
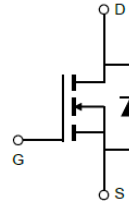
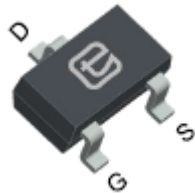


**20V N-Channel Trench MOSFET(Preliminary)**

<p>General Description</p> <ul style="list-style-type: none"> ● Trench Power technology ● Low $R_{DS(ON)}$ ● Low Gate Charge ● Optimized for fast-switching applications <p>Applications</p> <ul style="list-style-type: none"> ● Synchronous Rectification in DC/DC and AC/DC Converters ● Isolated DC/DC Converters in Telecom and Industrial 	<p>Product Summary</p> <table> <tr> <td>V_{DS}</td> <td>20V</td> </tr> <tr> <td>I_D (at $V_{GS}=10V$)</td> <td>3.7A</td> </tr> <tr> <td>$R_{DS(ON)}$ (at $V_{GS}=10V$)</td> <td>< 24mΩ</td> </tr> <tr> <td>$R_{DS(ON)}$ (at $V_{GS}=4.5V$)</td> <td>< 27mΩ</td> </tr> <tr> <td>$R_{DS(ON)}$ (at $V_{GS}=2.5V$)</td> <td>< 37mΩ</td> </tr> </table> <div style="text-align: right;">  </div>	V_{DS}	20V	I_D (at $V_{GS}=10V$)	3.7A	$R_{DS(ON)}$ (at $V_{GS}=10V$)	< 24m Ω	$R_{DS(ON)}$ (at $V_{GS}=4.5V$)	< 27m Ω	$R_{DS(ON)}$ (at $V_{GS}=2.5V$)	< 37m Ω
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SOT-23



Part Number	Package Type	Form	Marking
TTX2302A	SOT-23	Tape&Reel	2302A

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

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	V_{DS}	20	V
Gate-Source Voltage	V_{GS}	± 12	V
Continuous Drain Current ^B	I_D	$T_C = 25^\circ\text{C}$	3.7
		$T_C = 70^\circ\text{C}$	3.7
Pulsed Drain Current ^A	I_{DM}	9	A
Avalanche Current ^A	I_{AS}	6	A
Single Pulse Avalanche Energy $L = 0.3\text{mH}$ ^A	E_{AS}	5.4	mJ
Power Dissipation ^C	P_D	$T_C = 25^\circ\text{C}$	0.89
		$T_C = 70^\circ\text{C}$	0.57
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 150	$^\circ\text{C}$

Thermal Characteristics

Parameter	Symbol	Maximum	Units
Maximum Junction-to-Lead	$R_{\theta JL}$	120	$^\circ\text{C}/\text{W}$
Maximum Junction-to-Ambient			
	$R_{\theta JA}$	140	



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	$I_D = 250\mu\text{A}, V_{GS} = 0\text{V}$	20			V	
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 20\text{V}, V_{GS} = 0\text{V}$	$T_J = 25^\circ\text{C}$		1	μA	
			$T_J = 125^\circ\text{C}$		100		
I_{GSS}	Gate-Body Leakage Current	$V_{DS} = 0\text{V}, V_{GS} = \pm 12\text{V}$			± 100	nA	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$	0.45	0.7	0.95	V	
$R_{DS(on)}$	Static Drain-Source On-Resistance		$V_{GS} = 10\text{V}, I_D = 3\text{A}$		20	24	$\text{m}\Omega$
			$V_{GS} = 4.5\text{V}, I_D = 3\text{A}$		22	27	$\text{m}\Omega$
			$V_{GS} = 2.5\text{V}, I_D = 3\text{A}$		30	37	$\text{m}\Omega$
g_{FS}	Forward Transconductance	$V_{DS} = 5\text{V}, I_D = 6\text{A}$		13		S	
V_{SD}	Diode Forward Voltage	$I_S = 3\text{A}, V_{GS} = 0\text{V}$			1	V	
I_S	Maximum Body-Diode Continuous Current ^B				3.7	A	
DYNAMIC PARAMETERS							
C_{iss}	Input Capacitance	$V_{GS} = 0\text{V}, V_{DS} = 10\text{V}, f = 1\text{MHz}$		408		pF	
C_{oss}	Output Capacitance			60			
C_{rss}	Reverse Transfer Capacitance			53			
R_g	Gate Resistance	$f = 1\text{MHz}$		4		Ω	
SWITCHING PARAMETERS							
$Q_g(10\text{V})$	Total Gate Charge	$V_{GS} = 10\text{V}, V_{DS} = 10\text{V}, I_D = 3\text{A}$		10.5		nC	
$Q_g(4.5\text{V})$				5.1			
Q_{gs}			Gate Source Charge		1		
Q_{gd}			Gate Drain Charge		0.8		
$t_{D(on)}$	Turn-On Delay Time	$V_{GS} = 10\text{V}, V_{DS} = 10\text{V}, I_D = 3\text{A}, R_G = 2.5\Omega$		3.2		ns	
t_r	Turn-On Rise Time			2.4			
$t_{D(off)}$	Turn-Off Delay Time			17			
t_f	Turn-Off Fall Time			3.8			
t_{rr}	Body Diode Reverse Recovery Time	$I_F = 3\text{A}, di/dt = 100\text{A}/\mu\text{s}$		4.6		ns	
Q_{rr}	Body Diode Reverse Recovery Charge			1.8		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 $T_{J(MAX)} = 150^\circ\text{C}$, 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

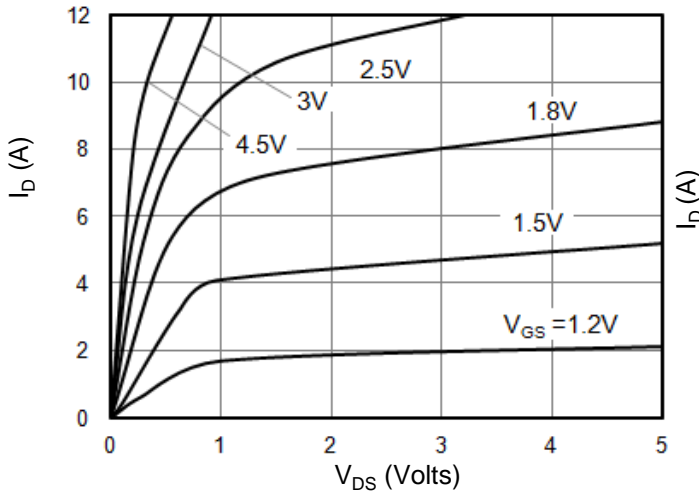


Figure 1: On-Region Characteristics

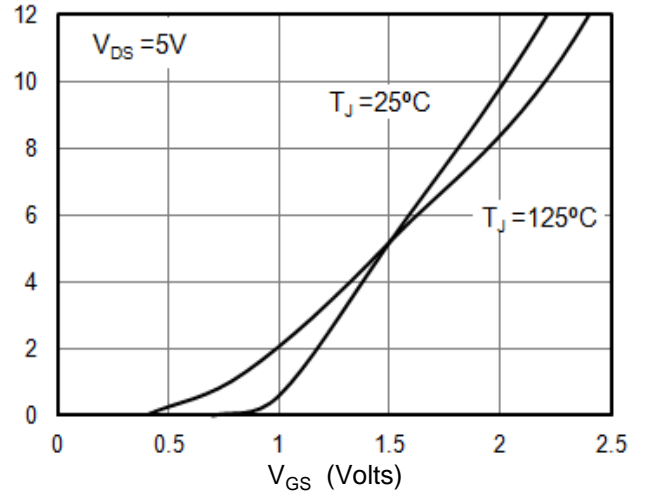


Figure 2: Transfer Characteristics

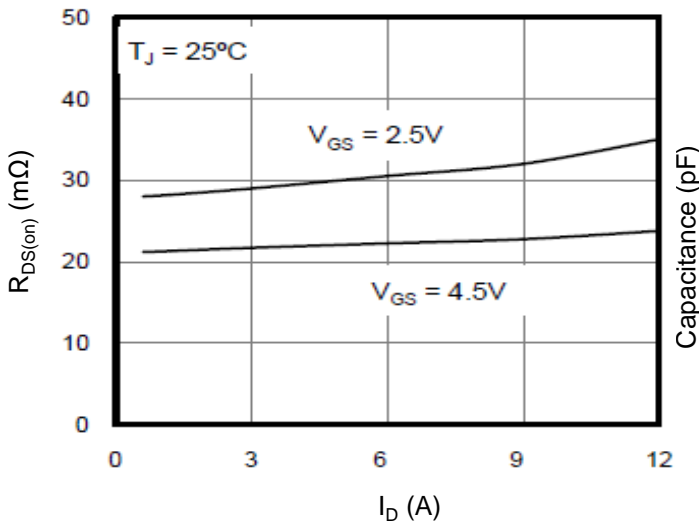


Figure 3: On-Resistance vs. Drain Current

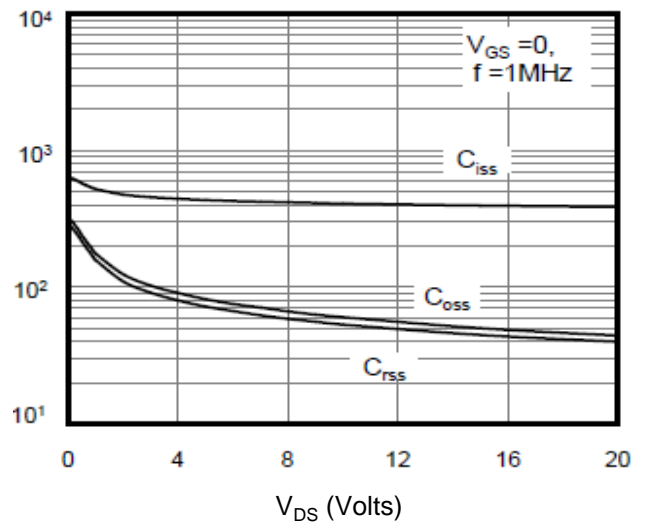


Figure 4: Capacitance Characteristics

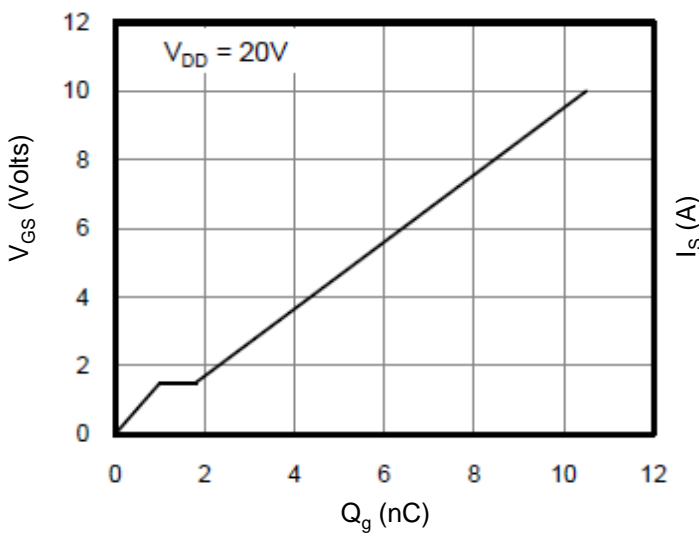


Figure 5: Gate Charge Characteristics

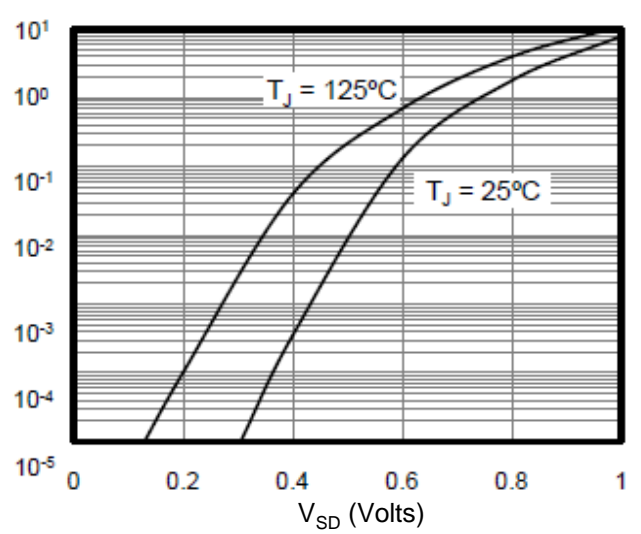


Figure 6: Body Diode Forward Voltage



TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

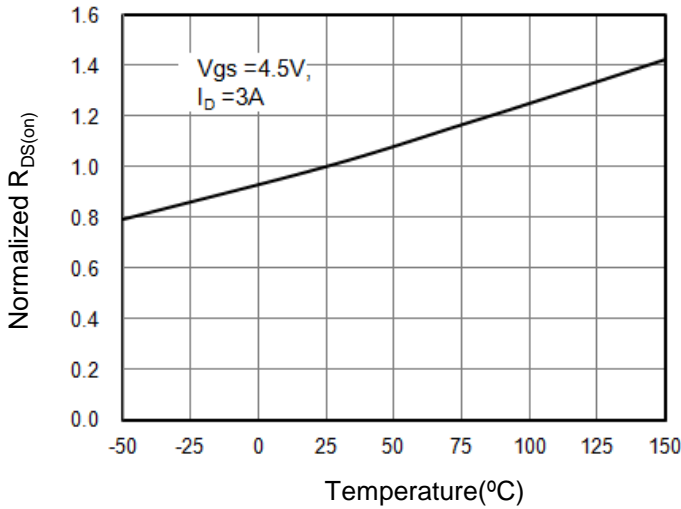


Figure 7: On-Resistance vs. Junction Temperature

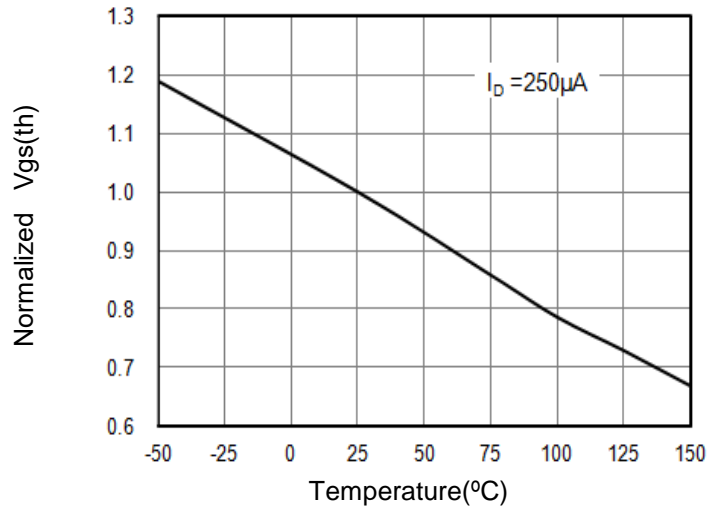


Figure 8: V_GS(th) vs. Junction Temperature

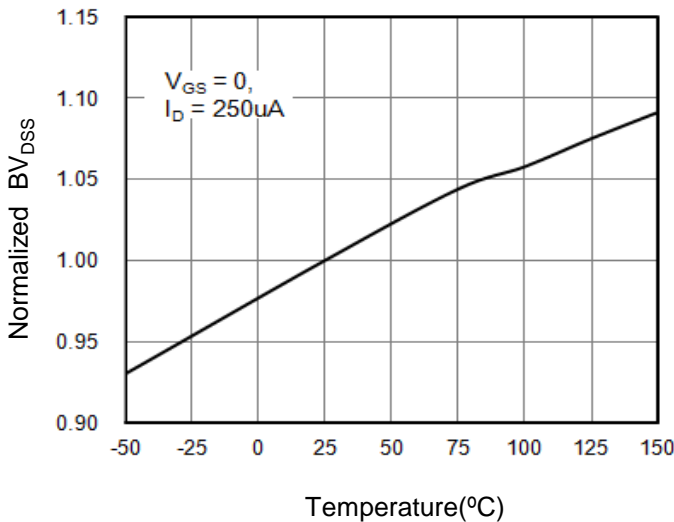


Figure 9: BV_DS vs. Junction Temperature

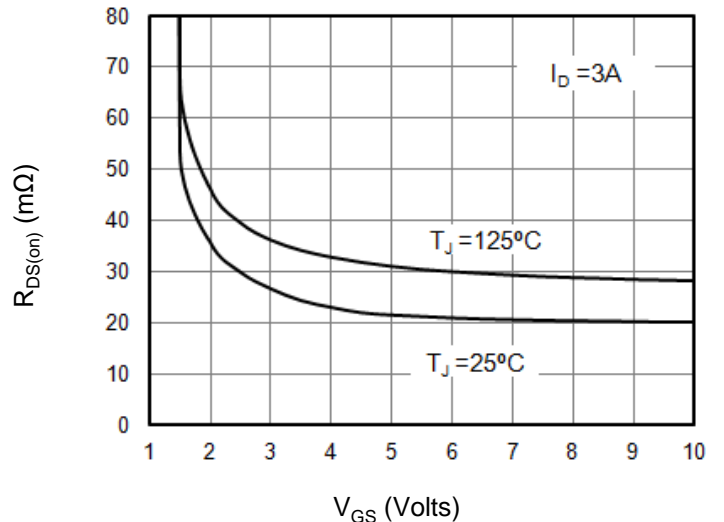


Figure 10: On-Resistance vs. Gate-Source Voltage

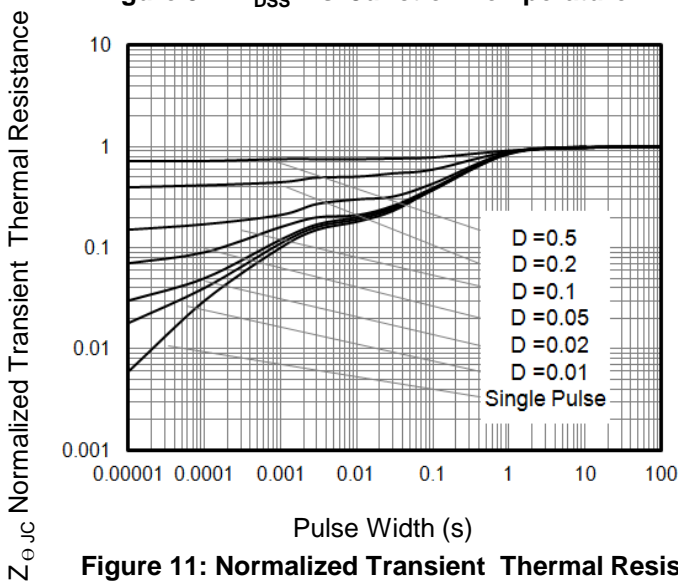


Figure 11: Normalized Transient Thermal Resistance

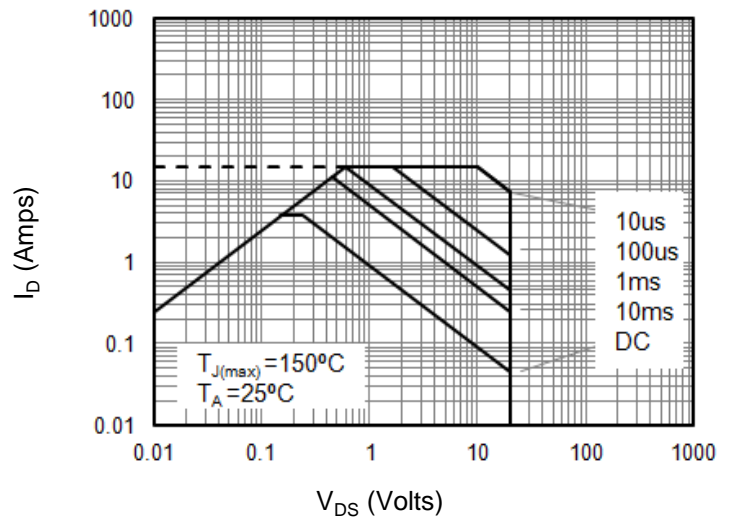


Figure 12: Safe Operating Area



Figure A: Gate Charge Test Circuit and Waveforms



Figure B: Resistive Switching Test Circuit and Waveforms

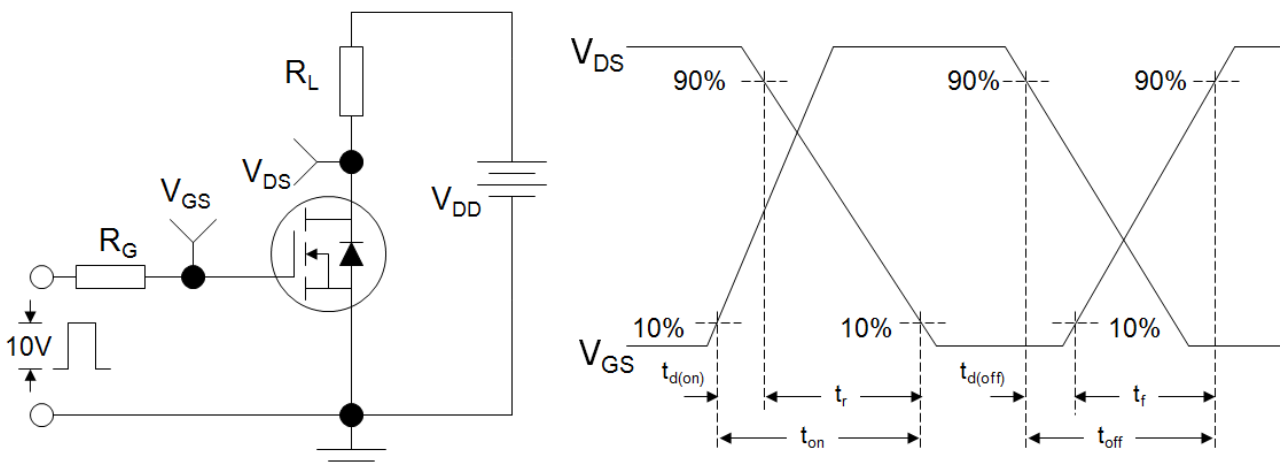
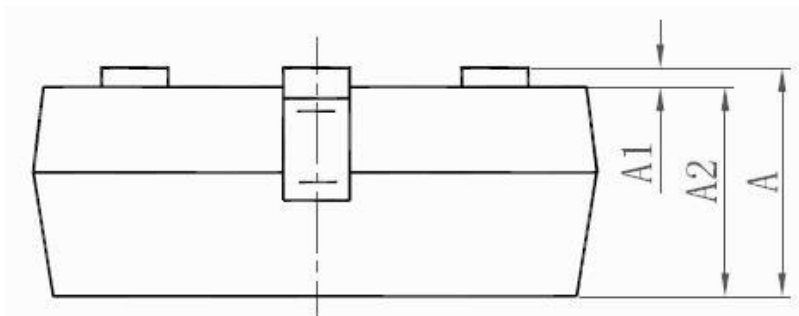
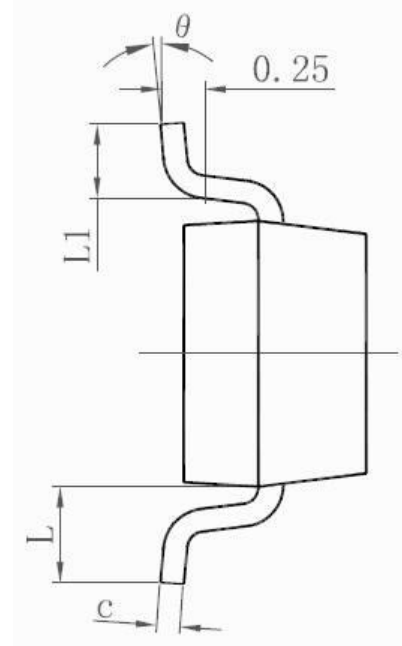
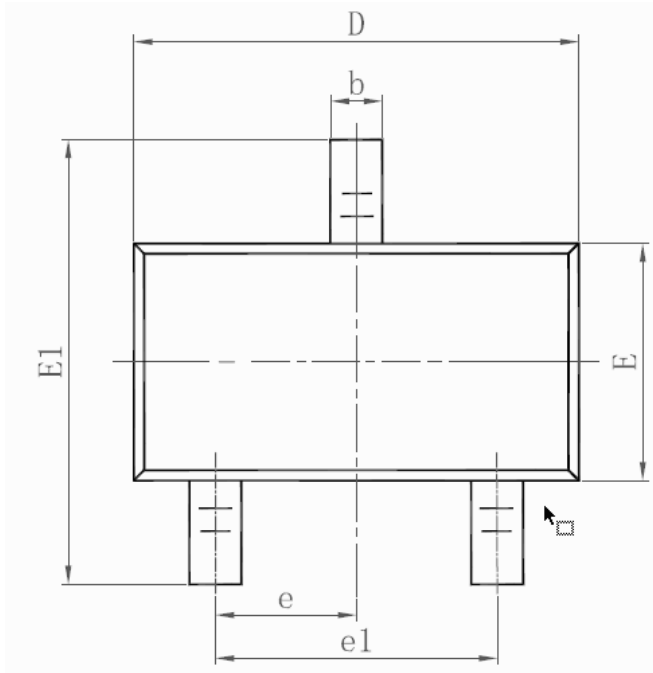


Figure C: Unclamped Inductive Switching (UIS) Test Circuit and Waveforms





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Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.900	1.150	0.035	0.045
A1	0.000	0.100	0.000	0.004
A2	0.900	1.050	0.035	0.041
b	0.300	0.500	0.012	0.020
c	0.080	0.150	0.003	0.006
D	2.800	3.000	0.110	0.118
E	1.200	1.400	0.047	0.055
E1	2.250	2.550	0.089	0.100
e	0.950 TYP.		0.037 TYP.	
e1	1.800	2.000	0.071	0.079
L	0.550 REF.		0.022 REF.	
L1	0.300	0.500	0.012	0.020
θ	0°	8°	0°	8°



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