

## DUAL BUS BUFFER GATE WITH 3-STATE OUTPUTS

Check for Samples: [SN74LVC2G126-EP](#)

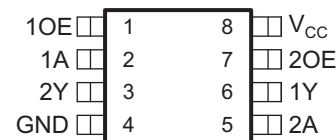
### FEATURES

- Supports 5-V  $V_{CC}$  Operation
- Inputs Accept Voltages to 5.5 V
- Max  $t_{pd}$  of 6.8 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 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)

### SUPPORTS DEFENSE, AEROSPACE, AND MEDICAL APPLICATIONS

- Controlled Baseline
- One Assembly and Test Site
- One Fabrication Site
- Available in Military ( $-55^\circ\text{C}$  to  $125^\circ\text{C}$ ) Temperature Range
- Extended Product Life Cycle
- Extended Product-Change Notification
- Product Traceability

DCU PACKAGE  
(TOP VIEW)



### DESCRIPTION

This dual bus buffer gate is designed for 1.65-V to 5.5-V  $V_{CC}$  operation.

The SN74LVC2G126 is a dual bus driver/line driver with 3-state outputs. The outputs are disabled when the associated output-enable (OE) input is low.

To ensure the high-impedance state during power up or power down, OE should be tied to GND through a pulldown resistor; the minimum value of the resistor is determined by 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.

### ORDERING INFORMATION<sup>(1)</sup>

| $T_J$                                      | PACKAGE <sup>(2)</sup>  | ORDERABLE PART NUMBER | TOP-SIDE MARKING | VID NUMBER     |
|--|-------------------------|-----------------------|------------------|----------------|
| $-55^\circ\text{C}$ to $125^\circ\text{C}$ | VSSOP - DCU Tape of 250 | CLVC2G126MDCUTEP      | CEPR             | V62/14604-01XE |

(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](http://www.ti.com).

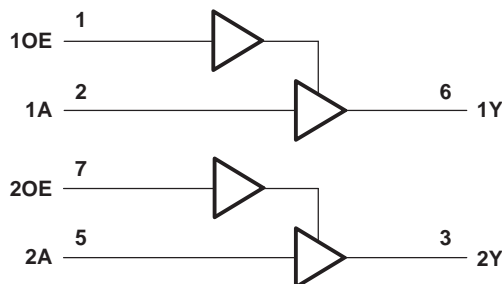
(2) Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at [www.ti.com/sc/package](http://www.ti.com/sc/package).

Function Table  
(Each Buffer)

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



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.

**Logic Diagram (Positive Logic)****ABSOLUTE MAXIMUM RATINGS<sup>(1)</sup>**

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 <sup>(2)</sup>  | -0.5      | 6.5            | V    |
| $V_O$ Voltage range applied to any output in the high-impedance or power-off state <sup>(2)</sup> | -0.5      | 6.5            | V    |
| $V_O$ Voltage range applied to any output in the high or low state <sup>(2) (3)</sup>             | -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 $V_{CC}$ or GND  |           | ±100           | mA   |
| $T_J$ Absolute maximum junction temperature range   | -55       | 150            | °C   |
| $T_{stg}$ 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 clamp-current ratings are observed.
- (3) The value of  $V_{CC}$  is provided in the recommended operating conditions table.

**THERMAL INFORMATION**

| THERMAL METRIC <sup>(1)</sup> |   | SN74LVC2G126-EP | UNITS |
|-------------------------------|---|-----------------|-------|
|                               |   | DCU             |       |
|                               |   | 8 PINS          |       |
| $\theta_{JA}$                 | Junction-to-ambient thermal resistance <sup>(2)</sup>       | 204.3           | °C/W  |
| $\theta_{JCTop}$              | Junction-to-case (top) thermal resistance <sup>(3)</sup>    | 78              |       |
| $\theta_{JB}$                 | Junction-to-board thermal resistance <sup>(4)</sup>         | 83              |       |
| $\Psi_{JT}$                   | Junction-to-top characterization parameter <sup>(5)</sup>   | 7.6             |       |
| $\Psi_{JB}$                   | Junction-to-board characterization parameter <sup>(6)</sup> | 82.6            |       |
| $\theta_{JCbott}$             | Junction-to-case (bottom) thermal resistance <sup>(7)</sup> | N/A             |       |

- (1) For more information about traditional and new thermal metrics, see the *IC Package Thermal Metrics* application report, [SPRA953](#).
- (2) The junction-to-ambient thermal resistance under natural convection is obtained in a simulation on a JEDEC-standard, high-K board, as specified in JESD51-7, in an environment described in JESD51-2a.
- (3) The junction-to-case (top) thermal resistance is obtained by simulating a cold plate test on the package top. No specific JEDEC-standard test exists, but a close description can be found in the ANSI SEMI standard G30-88.
- (4) The junction-to-board thermal resistance is obtained by simulating in an environment with a ring cold plate fixture to control the PCB temperature, as described in JESD51-8.
- (5) The junction-to-top characterization parameter,  $\Psi_{JT}$ , estimates the junction temperature of a device in a real system and is extracted from the simulation data for obtaining  $\theta_{JA}$ , using a procedure described in JESD51-2a (sections 6 and 7).
- (6) The junction-to-board characterization parameter,  $\Psi_{JB}$ , estimates the junction temperature of a device in a real system and is extracted from the simulation data for obtaining  $\theta_{JA}$ , using a procedure described in JESD51-2a (sections 6 and 7).
- (7) The junction-to-case (bottom) thermal resistance is obtained by simulating a cold plate test on the exposed (power) pad. No specific JEDEC standard test exists, but a close description can be found in the ANSI SEMI standard G30-88.

**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>J</sub>  | Operating virtual junction temperature |   | –55                    | 125                    | °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

These specifications apply for  $-55^{\circ}\text{C} \leq T_J \leq 125^{\circ}\text{C}$  (unless otherwise noted)

| PARAMETER       |                | TEST CONDITIONS   | $V_{CC}$        | MIN            | TYP <sup>(1)</sup> | MAX      | UNIT          |
|-----------------|----------------|---|-----------------|----------------|--------------------|----------|---------------|
| $V_{OH}$        |                | $I_{OH} = -100\ \mu\text{A}$  | 1.65 V to 5.5 V | $V_{CC} - 0.1$ |                    |          | V             |
|                 |                | $I_{OH} = -4\ \text{mA}$  | 1.65 V          | 1.2            |                    |          |               |
|                 |                | $I_{OH} = -8\ \text{mA}$  | 2.3 V           | 1.9            |                    |          |               |
|                 |                | $I_{OH} = -16\ \text{mA}$   | 3 V             | 2.4            |                    |          |               |
|                 |                | $I_{OH} = -24\ \text{mA}$   |                 | 2.3            |                    |          |               |
|                 |                | $I_{OH} = -32\ \text{mA}$   | 4.5 V           | 3.8            |                    |          |               |
| $V_{OL}$        |                | $I_{OL} = 100\ \mu\text{A}$   | 1.65 V to 5.5 V |                |                    | 0.1      | V             |
|                 |                | $I_{OL} = 4\ \text{mA}$   | 1.65 V          |                |                    | 0.45     |               |
|                 |                | $I_{OL} = 8\ \text{mA}$   | 2.3 V           |                |                    | 0.3      |               |
|                 |                | $I_{OL} = 16\ \text{mA}$  | 3 V             |                |                    | 0.4      |               |
|                 |                | $I_{OL} = 24\ \text{mA}$  |                 |                |                    | 0.55     |               |
|                 |                | $I_{OL} = 32\ \text{mA}$  | 4.5 V           |                |                    | 0.55     |               |
| $I_I$           | A or OE inputs | $V_I = 5.5\ \text{V}$ or GND  | 0 to 5.5 V      |                |                    | $\pm 5$  | $\mu\text{A}$ |
| $I_{off}$       |                | $V_I$ or $V_O = 5.5\ \text{V}$  | 0               |                |                    | $\pm 10$ | $\mu\text{A}$ |
| $I_{OZ}$        |                | $V_O = 0$ to 5.5 V  | 3.6 V           |                |                    | 10       | $\mu\text{A}$ |
| $I_{CC}$        |                | $V_I = 5.5\ \text{V}$ or GND, $I_O = 0$                                 | 1.65 V to 5.5 V |                |                    | 10       | $\mu\text{A}$ |
| $\Delta I_{CC}$ |                | One input at $V_{CC} - 0.6\ \text{V}$ , Other inputs at $V_{CC}$ or GND | 3 V to 5.5 V    |                |                    | 500      | $\mu\text{A}$ |
| $C_I$           | Data inputs    | $V_I = V_{CC}$ or GND   | 3.3 V           |                | 3.5                |          | pF            |
|                 | Control inputs |   |                 |                | 4                  |          |               |
| $C_O$           |                | $V_O = V_{CC}$ or GND   | 3.3 V           |                | 6.5                |          | pF            |

(1) All typical values are at  $V_{CC} = 3.3\ \text{V}$ ,  $T_J = 25^{\circ}\text{C}$ .

## SWITCHING CHARACTERISTICS

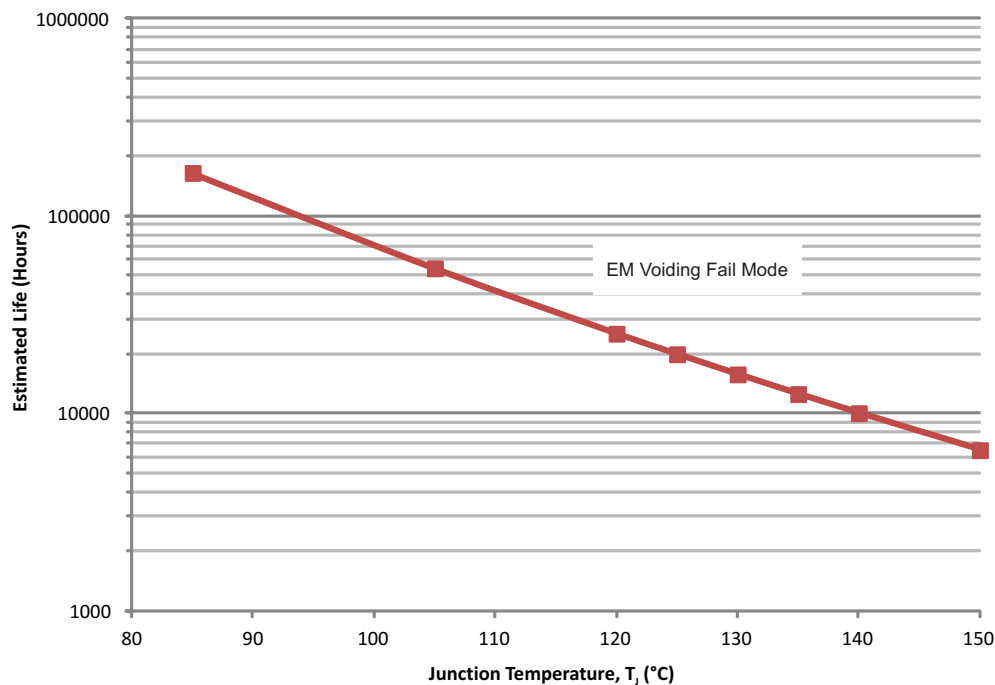
These specifications apply for  $-55^{\circ}\text{C} \leq T_J \leq 125^{\circ}\text{C}$  (unless otherwise noted) (see [Figure 2](#))

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | $V_{CC} = 1.8\ \text{V} \pm 0.15\ \text{V}$ |      | $V_{CC} = 2.5\ \text{V} \pm 0.2\ \text{V}$ |     | $V_{CC} = 3.3\ \text{V} \pm 0.3\ \text{V}$ |     | $V_{CC} = 5\ \text{V} \pm 0.5\ \text{V}$ |     | UNIT |
|-----------|--------------|-------------|---|------|--|-----|--|-----|--|-----|------|
|           |              |             | MIN   | MAX  | MIN  | MAX | MIN  | MAX | MIN                                      | MAX |      |
| $t_{pd}$  | A            | Y           | 3.5   | 15.2 | 1.7  | 8.6 | 1.4  | 6.8 | 1  | 5.5 | ns   |
| $t_{en}$  | OE           | Y           | 3.5   | 15.2 | 1.7  | 8.6 | 1.5  | 6.8 | 1  | 5.5 | ns   |
| $t_{dis}$ | OE           | Y           | 1.7   | 12.6 | 1  | 5.7 | 1  | 4.5 | 0.1                                      | 3.3 | ns   |

## OPERATING CHARACTERISTICS

$T_J = 25^{\circ}$

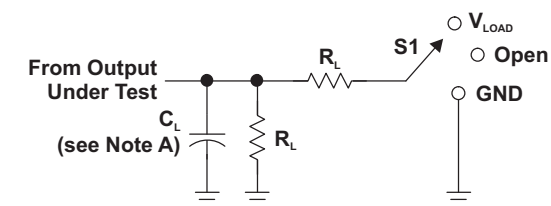
| PARAMETER |                               |                  | TEST CONDITIONS      | $V_{CC} = 1.8\ \text{V}$ | $V_{CC} = 2.5\ \text{V}$ | $V_{CC} = 3.3\ \text{V}$ | $V_{CC} = 5\ \text{V}$ | UNIT |
|-----------|-------------------------------|------------------|----------------------|--------------------------|--------------------------|--------------------------|------------------------|------|
|           |                               |                  |                      | TYP                      | TYP                      | TYP                      | TYP                    |      |
| $C_{pd}$  | Power dissipation capacitance | Outputs enabled  | $f = 10\ \text{MHz}$ | 19                       | 19                       | 20                       | 22                     | pF   |
|           |                               | Outputs disabled |                      | 2                        | 2                        | 2                        | 3                      |      |



- (1) See datasheet for absolute maximum and minimum recommended operating conditions.
- (2) Silicon operating life design goal is 10 years at 105°C junction temperature (does not include package interconnect life).
- (3) Enhanced plastic product disclaimer applies.

**Figure 1. SN74LVC2G126-EP Operating Life Derating Chart**

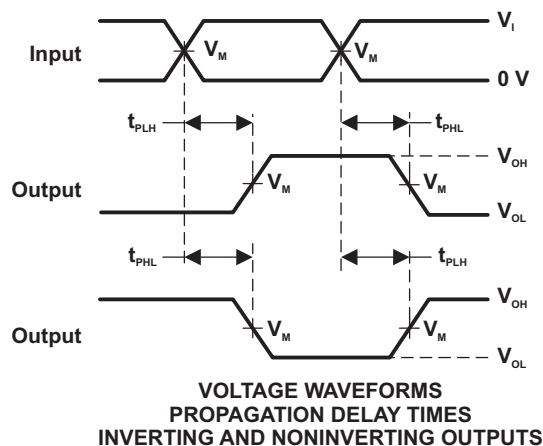
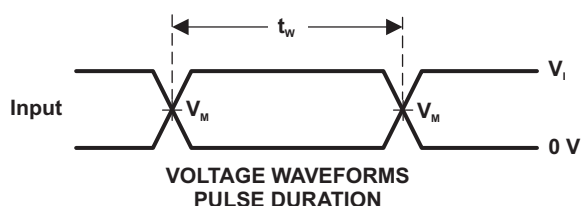
## PARAMETER MEASUREMENT INFORMATION



LOAD CIRCUIT

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

| $V_{CC}$                         | INPUTS   |                      | $V_M$      | $V_{LOAD}$        | $C_L$ | $R_L$        | $V_{\Delta}$ |
|----------------------------------|----------|----------------------|------------|-------------------|-------|--------------|--------------|
|                                  | $V_I$    | $t_r/t_f$            |            |                   |       |              |              |
| $1.8\text{ V} \pm 0.15\text{ V}$ | $V_{CC}$ | $\leq 2\text{ ns}$   | $V_{CC}/2$ | $2 \times V_{CC}$ | 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:
- $C_L$  includes probe and jig capacitance.
  - Waveform 1 is for an output with internal conditions such that the output is low, except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high, except when disabled by the output control.
  - All input pulses are supplied by generators having the following characteristics: PRR  $\leq 10\text{ MHz}$ ,  $Z_o = 50\ \Omega$ .
  - The outputs are measured one at a time, with one transition per measurement.
  - $t_{PLZ}$  and  $t_{PHZ}$  are the same as  $t_{dis}$ .
  - $t_{PZL}$  and  $t_{PZH}$  are the same as  $t_{en}$ .
  - $t_{PLH}$  and  $t_{PHL}$  are the same as  $t_{pd}$ .
  - All parameters and waveforms are not applicable to all devices.

Figure 2. Load Circuit and Voltage Waveforms

## 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                 |
|------------------|---------------|--------------|--------------------|------|----------------|----------------------------|-------------------------|----------------------|--------------|-------------------------|-------------------------|
| CLVC2G126MDCUTEP | ACTIVE        | VSSOP        | DCU                | 8    | 250            | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -55 to 125   | CEPR                    | <a href="#">Samples</a> |
| V62/14604-01XE   | ACTIVE        | VSSOP        | DCU                | 8    | 250            | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -55 to 125   | CEPR                    | <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.

(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/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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**OTHER QUALIFIED VERSIONS OF SN74LVC2G126-EP :**

- Catalog: [SN74LVC2G126](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product



## 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 |
|------------------|--------------|-----------------|------|-----|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| CLVC2G126MDCUTEP | VSSOP        | DCU             | 8    | 250 | 180.0              | 8.4                | 2.25    | 3.35    | 1.05    | 4.0     | 8.0    | Q3            |

## TAPE AND REEL BOX DIMENSIONS



\*All dimensions are nominal

| Device           | Package Type | Package Drawing | Pins | SPQ | Length (mm) | Width (mm) | Height (mm) |
|------------------|--------------|-----------------|------|-----|-------------|------------|-------------|
| CLVC2G126MDCUTEP | VSSOP        | DCU             | 8    | 250 | 202.0       | 201.0      | 28.0        |

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.

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