

Description

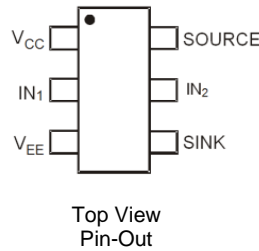
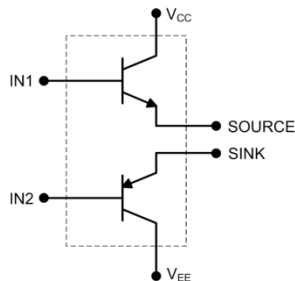
The ZXGD3004E6Q is a high-speed, non-inverting single gate driver designed for switching MOSFETs or IGBTs. It can transfer up to 8A peak source/source current into the gate for effective charging and discharging of the capacitive gate load.

This gate driver ensures rapid switching of the MOSFET to minimize power losses and distortion in high current switching applications. It can typically drive 1.9A into the low gate impedance with just 10mA input from a controller. The turn-on and turn-off switching behaviour of the MOSFET can be individually tailored to suit an application. By defining the switching characteristics appropriately, EMI and cross conduction can be reduced.

Applications

Gate Driving Power MOSFET and IGBTs in:

- AC-DC Power Supplies (SMPS)
- DC-DC Converters
- DC-AC Inverters (i.e. Solar)
- 1, 2 and 3-Phase Motor Control Circuits
- Amplifier Output Stages



| Pin Name | Pin Function |
|-----------------------------------|--------------------------|
| V _{CC} | Driver Supply High |
| IN ₁ & IN ₂ | Driver Input * |
| V _{EE} | Supply Voltage Low |
| SOURCE | Source Current Output ** |
| SINK | Sink Current Output ** |

* Typically connect IN₁ & IN₂ together

** Typically connect SOURCE & SINK together

Features

- High-Gain Buffer with Typically 1.9A Output from 10mA Input
- 8 Amps Peak Output Current
- 40V Supply for +20V to -18V Gate Driving to Prevent dV/dt Induced False Triggering and Minimize On-Losses
- Emitter-Follower that is Rugged to Latch-Up/Shoot-Through
- Fast Switching Emitter-Follower Configuration
 - 1ns Propagation Delay Time
 - 14ns Rise/Fall Time, 1500pF Load
- 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**
- **PPAP Capable (Note 4)**

Mechanical Data

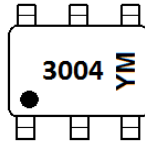
- Case: SOT26
- Case material: molded plastic. "Green" Molding Compound; UL Flammability Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish - Matte Tin Plated Leads, Solderable per MIL-STD-202, Method 208 Ⓔ3
- Weight: 0.018 grams (Approximate)

Ordering Information (Notes 4 & 5)

| Product | Compliance | Marking | Reel Size (inches) | Tape Width (mm) | Quantity per Reel |
|---------------|------------|---------|--------------------|-----------------|-------------------|
| ZXGD3004E6QTA | Automotive | 3004 | 7 | 8 | 3,000 |

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
 2. See http://www.diodes.com/quality/lead_free/ 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. Automotive products are AEC-Q101 qualified and are PPAP capable. Refer to <https://www.diodes.com/quality/>.
 5. For packaging details, go to our website at <https://www.diodes.com/design/support/packaging/diodes-packaging/>.

Marking Information

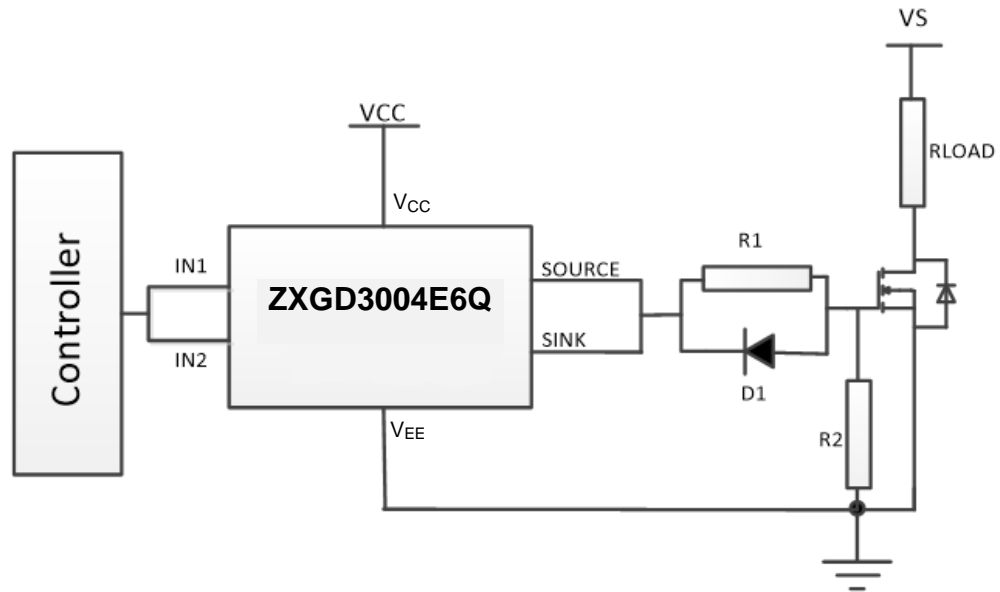


3004 = Product Type Marking Code
 YM = Date Code Marking
 Y = Year (ex: F = 2018)
 M = Month (ex: 9 = September)

Date Code Key

| | | | | | | | | | | | | |
|--------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|------------|------------|------------|------------|
| Year | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | | | | |
| Code | F | G | H | I | J | K | L | M | | | | |
| Month | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
| Code | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | O | N | D |

Typical Application Circuit



R1, D1 combination can be used for variable turn on and turn off times.

Absolute Maximum Ratings (@T_A = +25°C, unless otherwise specified.)

| Characteristic | Symbol | Value | Unit |
|---|-------------------------------------|-------|------|
| Supply Voltage, with Respect to V _{EE} | V _{CC} | 40 | V |
| Input Voltage, with Respect to V _{EE} | V _{IN} | 40 | V |
| Output Difference Voltage (Source – Sink) | ΔV _(source-sink) | ±7 | V |
| Peak Pulsed Output Current (Source – Sink) | I _{OM} | ±8 | A |
| Peak Pulsed Input Current | I _{IN1} , I _{IN2} | ±1 | A |

Thermal Characteristics (@T_A = +25°C, unless otherwise specified.)

| Characteristic | Symbol | Value | Unit |
|---|-----------------------------------|-------------|-------|
| Power Dissipation (Notes 6 & 7) | P _D | 1.1 | W |
| Linear Derating Factor | | 8.8 | mW/°C |
| Thermal Resistance, Junction to Ambient (Notes 6 & 7) | R _{θJA} | 113 | °C/W |
| Thermal Resistance, Junction to Lead (Note 8) | R _{θJL} | 105 | |
| Operating and Storage Temperature Range | T _J , T _{STG} | -55 to +150 | °C |

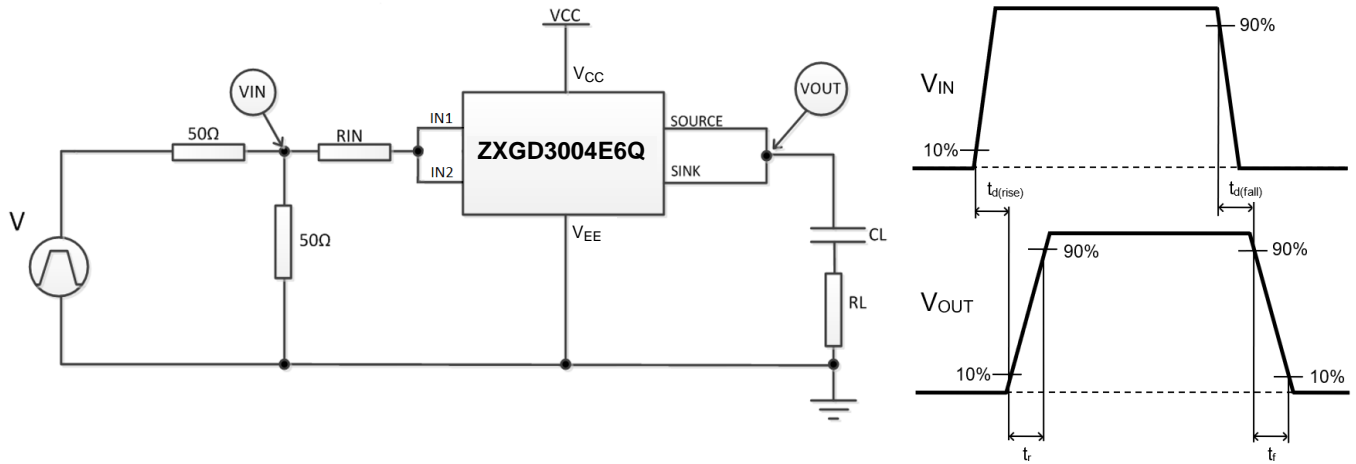
ESD Ratings (Note 9)

| Characteristic | Symbol | Value | Unit | JEDEC Class |
|--|---------|-------|------|-------------|
| Electrostatic Discharge - Human Body Model | ESD HBM | 4,000 | V | 3A |
| Electrostatic Discharge - Machine Model | ESD MM | 400 | V | C |
| Electrostatic Discharge – Charged Device Model | ESD CDM | 1,000 | V | IV |

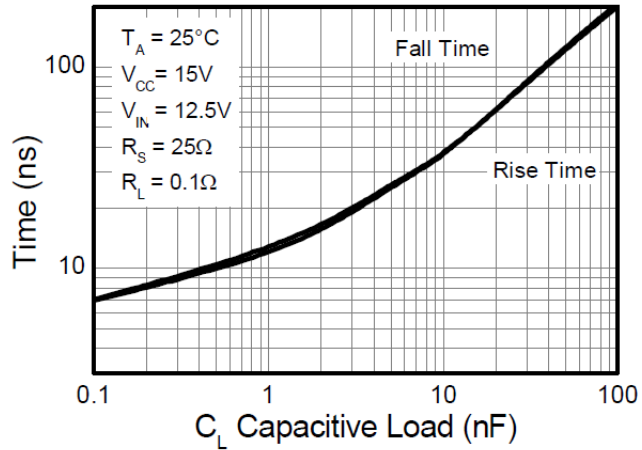
- Notes:
6. For a device mounted on 25mm x 25mm 1oz copper that is on a single-sided 1.6mm FR-4 PCB; device is measured under still air conditions whilst operating in a steady-state. The heatsink is split in half with the pin 1 (V_{CC}) and pin 3 (V_{EE}) connected separately to each half.
 7. For device with two active die running at equal power.
 8. Thermal resistance from junction to solder-point at the end of each lead on pin 1 (V_{CC}) and pin 3 (V_{EE}).
 9. Refer to JEDEC specification JESD22-A114, JESD22-A115 and JESD22-C101.

Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)

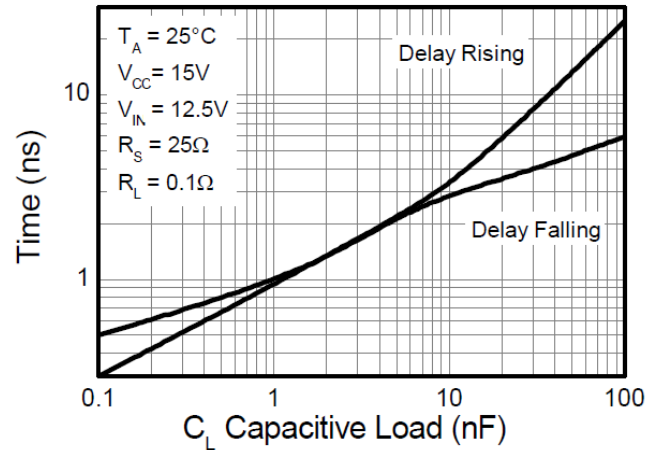
| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|-----------------------------------|------------------------|-----|------------------------|-----|------|--|
| Output Voltage, High | V _{OUT(hi)} | — | V _{IN1} - 0.4 | — | V | I _{source} = 1μA |
| Output Voltage, Low | V _{OUT(low)} | — | V _{IN1} + 0.4 | — | | I _{sink} = 1μA |
| Source Output Leakage Current | I _{L(source)} | — | — | 1 | μA | V _{CC} = 40V, V _{IN1} = V _{IN2} = 0V |
| Sink Output Leakage Current | I _{L(sink)} | — | — | 1 | μA | V _{CC} = 40V, V _{IN1} = V _{IN2} = V _{CC} |
| Quiescent Supply Current | I _Q | — | — | 50 | nA | V _{CC} = 32V, V _{IN1} = V _{IN2} = 0V |
| Peak Pulsed Source Output Current | I _{(source)M} | 1.2 | 1.9 | — | A | I _{IN1} + I _{IN2} = 10mA |
| Peak Pulsed Sink Output Current | I _{(sink)M} | 1.2 | 1.9 | — | A | I _{IN1} + I _{IN2} = -10mA |
| Peak Pulsed Source Output Current | I _{(source)M} | — | 8 | — | A | I _{IN1} + I _{IN2} = 1A |
| Peak Pulsed Sink Output Current | I _{(sink)M} | — | 8 | — | A | I _{IN1} + I _{IN2} = -1A |
| Gate Driver Switching Times | t _{d(rise)} | — | 1.1 | — | ns | V _{CC} = 15V, V _{EE} = 0V, V _{IN} = 0 to 12.5V, C _L = 1.5nF, R _L = 0.1Ω, R _{IN} = 25Ω |
| | t _r | | 13.4 | | | |
| | t _{d(fall)} | | 0.95 | | | |
| | t _f | | 12.4 | | | |
| Gate Driver Switching Times | t _{d(rise)} | — | 3.2 | — | ns | V _{CC} = 15V, V _{EE} = 0V, V _{IN} = 0 to 12.5V, C _L = 1.5nF, R _L = 0.1Ω, R _{IN} = 1kΩ |
| | t _r | | 77.9 | | | |
| | t _{d(fall)} | | 3.6 | | | |
| | t _f | | 82 | | | |

Switching Test Circuit and Timing Diagram


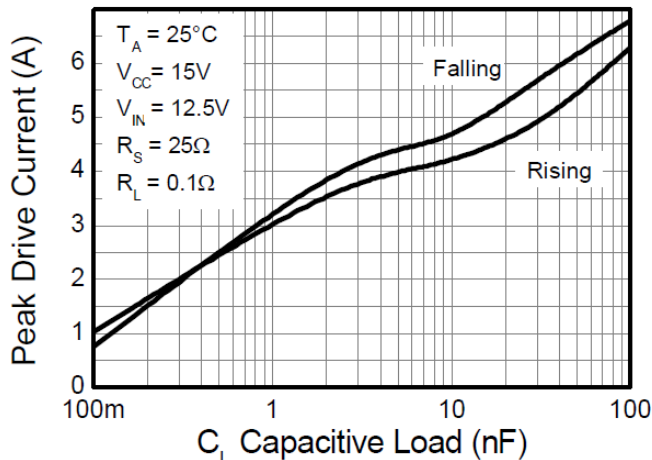
Typical Gate Driver Characteristics (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)



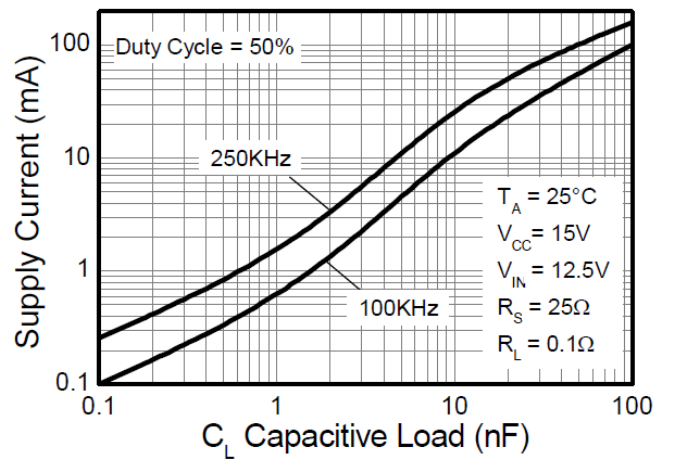
Rise and Fall Time



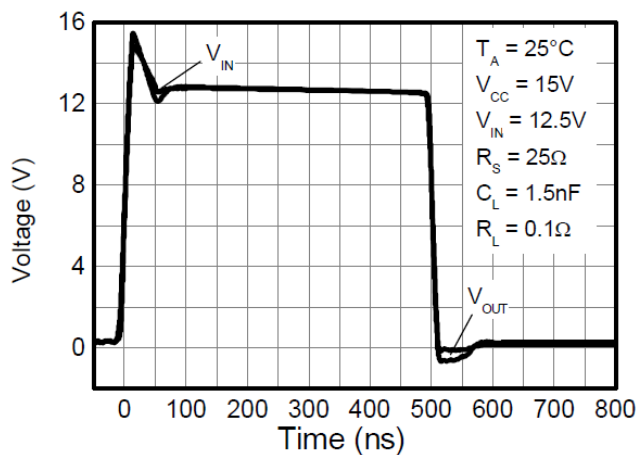
Propagation Delay



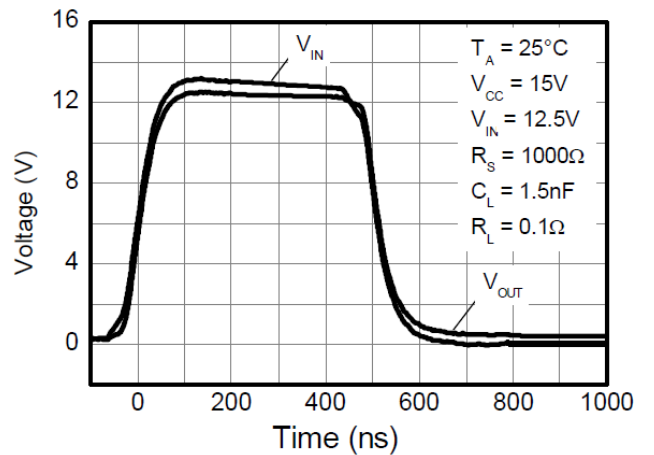
Peak Drive Current



Supply Current

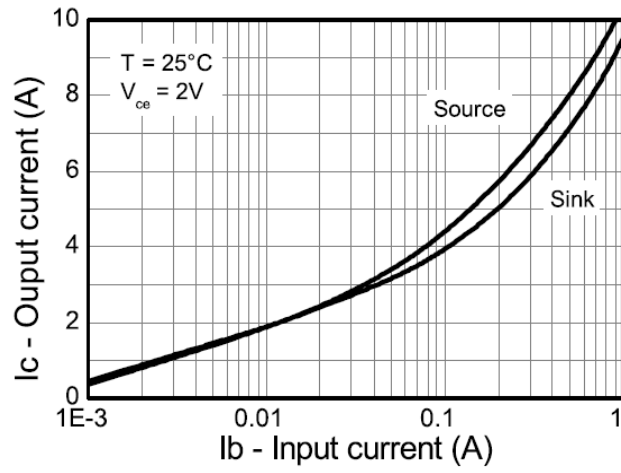


Switching Speed



Switching Speed

Typical Gate Driver Characteristics (Cont.)

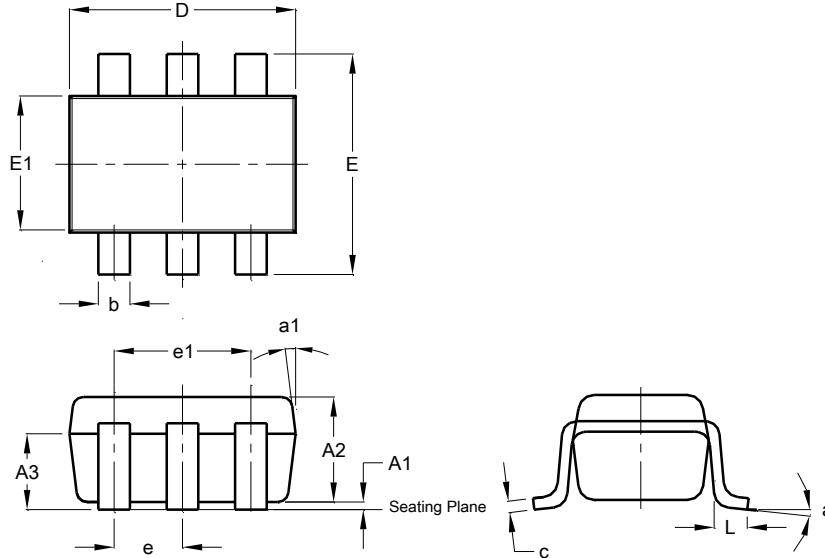


Output current Vs Input current

Package Outline Dimensions

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

SOT26

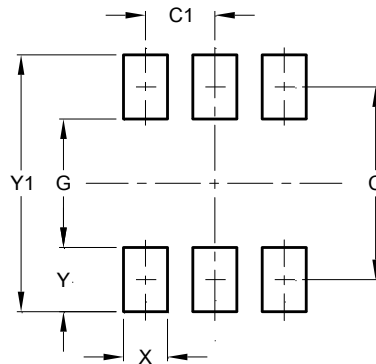


| SOT26 | | | |
|----------------------|-------|------|------|
| Dim | Min | Max | Typ |
| A1 | 0.013 | 0.10 | 0.05 |
| A2 | 1.00 | 1.30 | 1.10 |
| A3 | 0.70 | 0.80 | 0.75 |
| b | 0.35 | 0.50 | 0.38 |
| c | 0.10 | 0.20 | 0.15 |
| D | 2.90 | 3.10 | 3.00 |
| e | - | - | 0.95 |
| e1 | - | - | 1.90 |
| E | 2.70 | 3.00 | 2.80 |
| E1 | 1.50 | 1.70 | 1.60 |
| L | 0.35 | 0.55 | 0.40 |
| a | - | - | 8° |
| a1 | - | - | 7° |
| All Dimensions in mm | | | |

Suggested Pad Layout

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

SOT26



| Dimensions | Value (in mm) |
|------------|---------------|
| C | 2.40 |
| C1 | 0.95 |
| G | 1.60 |
| X | 0.55 |
| Y | 0.80 |
| Y1 | 3.20 |

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