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.

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)**
- **The ZXGD3006E6Q is suitable for automotive applications requiring specific change control; this part is AEC-Q101 qualified, PPAP capable, and manufactured in IATF16949 certified facilities.**
  https://www.diodes.com/quality/product-definitions/

Applications

Gate driving IGBTs and SiC MOSFETs in:

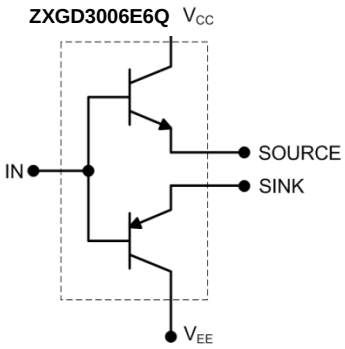
- DC-DC converters in electric cars
- Automotive active suspension systems
- Solar inverters
- Power supplies
- Plasma display panel power modules

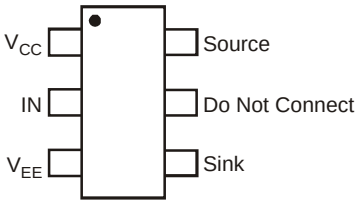
Mechanical Data

- Package: SOT26
- Package 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 e3
- Weight: 0.018 grams (Approximate)

SOT26

Top View





Top View
Pin-Out

Pin Name	Pin Function
V_{CC}	Supply Voltage High
IN	Driver Input Pin
V_{EE}	Supply Voltage Low
SOURCE	Source Current Output *
SINK	Sink Current Output *

* Typically connect SOURCE & SINK together

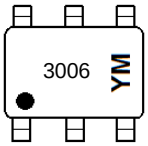
Ordering Information (Note 4)

Orderable Part Number	Compliance	Marking	Reel Size (inches)	Tape Width (mm)	Packing	
					Quantity	Carrier
ZXGD3006E6QTA	Automotive	3006	7	8	3,000	Reel

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. For packaging details, go to our website at https://www.diodes.com/design/support/packaging/diodes-packaging/.

Marking Information

SOT26



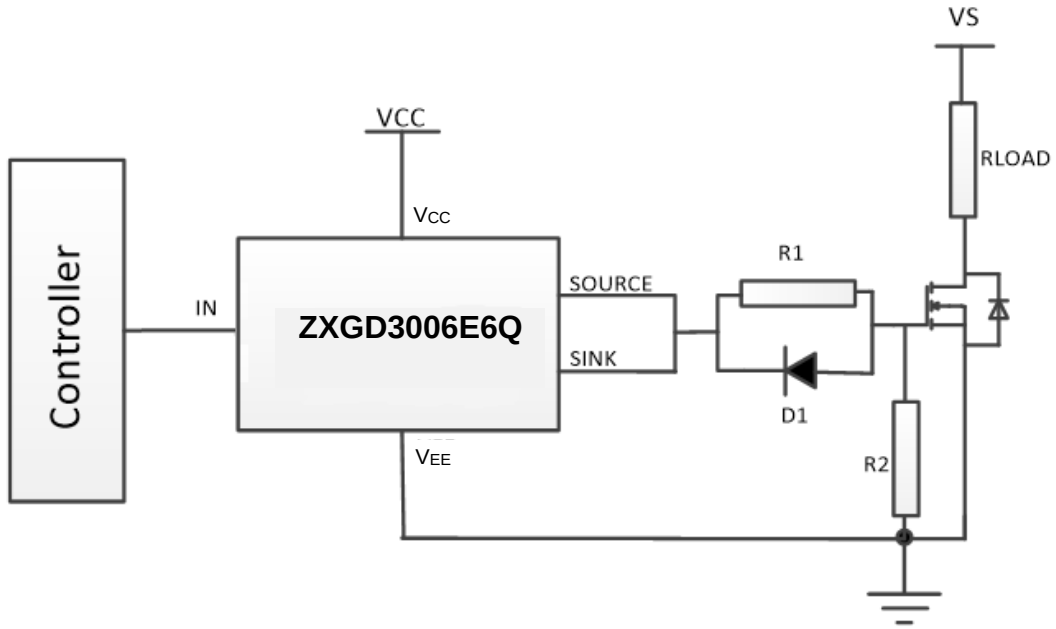
3006 = Product Type Marking Code
YM = Date Code Marking
Y or $\overline{Y}$ = Year (ex: F = 2018)
M or $\overline{M}$ = Month (ex: 9 = September)

Date Code Key

Year	2018	……	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Code	F	……	K	L	M	N	P	R	S	T	U	V

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)	$\Delta V_{(source-sink)}$	±7	V
Peak Pulsed Output Current (Source – Sink)	I_{OM}	±10	A
Peak Pulsed Input Current	I_{IN}	±100	mA

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

Characteristic	Symbol	Value	Unit
Power Dissipation (Notes 5 & 6) Linear Derating Factor	P_D	1.1 8.8	W mW/°C
Thermal Resistance, Junction to Ambient (Notes 5 & 6)	$R_{\theta JA}$	113	°C/W
Thermal Resistance, Junction to Lead (Note 7)	$R_{\theta JL}$	105	
Operating and Storage Temperature Range	T_J, T_{STG}	-55 to +150	°C

ESD Ratings (Note 8)

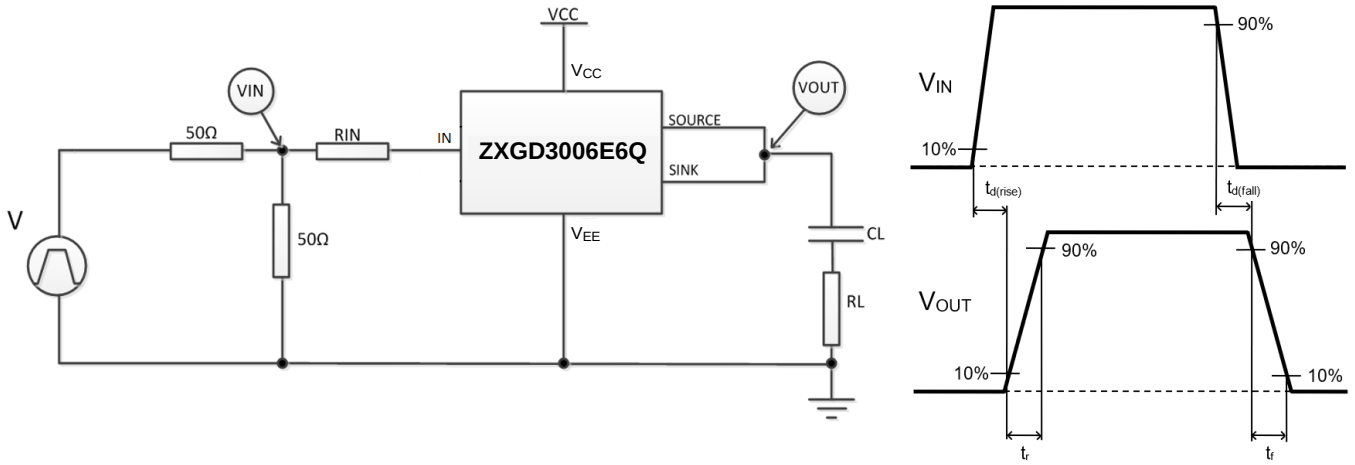
Characteristic	Symbol	Value	Unit	JEDEC Class
Electrostatic Discharge - Human Body Model	ESD HBM	1,500	V	1C
Electrostatic Discharge – Charged Device Model	ESD CDM	1,000	V	IV

Notes:
5. 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.
6. For device with two active die running at equal power.
7. Thermal resistance from junction to solder-point at the end of each lead on pin 1 (V_{CC}) and pin 3 (V_{EE}).
8. Refer to JEDEC specification JESD22-A114 and JESD22-C101.

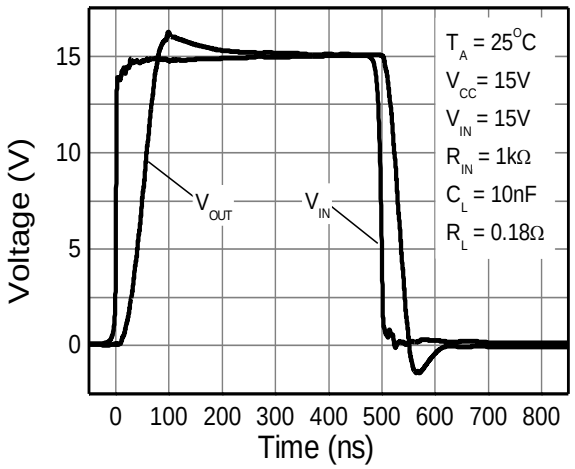
Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Output Voltage, High	$V_{OUT(hi)}$	V_{CC} - 1.0	V_{CC} - 0.8	—	V	V_{IN} = V_{CC}, C_L = 1nF
Output Voltage, Low	$V_{OUT(low)}$	—	V_{EE} + 0.12	V_{EE} + 0.3	V	V_{IN} = V_{EE}, C_L = 1nF
Supply Breakdown Voltage	BV_{CC}	40	—	—	V	I_Q = 100µA, V_{IN} = V_{CC}
		40	—	—	V	I_Q = 100µA, V_{IN} = V_{EE} = 0V
Quiescent Supply Current	I_Q	—	—	50	nA	V_{CC} = 30V, V_{IN} = V_{CC}
		—	—	50	nA	V_{CC} = 30V, V_{IN} = V_{EE} = 0V
Peak Pulsed Source Current	$I_{(source)M}$	—	4.0	—	A	V_{CC} = 5V, I_{IN} = 1mA, V_{OUT} = 0V
Peak Pulsed Sink Current	$I_{(sink)M}$	—	3.8	—	A	V_{CC} = 5V, I_{IN} = -1mA, V_{OUT} = 5V
Source Current with Varying Input Resistances	I_{SOURCE}	—	6.4 5.5 3.9 2.2 0.44	—	A	R_{IN} = 200Ω R_{IN} = 1kΩ R_{IN} = 10kΩ R_{IN} = 100kΩ R_{IN} = 1000kΩ V_{CC} = 15V, V_{EE} = 0V, V_{IN} = 15V, C_L = 100nF, R_L = 0.18Ω
Sink Current with Varying Input Resistances	I_{SINK}	—	7.7 6.5 4.4 2.3 0.46	—	A	R_{IN} = 200Ω R_{IN} = 1kΩ R_{IN} = 10kΩ R_{IN} = 100kΩ R_{IN} = 1000kΩ V_{CC} = 15V, V_{EE} = 0V, V_{IN} = 15V, C_L = 100nF, R_L = 0.18Ω
Switching Times with Low Load Capacitance C_L = 10nF	$t_{d(rise)}$ t_r $t_{d(fall)}$ t_f	—	8 48 16 35	—	ns	V_{CC} = 15V, V_{EE} = 0V, V_{IN} = 0 to 15V, R_{IN} = 1kΩ, C_L = 10nF, R_L = 0.18Ω
Switching Times with High Load Capacitance C_L = 100nF	$t_{d(rise)}$ t_r $t_{d(fall)}$ t_f	—	46 419 47 467	—	ns	V_{CC} = 15V, V_{EE} = 0V, V_{IN} = 0 to 15V, R_{IN} = 1kΩ, C_L = 100nF, R_L = 0.18Ω
Switching Times with Asymmetric Source and Sink Resistors	$t_{d(rise)}$ t_r $t_{d(fall)}$ t_f	—	27 208 11 53	—	ns	V_{CC} = 20V, V_{EE} = -18V, V_{IN} = -18V to 20V, R_{IN}= 1kΩ, C_L = 10nF, R_L = 0.18Ω, R_{SOURCE} = 4.7Ω, R_{SINK} = 0Ω (See page 7).

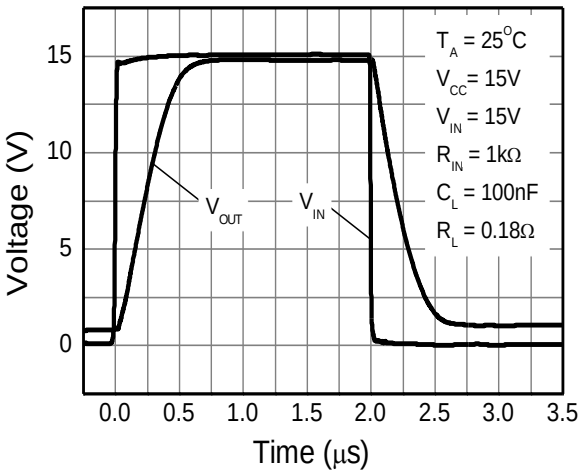
Switching Test Circuit and Timing Diagram



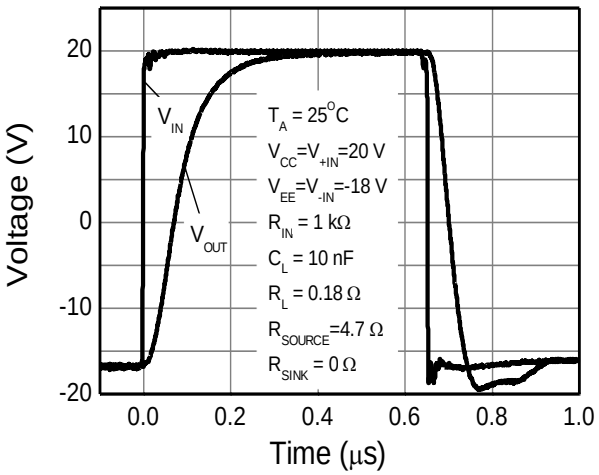
Typical Switching Characteristics (@T_A = +25°C, unless otherwise specified.)



Switching Speed

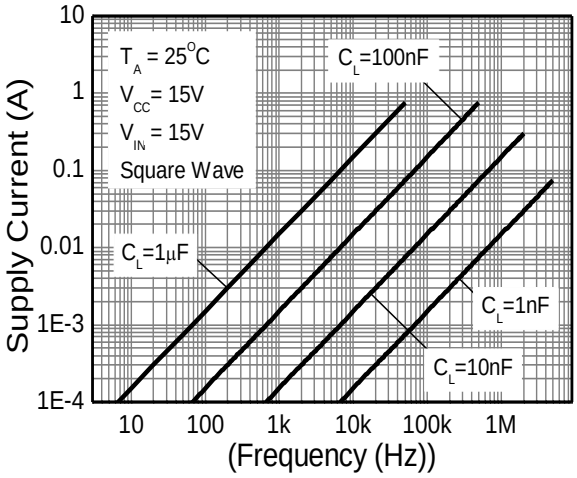


Switching Speed



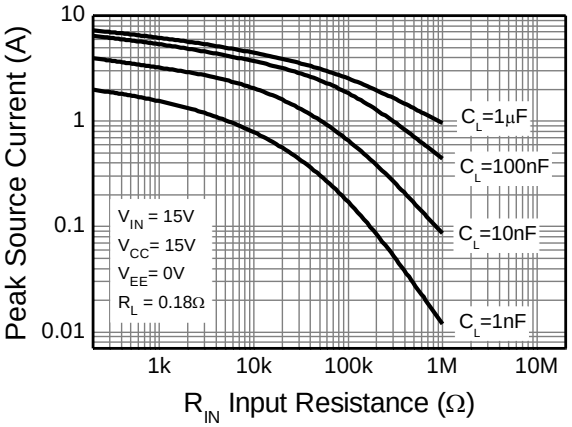
Switching Speed

Asymmetric Source and Sink Resistance

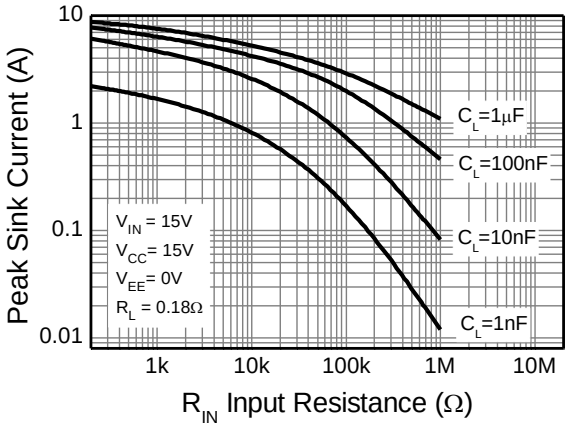


Supply Current

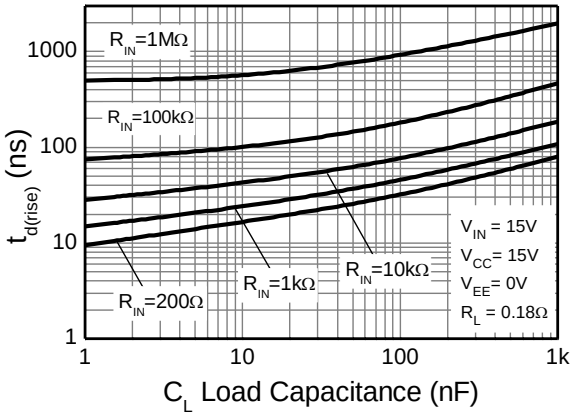
Typical Switching Characteristics (@T_A = +25°C, unless otherwise specified.)



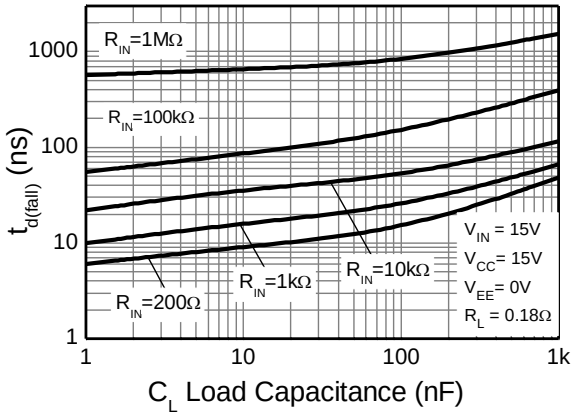
Source Current vs. Input Resistance



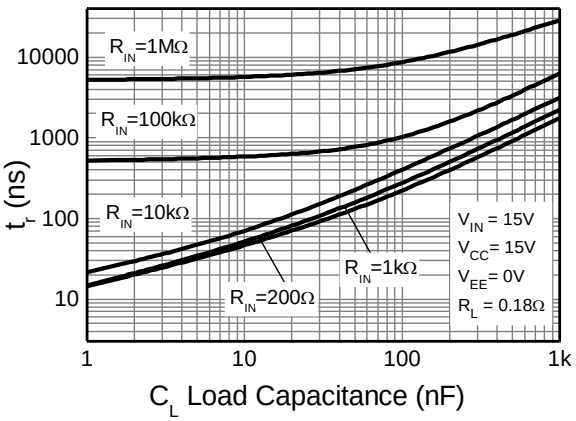
Sink Current vs. Input Resistance



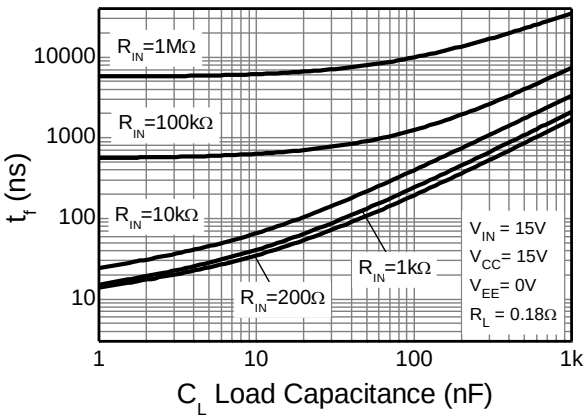
Turn-On Delay Time



Turn-Off Delay Time



Turn-On Rise Time

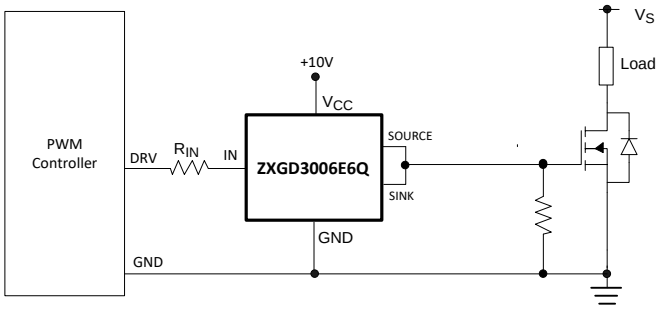


Turn-Off Fall Time

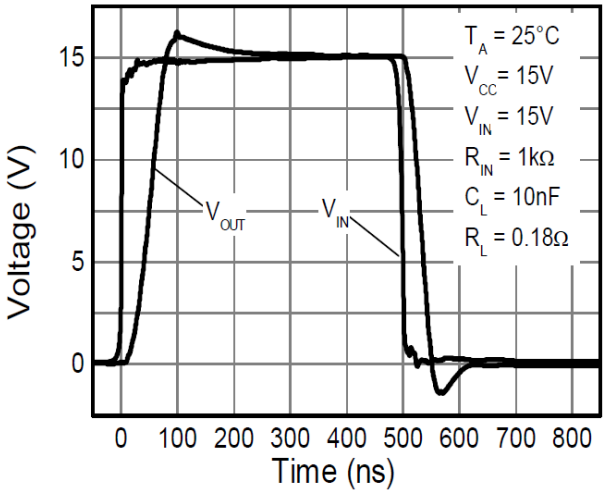
Circuit Examples

ZXGD3006E6Q Driving a MOSFET

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



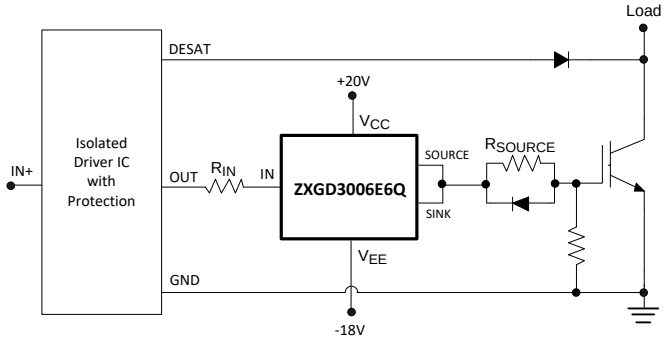
Switching Time Characteristic



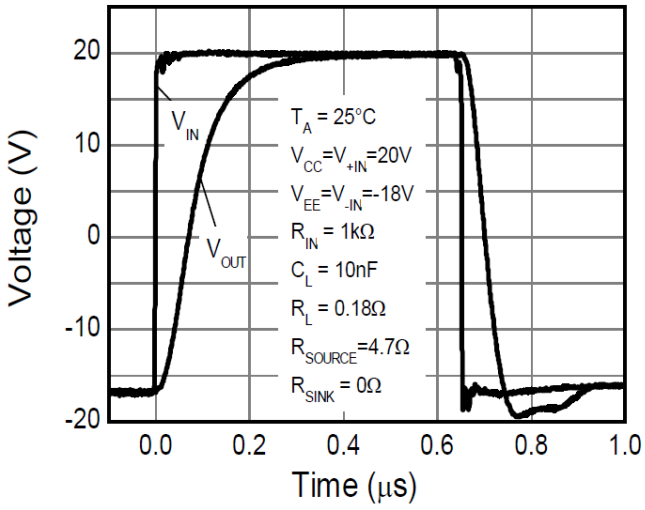
Symmetric Source and Sink Resistors

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.

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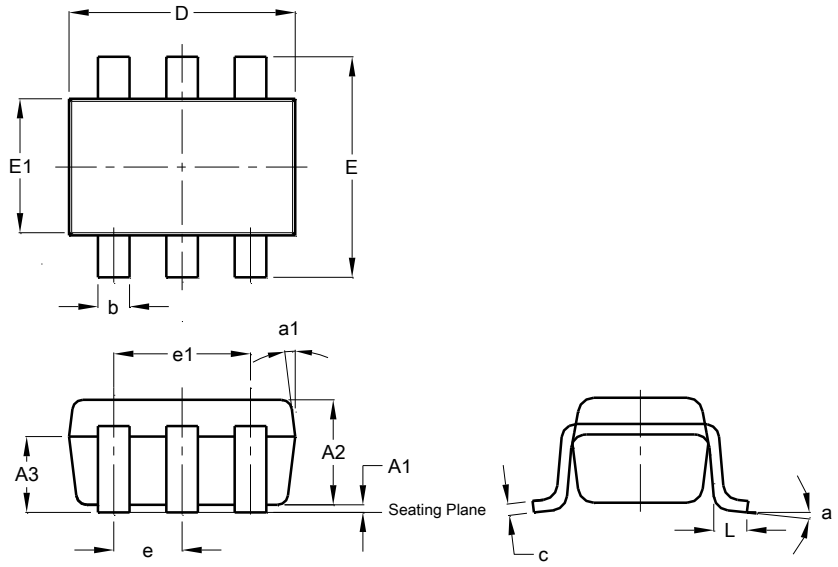
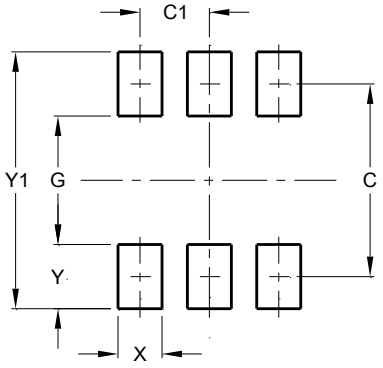


SOT26			
Dim	**Min**	**Max**	**Typ**
A1	0.013	0.10	0.05
A2	1.00	1.30	1.10
A3	0.70	0.80	0.75
b	0.35	0.50	0.38
c	0.10	0.20	0.15
D	2.90	3.10	3.00
e	-	-	0.95
e1	-	-	1.90
E	2.70	3.00	2.80
E1	1.50	1.70	1.60
L	0.35	0.55	0.40
a	-	-	8°
a1	-	-	7°
All Dimensions in mm			

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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