

## Dual Buffer/Driver With 3-State Outputs

Check for Samples: [SN74LVC2G241](#)

### FEATURES

- Available in the Texas Instruments NanoFree™ Package
- Supports 5-V  $V_{CC}$  Operation
- Inputs Accept Voltages to 5.5 V
- Max  $t_{pd}$  of 4.1 ns at 3.3 V
- Low Power Consumption, 10- $\mu$ A Max  $I_{CC}$
- $\pm 24$ -mA Output Drive at 3.3 V
- Typical  $V_{OLP}$  (Output Ground Bounce)  $< 0.8$  V at  $V_{CC} = 3.3$  V,  $T_A = 25^\circ\text{C}$
- Typical  $V_{OHV}$  (Output  $V_{OH}$  Undershoot)  $> 2$  V at  $V_{CC} = 3.3$  V,  $T_A = 25^\circ\text{C}$
- $I_{off}$  Supports Live Insertion, Partial-Power-Down Mode, and Back-Drive Protection
- Can Be Used as a Down Translator to Translate Inputs From a Max of 5.5 V Down to the  $V_{CC}$  Level
- 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)

### DESCRIPTION

This dual buffer/line driver is designed for 1.65-V to 5.5-V  $V_{CC}$  operation.

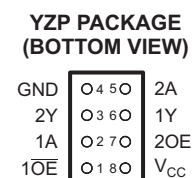
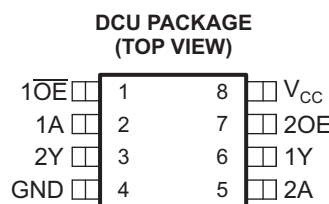
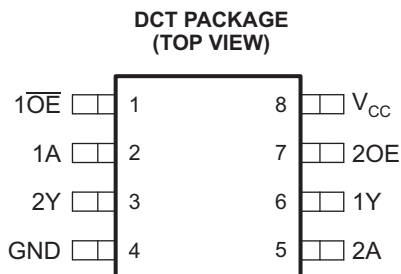
The SN74LVC2G241 device is designed specifically to improve both the performance and density of 3-state memory-address drivers, clock drivers, and bus-oriented receivers and transmitters.

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

The SN74LVC2G241 device is organized as two 1-bit line drivers with separate output-enable (1OE, 2OE) inputs. When 1OE is low and 2OE is high, the device passes data from the A inputs to the Y outputs. When 1OE is high and 2OE is low, the outputs are in the high-impedance state.

To ensure the high-impedance state during power up or power down, OE should be tied to  $V_{CC}$  through a pullup resistor, and OE should be tied to GND through a pulldown resistor; the minimum value of the resistor is determined by the current-sinking or the current-sourcing 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.



See mechanical drawings for dimensions.



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.

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PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of the Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

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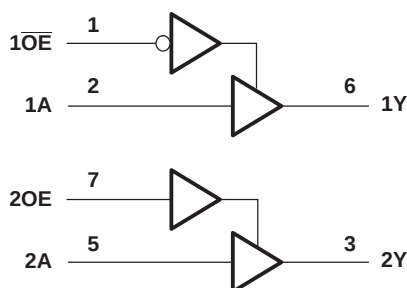


These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

**Function Tables**

| INPUTS           |    | OUTPUT<br>1Y |
|------------------|----|--------------|
| $\overline{1OE}$ | 1A |              |
| L                | H  | H            |
| L                | L  | L            |
| H                | X  | Z            |

| INPUTS |    | OUTPUT<br>2Y |
|--------|----|--------------|
| 2OE    | 2A |              |
| H      | H  | H            |
| H      | L  | L            |
| L      | X  | Z            |

**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>                                                    | DCT package        |      | 220                   | °C/W |
|                  |                                                                                             | DCU package        |      | 227                   |      |
|                  |                                                                                             | YZP package        |      | 102                   |      |
| 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  $V_{CC}$  is provided in the recommended operating conditions table.
- (4) The package thermal impedance is calculated in accordance with JESD 51-7.

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

|                 |                                    |                                                 | MIN                    | MAX                    | UNIT |
|-----------------|------------------------------------|-------------------------------------------------|------------------------|------------------------|------|
| V <sub>CC</sub> | Supply voltage                     | Operating                                       | 1.65                   | 5.5                    | 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> = 3 V to 3.6 V                  | 2                      |                        |      |
|                 |                                    | V <sub>CC</sub> = 4.5 V to 5.5 V                | 0.7 × V <sub>CC</sub>  |                        |      |
| 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> = 3 V to 3.6 V                  |                        | 0.8                    |      |
|                 |                                    | V <sub>CC</sub> = 4.5 V to 5.5 V                |                        | 0.3 × V <sub>CC</sub>  |      |
| 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> = 3 V                           |                        | –16                    |      |
|                 |                                    | V <sub>CC</sub> = 4.5 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> = 3 V                           |                        | 16                     |      |
|                 |                                    | V <sub>CC</sub> = 4.5 V                         |                        | 24                     |      |
| Δt/Δv           | Input transition rise or fall rate | V <sub>CC</sub> = 1.8 V ± 0.15 V, 2.5 V ± 0.2 V |                        | 20                     | ns/V |
|                 |                                    | V <sub>CC</sub> = 3.3 V ± 0.3 V                 |                        | 10                     |      |
|                 |                                    | V <sub>CC</sub> = 5 V ± 0.5 V                   |                        | 5                      |      |
| 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](#).

## Electrical Characteristics

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

| PARAMETER        |                           | TEST CONDITIONS                                                              | V <sub>CC</sub> | –40°C to 85°C         |                    |     | –40°C to 125°C        |                    |     | UNIT |
|------------------|---------------------------|------------------------------------------------------------------------------|-----------------|-----------------------|--------------------|-----|-----------------------|--------------------|-----|------|
|                  |                           |                                                                              |                 | MIN                   | TYP <sup>(1)</sup> | MAX | MIN                   | TYP <sup>(1)</sup> | MAX |      |
| V <sub>OH</sub>  | I <sub>OH</sub> = –100 μA |                                                                              | 1.65 V to 5.5 V | V <sub>CC</sub> – 0.1 |                    |     | V <sub>CC</sub> – 0.1 |                    |     | V    |
|                  | I <sub>OH</sub> = –4 mA   |                                                                              | 1.65 V          | 1.2                   |                    |     | 1.2                   |                    |     |      |
|                  | I <sub>OH</sub> = –8 mA   |                                                                              | 2.3 V           | 1.9                   |                    |     | 1.9                   |                    |     |      |
|                  | I <sub>OH</sub> = –16 mA  |                                                                              | 3 V             | 2.4                   |                    |     | 2.4                   |                    |     |      |
|                  | I <sub>OH</sub> = –24 mA  |                                                                              |                 | 2.3                   |                    |     | 2.3                   |                    |     |      |
|                  | I <sub>OH</sub> = –32 mA  |                                                                              | 4.5 V           | 3.8                   |                    |     | 3.8                   |                    |     |      |
| V <sub>OL</sub>  | I <sub>OL</sub> = 100 μA  |                                                                              | 1.65 V to 5.5 V | 0.1                   |                    |     | 0.1                   |                    |     | V    |
|                  | I <sub>OL</sub> = 4 mA    |                                                                              | 1.65 V          | 0.45                  |                    |     | 0.45                  |                    |     |      |
|                  | I <sub>OL</sub> = 8 mA    |                                                                              | 2.3 V           | 0.3                   |                    |     | 0.3                   |                    |     |      |
|                  | I <sub>OL</sub> = 16 mA   |                                                                              | 3 V             | 0.4                   |                    |     | 0.4                   |                    |     |      |
|                  | I <sub>OL</sub> = 24 mA   |                                                                              |                 | 0.55                  |                    |     | 0.55                  |                    |     |      |
|                  | I <sub>OL</sub> = 32 mA   |                                                                              | 4.5 V           | 0.55                  |                    |     | 0.75                  |                    |     |      |
| I <sub>I</sub>   | A or control inputs       | V <sub>I</sub> = 5.5 V or GND                                                | 0 to 5.5 V      | ±5                    |                    |     | ±5                    |                    |     | μA   |
| I <sub>off</sub> |                           | V <sub>I</sub> or V <sub>O</sub> = 5.5 V                                     | 0               | ±10                   |                    |     | ±10                   |                    |     | μA   |
| I <sub>OZ</sub>  |                           | V <sub>O</sub> = 0 to 5.5 V                                                  | 3.6 V           | 10                    |                    |     | 10                    |                    |     | μA   |
| I <sub>CC</sub>  |                           | V <sub>I</sub> = 5.5 V or GND, I <sub>O</sub> = 0                            | 1.65 V to 5.5 V | 10                    |                    |     | 10                    |                    |     | μA   |
| ΔI <sub>CC</sub> |                           | One input at V <sub>CC</sub> – 0.6 V, Other inputs at V <sub>CC</sub> or GND | 3 V to 5.5 V    | 500                   |                    |     | 500                   |                    |     | μA   |
| C <sub>i</sub>   |                           | V <sub>I</sub> = V <sub>CC</sub> or GND                                      | 3.3 V           | 3.5                   |                    |     |                       |                    |     | pF   |
| C <sub>o</sub>   |                           | V <sub>O</sub> = V <sub>CC</sub> or GND                                      | 3.3 V           | 6.5                   |                    |     |                       |                    |     | pF   |

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

## Switching Characteristics

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

| PARAMETER        | FROM<br>(INPUT) | TO<br>(OUTPUT) | SN74LVC2G241<br>–40°C to 85°C       |      |                                    |     |                                    |     |                                  |     | UNIT |
|------------------|-----------------|----------------|-------------------------------------|------|------------------------------------|-----|------------------------------------|-----|----------------------------------|-----|------|
|                  |                 |                | 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> = 3.3 V<br>± 0.3 V |     | V <sub>CC</sub> = 5 V<br>± 0.5 V |     |      |
|                  |                 |                | MIN                                 | MAX  | MIN                                | MAX | MIN                                | MAX | MIN                              | MAX |      |
| t <sub>pd</sub>  | A               | Y              | 3.3                                 | 8.8  | 1.5                                | 4.8 | 1.4                                | 4.3 | 1                                | 3.7 | ns   |
| t <sub>en</sub>  | $\overline{OE}$ | Y              | 4                                   | 9.9  | 1.9                                | 5.6 | 1.2                                | 4.7 | 1.2                              | 3.8 | ns   |
| t <sub>dis</sub> | $\overline{OE}$ | Y              | 1.5                                 | 11.6 | 1                                  | 5.8 | 1.4                                | 4.4 | 1                                | 3.4 | ns   |
| t <sub>en</sub>  | OE              | Y              | 3.2                                 | 8.8  | 1.5                                | 4.7 | 1.6                                | 4.1 | 1.1                              | 3.3 | ns   |
| t <sub>dis</sub> | OE              | Y              | 1.7                                 | 12.5 | 1                                  | 5.2 | 1                                  | 4.2 | 1                                | 3.3 | ns   |

## Switching Characteristics

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

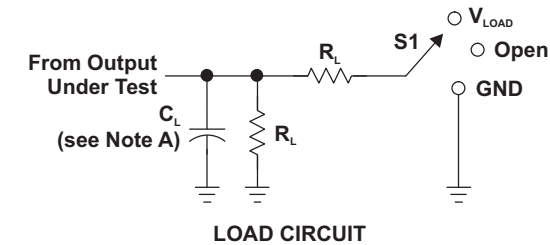
| PARAMETER        | FROM<br>(INPUT) | TO<br>(OUTPUT) | SN74LVC2G241<br>–40°C to 125°C      |      |                                    |     |                                    |     |                                  |     | UNIT |
|------------------|-----------------|----------------|-------------------------------------|------|------------------------------------|-----|------------------------------------|-----|----------------------------------|-----|------|
|                  |                 |                | 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> = 3.3 V<br>± 0.3 V |     | V <sub>CC</sub> = 5 V<br>± 0.5 V |     |      |
|                  |                 |                | MIN                                 | MAX  | MIN                                | MAX | MIN                                | MAX | MIN                              | MAX |      |
| t <sub>pd</sub>  | A               | Y              | 3.3                                 | 9.8  | 1.5                                | 5.8 | 1.4                                | 5.3 | 1                                | 4.2 | ns   |
| t <sub>en</sub>  | $\overline{OE}$ | Y              | 4                                   | 10.9 | 1.9                                | 6.6 | 1.2                                | 5.7 | 1.2                              | 4.3 | ns   |
| t <sub>dis</sub> | $\overline{OE}$ | Y              | 1.5                                 | 12.6 | 1                                  | 6.8 | 1.4                                | 5.4 | 1                                | 4.4 | ns   |
| t <sub>en</sub>  | OE              | Y              | 3.2                                 | 9.8  | 1.5                                | 5.7 | 1.6                                | 5.1 | 1.1                              | 3.8 | ns   |
| t <sub>dis</sub> | OE              | Y              | 1.7                                 | 13.5 | 1                                  | 6.2 | 1                                  | 5.2 | 1                                | 4.3 | ns   |

## Operating Characteristics

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

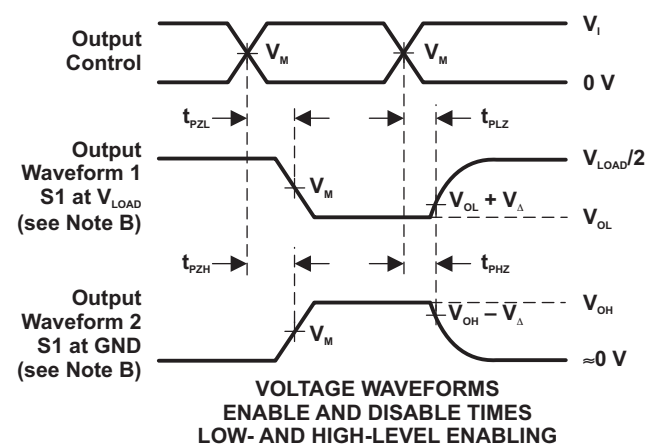
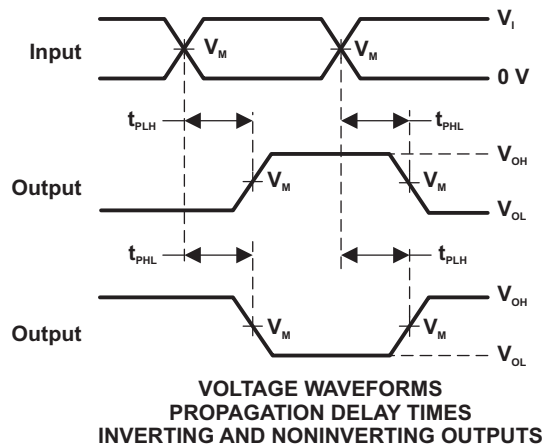
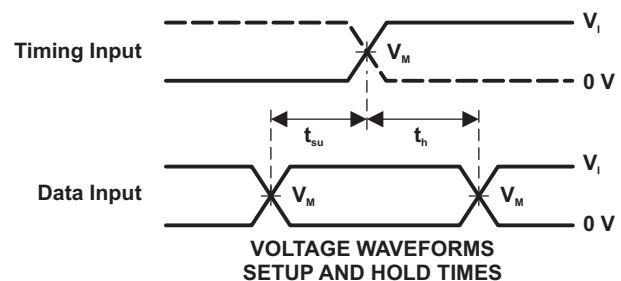
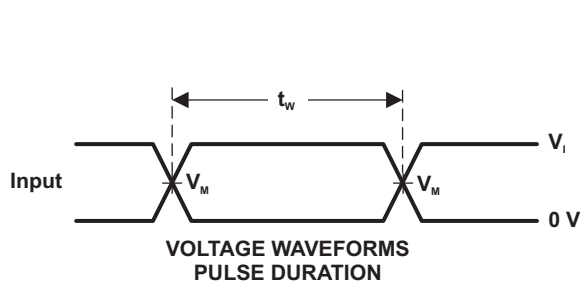
| PARAMETER       |                                                       |                  | TEST<br>CONDITIONS | V <sub>CC</sub> = 1.8 V | V <sub>CC</sub> = 2.5 V | V <sub>CC</sub> = 3.3 V | V <sub>CC</sub> = 5 V | UNIT |
|-----------------|-------------------------------------------------------|------------------|--------------------|-------------------------|-------------------------|-------------------------|-----------------------|------|
|                 |                                                       |                  |                    | TYP                     | TYP                     | TYP                     | TYP                   |      |
| C <sub>pd</sub> | Power dissipation<br>capacitance<br>per buffer/driver | Outputs enabled  | f = 10 MHz         | 19                      | 19                      | 20                      | 22                    | pF   |
|                 |                                                       | Outputs disabled |                    | 2                       | 2                       | 2                       | 3                     |      |

## 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       |
| $3.3\text{ V} \pm 0.3\text{ V}$  | 3 V      | $\leq 2.5\text{ ns}$ | 1.5 V      | 6 V               | 50 pF | 500 $\Omega$ | 0.3 V        |
| $5\text{ V} \pm 0.5\text{ V}$    | $V_{CC}$ | $\leq 2.5\text{ ns}$ | $V_{CC}/2$ | $2 \times V_{CC}$ | 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  $\leq 10\text{ MHz}$ ,  $Z_o = 50\text{ }\Omega$ .

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**

## REVISION HISTORY

| Changes from Revision M (February 2007) to Revision N | Page              |
|-------------------------------------------------------|-------------------|
| • Updated document to new TI data sheet format. ....  | <a href="#">1</a> |
| • Removed ordering information. ....                  | <a href="#">1</a> |
| • Updated Features. ....                              | <a href="#">1</a> |
| • Added ESD warning. ....                             | <a href="#">2</a> |
| • Updated operating temperature range. ....           | <a href="#">3</a> |

## PACKAGING INFORMATION

| Orderable Device | Status<br>(1) | Package Type | Package<br>Drawing | Pins | Package<br>Qty | Eco Plan<br>(2)            | Lead/Ball Finish<br>(6) | MSL Peak Temp<br>(3) | Op Temp (°C) | Device Marking<br>(4/5) | Samples                 |
|------------------|---------------|--------------|--------------------|------|----------------|----------------------------|-------------------------|----------------------|--------------|-------------------------|-------------------------|
| 74LVC2G241DCTRE4 | ACTIVE        | SM8          | DCT                | 8    | 3000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 125   | C41<br>Z                | <a href="#">Samples</a> |
| 74LVC2G241DCTRG4 | ACTIVE        | SM8          | DCT                | 8    | 3000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 125   | C41<br>Z                | <a href="#">Samples</a> |
| 74LVC2G241DCURE4 | ACTIVE        | US8          | DCU                | 8    | 3000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 125   | C41R                    | <a href="#">Samples</a> |
| 74LVC2G241DCUTE4 | ACTIVE        | US8          | DCU                | 8    |                | TBD                        | Call TI                 | Call TI              | -40 to 125   |                         | <a href="#">Samples</a> |
| 74LVC2G241DCUTG4 | ACTIVE        | US8          | DCU                | 8    | 250            | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 125   | C41R                    | <a href="#">Samples</a> |
| SN74LVC2G241DCTR | ACTIVE        | SM8          | DCT                | 8    | 3000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 125   | C41<br>Z                | <a href="#">Samples</a> |
| SN74LVC2G241DCUR | ACTIVE        | US8          | DCU                | 8    | 3000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU   CU SN       | Level-1-260C-UNLIM   | -40 to 125   | (C41Q ~ C41R)           | <a href="#">Samples</a> |
| SN74LVC2G241DCUT | ACTIVE        | US8          | DCU                | 8    | 250            | Green (RoHS<br>& no Sb/Br) | CU NIPDAU   CU SN       | Level-1-260C-UNLIM   | -40 to 125   | (C41Q ~ C41R)           | <a href="#">Samples</a> |
| SN74LVC2G241YZPR | ACTIVE        | DSBGA        | YZP                | 8    | 3000           | Green (RoHS<br>& no Sb/Br) | SNAGCU                  | Level-1-260C-UNLIM   | -40 to 125   | (C2 ~ C27)              | <a href="#">Samples</a> |

(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.

- <sup>(4)</sup> There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.
- <sup>(5)</sup> Multiple Device Markings will be inside parentheses. Only one Device 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 Device Marking for that device.
- <sup>(6)</sup> Lead/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

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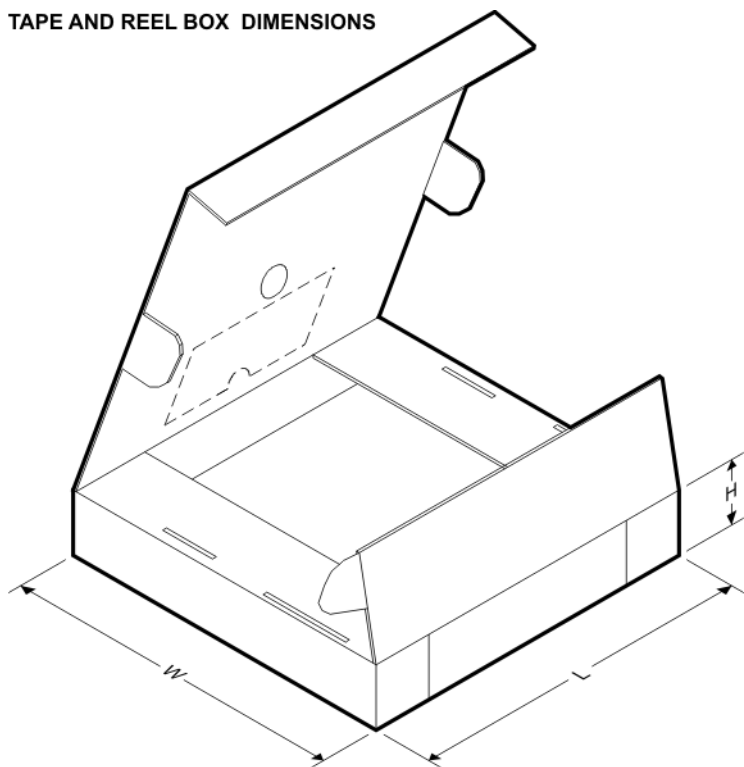
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**TAPE AND REEL INFORMATION**


\*All dimensions are nominal

| Device           | Package Type | Package Drawing | Pins | SPQ  | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|------------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN74LVC2G241DCUR | US8          | DCU             | 8    | 3000 | 180.0              | 8.4                | 2.25    | 3.35    | 1.05    | 4.0     | 8.0    | Q3            |
| SN74LVC2G241YZPR | DSBGA        | YZP             | 8    | 3000 | 180.0              | 8.4                | 1.02    | 2.02    | 0.63    | 4.0     | 8.0    | Q1            |

## TAPE AND REEL BOX DIMENSIONS

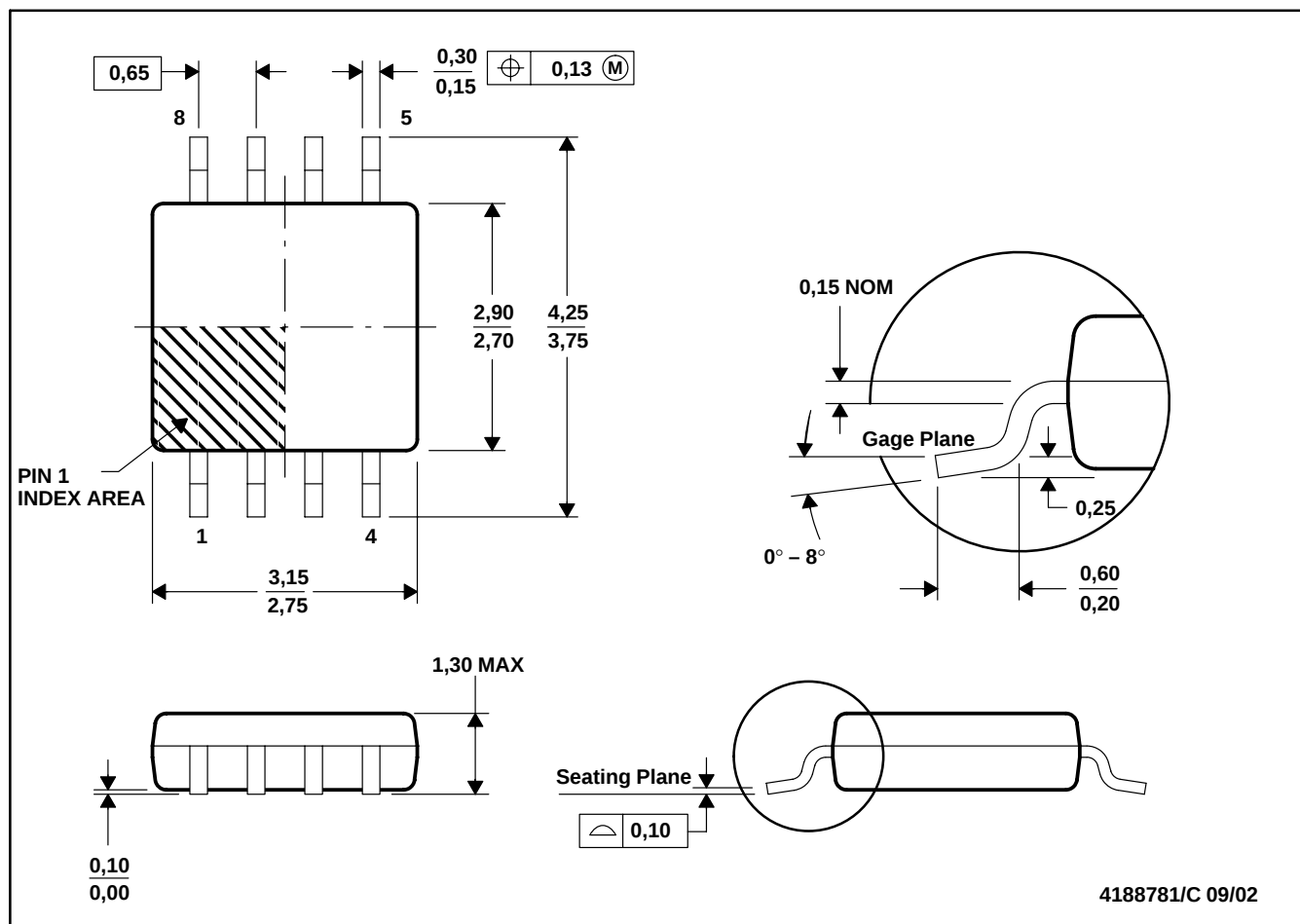


\*All dimensions are nominal

| Device           | Package Type | Package Drawing | Pins | SPQ  | Length (mm) | Width (mm) | Height (mm) |
|------------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN74LVC2G241DCUR | US8          | DCU             | 8    | 3000 | 202.0       | 201.0      | 28.0        |
| SN74LVC2G241YZPR | DSBGA        | YZP             | 8    | 3000 | 210.0       | 185.0      | 35.0        |

## DCT (R-PDSO-G8)

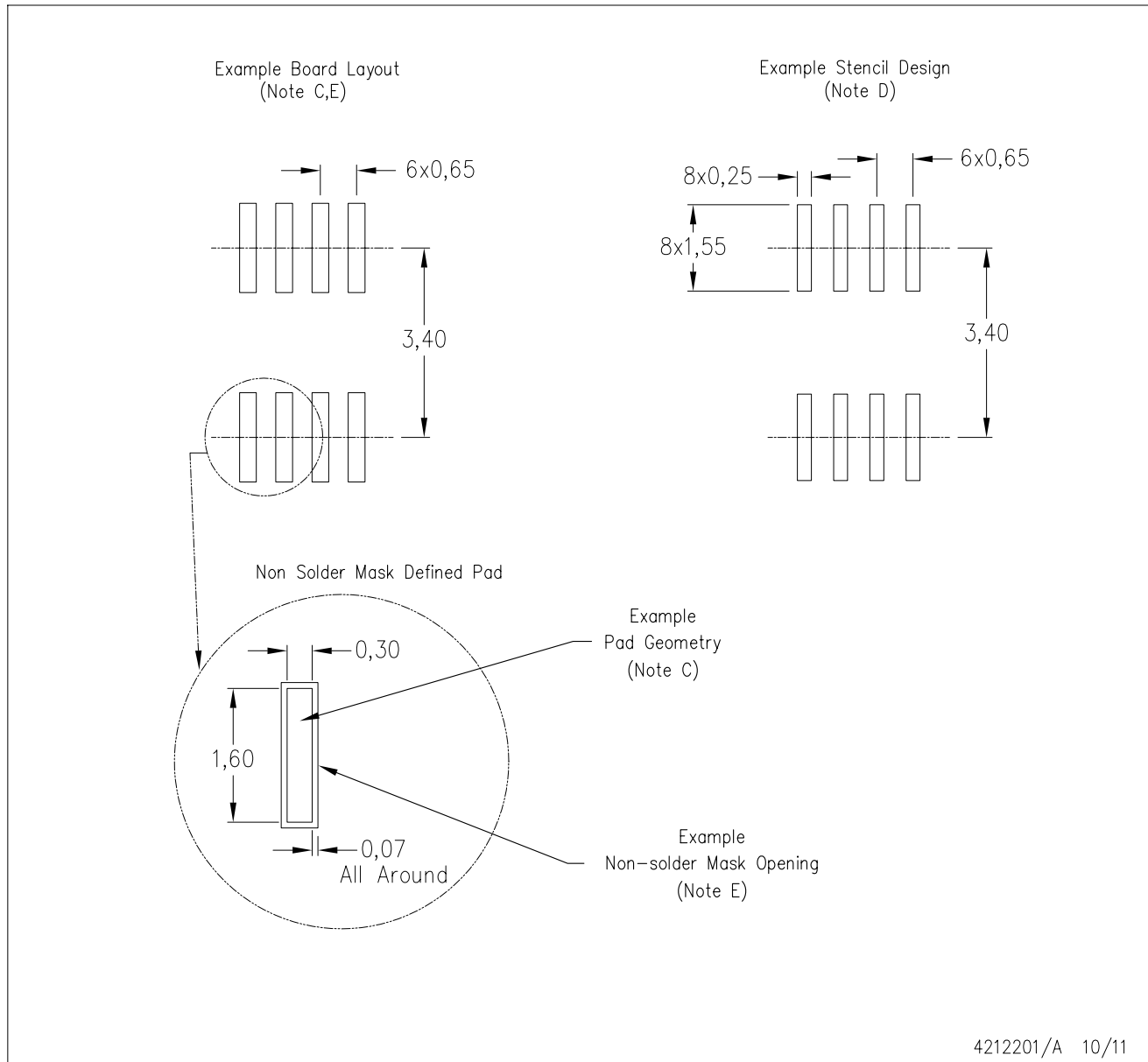
## PLASTIC SMALL-OUTLINE PACKAGE



- NOTES:
- All linear dimensions are in millimeters.
  - This drawing is subject to change without notice.
  - Body dimensions do not include mold flash or protrusion.
  - Falls within JEDEC MO-187 variation DA.

DCT (R-PDSO-G8)

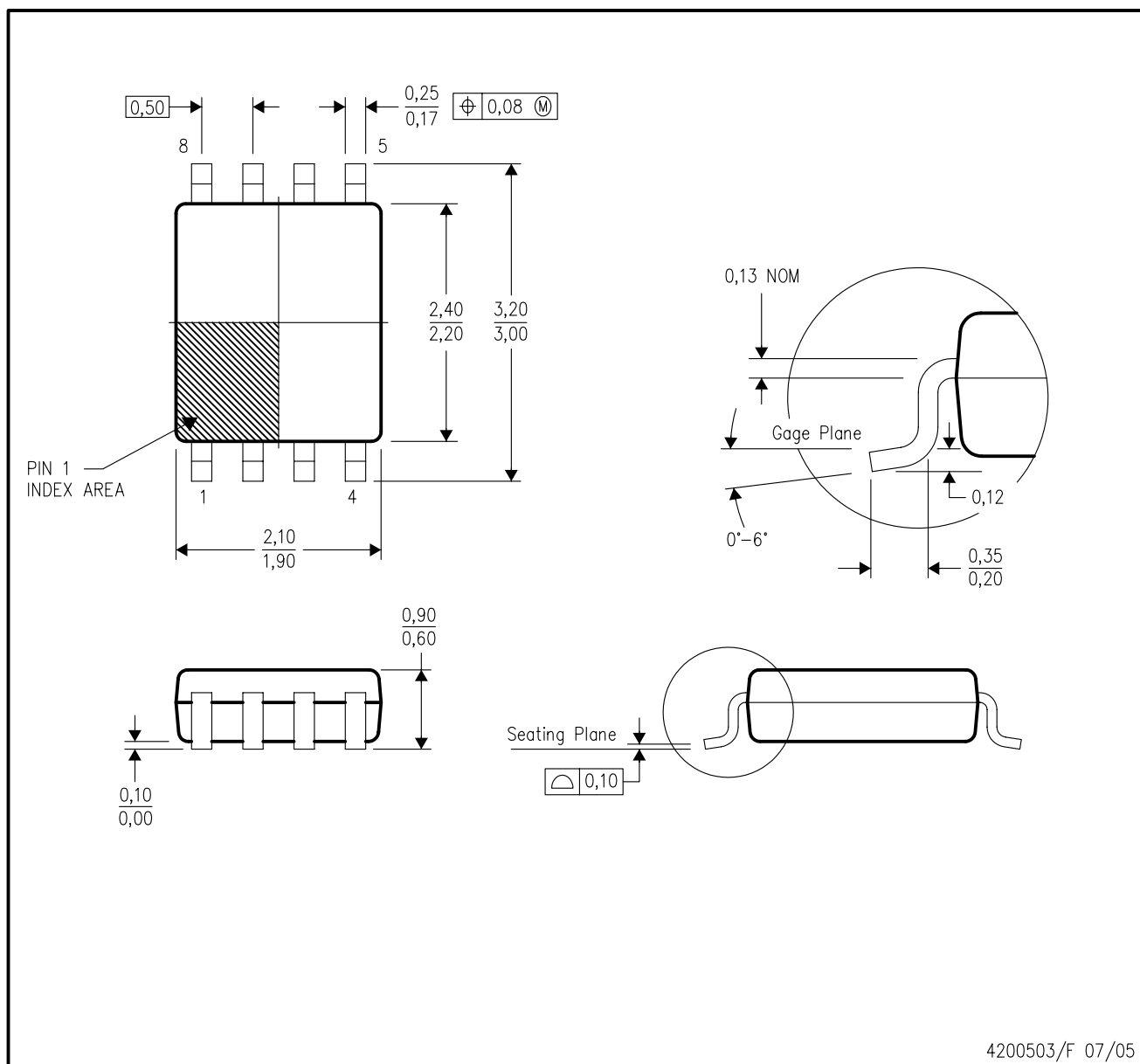
PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Publication IPC-7351 is recommended for alternate designs.
  - D. 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. Refer to IPC-7525.
  - E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

DCU (R-PDSO-G8)

PLASTIC SMALL-OUTLINE PACKAGE (DIE DOWN)

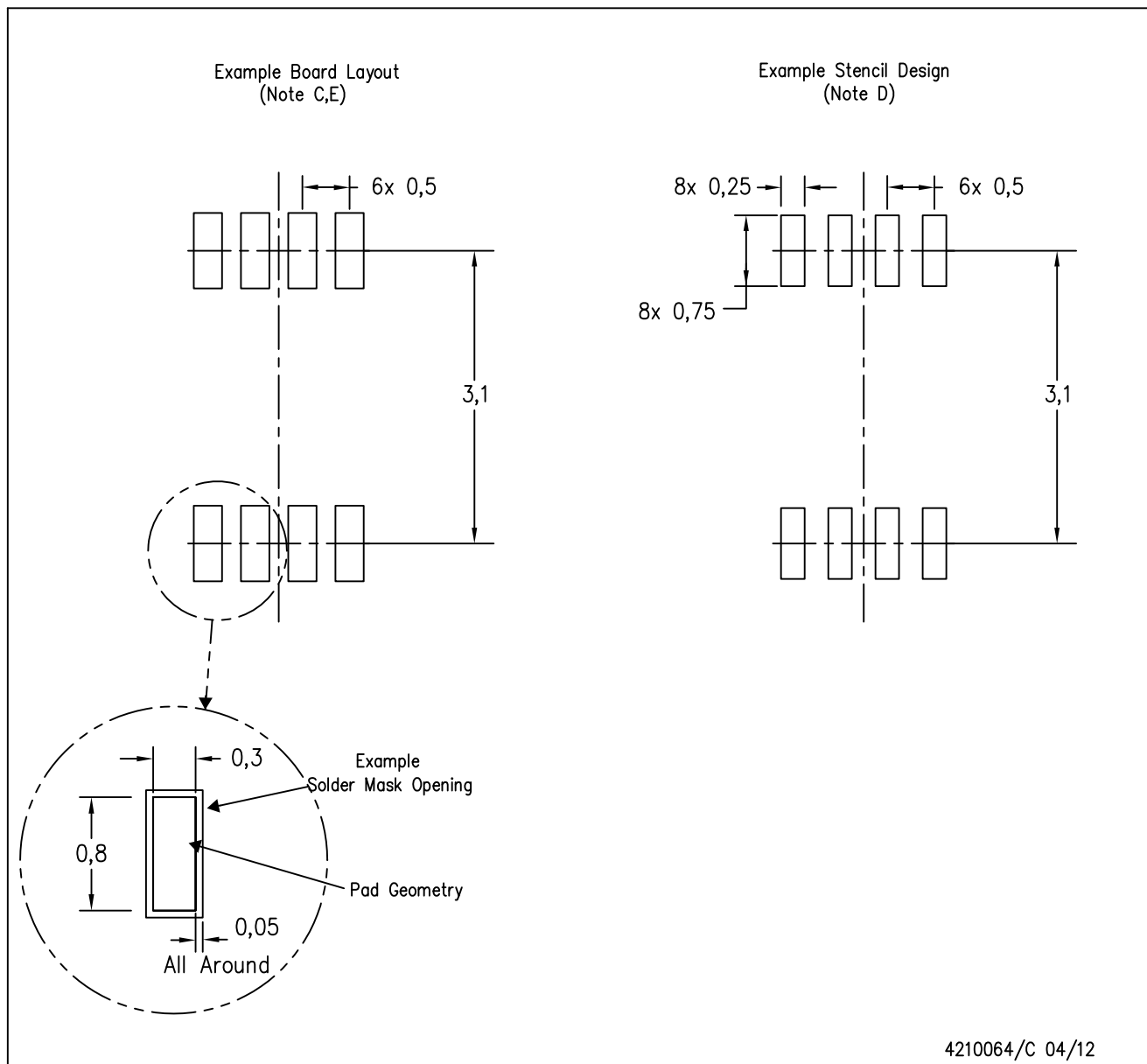


## NOTES:

- All linear dimensions are in millimeters.
- This drawing is subject to change without notice.
- Body dimensions do not include mold flash or protrusion. Mold flash and protrusion shall not exceed 0.15 per side.
- Falls within JEDEC MO-187 variation CA.

DCU (S-PDSO-G8)

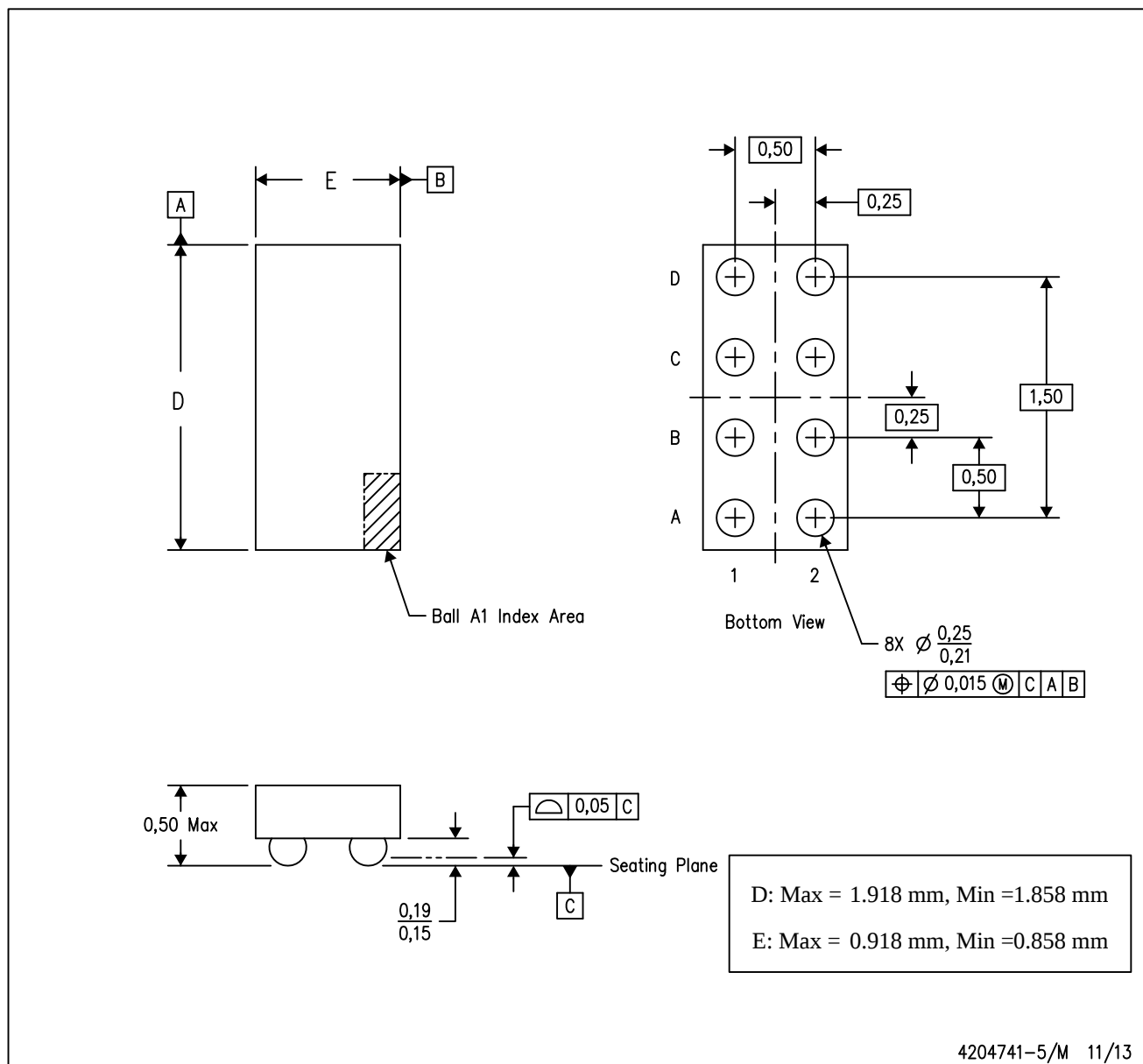
PLASTIC SMALL OUTLINE PACKAGE (DIE DOWN)



- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Publication IPC-7351 is recommended for alternate designs.
  - D. 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. Refer to IPC-7525 for other stencil recommendations.
  - E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

YZP (R-XBGA-N8)

DIE-SIZE 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. NanoFree™ package configuration.

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