
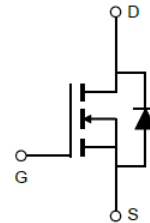
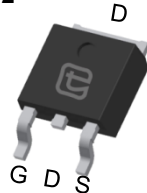


**40V N-Channel Trench MOSFET(Preliminary)**

<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>40V</td> </tr> <tr> <td>I_D (at $V_{GS}=10V$)</td> <td>20A</td> </tr> <tr> <td>$R_{DS(ON)}$ (at $V_{GS}=10V$)</td> <td><23mΩ</td> </tr> <tr> <td>$R_{DS(ON)}$ (at $V_{GS}=4.5V$)</td> <td><28mΩ</td> </tr> </table> <p>100% UIS Tested</p> 	V_{DS}	40V	I_D (at $V_{GS}=10V$)	20A	$R_{DS(ON)}$ (at $V_{GS}=10V$)	<23m Ω	$R_{DS(ON)}$ (at $V_{GS}=4.5V$)	<28m Ω
V_{DS}	40V								
I_D (at $V_{GS}=10V$)	20A								
$R_{DS(ON)}$ (at $V_{GS}=10V$)	<23m Ω								
$R_{DS(ON)}$ (at $V_{GS}=4.5V$)	<28m Ω								

TO-252



Part Number	Package Type	Form	Marking
TTD20N04AT	TO-252	Tape&Reel	TTD20N04AT

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

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	V_{DS}	40	V
Gate-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current ^B	I_D	$T_C = 25^\circ\text{C}$	20
		$T_C = 100^\circ\text{C}$	17
Pulsed Drain Current ^A	I_{DM}	60	A
Avalanche Current ^A	I_{AS}	13	A
Single Pulse Avalanche Energy $L = 0.3\text{mH}$ ^A	E_{AS}	25	mJ
Power Dissipation ^C	P_D	$T_C = 25^\circ\text{C}$	28.8
		$T_C = 100^\circ\text{C}$	14.4
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 175	$^\circ\text{C}$

Thermal Characteristics

Parameter	Symbol	Maximum	Units
Maximum Junction-to-Case	$R_{\theta JC}$	5.2	$^\circ\text{C}/\text{W}$
Maximum Junction-to-Ambient	$R_{\theta JA}$	100	



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	$I_D = 250\mu\text{A}, V_{GS} = 0\text{V}$	40			V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 40\text{V}, V_{GS} = 0\text{V}$	$T_J = 25^\circ\text{C}$		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	1.4	2	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = 10\text{V}, I_D = 20\text{A}$		18	23	$\text{m}\Omega$
		$V_{GS} = 4.5\text{V}, I_D = 16\text{A}$		21.5	28	$\text{m}\Omega$
g_{FS}	Forward Transconductance	$V_{DS} = 5\text{V}, I_D = 20\text{A}$		19		S
V_{SD}	Diode Forward Voltage	$I_S = 20\text{A}, V_{GS} = 0\text{V}$			1	V
I_S	Maximum Body-Diode Continuous Current ^B				20	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	$V_{GS} = 0\text{V}, V_{DS} = 20\text{V}, f = 1\text{MHz}$		659		pF
C_{oss}	Output Capacitance			70		
C_{rss}	Reverse Transfer Capacitance			62		
R_g	Gate Resistance	$f = 1\text{MHz}$		1.2		Ω
SWITCHING PARAMETERS						
$Q_g(10\text{V})$	Total Gate Charge	$V_{GS} = 10\text{V}, V_{DS} = 20\text{V}, I_D = 20\text{A}$		16.7		nC
$Q_g(4.5\text{V})$	Total Gate Charge			9		
Q_{gs}	Gate Source Charge			1.9		
Q_{gd}	Gate Drain Charge			4.5		
$t_{D(on)}$	Turn-On Delay Time	$V_{GS} = 10\text{V}, V_{DS} = 20\text{V}, I_D = 20\text{A}, R_G = 1.8\Omega$		31		ns
t_r	Turn-On Rise Time			3.6		
$T_{D(off)}$	Turn-Off Delay Time			46		
t_f	Turn-Off Fall Time			2.8		
t_{rr}	Body Diode Reverse Recovery Time	$I_F = 20\text{A}, di/dt = 100\text{A}/\mu\text{s}$		18.3		ns
Q_{rr}	Body Diode Reverse Recovery Charge			4		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

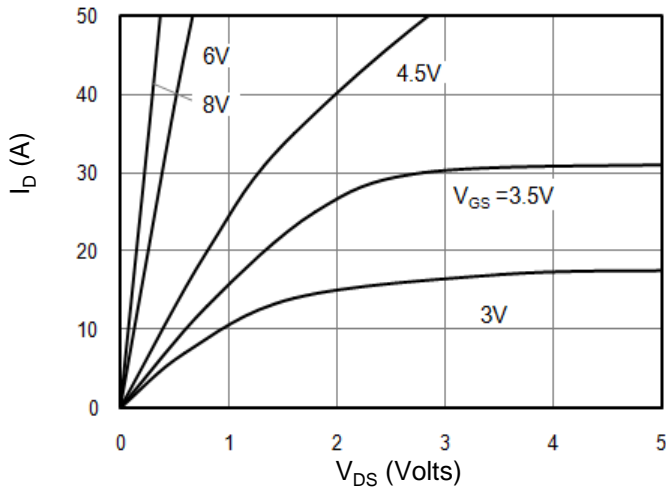


Figure 1: On-Region Characteristics

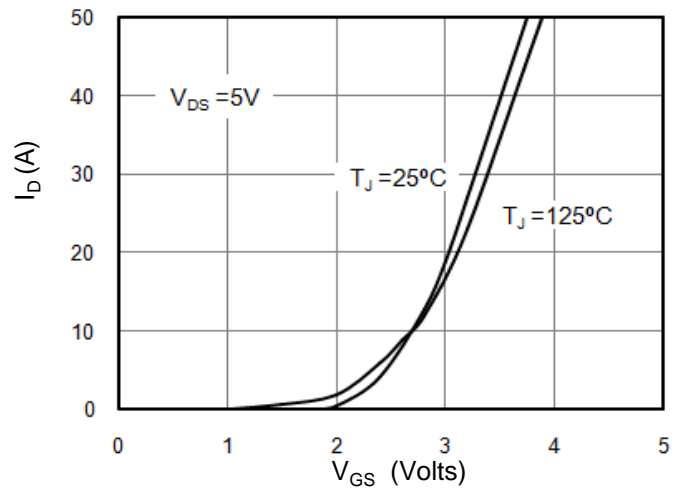


Figure 2: Transfer Characteristics

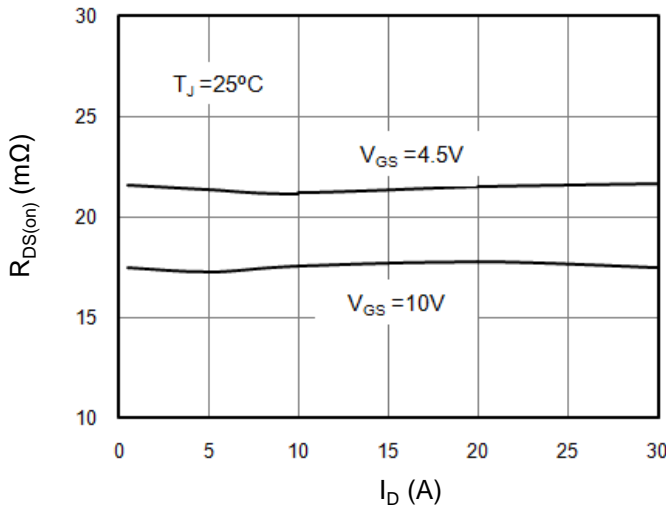


Figure 3: On-Resistance vs. Drain Current

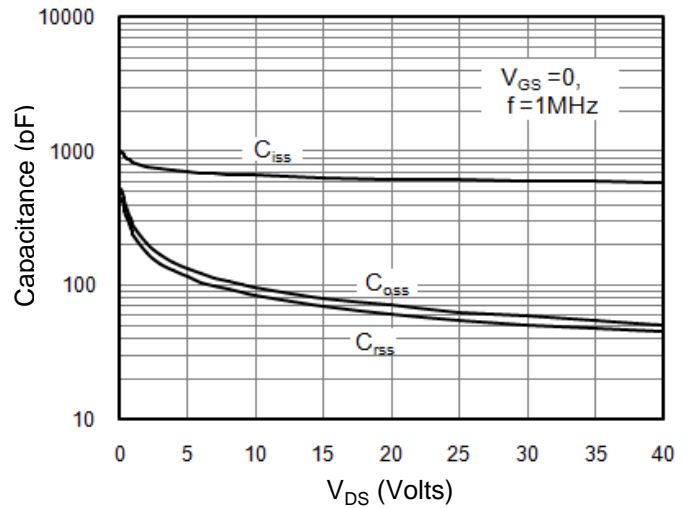


Figure 4: Capacitance Characteristics

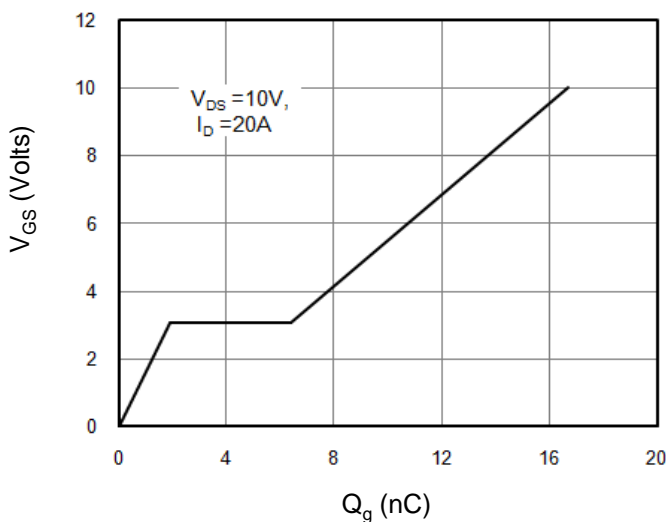


Figure 5: Gate Charge Characteristics

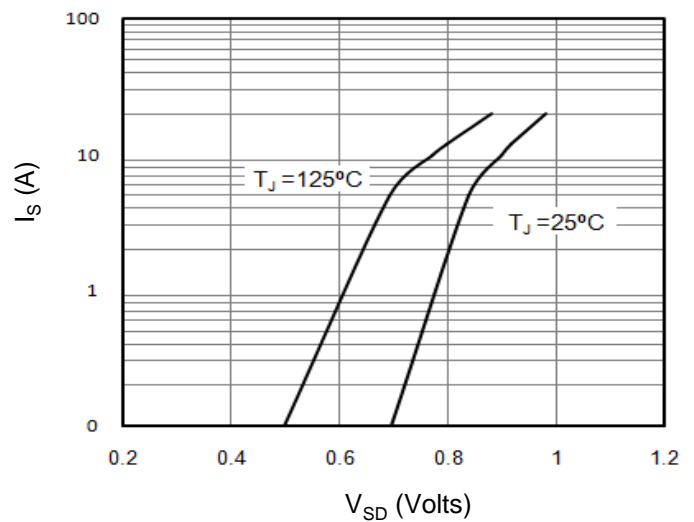


Figure 6: Body Diode Forward Voltage



TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

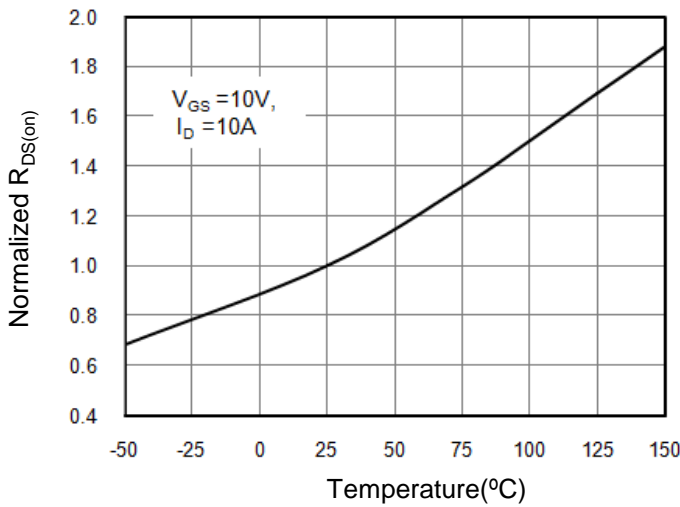


Figure 7: On-Resistance vs. Junction Temperature

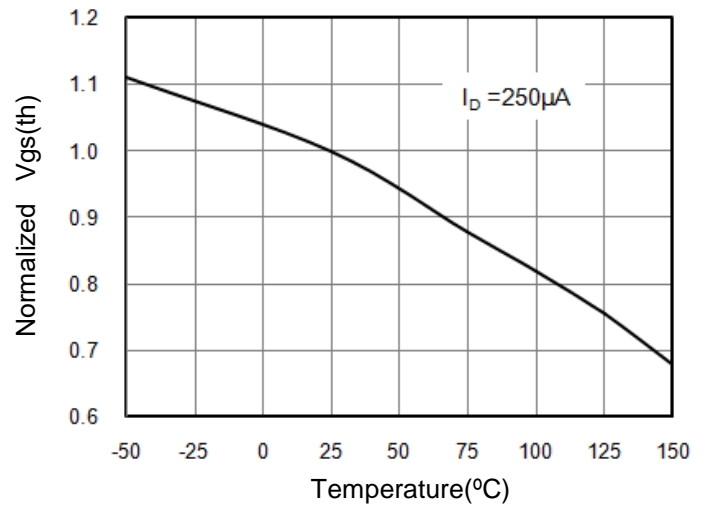


Figure 8: $V_{GS(th)}$ vs. Junction Temperature

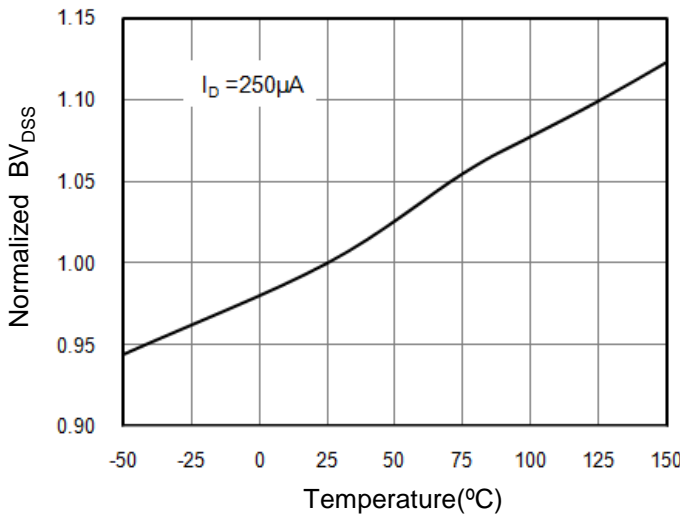


Figure 9: BV_{DS} vs. Junction Temperature

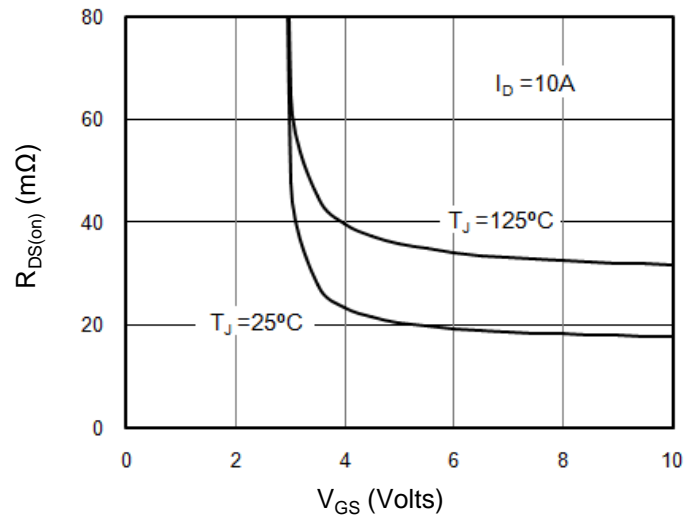


Figure 10: On-Resistance vs. Gate-Source Voltage

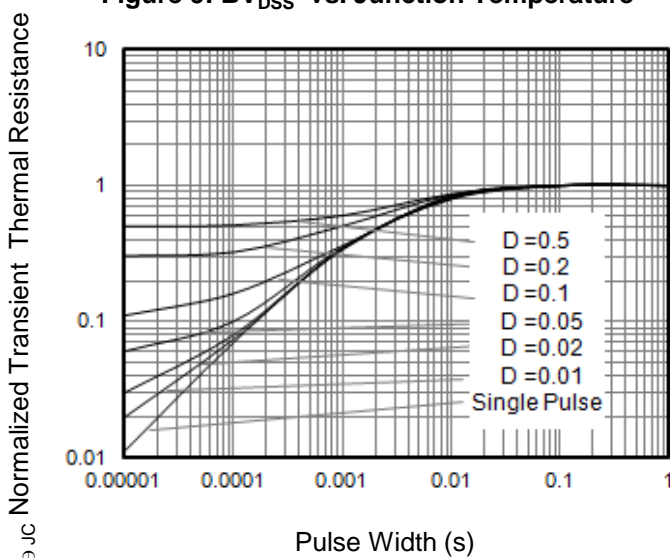


Figure 11: Normalized Transient Thermal Resistance

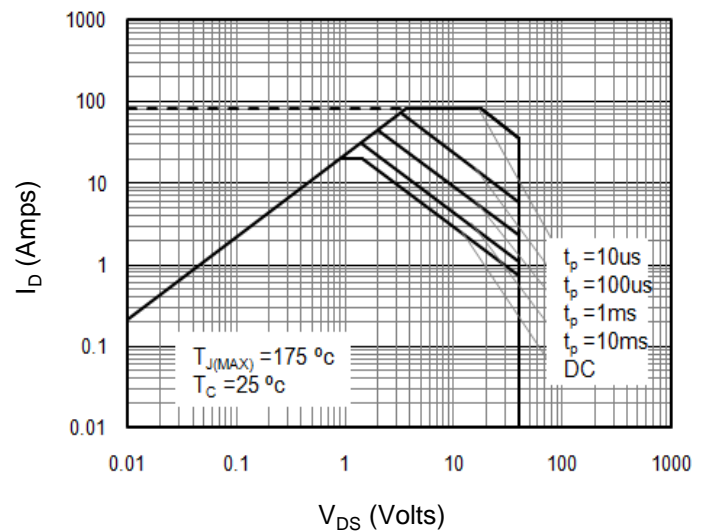


Figure 12: Safe Operating Area



Figure A: Gate Charge Test Circuit and Waveforms

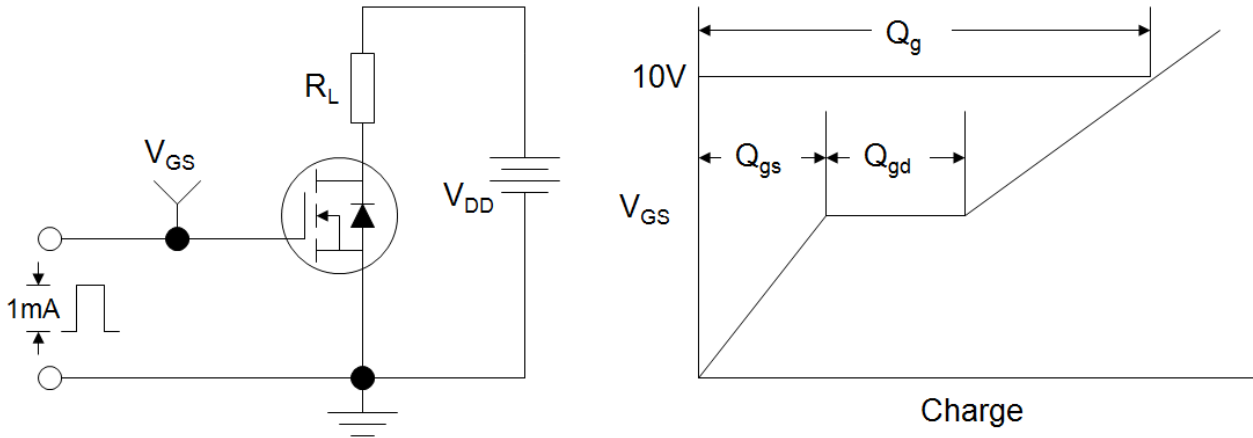


Figure B: Resistive Switching Test Circuit and Waveforms

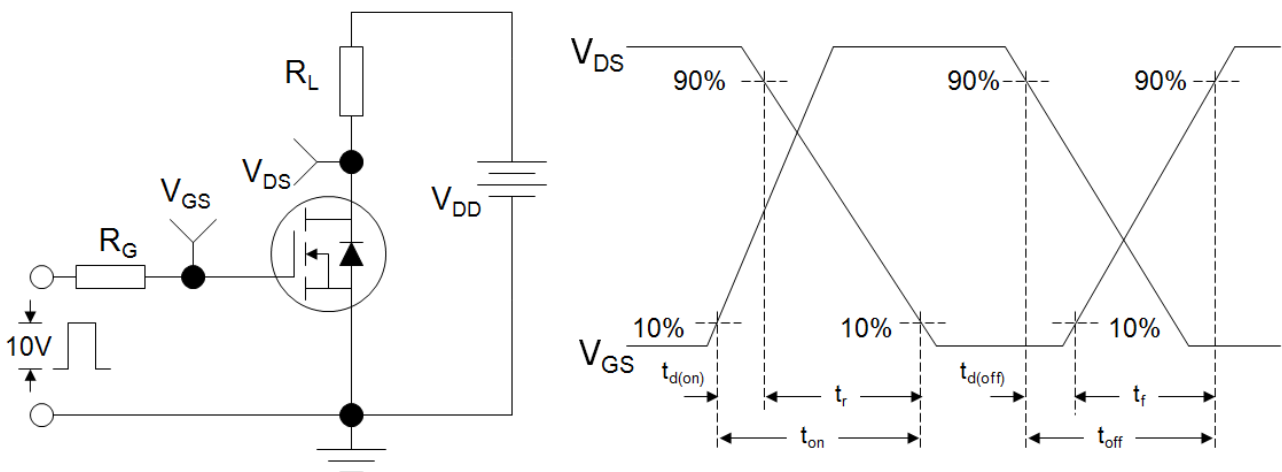
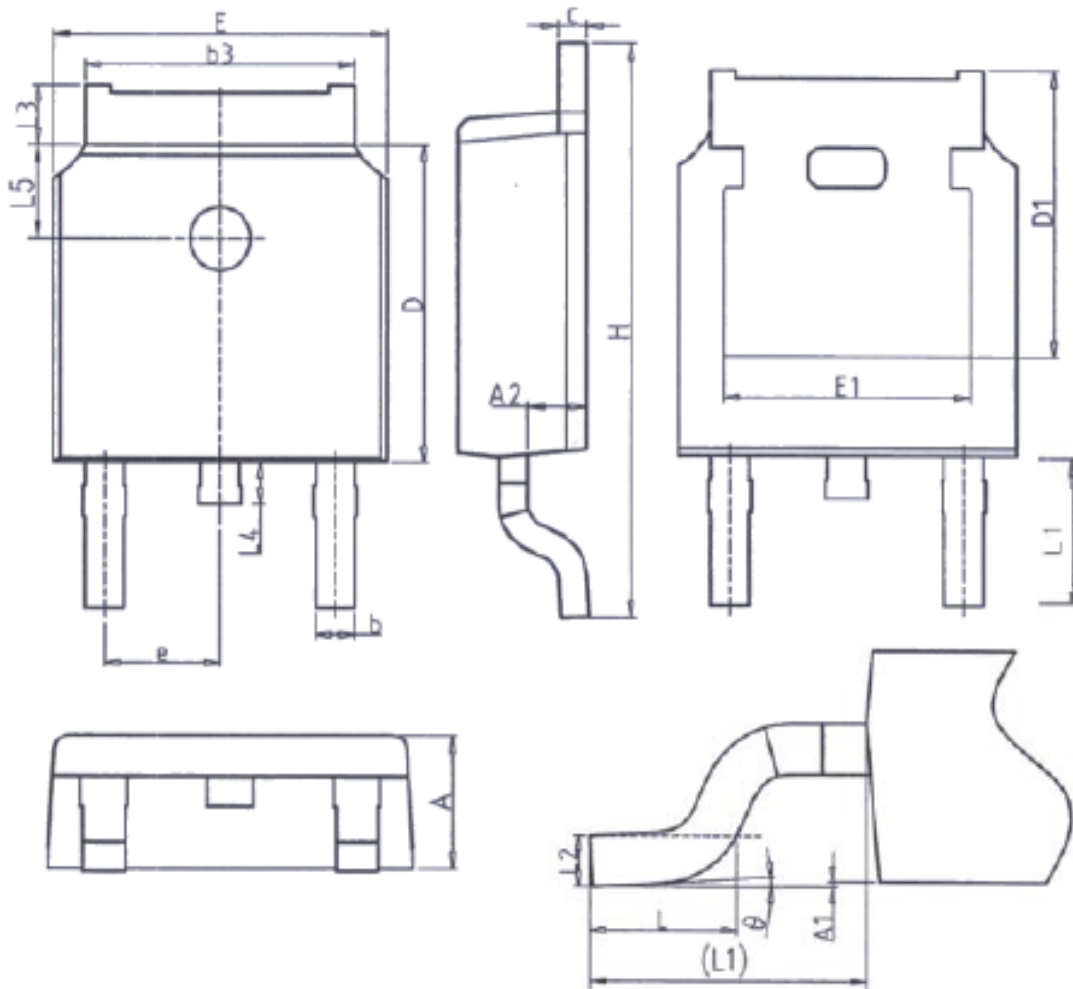


Figure C: Unclamped Inductive Switching (UIS) Test Circuit and Waveforms





TO-252(集佳)



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	0.80	1.00
L5	1.8 REF		
θ	0°	-	8°



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