优尚

YOUSHANG SEMICONDUCTOR

设计研发新型功率器件

各类小信号开关

中低压及高压大电流等场效应管

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Description

The NK-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 NK-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 can be reduced.
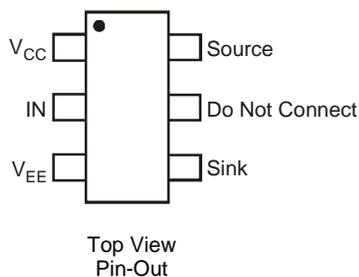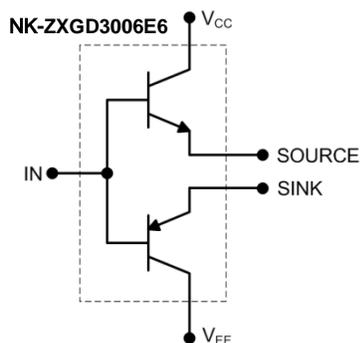
Applications

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

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 ⓔ③
- Weight: 0.018 grams (Approximate)

SOT26

NK-ZXGD3006E6

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

Typical Application Circuit
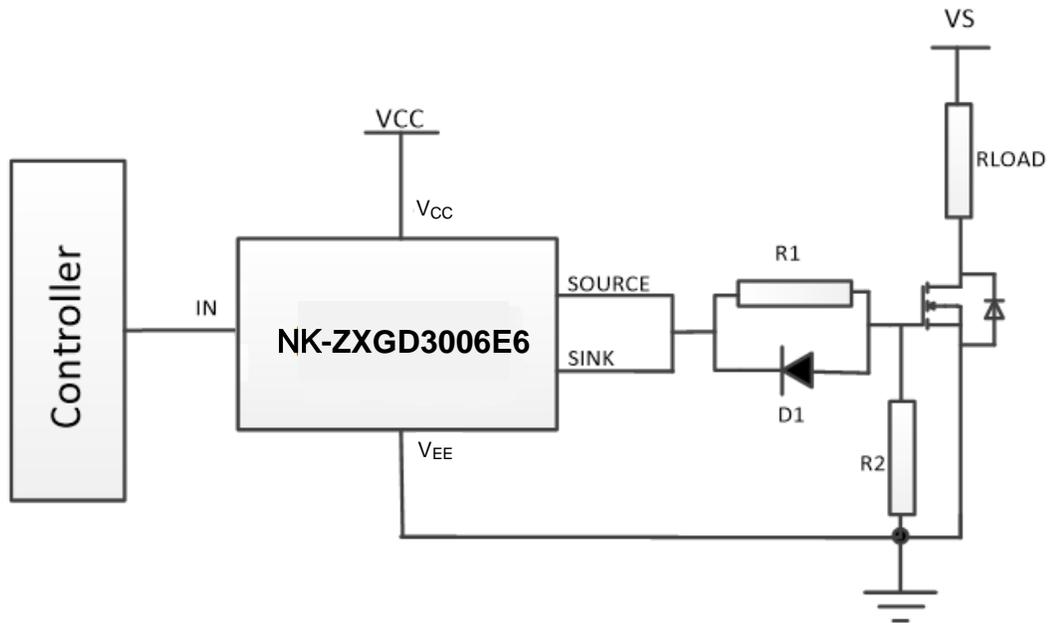
R1, D1 combination can be used for variable turn on and turn off times.

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		$V_{IN} = V_{EE}$	
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	
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	—		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
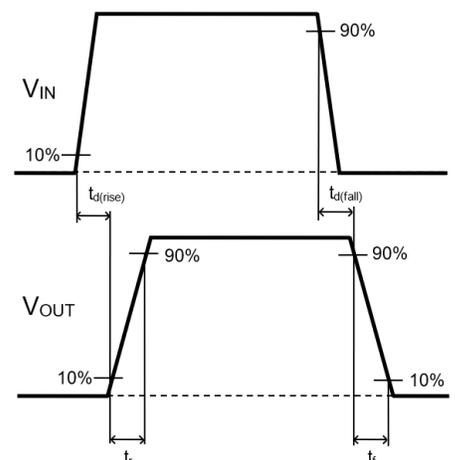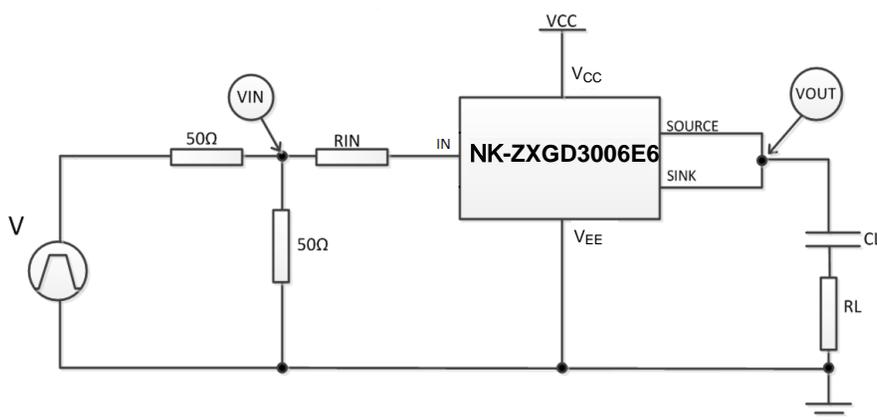
Typical Switching Characteristics (@T_A = +25°C, unless otherwise specified.)
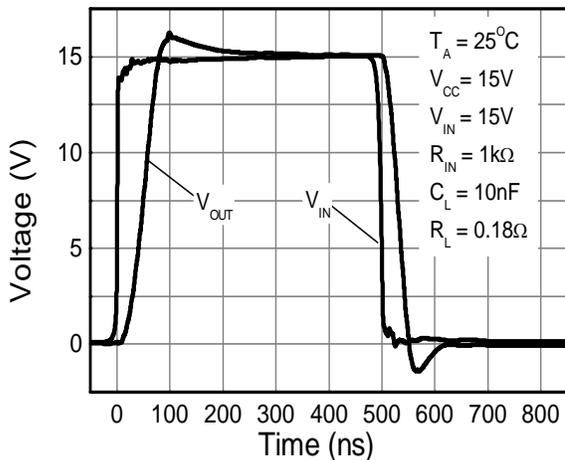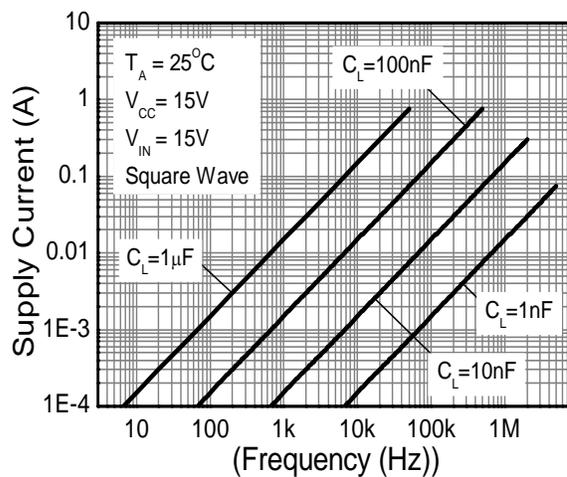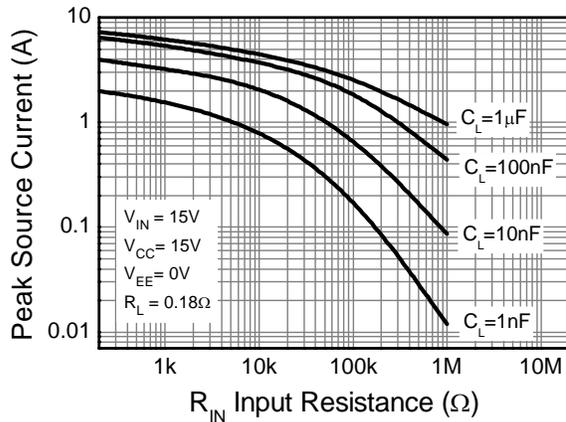

Switching Speed
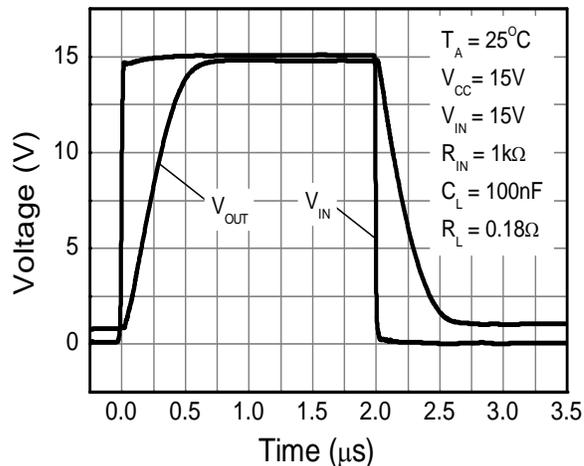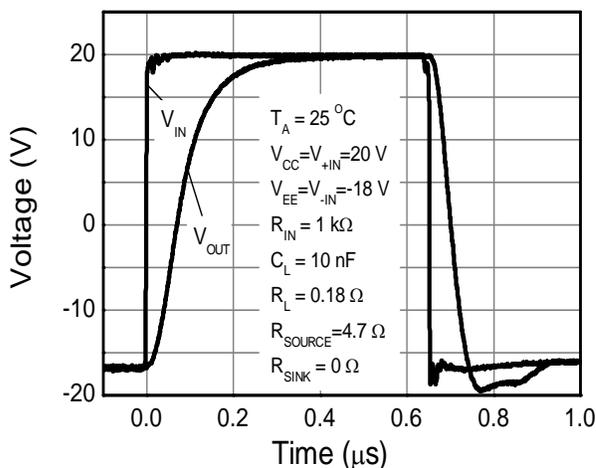
Switching Speed

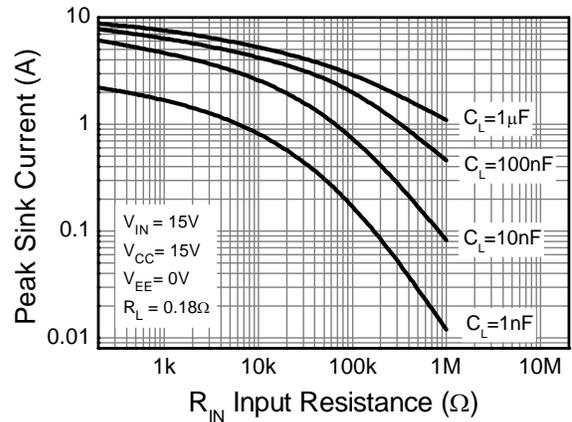**Switching Speed**
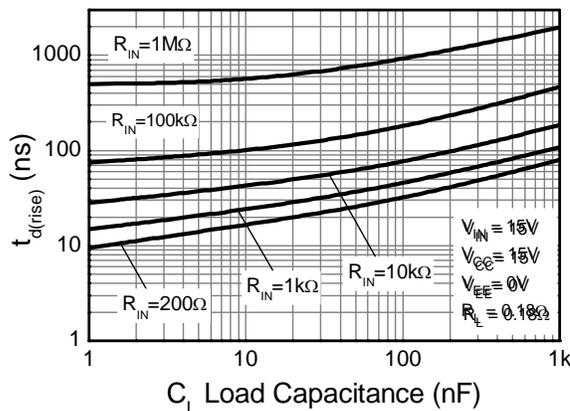Asymmetric Source and Sink Resistance

Supply Current

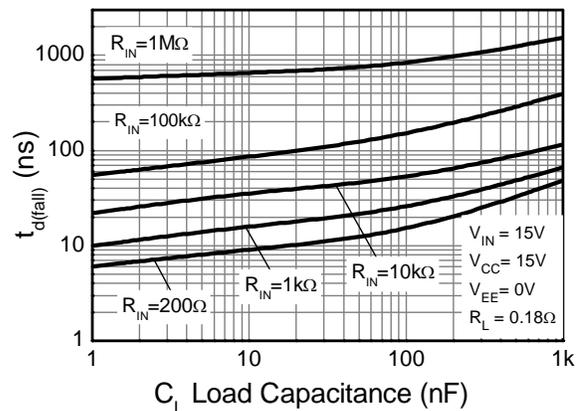## Typical Switching Characteristics (@T_A = +25℃, unless otherwise specified.)

Source Current vs. Input Resistance

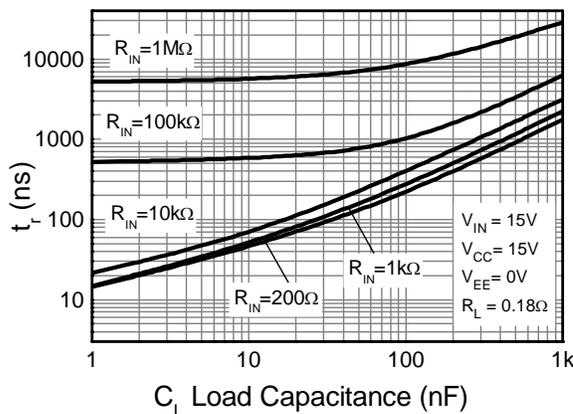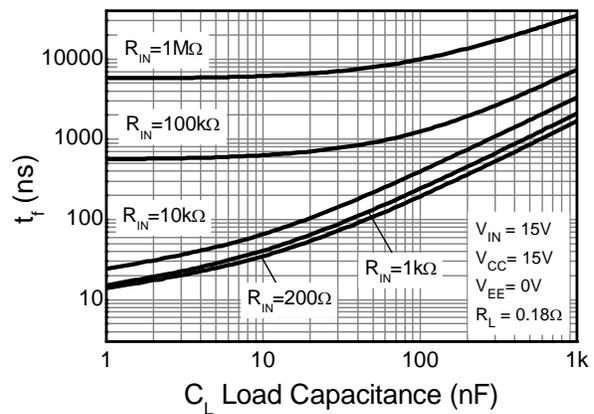**Sink Current vs. Input Resistance**

Turn-On Delay Time

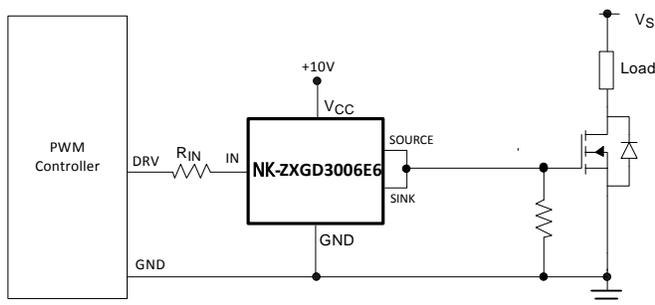**Turn-Off Delay Time**

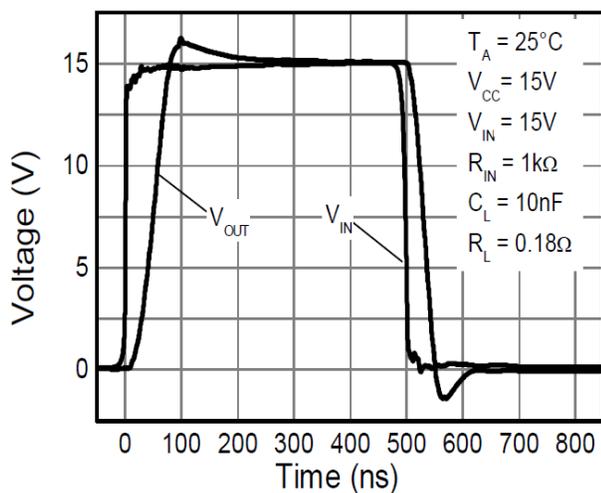**Turn-On Rise Time**

Turn-Off Fall Time

Circuit Examples

NK-ZXGD3006E6 Driving a MOSFET

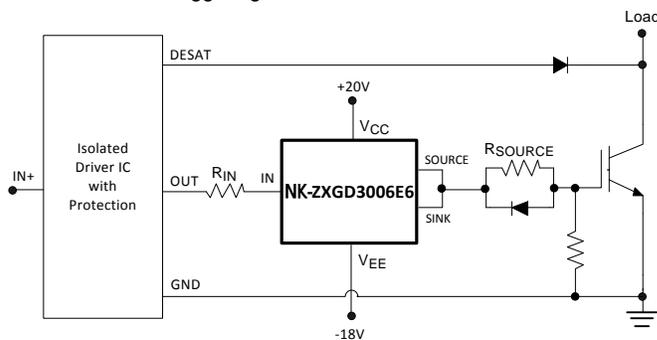Application example of the NK-ZXGD3006E6 driving the gate of a MOSFET from 0 to +15V.
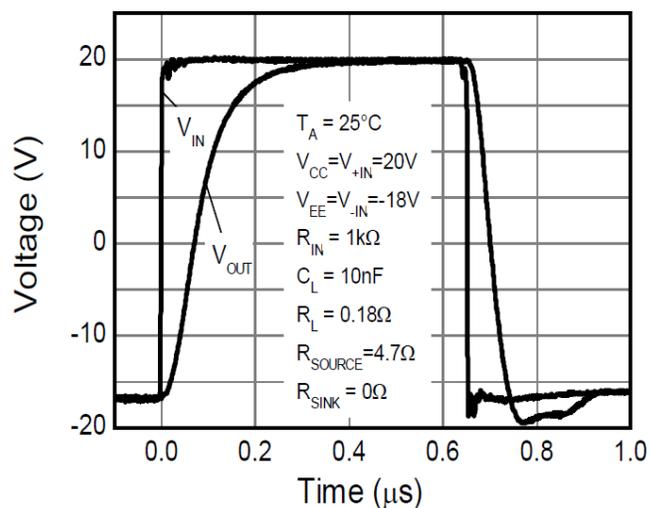

Switching Time Characteristic

$T_A = 25°C$
$V_{CC} = 15V$
$V_{IN} = 15V$
$R_{IN} = 1k\Omega$
$C_L = 10nF$
$R_L = 0.18\Omega$

Symmetric Source and Sink Resistors

NK-ZXGD3006E6 Driving an IGBT

Application example of NK-ZXGD3006E6 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.
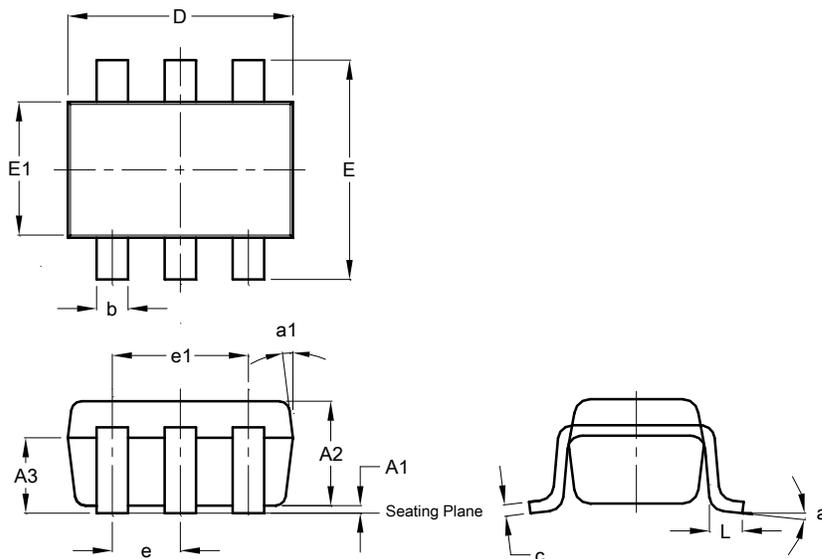

Switching Time Characteristic

$T_A = 25°C$
$V_{CC} = V_{+IN} = 20V$
$V_{EE} = V_{-IN} = -18V$
$R_{IN} = 1k\Omega$
$C_L = 10nF$
$R_L = 0.18\Omega$
$R_{SOURCE} = 4.7\Omega$
$R_{SINK} = 0\Omega$

Asymmetric Source and Sink Resistors

Package Outline Dimensions

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

SOT26
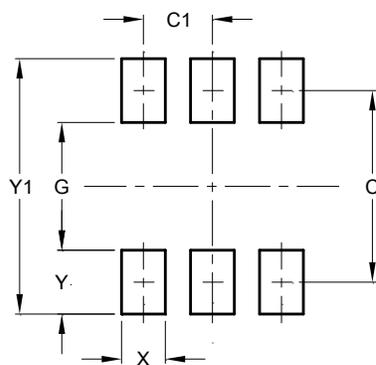
Dimensions	Value (in mm)
C	2.40
C1	0.95
G	1.60
X	0.55
Y	0.80
Y1	3.20