

**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:

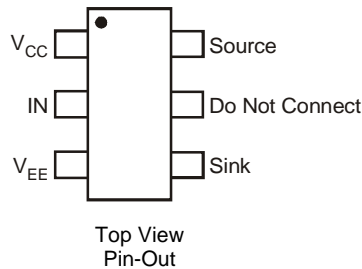
- Solar inverters
- Power supplies
- Plasma display panel power modules

**Features and Benefits**

- 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
- **“Lead-Free”, RoHS Compliant (Note 1)**
- **Halogen and Antimony free. “Green” Device (Note 2)**
- **Qualified to AEC-Q101 Standards for High Reliability**

**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: Matte Tin Finish
- Weight: 0.018 grams (approximate)



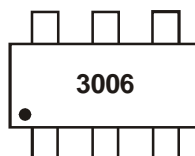
Pin Name	Pin Function
V <sub>CC</sub>	Supply voltage high
IN	Driver input pin
V <sub>EE</sub>	Supply voltage low
SOURCE	Source current output
SINK	Sink current output

**Ordering Information** (Note 3)

Product	Marking	Reel size (inches)	Tape width (mm)	Quantity per reel
ZXGD3006E6TA	3006	7	8	3000

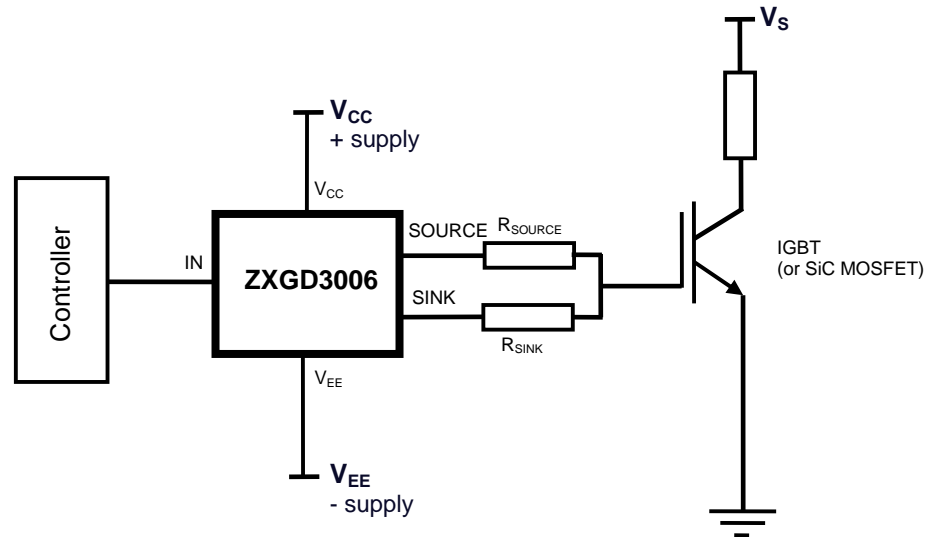
- Notes:
1. No purposefully added lead
  2. Diodes Inc's "Green" Policy can be found on our website at <http://www.diodes.com>
  3. For packaging details, go to our website at <http://www.diodes.com>

**Marking Information**



3006 = Product Type Marking Code

## Typical Application Circuit



## Maximum Ratings @ $T_A = 25^\circ\text{C}$ 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)	$\Delta V_{(\text{source-sink})}$	$\pm 7.5$	V
Peak output current	$I_{PK}$	$\pm 10$	A
Input current	$I_{IN}$	$\pm 100$	mA

## Thermal Characteristics @ $T_A = 25^\circ\text{C}$ unless otherwise specified

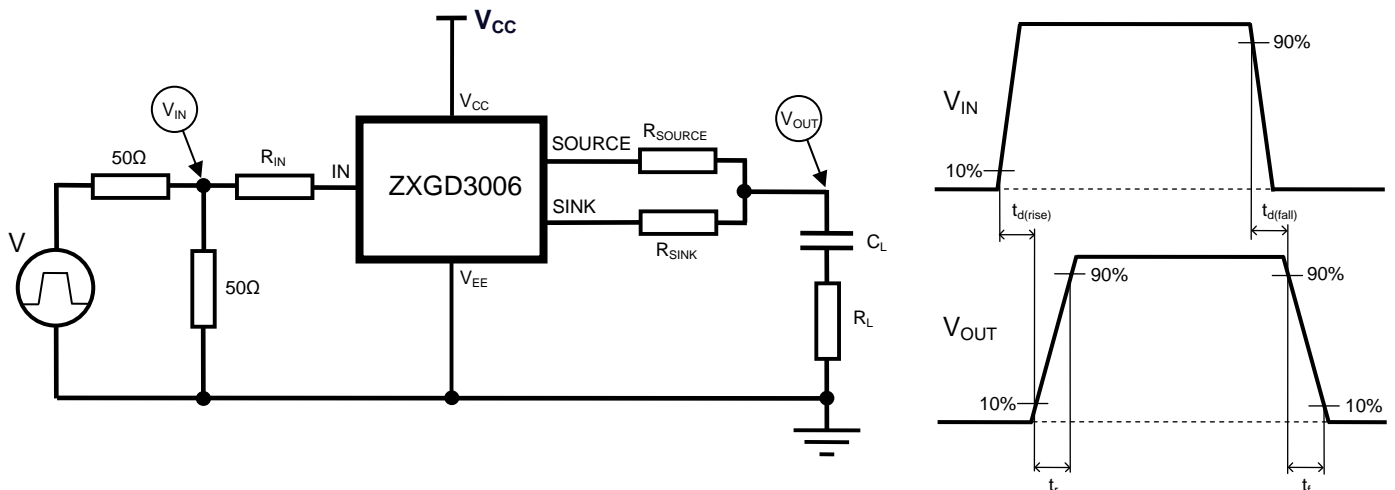
Characteristic	Symbol	Value	Unit
Power Dissipation (Notes 4 & 5)	$P_D$	1.1	W
Linear derating factor		8.8	mW/ $^\circ\text{C}$
Thermal Resistance, Junction to Ambient (Notes 4 & 5)	$R_{\theta JA}$	113	$^\circ\text{C}/\text{W}$
Thermal Resistance, Junction to Lead (Note 6)	$R_{\theta JL}$	105	
Operating and Storage Temperature Range	$T_J, T_{STG}$	-55 to +150	$^\circ\text{C}$

- Notes:
4. 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.
  5. For device with two active die running at equal power.
  6. Thermal resistance from junction to solder-point at the end of each lead on pin 1 ( $V_{CC}$ ) and pin 3 ( $V_{EE}$ ).

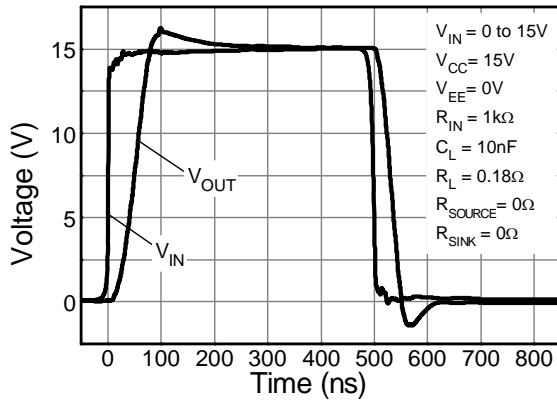
**Electrical Characteristics** @T<sub>A</sub> = 25°C unless otherwise specified

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Output voltage, high	V <sub>OUT(hi)</sub>	V <sub>CC</sub> - 1.0	V <sub>CC</sub> - 0.8	-	V	V <sub>IN</sub> = V <sub>CC</sub> C <sub>L</sub> = 1nF
Output voltage, low	V <sub>OUT(low)</sub>	-	V <sub>EE</sub> + 0.12	V <sub>EE</sub> + 0.3		V <sub>IN</sub> = V <sub>EE</sub> R <sub>SOURCE</sub> = 0Ω, R <sub>SINK</sub> = 0Ω
Supply breakdown voltage	BV <sub>CC</sub>	40	-	-	V	I <sub>Q</sub> = 100μA, V <sub>IN</sub> = V <sub>CC</sub>
		40	-	-		I <sub>Q</sub> = 100μA, V <sub>IN</sub> = V <sub>EE</sub> = 0V
Quiescent supply current	I <sub>Q</sub>	-	-	50	nA	V <sub>CC</sub> = 30V, V <sub>IN</sub> = V <sub>CC</sub>
		-	-	50		V <sub>CC</sub> = 30V, V <sub>IN</sub> = V <sub>EE</sub> = 0V
Source current	I <sub>(source)</sub>	-	4.0	-	A	V <sub>CC</sub> = 5V, I <sub>IN</sub> = 1mA, V <sub>OUT</sub> = 0V
Sink current	I <sub>(sink)</sub>	-	3.8	-		V <sub>CC</sub> = 5V, I <sub>IN</sub> = -1mA, V <sub>OUT</sub> = 5V
Source current with varying input resistances	I <sub>(source)</sub>	-	6.4	-	A	V <sub>CC</sub> = 15V, V <sub>EE</sub> = 0V V <sub>IN</sub> = 15V C <sub>L</sub> = 100nF, R <sub>L</sub> = 0.18Ω R <sub>SOURCE</sub> = 0Ω, R <sub>SINK</sub> = 0Ω
			5.5			
			3.9			
			2.2			
			0.44			
Sink current with varying input resistances	I <sub>(sink)</sub>	-	7.7	-	A	V <sub>CC</sub> = 15V, V <sub>EE</sub> = 0V V <sub>IN</sub> = 15V C <sub>L</sub> = 100nF, R <sub>L</sub> = 0.18Ω R <sub>SOURCE</sub> = 0Ω, R <sub>SINK</sub> = 0Ω
			6.5			
			4.4			
			2.3			
			0.46			
Switching times with low load capacitance C <sub>L</sub> = 10nF	t <sub>d(rise)</sub> t <sub>r</sub> t <sub>d(fall)</sub> t <sub>f</sub>	-	8	-	ns	V <sub>CC</sub> = 15V, V <sub>EE</sub> = 0V V <sub>IN</sub> = 0 to 15V R <sub>IN</sub> = 1kΩ C <sub>L</sub> = 10nF, R <sub>L</sub> = 0.18Ω R <sub>SOURCE</sub> = 0Ω, R <sub>SINK</sub> = 0Ω
			48			
			16			
			35			
Switching times with high load capacitance C <sub>L</sub> = 100nF	t <sub>d(rise)</sub> t <sub>r</sub> t <sub>d(fall)</sub> t <sub>f</sub>	-	46	-	ns	V <sub>CC</sub> = 15V, V <sub>EE</sub> = 0V V <sub>IN</sub> = 0 to 15V R <sub>IN</sub> = 1kΩ C <sub>L</sub> = 100nF, R <sub>L</sub> = 0.18Ω R <sub>SOURCE</sub> = 0Ω, R <sub>SINK</sub> = 0Ω
			419			
			47			
			467			
Switching times with asymmetric source and sink resistors	t <sub>d(rise)</sub> t <sub>r</sub> t <sub>d(fall)</sub> t <sub>f</sub>	-	27	-	ns	V <sub>CC</sub> = 20V, V <sub>EE</sub> = -18V V <sub>IN</sub> = -18 to 20V R <sub>IN</sub> = 1kΩ C <sub>L</sub> = 10nF, R <sub>L</sub> = 0.18Ω R <sub>SOURCE</sub> = 4.7Ω, R <sub>SINK</sub> = 0Ω
			208			
			11			
			53			

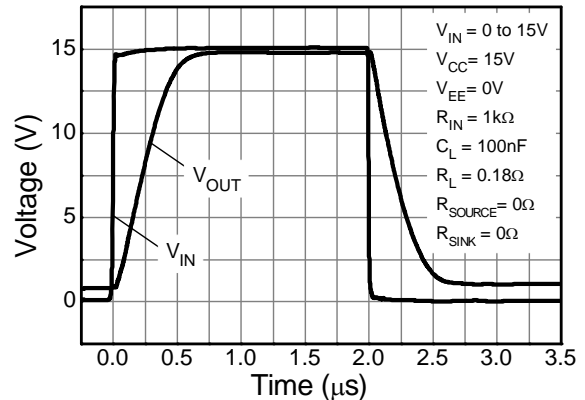
**Switching Test Circuit and Timing Diagram**



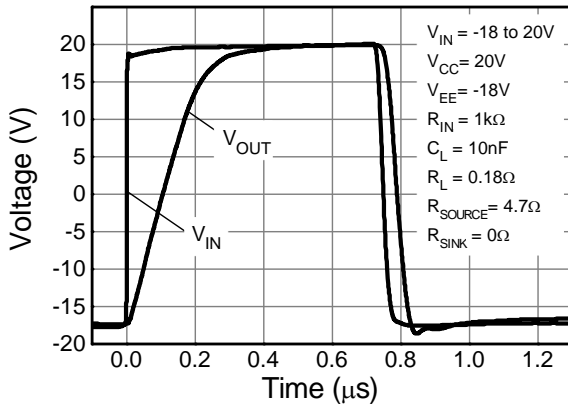
**Typical Switching Characteristics** @ $T_A = 25^\circ\text{C}$  unless otherwise specified



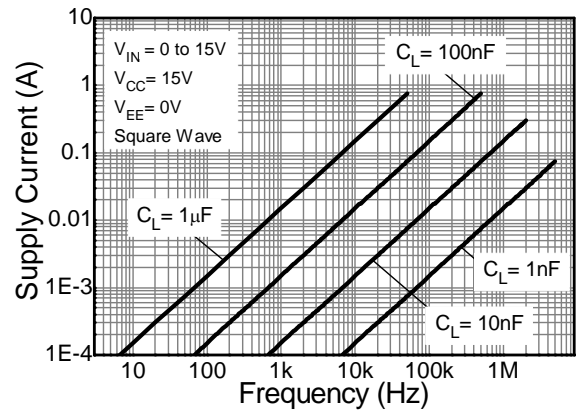
**Switching Speed**  
Low Load Capacitance  $C_L = 10\text{nF}$



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

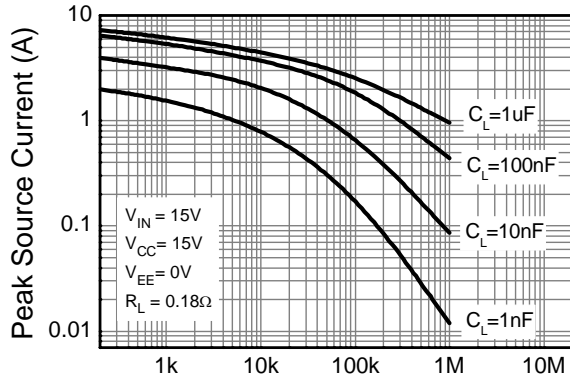


**Switching Speed**  
Asymmetric Source and Sink Resistors

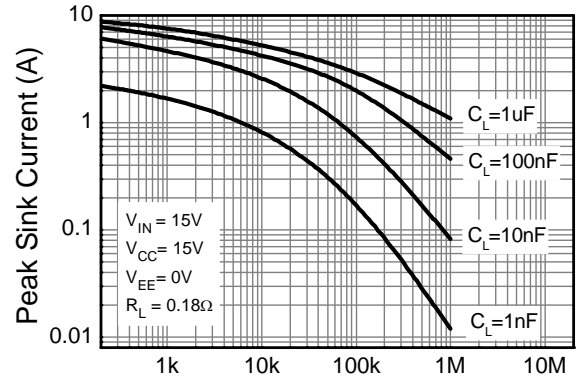


**Supply Current**

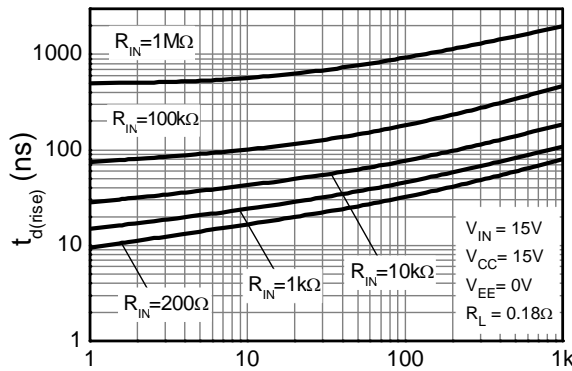
**Typical Switching Characteristics** @ $T_A = 25^\circ\text{C}$  unless otherwise specified



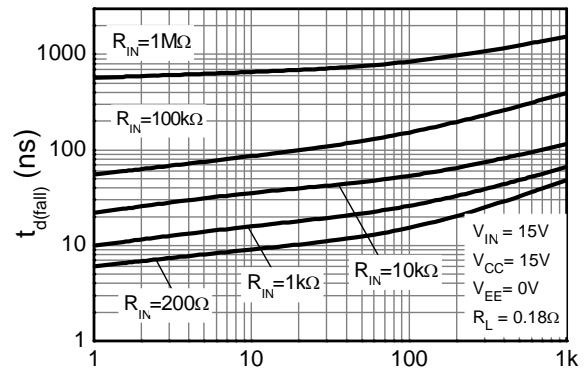
**Source Current vs. Input Resistance**



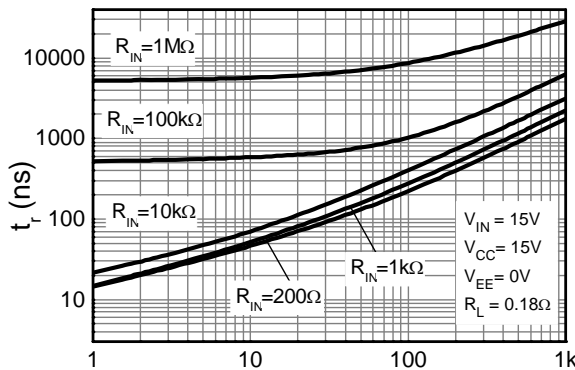
**Sink Current vs. Input Resistance**



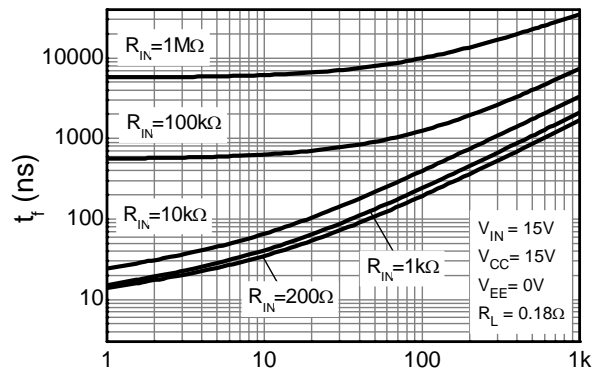
**Turn-On Delay Time**



**Turn-Off Delay Time**



**Turn-On Rise Time**

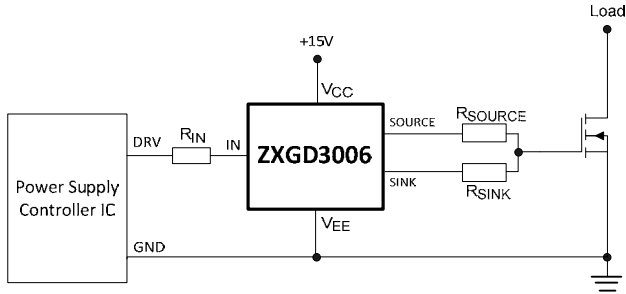


**Turn-Off Fall Time**

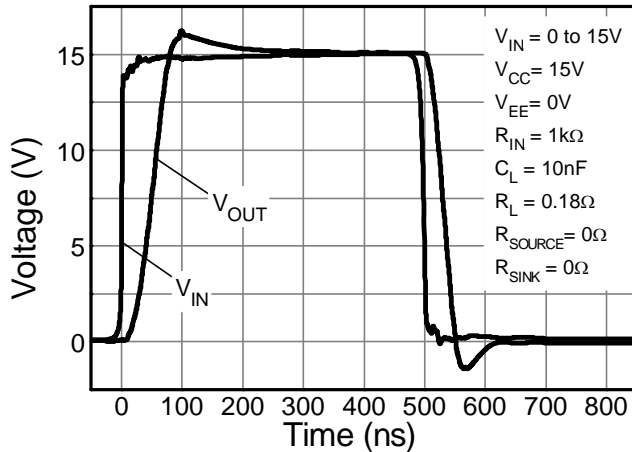
**Circuit Examples**

**ZXGD3006 driving a MOSFET**

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



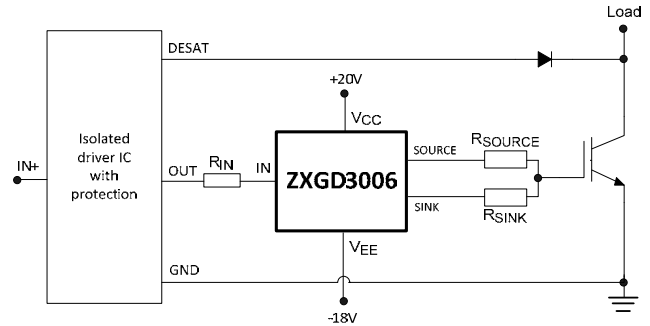
**Switching Time Characteristic**



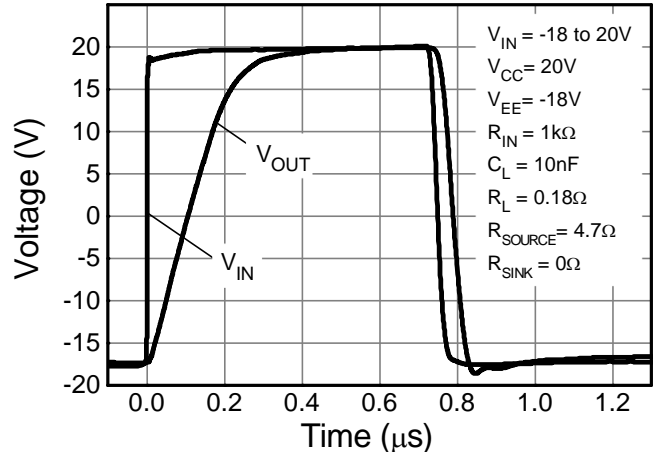
Symmetric Source and Sink Resistors

**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.

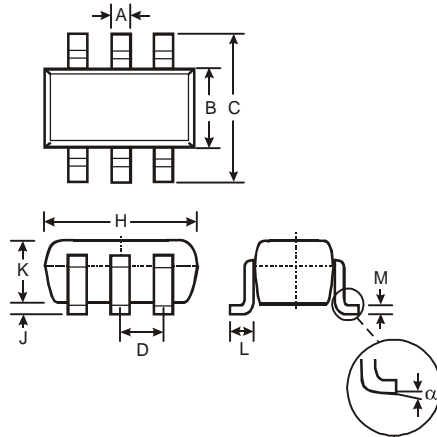


**Switching Time Characteristic**



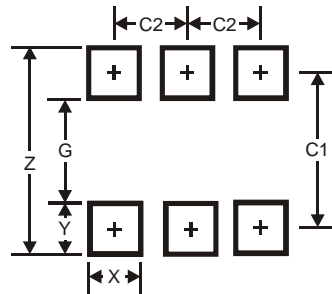
Asymmetric Source and Sink Resistors

**Package Outline Dimensions**



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**



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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