |       |                          | –5  |      |
| I <sub>CCA</sub> + I <sub>CCB</sub> |                | V <sub>I</sub> = V <sub>CCI</sub> or GND, I <sub>O</sub> = 0                          | 1.2 V to 3.6 V   | 1.2 V to 3.6 V   |                       |        |       |                          | 65  | µA   |
| C <sub>i</sub>                      | Control inputs | V <sub>I</sub> = 3.3 V or GND                                                         | 3.3 V            | 3.3 V            |                       | 3.5    |       |                          |     | pF   |
| C <sub>io</sub>                     | A or B ports   | V <sub>O</sub> = 3.3 V or GND                                                         | 3.3 V            | 3.3 V            |                       | 7      |       |                          |     | pF   |

<sup>†</sup> For I/O ports, the parameter I<sub>OZ</sub> includes the input leakage current.

NOTES: 9. V<sub>CCO</sub> is the V<sub>CC</sub> associated with the output port.

10. V<sub>CCI</sub> is the V<sub>CC</sub> associated with the input port.



switching characteristics over recommended operating free-air temperature range,  
 $V_{CCA} = 1.2\text{ V}$  (see Figure 1)

| PARAMETER | FROM<br>(INPUT) | TO<br>(OUTPUT) | $V_{CCB} = 1.2\text{ V}$ | $V_{CCB} = 1.5\text{ V}$ | $V_{CCB} = 1.8\text{ V}$ | $V_{CCB} = 2.5\text{ V}$ | $V_{CCB} = 3.3\text{ V}$ | UNIT |
|-----------|-----------------|----------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|------|
|           |                 |                | TYP                      | TYP                      | TYP                      | TYP                      | TYP                      |      |
| $t_{PLH}$ | A               | B              | 3.8                      | 3.1                      | 2.8                      | 2.7                      | 3.3                      | ns   |
| $t_{PHL}$ |                 |                | 3.8                      | 3.1                      | 2.8                      | 2.7                      | 3.3                      |      |
| $t_{PLH}$ | B               | A              | 4.1                      | 3.8                      | 3.6                      | 3.5                      | 3.4                      | ns   |
| $t_{PHL}$ |                 |                | 4.1                      | 3.8                      | 3.6                      | 3.5                      | 3.4                      |      |
| $t_{PZH}$ | $\overline{OE}$ | A              | 6.5                      | 6.5                      | 6.5                      | 6.5                      | 6.5                      | ns   |
| $t_{PZL}$ |                 |                | 6.5                      | 6.5                      | 6.5                      | 6.5                      | 6.5                      |      |
| $t_{PZH}$ | $\overline{OE}$ | B              | 5.6                      | 4.4                      | 3.8                      | 3.3                      | 3.2                      | ns   |
| $t_{PZL}$ |                 |                | 5.6                      | 4.4                      | 3.8                      | 3.3                      | 3.2                      |      |
| $t_{PHZ}$ | $\overline{OE}$ | A              | 6.4                      | 6.4                      | 6.4                      | 6.4                      | 6.4                      | ns   |
| $t_{PLZ}$ |                 |                | 6.4                      | 6.4                      | 6.4                      | 6.4                      | 6.4                      |      |
| $t_{PHZ}$ | $\overline{OE}$ | B              | 5.7                      | 4.6                      | 4.7                      | 4.1                      | 5.4                      | ns   |
| $t_{PLZ}$ |                 |                | 5.7                      | 4.6                      | 4.7                      | 4.1                      | 5.4                      |      |

switching characteristics over recommended operating free-air temperature range,  
 $V_{CCA} = 1.5\text{ V} \pm 0.1\text{ V}$  (see Figure 1)

| PARAMETER | FROM<br>(INPUT) | TO<br>(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              | 3.8                      | 0.5                                       | 6.4  | 0.5                                        | 5.4  | 0.5                                       | 4.3  | 0.5                                       | 3.9  | ns   |
| $t_{PHL}$ |                 |                | 3.8                      | 0.5                                       | 6.4  | 0.5                                        | 5.4  | 0.5                                       | 4.3  | 0.5                                       | 3.9  |      |
| $t_{PLH}$ | B               | A              | 3.1                      | 0.5                                       | 6.4  | 0.5                                        | 6.1  | 0.5                                       | 5.8  | 0.5                                       | 5.7  | ns   |
| $t_{PHL}$ |                 |                | 3.1                      | 0.5                                       | 6.4  | 0.5                                        | 6.1  | 0.5                                       | 5.8  | 0.5                                       | 5.7  |      |
| $t_{PZH}$ | $\overline{OE}$ | A              | 4.3                      | 1.5                                       | 10.3 | 1.5                                        | 10.3 | 1.5                                       | 10.2 | 1.5                                       | 10.2 | ns   |
| $t_{PZL}$ |                 |                | 4.3                      | 1.5                                       | 10.3 | 1.5                                        | 10.3 | 1.5                                       | 10.2 | 1.5                                       | 10.2 |      |
| $t_{PZH}$ | $\overline{OE}$ | B              | 5.2                      | 1                                         | 10.3 | 1                                          | 8.4  | 0.5                                       | 6.1  | 0.5                                       | 5.3  | ns   |
| $t_{PZL}$ |                 |                | 5.2                      | 1                                         | 10.3 | 1                                          | 8.4  | 0.5                                       | 6.1  | 0.5                                       | 5.3  |      |
| $t_{PHZ}$ | $\overline{OE}$ | A              | 4.5                      | 2                                         | 9    | 2                                          | 9    | 2                                         | 9    | 2                                         | 9    | ns   |
| $t_{PLZ}$ |                 |                | 4.5                      | 2                                         | 9    | 2                                          | 9    | 2                                         | 9    | 2                                         | 9    |      |
| $t_{PHZ}$ | $\overline{OE}$ | B              | 5.1                      | 1.5                                       | 9    | 1.5                                        | 7.8  | 1                                         | 6.4  | 1                                         | 5.9  | ns   |
| $t_{PLZ}$ |                 |                | 5.1                      | 1.5                                       | 9    | 1.5                                        | 7.8  | 1                                         | 6.4  | 1                                         | 5.9  |      |

**SN74AVC20T245**  
**20-BIT DUAL-SUPPLY BUS TRANSCEIVER**  
**WITH CONFIGURABLE VOLTAGE TRANSLATION AND 3-STATE OUTPUTS**

SCES566F – MAY 2004 – REVISED APRIL 2005

switching characteristics over recommended operating free-air temperature range,  
 $V_{CCA} = 1.8 \text{ V} \pm 0.15 \text{ V}$  (see Figure 1)

| PARAMETER | FROM<br>(INPUT) | TO<br>(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              | 3.6                       | 0.5                                         | 6.1 | 0.5                                          | 5   | 0.5                                         | 3.9 | 0.5                                         | 3.5 | ns   |
| $t_{PHL}$ |                 |                | 3.6                       | 0.5                                         | 6.1 | 0.5                                          | 5   | 0.5                                         | 3.9 | 0.5                                         | 3.5 |      |
| $t_{PLH}$ | B               | A              | 2.8                       | 0.5                                         | 5.4 | 0.5                                          | 5   | 0.5                                         | 4.7 | 0.5                                         | 4.6 | ns   |
| $t_{PHL}$ |                 |                | 2.8                       | 0.5                                         | 5.4 | 0.5                                          | 5   | 0.5                                         | 4.7 | 0.5                                         | 4.6 |      |
| $t_{PZH}$ | $\overline{OE}$ | A              | 3.4                       | 1                                           | 8.1 | 1                                            | 7.9 | 1                                           | 7.9 | 1                                           | 7.9 | ns   |
| $t_{PZL}$ |                 |                | 3.4                       | 1                                           | 8.1 | 1                                            | 7.9 | 1                                           | 7.9 | 1                                           | 7.9 |      |
| $t_{PZH}$ | $\overline{OE}$ | B              | 5                         | 0.5                                         | 10  | 0.5                                          | 7.9 | 0.5                                         | 5.7 | 0.5                                         | 4.8 | ns   |
| $t_{PZL}$ |                 |                | 5                         | 0.5                                         | 10  | 0.5                                          | 7.9 | 0.5                                         | 5.7 | 0.5                                         | 4.8 |      |
| $t_{PHZ}$ | $\overline{OE}$ | A              | 4.1                       | 2                                           | 7.4 | 2                                            | 7.4 | 2                                           | 7.4 | 2                                           | 7.4 | ns   |
| $t_{PLZ}$ |                 |                | 4.1                       | 2                                           | 7.4 | 2                                            | 7.4 | 2                                           | 7.4 | 2                                           | 7.4 |      |
| $t_{PHZ}$ | $\overline{OE}$ | B              | 4.9                       | 1.5                                         | 8.7 | 1.5                                          | 7.4 | 1                                           | 5.8 | 1                                           | 5.1 | ns   |
| $t_{PLZ}$ |                 |                | 4.9                       | 1.5                                         | 8.7 | 1.5                                          | 7.4 | 1                                           | 5.8 | 1                                           | 5.1 |      |

switching characteristics over recommended operating free-air temperature range,  
 $V_{CCA} = 2.5 \text{ V} \pm 0.2 \text{ V}$  (see Figure 1)

| PARAMETER | FROM<br>(INPUT) | TO<br>(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              | 3.5                       | 0.5                                         | 5.8 | 0.5                                          | 4.7 | 0.5                                         | 3.5 | 0.5                                         | 3   | ns   |
| $t_{PHL}$ |                 |                | 3.5                       | 0.5                                         | 5.8 | 0.5                                          | 4.7 | 0.5                                         | 3.5 | 0.5                                         | 3   |      |
| $t_{PLH}$ | B               | A              | 2.7                       | 0.5                                         | 4.3 | 0.5                                          | 3.9 | 0.5                                         | 3.5 | 0.5                                         | 3.4 | ns   |
| $t_{PHL}$ |                 |                | 2.7                       | 0.5                                         | 4.3 | 0.5                                          | 3.9 | 0.5                                         | 3.5 | 0.5                                         | 3.4 |      |
| $t_{PZH}$ | $\overline{OE}$ | A              | 2.5                       | 0.5                                         | 5.4 | 0.5                                          | 5.3 | 0.5                                         | 5.2 | 0.5                                         | 5.2 | ns   |
| $t_{PZL}$ |                 |                | 2.5                       | 0.5                                         | 5.4 | 0.5                                          | 5.3 | 0.5                                         | 5.2 | 0.5                                         | 5.2 |      |
| $t_{PZH}$ | $\overline{OE}$ | B              | 4.8                       | 0.5                                         | 9.6 | 0.5                                          | 7.6 | 0.5                                         | 5.3 | 0.5                                         | 4.3 | ns   |
| $t_{PZL}$ |                 |                | 4.8                       | 0.5                                         | 9.6 | 0.5                                          | 7.6 | 0.5                                         | 5.3 | 0.5                                         | 4.3 |      |
| $t_{PHZ}$ | $\overline{OE}$ | A              | 3                         | 1.1                                         | 5.2 | 1.1                                          | 5.2 | 1.1                                         | 5.2 | 1.1                                         | 5.2 | ns   |
| $t_{PLZ}$ |                 |                | 3                         | 1.1                                         | 5.2 | 1.1                                          | 5.2 | 1.1                                         | 5.2 | 1.1                                         | 5.2 |      |
| $t_{PHZ}$ | $\overline{OE}$ | B              | 4.7                       | 1.2                                         | 8.2 | 1.2                                          | 6.9 | 1                                           | 5.3 | 1                                           | 5   | ns   |
| $t_{PLZ}$ |                 |                | 4.7                       | 1.2                                         | 8.2 | 1.2                                          | 6.9 | 1                                           | 5.3 | 1                                           | 5   |      |

# SN74AVC20T245

## 20-BIT DUAL-SUPPLY BUS TRANSCEIVER

### WITH CONFIGURABLE VOLTAGE TRANSLATION AND 3-STATE OUTPUTS

SCES566F – MAY 2004 – REVISED APRIL 2005

switching characteristics over recommended operating free-air temperature range,  
 $V_{CCA} = 3.3 \text{ V} \pm 0.3 \text{ V}$  (see Figure 1)

| PARAMETER | FROM<br>(INPUT) | TO<br>(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              | 3.4                       | 0.5                                         | 5.7 | 0.5                                          | 4.6 | 0.5                                         | 3.4 | 0.5                                         | 2.9 | ns   |
| $t_{PHL}$ |                 |                | 3.4                       | 0.5                                         | 5.7 | 0.5                                          | 4.6 | 0.5                                         | 3.4 | 0.5                                         | 2.9 |      |
| $t_{PLH}$ | B               | A              | 3.3                       | 0.5                                         | 3.9 | 0.5                                          | 3.5 | 0.5                                         | 3   | 0.5                                         | 2.9 | ns   |
| $t_{PHL}$ |                 |                | 3.3                       | 0.5                                         | 3.9 | 0.5                                          | 3.5 | 0.5                                         | 3   | 0.5                                         | 2.9 |      |
| $t_{PZH}$ | $\overline{OE}$ | A              | 2.2                       | 0.5                                         | 4.4 | 0.5                                          | 4.3 | 0.5                                         | 4.2 | 0.5                                         | 4.1 | ns   |
| $t_{PZL}$ |                 |                | 2.2                       | 0.5                                         | 4.4 | 0.5                                          | 4.3 | 0.5                                         | 4.2 | 0.5                                         | 4.1 |      |
| $t_{PZH}$ | $\overline{OE}$ | B              | 4.7                       | 1                                           | 9.6 | 0.5                                          | 7.5 | 0.5                                         | 5.1 | 0.5                                         | 4.1 | ns   |
| $t_{PZL}$ |                 |                | 4.7                       | 1                                           | 9.6 | 0.5                                          | 7.5 | 0.5                                         | 5.1 | 0.5                                         | 4.1 |      |
| $t_{PHZ}$ | $\overline{OE}$ | A              | 3.4                       | 0.8                                         | 5   | 0.8                                          | 5   | 0.8                                         | 5   | 0.8                                         | 5   | ns   |
| $t_{PLZ}$ |                 |                | 3.4                       | 0.8                                         | 5   | 0.8                                          | 5   | 0.8                                         | 5   | 0.8                                         | 5   |      |
| $t_{PHZ}$ | $\overline{OE}$ | B              | 4.6                       | 1.2                                         | 8.1 | 1.2                                          | 6.7 | 1                                           | 5.1 | 0.8                                         | 5   | ns   |
| $t_{PLZ}$ |                 |                | 4.6                       | 1.2                                         | 8.1 | 1.2                                          | 6.7 | 1                                           | 5.1 | 0.8                                         | 5   |      |

operating characteristics,  $T_A = 25^\circ\text{C}$

| PARAMETER         |        |                  | TEST<br>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                                 |      |
| $C_{pdA}^\dagger$ | A to B | Outputs Enabled  | $C_L = 0$ ,<br>$f = 10 \text{ MHz}$ ,<br>$t_r = t_f = 1 \text{ ns}$ | 1                                   | 1                                   | 1                                   | 1                                   | 2                                   | pF   |
|                   |        | Outputs Disabled |                                                                     | 1                                   | 1                                   | 1                                   | 1                                   | 1                                   |      |
|                   | B to A | Outputs Enabled  |                                                                     | 12                                  | 13                                  | 14                                  | 15                                  | 16                                  |      |
|                   |        | Outputs Disabled |                                                                     | 1                                   | 1                                   | 1                                   | 1                                   | 1                                   |      |
| $C_{pdB}^\dagger$ | A to B | Outputs Enabled  | $C_L = 0$ ,<br>$f = 10 \text{ MHz}$ ,<br>$t_r = t_f = 1 \text{ ns}$ | 13                                  | 13                                  | 14                                  | 15                                  | 16                                  | pF   |
|                   |        | Outputs Disabled |                                                                     | 1                                   | 1                                   | 1                                   | 1                                   | 1                                   |      |
|                   | B to A | Outputs Enabled  |                                                                     | 1                                   | 1                                   | 1                                   | 2                                   | 2                                   |      |
|                   |        | Outputs Disabled |                                                                     | 1                                   | 1                                   | 1                                   | 1                                   | 1                                   |      |

$^\dagger$  Power-dissipation capacitance per transceiver



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**SN74AVC20T245**  
**20-BIT DUAL-SUPPLY BUS TRANSCEIVER**  
**WITH CONFIGURABLE VOLTAGE TRANSLATION AND 3-STATE OUTPUTS**  
SCES566F – MAY 2004 – REVISED APRIL 2005

typical total static power consumption ( $I_{CCA} + I_{CCB}$ )

**TABLE 1**

| $V_{CCB}$ | $V_{CCA}$ |       |       |       |       |       | UNIT    |
|-----------|-----------|-------|-------|-------|-------|-------|---------|
|           | 0 V       | 1.2 V | 1.5 V | 1.8 V | 2.5 V | 3.3 V |         |
| 0 V       | 0         | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | $\mu A$ |
| 1.2 V     | < 0.5     | < 1   | < 1   | < 1   | < 1   | 1     |         |
| 1.5 V     | < 0.5     | < 1   | < 1   | < 1   | < 1   | 1     |         |
| 1.8 V     | < 0.5     | < 1   | < 1   | < 1   | < 1   | < 1   |         |
| 2.5 V     | < 0.5     | 1     | < 1   | < 1   | < 1   | < 1   |         |
| 3.3 V     | < 0.5     | 1     | < 1   | < 1   | < 1   | < 1   |         |

# SN74AVC20T245

## 20-BIT DUAL-SUPPLY BUS TRANSCEIVER

### WITH CONFIGURABLE VOLTAGE TRANSLATION AND 3-STATE OUTPUTS

SCES566F – MAY 2004 – REVISED APRIL 2005

#### TYPICAL CHARACTERISTICS

##### TYPICAL PROPAGATION DELAY (A to B) vs LOAD CAPACITANCE

$T_A = 25^\circ\text{C}$ ,  $V_{CCA} = 1.2\text{ V}$

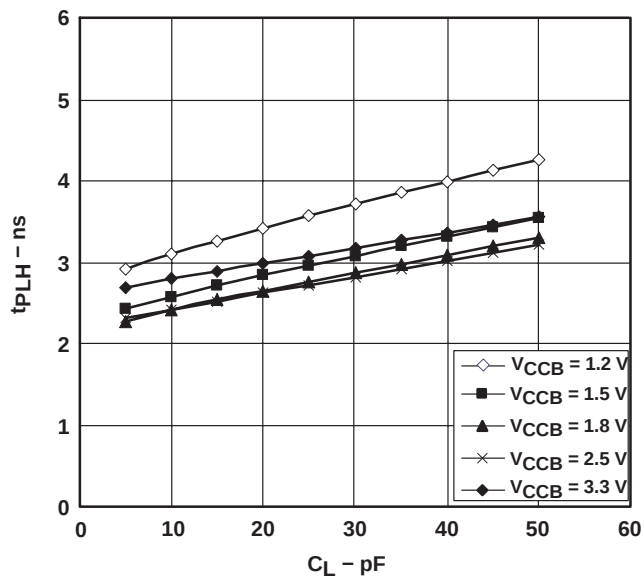


Figure 1

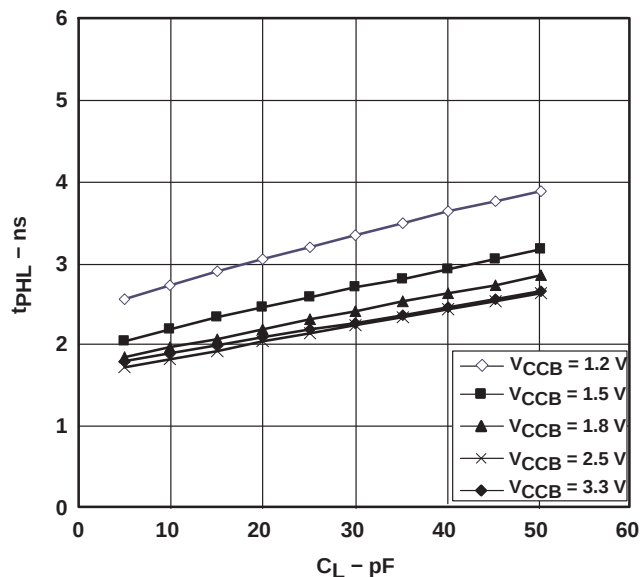


Figure 2

##### TYPICAL PROPAGATION DELAY (A to B) vs LOAD CAPACITANCE

$T_A = 25^\circ\text{C}$ ,  $V_{CCA} = 1.5\text{ V}$

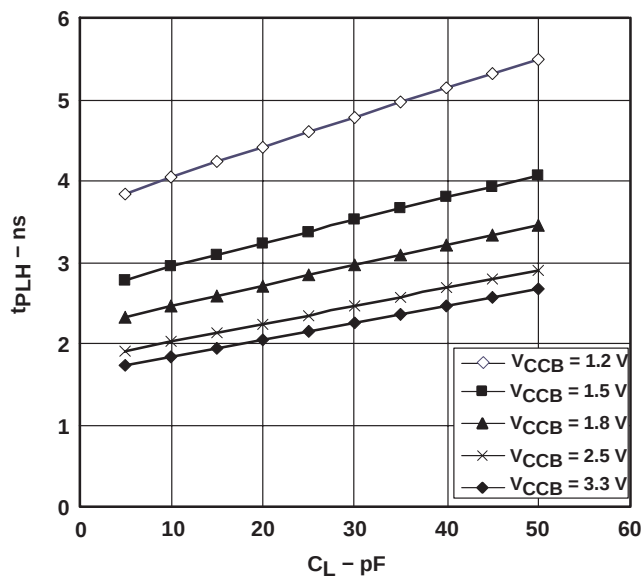


Figure 3

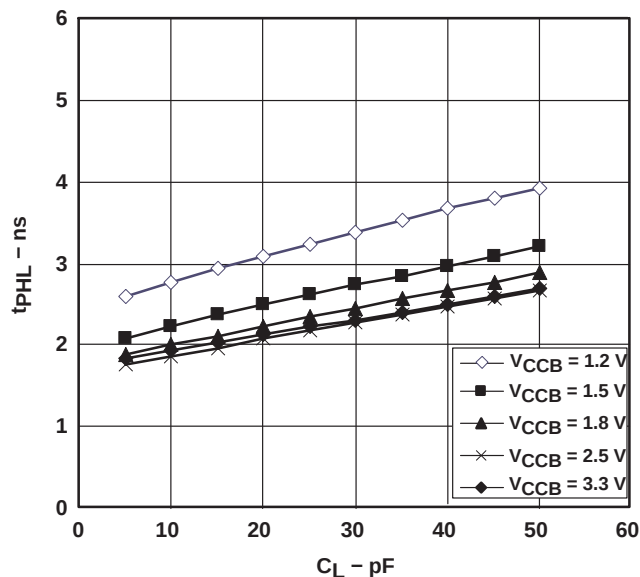


Figure 4

**SN74AVC20T245**  
**20-BIT DUAL-SUPPLY BUS TRANSCEIVER**  
**WITH CONFIGURABLE VOLTAGE TRANSLATION AND 3-STATE OUTPUTS**

SCES566F – MAY 2004 – REVISED APRIL 2005

**TYPICAL PROPAGATION DELAY (A to B) vs LOAD CAPACITANCE**  
 $T_A = 25^\circ\text{C}$ ,  $V_{CCA} = 1.8\text{ V}$

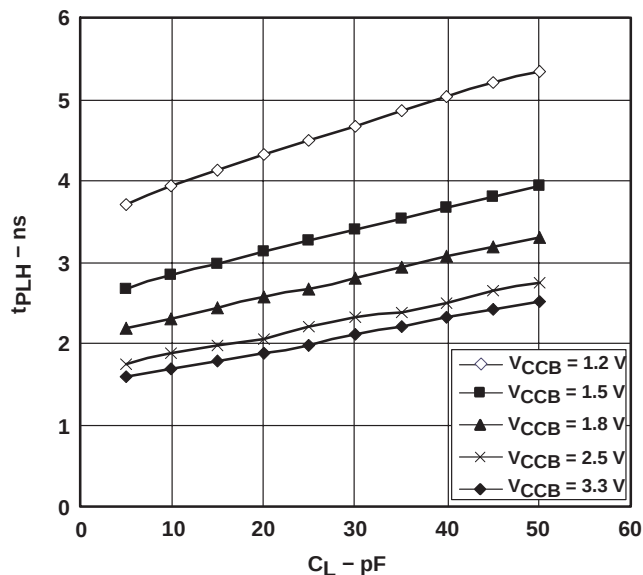


Figure 5

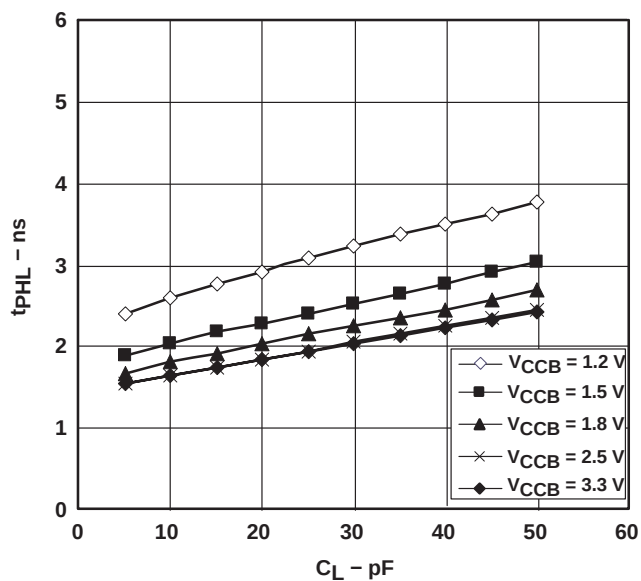


Figure 6

**TYPICAL PROPAGATION DELAY (A to B) vs LOAD CAPACITANCE**  
 $T_A = 25^\circ\text{C}$ ,  $V_{CCA} = 2.5\text{ V}$

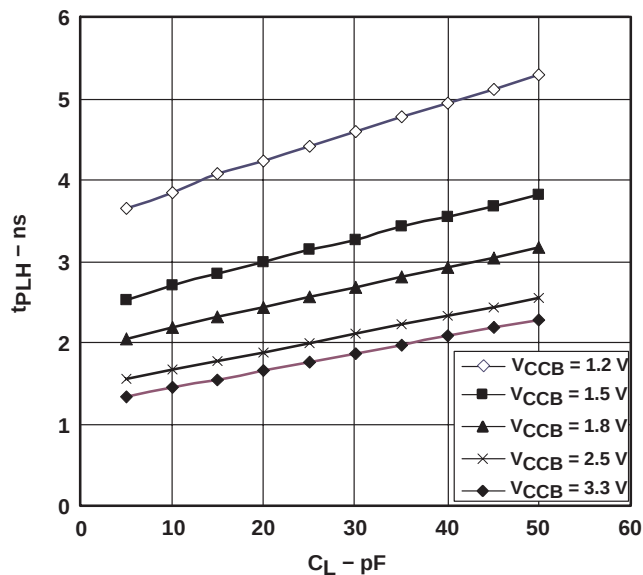


Figure 7

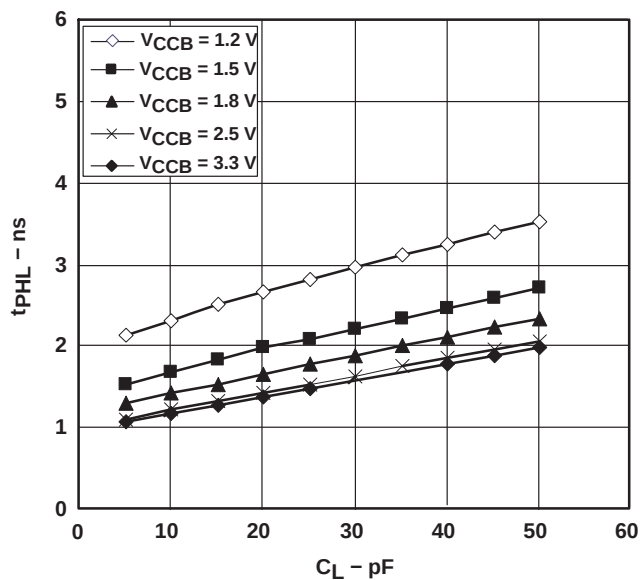


Figure 8

SN74AVC20T245  
20-BIT DUAL-SUPPLY BUS TRANSCEIVER  
WITH CONFIGURABLE VOLTAGE TRANSLATION AND 3-STATE OUTPUTS  
SCES566F – MAY 2004 – REVISED APRIL 2005

TYPICAL PROPAGATION DELAY (A to B) vs LOAD CAPACITANCE  
 $T_A = 25^{\circ}\text{C}$ ,  $V_{CCA} = 3.3\text{ V}$

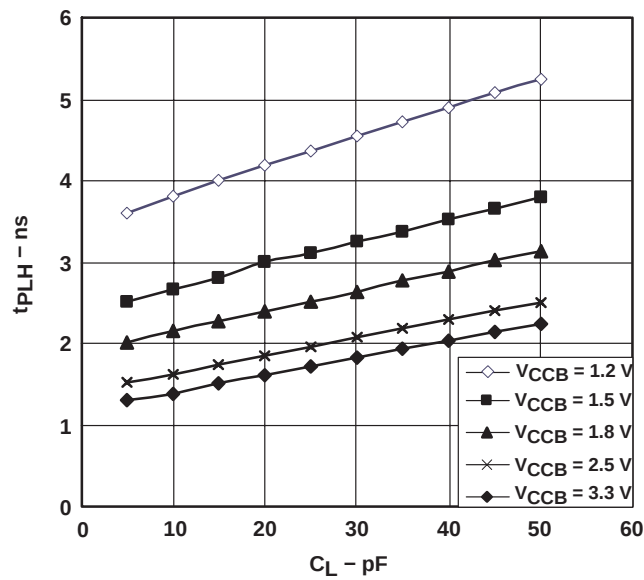


Figure 9

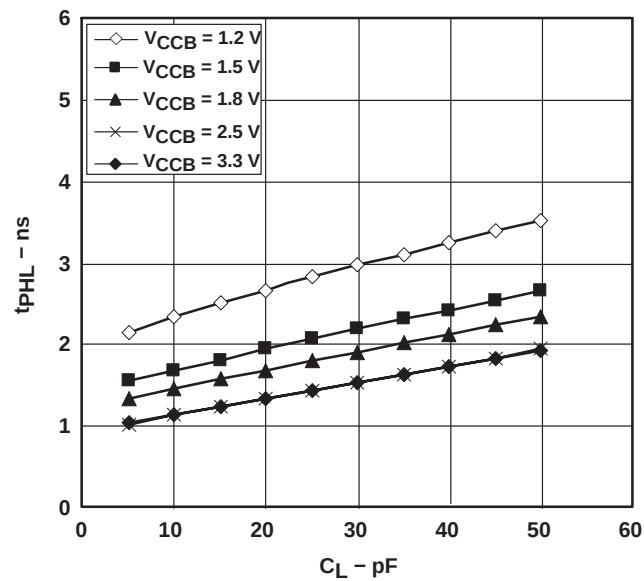


Figure 10

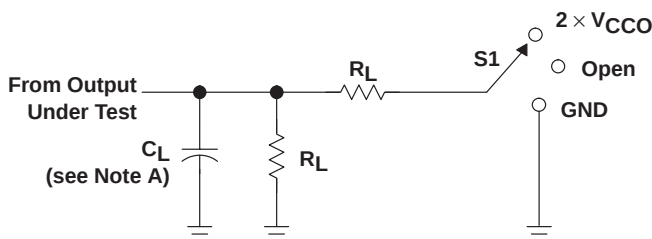
# SN74AVC20T245

## 20-BIT DUAL-SUPPLY BUS TRANSCEIVER

### WITH CONFIGURABLE VOLTAGE TRANSLATION AND 3-STATE OUTPUTS

SCES566F – MAY 2004 – REVISED APRIL 2005

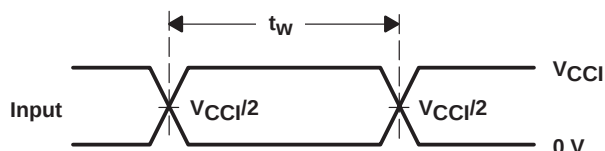
#### PARAMETER MEASUREMENT INFORMATION



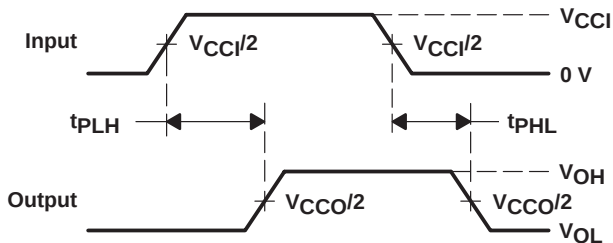
LOAD CIRCUIT

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

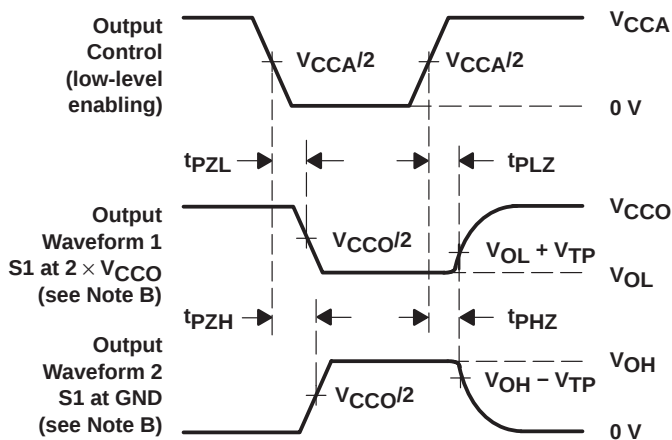
| TEST              | S1                 |
|-------------------|--------------------|
| $t_{pd}$          | Open               |
| $t_{PLZ}/t_{PZL}$ | $2 \times V_{CCO}$ |
| $t_{PHZ}/t_{PZH}$ | GND                |



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 11. Load Circuit and Voltage Waveforms

**PACKAGING INFORMATION**

| Orderable Device  | Status <sup>(1)</sup> | Package Type          | Package Drawing | Pins | Package Qty | Eco Plan <sup>(2)</sup> | Lead/Ball Finish | MSL Peak Temp <sup>(3)</sup> |
|-------------------|-----------------------|-----------------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| 74AVC20T245DGGRE4 | ACTIVE                | TSSOP                 | DGG             | 56   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| 74AVC20T245DGGRG4 | ACTIVE                | TSSOP                 | DGG             | 56   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| 74AVC20T245DGVRE4 | ACTIVE                | TVSOP                 | DGV             | 56   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| 74AVC20T245DGVRG4 | ACTIVE                | TVSOP                 | DGV             | 56   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74AVC20T245DGG  | PREVIEW               | TSSOP                 | DGG             | 56   | 35          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74AVC20T245DGGR | ACTIVE                | TSSOP                 | DGG             | 56   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74AVC20T245DGVR | ACTIVE                | TVSOP                 | DGV             | 56   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74AVC20T245GQLR | NRND                  | BGA MI CROSTAR JUNIOR | GQL             | 56   | 1000        | TBD                     | SNPB             | Level-1-240C-UNLIM           |
| SN74AVC20T245ZQLR | ACTIVE                | BGA MI CROSTAR JUNIOR | ZQL             | 56   | 1000        | Green (RoHS & no Sb/Br) | SNAGCU           | Level-1-260C-UNLIM           |

<sup>(1)</sup> 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.

<sup>(2)</sup> 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)

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

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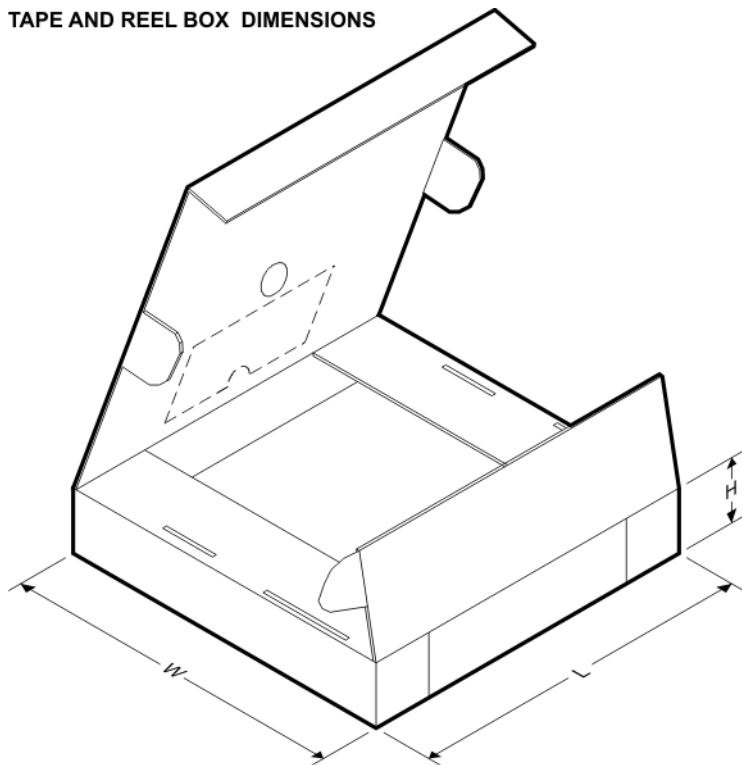
**TAPE AND REEL INFORMATION**



\*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 |
|-------------------|----------------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN74AVC20T245DGGR | TSSOP                | DGG             | 56   | 2000 | 330.0              | 24.4               | 8.6     | 15.6    | 1.8     | 12.0    | 24.0   | Q1            |
| SN74AVC20T245DGVR | TVSOP                | DGV             | 56   | 2000 | 330.0              | 24.4               | 6.8     | 11.7    | 1.6     | 12.0    | 24.0   | Q1            |
| SN74AVC20T245GQLR | BGA MICROSTAR JUNIOR | GQL             | 56   | 1000 | 330.0              | 16.4               | 4.8     | 7.3     | 1.45    | 8.0     | 16.0   | Q1            |
| SN74AVC20T245ZQLR | BGA MICROSTAR JUNIOR | ZQL             | 56   | 1000 | 330.0              | 16.4               | 4.8     | 7.3     | 1.45    | 8.0     | 16.0   | Q1            |

## TAPE AND REEL BOX DIMENSIONS

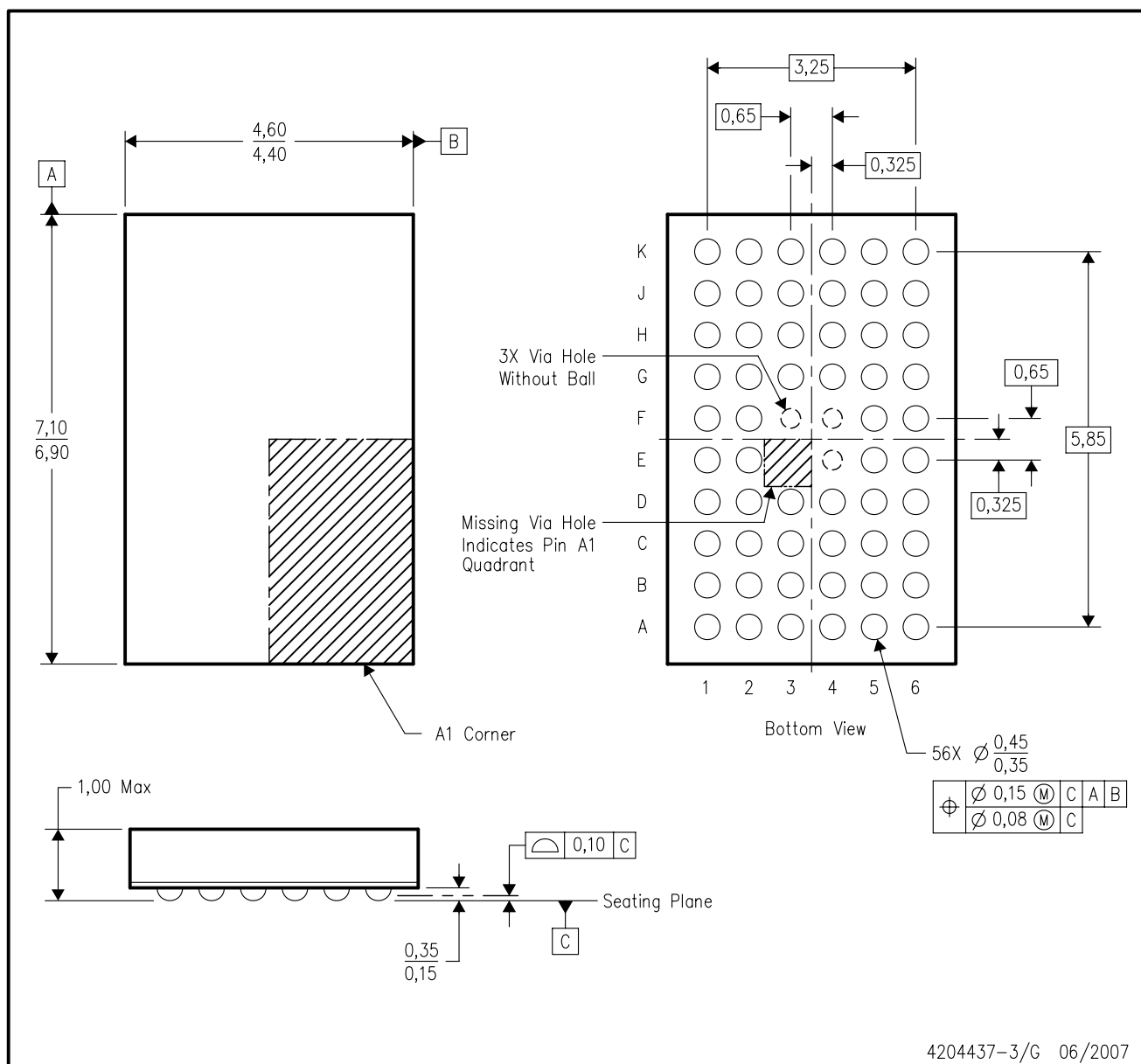


\*All dimensions are nominal

| Device            | Package Type         | Package Drawing | Pins | SPQ  | Length (mm) | Width (mm) | Height (mm) |
|-------------------|----------------------|-----------------|------|------|-------------|------------|-------------|
| SN74AVC20T245DGGR | TSSOP                | DGG             | 56   | 2000 | 346.0       | 346.0      | 41.0        |
| SN74AVC20T245DGVR | TVSOP                | DGV             | 56   | 2000 | 346.0       | 346.0      | 41.0        |
| SN74AVC20T245GQLR | BGA MICROSTAR JUNIOR | GQL             | 56   | 1000 | 346.0       | 346.0      | 33.0        |
| SN74AVC20T245ZQLR | BGA MICROSTAR JUNIOR | ZQL             | 56   | 1000 | 346.0       | 346.0      | 33.0        |

## ZQL (R-PBGA-N56)

## PLASTIC BALL GRID ARRAY

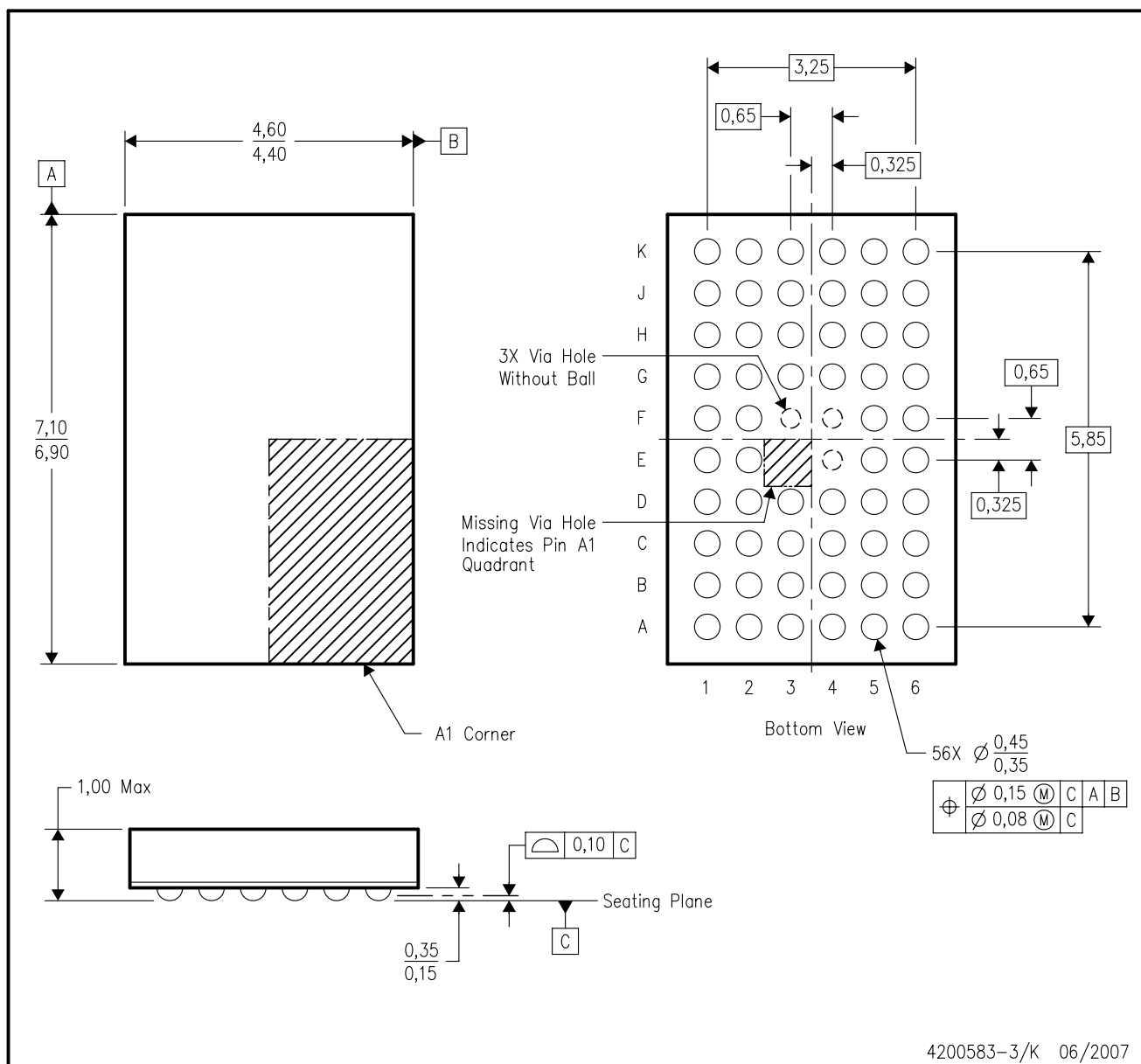


4204437-3/G 06/2007

- NOTES:
- All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
  - This drawing is subject to change without notice.
  - Falls within JEDEC MO-285 variation BA-2.
  - This package is lead-free. Refer to the 56 GQL package (drawing 4200583) for tin-lead (SnPb).

## GQL (R-PBGA-N56)

## PLASTIC BALL GRID ARRAY



- 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. Falls within JEDEC MO-285 variation BA-2.
  - D. This package is tin-lead (SnPb). Refer to the 56 ZQL package (drawing 4204437) for lead-free.

## DGG (R-PDSO-G\*\*)

## PLASTIC SMALL-OUTLINE PACKAGE

48 PINS SHOWN



- NOTES: A. All linear dimensions are in millimeters.  
 B. This drawing is subject to change without notice.  
 C. Body dimensions do not include mold protrusion not to exceed 0,15.  
 D. Falls within JEDEC MO-153

## DGV (R-PDSO-G\*\*)

## PLASTIC SMALL-OUTLINE

24 PINS SHOWN



- 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

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Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265  
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