

## Description

The ZXGD3006E6Q is a 40V Gate Driver for switching IGBTs and SiC MOSFETs. It can transfer up to 10A peak source/sink current into the gate for effective charging and discharging of a large capacitive load.

The ZXGD3006E6Q can drive typically 4A into the low gate impedance of an IGBT, with just 1mA input from a controller. Also, the turn-on and turn-off switching behavior of the IGBT can be individually tailored to suit an application. In particular, by defining the switching characteristics appropriately, EMI and cross conduction can be reduced.

## Applications

Gate driving IGBTs and SiC MOSFETs in:

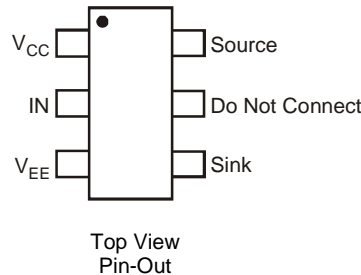
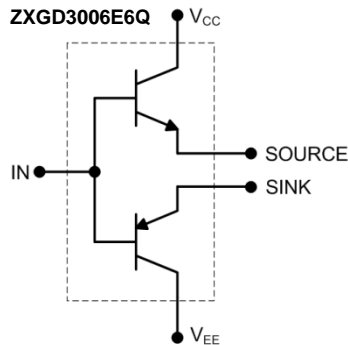
- DC-DC Converters in Electric Cars
- Automotive Active Suspension Systems
- Solar Inverters
- Power Supplies
- Plasma Display Panel Power Modules

## Features

- High-Gain Buffer with Typically 4A Output from 1mA Input
- 40V Supply for +20V to -18V gate driving to prevent dV/dt induced false triggering
- Emitter-Follower that is Rugged to Latch-Up / Shoot-Through Issues, and Delivers <10ns Propagation Delay Time
- 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 <sup>Ⓔ3</sup>
- Weight: 0.018 grams (Approximate)



Pin Name	Pin Function
VCC	Supply Voltage High
IN	Driver Input Pin
VEE	Supply Voltage Low
SOURCE	Source Current Output *
SINK	Sink Current Output *

\* Typically connect SOURCE & SINK together

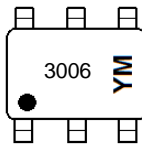
## Ordering Information (Note 5)

Product	Compliance	Marking	Reel Size (inches)	Tape Width (mm)	Quantity per Reel
ZXGD3006E6QTA	Automotive	3006	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/](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**

SOT26



3006 = Product Type Marking Code  
 YM = Date Code Marking  
 Y or  $\bar{Y}$  = Year (ex: F = 2018)  
 M or  $\bar{M}$  = Month (ex: 9 = September)

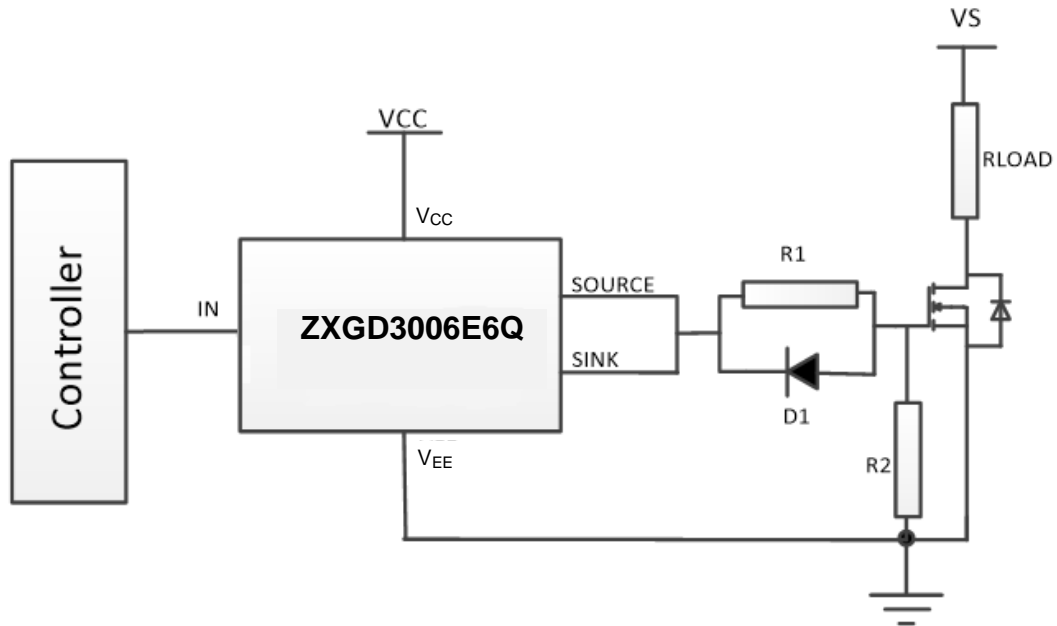
Date Code Key

Year	2018	2019	2020	2021	2022	2022	2023	2024	2025	2026	2027
Code	F	G	H	I	J	K	L	M	N	O	P

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<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 – Sink)	I <sub>OM</sub>	±10	A
Peak Pulsed Input Current	I <sub>IN</sub>	±100	mA

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

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

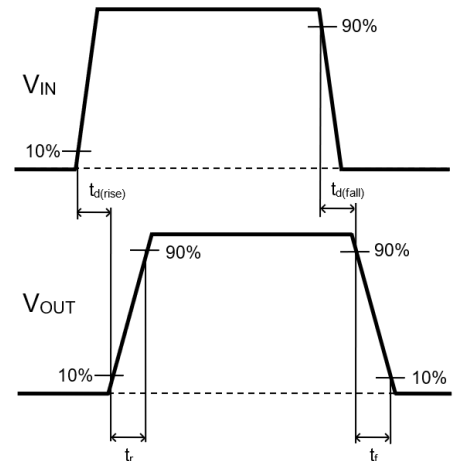
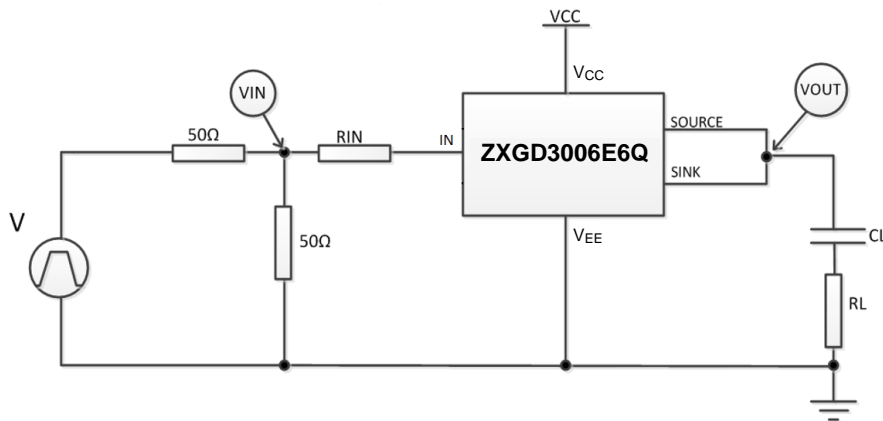
**ESD Ratings** (Note 9)

Characteristic	Symbol	Value	Unit	JEDEC Class
Electrostatic Discharge - Human Body Model	ESD HBM	1,500	V	1C
Electrostatic Discharge – Charged Device Model	ESD CDM	1,000	V	IV

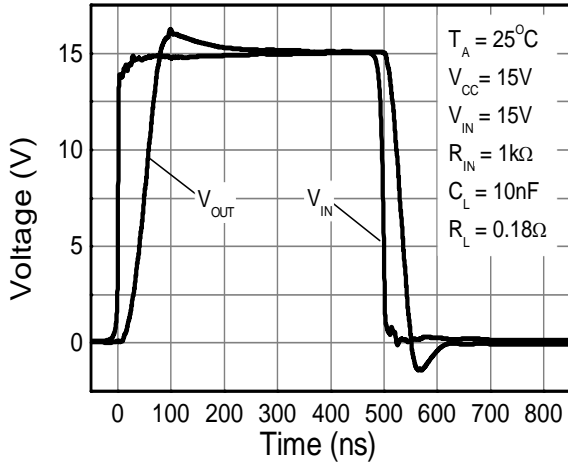
- Notes:
6. For a device mounted on 25mm x 25mm 1oz copper that is on a single-sided 1.6mm FR-4 PCB; device is measured under still air conditions whilst operating in a steady-state. The heatsink is split in half with the pin 1 (V<sub>CC</sub>) and pin 3 (V<sub>EE</sub>) connected separately to each 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<sub>CC</sub>) and pin 3 (V<sub>EE</sub>).
  9. Refer to JEDEC specification JESD22-A114 and JESD22-C101.

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

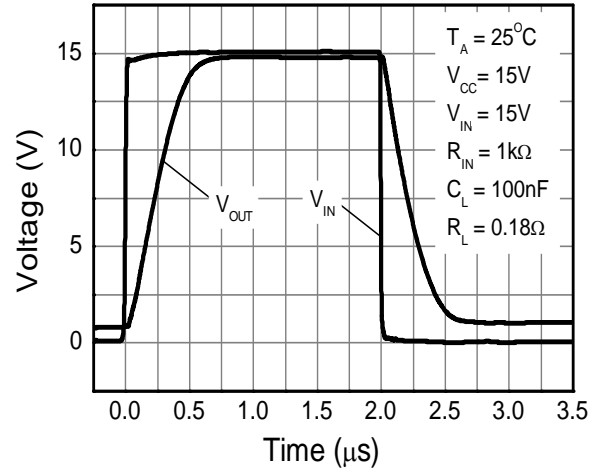
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Output Voltage, High	$V_{OUT(hi)}$	$V_{CC} - 1.0$	$V_{CC} - 0.8$	—	V	$V_{IN} = V_{CC}$ $C_L = 1\text{nF}$
Output Voltage, Low	$V_{OUT(low)}$	—	$V_{EE} + 0.12$	$V_{EE} + 0.3$		
Supply Breakdown Voltage	$BV_{CC}$	40	—	—	V	$I_Q = 100\mu\text{A}, V_{IN} = V_{CC}$
		40	—	—		$I_Q = 100\mu\text{A}, V_{IN} = V_{EE} = 0\text{V}$
Quiescent Supply Current	$I_Q$	—	—	50	nA	$V_{CC} = 30\text{V}, V_{IN} = V_{CC}$
		—	—	50		$V_{CC} = 30\text{V}, V_{IN} = V_{EE} = 0\text{V}$
Peak Pulsed Source Current	$I_{(source)M}$	—	4.0	—	A	$V_{CC} = 5\text{V}, I_{IN} = 1\text{mA}, V_{OUT} = 0\text{V}$
Peak Pulsed Sink Current	$I_{(sink)M}$	—	3.8	—		$V_{CC} = 5\text{V}, I_{IN} = -1\text{mA}, V_{OUT} = 5\text{V}$
Source Current with Varying Input Resistances	$I_{SOURCE}$	—	6.4 5.5 3.9 2.2 0.44	—	A	$V_{CC} = 15\text{V}, V_{EE} = 0\text{V}$ $V_{IN} = 15\text{V}$ $C_L = 100\text{nF}, R_L = 0.18\Omega$
Sink Current with Varying Input Resistances	$I_{SINK}$	—	7.7 6.5 4.4 2.3 0.46	—		
Switching Times with Low Load Capacitance $C_L = 10\text{nF}$	$t_{d(rise)}$	—	8	—	ns	$V_{CC} = 15\text{V}, V_{EE} = 0\text{V}$ $V_{IN} = 0 \text{ to } 15\text{V}$ $R_{IN} = 1\text{k}\Omega$ $C_L = 10\text{nF}, R_L = 0.18\Omega$
	$t_r$		48			
	$t_{d(fall)}$		16			
	$t_f$		35			
Switching Times with High Load Capacitance $C_L = 100\text{nF}$	$t_{d(rise)}$	—	46	—	ns	$V_{CC} = 15\text{V}, V_{EE} = 0\text{V}$ $V_{IN} = 0 \text{ to } 15\text{V}$ $R_{IN} = 1\text{k}\Omega$ $C_L = 100\text{nF}, R_L = 0.18\Omega$
	$t_r$		419			
	$t_{d(fall)}$		47			
	$t_f$		467			
Switching Times with Asymmetric Source and Sink Resistors	$t_{d(rise)}$	—	27	—	ns	$V_{CC} = 20\text{V}, V_{EE} = -18\text{V}$ $V_{IN} = -18\text{V} \text{ to } 20\text{V}$ $R_{IN} = 1\text{k}\Omega$ $C_L = 10\text{nF}, R_L = 0.18\Omega$ $R_{SOURCE} = 4.7\Omega, R_{SINK} = 0\Omega$ (See page 7).
	$t_r$		208			
	$t_{d(fall)}$		11			
	$t_f$		53			

**Switching Test Circuit and Timing Diagram**


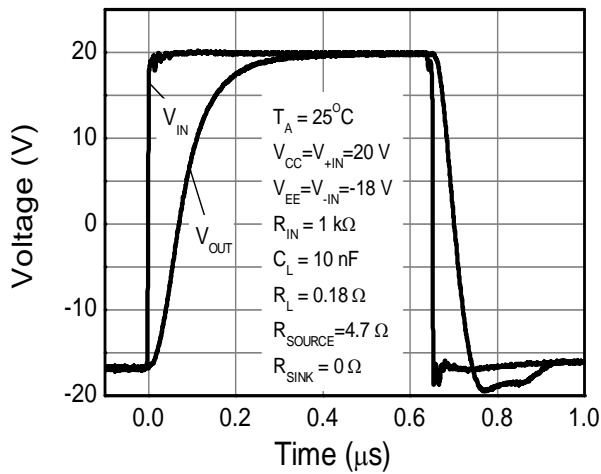
**Typical Switching Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)



**Switching Speed**

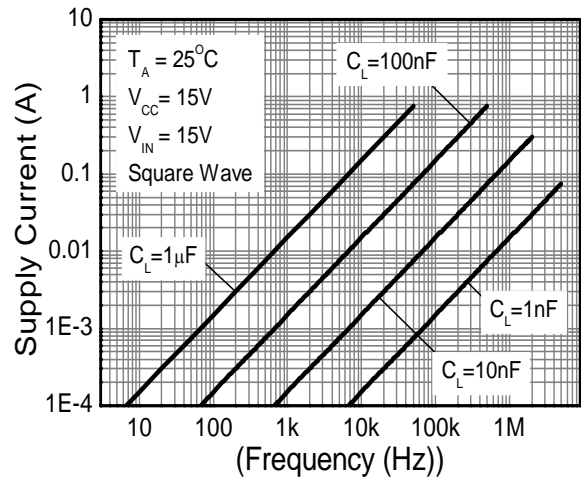


**Switching Speed**



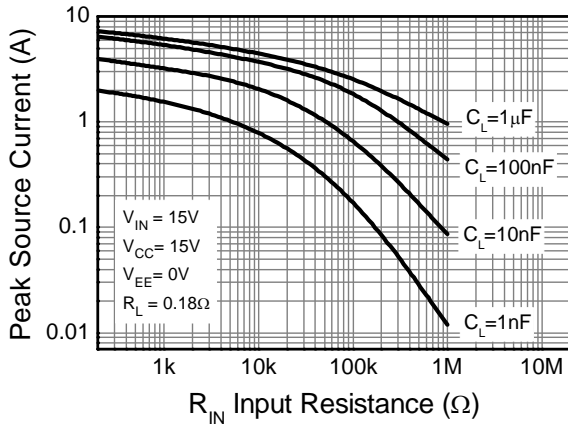
**Switching Speed**

Asymmetric Source and Sink Resistance

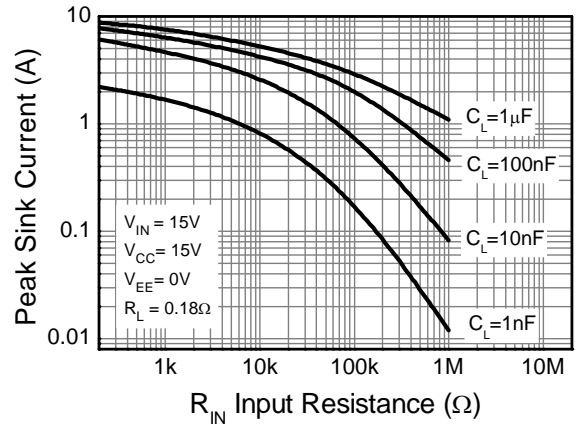


**Supply Current**

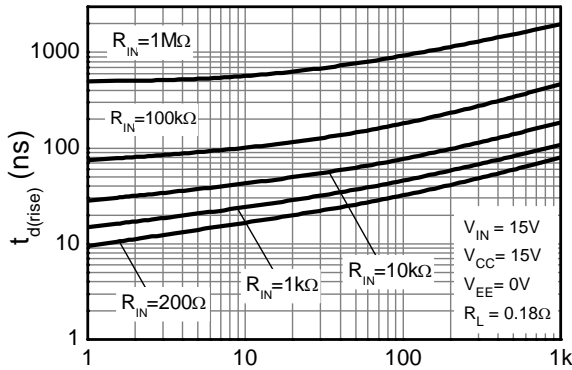
**Typical Switching Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)



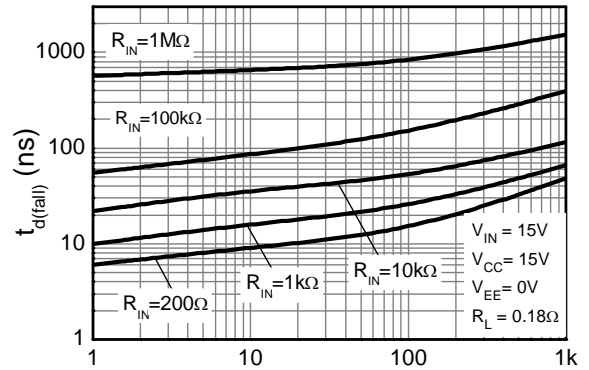
**Source Current vs. Input Resistance**



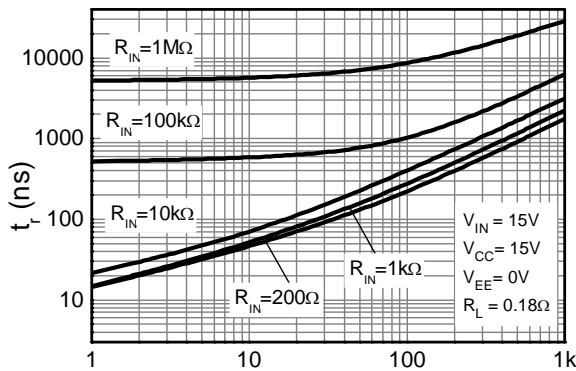
**Sink Current vs. Input Resistance**



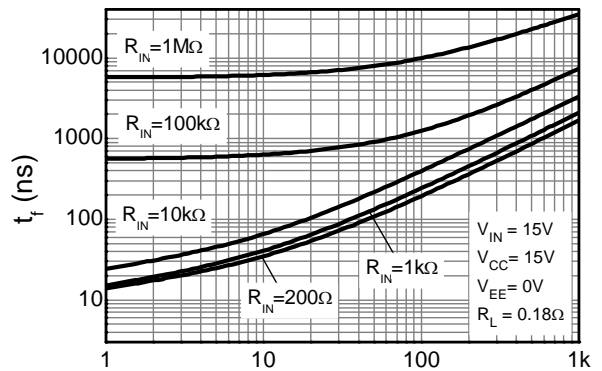
**Turn-On Delay Time**



**Turn-Off Delay Time**



**Turn-On Rise Time**

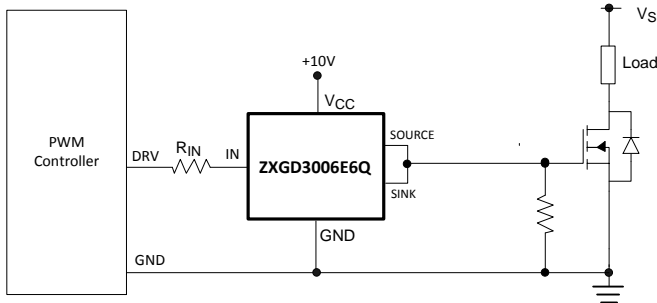


**Turn-Off Fall Time**

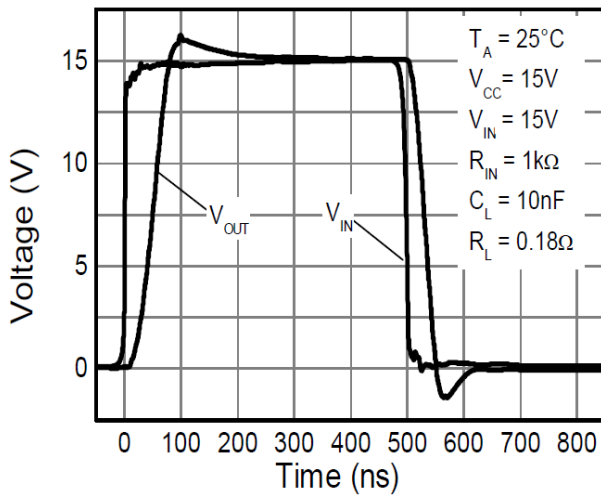
**Circuit Examples**

**ZXGD3006E6Q Driving a MOSFET**

Application example of the ZXGD3006E6Q driving the gate of a MOSFET from 0 to +15V.



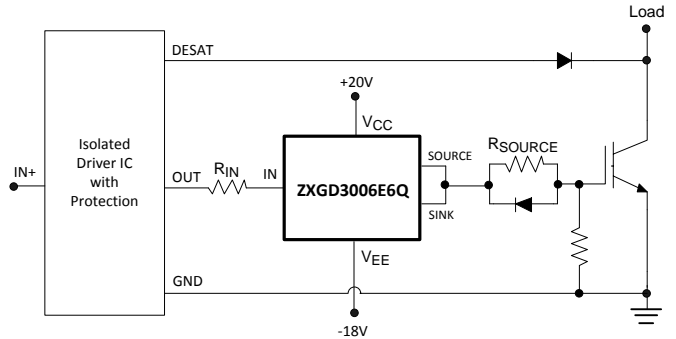
**Switching Time Characteristic**



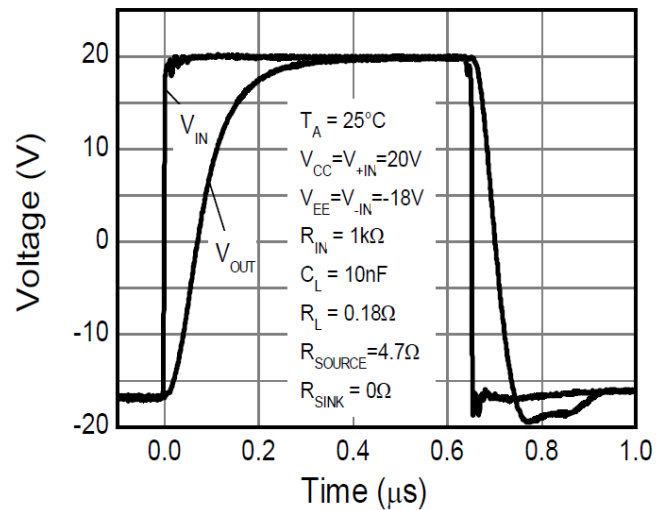
**Symmetric Source and Sink Resistors**

**ZXGD3006E6Q Driving an IGBT**

Application example of ZXGD3006E6Q driving the gate of an IGBT with independent  $t_{ON}$  and  $t_{OFF}$  using asymmetric  $R_{SOURCE}$  and  $R_{SINK}$ . In addition, the gate is driven negative to -18V to prevent dV/dt induced false triggering.



**Switching Time Characteristic**

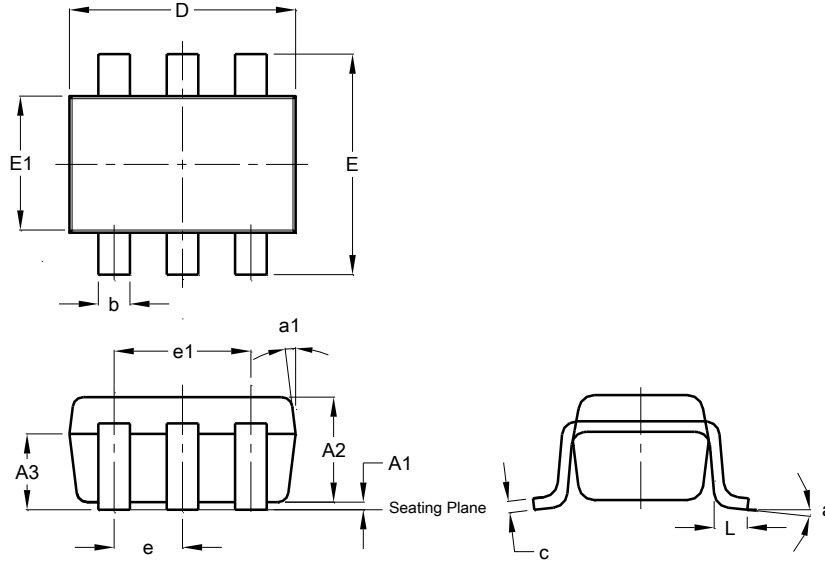


**Asymmetric Source and Sink Resistors**

## Package Outline Dimensions

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

### SOT26

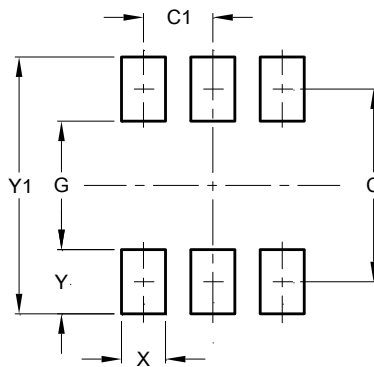


SOT26			
Dim	Min	Max	Typ
A1	0.013	0.10	0.05
A2	1.00	1.30	1.10
A3	0.70	0.80	0.75
b	0.35	0.50	0.38
c	0.10	0.20	0.15
D	2.90	3.10	3.00
e	-	-	0.95
e1	-	-	1.90
E	2.70	3.00	2.80
E1	1.50	1.70	1.60
L	0.35	0.55	0.40
a	-	-	8°
a1	-	-	7°
All Dimensions in mm			

## 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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