



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

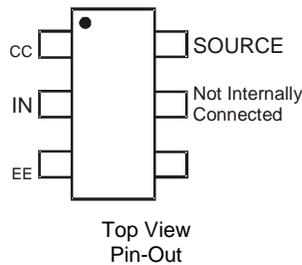
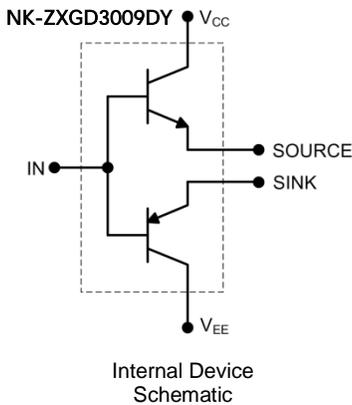
NK-ZXGD3009DY is a high-speed, non-inverting single gate driver for switching MOSFETs. It can transfer up to 1A peak source/sink current into the gate for effective charging and discharging of the capacitive load.

This gate driver ensures rapid switching of the MOSFET to minimize power losses and distortion in high current switching applications. It can typically drive 500mA into the low gate impedance with just 10mA input from a controller. The turn-on and turn-off switching behavior of the MOSFET 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

Power MOSFET Gate Driving in:

- Power Supplies
- DC-DC Converters
- Amplifier Output Stages



Pin Name	Pin Function
V <sub>CC</sub>	Supply Voltage High
IN	Driver Input
V <sub>EE</sub>	Supply Voltage Low
SOURCE	Source Current Output *
SINK	Sink Current Output *

\* Typically connect SOURCE & SINK together

## Features

- High-Gain Buffer with Typically 500mA Output from 10mA Input
- Emitter-Follower that is Rugged to Latch-Up/Shoot-Through Issues
- Wide Supply Voltage to Minimize On-Losses
- Separate Source and Sink Outputs for Independent Control of MOSFET Turn-On and Turn-Off Times
- Optimized Pin-Out to Simplify PCB Layout and Reduce Parasitic Trace Inductances
- Near-Zero Quiescent Supply Current

## Mechanical Data

- Case: SOT363
- 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 208③
- Weight: 0.018 grams (Approximate)

**Absolute Maximum Ratings** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Supply Voltage, with Respect to V <sub>EE</sub>	V <sub>CC</sub>	40	V
Input Voltage, with Respect to V <sub>EE</sub>	V <sub>IN</sub>	40	V
Output Difference Voltage (Source – Sink)	ΔV <sub>(source-sink)</sub>	±7	V
Peak Pulsed Output Current (Source and Sink)	I <sub>OM</sub>	±2	A
Peak Pulsed Input Current	I <sub>IM</sub>	±1	A

**Thermal Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Power Dissipation	P <sub>D</sub>	320	mW
		277	
Thermal Resistance, Junction to Ambient	R <sub>θJA</sub>	391	°C/W
		450	
Thermal Resistance, Junction to Lead (Note 8)	R <sub>θJL</sub>	350	
Operating and Storage Temperature Range	T <sub>J</sub> , T <sub>STG</sub>	-55 to +150	°C

**ESD Ratings** (Note 9)

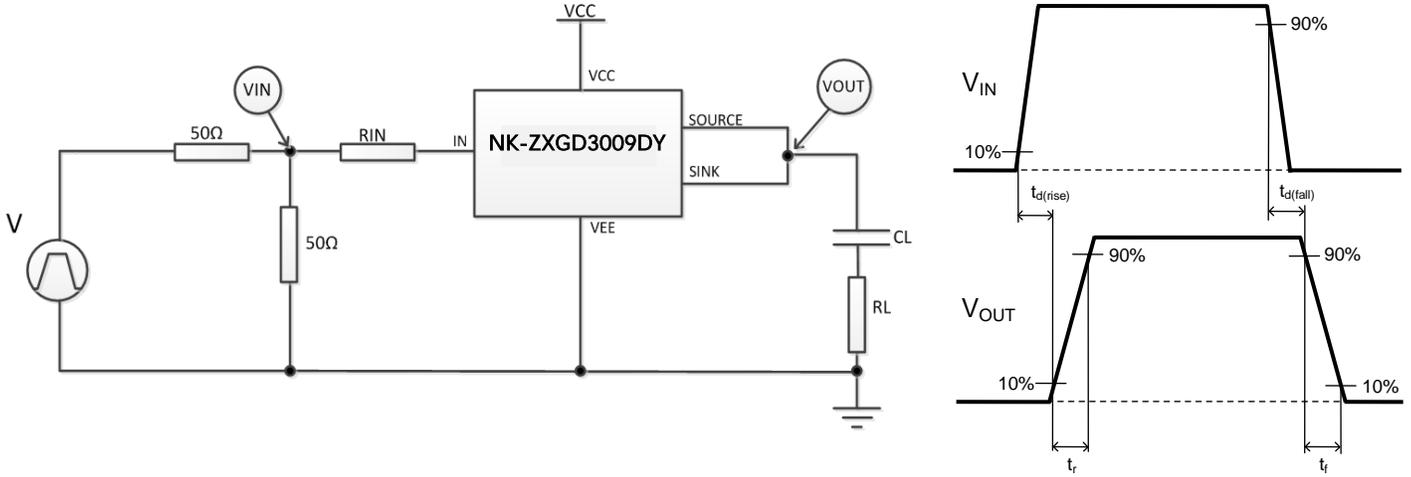
Characteristics	Symbols	Value	Unit	JEDEC Class
Electrostatic Discharge – Human Body Model	ESD HBM	4,000	V	3A
Electrostatic Discharge – Machine Model	ESD MM	400	V	C

- Notes:
- For a device mounted with pin 1 (V<sub>CC</sub>) and pin 3 (V<sub>EE</sub>) 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 steady-state. The heatsink is split in half with pin 1 (V<sub>CC</sub>) and pin 3 (V<sub>EE</sub>) connected separately to each half.
  - Same as Note 5, except the device is mounted on minimum recommended pad layout.
  - 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<sub>CC</sub>) and pin 3 (V<sub>EE</sub>).
  - Refer to JEDEC specification JESD22-A114 and JESD22-A115.

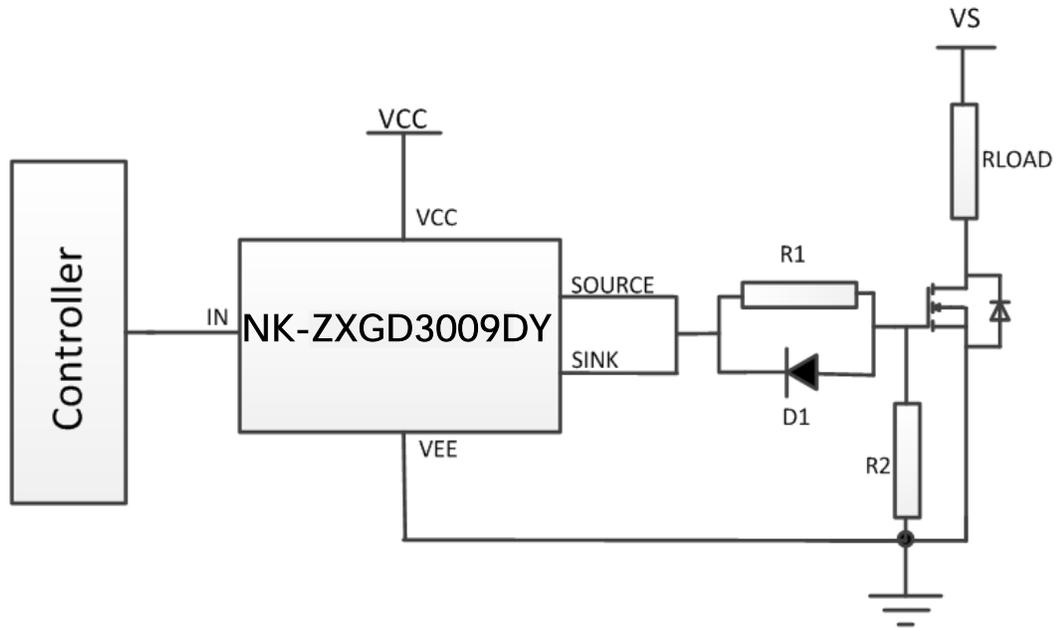
**Electrical Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Output Voltage, High	V <sub>OH</sub>	V <sub>CC</sub> - 0.8	V <sub>CC</sub> - 0.4	—	V	I <sub>(source)</sub> = 1μA, V <sub>IN</sub> = V <sub>CC</sub>
Output Voltage, Low	V <sub>OL</sub>	—	V <sub>EE</sub> + 0.2	V <sub>EE</sub> + 0.5		I <sub>(sink)</sub> = 1μA, V <sub>IN</sub> = V <sub>EE</sub>
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>	—	—	20	nA	V <sub>CC</sub> = 32V, V <sub>IN</sub> = V <sub>CC</sub>
		—	—	20		V <sub>CC</sub> = 32V, V <sub>IN</sub> = V <sub>EE</sub> = 0V
Peak Pulsed Source Current	I <sub>(source)M</sub>	—	0.98	—	A	I <sub>IN</sub> = 10mA, V <sub>CC</sub> = 5V, V <sub>OUT</sub> = 0V
Peak Pulsed Sink Current	I <sub>(sink)M</sub>	—	0.78	—		I <sub>IN</sub> = -10mA, V <sub>EE</sub> = 0V, V <sub>OUT</sub> = 5V
Peak Pulsed Source Current	I <sub>(source)M</sub>	—	1.58	—	A	I <sub>IN</sub> = 50mA, V <sub>CC</sub> = 5V, V <sub>OUT</sub> = 0V
Peak Pulsed Sink Current	I <sub>(sink)M</sub>	—	1.38	—		I <sub>IN</sub> = -50mA, V <sub>EE</sub> = 0V, V <sub>OUT</sub> = 5V
Peak Pulsed Source Current with Varying Input Resistances	I <sub>(source)M</sub>	—	0.74 0.175 0.019	—	A	R <sub>IN</sub> = 100Ω R <sub>IN</sub> = 1kΩ R <sub>IN</sub> = 10kΩ V <sub>CC</sub> = 15V, V <sub>EE</sub> = 0V V <sub>IN</sub> = 15V C <sub>L</sub> = 1nF, R <sub>L</sub> = 0.18Ω R <sub>SOURCE</sub> = 0Ω, R <sub>SINK</sub> = 0Ω
Peak Pulsed Sink Current with Varying Input Resistances	I <sub>(sink)M</sub>	—	1.05 0.22 0.025	—	A	R <sub>IN</sub> = 100Ω R <sub>IN</sub> = 1kΩ R <sub>IN</sub> = 10kΩ V <sub>CC</sub> = 15V, V <sub>EE</sub> = 0V V <sub>IN</sub> = 15V C <sub>L</sub> = 1nF, R <sub>L</sub> = 0.18Ω R <sub>SOURCE</sub> = 0Ω, R <sub>SINK</sub> = 0Ω
Switching Times with Low Input Resistance	t <sub>d(rise)</sub>	—	3.8	—	ns	V <sub>CC</sub> = 12V, V <sub>EE</sub> = 0V V <sub>IN</sub> = 0 to 10V R <sub>IN</sub> = 25Ω C <sub>L</sub> = 1nF, R <sub>L</sub> = 0.18Ω R <sub>SOURCE</sub> = 0Ω, R <sub>SINK</sub> = 0Ω
	t <sub>r</sub>		15			
	t <sub>d(fall)</sub>		4			
	t <sub>f</sub>		15			
Switching Times with Low Load Capacitance C <sub>L</sub> = 1nF	t <sub>d(rise)</sub>	—	18	—	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> = 1nF, R <sub>L</sub> = 0.18Ω R <sub>SOURCE</sub> = 0Ω, R <sub>SINK</sub> = 0Ω
	t <sub>r</sub>		36			
	t <sub>d(fall)</sub>		16			
	t <sub>f</sub>		40			
Switching Times with High Load Capacitance C <sub>L</sub> = 10nF	t <sub>d(rise)</sub>	—	47	—	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
	t <sub>r</sub>		210			
	t <sub>d(fall)</sub>		39			
	t <sub>f</sub>		240			

### Switching Test Circuit and Timing Diagram

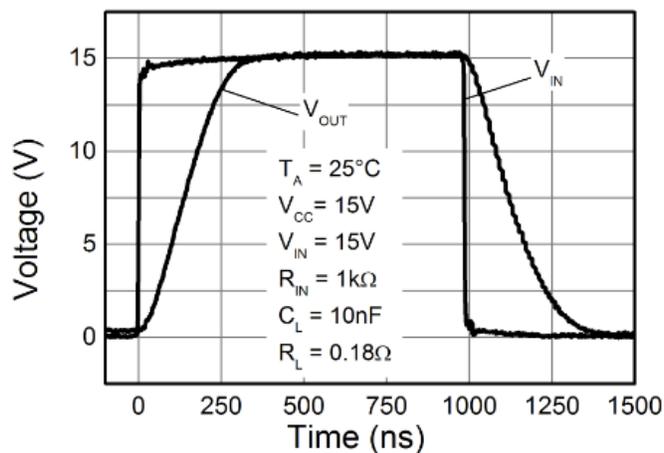


### Typical Application Circuit

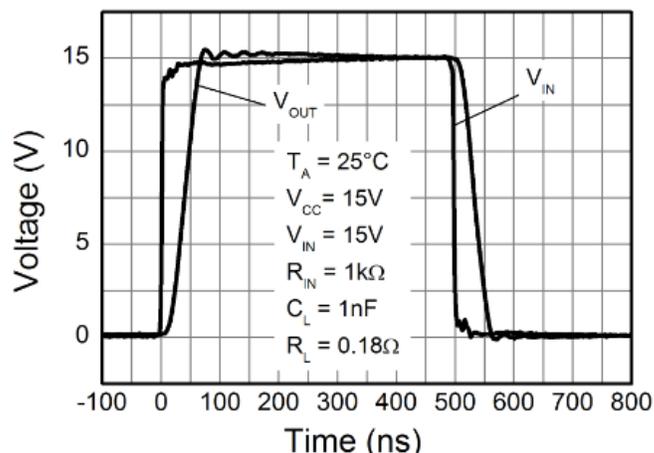


$R_1$ ,  $D_1$  combination can be used for variable turn on and turn off times.

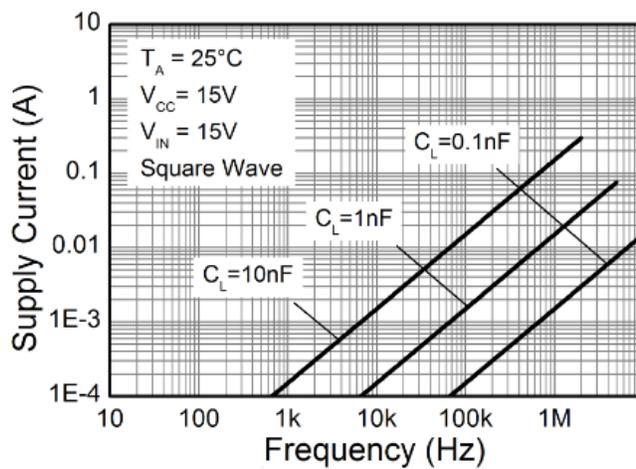
**Typical Switching Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)



**Switching Speed**

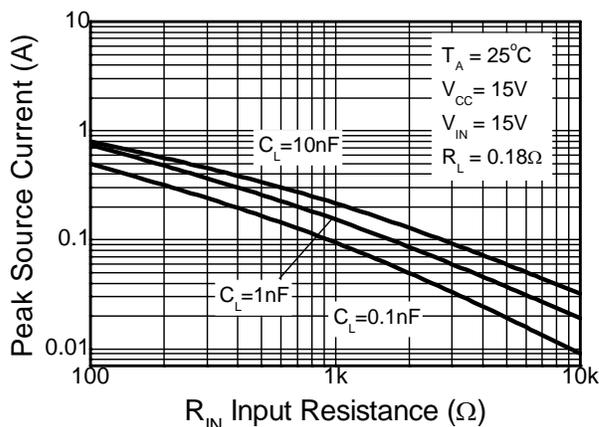


**Switching Speed**

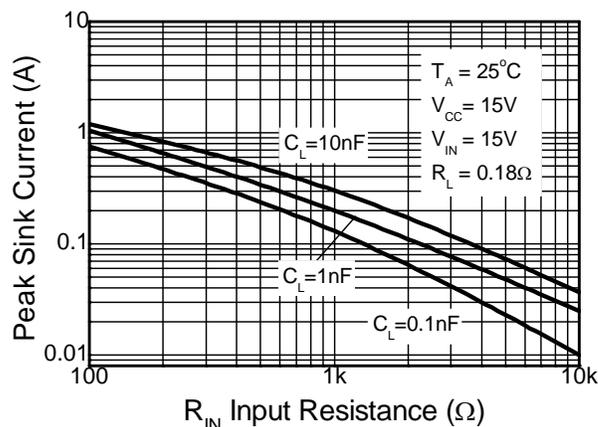


**Supply Current**

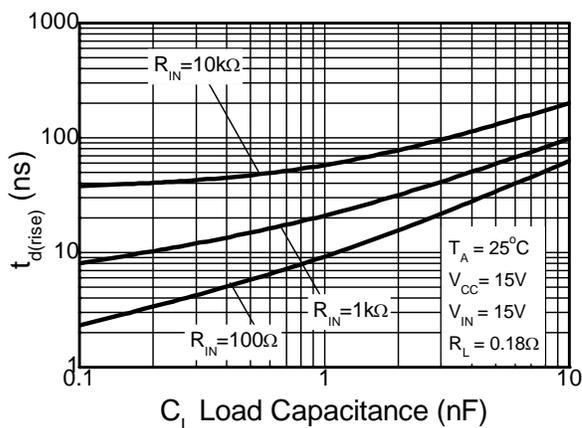
**Typical Switching Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)



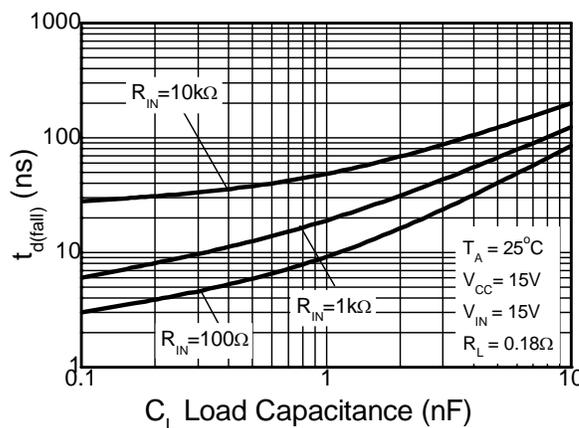
**Source Current vs. Input Resistance**



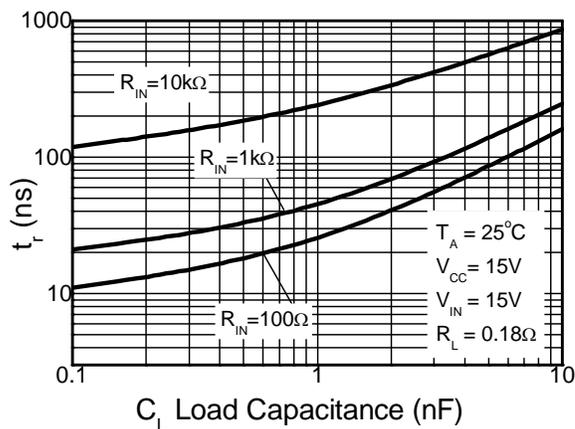
**Sink Current vs. Input Resistance**



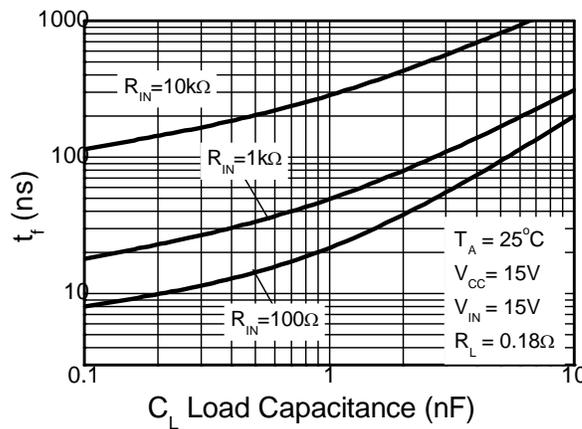
**Turn-On Delay Time**



**Turn-Off Delay Time**



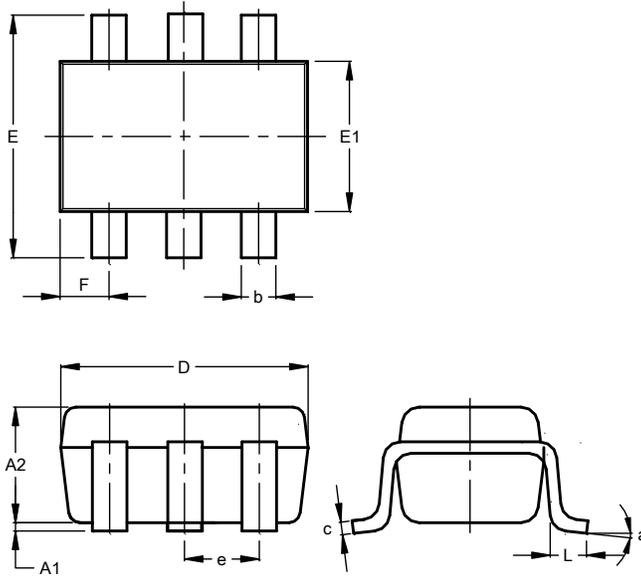
**Turn-On Rise Time**



**Turn-Off Fall Time**

## Package Outline Dimensions

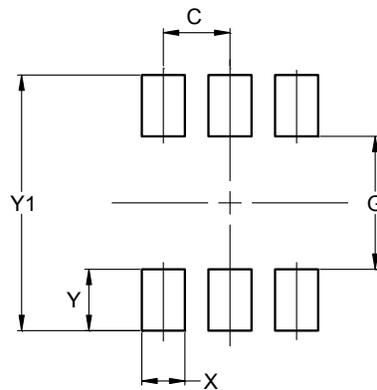
SOT363



SOT363			
Dim	Min	Max	Typ
A1	0.00	0.10	0.05
A2	0.90	1.00	0.95
b	0.10	0.30	0.25
c	0.10	0.22	0.11
D	1.80	2.20	2.15
E	2.00	2.20	2.10
E1	1.15	1.35	1.30
e	0.650 BSC		
F	0.40	0.45	0.425
L	0.25	0.40	0.30
a	0°	8°	--
All Dimensions in mm			

## Suggested Pad Layout

SOT363



Dimensions	Value (in mm)
C	0.650
G	1.300
X	0.420
Y	0.600
Y1	2.500