

FEATURES

- Member of the Texas Instruments Widebus™ Family
- Bus Hold on Data Inputs Eliminates the Need for External Pullup/Pulldown Resistors
- Latch-Up Performance Exceeds 250 mA Per JESD 17
- ESD Protection Exceeds JESD 22
 - 2000-V Human-Body Model (A114-A)
 - 200-V Machine Model (A115-A)

DESCRIPTION/ORDERING INFORMATION

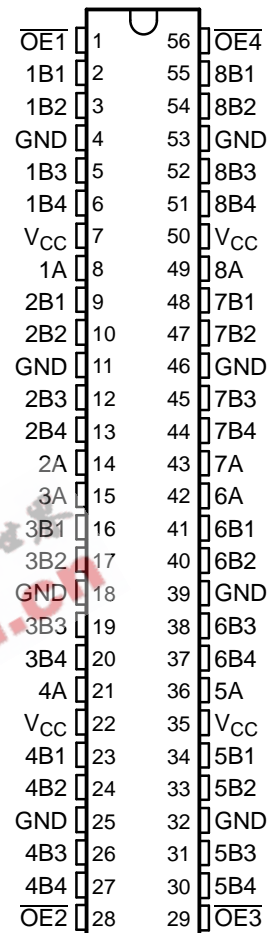
This 1-bit to 4-bit address driver is designed for 1.65-V to 3.6-V V_{CC} operation.

The SN74ALVCH16344 is used in applications in which four separate memory locations must be addressed by a single address.

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.

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

DGG OR DL PACKAGE
(TOP VIEW)



ORDERING INFORMATION

| T_A | PACKAGE ⁽¹⁾ | | ORDERABLE PART NUMBER | TOP-SIDE MARKING |
|---------------|------------------------|---------------|-----------------------|------------------|
| -40°C to 85°C | SSOP - DL | Tube | SN74ALVCH16344DL | ALVCH16344 |
| | | Tape and reel | SN74ALVCH16344DLR | |
| | TSSOP - DGG | Tape and reel | SN74ALVCH16344DGGR | ALVCH16344 |

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

FUNCTION TABLE

| INPUTS | | OUTPUT |
|-----------------|---|--------|
| \overline{OE} | A | B_n |
| L | H | H |
| L | L | L |
| H | H | Z |



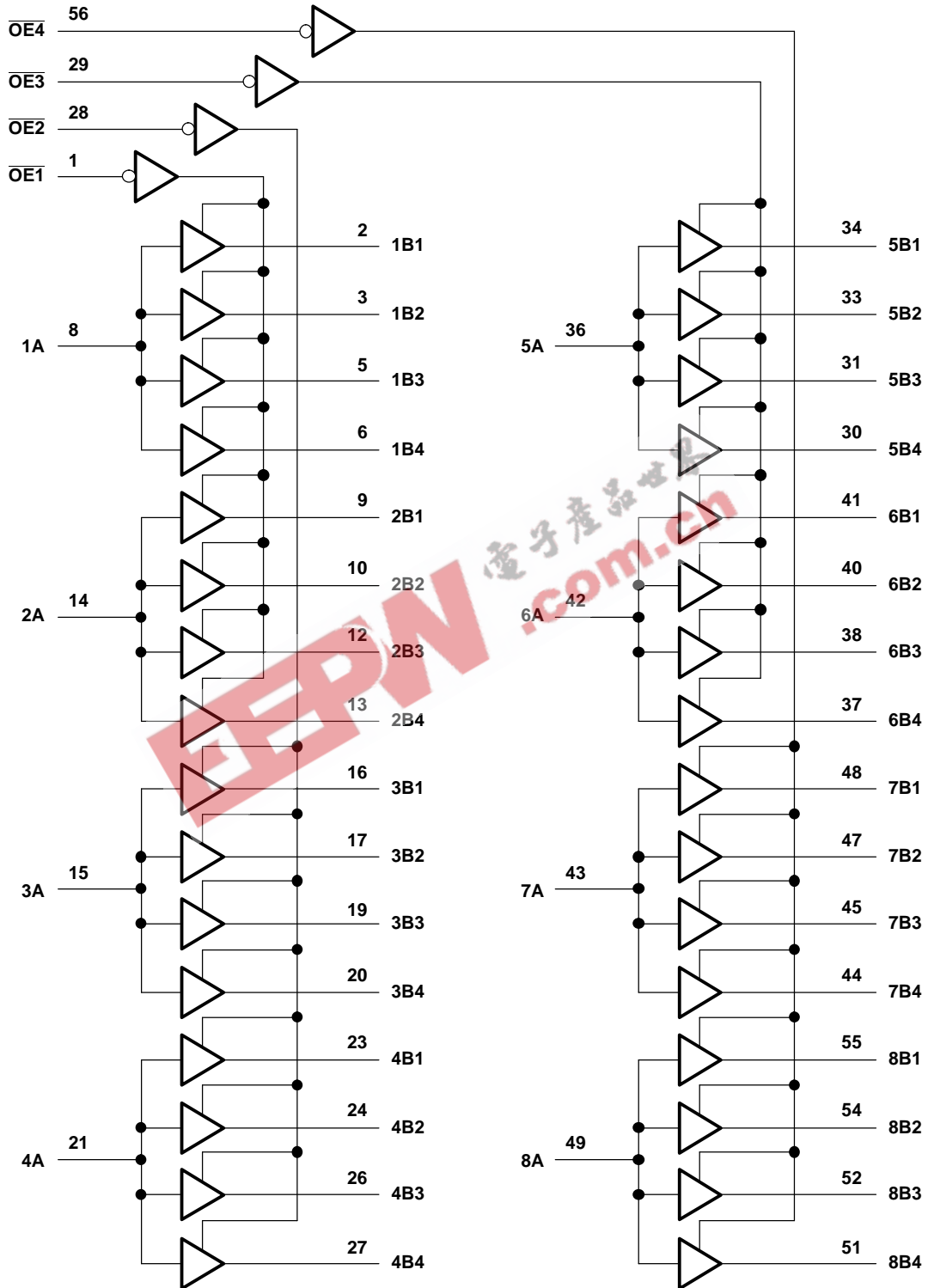
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SN74ALVCH16344
1-BIT TO 4-BIT ADDRESS DRIVER
WITH 3-STATE OUTPUTS

SCES054H-SEPTEMBER 1995-REVISED SEPTEMBER 2004

LOGIC DIAGRAM (POSITIVE LOGIC)



ABSOLUTE MAXIMUM RATINGS⁽¹⁾

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

| | | | MIN | MAX | UNIT |
|------------------|--|--------------------|------|-----------------------|------|
| V _{CC} | Supply voltage range | | -0.5 | 4.6 | V |
| V _I | Input voltage range ⁽²⁾ | | -0.5 | 4.6 | V |
| V _O | Output voltage range ⁽²⁾⁽³⁾ | | -0.5 | V _{CC} + 0.5 | V |
| I _{IK} | Input clamp current | V _I < 0 | | -50 | mA |
| I _{OK} | Output clamp current | V _O < 0 | | -50 | mA |
| I _O | Continuous output current | | | ±50 | mA |
| | Continuous current through each V _{CC} or GND | | | ±100 | mA |
| θ _{JA} | Package thermal impedance ⁽⁴⁾ | DGG package | | 64 | °C/W |
| | | DL package | | 56 | |
| T _{stg} | Storage temperature range | | -65 | 150 | °C |

- (1) Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
- (2) The input negative-voltage and output voltage ratings may be exceeded if the input and output current ratings are observed.
- (3) This value is limited to 4.6 V maximum.
- (4) The package thermal impedance is calculated in accordance with JESD 51-7.

RECOMMENDED OPERATING CONDITIONS⁽¹⁾

| | | | MIN | MAX | UNIT |
|-----------------|------------------------------------|------------------------------------|------------------------|-----------------|------|
| V _{CC} | Supply voltage | | 1.65 | 3.6 | V |
| V _{IH} | High-level input voltage | V _{CC} = 1.65 V to 1.95 V | 0.65 × V _{CC} | | V |
| | | V _{CC} = 2.3 V to 2.7 V | 1.7 | | |
| | | V _{CC} = 2.7 V to 3.6 V | 2 | | |
| V _{IL} | Low-level input voltage | V _{CC} = 1.65 V to 1.95 V | 0.35 × V _{CC} | | V |
| | | V _{CC} = 2.3 V to 2.7 V | 0.7 | | |
| | | V _{CC} = 2.7 V to 3.6 V | 0.8 | | |
| V _I | Input voltage | | 0 | V _{CC} | V |
| V _O | Output voltage | | 0 | V _{CC} | V |
| I _{OH} | High-level output current | V _{CC} = 1.65 V | -4 | | mA |
| | | V _{CC} = 2.3 V | -12 | | |
| | | V _{CC} = 2.7 V | -12 | | |
| | | V _{CC} = 3 V | -24 | | |
| I _{OL} | Low-level output current | V _{CC} = 1.65 V | 4 | | mA |
| | | V _{CC} = 2.3 V | 12 | | |
| | | V _{CC} = 2.7 V | 12 | | |
| | | V _{CC} = 3 V | 24 | | |
| Δt/Δv | Input transition rise or fall rate | | | 10 | ns/V |
| T _A | Operating free-air temperature | | -40 | 85 | °C |

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

SN74ALVCH16344

1-BIT TO 4-BIT ADDRESS DRIVER WITH 3-STATE OUTPUTS

SCES054H-SEPTEMBER 1995-REVISED SEPTEMBER 2004

ELECTRICAL CHARACTERISTICS

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

| PARAMETER | | TEST CONDITIONS | V _{CC} | MIN | TYP ⁽¹⁾ | MAX | UNIT |
|----------------------|-------------------------|--|-----------------|-----------------------|--------------------|------|------|
| V _{OH} | | I _{OH} = -100 μA | 1.65 V to 3.6 V | V _{CC} - 0.2 | | | V |
| | | I _{OH} = -4 mA | 1.65 V | 1.2 | | | |
| | | I _{OH} = -6 mA | 2.3 V | 2 | | | |
| | | I _{OH} = -12 mA | 2.3 V | 1.7 | | | |
| | | | 2.7 V | 2.2 | | | |
| | | I _{OH} = -24 mA | 3 V | 2.4 | | | |
| V _{OL} | | I _{OL} = 100 μA | 1.65 V to 3.6 V | | | 0.2 | V |
| | | I _{OL} = 4 mA | 1.65 V | | | 0.45 | |
| | | I _{OL} = 6 mA | 2.3 V | | | 0.4 | |
| | | I _{OL} = 12 mA | 2.3 V | | | 0.7 | |
| | | | 2.7 V | | | 0.4 | |
| | I _{OL} = 24 mA | 3 V | | | 0.55 | | |
| I _I | | V _I = V _{CC} or GND | 3.6 V | | | ±5 | μA |
| I _{I(hold)} | | V _I = 0.58 V | 1.65 V | 25 | | | μA |
| | | V _I = 1.07 V | 1.65 V | -25 | | | |
| | | V _I = 0.7 V | 2.3 V | 45 | | | |
| | | V _I = 1.7 V | 2.3 V | -45 | | | |
| | | V _I = 0.8 V | 3 V | 75 | | | |
| | | V _I = 2 V | 3 V | -75 | | | |
| | | V _I = 0 to 3.6 V ⁽²⁾ | 3.6 V | | | ±500 | |
| I _{OZ} | | V _O = V _{CC} or GND | 3.6 V | | | ±10 | μA |
| I _{CC} | | V _I = V _{CC} or GND, I _O = 0 | 3.6 V | | | 40 | μA |
| ΔI _{CC} | | One input at V _{CC} - 0.6 V, Other inputs at V _{CC} or GND | 3 V to 3.6 V | | | 750 | μA |
| C _i | Control inputs | V _I = V _{CC} or GND | 3.3 V | 2.5 | | | pF |
| | Data inputs | | | 3.5 | | | |
| C _o | Outputs | V _O = V _{CC} or GND | 3.3 V | 4 | | | pF |

(1) All typical values are at V_{CC} = 3.3 V, T_A = 25°C.

(2) This is the bus-hold maximum dynamic current. It is the minimum overdrive current required to switch the input from one state to another.

SWITCHING CHARACTERISTICS

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

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | V _{CC} = 1.8 V | | V _{CC} = 2.5 V ± 0.2 V | | V _{CC} = 2.7 V | | V _{CC} = 3.3 V ± 0.3 V | | UNIT |
|-----------------------------------|-----------------|-------------|-------------------------|-----|---------------------------------|-----|-------------------------|-----|---------------------------------|----|------|
| | | | TYP | MIN | MAX | MIN | MAX | MIN | MAX | | |
| t _{pd} | A | B | (1) | 1 | 4.6 | | 4.6 | 1.4 | 4 | ns | |
| t _{en} | \overline{OE} | B | (1) | 1 | 6.2 | | 6.2 | 1.2 | 5.1 | ns | |
| t _{dis} | \overline{OE} | B | (1) | 1 | 5.1 | | 4.4 | 1.2 | 4 | ns | |
| t _{sk(o)} ⁽²⁾ | | | | | | | | | 0.35 | ns | |
| t _{sk(o)} ⁽³⁾ | | | | | | | | | 0.5 | ns | |

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

(2) Skew between outputs of same bank and same package (same transition)

(3) Skew between outputs of all banks and same package (A1 through A8 tied together)

OPERATING CHARACTERISTICS

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

| PARAMETER | | TEST 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 per bit (four outputs switching) | $C_L = 50\text{ pF}, f = 10\text{ MHz}$ | (1) | 68 | 84 | pF |
| | Outputs enabled | | (1) | 11 | 14 | |
| | Outputs disabled | | | | | |

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

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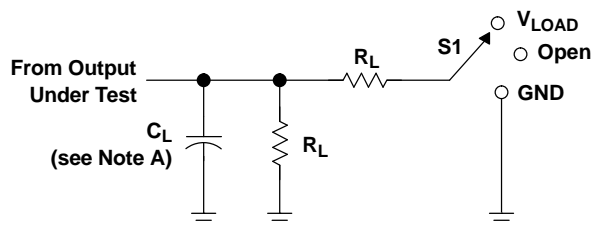
SN74ALVCH16344

1-BIT TO 4-BIT ADDRESS DRIVER

WITH 3-STATE OUTPUTS

SCES054H-SEPTEMBER 1995-REVISED SEPTEMBER 2004

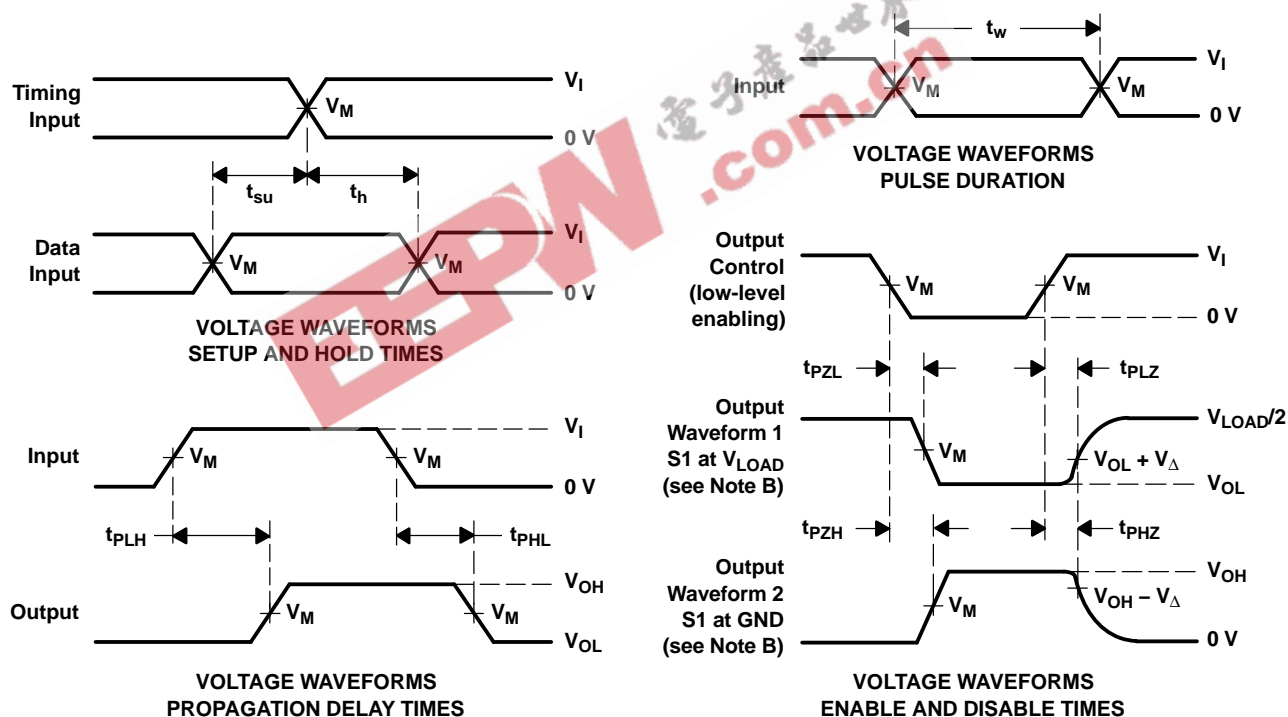
PARAMETER MEASUREMENT INFORMATION



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

LOAD CIRCUIT

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



- NOTES:
- C_L includes probe and jig capacitance.
 - 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.
 - All input pulses are supplied by generators having the following characteristics: PRR ≤ 10 MHz, $Z_O = 50 \Omega$.
 - The outputs are measured one at a time, with one transition per measurement.
 - t_{PLZ} and t_{PHZ} are the same as t_{dis} .
 - t_{PZL} and t_{PZH} are the same as t_{en} .
 - t_{PLH} and t_{PHL} are the same as t_{pd} .
 - All parameters and waveforms are not applicable to all devices.

Figure 1. Load Circuit and Voltage Waveforms

PACKAGING INFORMATION

| Orderable Device | Status ⁽¹⁾ | Package Type | Package Drawing | Pins | Package Qty | Eco Plan ⁽²⁾ | Lead/Ball Finish | MSL Peak Temp ⁽³⁾ |
|--------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| 74ALVCH16344DGGRE4 | ACTIVE | TSSOP | DGG | 56 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| 74ALVCH16344DGGRG4 | ACTIVE | TSSOP | DGG | 56 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| 74ALVCH16344DLG4 | ACTIVE | SSOP | DL | 56 | 20 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| 74ALVCH16344DLRG4 | ACTIVE | SSOP | DL | 56 | 1000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74ALVCH16344DGGR | ACTIVE | TSSOP | DGG | 56 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74ALVCH16344DL | ACTIVE | SSOP | DL | 56 | 20 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74ALVCH16344DLR | ACTIVE | SSOP | DL | 56 | 1000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |

⁽¹⁾ The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.

LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

PREVIEW: Device has been announced but is not in production. Samples may or may not be available.

OBSOLETE: TI has discontinued the production of the device.

⁽²⁾ Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

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

Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

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

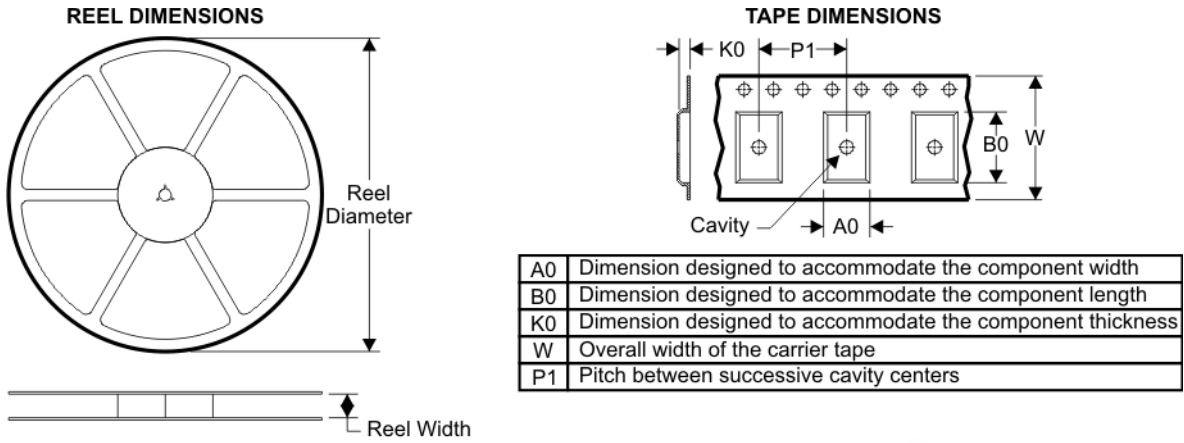
Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

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

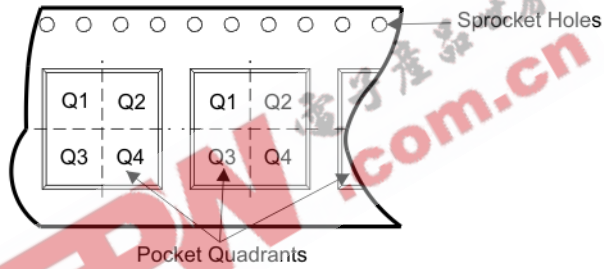
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TAPE AND REEL BOX INFORMATION

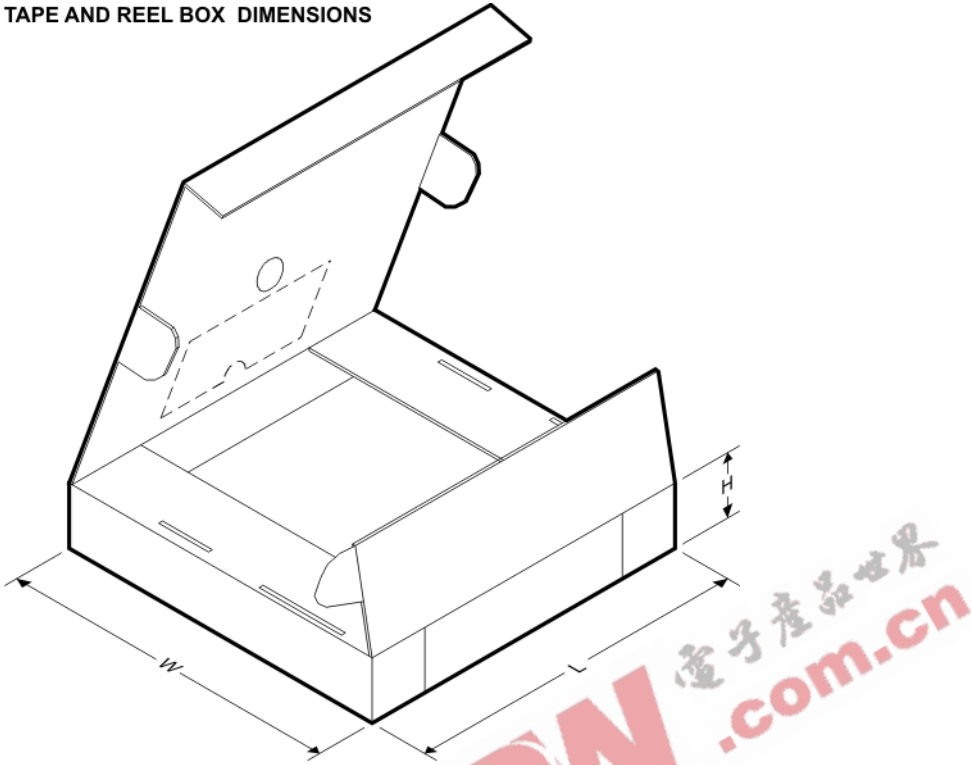


QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



| Device | Package | Pins | Site | Reel Diameter (mm) | Reel Width (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|--------------------|---------|------|---------|--------------------|-----------------|---------|---------|---------|---------|--------|---------------|
| SN74ALVCH16344DGGR | DGG | 56 | SITE 41 | 330 | 24 | 8.6 | 15.6 | 1.8 | 12 | 24 | Q1 |
| SN74ALVCH16344DLR | DL | 56 | SITE 41 | 330 | 32 | 11.35 | 18.67 | 3.1 | 16 | 32 | Q1 |

TAPE AND REEL BOX DIMENSIONS



| Device | Package | Pins | Site | Length (mm) | Width (mm) | Height (mm) |
|--------------------|---------|------|---------|-------------|------------|-------------|
| SN74ALVCH16344DGGR | DGG | 56 | SITE 41 | 346.0 | 346.0 | 41.0 |
| SN74ALVCH16344DLR | DL | 56 | SITE 41 | 346.0 | 346.0 | 49.0 |

MECHANICAL DATA

MSS0001C – JANUARY 1995 – REVISED DECEMBER 2001

DL (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

48 PINS SHOWN



- NOTES: A. All linear dimensions are in inches (millimeters).
 B. This drawing is subject to change without notice.
 C. Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
 D. Falls within JEDEC MO-118

MECHANICAL DATA

MTSS003D – JANUARY 1995 – REVISED JANUARY 1998

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

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