

FEATURES

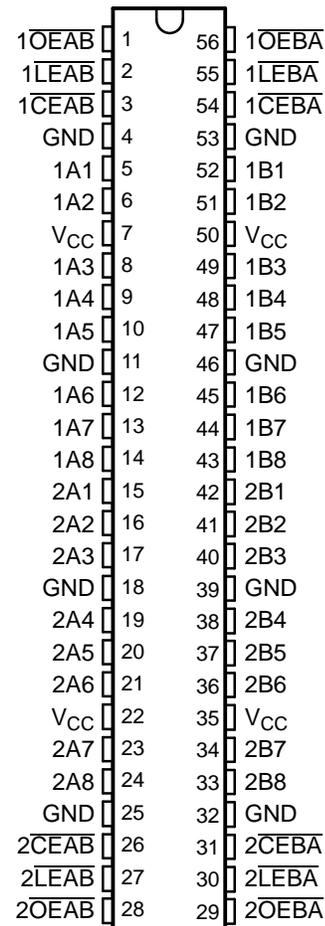
- Member of the Texas Instruments Widebus™ Family
- Operates From 1.65 V to 3.6 V
- Inputs Accept Voltages to 5.5 V
- Max t_{pd} of 5.4 ns at 3.3 V
- Typical V_{OLP} (Output Ground Bounce) < 0.8 V at $V_{CC} = 3.3$ V, $T_A = 25^\circ\text{C}$
- Typical V_{OHV} (Output V_{OH} Undershoot) > 2 V at $V_{CC} = 3.3$ V, $T_A = 25^\circ\text{C}$
- I_{off} Supports Partial-Power-Down Mode Operation
- Supports Mixed-Mode Signal Operation on All Ports (5-V Input/Output Voltage With 3.3-V V_{CC})
- 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)
 - 1000-V Charged-Device Model (C101)

DESCRIPTION/ORDERING INFORMATION

This 16-bit registered transceiver is designed for 1.65-V to 3.6-V V_{CC} operation.

The SN74LVCH16543A can be used as two 8-bit transceivers or one 16-bit transceiver. Separate latch-enable (\overline{LEAB} or \overline{LEBA}) and output-enable (\overline{OEAB} or \overline{OEBA}) inputs are provided for each register, to permit independent control in either direction of data flow.

DGG, DGV, 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 | SN74LVCH16543ADL | LVCH16543A |
| | | Tape and reel | SN74LVCH16543ADLR | |
| | TSSOP – DGG | Tape and reel | SN74LVCH16543ADGGR | LVCH16543A |
| | TVSOP – DGV | Tape and reel | SN74LVCH16543ADGVR | LDH543A |
| | VFBGA – GQL | Tape and reel | SN74LVCH16543AGQLR | LDH543A |
| VFBGA – ZQL (Pb-free) | SN74LVCH16543AZQLR | | | |

(1) Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at 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.

Widebus is a trademark of Texas Instruments.

SN74LVCH16543A
16-BIT REGISTERED TRANSCEIVER
WITH 3-STATE OUTPUTS

SCAS317M–NOVEMBER 1993–REVISED MARCH 2005

DESCRIPTION/ORDERING INFORMATION (CONTINUED)

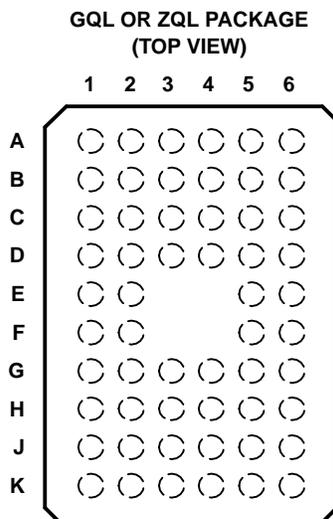
The A-to-B enable (\overline{CEAB}) input must be low to enter data from A or to output data from B. If \overline{CEAB} is low and \overline{LEAB} is low, the A-to-B latches are transparent; a subsequent low-to-high transition of \overline{LEAB} puts the A latches in the storage mode. With \overline{CEAB} and \overline{OEAB} both low, the 3-state B outputs are active and reflect the data present at the output of the A latches. Data flow from B to A is similar, but requires using the \overline{CEBA} , \overline{LEBA} , and \overline{OEBA} inputs.

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.

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

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.

Active bus-hold circuitry is provided to hold unused or floating data inputs at a valid logic level. Use of pullup or pulldown resistors with the bus-hold circuitry is not recommended. The bus-hold circuitry is part of the input circuit and is not disabled by \overline{OE} or DIR.



TERMINAL ASSIGNMENTS

| | 1 | 2 | 3 | 4 | 5 | 6 |
|----------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| A | 1 \overline{CEAB} | 1 \overline{LEAB} | 1 \overline{OEAB} | 1 \overline{OEBA} | 1 \overline{LEBA} | 1 \overline{CEBA} |
| B | 1A2 | 1A1 | GND | GND | 1B1 | 1B2 |
| C | 1A4 | 1A3 | V_{CC} | V_{CC} | 1B3 | 1B4 |
| D | 1A6 | 1A5 | GND | GND | 1B5 | 1B6 |
| E | 1A8 | 1A7 | | | 1B7 | 1B8 |
| F | 2A1 | 2A2 | | | 2B2 | 2B1 |
| G | 2A3 | 2A4 | GND | GND | 2B4 | 2B3 |
| H | 2A5 | 2A6 | V_{CC} | V_{CC} | 2B6 | 2B5 |
| J | 2A7 | 2A8 | GND | GND | 2B8 | 2B7 |
| K | 2 \overline{CEAB} | 2 \overline{LEAB} | 2 \overline{OEAB} | 2 \overline{OEBA} | 2 \overline{LEBA} | 2 \overline{CEBA} |

FUNCTION TABLE⁽¹⁾
(EACH 8-BIT SECTION)

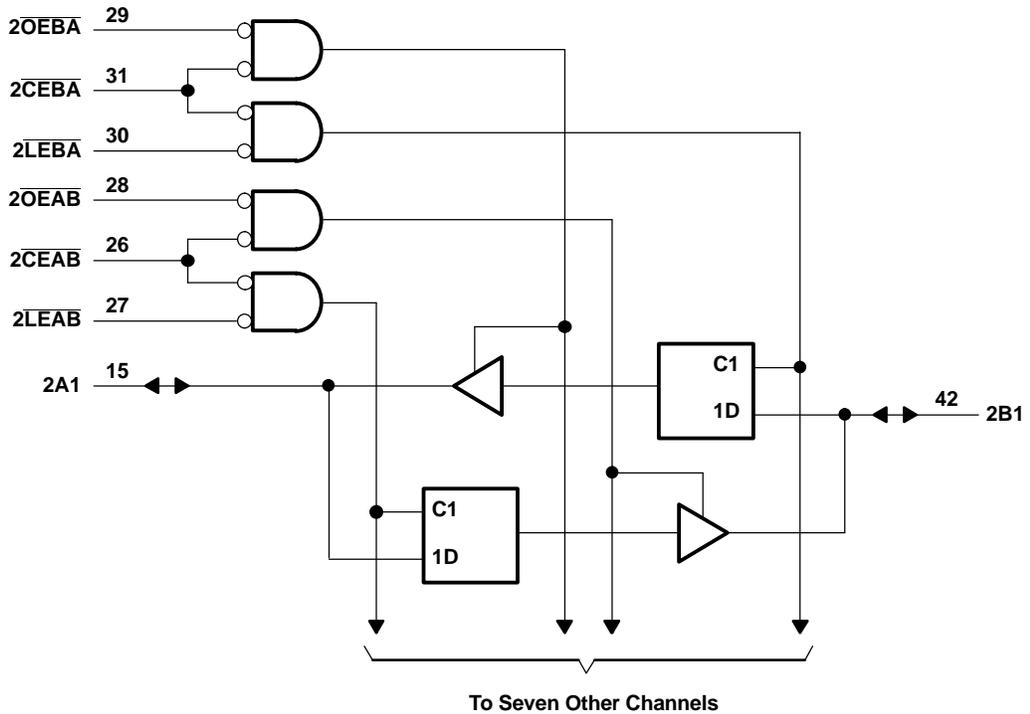
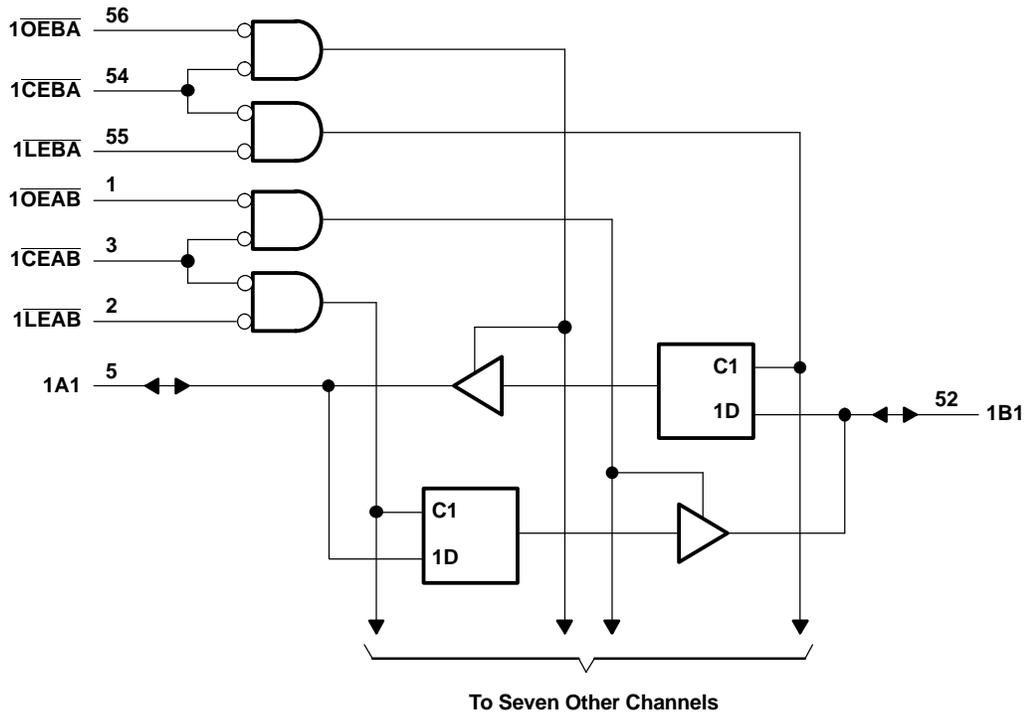
| INPUTS | | | | OUTPUT B |
|-------------------|-------------------|-------------------|---|-------------|
| \overline{CEAB} | \overline{LEAB} | \overline{OEAB} | A | |
| H | X | X | X | Z |
| X | X | H | X | Z |
| L | H | L | X | $B_0^{(2)}$ |
| L | L | L | L | L |
| L | L | L | H | H |

- (1) A-to-B data flow is shown; B-to-A flow control is the same, except that it uses \overline{CEBA} , \overline{LEBA} , and \overline{OEBA} .
- (2) Output level before the indicated steady-state input conditions were established

SN74LVCH16543A
16-BIT REGISTERED TRANSCEIVER
WITH 3-STATE OUTPUTS

SCAS317M—NOVEMBER 1993—REVISED MARCH 2005

LOGIC DIAGRAM (POSITIVE LOGIC)



Pin numbers shown are for the DGG, DGV, and DL packages.

Absolute Maximum Ratings⁽¹⁾

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

| | | MIN | MAX | UNIT |
|---------------|---|-----------------|----------------|------|
| V_{CC} | Supply voltage range | −0.5 | 6.5 | V |
| V_I | Input voltage range ⁽²⁾ | −0.5 | 6.5 | V |
| V_O | Voltage range applied to any output in the high-impedance or power-off state ⁽²⁾ | −0.5 | 6.5 | V |
| V_O | Voltage range applied to any output in the high or low state ⁽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 |
| | | DGV package | 48 | |
| | | DL package | 56 | |
| | | GQL/ZQL package | 42 | |
| 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) The value of V_{CC} is provided in the recommended operating conditions table.
- (4) The package thermal impedance is calculated in accordance with JESD 51-7.

Recommended Operating Conditions⁽¹⁾

| | | MIN | MAX | UNIT | |
|---------------------|------------------------------------|---|----------------------|----------------------|----|
| V_{CC} | Supply voltage | Operating | 1.65 | 3.6 | V |
| | | Data retention only | 1.5 | | |
| V_{IH} | High-level input voltage | $V_{CC} = 1.65\text{ V to }1.95\text{ V}$ | $0.65 \times V_{CC}$ | | V |
| | | $V_{CC} = 2.3\text{ V to }2.7\text{ V}$ | 1.7 | | |
| | | $V_{CC} = 2.7\text{ V to }3.6\text{ V}$ | 2 | | |
| V_{IL} | Low-level input voltage | $V_{CC} = 1.65\text{ V to }1.95\text{ V}$ | | $0.35 \times V_{CC}$ | V |
| | | $V_{CC} = 2.3\text{ V to }2.7\text{ V}$ | | 0.7 | |
| | | $V_{CC} = 2.7\text{ V to }3.6\text{ V}$ | | 0.8 | |
| V_I | Input voltage | 0 | 5.5 | V | |
| V_O | Output voltage | High or low state | 0 | V_{CC} | V |
| | | 3-state | 0 | 5.5 | |
| I_{OH} | High-level output current | $V_{CC} = 1.65\text{ V}$ | | −4 | mA |
| | | $V_{CC} = 2.3\text{ V}$ | | −8 | |
| | | $V_{CC} = 2.7\text{ V}$ | | −12 | |
| | | $V_{CC} = 3\text{ V}$ | | −24 | |
| I_{OL} | Low-level output current | $V_{CC} = 1.65\text{ V}$ | | 4 | mA |
| | | $V_{CC} = 2.3\text{ V}$ | | 8 | |
| | | $V_{CC} = 2.7\text{ V}$ | | 12 | |
| | | $V_{CC} = 3\text{ V}$ | | 24 | |
| $\Delta t/\Delta v$ | 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.

SN74LVCH16543A

16-BIT REGISTERED TRANSCEIVER WITH 3-STATE OUTPUTS

SCAS317M–NOVEMBER 1993–REVISED MARCH 2005

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} = -8 mA | 2.3 V | 1.7 | | | |
| | | I _{OH} = -12 mA | 2.7 V | 2.2 | | | |
| | | | 3 V | 2.4 | | | |
| | I _{OH} = -24 mA | 3 V | 2.2 | | | | |
| 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} = 8 mA | 2.3 V | | | 0.7 | |
| | | I _{OL} = 12 mA | 2.7 V | | | 0.4 | |
| | | I _{OL} = 24 mA | 3 V | | | 0.55 | |
| I _I | Control inputs | V _I = 0 to 5.5 V | 3.6 V | | | ±5 | μA |
| I _{off} | | V _I or V _O = 5.5 V | 0 | | | ±10 | μA |
| I _{I(hold)} | A or B ports | V _I = 0.58 V | 1.65 V | (2) | | | μA |
| | | V _I = 1.07 V | | (2) | | | |
| | | V _I = 0.7 V | 2.3 V | 45 | | | |
| | | V _I = 1.7 V | | -45 | | | |
| | | V _I = 0.8 V | 3 V | 75 | | | |
| | | V _I = 2 V | | -75 | | | |
| | | V _I = 0 to 3.6 V ⁽³⁾ | 3.6 V | | | ±500 | |
| I _{OZ} ⁽⁴⁾ | | V _O = 0 V or (V _{CC} to 5.5 V) | 2.3 V to 3.6 V | | | ±5 | μA |
| I _{CC} | | V _I = V _{CC} or GND, I _O = 0 | 3.6 V | | | 20 | μA |
| | | 3.6 V ≤ V _I ≤ 5.5 V ⁽⁵⁾ , I _O = 0 | | | | 20 | |
| ΔI _{CC} | | One input at V _{CC} - 0.6 V, Other inputs at V _{CC} or GND | 2.7 V to 3.6 V | | | 500 | μA |
| C _i | Control inputs | V _I = V _{CC} or GND | 3.3 V | | | 5 | pF |
| C _{io} | A or B ports | V _O = V _{CC} or GND | 3.3 V | | | 8 | pF |

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

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

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

(4) For the total leakage current in an I/O port, consult the I_{I(hold)} specification for the input voltage condition, 0 V < V_I < V_{CC}, and the I_{OZ} specification for the input voltage conditions, V_I = 0 V or V_I = V_{CC} to 5.5 V. The bus-hold current, at input voltage greater than V_{CC}, is negligible.

(5) This applies in the disabled state only.

Timing Requirements

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

| | | V _{CC} = 1.8 V ± 0.15 V | | V _{CC} = 2.5 V ± 0.2 V | | V _{CC} = 2.7 V | | V _{CC} = 3.3 V ± 0.3 V | | UNIT |
|-----------------|--|-------------------------------------|-----|------------------------------------|-----|-------------------------|-----|------------------------------------|-----|------|
| | | MIN | MAX | MIN | MAX | MIN | MAX | MIN | MAX | |
| t _w | Pulse duration, \overline{LE} or \overline{CE} low | (1) | | (1) | | 3.3 | | 3.3 | | ns |
| t _{su} | Setup time, data before \overline{LE} or \overline{CE} ↓ | (1) | | (1) | | 1.1 | | 1.1 | | ns |
| t _h | Hold time, data after \overline{LE} or \overline{CE} ↓ | (1) | | (1) | | 1.9 | | 1.9 | | ns |

(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 (INPUT) | TO (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 | |
| t_{pd} | A or B | B or A | (1) | (1) | (1) | (1) | 6.1 | 1.2 | 5.4 | ns | |
| | \overline{LE} | A or B | (1) | (1) | (1) | (1) | 7.4 | 1.5 | 6.1 | | |
| t_{en} | \overline{CE} | A or B | (1) | (1) | (1) | (1) | 7.9 | 1.2 | 6.6 | ns | |
| t_{dis} | | | (1) | (1) | (1) | (1) | 7.1 | 1.5 | 6.6 | | |
| t_{en} | \overline{OE} | A or B | (1) | (1) | (1) | (1) | 7.6 | 1 | 6.3 | ns | |
| t_{dis} | | | (1) | (1) | (1) | (1) | 6.9 | 1.5 | 6.3 | | |

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

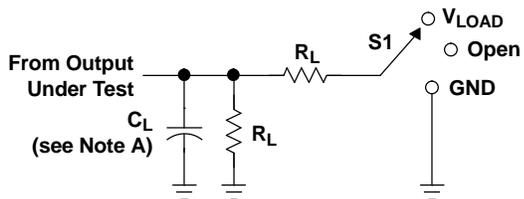
Operating Characteristics

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

| 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 transceiver | Outputs enabled | (1) | (1) | 44 | pF |
| | | Outputs disabled | (1) | (1) | 4 | |

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

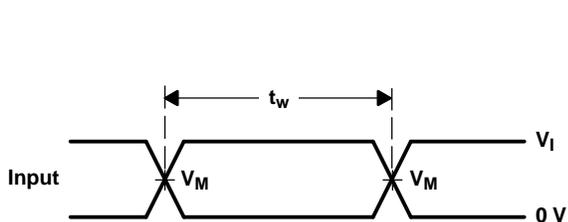
PARAMETER MEASUREMENT INFORMATION



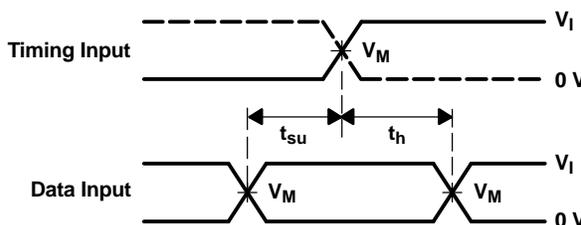
LOAD CIRCUIT

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

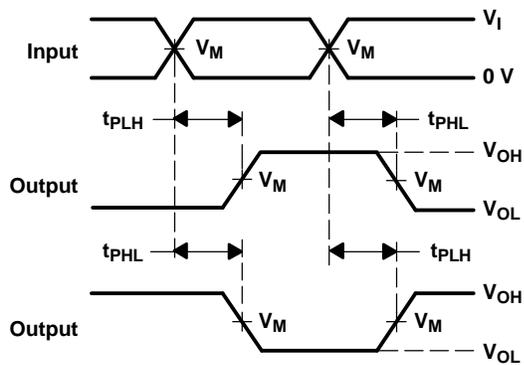
| V_{CC} | INPUTS | | V_M | V_{LOAD} | C_L | R_L | V_{Δ} |
|----------------------------------|----------|----------------------|------------|-------------------|-------|--------------|--------------|
| | V_I | t_r/t_f | | | | | |
| $1.8\text{ V} \pm 0.15\text{ V}$ | V_{CC} | $\leq 2\text{ ns}$ | $V_{CC}/2$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



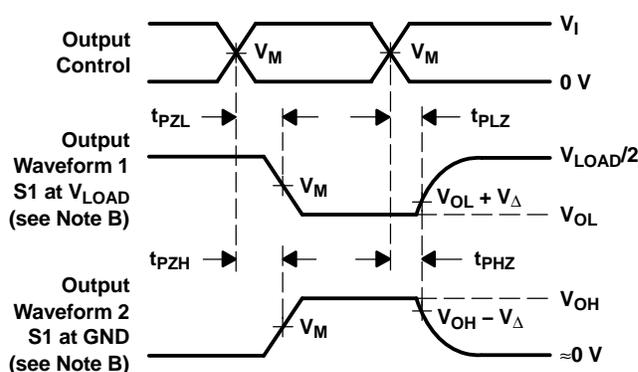
VOLTAGE WAVEFORMS
PULSE DURATION



VOLTAGE WAVEFORMS
SETUP AND HOLD TIMES



VOLTAGE WAVEFORMS
PROPAGATION DELAY TIMES
INVERTING AND NONINVERTING OUTPUTS



VOLTAGE WAVEFORMS
ENABLE AND DISABLE TIMES
LOW- AND HIGH-LEVEL ENABLING

- 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, $Z_O = 50\ \Omega$.
 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 (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead/Ball Finish | MSL Peak Temp (3) | Op Temp (°C) | Top-Side Markings (4) | Samples |
|--------------------|---------------|----------------------------|--------------------|------|----------------|----------------------------|------------------|----------------------|--------------|--------------------------|-------------------------|
| 74LVCH16543ADGGRE4 | ACTIVE | TSSOP | DGG | 56 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 85 | LVCH16543A | Samples |
| 74LVCH16543ADGGRG4 | ACTIVE | TSSOP | DGG | 56 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 85 | LVCH16543A | Samples |
| 74LVCH16543ADGVRE4 | ACTIVE | TVSOP | DGV | 56 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 85 | LDH543A | Samples |
| 74LVCH16543ADGVRG4 | ACTIVE | TVSOP | DGV | 56 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 85 | LDH543A | Samples |
| 74LVCH16543ADLRG4 | ACTIVE | SSOP | DL | 56 | 1000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 85 | LVCH16543A | Samples |
| SN74LVCH16543ADGGR | ACTIVE | TSSOP | DGG | 56 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 85 | LVCH16543A | Samples |
| SN74LVCH16543ADGVR | ACTIVE | TVSOP | DGV | 56 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 85 | LDH543A | Samples |
| SN74LVCH16543ADL | ACTIVE | SSOP | DL | 56 | 20 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 85 | LVCH16543A | Samples |
| SN74LVCH16543ADLG4 | ACTIVE | SSOP | DL | 56 | 20 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 85 | LVCH16543A | Samples |
| SN74LVCH16543ADLR | ACTIVE | SSOP | DL | 56 | 1000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 85 | LVCH16543A | Samples |
| SN74LVCH16543AGQLR | OBSOLETE | BGA MICROSTAR JUNIOR | GQL | 56 | | TBD | Call TI | Call TI | -40 to 85 | LDH543A | |

(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.

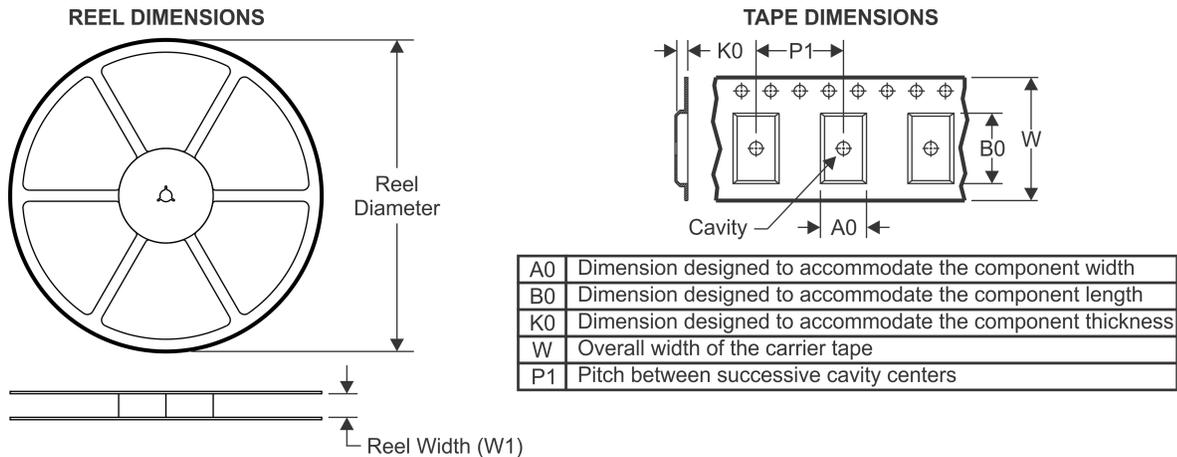
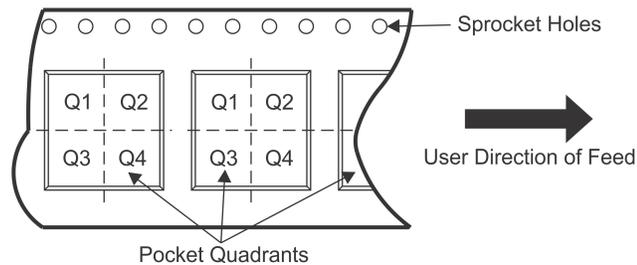
Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

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

⁽⁴⁾ Multiple Top-Side Markings will be inside parentheses. Only one Top-Side Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Top-Side Marking for that device.

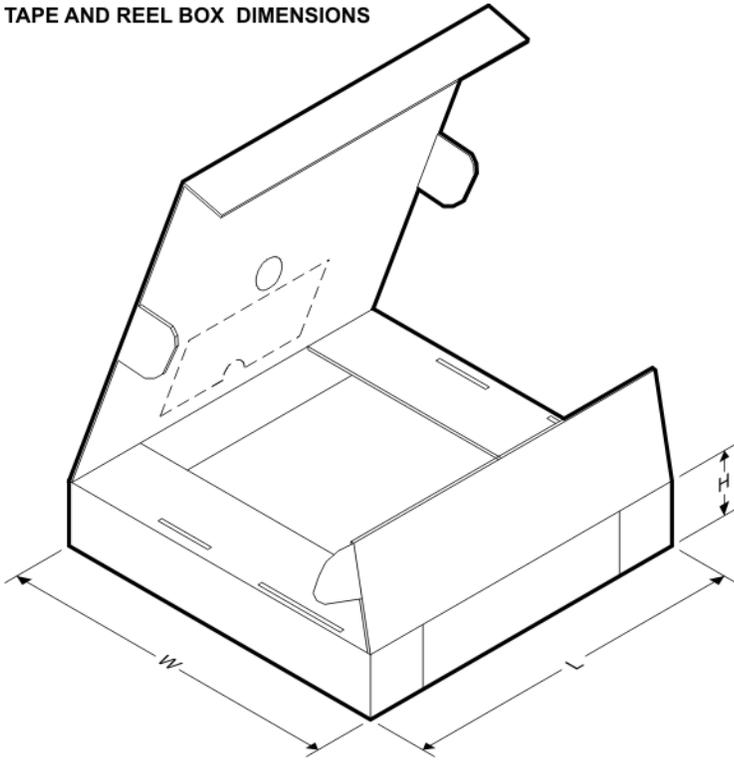
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TAPE AND REEL INFORMATION

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 |
|--------------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN74LVCH16543ADGGR | TSSOP | DGG | 56 | 2000 | 330.0 | 24.4 | 8.6 | 15.6 | 1.8 | 12.0 | 24.0 | Q1 |
| SN74LVCH16543ADGVR | TVSOP | DGV | 56 | 2000 | 330.0 | 24.4 | 6.8 | 11.7 | 1.6 | 12.0 | 24.0 | Q1 |
| SN74LVCH16543ADLR | SSOP | DL | 56 | 1000 | 330.0 | 32.4 | 11.35 | 18.67 | 3.1 | 16.0 | 32.0 | Q1 |

TAPE AND REEL BOX DIMENSIONS


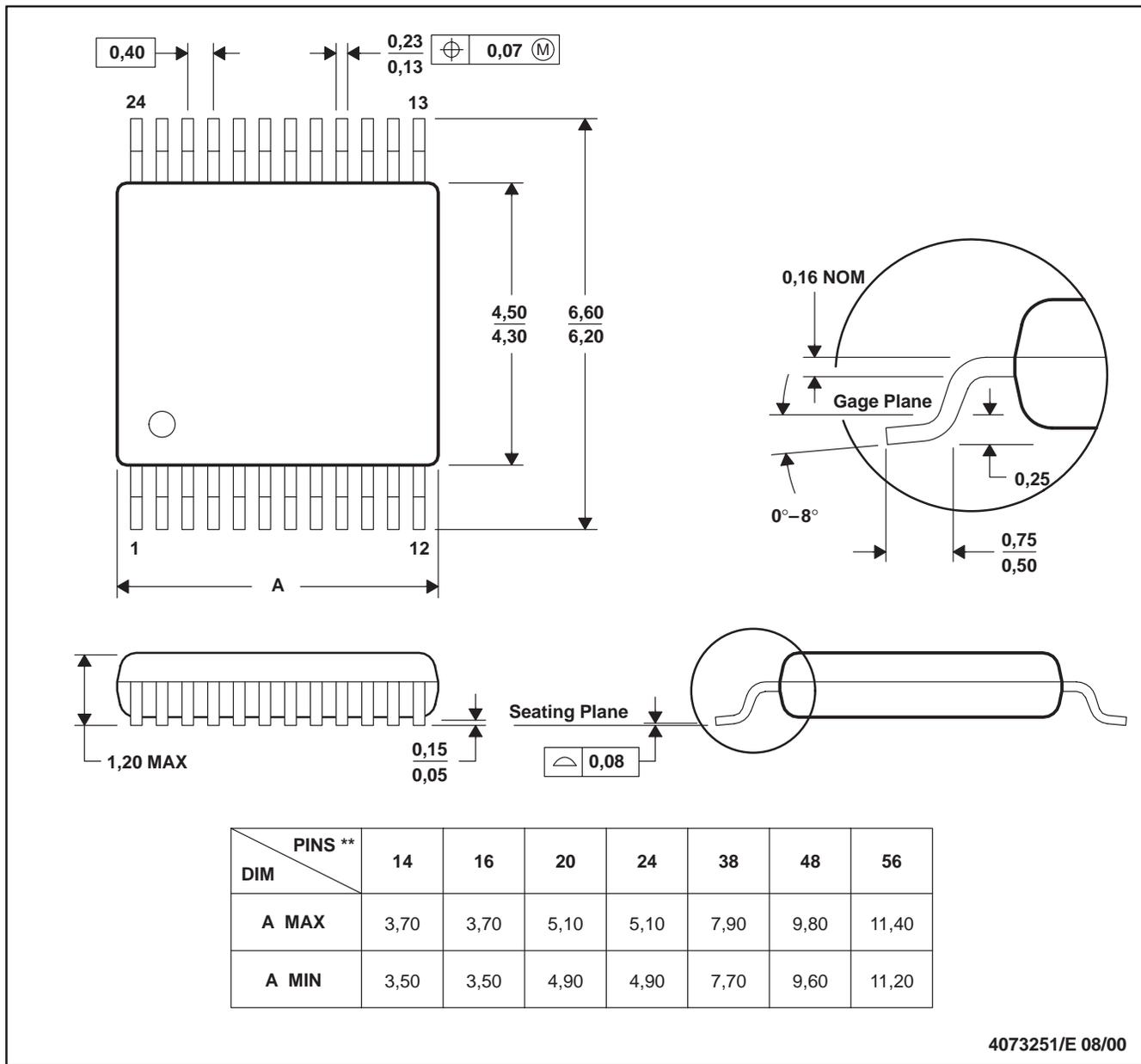
*All dimensions are nominal

| Device | Package Type | Package Drawing | Pins | SPQ | Length (mm) | Width (mm) | Height (mm) |
|--------------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN74LVCH16543ADGGR | TSSOP | DGG | 56 | 2000 | 367.0 | 367.0 | 45.0 |
| SN74LVCH16543ADGVR | TVSOP | DGV | 56 | 2000 | 367.0 | 367.0 | 45.0 |
| SN74LVCH16543ADLR | SSOP | DL | 56 | 1000 | 367.0 | 367.0 | 55.0 |

DGV (R-PDSO-G**)

PLASTIC SMALL-OUTLINE

24 PINS SHOWN



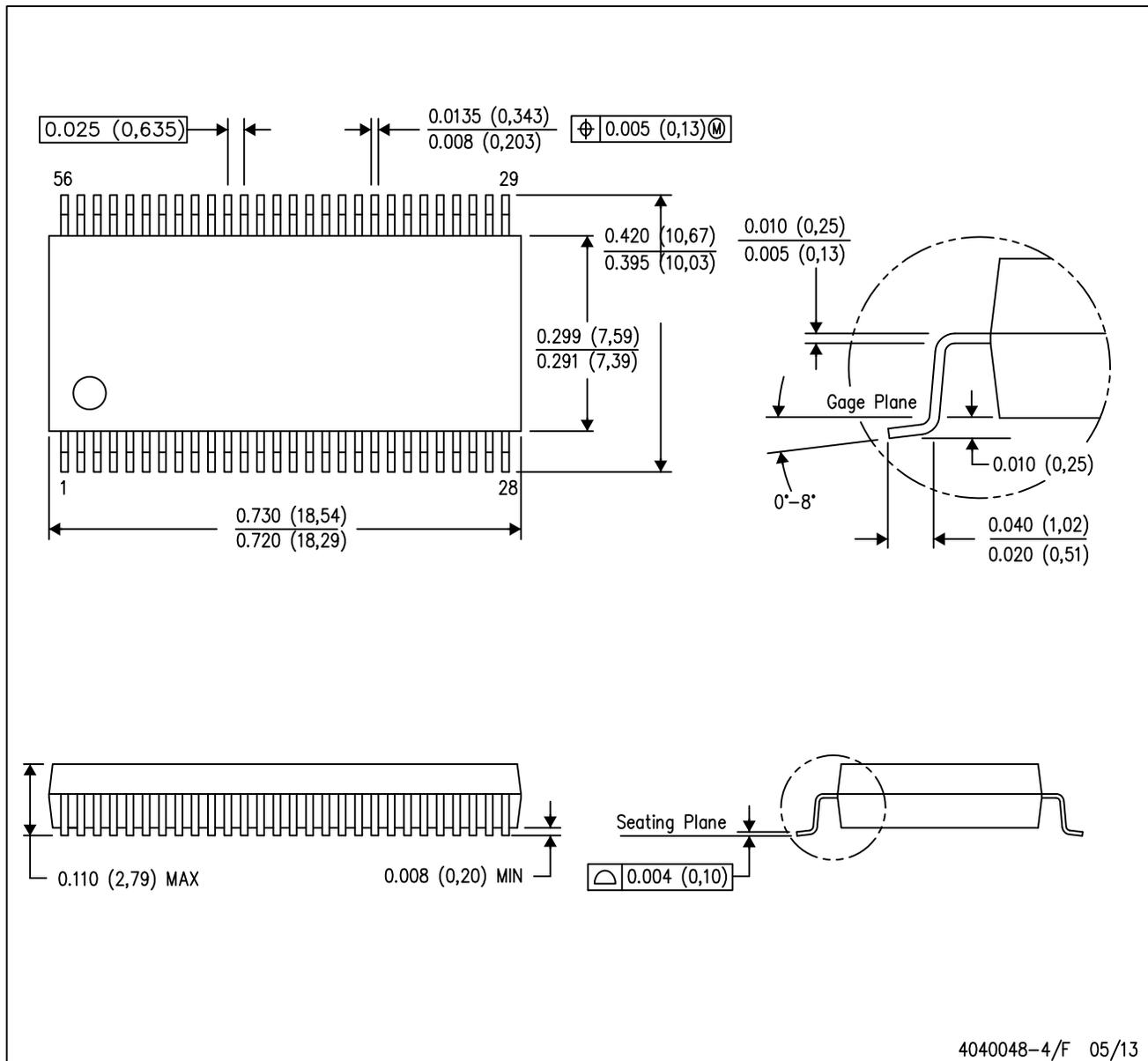
4073251/E 08/00

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

MECHANICAL DATA

DL (R-PDSO-G56)

PLASTIC SMALL-OUTLINE PACKAGE

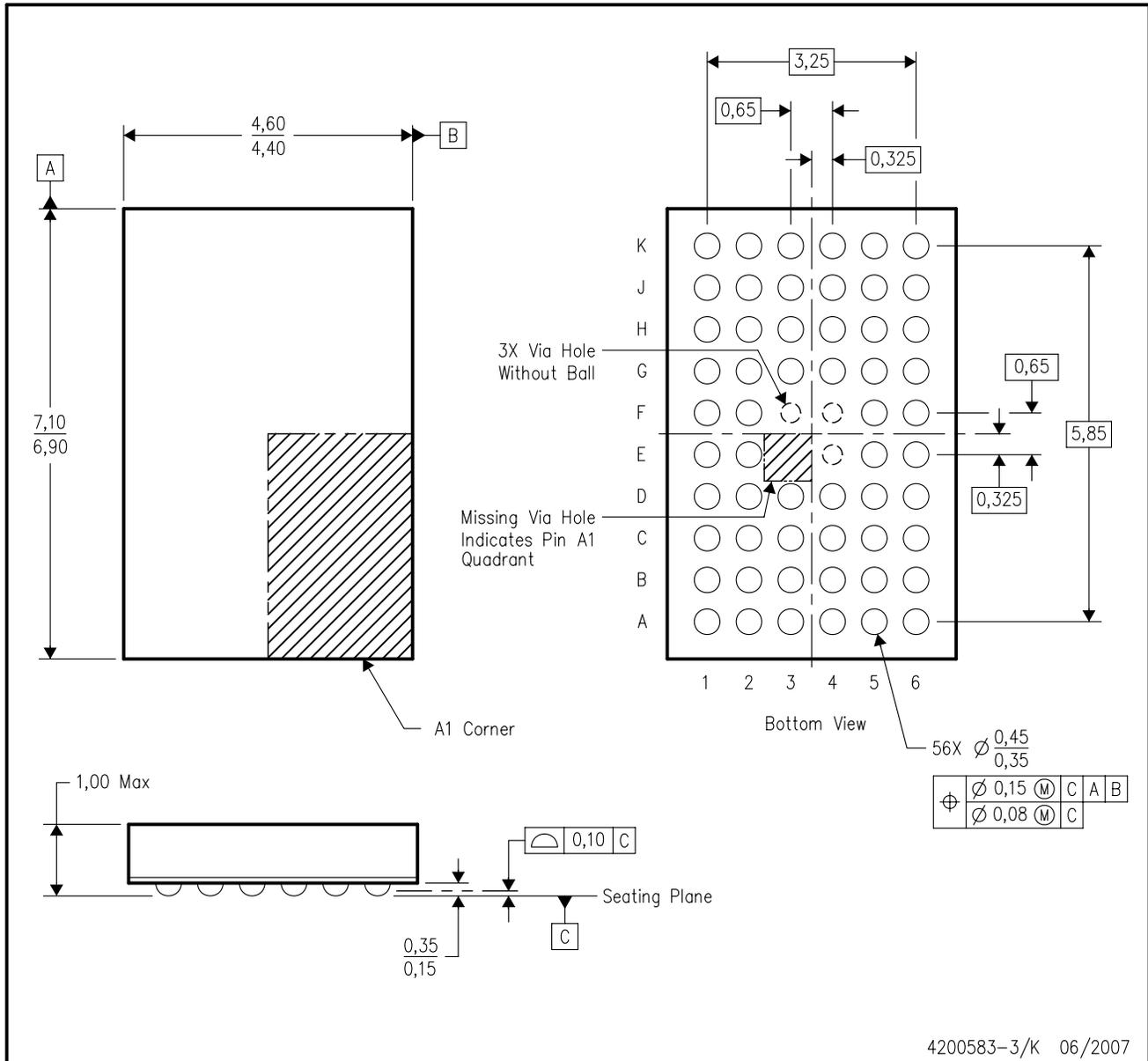


- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - C. Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
 - D. Falls within JEDEC MO-118

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GQL (R-PBGA-N56)

PLASTIC BALL GRID ARRAY

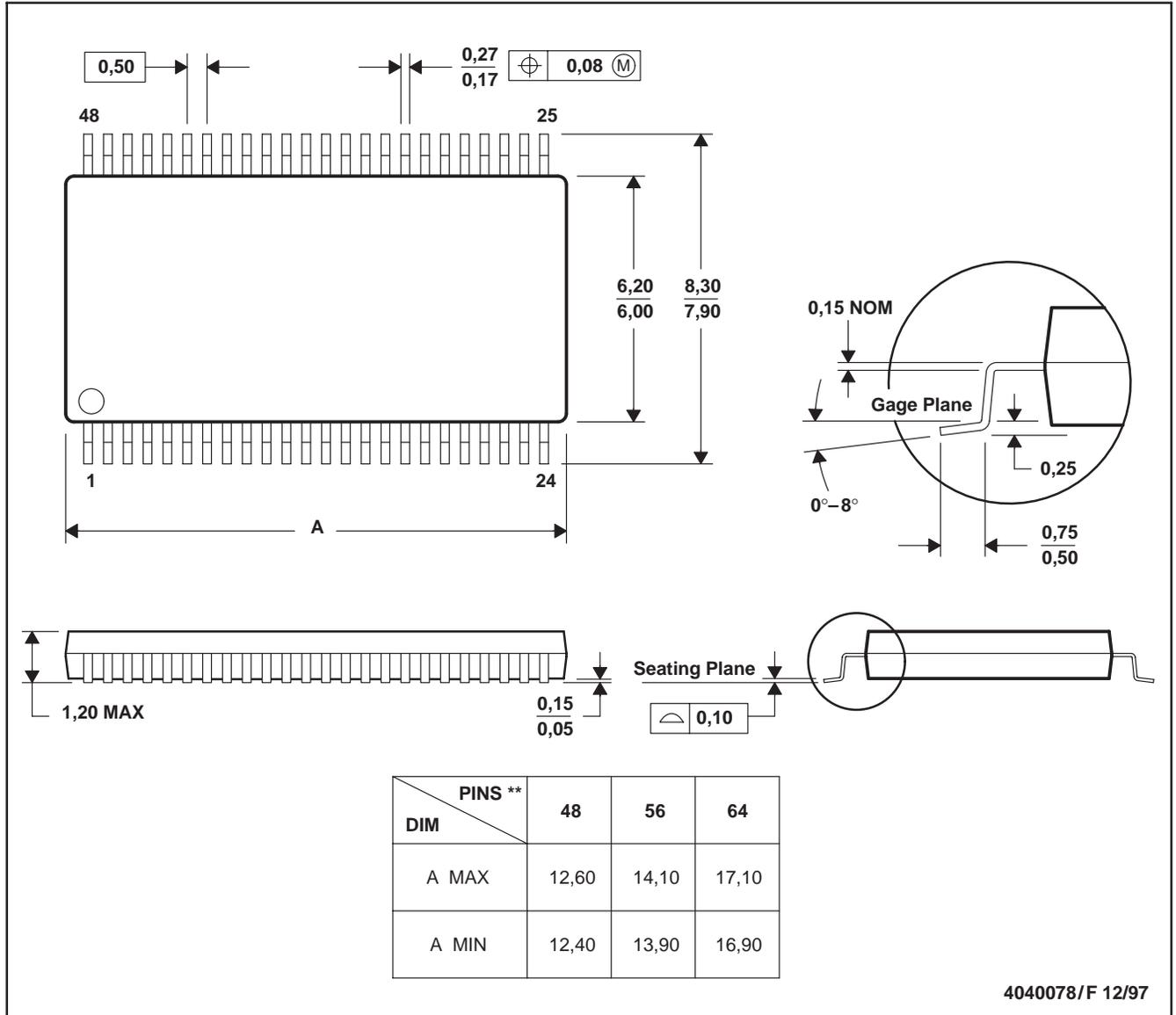


- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
 - B. This drawing is subject to change without notice.
 - C. Falls within JEDEC MO-285 variation BA-2.
 - D. This package is tin-lead (SnPb). Refer to the 56 ZQL package (drawing 4204437) for lead-free.

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

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