




100V N-Channel SGT MOSFET

<p>General Description</p> <ul style="list-style-type: none"> ● Trench Power SGT technology ● Very low on-resistance $R_{DS(ON)}$ ● Low Gate Charge ● Excellent Gate Charge x $R_{DS(ON)}$ Product <p>Applications</p> <ul style="list-style-type: none"> ● High Frequency Switching and Synchronous Rectification 	<p>Product Summary</p> <table border="0"> <tr> <td>V_{DS}</td> <td>100V</td> </tr> <tr> <td>I_D (at $V_{GS}=10V$)</td> <td>55A</td> </tr> <tr> <td>$R_{DS(ON)}$ (at $V_{GS}=10V$)</td> <td>< 12mΩ</td> </tr> <tr> <td>$R_{DS(ON)}$ (at $V_{GS}=4.5V$)</td> <td>< 15mΩ</td> </tr> </table> <p>100% UIS Tested 100% DVDS Tested</p> 	V_{DS}	100V	I_D (at $V_{GS}=10V$)	55A	$R_{DS(ON)}$ (at $V_{GS}=10V$)	< 12m Ω	$R_{DS(ON)}$ (at $V_{GS}=4.5V$)	< 15m Ω
V_{DS}	100V								
I_D (at $V_{GS}=10V$)	55A								
$R_{DS(ON)}$ (at $V_{GS}=10V$)	< 12m Ω								
$R_{DS(ON)}$ (at $V_{GS}=4.5V$)	< 15m Ω								



Part Number	Package Type	Form	Marking
TSD120N10AT	TO-252	Tape&Reel	TSD120N10AT
TSP120N10AT	TO-220	Tube	TSP120N10AT
TSG120N10AT	DFN5x6	Tape&Reel	TSG120N10AT

Absolute Maximum Ratings ($T_A = 25^\circ C$ unless otherwise noted)

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	V_{DS}	100	V
Gate-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current ^B	I_D	$T_C = 25^\circ C$	55
		$T_C = 100^\circ C$	39
Pulsed Drain Current ^A	I_{DM}	220	A
Avalanche Current ^A	I_{AS}	20	A
Single Pulse Avalanche Energy $L = 0.3mH$ ^A	E_{AS}	60	mJ
Power Dissipation ^C	P_D	$T_C = 25^\circ C$	83.3
		$T_C = 100^\circ C$	41.7
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 175	$^\circ C$

Thermal Characteristics

Parameter	Symbol	Maximum	Units
Maximum Junction-to-Case	$R_{\theta JC}$	1.8	$^\circ C/W$
Maximum Junction-to-Ambient			
	$R_{\theta JA}$	50	



Electrical Characteristics($T_J = 25^\circ\text{C}$ unless otherwise noted)						
Symbol	Parameter	Conditions	Value			Units
			Min	Typ	Max	
STATIC PARAMETERS						
BV_{DSS}	Drain-Source Breakdown Voltage	$I_D = 250\mu\text{A}, V_{GS} = 0\text{V}$	100			V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 100\text{V}, V_{GS} = 0\text{V}$	$T_J = 25^\circ\text{C}$		1	μA
			$T_J = 125^\circ\text{C}$		100	
I_{GSS}	Gate-Body Leakage Current	$V_{DS} = 0\text{V}, V_{GS} = \pm 20\text{V}$			± 100	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$	1.1	1.6	2.4	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = 10\text{V}, I_D = 30\text{A}$		10	12	$\text{m}\Omega$
		$V_{GS} = 4.5\text{V}, I_D = 30\text{A}$		12	15	$\text{m}\Omega$
g_{FS}	Forward Transconductance	$V_{DS} = 5\text{V}, I_D = 20\text{A}$		32		S
V_{SD}	Diode Forward Voltage	$I_S = 30\text{A}, V_{GS} = 0\text{V}$			1	V
I_S	Maximum Body-Diode Continuous Current ^B				55	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	$V_{GS} = 0\text{V}, V_{DS} = 50\text{V}, f = 1\text{MHz}$		1766		pF
C_{oss}	Output Capacitance			201		
C_{rss}	Reverse Transfer Capacitance			4.1		
R_g	Gate Resistance	$f = 1\text{MHz}$		2.3		Ω
SWITCHING PARAMETERS						
$Q_g(10\text{V})$	Total Gate Charge	$V_{GS} = 10\text{V}, V_{DS} = 50\text{V}, I_D = 20\text{A}$		25.7		nC
$Q_g(4.5\text{V})$	Gate Source Charge			13		
Q_{gs}	Gate Source Charge			4.3		
Q_{gd}	Gate Drain Charge			5.3		
Q_{oss}	Output Charge	$V_{GS} = 0\text{V}, V_{DS} = 50\text{V}$		34.2		
$t_{D(on)}$	Turn-On Delay Time	$V_{GS} = 10\text{V}, V_{DS} = 50\text{V}, I_D = 20\text{A}, R_G = 1.8\Omega$		33		ns
t_r	Turn-On Rise Time			4		
$t_{D(off)}$	Turn-Off Delay Time			55		
t_f	Turn-Off Fall Time			3.1		
t_{rr}	Body Diode Reverse Recovery Time	$I_F = 20\text{A}, di/dt = 100\text{A}/\mu\text{s}$		49		ns
Q_{rr}	Body Diode Reverse Recovery Charge			71		nC

A. Single pulse width limited by maximum junction temperature.

B. The maximum current rating is package limited.

C. The power dissipation P_D is based on $T_{J(MAX)} = 175^\circ\text{C}$, using junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heatsinking is used.



TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

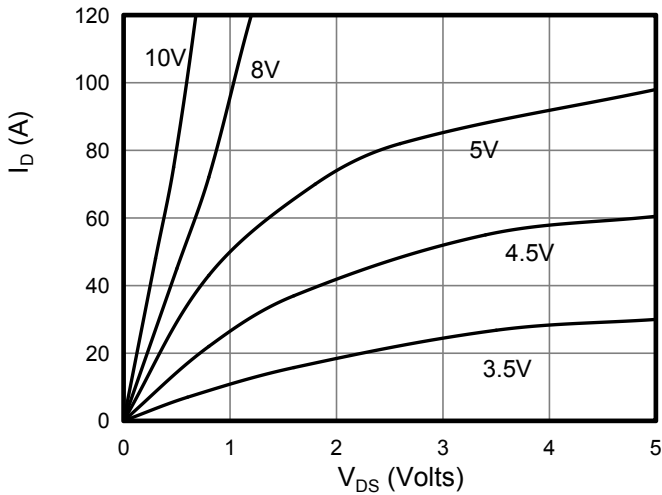


Figure 1: On-Region Characteristics

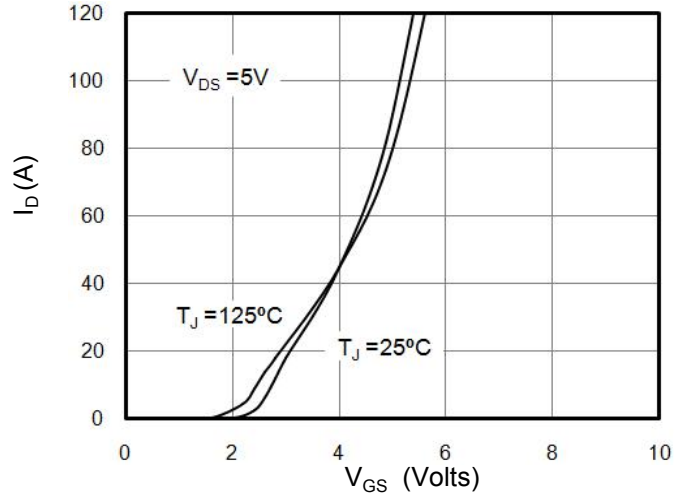


Figure 2: Transfer Characteristics

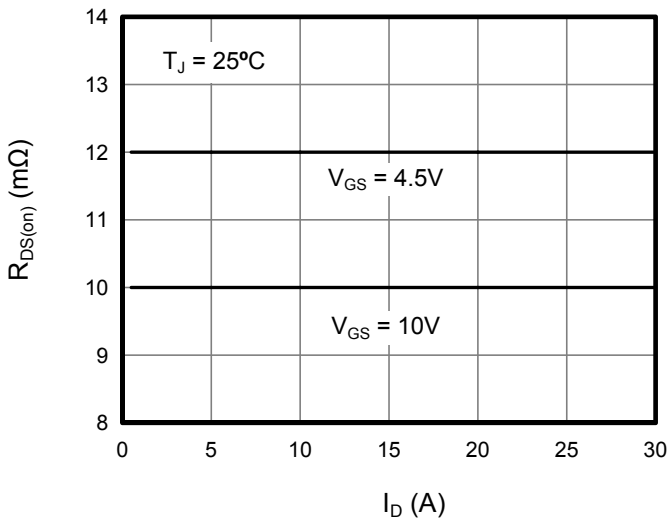


Figure 3: On-Resistance vs. Drain Current

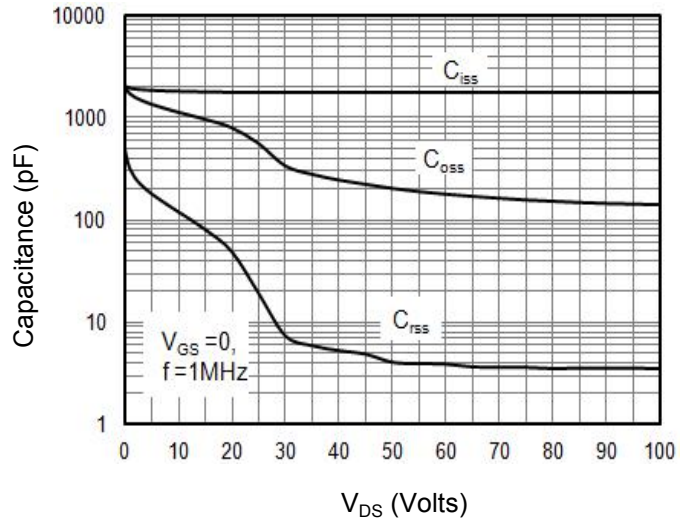


Figure 4: Capacitance Characteristics

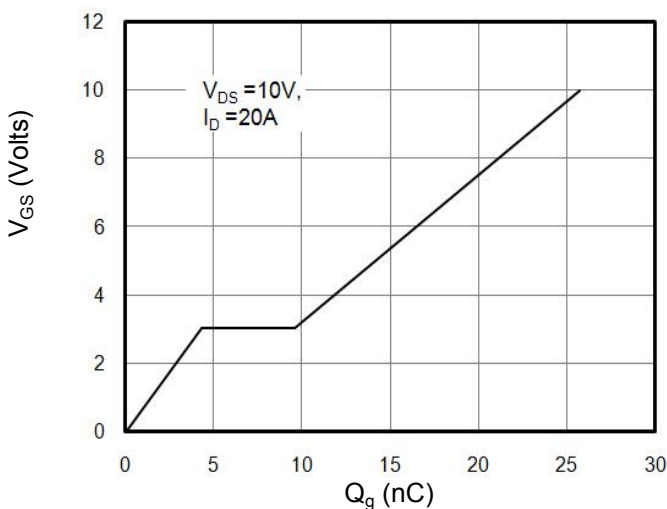


Figure 5: Gate Charge Characteristics

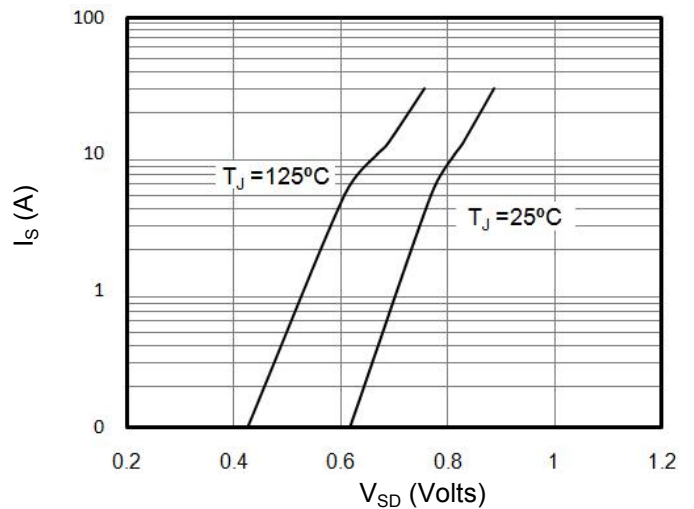


Figure 6: Body Diode Forward Voltage



TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

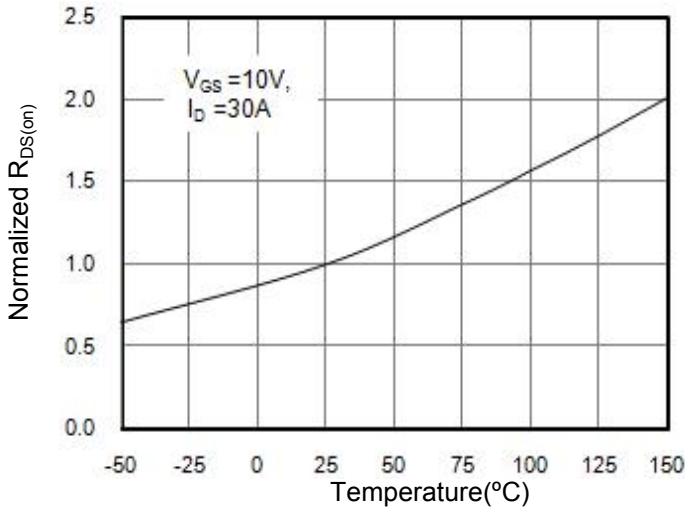


Figure 7: On-Resistance vs. Junction Temperature

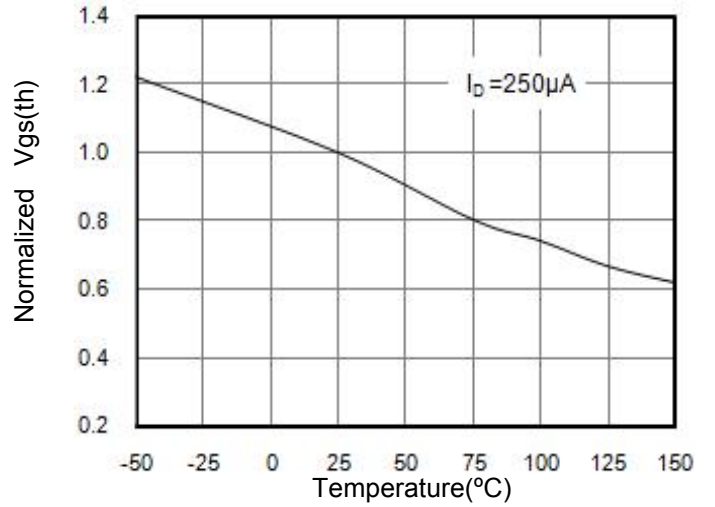


Figure 8: $V_{GS(th)}$ vs. Junction Temperature

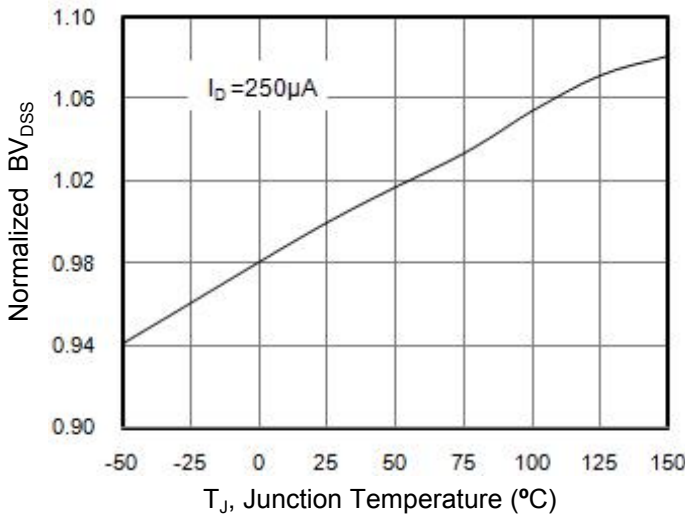


Figure 9: BV_{DS} vs. Junction Temperature

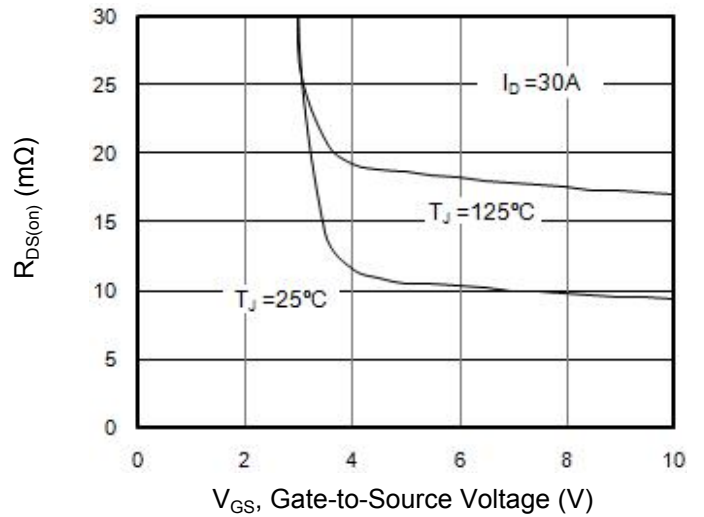


Figure 10: On-Resistance vs. Gate-Source Voltage

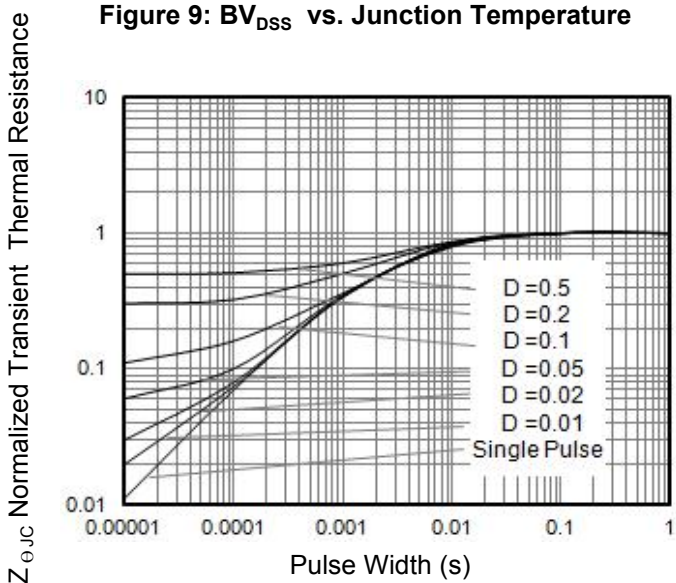


Figure 11: Normalized Transient Thermal Resistance

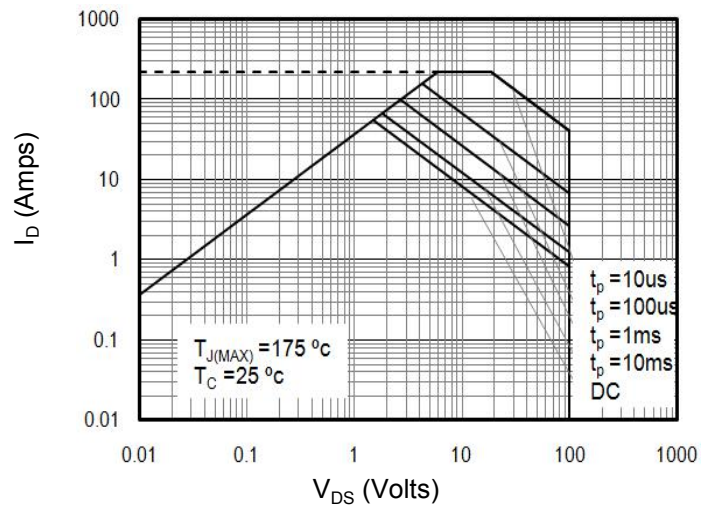


Figure 12: Safe Operating Area



Figure A: Gate Charge Test Circuit and Waveforms

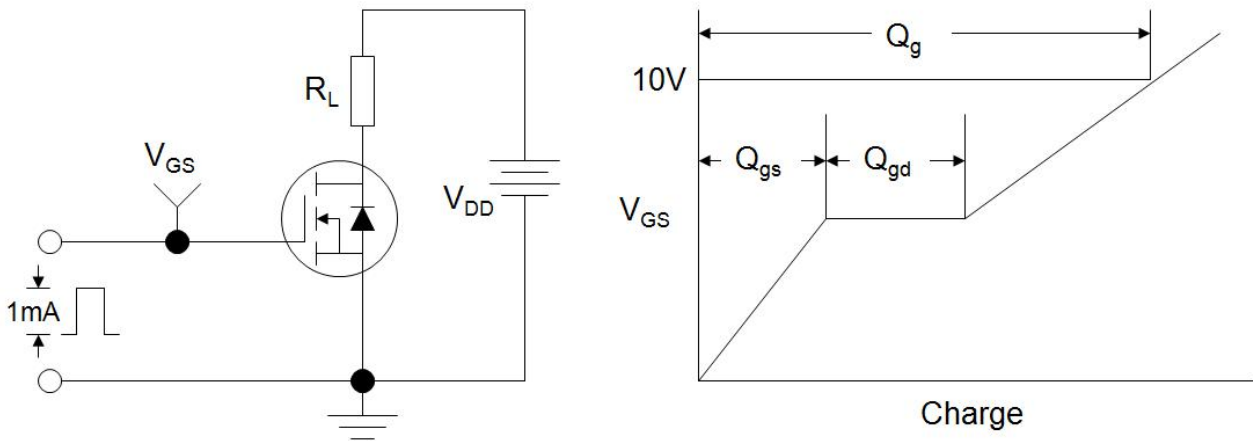


Figure B: Resistive Switching Test Circuit and Waveforms

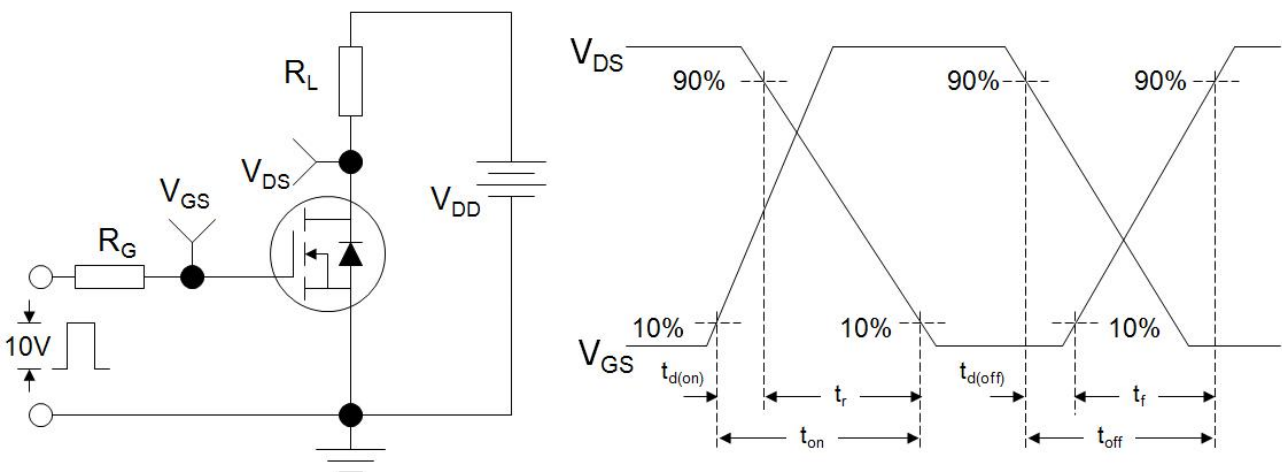
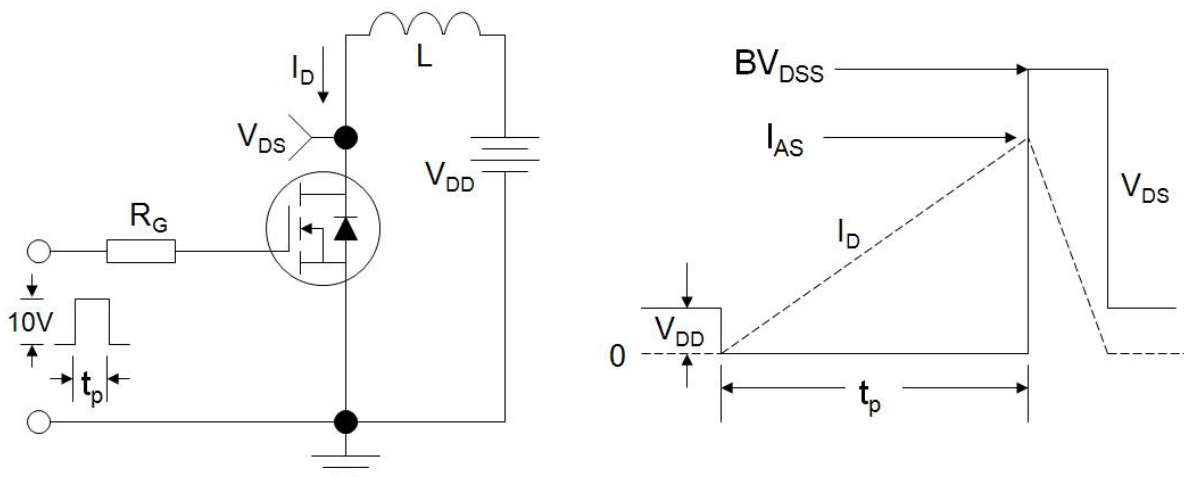
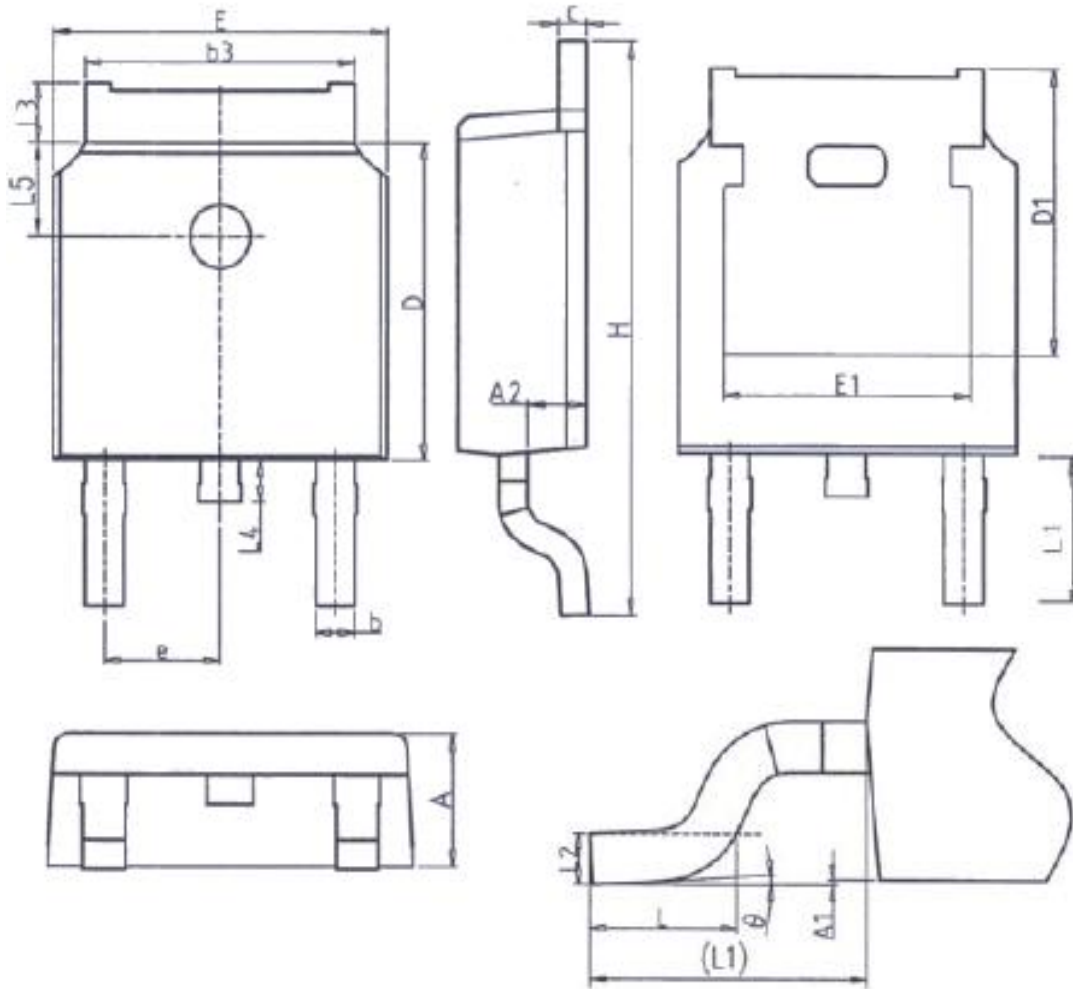


Figure C: Unclamped Inductive Switching (UIS) Test Circuit and Waveforms





TO-252

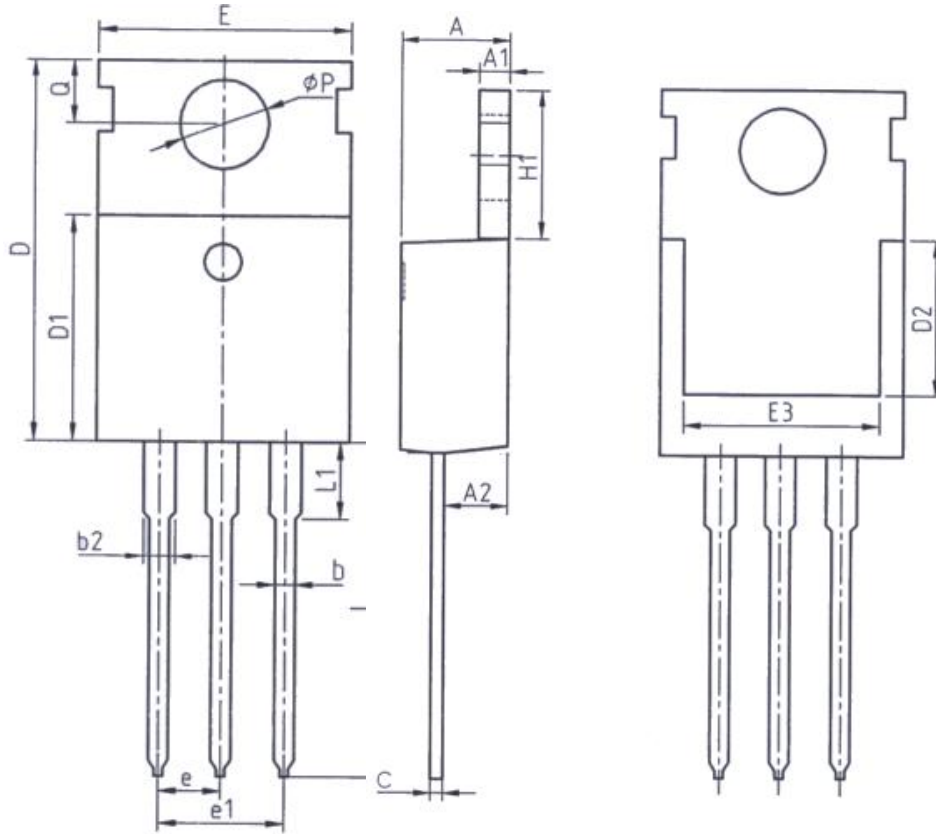


Unit: mm			
Symbol	Min	Nom	Max
A	2.20	2.30	2.38
A1	0.00	-	0.10
A2	0.90	1.01	1.10
b	0.72	-	0.85
b3	5.13	5.33	5.46
c	0.47	-	0.60
D	6.00	6.10	6.20
D1	5.25 REF		
E	6.50	6.60	6.70
E1	4.70	-	-

Unit: mm			
Symbol	Min	Nom	Max
e	2.286BSC		
H	9.80	10.10	10.40
L	1.40	1.50	1.70
L1	2.90REF		
L2	0.508BSC		
L3	0.90	-	1.25
L4	0.60	0.90	1.00
L5	1.8 REF		
theta	0°	-	8°



TO-220

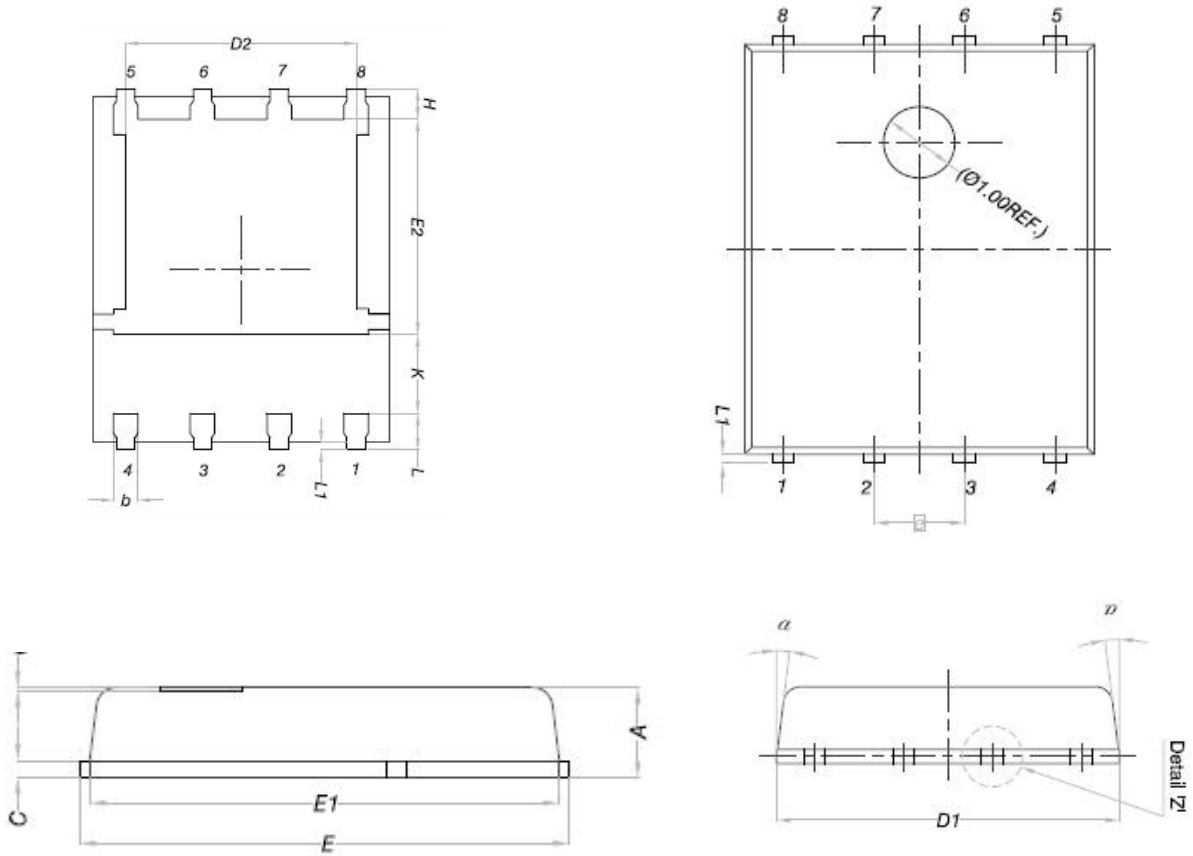


Unit: mm		
Symbol	Min.	Max.
A	4.37	4.77
A1	1.25	1.45
A2	2.20	2.60
b	0.70	0.95
b2	1.17	1.47
c	0.40	0.65
D	15.10	16.10
D1	8.80	9.40
D2	5.50	-

Unit: mm		
Symbol	Min.	Max.
E	9.70	10.30
E3	7.00	-
e	2.54BSC	
e1	5.08BSC	
H1	6.25	6.85
L	12.75	13.80
L1	-	3.40
P	3.40	3.80
Q	2.60	3.00



DFN5x6



DIM.	MILLIMETERS			DIM.	MILLIMETERS		
	MIN.	NOM.	MAX.		MIN.	NOM.	MAX.
A	0.90	1.00	1.10	E	5.90	6.00	6.10
A1	0	-	0.05	E1	5.70	5.75	5.80
b	0.33	0.41	0.51	E2	3.38	3.58	3.78
C	0.20	0.25	0.30	e	1.27 BSC		
D1	4.80	4.90	5.00	H	0.41	0.51	0.61
D2	3.61	3.81	3.96	K	1.10	-	-
				L	0.51	0.61	0.71
				L1	0.06	0.13	0.20
				α	0°	-	12°



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