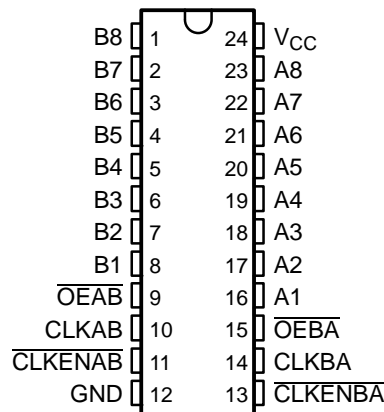


## FEATURES

- Operates From 1.65 V to 3.6 V
- Inputs Accept Voltages to 5.5 V
- Max  $t_{pd}$  of 8.2 ns at 3.3 V
- Typical  $V_{OLP}$  (Output Ground Bounce)  $<0.8$  V at  $V_{CC} = 3.3$  V,  $T_A = 25^\circ\text{C}$
- Typical  $V_{OHV}$  (Output  $V_{OH}$  Undershoot)  $>2$  V at  $V_{CC} = 3.3$  V,  $T_A = 25^\circ\text{C}$
- Supports Mixed-Mode Signal Operation on All Ports (5-V Input/Output Voltage With 3.3-V  $V_{CC}$ )
- $I_{off}$  Supports Partial-Power-Down Mode Operation
- Latch-Up Performance Exceeds 250 mA Per JESD 17
- ESD Protection Exceeds JESD 22
  - 2000-V Human-Body Model (A114-A)
  - 1000-V Charged-Device Model (C101)

 DB, DW, NS, OR PW PACKAGE  
(TOP VIEW)


## DESCRIPTION/ORDERING INFORMATION

This octal bus transceiver and register is designed for 1.65-V to 3.6-V  $V_{CC}$  operation.

The SN74LVC2952A consists of two 8-bit back-to-back registers that store data flowing in both directions between two bidirectional buses. Data on the A or B bus is stored in the registers on the low-to-high transition of the clock (CLKAB or CLKBA) input, provided that the clock-enable ( $\overline{\text{CLKENAB}}$  or  $\overline{\text{CLKENBA}}$ ) input is low. Taking the output-enable ( $\overline{\text{OEAB}}$  or  $\overline{\text{OEBA}}$ ) input low accesses the data on either port.

Inputs can be driven from either 3.3-V or 5-V devices. This feature allows the use of these devices as translators in a mixed 3.3-V/5-V system environment.

To ensure the high-impedance state during power up or power down,  $\overline{\text{OE}}$  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.

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.

## ORDERING INFORMATION

| $T_A$         | PACKAGE <sup>(1)</sup> |              | ORDERABLE PART NUMBER | TOP-SIDE MARKING |
|---------------|------------------------|--------------|-----------------------|------------------|
| –40°C to 85°C | SOIC – DW              | Tube of 25   | SN74LVC2952ADW        | LVC2952A         |
|               |                        | Reel of 2000 | SN74LVC2952ADWR       |                  |
|               | SOP – NS               | Reel of 2000 | SN74LVC2952ANSR       | LVC2952A         |
|               | SSOP – DB              | Reel of 2000 | SN74LVC2952ADBR       | LE952A           |
|               | TSSOP – PW             | Tube of 60   | SN74LVC2952APW        | LE952A           |
|               |                        | Reel of 2000 | SN74LVC2952APWR       |                  |
|               |                        | Reel of 250  | SN74LVC2952APWT       |                  |

(1) 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).



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.

**SN74LVC2952A**  
**OCTAL BUS TRANSCEIVER AND REGISTER**  
**WITH 3-STATE OUTPUTS**

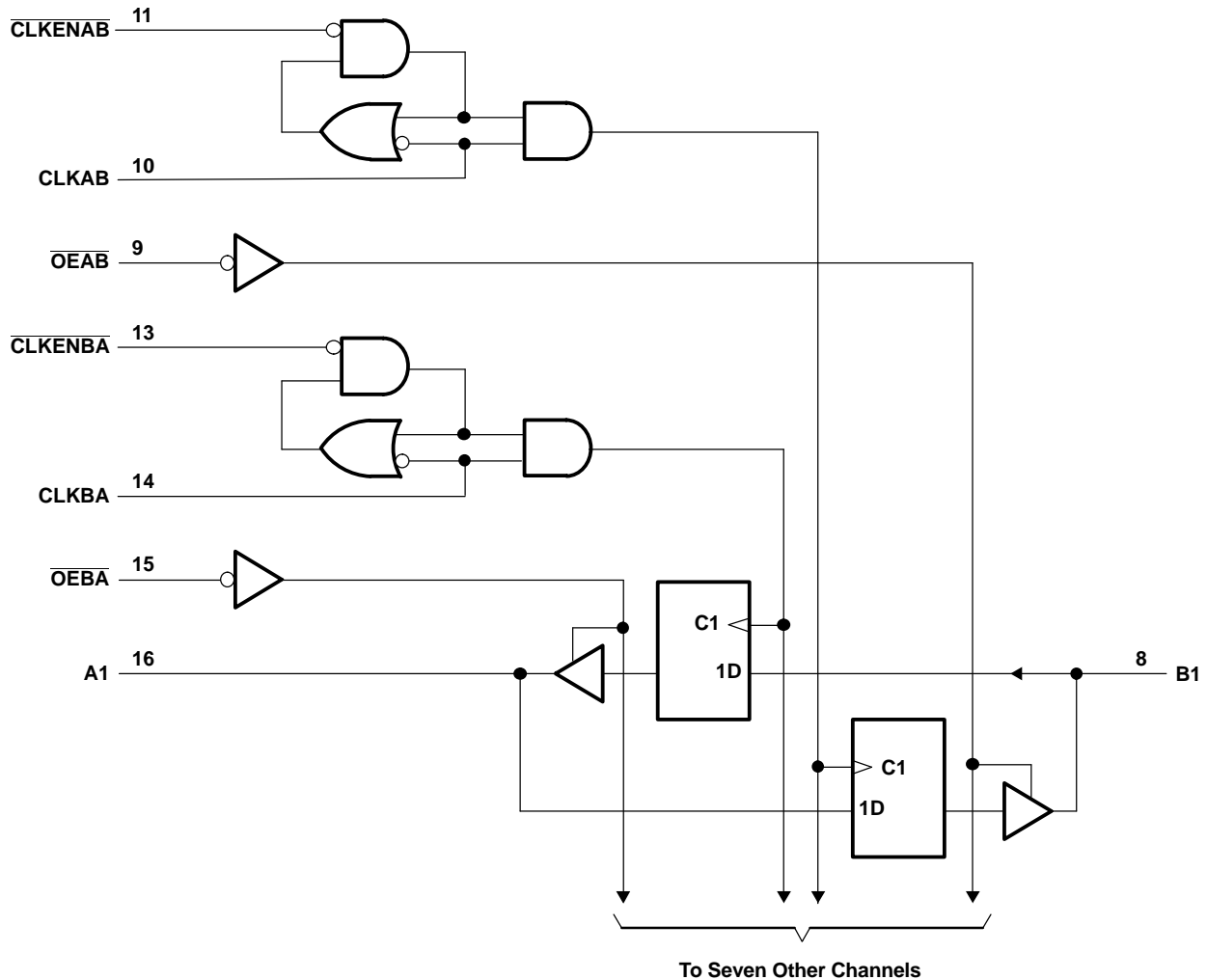
SCAS311I—JANUARY 1993—REVISED MARCH 2005

**FUNCTION TABLE<sup>(1)</sup>**

| INPUTS  |        |      |   | OUTPUT<br>B                   |
|---------|--------|------|---|-------------------------------|
| CLKENAB | CLKAB  | OEAB | A |                               |
| H       | X      | L    | X | B <sub>0</sub> <sup>(2)</sup> |
| X       | H or L | L    | X | B <sub>0</sub> <sup>(2)</sup> |
| L       | ↑      | L    | L | L                             |
| L       | ↑      | L    | H | H                             |
| X       | X      | H    | X | Z                             |

- (1) A-to-B data flow is shown; B-to-A data flow is similar, but uses CLKENBA, CLKBA, and OEBA.  
(2) Level of B before the indicated steady-state input conditions were established

**LOGIC DIAGRAM (POSITIVE LOGIC)**



**Absolute Maximum Ratings<sup>(1)</sup>**

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

|                  |   | MIN                | MAX                   | UNIT |
|------------------|---|--------------------|-----------------------|------|
| V <sub>CC</sub>  | Supply voltage range  | –0.5               | 6.5                   | V    |
| V <sub>I</sub>   | Input voltage range <sup>(2)</sup>  | –0.5               | 6.5                   | V    |
| V <sub>O</sub>   | Voltage range applied to any output in the high-impedance or power-off state <sup>(2)</sup> | –0.5               | 6.5                   | V    |
| V <sub>O</sub>   | Voltage range applied to any output in the high or low state <sup>(2)(3)</sup>              | –0.5               | V <sub>CC</sub> + 0.5 | V    |
| I <sub>IK</sub>  | Input clamp current   | V <sub>I</sub> < 0 | –50                   | mA   |
| I <sub>OK</sub>  | Output clamp current  | V <sub>O</sub> < 0 | –50                   | mA   |
| I <sub>O</sub>   | Continuous output current   |                    | ±50                   | mA   |
|                  | Continuous current through V <sub>CC</sub> or GND   |                    | ±100                  | mA   |
| θ <sub>JA</sub>  | Package thermal impedance <sup>(4)</sup>  | DB package         | 63                    | °C/W |
|                  |   | DW package         | 46                    |      |
|                  |   | NS package         | 65                    |      |
|                  |   | PW package         | 88                    |      |
| T <sub>stg</sub> | 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 negative-voltage and output voltage ratings may be exceeded if the input and output current ratings are observed.
- (3) The value of V<sub>CC</sub> is provided in the recommended operating conditions table.
- (4) The package thermal impedance is calculated in accordance with JESD 51-7.

**Recommended Operating Conditions<sup>(1)</sup>**

|                 |                                    | MIN                                | MAX                    | UNIT                   |    |
|-----------------|------------------------------------|------------------------------------|------------------------|------------------------|----|
| V <sub>CC</sub> | Supply voltage                     | Operating                          | 1.65                   | 3.6                    | V  |
|                 |                                    | Data retention only                | 1.5                    |                        |    |
| V <sub>IH</sub> | High-level input voltage           | V <sub>CC</sub> = 1.65 V to 1.95 V | 0.65 × V <sub>CC</sub> |                        | V  |
|                 |                                    | V <sub>CC</sub> = 2.3 V to 2.7 V   | 1.7                    |                        |    |
|                 |                                    | V <sub>CC</sub> = 2.7 V to 3.6 V   | 2                      |                        |    |
| V <sub>IL</sub> | Low-level input voltage            | V <sub>CC</sub> = 1.65 V to 1.95 V |                        | 0.35 × V <sub>CC</sub> | V  |
|                 |                                    | V <sub>CC</sub> = 2.3 V to 2.7 V   |                        | 0.7                    |    |
|                 |                                    | V <sub>CC</sub> = 2.7 V to 3.6 V   |                        | 0.8                    |    |
| V <sub>I</sub>  | Input voltage                      | 0                                  | 5.5                    | V                      |    |
| V <sub>O</sub>  | Output voltage                     | High or low state                  | 0                      | V <sub>CC</sub>        | V  |
|                 |                                    | 3-state                            | 0                      | 5.5                    |    |
| I <sub>OH</sub> | High-level output current          | V <sub>CC</sub> = 1.65 V           |                        | –4                     | mA |
|                 |                                    | V <sub>CC</sub> = 2.3 V            |                        | –8                     |    |
|                 |                                    | V <sub>CC</sub> = 2.7 V            |                        | –12                    |    |
|                 |                                    | V <sub>CC</sub> = 3 V              |                        | –24                    |    |
| I <sub>OL</sub> | Low-level output current           | V <sub>CC</sub> = 1.65 V           |                        | 4                      | mA |
|                 |                                    | V <sub>CC</sub> = 2.3 V            |                        | 8                      |    |
|                 |                                    | V <sub>CC</sub> = 2.7 V            |                        | 12                     |    |
|                 |                                    | V <sub>CC</sub> = 3 V              |                        | 24                     |    |
| Δt/Δv           | Input transition rise or fall rate |                                    | 10                     | ns/V                   |    |
| T <sub>A</sub>  | Operating free-air temperature     | –40                                | 85                     | °C                     |    |

- (1) All unused inputs of the device must be held at V<sub>CC</sub> or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

# SN74LVC2952A

## OCTAL BUS TRANSCEIVER AND REGISTER WITH 3-STATE OUTPUTS

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### Electrical Characteristics

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

| PARAMETER                      |                | TEST CONDITIONS  | V <sub>CC</sub> | MIN                   | TYP <sup>(1)</sup> | MAX  | UNIT |    |
|--------------------------------|----------------|--|-----------------|-----------------------|--------------------|------|------|----|
| V <sub>OH</sub>                |                | I <sub>OH</sub> = -100 μA  | 1.65 V to 3.6 V | V <sub>CC</sub> - 0.2 |                    |      | V    |    |
|                                |                | I <sub>OH</sub> = -4 mA  | 1.65 V          | 1.2                   |                    |      |      |    |
|                                |                | I <sub>OH</sub> = -8 mA  | 2.3 V           | 1.7                   |                    |      |      |    |
|                                |                | I <sub>OH</sub> = -12 mA   | 2.7 V           | 2.2                   |                    |      |      |    |
|                                |                |  | 3 V             | 2.4                   |                    |      |      |    |
|                                |                | I <sub>OH</sub> = -24 mA   | 3 V             | 2.2                   |                    |      |      |    |
| V <sub>OL</sub>                |                | I <sub>OL</sub> = 100 μA   | 1.65 V to 3.6 V |                       |                    | 0.2  | V    |    |
|                                |                | I <sub>OL</sub> = 4 mA   | 1.65 V          |                       |                    | 0.45 |      |    |
|                                |                | I <sub>OL</sub> = 8 mA   | 2.3 V           |                       |                    | 0.7  |      |    |
|                                |                | I <sub>OL</sub> = 12 mA  | 2.7 V           |                       |                    | 0.4  |      |    |
|                                |                | I <sub>OL</sub> = 24 mA  | 3 V             |                       |                    | 0.55 |      |    |
| I <sub>I</sub>                 | Control inputs | V <sub>I</sub> = 0 to 5.5 V  | 3.6 V           |                       |                    | ±5   | μA   |    |
| I <sub>off</sub>               |                | V <sub>I</sub> or V <sub>O</sub> = 5.5 V                                     | 0               |                       |                    | ±10  | μA   |    |
| I <sub>OZ</sub> <sup>(2)</sup> |                | V <sub>O</sub> = 0 to 5.5 V  | 3.6 V           |                       |                    | ±10  | μA   |    |
| I <sub>CC</sub>                |                | V <sub>I</sub> = V <sub>CC</sub> or GND                                      | 3.6 V           | I <sub>O</sub> = 0    |                    |      | 10   | μA |
|                                |                | 3.6 V ≤ V <sub>I</sub> ≤ 5.5 V <sup>(3)</sup>                                |                 |                       |                    |      | 10   |    |
| ΔI <sub>CC</sub>               |                | One input at V <sub>CC</sub> - 0.6 V, Other inputs at V <sub>CC</sub> or GND | 2.7 V to 3.6 V  |                       |                    | 500  | μA   |    |
| C <sub>i</sub>                 | Control inputs | V <sub>I</sub> = V <sub>CC</sub> or GND                                      | 3.3 V           |                       |                    | 5    | pF   |    |
| C <sub>io</sub>                | A or B ports   | V <sub>O</sub> = V <sub>CC</sub> or GND                                      | 3.3 V           |                       |                    | 8.5  | pF   |    |

(1) All typical values are at V<sub>CC</sub> = 3.3 V, T<sub>A</sub> = 25°C.

(2) For I/O ports, the parameter I<sub>OZ</sub> includes the input leakage current.

(3) This applies in the disabled state only.

### Timing Requirements

over recommended operating free-air temperature range (unless otherwise noted) (see Figure 1)

|                    |                                 | V <sub>CC</sub> = 1.8 V<br>± 0.15 V |     | V <sub>CC</sub> = 2.5 V<br>± 0.2 V |     | V <sub>CC</sub> = 2.7 V |     | V <sub>CC</sub> = 3.3 V<br>± 0.3 V |     | UNIT |
|--------------------|---------------------------------|-------------------------------------|-----|------------------------------------|-----|-------------------------|-----|------------------------------------|-----|------|
|                    |                                 | MIN                                 | MAX | MIN                                | MAX | MIN                     | MAX | MIN                                | MAX |      |
| f <sub>clock</sub> | Clock frequency                 | (1)                                 |     | (1)                                |     | 150                     |     | 150                                |     | MHz  |
| t <sub>w</sub>     | Pulse duration, CLK high or low | (1)                                 |     | (1)                                |     | 3.3                     |     | 3.3                                |     | ns   |
| t <sub>su</sub>    | Setup time                      | Data before CLK high                |     | (1)                                |     | 1.7                     |     | 1.3                                |     | ns   |
|                    |                                 | CLKEN before CLK high               |     | (1)                                |     | 1.3                     |     | 1.1                                |     |      |
| t <sub>h</sub>     | Hold time                       | Data after CLK high                 |     | (1)                                |     | 1.8                     |     | 1.1                                |     | ns   |
|                    |                                 | CLKEN after CLK high                |     | (1)                                |     | 1.4                     |     | 1.1                                |     |      |

(1) This information was not available at the time of publication.

### Switching Characteristics

over recommended operating free-air temperature range (unless otherwise noted) (see Figure 1)

| PARAMETER   | FROM<br>(INPUT) | TO<br>(OUTPUT) | $V_{CC} = 1.8\text{ V} \pm 0.15\text{ V}$ |     | $V_{CC} = 2.5\text{ V} \pm 0.2\text{ V}$ |     | $V_{CC} = 2.7\text{ V}$ |     | $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$ |     | UNIT |
|-------------|-----------------|----------------|---|-----|--|-----|-------------------------|-----|--|-----|------|
|             |                 |                | MIN                                       | MAX | MIN                                      | MAX | MIN                     | MAX | MIN                                      | MAX |      |
| $f_{\max}$  |                 |                | (1)                                       |     | (1)                                      |     | 150                     |     | 150                                      |     | MHz  |
| $t_{pd}$    | CLKAB or CLKBA  | B or A         | (1)                                       | (1) | (1)                                      | (1) | 8.8                     |     | 1  | 8.2 | ns   |
| $t_{en}$    | $\overline{OE}$ | A or B         | (1)                                       | (1) | (1)                                      | (1) | 9                       |     | 1  | 7.8 | ns   |
| $t_{dis}$   | $\overline{OE}$ | A or B         | (1)                                       | (1) | (1)                                      | (1) | 8.8                     |     | 1  | 7.8 | ns   |
| $t_{sk(o)}$ |                 |                |   |     |  |     |                         |     | 1  |     | ns   |

(1) This information was not available at the time of publication.

### Operating Characteristics

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

| PARAMETER |  |                  | TEST<br>CONDITIONS | $V_{CC} = 1.8\text{ V}$ | $V_{CC} = 2.5\text{ V}$ | $V_{CC} = 3.3\text{ V}$ | UNIT |
|-----------|--|------------------|--------------------|-------------------------|-------------------------|-------------------------|------|
|           |  |                  |                    | TYP                     | TYP                     | TYP                     |      |
| $C_{pd}$  | Power dissipation capacitance<br>per transceiver | Outputs enabled  | f = 10 MHz         | (1)                     | (1)                     | 79                      | pF   |
|           |  | Outputs disabled |                    | (1)                     | (1)                     | 41                      |      |

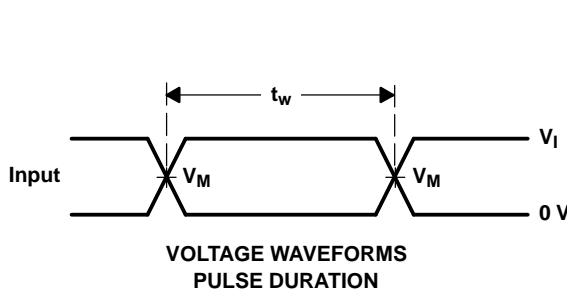
(1) This information was not available at the time of publication.

PARAMETER MEASUREMENT INFORMATION



| TEST              | S1         |
|-------------------|------------|
| $t_{PLH}/t_{PHL}$ | Open       |
| $t_{PLZ}/t_{PZL}$ | $V_{LOAD}$ |
| $t_{PHZ}/t_{PZH}$ | GND        |

| $V_{CC}$                         | INPUTS   |                      | $V_M$      | $V_{LOAD}$        | $C_L$ | $R_L$        | $V_{\Delta}$ |
|----------------------------------|----------|----------------------|------------|-------------------|-------|--------------|--------------|
|                                  | $V_I$    | $t_r/t_f$            |            |                   |       |              |              |
| $1.8\text{ V} \pm 0.15\text{ V}$ | $V_{CC}$ | $\leq 2\text{ ns}$   | $V_{CC}/2$ | $2 \times V_{CC}$ | 30 pF | 1 k $\Omega$ | 0.15 V       |
| $2.5\text{ V} \pm 0.2\text{ V}$  | $V_{CC}$ | $\leq 2\text{ ns}$   | $V_{CC}/2$ | $2 \times V_{CC}$ | 30 pF | 500 $\Omega$ | 0.15 V       |
| 2.7 V                            | 2.7 V    | $\leq 2.5\text{ ns}$ | 1.5 V      | 6 V               | 50 pF | 500 $\Omega$ | 0.3 V        |
| $3.3\text{ V} \pm 0.3\text{ V}$  | 2.7 V    | $\leq 2.5\text{ ns}$ | 1.5 V      | 6 V               | 50 pF | 500 $\Omega$ | 0.3 V        |



- 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  $\leq 10\text{ MHz}$ ,  $Z_O = 50\ \Omega$ .
  - 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. All parameters and waveforms are not applicable to all devices.

Figure 1. 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/<br>Ball Finish | MSL Peak Temp <sup>(3)</sup> | Samples<br>(Requires Login)      |
|-------------------|-----------------------|--------------|-----------------|------|-------------|----------------------------|----------------------|------------------------------|----------------------------------|
| SN74LVC2952ADBLE  | OBSOLETE              | SSOP         | DB              | 24   |             | TBD                        | Call TI              | Call TI                      | Samples Not Available            |
| SN74LVC2952ADBR   | ACTIVE                | SSOP         | DB              | 24   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           | <a href="#">Purchase Samples</a> |
| SN74LVC2952ADBRE4 | ACTIVE                | SSOP         | DB              | 24   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           | <a href="#">Purchase Samples</a> |
| SN74LVC2952ADBRG4 | ACTIVE                | SSOP         | DB              | 24   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           | <a href="#">Purchase Samples</a> |
| SN74LVC2952ADGVR  | OBSOLETE              | TVSOP        | DGV             | 24   |             | TBD                        | Call TI              | Call TI                      | Samples Not Available            |
| SN74LVC2952ADW    | ACTIVE                | SOIC         | DW              | 24   | 25          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           | <a href="#">Purchase Samples</a> |
| SN74LVC2952ADWE4  | ACTIVE                | SOIC         | DW              | 24   | 25          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           | <a href="#">Purchase Samples</a> |
| SN74LVC2952ADWG4  | ACTIVE                | SOIC         | DW              | 24   | 25          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           | <a href="#">Purchase Samples</a> |
| SN74LVC2952APW    | ACTIVE                | TSSOP        | PW              | 24   | 60          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           | <a href="#">Purchase Samples</a> |
| SN74LVC2952APWE4  | ACTIVE                | TSSOP        | PW              | 24   | 60          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           | <a href="#">Purchase Samples</a> |
| SN74LVC2952APWG4  | ACTIVE                | TSSOP        | PW              | 24   | 60          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           | <a href="#">Purchase Samples</a> |
| SN74LVC2952APWLE  | OBSOLETE              | TSSOP        | PW              | 24   |             | TBD                        | Call TI              | Call TI                      | Samples Not Available            |
| SN74LVC2952APWR   | ACTIVE                | TSSOP        | PW              | 24   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           | <a href="#">Purchase Samples</a> |
| SN74LVC2952APWRE4 | ACTIVE                | TSSOP        | PW              | 24   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           | <a href="#">Purchase Samples</a> |
| SN74LVC2952APWRG4 | ACTIVE                | TSSOP        | PW              | 24   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           | <a href="#">Purchase Samples</a> |
| SN74LVC2952APWT   | ACTIVE                | TSSOP        | PW              | 24   | 250         | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           | <a href="#">Purchase Samples</a> |
| SN74LVC2952APWTE4 | ACTIVE                | TSSOP        | PW              | 24   | 250         | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           | <a href="#">Purchase Samples</a> |
| SN74LVC2952APWTG4 | ACTIVE                | TSSOP        | PW              | 24   | 250         | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           | <a href="#">Purchase Samples</a> |

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<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



### QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



\*All dimensions are nominal

| Device          | Package Type | Package Drawing | Pins | SPQ  | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|-----------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN74LVC2952ADBR | SSOP         | DB              | 24   | 2000 | 330.0              | 16.4               | 8.2     | 8.8     | 2.5     | 12.0    | 16.0   | Q1            |
| SN74LVC2952APWR | TSSOP        | PW              | 24   | 2000 | 330.0              | 16.4               | 6.95    | 8.3     | 1.6     | 8.0     | 16.0   | Q1            |
| SN74LVC2952APWT | TSSOP        | PW              | 24   | 250  | 330.0              | 16.4               | 6.95    | 8.3     | 1.6     | 8.0     | 16.0   | Q1            |

**TAPE AND REEL BOX DIMENSIONS**


\*All dimensions are nominal

| Device          | Package Type | Package Drawing | Pins | SPQ  | Length (mm) | Width (mm) | Height (mm) |
|-----------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN74LVC2952ADBR | SSOP         | DB              | 24   | 2000 | 346.0       | 346.0      | 33.0        |
| SN74LVC2952APWR | TSSOP        | PW              | 24   | 2000 | 346.0       | 346.0      | 33.0        |
| SN74LVC2952APWT | TSSOP        | PW              | 24   | 250  | 346.0       | 346.0      | 33.0        |

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



DB (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE

28 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.  
 D. Falls within JEDEC MO-150

PW (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE PACKAGE

14 PINS SHOWN



4040064/F 01/97

- 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.  
 D. Falls within JEDEC MO-153

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