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## ZXGD3004E6

### 8A(peak) gate driver in SOT23-6

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#### General description

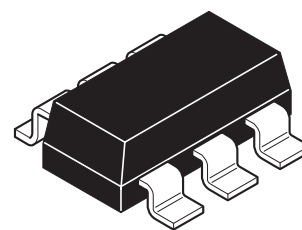
The ZXGD3004E6 is a high-speed non-inverting single MOSFET gate driver capable of driving up to 8A into a MOSFET or IGBT gate capacitive load from supply voltages up to 40V. With typical propagation delay times down to ~1ns and rise/fall times down to 14ns this device ensures rapid switching of the power MOSFET or IGBT to minimize power losses and distortion in high current fast switching applications.

The ZXGD3004E6 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.

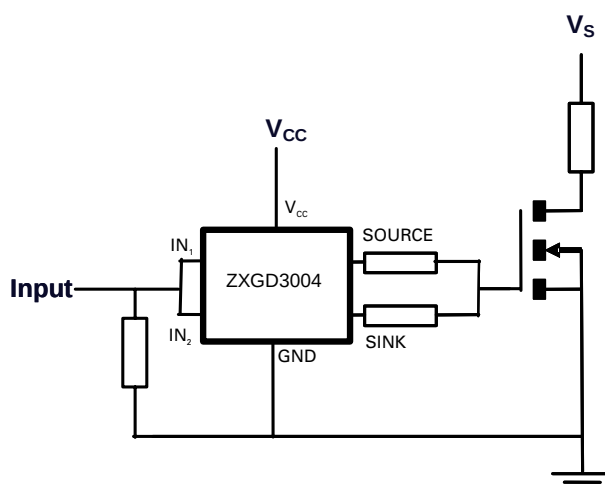
Its low input voltage requirement and high current gain allows high current driving from low voltage controller ICs, and the optimized pin-out SOT23-6 package with separate source and sink pins eases board layout, enabling reduced parasitic inductance and independent control of rise and fall slew rates.

#### Features

- 40V operating voltage range
- 8 amps peak output current
- Fast switching emitter-follower configuration
  - 1ns propagation delay time
  - 14ns rise/fall time, 1500pF load
- Low input current requirement
  - 1.9A(source)/1.9A(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

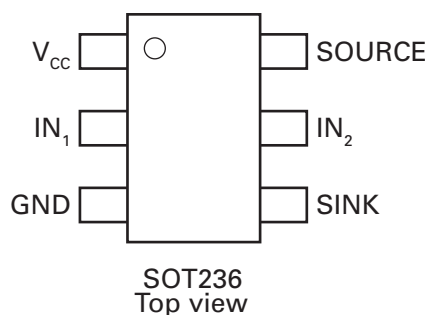


## Applications

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 description

| Pin Name      | Pin Function                                                                |
|---------------|-----------------------------------------------------------------------------|
| $V_{CC}$      | Driver supply.                                                              |
| $IN_1 / IN_2$ | 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 |
|--------------|--------------------|-----------------|-------------------|
| ZXGD3004E6TA | 7                  | 8 embossed      | 3000              |

## Device marking

3004

## Absolute maximum ratings

| Parameter                                         | Symbol             | Limit       | Unit            |
|---------------------------------------------------|--------------------|-------------|-----------------|
| Supply voltage                                    | $V_{CC}$           | 40          | V               |
| Input voltage                                     | $V_{IN}$           | 40          | V               |
| Peak sink current <sup>(c)</sup>                  | $I_{(sink)PK}$     | 8           | A               |
| Source current @ $I_{IN1} + I_{IN2} = 10mA^{(a)}$ | $I_{(source)}$     | 1.9         | A               |
| Sink current @ $I_{IN1} + I_{IN2} = 10mA^{(a)}$   | $I_{(sink)}$       | 1.9         | 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> | $R_{\theta JC}$ | 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.

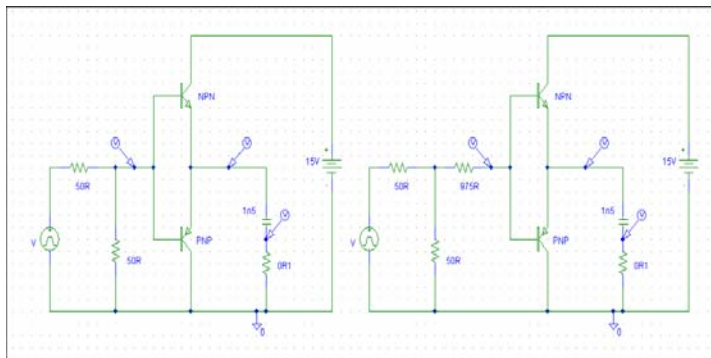
(c) Pulse width  $\leq 300\mu s$  limit repetition rate to comply with maximum junction temperature.

# ZXGD3004E6

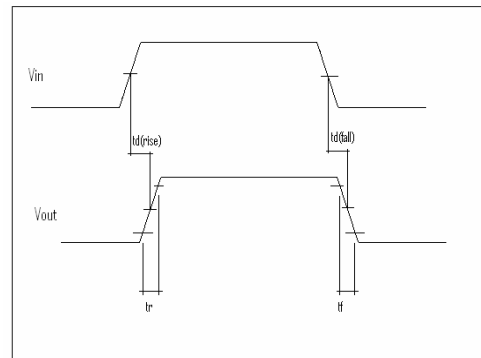
**Electrical characteristics (at Tamb = 25°C unless otherwise stated).**

| Parameter                     | Symbol           | Min. | Typ.            | Max. | Unit    | Conditions                                                                                     |
|-------------------------------|------------------|------|-----------------|------|---------|------------------------------------------------------------------------------------------------|
| Output voltage, high          | $V_{OH}$         |      | $V_{IN1} - 0.4$ |      | V       | $I_{source} = 1\mu A$                                                                          |
| Output voltage, low           | $V_{OL}$         |      | $V_{IN1} + 0.4$ |      | V       | $I_{sink} = 1\mu A$                                                                            |
| Source output leakage current | $I_{L(source)}$  |      |                 | 1    | $\mu A$ | $V_{CC} = 40V$ ,<br>$V_{IN1} = V_{IN2} = 0V$                                                   |
| Sink output leakage current   | $I_{L(sink)}$    |      |                 | 1    | $\mu A$ | $V_{CC} = 40V$ ,<br>$V_{IN1} = V_{IN2} = V_{CC}$                                               |
| Quiescent current             | $I_Q$            |      |                 | 50   | nA      | $V_{CC} = 32V$ ,<br>$V_{IN1} = V_{IN2} = 0V$                                                   |
| Source output current         | $I_{(source)}$   | 1.2  | 1.9             |      | A       | $I_{IN1} + I_{IN2} = 10mA$                                                                     |
| Sink output current           | $I_{(sink)}$     | 1.2  | 1.9             |      | A       | $I_{IN1} + I_{IN2} = 10mA$                                                                     |
| Source output current         | $I_{(source)PK}$ |      | 8               |      | A       | $I_{IN1} + I_{IN2} = 1A$                                                                       |
| Sink output current           | $I_{(sink)PK}$   |      | 8               |      | A       | $I_{IN1} + I_{IN2} = 1A$                                                                       |
| Gate driver switching times   | $t_{d(rise)}$    |      | 1.1             |      | ns      | $C_L = 1.5nF$ , $R_L = 0.1\Omega$ ,<br>$V_{CC} = 15V$ , $V_{IN} = 12.5V$ ,<br>$R_S = 25\Omega$ |
|                               | $t_r$            |      | 13.4            |      | ns      |                                                                                                |
|                               | $t_{d(fall)}$    |      | 0.95            |      | ns      |                                                                                                |
|                               | $t_f$            |      | 12.4            |      | ns      |                                                                                                |
| Gate driver switching times   | $t_{d(rise)}$    |      | 3.2             |      | ns      | $C_L = 1.5nF$ , $R_L = 0.1\Omega$ ,<br>$V_{CC} = 15V$ , $V_{IN} = 12.5V$ ,<br>$R_S = 1k\Omega$ |
|                               | $t_r$            |      | 77.9            |      | ns      |                                                                                                |
|                               | $t_{d(fall)}$    |      | 3.6             |      | ns      |                                                                                                |
|                               | $t_f$            |      | 82              |      | ns      |                                                                                                |

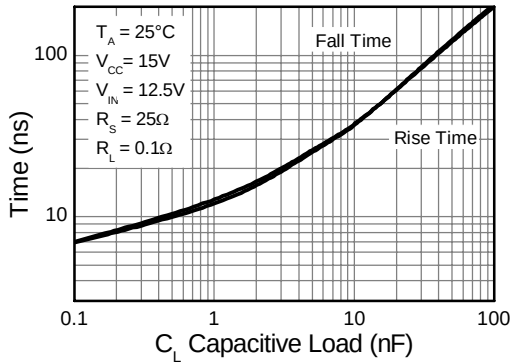
**Switching time test circuits**



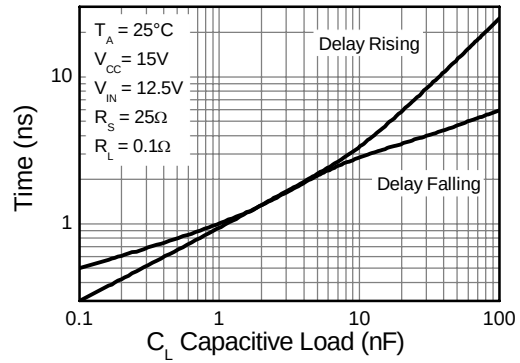
**Timing diagram**



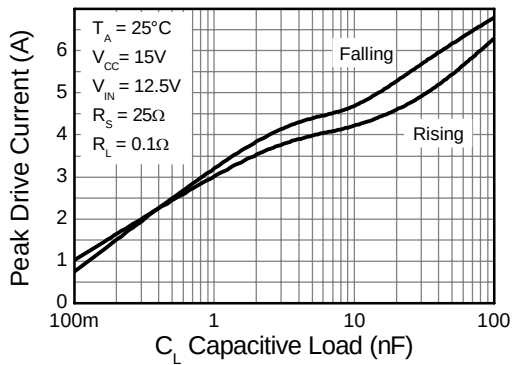
## Typical gate driver characteristics



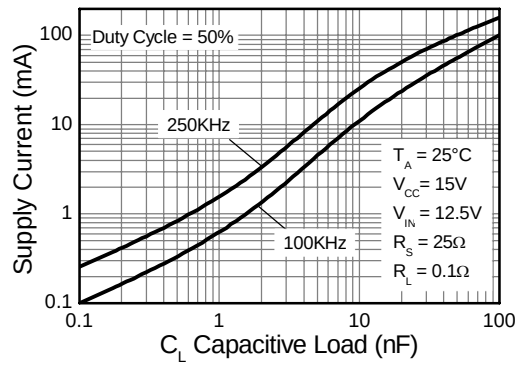
Rise and Fall Time



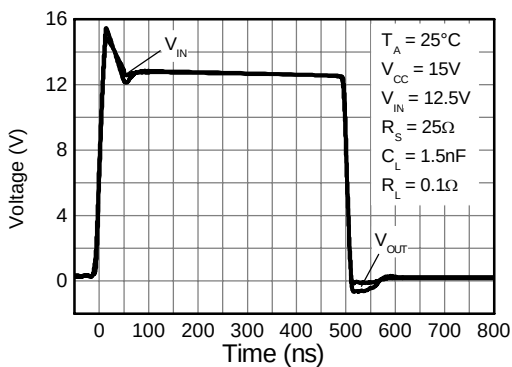
Propagation Delay



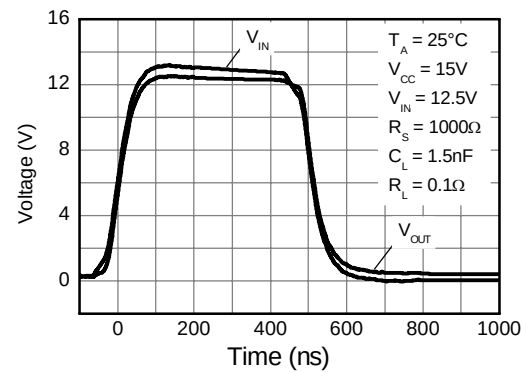
Peak Drive Current



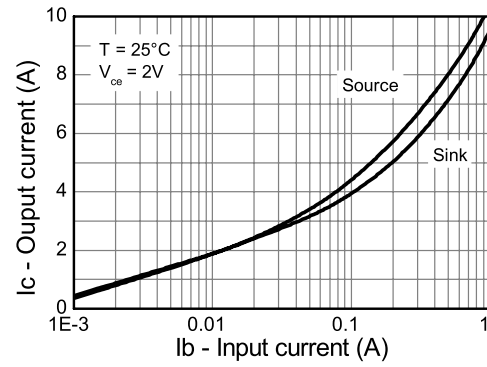
Supply Current



Switching Speed

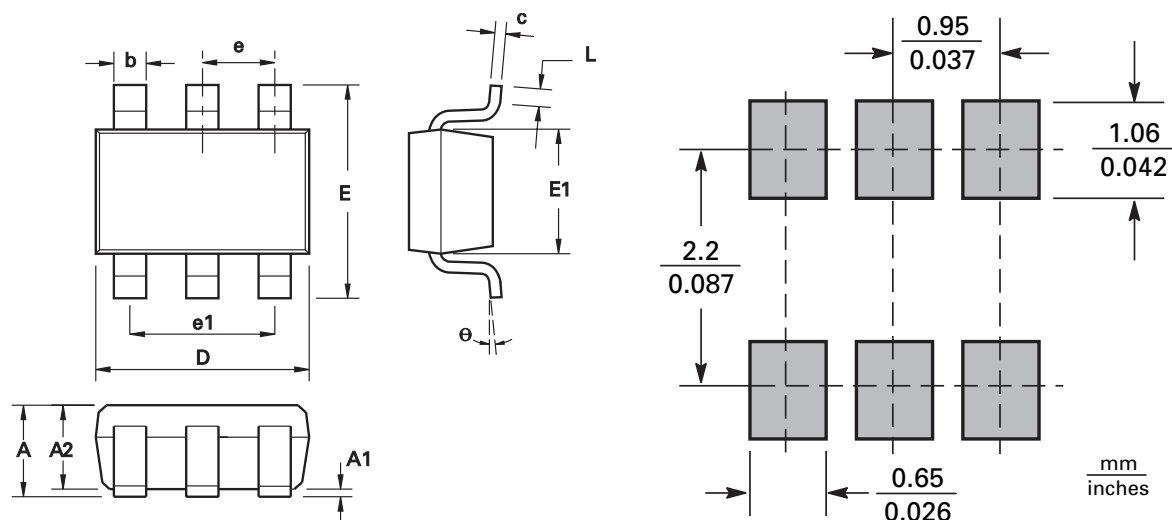


Switching Speed



Output current Vs Input current

## SOT23-6 Package outline



| 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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| "Not recommended for new designs" | Device is still in production to support existing designs and production       |
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