

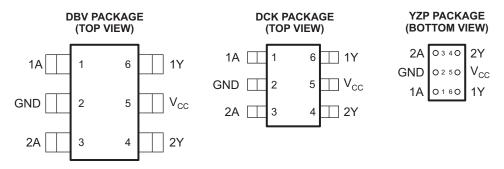
SCES308H-AUGUST 2001-REVISED JUNE 2008

DUAL BUFFER/DRIVER WITH OPEN-DRAIN OUTPUTS

FEATURES

- Available in the Texas Instruments NanoFree[™] Package
- Supports 5-V V_{CC} Operation
- Inputs and Open-Drain Outputs Accept Voltages up to 5.5 V
- Max t_{pd} of 3.7 ns at 3.3 V
- Low Power Consumption, 10- μ A Max I_{CC}
- ±24-mA Output Drive at 3.3 V
- **Typical V_{OLP} (Output Ground Bounce)** <0.8 V at V_{CC} = 3.3 V, T_A = 25°C

- Typical V_{OHV} (Output V_{OH} Undershoot) >2 V at V_{CC} = 3.3 V, T_A = 25°C
- Ioff Supports Partial-Power-Down Mode Operation
- Latch-Up Performance Exceeds 100 mA Per JESD 78. Class II
- **ESD Protection Exceeds JESD 22**
 - 2000-V Human-Body Model (A114-A)
 - 200-V Machine Model (A115-A)
 - 1000-V Charged-Device Model (C101)



See mechanical drawings for dimensions.

DESCRIPTION/ORDERING INFORMATION

This dual buffer/driver is designed for 1.65-V to 5.5-V V_{CC} operation. The output of the SN74LVC2G07 is open drain and can be connected to other open-drain outputs to implement active-low wired-OR or active-high wired-AND functions. The maximum sink current is 32 mA.

NanoFree[™] package technology is a major breakthrough in IC packaging concepts, using the die as the package.

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



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. NanoFree is a trademark of Texas Instruments.

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NSTRUMENTS

XAS

ORDERING INFORMATION

| T _A | PACKAGE ⁽¹⁾⁽²⁾ | | ORDERABLE PART NUMBER | TOP-SIDE MARKING ⁽³⁾ | |
|----------------|--|--------------|-----------------------|---------------------------------|--|
| | NanoFree™ – WCSP (DSBGA) 0.23-mm Large Bump – YZP (Pb-free) | Reel of 3000 | SN74LVC2G07YZPR | CV_ | |
| –40°C to 85°C | SOT (SOT-23) – DBV | Reel of 3000 | SN74LVC2G07DBVR | C07_ | |
| | 007 (00 70) DOV | Reel of 3000 | SN74LVC2G07DCKR | 0)/ | |
| | SOT (SC-70) – DCK | Reel of 250 | SN74LVC2G07DCKT | CV_ | |

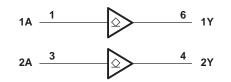
(1) For the most current package and ordering information, see the Package Option Addendum at the end of this document, or see the TI website at www.ti.com.

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

(3) DBV/DCK: The actual top-side marking has one additional character that designates the assembly/test site. YZP: The actual top-side marking has three preceding characters to denote year, month, and sequence code, and one following character to designate the assembly/test site. Pin 1 identifier indicates solder-bump composition (1 = SnPb, • = Pb-free).

| FUNCTION TABLE (EACH BUFFER/DRIVER) | | | | | | | |
|--|-------------|--|--|--|--|--|--|
| INPUT A | OUTPUT Y | | | | | | |
| L | L | | | | | | |
| Н | Z | | | | | | |

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 | 6.5 | V |
| VI | Input voltage range ⁽²⁾ | -0.5 | 6.5 | V | |
| Vo | Voltage range applied to any output in the high-im | -0.5 | 6.5 | V | |
| Vo | Voltage range applied to any output in the high or | -0.5 | 6.5 | V | |
| I _{IK} | Input clamp current | V ₁ < 0 | | -50 | mA |
| I _{OK} | Output clamp current | V _O < 0 | | -50 | mA |
| lo | Continuous output current | | | ±50 | mA |
| | Continuous current through V _{CC} or GND | | | ±100 | mA |
| | | DBV package | | 165 | |
| θ_{JA} | Package thermal impedance ⁽⁴⁾ | DCK package | | 259 | °C/W |
| | | YZP package | | 123 | |
| 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.



SN74LVC2G07

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RECOMMENDED OPERATING CONDITIONS⁽¹⁾

| | | | MIN | MAX | UNIT | | | |
|-----------------|------------------------------------|--|------------------------|----------------------|------|--|--|--|
| V | Supply voltage | Operating | 1.65 | 5.5 | V | | | |
| V _{CC} | Supply voltage | Data retention only | 1.5 | | v | | | |
| | | V _{CC} = 1.65 V to 1.95 V | 0.65 × V _{CC} | | | | | |
| | | $V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$ | | | V | | | |
| V _{IH} | High-level input voltage | $V_{CC} = 3 V \text{ to } 3.6 V$ | 2 | | V | | | |
| | | V_{CC} = 4.5 V to 5.5 V | $0.7 \times V_{CC}$ | | | | | |
| | | V _{CC} = 1.65 V to 1.95 V | | $0.35 \times V_{CC}$ | | | | |
| V | | $V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$ | | 0.7 | V | | | |
| V _{IL} | Low-level input voltage | $V_{CC} = 3 V \text{ to } 3.6 V$ | | 0.8 | | | | |
| | | $V_{CC} = 4.5 \text{ V} \text{ to } 5.5 \text{ V}$ | | $0.3 \times V_{CC}$ | | | | |
| VI | Input voltage | | 0 | 5.5 | V | | | |
| Vo | Output voltage | | 0 | 5.5 | V | | | |
| | | V _{CC} = 1.65 V | | 4 | | | | |
| | | $V_{CC} = 2.3 V$ | | 8 | | | | |
| I _{OL} | Low-level output current | N 2V | | 16 | mA | | | |
| | | $V_{CC} = 3 V$ | | 24 | | | | |
| | | $V_{CC} = 4.5 V$ | | 32 | | | | |
| | | V_{CC} = 1.8 V ± 0.15 V, 2.5 V ± 0.2 V | | 20 | | | | |
| Δt/Δv | Input transition rise or fall rate | $V_{CC} = 3.3 \text{ V} \pm 0.3 \text{ V}$ | | 10 | ns/V | | | |
| | | $V_{CC} = 5 V \pm 0.5 V$ | | 5 | | | | |
| T _A | Operating free-air temperature | | -40 | 85 | °C | | | |

 All unused 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.

ELECTRICAL CHARACTERISTICS

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

| PAF | RAMETER | TEST C | ONDITIONS | V _{cc} | MIN TYP ⁽¹⁾ | MAX | UNIT | | |
|------------------|----------|---|---------------------------------|-----------------|------------------------|------|------|--|--|
| | | I _{OL} = 100 μA | | 1.65 V to 5.5 V | | | | | |
| | | $I_{OL} = 4 \text{ mA}$ | | 1.65 V | | 0.45 | | | |
| V | | I _{OL} = 8 mA | 2.3 V | | 0.3 | V | | | |
| V _{OL} | | I _{OL} = 16 mA | 2.)/ | | V | | | | |
| | | I _{OL} = 24 mA | | - 3 V | | 0.55 | | | |
| | | I _{OL} = 32 mA | | 4.5 V | | | | | |
| l _l | A inputs | $V_1 = 5.5 V \text{ or GND}$ | | 0 to 5.5 V | | ±5 | μA | | |
| I _{off} | | $V_{I} \text{ or } V_{O} = 5.5 \text{ V}$ | | 0 | | ±10 | μA | | |
| I _{CC} | | $V_1 = 5.5 V \text{ or GND},$ | l _O = 0 | 1.65 V to 5.5 V | | 10 | μA | | |
| ΔI_{CC} | | One input at $V_{CC} - 0.6 V$, | Other inputs at V_{CC} or GND | 3 V to 5.5 V | | 500 | μA | | |
| CI | | $V_{I} = V_{CC}$ or GND | | 3.3 V | 3.5 | | pF | | |

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

3



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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 ± 0.15 V ± 0.2 V | | V _{CC} = 3.3 V ± 0.3 V | | V _{CC} = 5 V ± 0.5 V | | UNIT | |
|--|-----------------|-----------------|----------------|-----|---|-----|------------------------------------|-----|----------------------------------|-----|------|----|
| | | | (001201) | MIN | MAX | MIN | MAX | MIN | MAX | MIN | MAX | |
| | t _{pd} | А | Y | 1.5 | 8.6 | 1 | 4.4 | 1 | 3.7 | 1 | 2.9 | ns |

OPERATING CHARACTERISTICS

 $T_A = 25^{\circ}C$

| | PARAMETER | TEST CONDITIONS | V _{CC} = 1.8 V | V_{CC} = 2.5 V | V _{CC} = 3.3 V | $V_{CC} = 5 V$ | UNIT | |
|-----------------|-------------------------------|-----------------|-------------------------|------------------|-------------------------|----------------|------|--|
| | | | TYP | TYP | TYP | TYP | UNIT | |
| C _{pd} | Power dissipation capacitance | f = 10 MHz | 3 | 3 | 4 | 4 | pF | |

4

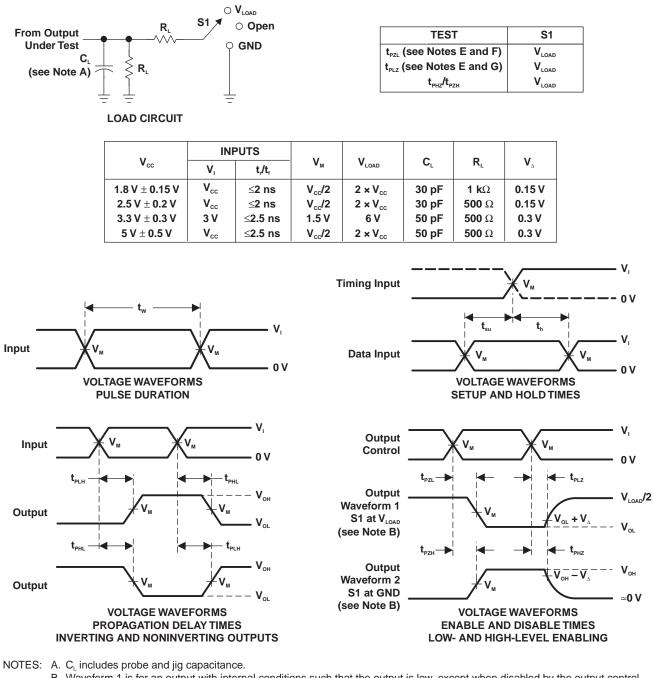
SN74LVC2G07



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PARAMETER MEASUREMENT INFORMATION (OPEN DRAIN)



- 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 have the following characteristics: PRR \leq 10 MHz, Z_o = 50 Ω .
- D. The outputs are measured one at a time, with one transition per measurement.
- E. Because this device has open-drain outputs, t_{PLZ} and t_{PZL} are the same as t_{PD} .
- F. t_{PZL} is measured at V_{M} .
- G. t_{PLZ} is measured at $V_{OL} + V_{\Delta}$.
- 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⁾ | Samples (Requires Login) |
|-------------------|-----------------------|--------------|--------------------|------|-------------|----------------------------|----------------------|------------------------------|-----------------------------|
| SN74LVC2G07DBVR | ACTIVE | SOT-23 | DBV | 6 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | Request Free Samples |
| SN74LVC2G07DBVRE4 | ACTIVE | SOT-23 | DBV | 6 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | Request Free Samples |
| SN74LVC2G07DBVRG4 | ACTIVE | SOT-23 | DBV | 6 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | Request Free Samples |
| SN74LVC2G07DCKR | ACTIVE | SC70 | DCK | 6 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | Request Free Samples |
| SN74LVC2G07DCKRE4 | ACTIVE | SC70 | DCK | 6 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | Purchase Samples |
| SN74LVC2G07DCKRG4 | ACTIVE | SC70 | DCK | 6 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | Request Free Samples |
| SN74LVC2G07DCKT | ACTIVE | SC70 | DCK | 6 | 250 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | Purchase Samples |
| SN74LVC2G07DCKTE4 | ACTIVE | SC70 | DCK | 6 | 250 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | Purchase Samples |
| SN74LVC2G07DCKTG4 | ACTIVE | SC70 | DCK | 6 | 250 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | Purchase Samples |
| SN74LVC2G07YEPR | OBSOLETE | WCSP | YEP | 6 | | TBD | Call TI | Call TI | Samples Not Available |
| SN74LVC2G07YZPR | ACTIVE | DSBGA | YZP | 6 | 3000 | Green (RoHS & no Sb/Br) | SNAGCU | Level-1-260C-UNLIM | Request Free Samples |

⁽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.



18-Oct-2010

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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OTHER QUALIFIED VERSIONS OF SN74LVC2G07 :

Enhanced Product: SN74LVC2G07-EP

NOTE: Qualified Version Definitions:

• Enhanced Product - Supports Defense, Aerospace and Medical Applications

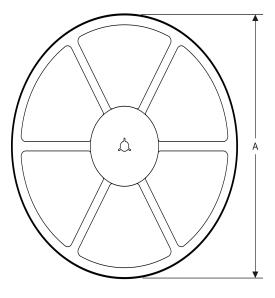
PACKAGE MATERIALS INFORMATION

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TAPE AND REEL INFORMATION

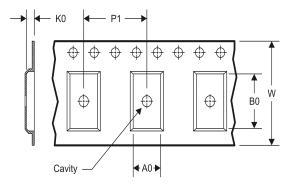
REEL DIMENSIONS

TEXAS INSTRUMENTS





TAPE DIMENSIONS



| A0 | Dimension designed to accommodate the component width |
|----|---|
| B0 | Dimension designed to accommodate the component length |
| K0 | Dimension designed to accommodate the component thickness |
| W | Overall width of the carrier tape |
| P1 | Pitch between successive cavity centers |

TAPE AND REEL INFORMATION

*All dimensions are nominal

| Device | Package Type | Package Drawing | | SPQ | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|-----------------|-----------------|--------------------|---|------|--------------------------|--------------------------|------------|------------|------------|------------|-----------|------------------|
| SN74LVC2G07DBVR | SOT-23 | DBV | 6 | 3000 | 178.0 | 9.2 | 3.3 | 3.2 | 1.55 | 4.0 | 8.0 | Q3 |
| SN74LVC2G07DBVR | SOT-23 | DBV | 6 | 3000 | 178.0 | 9.0 | 3.23 | 3.17 | 1.37 | 4.0 | 8.0 | Q3 |
| SN74LVC2G07DBVR | SOT-23 | DBV | 6 | 3000 | 180.0 | 9.2 | 3.17 | 3.23 | 1.37 | 4.0 | 8.0 | Q3 |
| SN74LVC2G07DCKR | SC70 | DCK | 6 | 3000 | 178.0 | 9.2 | 2.4 | 2.4 | 1.22 | 4.0 | 8.0 | Q3 |
| SN74LVC2G07DCKR | SC70 | DCK | 6 | 3000 | 178.0 | 9.0 | 2.4 | 2.5 | 1.2 | 4.0 | 8.0 | Q3 |
| SN74LVC2G07DCKR | SC70 | DCK | 6 | 3000 | 180.0 | 9.2 | 2.3 | 2.55 | 1.2 | 4.0 | 8.0 | Q3 |
| SN74LVC2G07DCKT | SC70 | DCK | 6 | 250 | 180.0 | 9.2 | 2.3 | 2.55 | 1.2 | 4.0 | 8.0 | Q3 |
| SN74LVC2G07DCKT | SC70 | DCK | 6 | 250 | 178.0 | 9.0 | 2.4 | 2.5 | 1.2 | 4.0 | 8.0 | Q3 |
| SN74LVC2G07DCKT | SC70 | DCK | 6 | 250 | 178.0 | 9.2 | 2.4 | 2.4 | 1.22 | 4.0 | 8.0 | Q3 |
| SN74LVC2G07YZPR | DSBGA | YZP | 6 | 3000 | 180.0 | 8.4 | 1.02 | 1.52 | 0.63 | 4.0 | 8.0 | Q1 |

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PACKAGE MATERIALS INFORMATION

14-Mar-2012



| *All dimensions are nominal | | | | | | | |
|-----------------------------|--------------|-----------------|------|------|-------------|------------|-------------|
| Device | Package Type | Package Drawing | Pins | SPQ | Length (mm) | Width (mm) | Height (mm) |
| SN74LVC2G07DBVR | SOT-23 | DBV | 6 | 3000 | 180.0 | 180.0 | 18.0 |
| SN74LVC2G07DBVR | SOT-23 | DBV | 6 | 3000 | 180.0 | 180.0 | 18.0 |
| SN74LVC2G07DBVR | SOT-23 | DBV | 6 | 3000 | 205.0 | 200.0 | 33.0 |
| SN74LVC2G07DCKR | SC70 | DCK | 6 | 3000 | 180.0 | 180.0 | 18.0 |
| SN74LVC2G07DCKR | SC70 | DCK | 6 | 3000 | 180.0 | 180.0 | 18.0 |
| SN74LVC2G07DCKR | SC70 | DCK | 6 | 3000 | 205.0 | 200.0 | 33.0 |
| SN74LVC2G07DCKT | SC70 | DCK | 6 | 250 | 205.0 | 200.0 | 33.0 |
| SN74LVC2G07DCKT | SC70 | DCK | 6 | 250 | 180.0 | 180.0 | 18.0 |
| SN74LVC2G07DCKT | SC70 | DCK | 6 | 250 | 180.0 | 180.0 | 18.0 |
| SN74LVC2G07YZPR | DSBGA | YZP | 6 | 3000 | 220.0 | 220.0 | 34.0 |

DBV (R-PDSO-G6)

PLASTIC SMALL-OUTLINE PACKAGE



- 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. Mold flash and protrusion shall not exceed 0.15 per side.
- D. Leads 1,2,3 may be wider than leads 4,5,6 for package orientation.
- È. Falls within JEDEC MO-178 Variation AB, except minimum lead width.



LAND PATTERN DATA



NOTES:

- A. All linear dimensions are in millimeters.B. This drawing is subject to change without notice.
- C. Customers should place a note on the circuit board fabrication drawing not to alter the center solder mask defined pad.
- D. Publication IPC-7351 is recommended for alternate designs.
- E. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Example stencil design based on a 50% volumetric metal load solder paste. Refer to IPC-7525 for other stencil recommendations.



DCK (R-PDSO-G6)

PLASTIC SMALL-OUTLINE PACKAGE



- 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. Mold flash and protrusion shall not exceed 0.15 per side.
 - D. Falls within JEDEC MO-203 variation AB.



LAND PATTERN DATA



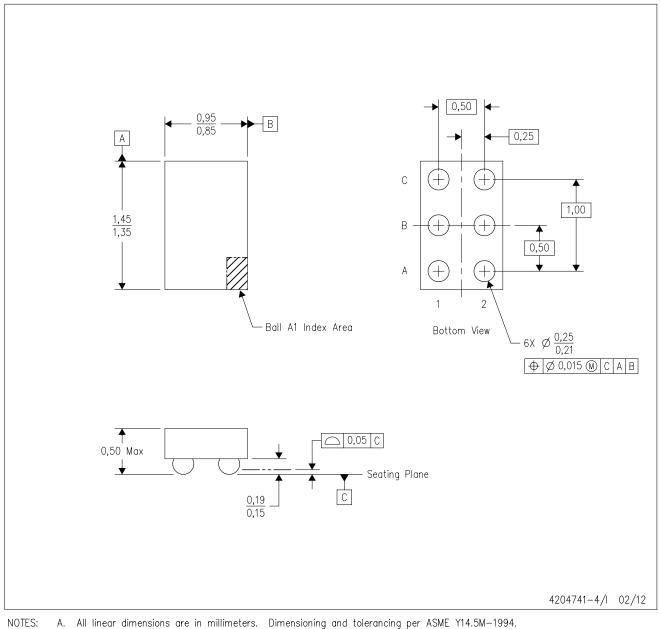
NOTES:

- A. All linear dimensions are in millimeters.B. This drawing is subject to change without notice.
- C. Customers should place a note on the circuit board fabrication drawing not to alter the center solder mask defined pad.
- D. Publication IPC-7351 is recommended for alternate designs.
- E. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Example stencil design based on a 50% volumetric metal load solder paste. Refer to IPC-7525 for other stencil recommendations.



YZP (R-XBGA-N6)

DIE-SIZE BALL GRID ARRAY



B. This drawing is subject to change without notice.

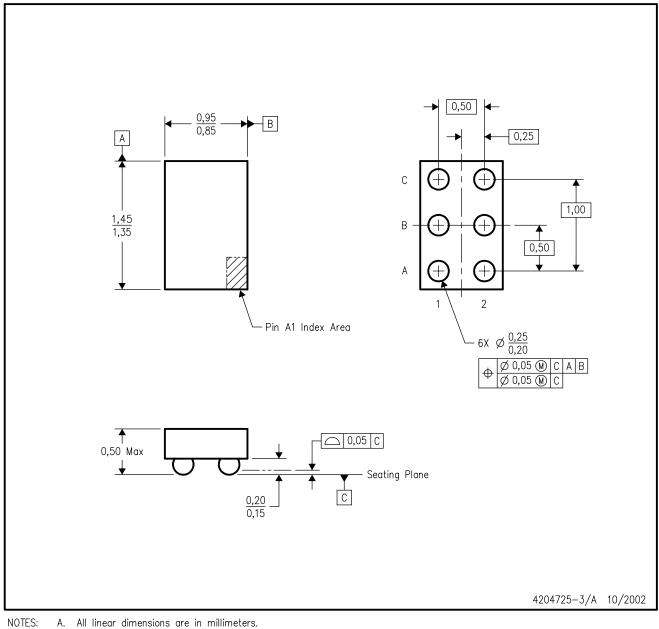
- C. NanoFree™ package configuration.
- D. This package is a Pb-free solder ball design. Refer to the 6 YEP package (drawing 4204725) for tin-lead (SnPb).

NanoFree is a trademark of Texas Instruments.



YEP (R-XBGA-N6)

DIE-SIZE BALL GRID ARRAY



- B. This drawing is subject to change without notice.
- C. NanoStar™ package configuration.
- D. This package is tin-lead (SnPb). Refer to the 6 YZP package (drawing 4204741) for lead-free.

NanoStar is a trademark of Texas Instruments.



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