Lead-free Green

ZXGD3006E6

40V 10A GATE DRIVER IN SOT26

Description

ZXGD3006E6 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 ZXGD3006E6 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 problems 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

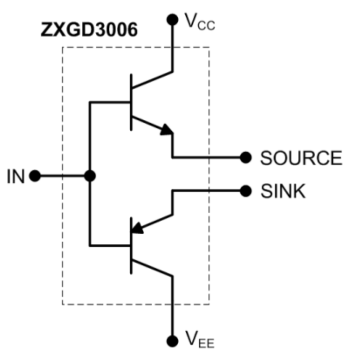
- High-gain buffer with typically 4A output from 1mA input
- 40V supply for +20V to -18V gate driving to prevent dV/dt induced false triggering
- Emitter-follower that is rugged to latch-up / shoot-through issues, and delivers <10ns propagation delay time
- Separate source and sink outputs for independent control of IGBT turn-on and turn-off times
- 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

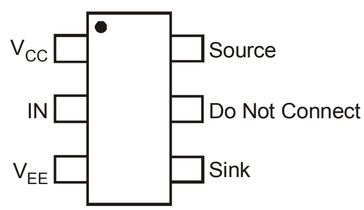
- Case: SOT26
- Case material: molded plastic. "Green" molding compound.
- UL Flammability Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish - Matte Tin Plated Leads, Solderable per MIL-STD-202, Method 208 (e3)
- Weight: 0.018 grams (approximate)

SOT26

Top View



Internal Device Schematic



Top View
Pin-Out

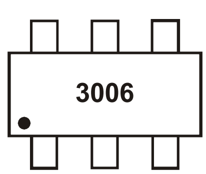
Pin Name	Pin Function
V_{CC}	Supply Voltage High
IN	Driver Input Pin
V_{EE}	Supply Voltage Low
SOURCE	Source Current Output
SINK	Sink Current Output

Ordering Information (Notes 4 & 5)

Product	Compliance	Marking	Reel size (inches)	Tape width (mm)	Quantity per reel
ZXGD3006E6TA	AEC-Q101	3006	7	8	3,000
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) compliant.
2. See http://www.diodes.com/quality/lead_free.html 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. Automotive, AEC-Q101 and standard products are electrically and thermally the same, except where specified.
5. For packaging details, go to our website at http://www.diodes.com/products/packages.html.

Marking Information



3006 = Product Type Marking Code

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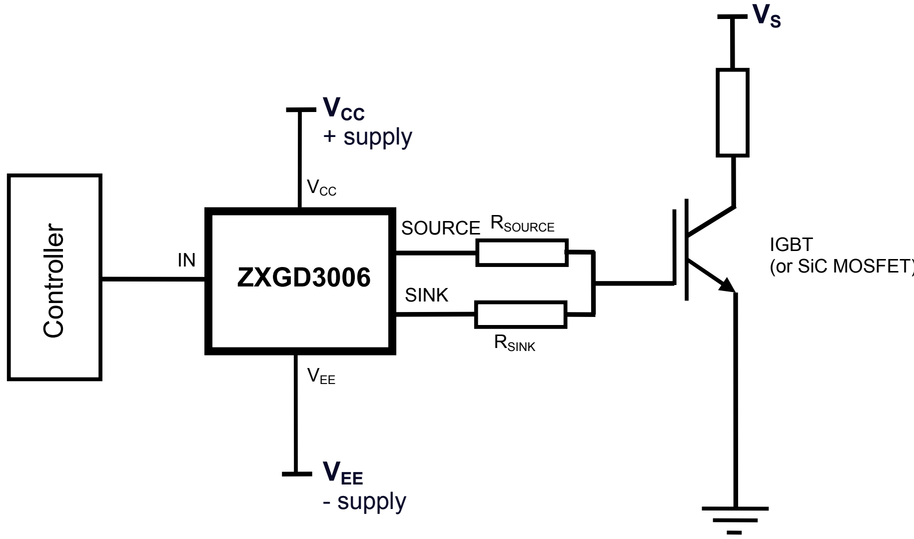
Typical Application Circuit



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)	$\Delta V_{(source-sink)}$	±7.5	V
Peak output current	I_{PK}	±10	A
Input current	I_{IN}	±100	mA

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

Characteristic	Symbol	Value	Unit
Power Dissipation (Notes 6 & 7) Linear derating factor	P_D	1.1 8.8	W mW/°C
Thermal Resistance, Junction to Ambient (Notes 6 & 7)	$R_{\theta JA}$	113	°C/W
Thermal Resistance, Junction to Lead (Note 8)	$R_{\theta JL}$	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	≥ 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 FR4 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 and JESD22-C101.

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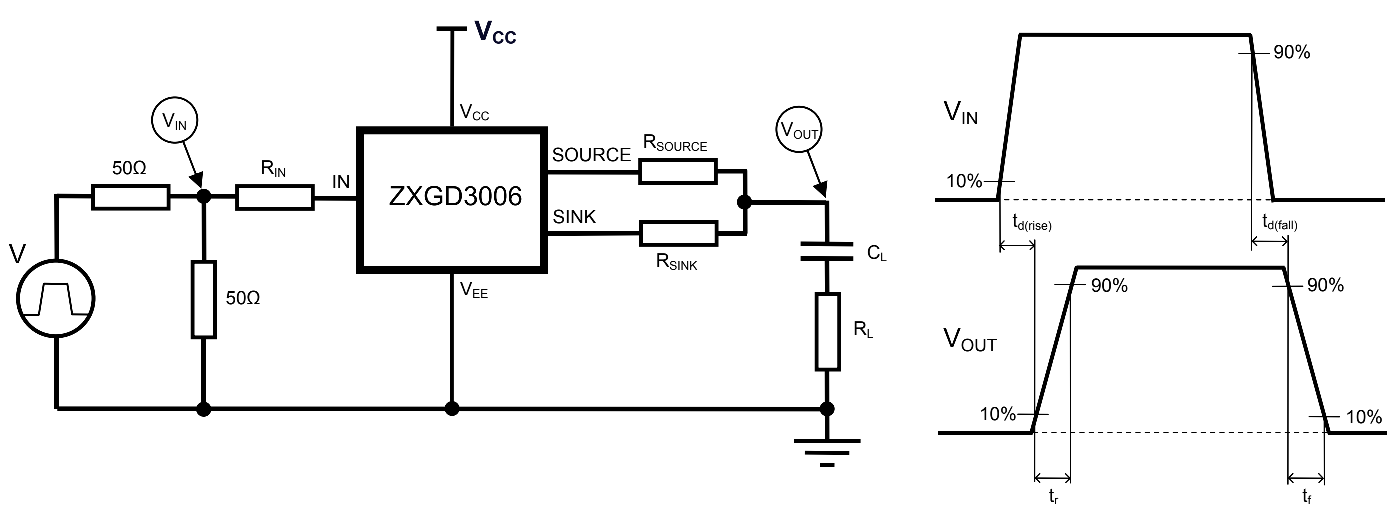
Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)

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, R_{SOURCE} = 0Ω, R_{SINK} = 0Ω
Output voltage, low	$V_{OUT(low)}$	—	V_{EE} + 0.12	V_{EE} + 0.3	V	$V_{IN} = V_{EE}$; C_L = 1nF, R_{SOURCE} = 0Ω, R_{SINK} = 0Ω
Supply breakdown voltage	BV_{CC}	40	—	—	V	I_Q = 100µA, $V_{IN} = V_{CC}$
		40	—	—		I_Q = 100µA, $V_{IN} = V_{EE}$ = 0V
Quiescent supply current	I_Q	—	—	50	nA	V_{CC} = 30V, $V_{IN} = V_{CC}$
		—	—	50		V_{CC}= 30V, $V_{IN} = V_{EE}$ = 0V
Source current	$I_{(source)}$	—	4.0	—	A	V_{CC}= 5V, I_{IN}= 1mA, V_{OUT}= 0V
Sink current	$I_{(sink)}$	—	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 R_{SOURCE} = 0Ω, R_{SINK} = 0Ω
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 R_{SOURCE} = 0Ω, R_{SINK} = 0Ω
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 R_{SOURCE} = 0 Ω, R_{SINK} = 0 Ω
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 to15V R_{IN} = 1kΩ C_L = 100nF, R_L = 0.18Ω R_{SOURCE} = 0Ω, R_{SINK} = 0Ω
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} = -18 to 20V R_{IN}= 1kΩ C_L = 10nF, R_L = 0.18Ω R_{SOURCE} = 4.7Ω, R_{SINK} = 0Ω

Switching Test Circuit and Timing Diagram



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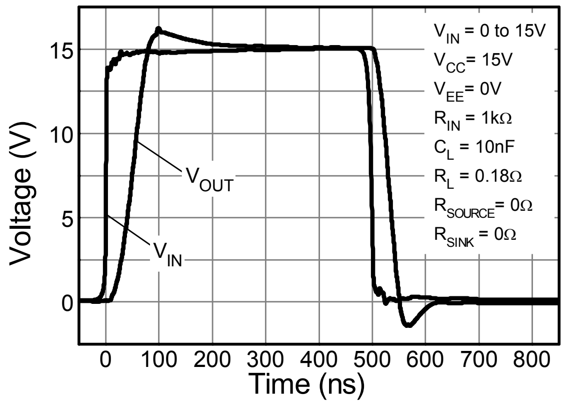
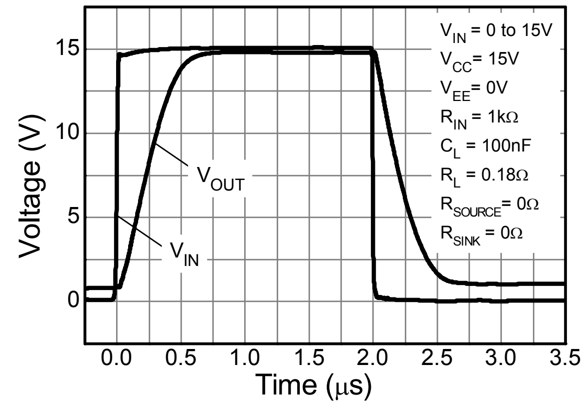
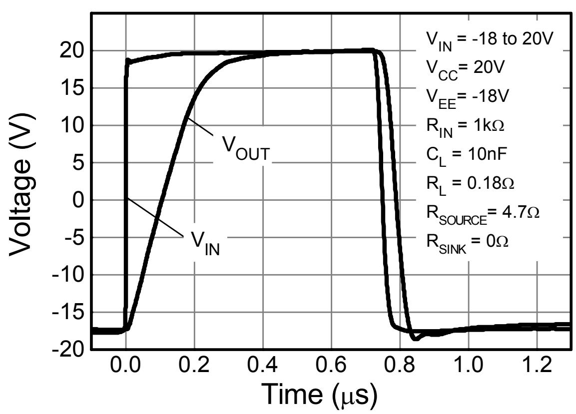
Typical Switching Characteristics (@T_A = +25°C, unless otherwise specified.)



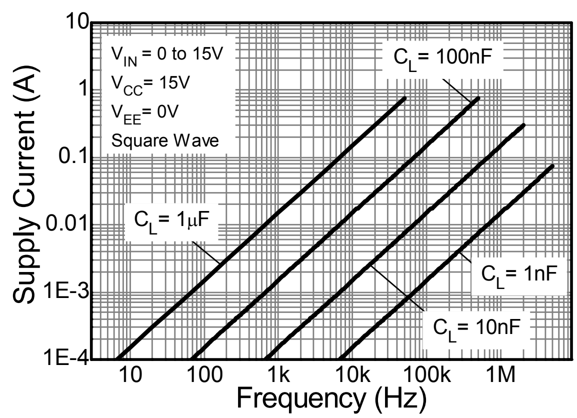
Switching Speed
Low Load Capacitance C_L = 10nF



Switching Speed
High Load Capacitance C_L = 100nF



Switching Speed
Asymmetric Source and Sink Resistors



Supply Current

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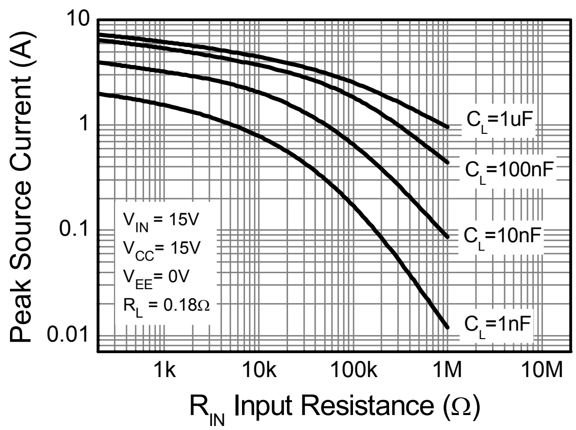
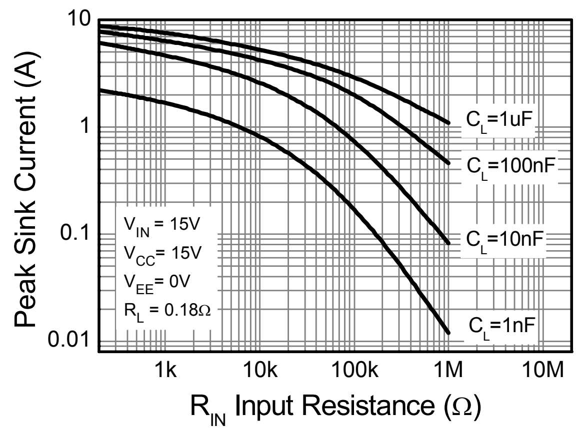
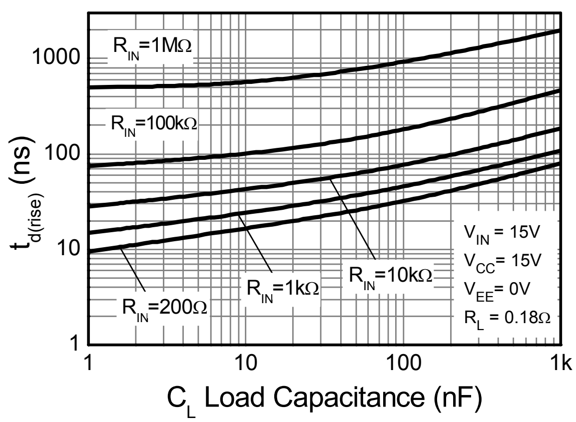
Typical Switching Characteristics (@T_A = +25°C, unless otherwise specified.)



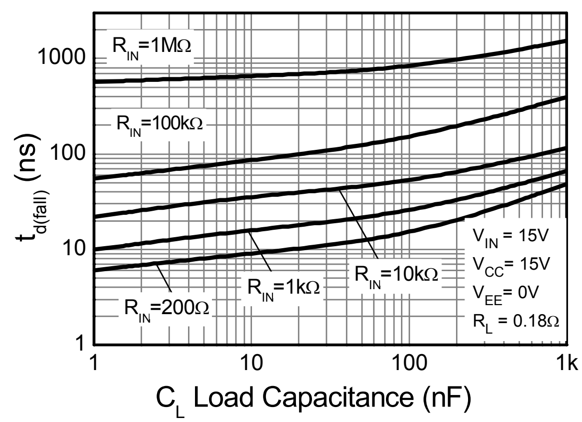
Source Current vs. Input Resistance



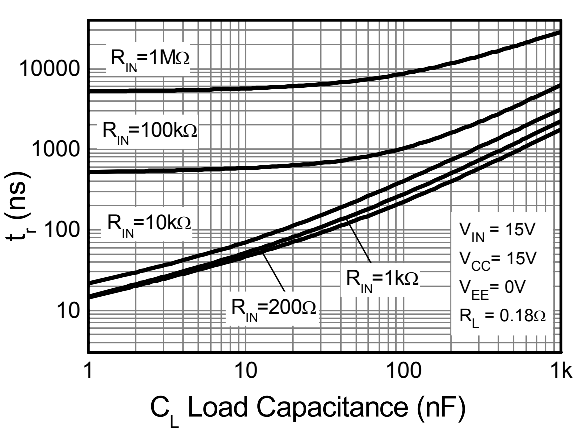
Sink Current vs. Input Resistance



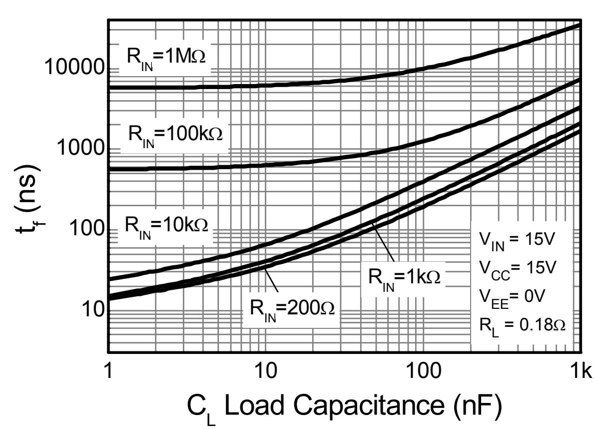
Turn-On Delay Time



Turn-Off Delay Time



Turn-On Rise Time



Turn-Off Fall Time

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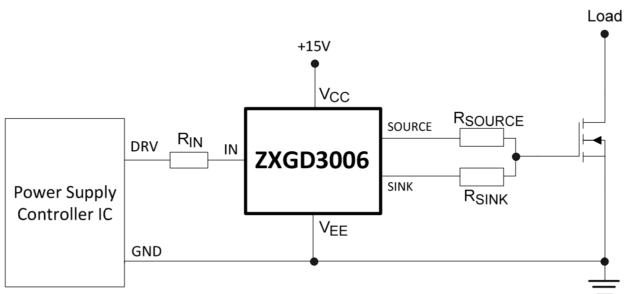
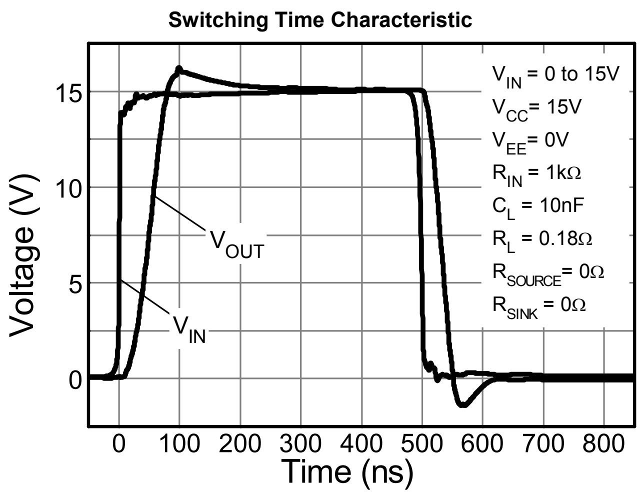
Circuit Examples

ZXGD3006 driving a MOSFET

Application example of the ZXGD3006 driving the gate of a MOSFET from 0 to +15V with $R_{SOURCE} = R_{SINK} = 0\Omega$

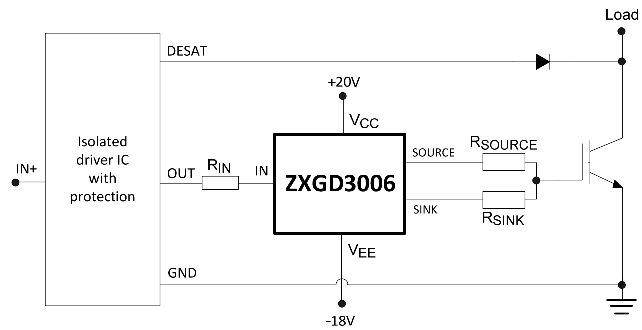


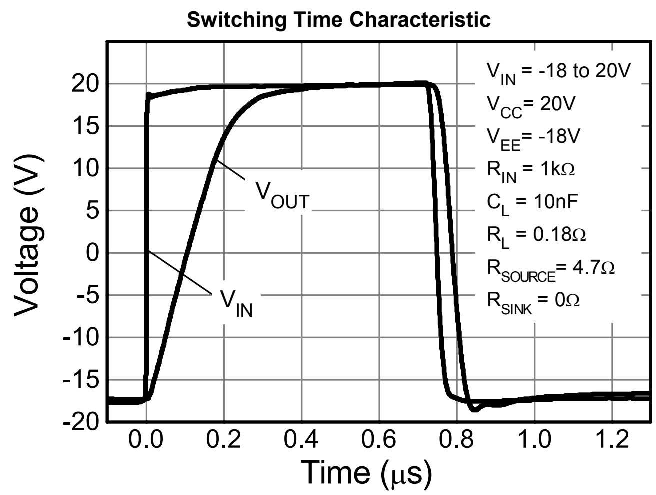


Symmetric Source and Sink Resistors

ZXGD3006 driving an IGBT

Application example of ZXGD3006 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.





Asymmetric Source and Sink Resistors

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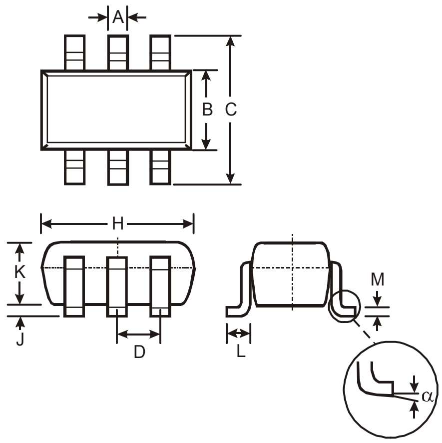
Package Outline Dimensions

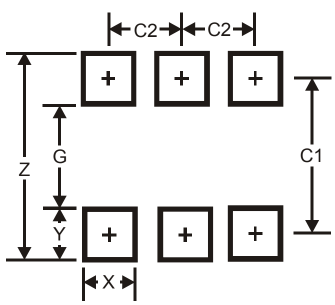
Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for latest version.



SOT26			
Dim	**Min**	**Max**	**Typ**
A	0.35	0.50	0.38
B	1.50	1.70	1.60
C	2.70	3.00	2.80
D	—	—	0.95
H	2.90	3.10	3.00
J	0.013	0.10	0.05
K	1.00	1.30	1.10
L	0.35	0.55	0.40
M	0.10	0.20	0.15
α	0°	8°	—
All Dimensions in mm			

Suggested Pad Layout

Please see AP02001 at http://www.diodes.com/datasheets/ap02001.pdf for the latest version.



Dimensions	Value (in mm)
Z	3.20
G	1.60
X	0.55
Y	0.80
C1	2.40
C2	0.95

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