

## Description

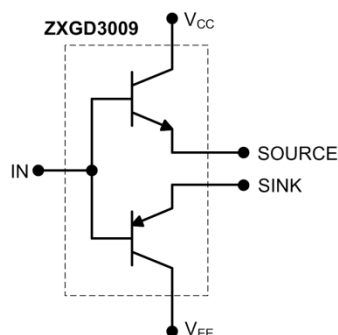
ZXGD3009E6 is a high-speed non-inverting single gate driver for switching MOSFETs. It can transfer up to 2A peak source/sink current into the gate for effective charging and discharging the capacitive load.

This gate driver ensures rapid switching of the MOSFET to minimize power losses and distortion in high current switching applications. It can typically drive 1A into the low gate impedance with just 10mA input from a controller. Also, the turn-on and turn-off switching behavior of the MOSFET can be individually tailored to suit an application. In particular, by defining the switching characteristics appropriately, EMI and cross conduction problems can be reduced.

## Applications

Power MOSFET Gate Driving in:

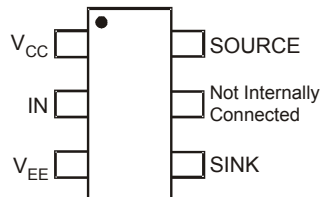
- Power Supplies
- DC-DC Converters
- Amplifier output stages



Internal Device  
Schematic



Top View




Top View  
Pin-Out

| Pin Name        | Pin Function          |
|-----------------|-----------------------|
| V <sub>CC</sub> | Supply Voltage High   |
| IN              | Driver Input          |
| V <sub>EE</sub> | Supply Voltage Low    |
| SOURCE          | Source Current Output |
| SINK            | Sink Current Output   |

## Features

- High-gain buffer with typically 1A output from 10mA input
- Emitter-follower that is rugged to latch-up / shoot-through issues
- Wide supply voltage to minimize on-losses
- Separate source and sink outputs for independent control of MOSFET turn-on and turn-off times
- Optimized pin-out to simplify PCB layout and reduce parasitic trace inductances
- Near-zero quiescent supply current
- **Totally Lead-Free & Fully RoHS compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**

## Mechanical Data

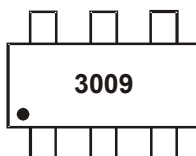
- Case: SOT26
- Case material: Molded Plastic. "Green" Molding Compound  
UL Flammability Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish - Matte Tin Plated Leads, Solderable per  
MIL-STD-202, Method 208 
- Weight: 0.018 grams (approximate)

## Ordering Information (Note 4)

| Product      | Marking | Reel size (inches) | Tape width (mm) | Quantity per reel |
|--------------|---------|--------------------|-----------------|-------------------|
| ZXGD3009E6TA | 3009    | 7                  | 8               | 3,000             |

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
  2. See [http://www.diodes.com/quality/lead\\_free.html](http://www.diodes.com/quality/lead_free.html) for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
  3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
  4. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

## Marking Information



3009 = Product Type Marking Code

**Absolute Maximum Ratings** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

| Characteristic                                  | Symbol                      | Value | Unit |
|---|-----------------------------|-------|------|
| Supply voltage, with respect to V <sub>EE</sub> | V <sub>CC</sub>             | 40    | V    |
| Input voltage, with respect to V <sub>EE</sub>  | V <sub>IN</sub>             | 40    | V    |
| Output difference voltage (Source – Sink)       | ΔV <sub>(source-sink)</sub> | ±7    | V    |
| Peak Pulsed Output Current (Source and Sink)    | I <sub>OM</sub>             | ±3    | A    |
| Peak Pulsed Input Current                       | I <sub>IM</sub>             | ±1    | A    |

**Thermal Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

| Characteristic  | Symbol                            | Value       | Unit  |
|---|-----------------------------------|-------------|-------|
| Power Dissipation (Notes 5 & 6)                       | P <sub>D</sub>                    | 1.1         | W     |
| Linear derating factor                                |                                   | 8.8         | mW/°C |
| Thermal Resistance, Junction to Ambient (Notes 5 & 6) | R <sub>θJA</sub>                  | 113         | °C/W  |
| Thermal Resistance, Junction to Lead (Note 7)         | R <sub>θJL</sub>                  | 105         |       |
| Operating and Storage Temperature Range               | T <sub>J</sub> , T <sub>STG</sub> | -55 to +150 | °C    |

**ESD Ratings** (Note 8)

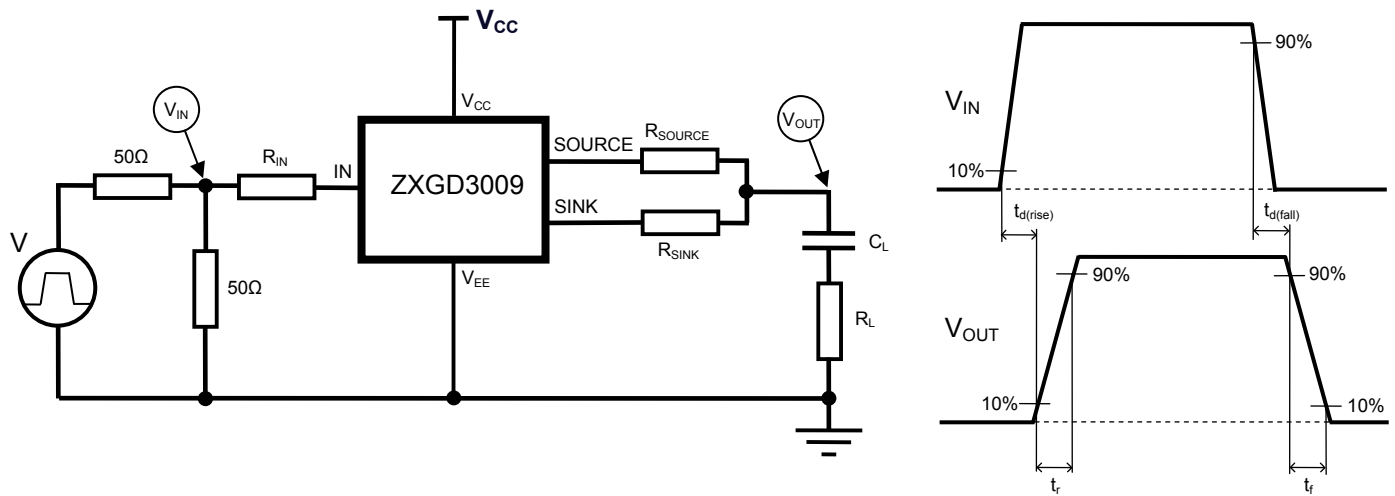
| Characteristics                            | Symbols | Value | Unit | JEDEC Class |
|--|---------|-------|------|-------------|
| Electrostatic Discharge – Human Body Model | ESD HBM | 4,000 | V    | 3A          |
| Electrostatic Discharge – Machine Model    | ESD MM  | 400   | V    | C           |

- Notes:
- For a device mounted with pin 1 (V<sub>CC</sub>) and pin 3 (V<sub>EE</sub>) on 25mm x 25mm 1oz copper that is on a single-sided 1.6mm FR4 PCB; device is measured under still air conditions whilst operating in steady-state. The heatsink is split in half with pin 1 (V<sub>CC</sub>) and pin 3 (V<sub>EE</sub>) connected separately to each half.
  - For device with two active die running at equal power.
  - Thermal resistance from junction to solder-point at the end of each lead on pin 1 (V<sub>CC</sub>) and pin 3 (V<sub>EE</sub>).
  - Refer to JEDEC specification JESD22-A114 and JESD22-A115.

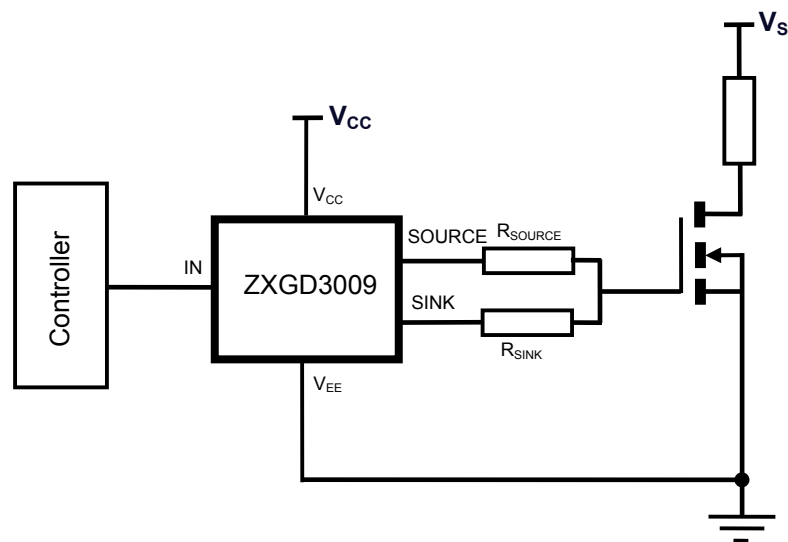
**Electrical Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

| Characteristic   | Symbol   | Min                   | Typ                    | Max                   | Unit | Test Condition  |
|--|--|-----------------------|------------------------|-----------------------|------|---|
| Output Voltage, high   | V <sub>OH</sub>  | V <sub>CC</sub> - 0.8 | V <sub>CC</sub> - 0.4  |                       | V    | I <sub>(source)</sub> = 1μA, V <sub>IN</sub> = V <sub>CC</sub>  |
| Output Voltage, low  | V <sub>OL</sub>  | -                     | V <sub>EE</sub> + 0.2  | V <sub>EE</sub> + 0.5 | V    | I <sub>(sink)</sub> = 1μA, V <sub>IN</sub> = V <sub>EE</sub>  |
| Supply Breakdown Voltage   | BV <sub>CC</sub>   | 40                    | —                      | —                     | V    | I <sub>Q</sub> = 100μA, V <sub>IN</sub> = V <sub>CC</sub>   |
|  |  | 40                    | —                      | —                     |      | I <sub>Q</sub> = 100μA, V <sub>IN</sub> = V <sub>EE</sub> = 0V  |
| Quiescent Supply Current   | I <sub>Q</sub>   | —                     | —                      | 20                    | nA   | V <sub>CC</sub> = 32V, V <sub>IN</sub> = V <sub>CC</sub>  |
|  |  | —                     | —                      | 20                    |      | V <sub>CC</sub> = 32V, V <sub>IN</sub> = V <sub>EE</sub> = 0V   |
| Peak Pulsed Source Current                                       | I <sub>(source)M</sub>   | —                     | 0.98                   | —                     | A    | I <sub>IN</sub> = 10mA, V <sub>CC</sub> = 5V, V <sub>OUT</sub> = 0V   |
| Peak Pulsed Sink Current   | I <sub>(sink)M</sub>   | —                     | 0.78                   | —                     | A    | I <sub>IN</sub> = -10mA, V <sub>EE</sub> = 0V, V <sub>OUT</sub> = 5V  |
| Peak Pulsed Source Current                                       | I <sub>(source)M</sub>   | —                     | 1.58                   | —                     | A    | I <sub>IN</sub> = 50mA, V <sub>CC</sub> = 5V, V <sub>OUT</sub> = 0V   |
| Peak Pulsed Sink Current   | I <sub>(sink)M</sub>   | —                     | 1.38                   | —                     | A    | I <sub>IN</sub> = -50mA, V <sub>EE</sub> = 0V, V <sub>OUT</sub> = 5V  |
| Peak Pulsed Source Current                                       | I <sub>(source)M</sub>   | —                     | 2.3                    | —                     | A    | I <sub>IN</sub> = 500mA, V <sub>CC</sub> = 5V, V <sub>OUT</sub> = 0V  |
| Peak Pulsed Sink Current   | I <sub>(sink)M</sub>   | —                     | 2.6                    | —                     | A    | I <sub>IN</sub> = -500mA, V <sub>EE</sub> = 0V, V <sub>OUT</sub> = 5V   |
| Peak Pulsed Source Current with varying input resistances        | I <sub>(source)M</sub>   | —                     | 0.74<br>0.175<br>0.019 | —                     | A    | R <sub>IN</sub> = 100Ω<br>R <sub>IN</sub> = 1kΩ<br>R <sub>IN</sub> = 10kΩ<br>V <sub>CC</sub> = 15V, V <sub>EE</sub> = 0V<br>V <sub>IN</sub> = 15V<br>C <sub>L</sub> = 1nF, R <sub>L</sub> = 0.18Ω<br>R <sub>SOURCE</sub> = 0Ω, R <sub>SINK</sub> = 0Ω |
| Peak Pulsed Sink Current with varying input resistances          | I <sub>(sink)M</sub>   | —                     | 1.05<br>0.22<br>0.025  | —                     | A    | R <sub>IN</sub> = 100Ω<br>R <sub>IN</sub> = 1kΩ<br>R <sub>IN</sub> = 10kΩ<br>V <sub>CC</sub> = 15V, V <sub>EE</sub> = 0V<br>V <sub>IN</sub> = 15V<br>C <sub>L</sub> = 1nF, R <sub>L</sub> = 0.18Ω<br>R <sub>SOURCE</sub> = 0Ω, R <sub>SINK</sub> = 0Ω |
| Switching Times with low input resistance                        | t <sub>d(rise)</sub><br>t <sub>r</sub><br>t <sub>d(fall)</sub><br>t <sub>f</sub> | —                     | 3.8<br>15<br>4<br>15   | —                     | ns   | V <sub>CC</sub> = 12V, V <sub>EE</sub> = 0V<br>V <sub>IN</sub> = 0 to 10V<br>R <sub>IN</sub> = 25Ω<br>C <sub>L</sub> = 1nF, R <sub>L</sub> = 0.18Ω<br>R <sub>SOURCE</sub> = 0Ω, R <sub>SINK</sub> = 0Ω  |
| Switching Times with low load capacitance C <sub>L</sub> = 1nF   | t <sub>d(rise)</sub><br>t <sub>r</sub><br>t <sub>d(fall)</sub><br>t <sub>f</sub> | —                     | 18<br>36<br>16<br>40   | —                     | ns   | V <sub>CC</sub> = 15V, V <sub>EE</sub> = 0V<br>V <sub>IN</sub> = 0 to 15V<br>R <sub>IN</sub> = 1kΩ<br>C <sub>L</sub> = 1nF, R <sub>L</sub> = 0.18Ω<br>R <sub>SOURCE</sub> = 0Ω, R <sub>SINK</sub> = 0Ω  |
| Switching Times with high load capacitance C <sub>L</sub> = 10nF | t <sub>d(rise)</sub><br>t <sub>r</sub><br>t <sub>d(fall)</sub><br>t <sub>f</sub> | —                     | 47<br>210<br>39<br>240 | —                     | ns   | V <sub>CC</sub> = 15V, V <sub>EE</sub> = 0V<br>V <sub>IN</sub> = 0 to 15V<br>R <sub>IN</sub> = 1kΩ<br>C <sub>L</sub> = 10nF, R <sub>L</sub> = 0.18Ω<br>R <sub>SOURCE</sub> = 0Ω, R <sub>SINK</sub> = 0Ω   |
| Switching Times with asymmetric source and sink resistors        | t <sub>d(rise)</sub><br>t <sub>r</sub><br>t <sub>d(fall)</sub><br>t <sub>f</sub> | —                     | 42<br>290<br>38<br>235 | —                     | ns   | V <sub>CC</sub> = 15V, V <sub>EE</sub> = 0V<br>V <sub>IN</sub> = 0 to 15V<br>R <sub>IN</sub> = 1kΩ<br>C <sub>L</sub> = 1nF, R <sub>L</sub> = 0.18Ω<br>R <sub>SOURCE</sub> = 4.7Ω, R <sub>SINK</sub> = 0Ω  |

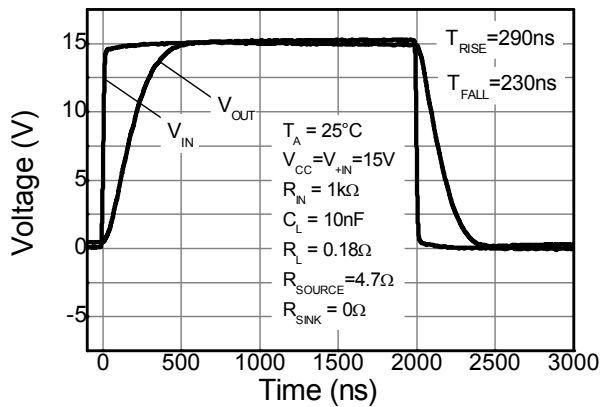
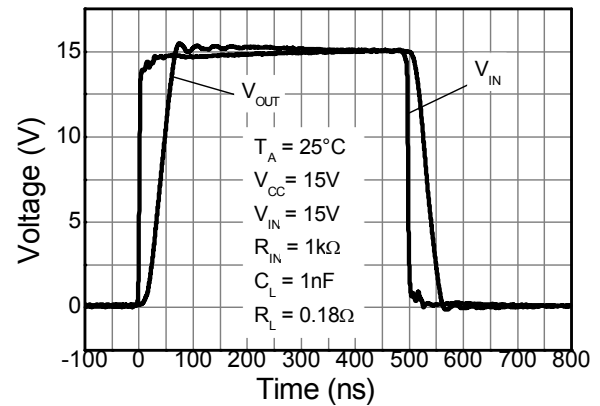
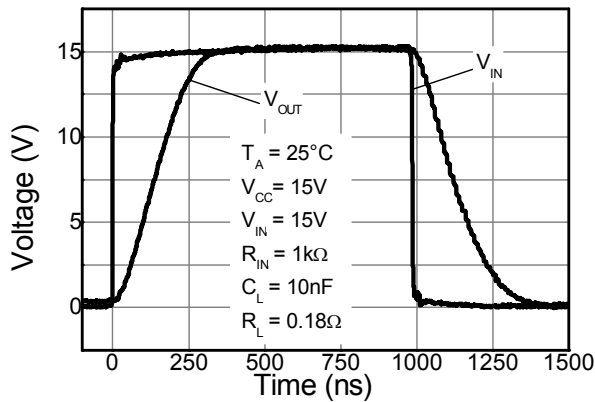
## Switching Test Circuit and Timing Diagram



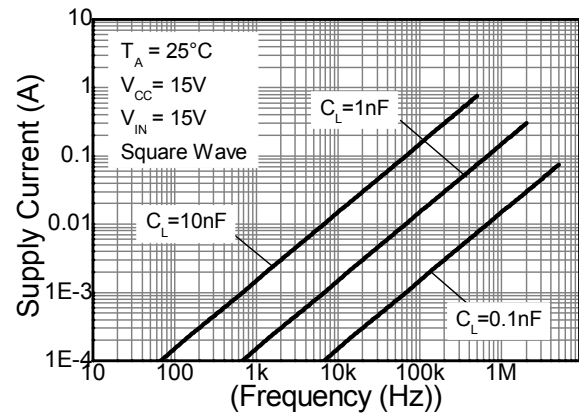
## Typical Application Circuit



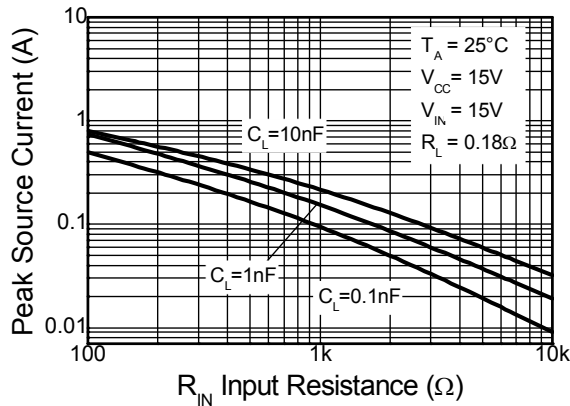
**Typical Switching Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)



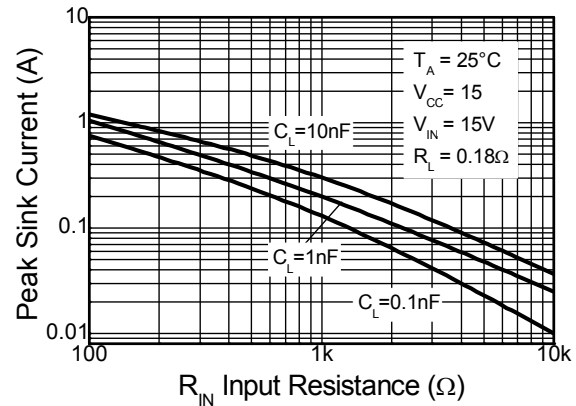
**Switching Speed**  
Asymmetric Source and Sink Resistance



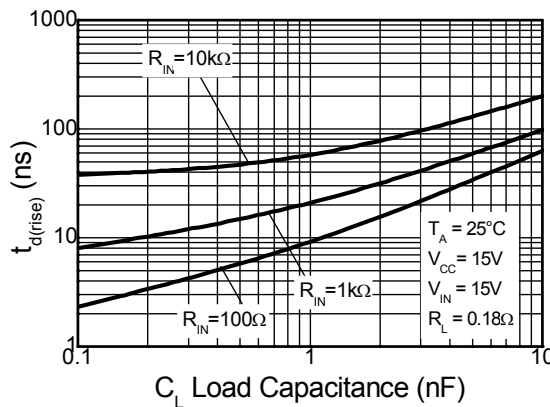
**Typical Switching Characteristics (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)**



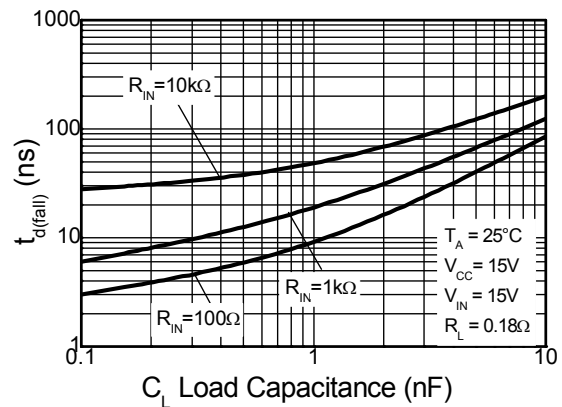
**Source Current vs. Input Resistance**



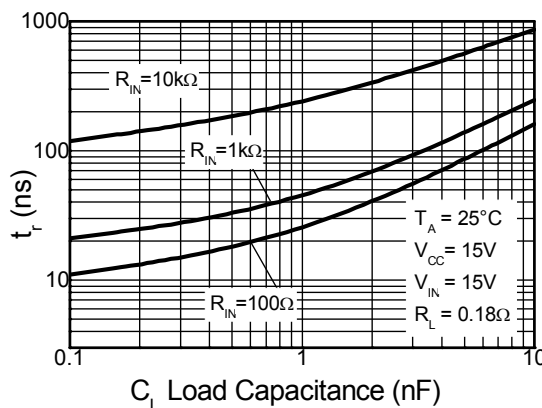
**Sink Current vs. Input Resistance**



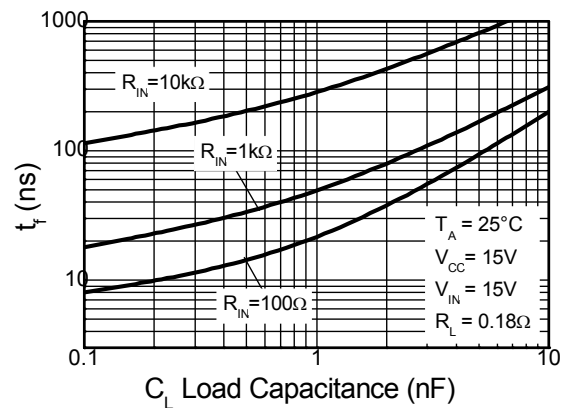
**Turn-On Delay Time**



**Turn-Off Delay Time**



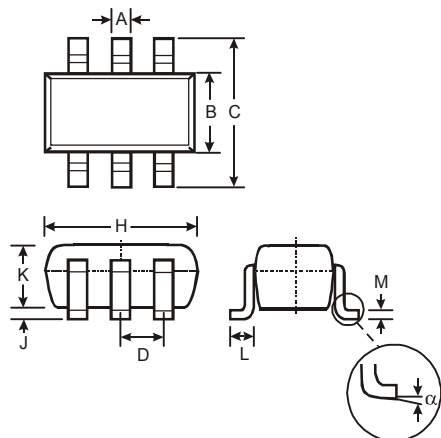
**Turn-On Rise Time**



**Turn-Off Fall Time**

## Package Outline Dimensions

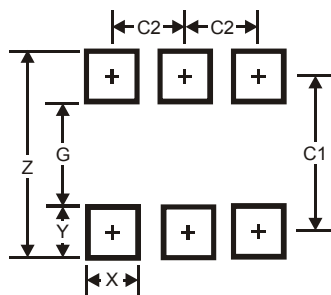
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



| SOT26                |       |      |      |
|----------------------|-------|------|------|
| Dim                  | Min   | Max  | Typ  |
| A                    | 0.35  | 0.50 | 0.38 |
| B                    | 1.50  | 1.70 | 1.60 |
| C                    | 2.70  | 3.00 | 2.80 |
| D                    | —     | —    | 0.95 |
| H                    | 2.90  | 3.10 | 3.00 |
| J                    | 0.013 | 0.10 | 0.05 |
| K                    | 1.00  | 1.30 | 1.10 |
| L                    | 0.35  | 0.55 | 0.40 |
| M                    | 0.10  | 0.20 | 0.15 |
| $\alpha$             | 0°    | 8°   | —    |
| All Dimensions in mm |       |      |      |

## Suggested Pad Layout

Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version.



| Dimensions | Value (in mm) |
|------------|---------------|
| Z          | 3.20          |
| G          | 1.60          |
| X          | 0.55          |
| Y          | 0.80          |
| C1         | 2.40          |
| C2         | 0.95          |

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