

# ZXGD3001E6

## 9A(peak) Gate driver in SOT23-6

### General description

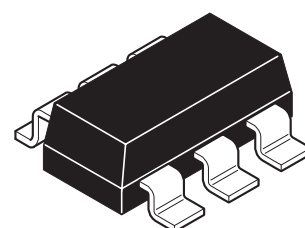
The ZXGD3001E6 is a high-speed non-inverting single MOSFET gate driver capable of driving up to 9A into a MOSFET or IGBT gate capacitive load from supply voltages up to 12V. With typical propagation delay times down to 3ns and rise/fall times down to 11ns this device ensures rapid switching of the power MOSFET or IGBT to minimize power losses and distortion in high current fast switching applications.

The ZXGD3001E6 is inherently rugged to latch-up and shoot-through, and its wide supply voltage range allows full enhancement to minimize on-losses of the power MOSFET or IGBT.

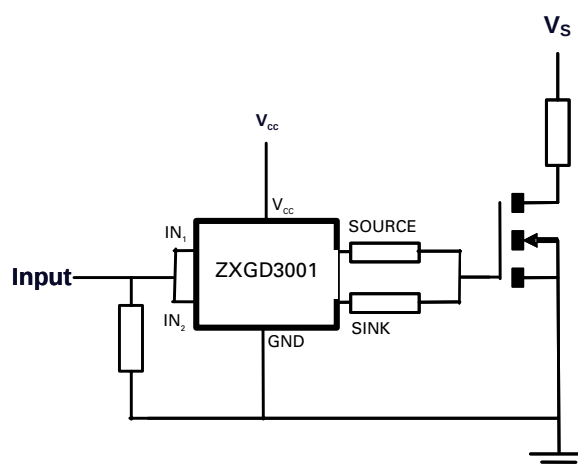
Its low input voltage requirement and high current gain allows high current driving from low voltage controller ICs, and the optimized pin-out SOT23-6 package with separate source and sink pins eases board layout, enabling reduced parasitic inductance and independent control of rise and fall slew rates.

### Features

- 12V operating voltage range
- 9 Amps peak output current
- Fast switching emitter-follower configuration
  - 3ns propagation delay time
  - 11ns rise/fall time, 1000pF load
- Low input current requirement
  - 4.2A(source)/2.2A(sink) output current from 10mA input
- SOT23-6 package
- Separate source and sink outputs for independent control of rise and fall time
- Optimized pin-out to ease board layout and minimize trace inductance
- No Latch Up
- No shoot through
- Near - Zero quiescent and output leakage current



### Typical application circuit



# ZXGD3001E6

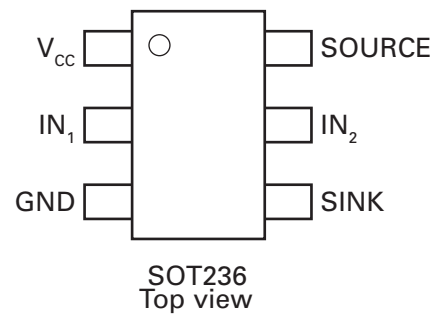
## Applications

Power MOSFET and IGBT Gate Driving in

- Synchronous switch-mode power supplies
- Secondary side synchronous rectification
- Plasma Display Panel power modules
- 1, 2 and 3-phase motor control circuits
- Audio switching amplifier power output stages

## Pin configuration

| Pin Name                          | Pin Function                                                                |
|-----------------------------------|-----------------------------------------------------------------------------|
| V <sub>CC</sub>                   | Driver supply                                                               |
| IN <sub>1</sub> / IN <sub>2</sub> | Driver input pins. These are normally connected together by circuit tracks. |
| GND                               | Ground                                                                      |
| SOURCE                            | Source current output.                                                      |
| SINK                              | Sink current output.                                                        |



## Ordering information

| DEVICE       | Reel size (inches) | Tape width (mm) | Quantity per reel |
|--------------|--------------------|-----------------|-------------------|
| ZXGD3001E6TA | 7                  | 8 embossed      | 3000              |

## Device marking

3001

## Absolute maximum ratings

| Parameter                                         | Symbol             | Limit       | Unit            |
|---------------------------------------------------|--------------------|-------------|-----------------|
| Supply voltage                                    | $V_{CC}$           | 12          | V               |
| Input voltage                                     | $V_{IN}$           | 12          | V               |
| Peak sink current <sup>(c)</sup>                  | $I_{(sink)PK}$     | 9           | A               |
| Source current @ $I_{IN1} + I_{IN2} = 10mA^{(a)}$ | $I_{(source)}$     | 4.2         | A               |
| Sink current @ $I_{IN1} + I_{IN2} = 10mA^{(a)}$   | $I_{(sink)}$       | 2.2         | A               |
| Input current <sup>(c)</sup>                      | $I_{IN1}, I_{IN2}$ | 1           | A               |
| Power dissipation at $T_A = 25^{\circ}C^{(a)(b)}$ | $P_D$              | 1.1         | W               |
| Linear derating factor                            |                    | 8.8         | mW/ $^{\circ}C$ |
| Operating and storage temperature range           | $T_j, T_{stg}$     | -55 to +150 | $^{\circ}C$     |

## Thermal resistance

| Parameter                             | Symbol          | Value | Unit          |
|---------------------------------------|-----------------|-------|---------------|
| Junction to ambient <sup>(a)(b)</sup> | $R_{\theta JA}$ | 113   | $^{\circ}C/W$ |

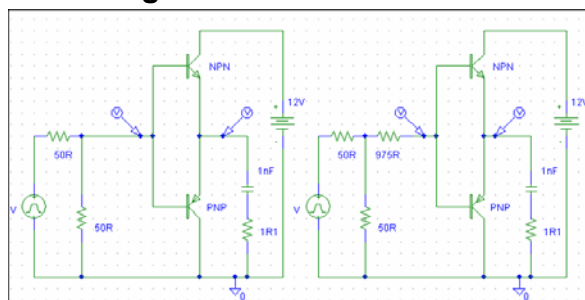
### NOTES:

- (a) For a device surface mounted on 25mm x 25mm x 0.6mm FR4 PCB with high coverage of single sided 1oz copper, in still air conditions.
- (b) For device with two active dice running at equal power.
- (c) Pulse width  $\leq 300\mu s$  limit repetition rate to comply with maximum junction temperature.

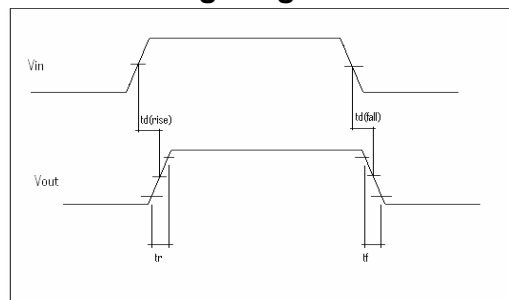
**Electrical characteristics (at  $T_{amb} = 25^{\circ}\text{C}$  unless otherwise stated).**

| Parameter                     | Symbol           | Min. | Typ.           | Max. | Unit          | Conditions                                                                                                      |
|-------------------------------|------------------|------|----------------|------|---------------|-----------------------------------------------------------------------------------------------------------------|
| Output voltage, high          | $V_{OH}$         |      | $V_{CC} - 0.4$ |      | V             | $I_{SOURCE} = 1\mu\text{A}$                                                                                     |
| Output voltage, low           | $V_{OL}$         |      | 0.4            |      | V             | $I_{SINK} = 1\mu\text{A}$                                                                                       |
| Source output leakage current | $I_{L(source)}$  |      |                | 1    | $\mu\text{A}$ | $V_{CC} = 12\text{V}$ ,<br>$V_{IN1} = V_{IN2} = 0\text{V}$                                                      |
| Sink output leakage current   | $I_{L(sink)}$    |      |                | 1    | $\mu\text{A}$ | $V_{CC} = 12\text{V}$ ,<br>$V_{IN1} = V_{IN2} = V_{CC}$                                                         |
| Quiescent current             | $I_Q$            |      |                | 50   | nA            | $V_{CC} = 9.6\text{V}$ ,<br>$V_{IN1} = V_{IN2} = 0\text{V}$                                                     |
| Source output current         | $I_{(source)}$   | 1    | 1.7            |      | A             | $I_{IN1} + I_{IN2} = 2.5\text{mA}$                                                                              |
| Sink output current           | $I_{(sink)}$     | 0.7  | 1.1            |      | A             | $I_{IN1} + I_{IN2} = 2.5\text{mA}$                                                                              |
| Source output current         | $I_{(source)}$   | 2.7  | 4.2            |      | A             | $I_{IN1} + I_{IN2} = 10\text{mA}$                                                                               |
| Sink output current           | $I_{(sink)}$     | 1.5  | 2.2            |      | A             | $I_{IN1} + I_{IN2} = 10\text{mA}$                                                                               |
| Source output current         | $I_{(source)PK}$ |      | 9              |      | A             | $I_{IN1} + I_{IN2} = 1\text{A}$                                                                                 |
| Sink output current           | $I_{(sink)PK}$   |      | 9              |      | A             | $I_{IN1} + I_{IN2} = 1\text{A}$                                                                                 |
| Gate driver switching times   | $t_{d(rise)}$    |      | 1.3            |      | ns            | $C_L = 1\text{nF}$ , $R_L = 1\Omega$ , $V_{CC} = 8\text{V}$ ,<br>$V_{IN} = 6\text{V}$ , $R_S = 25\Omega$        |
|                               | $t_r$            |      | 7.3            |      | ns            |                                                                                                                 |
|                               | $t_{d(fall)}$    |      | 3              |      | ns            |                                                                                                                 |
|                               | $t_f$            |      | 11             |      | ns            |                                                                                                                 |
| Gate driver switching times   | $t_{d(rise)}$    |      | 9              |      | ns            | $C_L = 1\text{nF}$ , $R_L = 1\Omega$ , $V_{CC} = 8\text{V}$ ,<br>$V_{IN} = 6\text{V}$ , $R_S = 1\text{k}\Omega$ |
|                               | $t_r$            |      | 141.5          |      | ns            |                                                                                                                 |
|                               | $t_{d(fall)}$    |      | 14             |      | ns            |                                                                                                                 |
|                               | $t_f$            |      | 151            |      | ns            |                                                                                                                 |

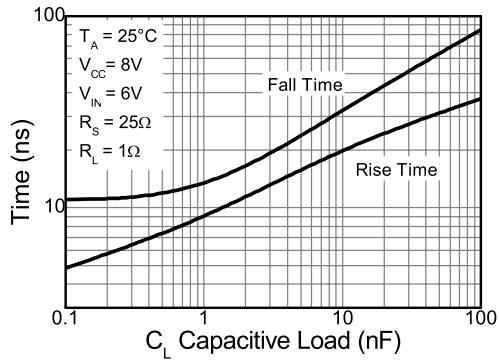
## Switching Time Test Circuits



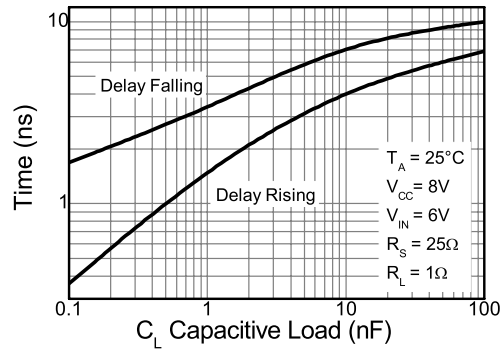
## Timing Diagram



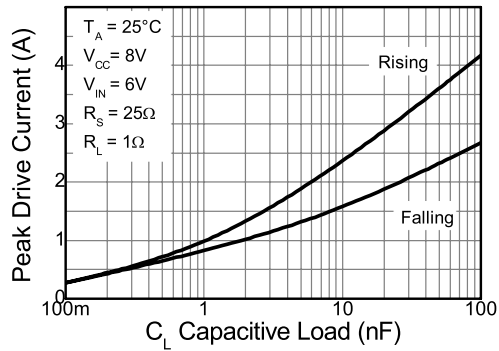
## Typical gate driver characteristics



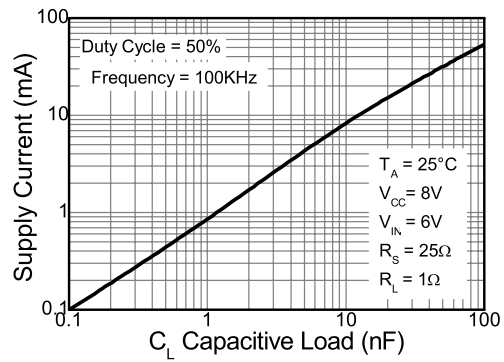
**Rise and Fall Time**



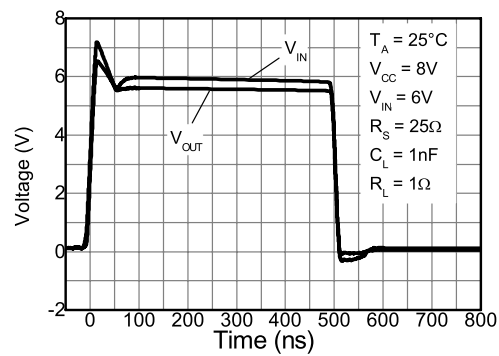
**Propagation Delay**



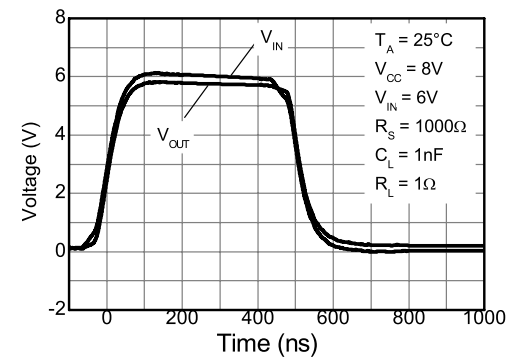
**Peak Drive Current**



**Supply Current**

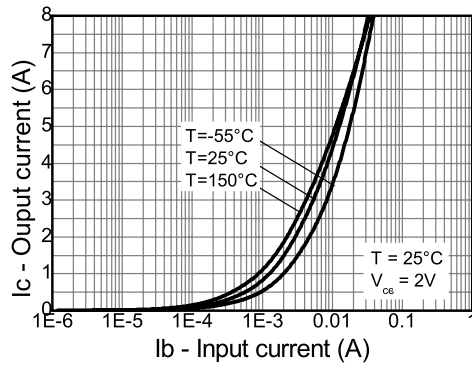


**Switching Speed**

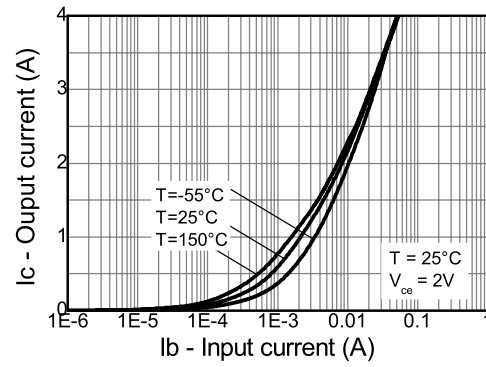


**Switching Speed**

# ZXGD3001E6



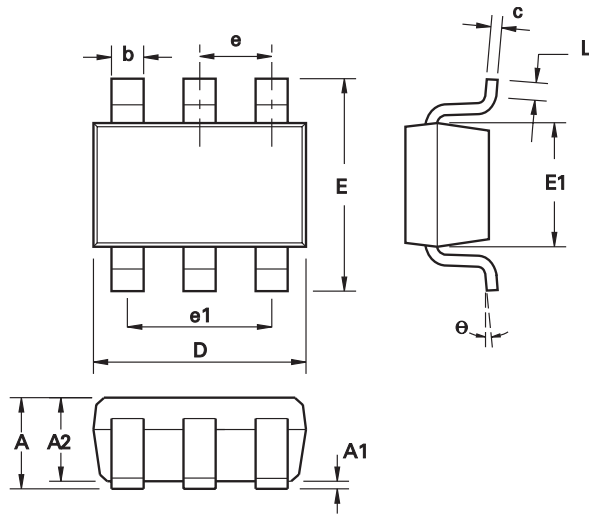
**Source Current Vs Input Current**



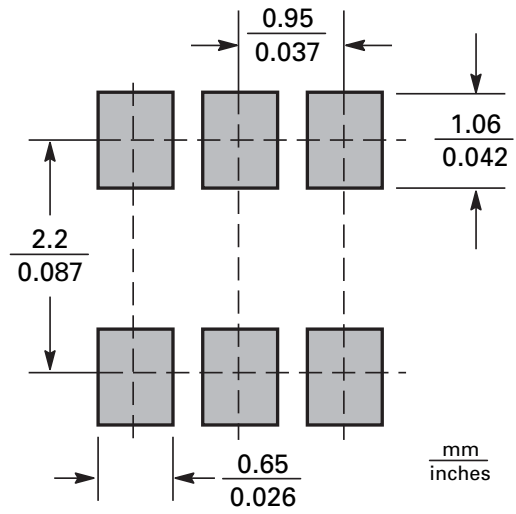
**Sink Current Vs Input Current**

# ZXGD3001E6

## SOT23-6 Package outline



## Pad layout details



| DIM | Millimeters |      | Inches     |        |
|-----|-------------|------|------------|--------|
|     | Min.        | Max. | Min.       | Max.   |
| A   | 0.90        | 1.45 | 0.0354     | 0.0570 |
| A1  | 0.00        | 0.15 | 0.00       | 0.0059 |
| A2  | 0.90        | 1.30 | 0.0354     | 0.0511 |
| b   | 0.35        | 0.50 | 0.0078     | 0.0196 |
| C   | 0.09        | 0.26 | 0.0035     | 0.0102 |
| D   | 2.70        | 3.10 | 0.1062     | 0.1220 |
| E   | 2.20        | 3.20 | 0.0866     | 0.1181 |
| E1  | 1.30        | 1.80 | 0.0511     | 0.0708 |
| L   | 0.10        | 0.60 | 0.0039     | 0.0236 |
| e   | 0.95 REF    |      | 0.0374 REF |        |
| e1  | 1.90 REF    |      | 0.0748 REF |        |
| L   | 0°          | 30°  | 0°         | 30°    |

**Note:** Controlling dimensions are in millimeters. Approximate dimensions are provided in inches

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| "Active"                          | Product status recommended for new designs                                     |
| "Last time buy (LTB)"             | Device will be discontinued and last time buy period and delivery is in effect |
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| "Obsolete"                        | Production has been discontinued                                               |

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|                       |                                                                                                                                                                                                             |
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