FEATURES

- Available in the Texas Instruments NanoFree™ Package
- Supports 5-V $V_{CC}$ Operation
- Inputs Accept Voltages to 5.5 V
- Provides Down Translation to $V_{CC}$
- Max $t_{pd}$ of 3.7 ns at 3.3 V
- Low Power Consumption, 10-μA Max $I_{CC}$
- ±24-mA Output Drive at 3.3 V
- $I_{off}$ Supports Live Insertion, Partial-Power-Down Mode, and Back Drive Protection
- 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 single buffer/driver is designed for 1.65-V to 5.5-V $V_{CC}$ operation.

The SN74LVC1G240 is a single line driver with a 3-state output. The output is disabled when the output-enable (OE) input is high.

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

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

This device is fully specified for partial-power-down applications using $I_{off}$. The $I_{off}$ circuitry disables the outputs, preventing damaging current backflow through the device when it is powered down.
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 Table

<table>
<thead>
<tr>
<th>INPUTS</th>
<th>OUTPUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>OE</td>
<td>A</td>
</tr>
<tr>
<td>L</td>
<td>H</td>
</tr>
<tr>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>H</td>
<td>X</td>
</tr>
</tbody>
</table>

### Logic Diagram (Positive Logic)

![Logic Diagram](image)

### Absolute Maximum Ratings

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

<table>
<thead>
<tr>
<th>Parameter</th>
<th>MIN</th>
<th>MAX</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>$V_{CC}$</td>
<td>$-0.5$</td>
<td>$6.5$</td>
<td>V</td>
</tr>
<tr>
<td>$V_{I}$</td>
<td>$-0.5$</td>
<td>$6.5$</td>
<td>V</td>
</tr>
<tr>
<td>$V_{O}$</td>
<td>$-0.5$</td>
<td>$V_{CC} + 0.5$</td>
<td>V</td>
</tr>
<tr>
<td>$I_{IK}$</td>
<td>$V_{I} &lt; 0$</td>
<td>$-50$</td>
<td>mA</td>
</tr>
<tr>
<td>$I_{OK}$</td>
<td>$V_{O} &lt; 0$</td>
<td>$-50$</td>
<td>mA</td>
</tr>
<tr>
<td>$I_{O}$</td>
<td>Continuous output current</td>
<td>$\pm 50$</td>
<td>mA</td>
</tr>
<tr>
<td>Continuous current through $V_{CC}$ or GND</td>
<td>$\pm 100$</td>
<td>mA</td>
<td></td>
</tr>
<tr>
<td>$\theta_{JA}$</td>
<td>Package thermal impedance</td>
<td>$206$</td>
<td>°C/W</td>
</tr>
<tr>
<td></td>
<td>DBV package</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>DCK package</td>
<td>$252$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>YZP package</td>
<td>$132$</td>
<td></td>
</tr>
<tr>
<td>$T_{stg}$</td>
<td>Storage temperature range</td>
<td>$-65$</td>
<td>°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$150$</td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Parameter</th>
<th>MIN</th>
<th>MAX</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>$V_{CC}$</strong> Supply voltage</td>
<td>Operating</td>
<td>1.65</td>
<td>5.5</td>
</tr>
<tr>
<td></td>
<td>Data retention only</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td><strong>$V_{IH}$</strong> High-level input voltage</td>
<td>$V_{CC} = 1.65$ V to 1.95 V</td>
<td>$0.65 \times V_{CC}$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$V_{CC} = 2.3$ V to 2.7 V</td>
<td>1.7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$V_{CC} = 3$ V to 3.6 V</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$V_{CC} = 4.5$ V to 5.5 V</td>
<td>$0.7 \times V_{CC}$</td>
<td></td>
</tr>
<tr>
<td><strong>$V_{IL}$</strong> Low-level input voltage</td>
<td>$V_{CC} = 1.65$ V to 1.95 V</td>
<td>$0.35 \times V_{CC}$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$V_{CC} = 2.3$ V to 2.7 V</td>
<td>0.7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$V_{CC} = 3$ V to 3.6 V</td>
<td>0.8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$V_{CC} = 4.5$ V to 5.5 V</td>
<td>$0.3 \times V_{CC}$</td>
<td></td>
</tr>
<tr>
<td><strong>$V_{I}$</strong> Input voltage</td>
<td>0</td>
<td>5.5</td>
<td>V</td>
</tr>
<tr>
<td><strong>$V_{O}$</strong> Output voltage</td>
<td>0</td>
<td>$V_{CC}$</td>
<td>V</td>
</tr>
<tr>
<td><strong>$I_{OH}$</strong> High-level output current</td>
<td>$V_{CC} = 1.65$ V</td>
<td>–4</td>
<td>mA</td>
</tr>
<tr>
<td></td>
<td>$V_{CC} = 2.3$ V</td>
<td>–8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$V_{CC} = 3$ V</td>
<td>–16</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$V_{CC} = 4.5$ V</td>
<td>–24</td>
<td></td>
</tr>
<tr>
<td><strong>$I_{OL}$</strong> Low-level output current</td>
<td>$V_{CC} = 1.65$ V</td>
<td>4</td>
<td>mA</td>
</tr>
<tr>
<td></td>
<td>$V_{CC} = 2.3$ V</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$V_{CC} = 3$ V</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$V_{CC} = 4.5$ V</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td><strong>$\Delta V/\Delta t$</strong> Input transition rise or fall rate</td>
<td>$V_{CC} = 1.8$ V $\pm 0.15$ V, 2.5 V $\pm 0.2$ V</td>
<td>20</td>
<td>ns/V</td>
</tr>
<tr>
<td></td>
<td>$V_{CC} = 3.3$ V $\pm 0.3$ V</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$V_{CC} = 5$ V $\pm 0.5$ V</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td><strong>$T_{A}$</strong> Operating free-air temperature</td>
<td>–40</td>
<td>125</td>
<td>°C</td>
</tr>
</tbody>
</table>

(1) 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)

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>TEST CONDITIONS</th>
<th>( V_{CC} )</th>
<th>(-40°C to 85°C)</th>
<th>(-40°C to 125°C)</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>( I_{OH} )</td>
<td>( I_{OH} = -100 \mu A )</td>
<td>1.65 V to 5.5 V</td>
<td>( V_{CC} ) – 0.1</td>
<td>( V_{CC} ) – 0.1</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>( I_{OH} = -4 ) mA</td>
<td>1.65 V</td>
<td>1.2</td>
<td>1.2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>( I_{OH} = -8 ) mA</td>
<td>2.3 V</td>
<td>1.9</td>
<td>1.9</td>
<td></td>
</tr>
<tr>
<td></td>
<td>( I_{OH} = -16 ) mA</td>
<td>3 V</td>
<td>2.4</td>
<td>2.4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>( I_{OH} = -24 ) mA</td>
<td>2.3</td>
<td>2.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>( I_{OH} = -32 ) mA</td>
<td>4.5 V</td>
<td>3.8</td>
<td>3.8</td>
<td></td>
</tr>
<tr>
<td>( I_{OL} )</td>
<td>( I_{OL} = 100 \mu A )</td>
<td>1.65 V to 5.5 V</td>
<td>0.1</td>
<td>0.1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>( I_{OL} = 4 ) mA</td>
<td>1.65 V</td>
<td>0.45</td>
<td>0.45</td>
<td></td>
</tr>
<tr>
<td></td>
<td>( I_{OL} = 8 ) mA</td>
<td>2.3 V</td>
<td>0.3</td>
<td>0.3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>( I_{OL} = 16 ) mA</td>
<td>3 V</td>
<td>0.4</td>
<td>0.4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>( I_{OL} = 24 ) mA</td>
<td>3.6 V</td>
<td>0.55</td>
<td>0.55</td>
<td></td>
</tr>
<tr>
<td></td>
<td>( I_{OL} = 32 ) mA</td>
<td>4.5 V</td>
<td>0.55</td>
<td>0.55</td>
<td></td>
</tr>
<tr>
<td>( I_{I} )</td>
<td>( V_{I} = 5.5 ) V or GND, ( V_{O} )</td>
<td>0 to 5.5 V</td>
<td>±5</td>
<td>±5</td>
<td>mA</td>
</tr>
<tr>
<td>( I_{IT} )</td>
<td>( V_{I} = 5.5 ) V or GND</td>
<td>0</td>
<td>±10</td>
<td>±10</td>
<td>mA</td>
</tr>
<tr>
<td>( I_{CC} )</td>
<td>( V_{CC} = 5 ) V or GND, ( I_{O} = 0 )</td>
<td>0 to 5.5 V</td>
<td>10</td>
<td>10</td>
<td>μA</td>
</tr>
<tr>
<td>( \Delta I_{CC} )</td>
<td>One input at ( V_{CC} = 0.6 ) V, other inputs at ( V_{CC} = 5 ) V</td>
<td>3 V to 5.5 V</td>
<td>500</td>
<td>500</td>
<td>μA</td>
</tr>
<tr>
<td>( C_{i} )</td>
<td>( V_{I} = V_{CC} ) or GND</td>
<td>3.3 V</td>
<td>4</td>
<td></td>
<td>pF</td>
</tr>
</tbody>
</table>

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

### Switching Characteristics

over recommended operating free-air temperature range, \( C_{L} = 15 \) pF (unless otherwise noted) (see Figure 1)

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>FROM (INPUT)</th>
<th>TO (OUTPUT)</th>
<th>( V_{CC} = 1.8 ) V ( \pm 0.15 ) V</th>
<th>( V_{CC} = 2.5 ) V ( \pm 0.2 ) V</th>
<th>( V_{CC} = 3.3 ) V ( \pm 0.3 ) V</th>
<th>( V_{CC} = 5 ) V ( \pm 0.5 ) V</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>Y</td>
<td>2.1</td>
<td>6.9</td>
<td>0.9</td>
<td>4.6</td>
<td>0.7</td>
</tr>
</tbody>
</table>

### Switching Characteristics

over recommended operating free-air temperature range, \( C_{L} = 30 \) pF or 50 pF (unless otherwise noted) (see Figure 2)

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>FROM (INPUT)</th>
<th>TO (OUTPUT)</th>
<th>( V_{CC} = 1.8 ) V ( \pm 0.15 ) V</th>
<th>( V_{CC} = 2.5 ) V ( \pm 0.2 ) V</th>
<th>( V_{CC} = 3.3 ) V ( \pm 0.3 ) V</th>
<th>( V_{CC} = 5 ) V ( \pm 0.5 ) V</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>Y</td>
<td>3</td>
<td>8.6</td>
<td>1.4</td>
<td>5.5</td>
<td>1.1</td>
</tr>
<tr>
<td></td>
<td>OE</td>
<td>Y</td>
<td>3.8</td>
<td>10</td>
<td>2.1</td>
<td>6.5</td>
<td>1.4</td>
</tr>
<tr>
<td></td>
<td>OE</td>
<td>Y</td>
<td>2.1</td>
<td>9.4</td>
<td>1</td>
<td>4.9</td>
<td>1.4</td>
</tr>
</tbody>
</table>
Switching Characteristics
over recommended operating free-air temperature range, \( C_L = 30 \) pF or 50 pF (unless otherwise noted) (see Figure 2)

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>FROM (INPUT)</th>
<th>TO (OUTPUT)</th>
<th>SN74LVC1G240</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>( V_{CC} = 1.8 ) V</td>
<td>( V_{CC} = 2.5 ) V</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>( \pm 0.15 ) V</td>
<td>( \pm 0.2 ) V</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>MIN</td>
<td>MAX</td>
</tr>
<tr>
<td>( t_{pd} )</td>
<td>A</td>
<td>Y</td>
<td>3</td>
<td>9.6</td>
</tr>
<tr>
<td>( t_{on} )</td>
<td>OE</td>
<td>Y</td>
<td>3.8</td>
<td>10.2</td>
</tr>
<tr>
<td>( t_{on} )</td>
<td>OE</td>
<td>Y</td>
<td>2.1</td>
<td>9.6</td>
</tr>
</tbody>
</table>

Operating Characteristics
\( T_A = 25^\circ C \)

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>TEST CONDITIONS</th>
<th>( V_{CC} = 1.8 ) V</th>
<th>( V_{CC} = 2.5 ) V</th>
<th>( V_{CC} = 3.3 ) V</th>
<th>( V_{CC} = 5 ) V</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>TYP</td>
<td>TYP</td>
<td>TYP</td>
<td>TYP</td>
</tr>
<tr>
<td>( C_{pd} )</td>
<td>Power dissipation capacitance</td>
<td>Outputs enabled</td>
<td>17</td>
<td>17</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td></td>
<td>f = 10 MHz</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Outputs disabled</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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Product Folder Links: SN74LVC1G240
Parameter Measurement Information

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Input</td>
</tr>
<tr>
<td></td>
<td>Output</td>
</tr>
</tbody>
</table>

**Notes:**
A. $C_s$ 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.
C. Waveform 2 is for an output with internal conditions such that the output is high, except when disabled by the output control.
D. All input pulses are supplied by generators having the following characteristics: PRR ≤ 10 MHz, $Z_o = 50 \, \Omega$.
E. $t_{PLZ}$ and $t_{PHL}$ are the same as $t_w$.
F. $t_{PHZ}$ and $t_{PZH}$ are the same as $t_r$.
G. $t_{PLZ}$ and $t_{PHL}$ are the same as $t_r$.
H. All parameters and waveforms are not applicable to all devices.

**Figure 1. Load Circuit and Voltage Waveforms**
Parameter Measurement Information

<table>
<thead>
<tr>
<th>$V_{CC}$</th>
<th>$V_i$</th>
<th>$t/L$</th>
<th>$V_w$</th>
<th>$V_{LOAD}$</th>
<th>$C_L$</th>
<th>$R_L$</th>
<th>$V_L$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.8 $\pm$ 0.15 V</td>
<td>$V_{CC}$</td>
<td>$\leq$ 2 ns</td>
<td>$V_{CC}/2$</td>
<td>2 $\times$ $V_{CC}$</td>
<td>30 pF</td>
<td>1 k$\Omega$</td>
<td>0.15 V</td>
</tr>
<tr>
<td>2.5 $\pm$ 0.2 V</td>
<td>$V_{CC}$</td>
<td>$\leq$ 2 ns</td>
<td>$V_{CC}/2$</td>
<td>2 $\times$ $V_{CC}$</td>
<td>30 pF</td>
<td>500 $\Omega$</td>
<td>0.15 V</td>
</tr>
<tr>
<td>3.3 $\pm$ 0.3 V</td>
<td>3 V</td>
<td>$\leq$ 2.5 ns</td>
<td>1.5 V</td>
<td>6 V</td>
<td>50 pF</td>
<td>500 $\Omega$</td>
<td>0.3 V</td>
</tr>
<tr>
<td>5 V $\pm$ 0.5 V</td>
<td>$V_{CC}$</td>
<td>$\leq$ 2.5 ns</td>
<td>$V_{CC}/2$</td>
<td>2 $\times$ $V_{CC}$</td>
<td>50 pF</td>
<td>500 $\Omega$</td>
<td>0.3 V</td>
</tr>
</tbody>
</table>

**Figure 2. Load Circuit and Voltage Waveforms**

### NOTES:
- **A.** $C_c$ 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 $t_{PZL}$ are the same as $t_w$.
- **F.** $t_{PLH}$ and $t_{PZL}$ are the same as $t_w$.
- **G.** $t_{PHL}$ and $t_{PZH}$ are the same as $t_w$.
- **H.** All parameters and waveforms are not applicable to all devices.
## REVISION HISTORY

### Changes from Revision J (January 2007) to Revision K

<table>
<thead>
<tr>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Added DSF and DRY package options to the datasheet.</td>
<td>1</td>
</tr>
</tbody>
</table>

### Changes from Revision K (March 2012) to Revision L

<table>
<thead>
<tr>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Updated document to new TI data sheet format.</td>
<td>1</td>
</tr>
<tr>
<td>Removed ordering information.</td>
<td>1</td>
</tr>
<tr>
<td>Added ESD warning.</td>
<td>2</td>
</tr>
<tr>
<td>Updated operating temperature range.</td>
<td>3</td>
</tr>
</tbody>
</table>
## PACKAGING INFORMATION

<table>
<thead>
<tr>
<th>Orderable Device</th>
<th>Status (1)</th>
<th>Package Type</th>
<th>Package Drawing</th>
<th>Pins</th>
<th>Package Qty</th>
<th>Eco Plan (2)</th>
<th>Lead finish/ Ball material (6)</th>
<th>MSL Peak Temp (3)</th>
<th>Op Temp (°C)</th>
<th>Device Marking (4/5)</th>
<th>Samples</th>
</tr>
</thead>
<tbody>
<tr>
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<td>CKN</td>
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</tbody>
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(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) **RoHS**: TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".

**RoHS Exempt**: TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.

**Green**: TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.
(3) MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) 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.

(6) Lead finish/Ball material - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

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In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.
### TAPE AND REEL INFORMATION

#### REEL DIMENSIONS

![Reel Dimensions Diagram](image1)

#### TAPE DIMENSIONS

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<tr>
<th>A0</th>
<th>Dimension designed to accommodate the component width</th>
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<td>Dimension designed to accommodate the component length</td>
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<tr>
<td>K0</td>
<td>Dimension designed to accommodate the component thickness</td>
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<tr>
<td>W</td>
<td>Overall width of the carrier tape</td>
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<tr>
<td>P1</td>
<td>Pitch between successive cavity centers</td>
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#### QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE

![Quadrant Assignments Diagram](image2)

*All dimensions are nominal.*

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<tr>
<th>Device</th>
<th>Package Type</th>
<th>Package Drawing</th>
<th>Pins</th>
<th>SPQ</th>
<th>Reel Diameter (mm)</th>
<th>Reel Width (W1) (mm)</th>
<th>A0 (mm)</th>
<th>B0 (mm)</th>
<th>K0 (mm)</th>
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www.ti.com 24-Jul-2020
### TAPE AND REEL BOX DIMENSIONS

*All dimensions are nominal*

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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 AA.
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.
Images above are just a representation of the package family, actual package may vary. Refer to the product data sheet for package details.
NOTES:

1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
NOTES: (continued)

3. For more information, see QFN/SON PCB application report in literature No. SLUA271 (www.ti.com/lit/slua271).
NOTES: (continued)

4. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
NOTES:

1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
4. Body dimensions do not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.25 mm per side.
NOTES: (continued)

5. Publication IPC-7351 may have alternate designs.
6. Solder mask tolerances between and around signal pads can vary based on board fabrication site.
NOTES: (continued)

7. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.

8. Board assembly site may have different recommendations for stencil design.
NOTES:

1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. Reference JEDEC registration MO-287, variation X2AAF.
4. For more information, see Texas Instruments literature number SLUA271 (www.ti.com/lit/slua271).
4. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
NOTES:

1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
NOTES: (continued)

3. Final dimensions may vary due to manufacturing tolerance considerations and also routing constraints. For more information, see Texas Instruments literature number SNVA009 (www.ti.com/lit/snva009).
4. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release.
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