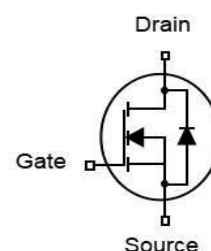


## Features

- N-Channel
- Low gate Charge (typical 12.5nC)
- Low Crss (typical 3.9pF)
- Fast switching capability
- Improved dv/dt capability
- 100% EAS Tested

$V_{DS}$	500	V
$R_{DS(on),TYP}@ V_{GS}=10V$	2.1	$\Omega$
$I_D$	5	A

### TO-252



Part ID	Package Type	Marking	Packing
ZT5N50D	TO-252	5N50	2500pcs/reel

### Absolute Maximum Ratings $T_A = 25^\circ\text{C}$ , unless otherwise specified

Symbol	Parameter	Rating	Unit	
<b>Common Ratings (<math>T_C = 25^\circ\text{C}</math> Unless Otherwise Noted)</b>				
$V_{GS}$	Gate-Source Voltage	$\pm 30$	V	
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	500	V	
$T_J$	Maximum Junction Temperature	150	$^\circ\text{C}$	
$T_{STG}$	Storage Temperature Range	-55 to 150	$^\circ\text{C}$	
$I_{DM}$	Drain Current-Continuous@ Current-Pulsed (Note 2)	$T_C = 25^\circ\text{C}$ 20	A	
<b>Mounted on Large Heat Sink</b>				
$I_D$	Drain Current-Continuous (Note 1)	$T_C = 25^\circ\text{C}$	5	A
		$T_C = 100^\circ\text{C}$	2.5	A
$P_D$	Maximum Power Dissipation	28	W	
$I_S$	Continuous Diode Forward Current	5	A	
$R_{\theta JC}$	Thermal Resistance-Junction to Case	11	$^\circ\text{C/W}$	
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	77	$^\circ\text{C/W}$	
<b>Drain-Source Avalanche Ratings</b>				
EAS	Avalanche Energy, Single Pulsed (Note 3)	125	mJ	
dv/dt	Reverse Diode dv/dt (Note 4)	5	V/ns	

**Electrical Characteristics (T<sub>J</sub>=25°C unless otherwise noted)**

Symbol	Parameter	Condition	Min	Typ	Max	Unit
<b>Static Electrical Characteristics @ T<sub>J</sub>=25°C (unless otherwise stated)</b>						
V <sub>(BR)DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA	500	--	--	V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =500V, V <sub>GS</sub> =0V	--	--	1	μA
I <sub>GSS</sub>	Gate-Body Leakage Current	V <sub>GS</sub> =±30V, V <sub>DS</sub> =0V	--	--	±100	nA
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	2.0	--	4.0	V
R <sub>DS(on)</sub>	Drain-Source On-State Resistance	V <sub>GS</sub> =10V, I <sub>D</sub> =2.5A	--	2.1	2.5	Ω
<b>Dynamic Electrical Characteristics @ T<sub>J</sub> = 25°C (unless otherwise stated)</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =25V, V <sub>GS</sub> =0V, f=1MHz	--	272	--	pF
C <sub>oss</sub>	Output Capacitance		--	35	--	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		--	3.8	--	pF
Q <sub>g</sub>	Total Gate Charge	V <sub>DD</sub> =400V, I <sub>D</sub> =5A, V <sub>GS</sub> =10V	--	12.4	--	nC
Q <sub>gs</sub>	Gate-Source Charge		--	3.4	--	nC
Q <sub>gd</sub>	Gate-Drain Charge		--	4.4	--	nC
V <sub>plateau</sub>	Gate plateau voltage		--	5	--	V
<b>Switching Characteristics (Note 2)</b>						
T <sub>d(on)</sub>	Turn-on Delay Time	V <sub>DD</sub> =250V, I <sub>D</sub> =5A, R <sub>G</sub> =10Ω, V <sub>GS</sub> =10V	--	7.6	--	ns
T <sub>r</sub>	Turn-on Rise Time		--	5.4	--	ns
T <sub>d(off)</sub>	Turn-Off Delay Time		--	32	--	ns
T <sub>f</sub>	Turn-Off Fall Time		--	16	--	ns
<b>Source- Drain Diode Characteristics @ T<sub>J</sub> = 25°C (unless otherwise stated)</b>						
V <sub>SD</sub>	Forward on voltage	I <sub>S</sub> =5A, V <sub>GS</sub> =0V	--	--	1.2	V
T <sub>rr</sub>	Reverse Recovery Time	T <sub>J</sub> =25°C, I <sub>F</sub> =5A, V <sub>R</sub> =400V di/dt=100A/μs	--	447	--	ns
Q <sub>rr</sub>	Reverse Recovery Charge		--	1.8	--	μC

**Notes:**

- Limited by maximum junction temperature.
- Repetitive Rating: Pulse width limited by maximum junction temperature.
- L=10mH, I<sub>D</sub>=5A, R<sub>G</sub>=25Ω, V<sub>DD</sub>=100V, Start T<sub>J</sub>=25°C.
- I<sub>SD</sub> ≤5A, di/dt ≤100A/μs, V<sub>DD</sub> ≤BV<sub>DSS</sub>, Start T<sub>J</sub>=25°C.

Typical Characteristics  $T_J = 25^\circ\text{C}$ , unless otherwise noted

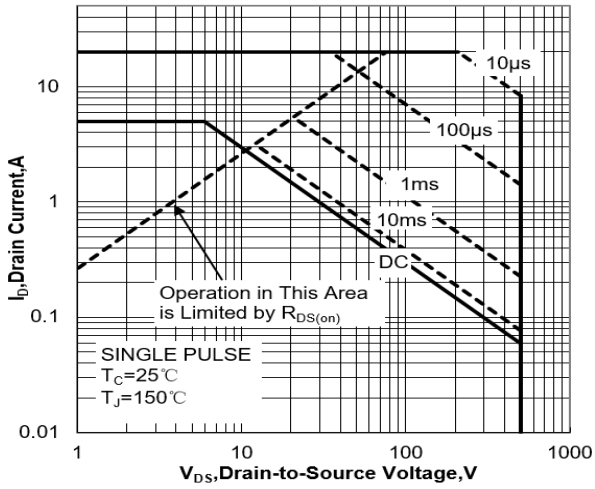


Figure 1. Safe Operation Area

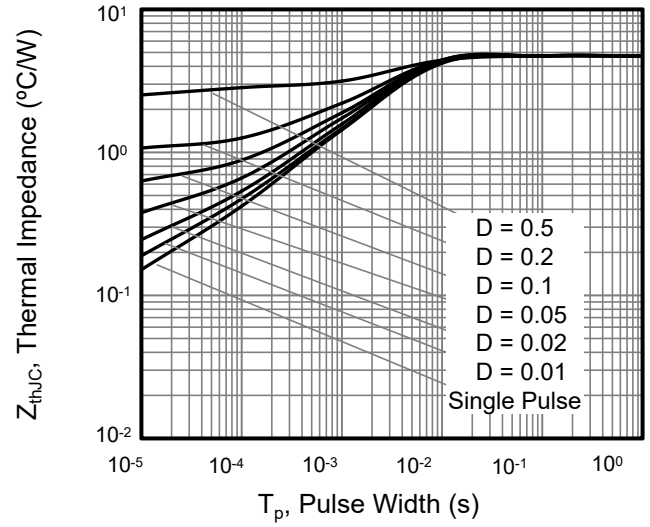


Figure 4. Transient Thermal Impedance

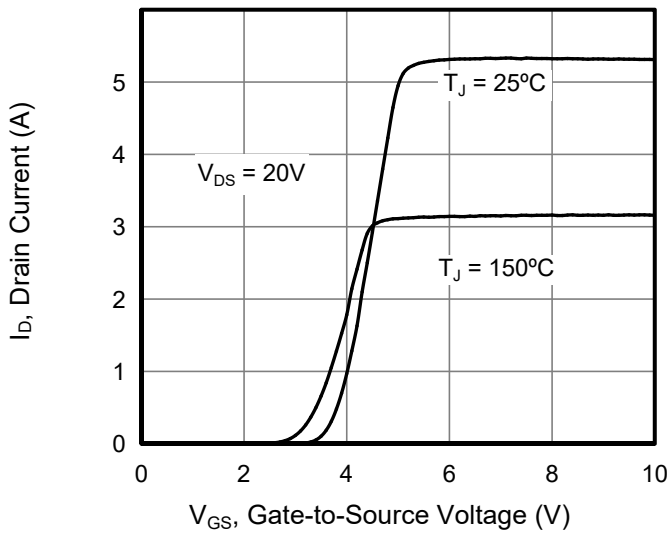


Figure 2. Transfer Characteristics

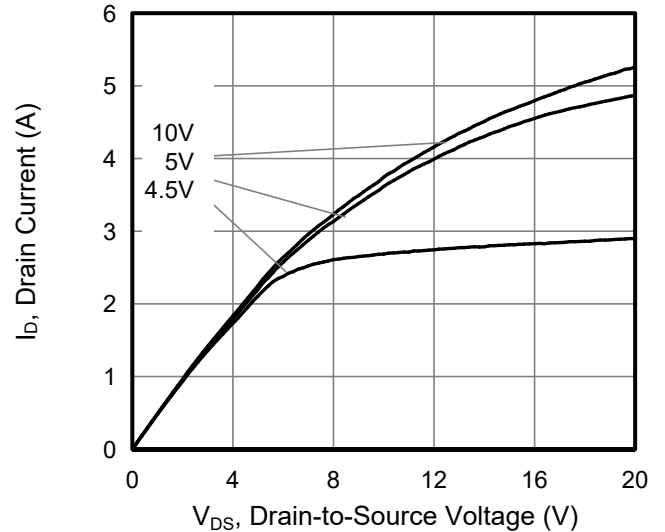


Figure 5. Output Characteristics

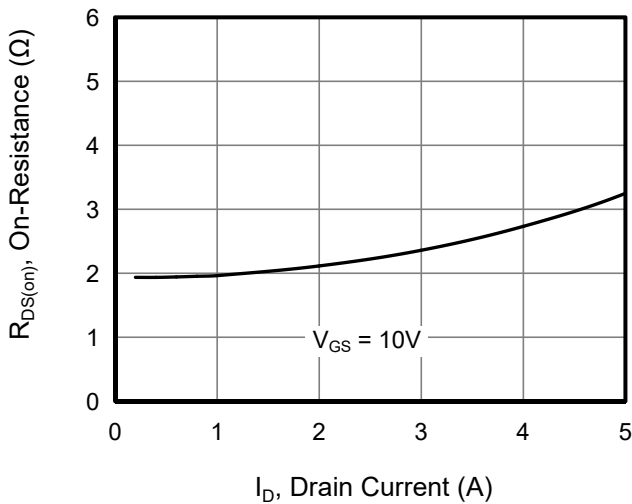


Figure 3. On-Resistance vs Drain Current

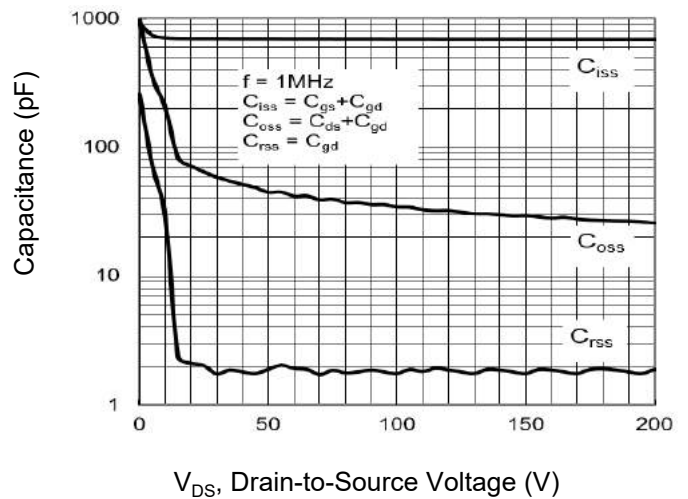


Figure 6. Capacitance

Typical Characteristics  $T_J = 25^\circ\text{C}$ , unless otherwise noted

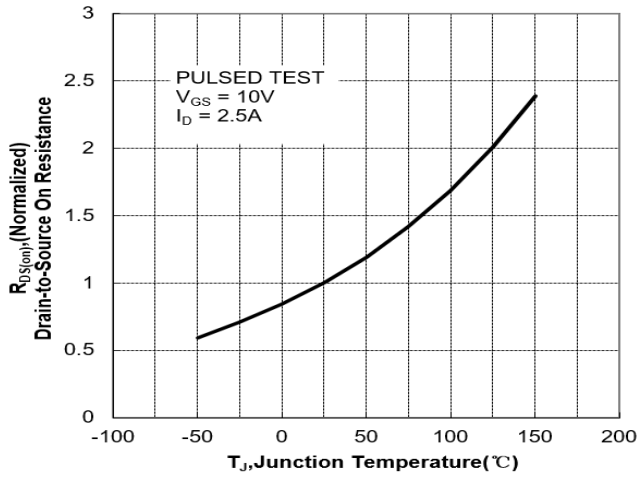


Figure 7 Typical Drain to Source on Resistance vs Junction Temperature

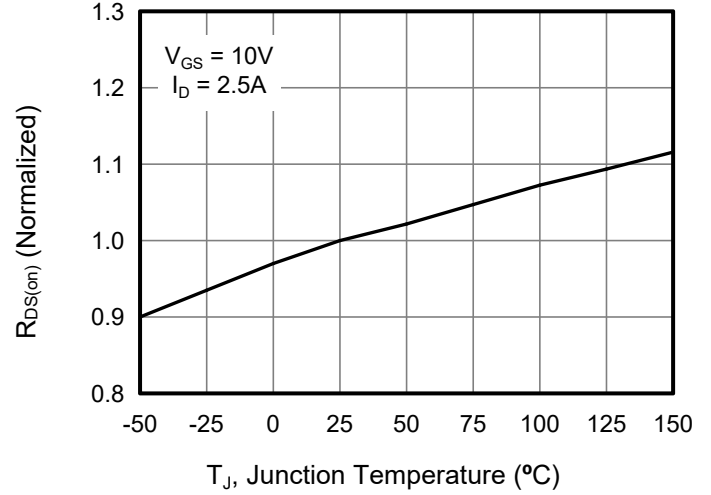


Figure 9. On-Resistance vs Temperature

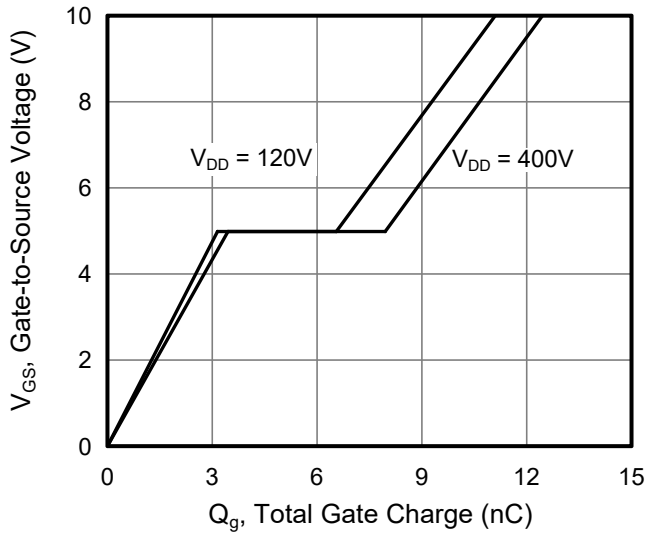


Figure 8. Gate Charge

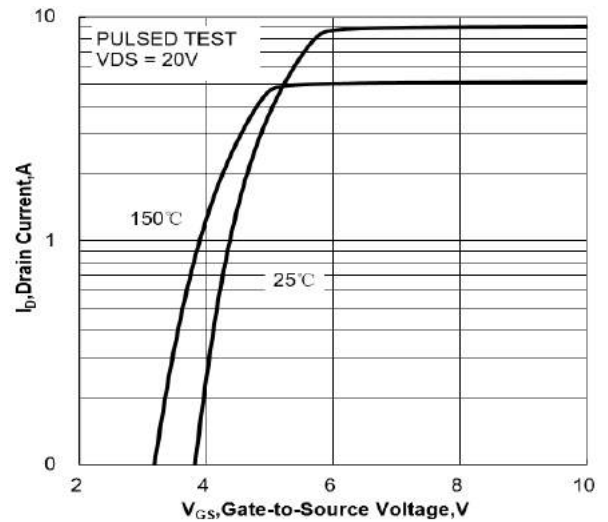
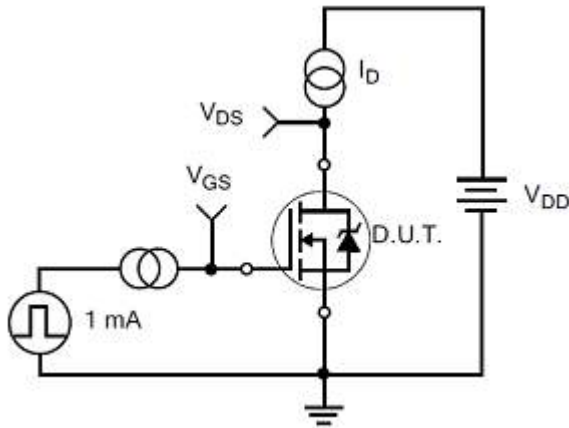
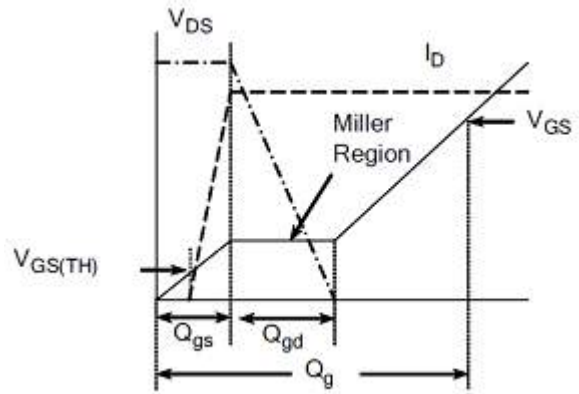


Figure 10. Typical Transfer Characteristics

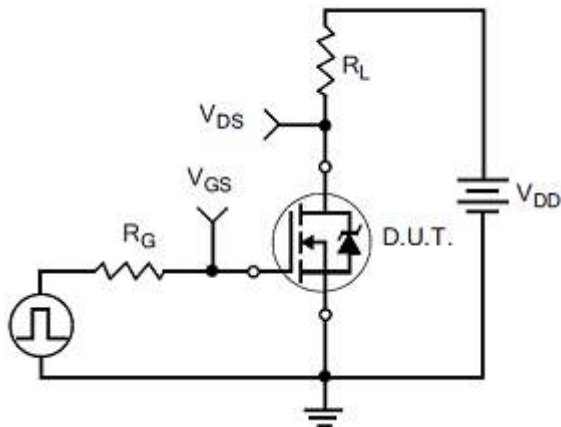
## Test Circuit and Waveform



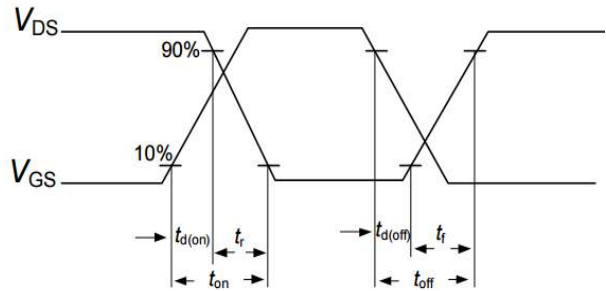
Gate Charge Test Circuit



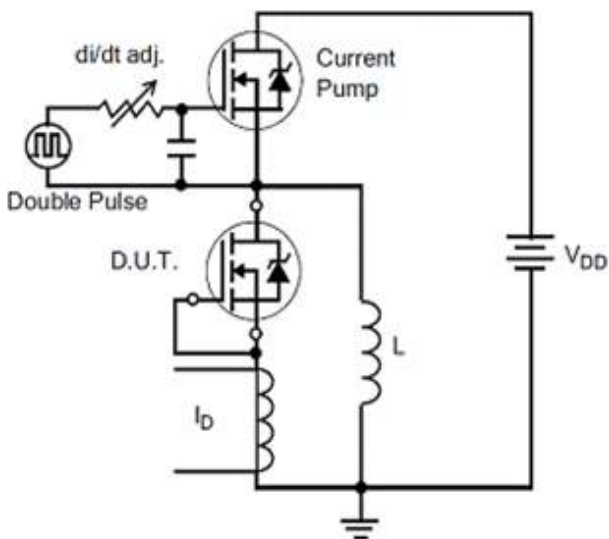
Gate Charge Waveforms



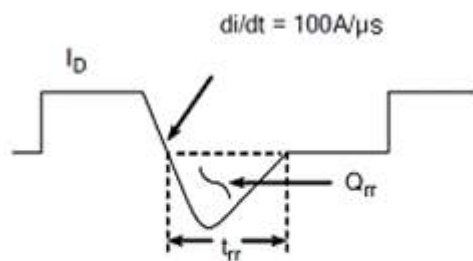
Resistive Switching Test Circuit



Resistive Switching Waveforms

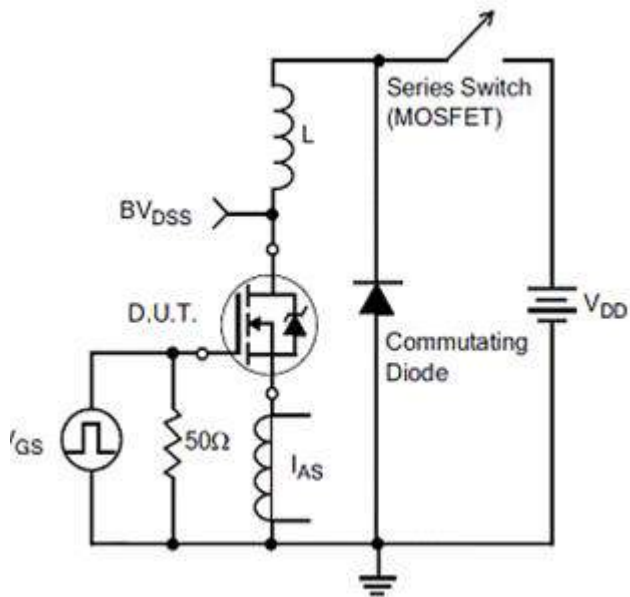


Diode Reverse Recovery Test Circuit

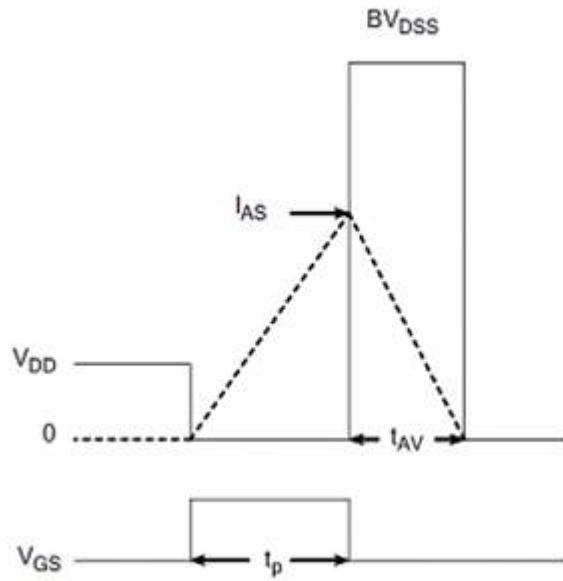


Diode Reverse Recovery Waveform

## Test Circuit and Waveform

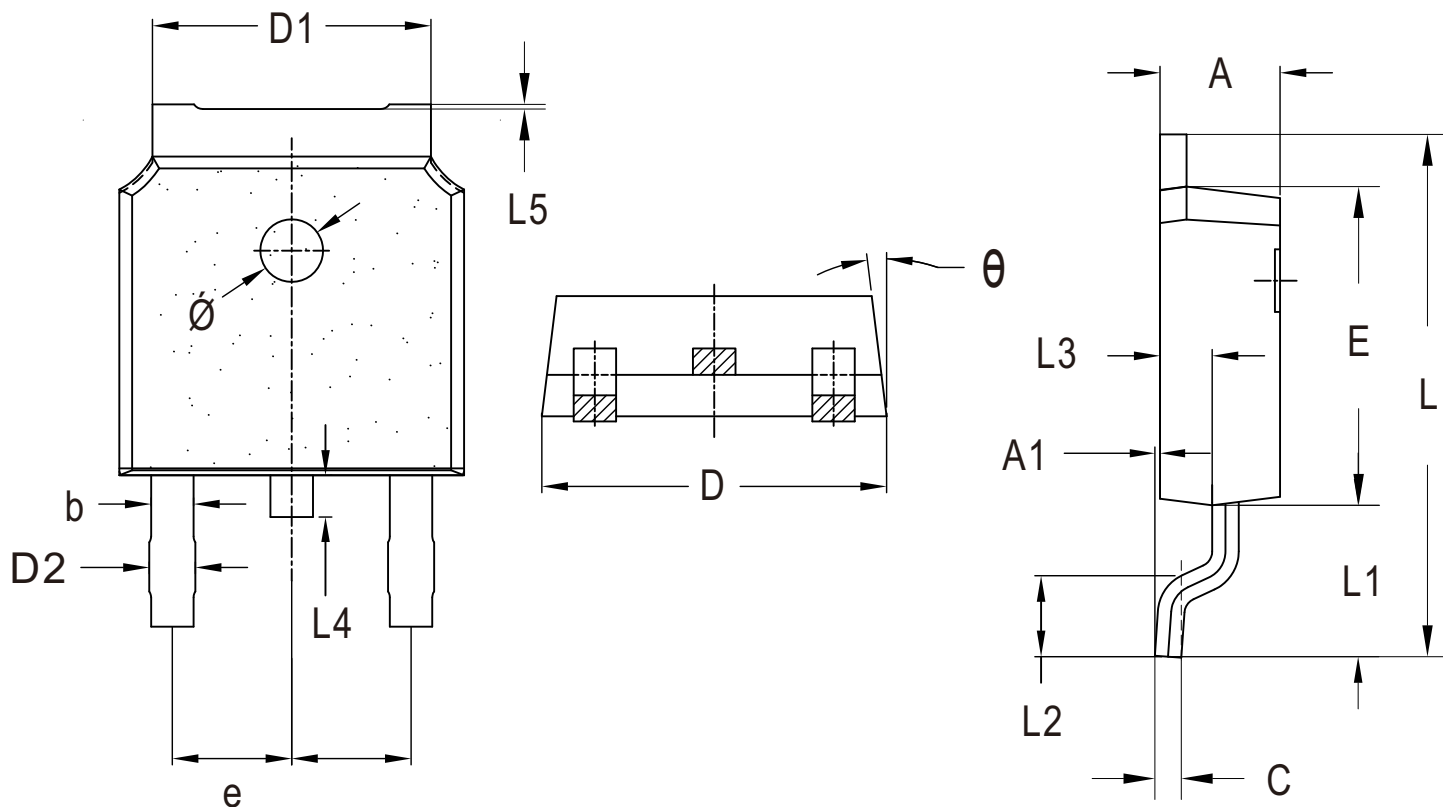


Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveform

## TO-252 Package Information



Symbol	Millimeters		Symbol	Millimeters	
	Min.	Max.		Min.	Max.
A	2.20	2.40	L	9.80	10.40
A1	0.00	0.13	L1	2.80	3.00
b	0.60	0.86	L2	1.40	1.70
C	0.48	0.52	L3	0.95	1.05
D	6.50	6.70	L4	0.70	0.90
D1	5.10	5.46	L5	0.095	0.105
E	6.00	6.30	$\varnothing$	1.10	1.30
e	2.19	2.39	$\theta$	0.0°	7.0°

## Customer Service

Sales and Service:

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