

Description and Applications

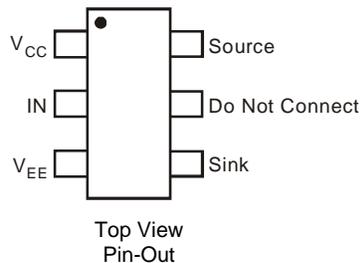
The ZXGD3005E6 is a high-speed non-inverting single gate driver capable of driving up to 10A into a MOSFET or IGBT gate capacitive load from supply voltages up to 25V. With propagation delay times down to <10ns and correspondingly rise/fall times of <20ns.

This gate driver ensures rapid switching of the MOSFET or IGBT to minimize power losses and distortion in high current switching applications. It is ideally suited to act as a voltage buffer between the typically high output impedances of a controller IC and the effectively low impedance on the gate of a power MOSFET or IGBT during switching. Its low input voltage requirement and high current gain allows high current driving from low voltage controller ICs.

The ZXGD3005E6 has separate source and sink outputs that enables the turn-on and turn-off times of the MOSFET or IGBT to be independently controlled. In addition, the wide supply voltage range allows full enhancement of the MOSFET or IGBT to minimize on-state losses and permits +15V to -5V gate drive voltage to prevent dV/dt induced false triggering of IGBTs. The ZXGD3005E6 has been designed to be inherently rugged to latch-up and shoot-through issues. The optimized pin-out SOT26 package eases board layout, enabling reduced parasitic inductance of traces.

Power MOSFET and IGBT Gate Driving in:

- Synchronous Switch-Mode Power Supplies
- Power Factor Correction (PFC) in 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
- Solar Inverters



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

Features and Benefits

- Emitter-Follower Configuration for Ultra-Fast Switching
- <10ns Propagation Delay Time
- <20ns Rise/Fall Time
- Non-Inverting Voltage Buffer Stage
- Wide Supply Voltage Up to 25V to Minimize On-Losses
- 10A Peak Current Drive into Capacitive Loads
- Low Input Current of 1mA to Deliver 4A Output Current
- Separate Source and Sink Outputs for Independent Control of Rise and Fall Time
- Optimized Pin-Out to Ease Board Layout and Minimize Parasitic Inductance of Traces
- Rugged Design That Avoids Latch-Up or Shoot-Through Issues
- Near - Zero Quiescent Supply Current
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **For automotive applications requiring specific change control (i.e. parts qualified to AEC-Q100/101/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please [contact us](mailto:contact@diodes.com) or your local Diodes representative.**

<https://www.diodes.com/quality/product-definitions/>

Mechanical Data

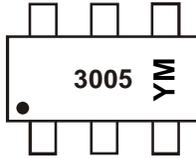
- Case: SOT26
- Case Material: Molded Plastic, "Green" Molding Compound
UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – Matte Tin Plated Leads, Solderable per MIL-STD-202, Method 208 Ⓜ3
- Weight: 0.018 grams (Approximate)

Ordering Information (Note 4)

Part Number	Marking	Reel Size (inches)	Tape Width (mm)	Quantity per Reel
ZXGD3005E6TA	3005	7	8	3000

- 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 <https://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

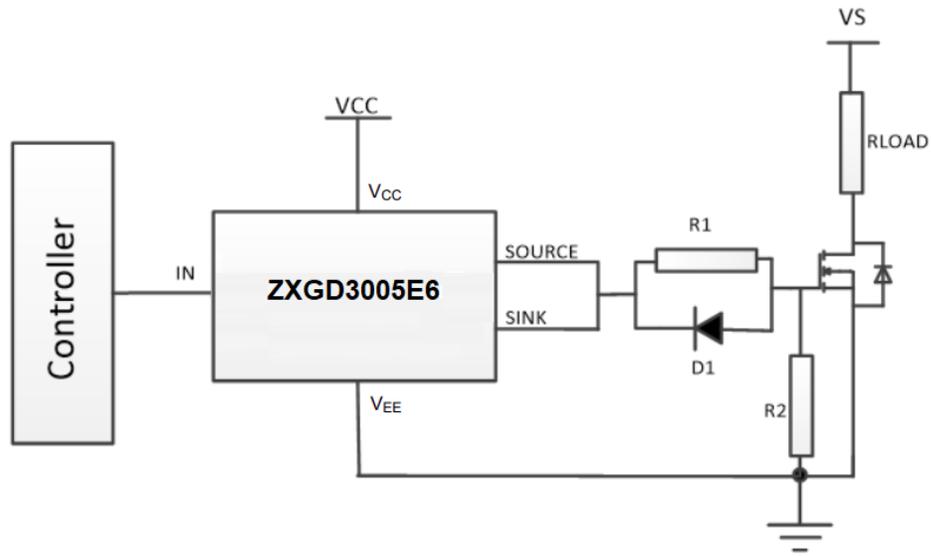


3005 = Product Type Marking Code
 YM = Date Code Marking
 Y = Year (ex: 1 = 2021)
 M = Month (ex: 9 = September)

Date Code Key

Year	2010	...	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Code	X	...	I	J	K	L	M	N	O	P	R	S
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



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

Characteristic	Symbol	Value	Unit
Supply Voltage, with Respect to V _{EE}	V _{CC}	25	V
Input Voltage, with Respect to V _{EE}	V _{IN}	25	V
Output Difference Voltage (Source – Sink)	ΔV(SOURCE-SINK)	±7.5	V
Peak Output Current	I _{PK}	±10	A
Input Current	I _{IN}	±100	mA

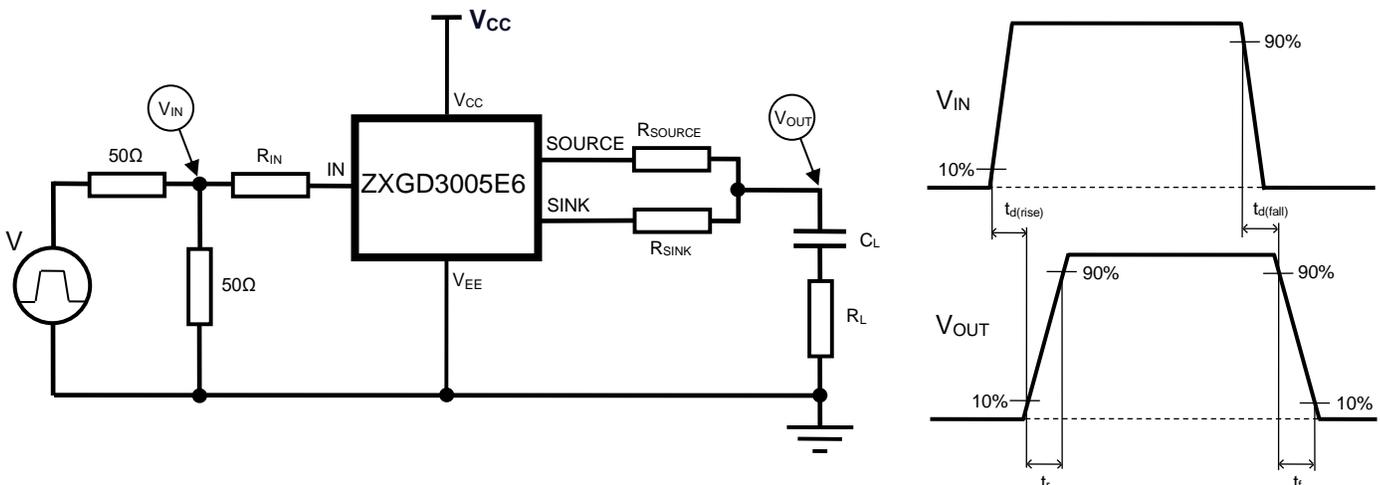
Thermal Characteristics (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Power Dissipation (Notes 5 & 6)	P _D	1.1	W
Linear Derating Factor		8.8	mW/°C
Thermal Resistance, Junction to Ambient (Notes 5 & 6)	R _{θJA}	113	°C/W
Thermal Resistance, Junction to Lead (Note 7)	R _{θJL}	105	
Operating and Storage Temperature Range	T _J , T _{STG}	-55 to +150	°C

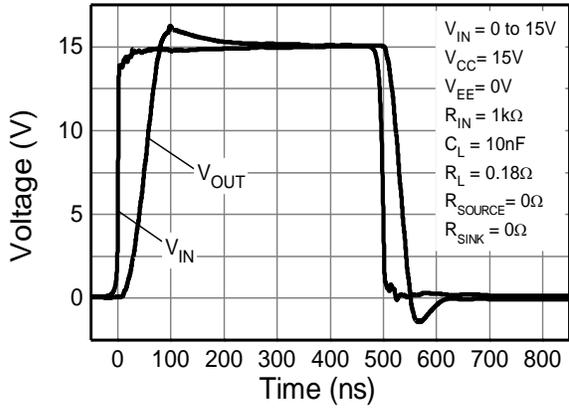
- Notes:
- For a device surface mounted on 25mm x 25mm x 0.6mm FR4 PCB with high coverage of single sided 1oz copper, in still air conditions; the device is measured when operating in a steady-state condition. The heatsink is split in half with the pin 1 (V_{CC}) and pin 3 (V_{EE}) connected separately to each half.
 - For device with two active die running at equal power.
 - Thermal resistance from junction to solder-point at the end of each lead on pin 1 (V_{CC}) and pin 3 (V_{EE}).

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Output Voltage, High	V _{OH}	—	V _{CC} - 0.8	—	V	V _{IN} = V _{CC}
Output Voltage, Low	V _{OL}	—	V _{EE} + 0.2	V _{EE} + 0.5		V _{IN} = V _{EE}
Supply Breakdown Voltage	BV _{CC}	25	—	—	V	I _Q = 100μA, V _{IN} = V _{CC}
		25	—	—		I _Q = 100μA, V _{IN} = V _{EE} = 0V
Quiescent Supply Current	I _Q	—	—	50	nA	V _{CC} = 20V, V _{IN} = V _{CC}
		—	—	50		V _{CC} = 20V, 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	—		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)}	—	8	—	ns	V _{CC} = 15V, V _{EE} = 0V V _{IN} = 0V to 15V R _{IN} = 1kΩ C _L = 10nF, R _L = 0.18Ω R _{SOURCE} = 0Ω, R _{SINK} = 0Ω
	t _r		48			
	t _{d(fall)}		16			
	t _f		35			
Switching Times with High Load Capacitance C _L = 100nF	t _{d(rise)}	—	46	—	ns	V _{CC} = 15V, V _{EE} = 0V V _{IN} = 0V to 15V R _{IN} = 1kΩ C _L = 100nF, R _L = 0.18Ω R _{SOURCE} = 0Ω, R _{SINK} = 0Ω
	t _r		419			
	t _{d(fall)}		47			
	t _f		467			
Switching Times with Asymmetric Source and Sink Resistors	t _{d(rise)}	—	24	—	ns	V _{CC} = 15V, V _{EE} = -5V V _{IN} = -5 to 15V R _{IN} = 1kΩ C _L = 10nF, R _L = 0.18Ω R _{SOURCE} = 4.7Ω, R _{SINK} = 0Ω
	t _r		133			
	t _{d(fall)}		16			
	t _f		37			

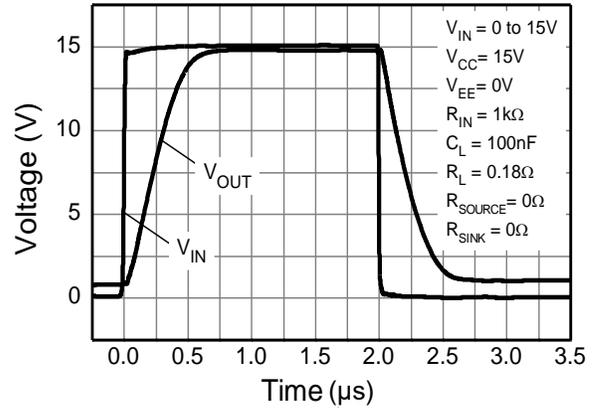
Switching Test Circuit and Timing Diagram


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



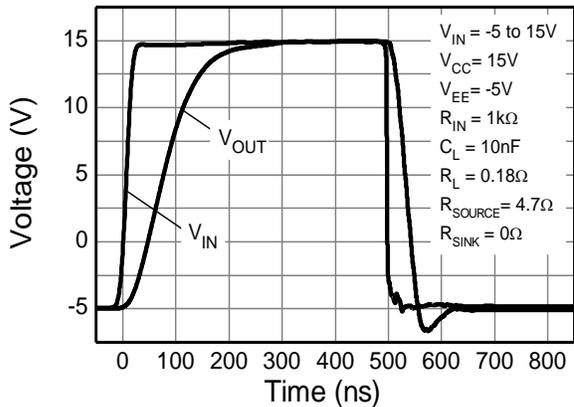
Switching Speed

Low Load Capacitance $C_L = 10\text{nF}$



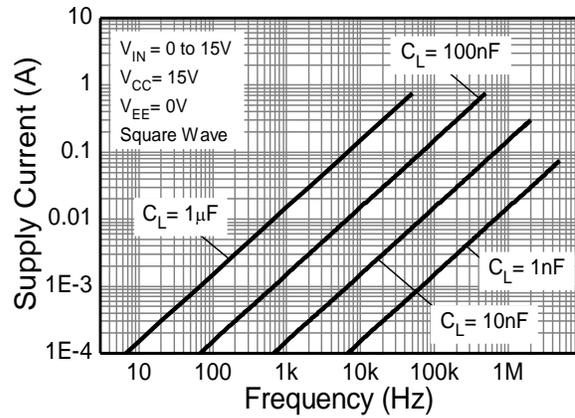
Switching Speed

High Load Capacitance $C_L = 100\text{nF}$



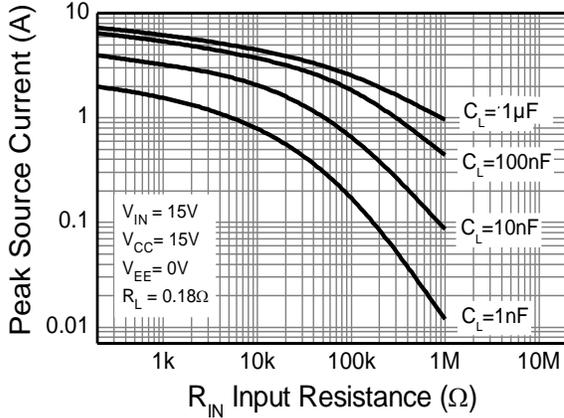
Switching Speed

Asymmetric Source and Sink Resistors

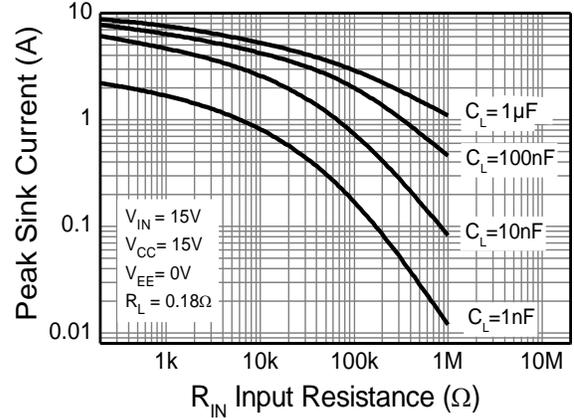


Supply Current

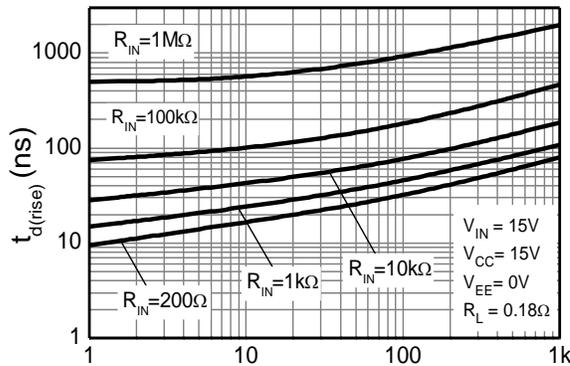
Typical Switching Characteristics (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)



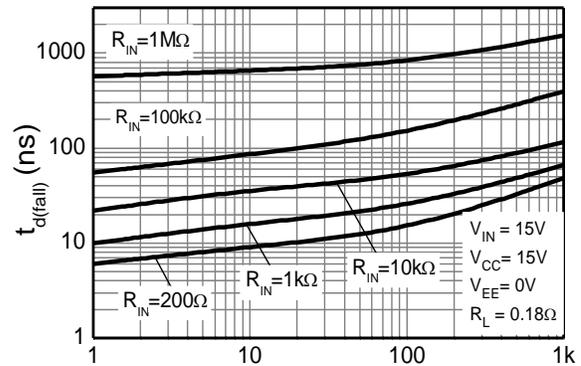
Source Current vs. Input Resistance



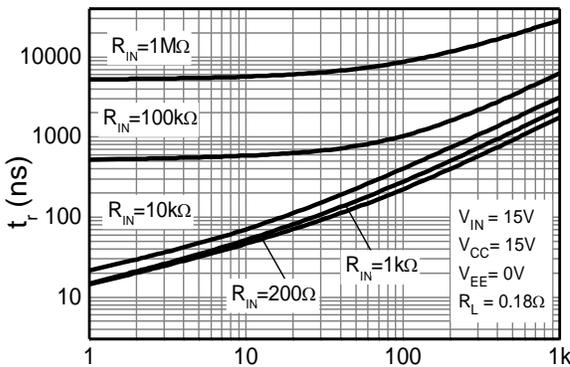
Sink Current vs. Input Resistance



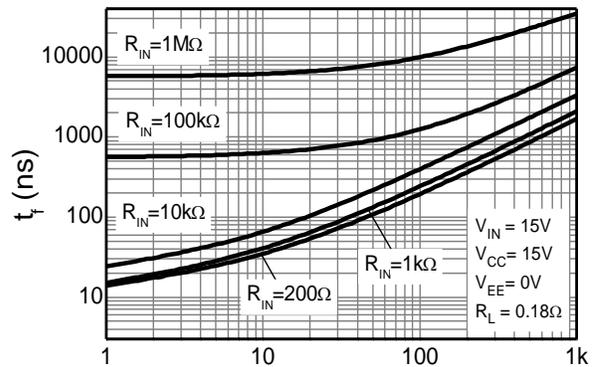
Turn-On Delay Time



Turn-Off Delay Time



Turn-On Rise Time



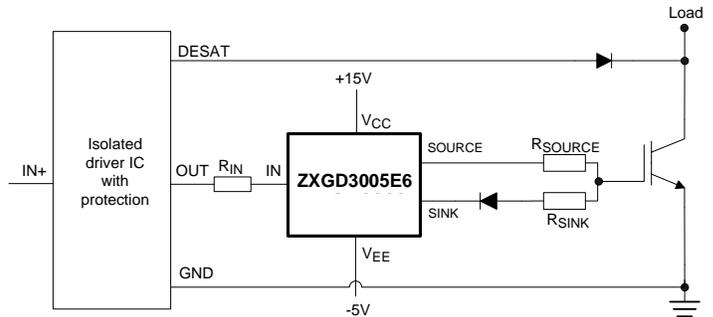
Turn-Off Fall Time

Application Notes

Independent Control of Rise and Fall Time

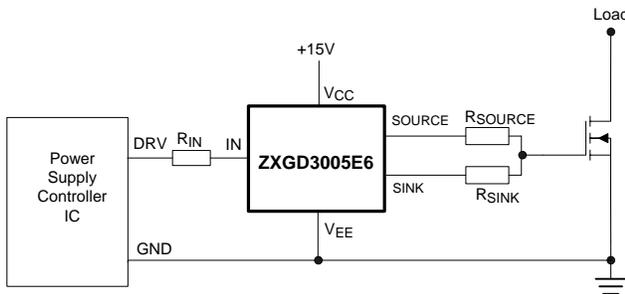
An application may require the turn-on (t_{ON}) and turn-off (t_{OFF}) time to be independently controlled, which can be achieved by setting different R_{SOURCE} and R_{SINK} values. With asymmetric R_{SOURCE} and R_{SINK} resistors, then a potential difference will occur between the SOURCE and SINK pins during the switching transition. If the potential difference across the SOURCE and SINK pins is greater than 7.5V, then it could damage the ZXGD3005E6.

In this circuit example of driving an IGBT, a blocking diode is added in series with R_{SINK} to protect against excess reverse current being induced into the SINK pin.

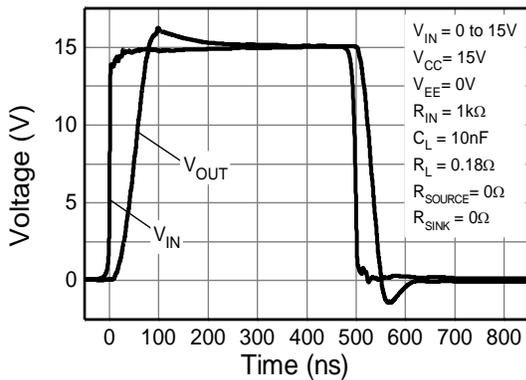


Circuit Example of Driving A MOSFET

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



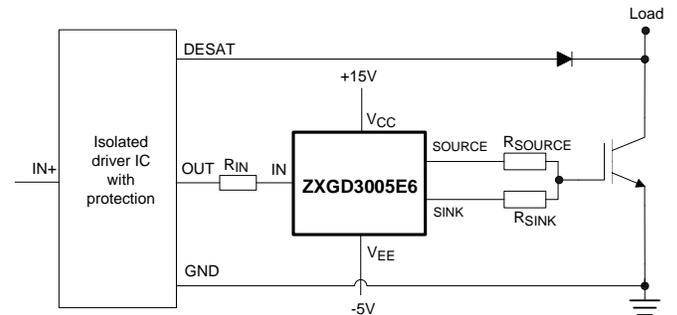
Switching Time Characteristic



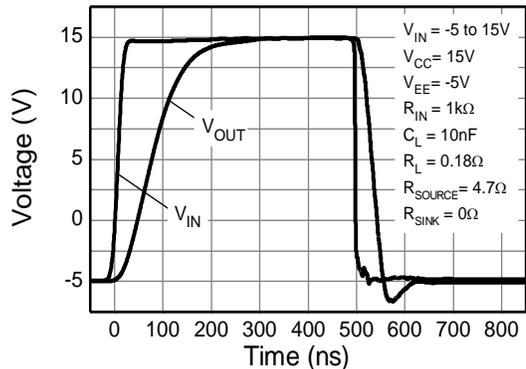
Symmetric Source and Sink Resistors

Circuit Example of Driving An IGBT

Application example of gate driving an IGBT with independent t_{ON} and t_{OFF} using asymmetric R_{SOURCE} and R_{SINK} . In addition, the gate is driven from -5 to +15V to prevent dV/dt induced false triggering.



Switching Time Characteristic

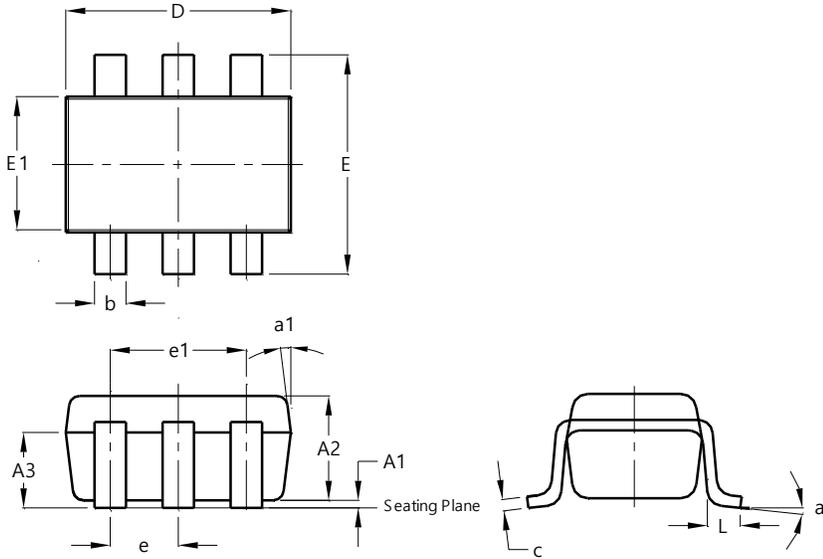


Asymmetric Source and Sink Resistors

Package Outline Dimensions

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

SOT26

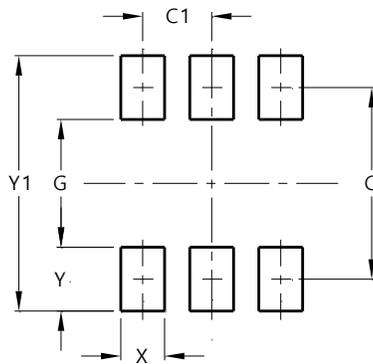


SOT26			
Dim	Min	Max	Typ
A1	0.013	0.10	0.05
A2	1.00	1.30	1.10
A3	0.70	0.80	0.75
b	0.35	0.50	0.38
c	0.10	0.20	0.15
D	2.90	3.10	3.00
e	-	-	0.95
e1	-	-	1.90
E	2.70	3.00	2.80
E1	1.50	1.70	1.60
L	0.35	0.55	0.40
a	-	-	8°
a1	-	-	7°
All Dimensions in mm			

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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