
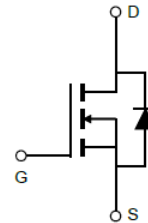
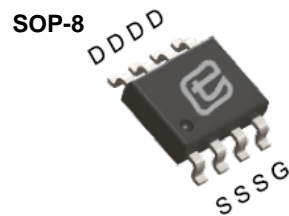


**40V N-Channel Trench MOSFET(Preliminary)**

<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>12A</td> </tr> <tr> <td>$R_{DS(ON)}$ (at $V_{GS}=10V$)</td> <td><10mΩ</td> </tr> <tr> <td>$R_{DS(ON)}$ (at $V_{GS}=4.5V$)</td> <td><14mΩ</td> </tr> </table> <div style="text-align: right;">  </div>	V_{DS}	40V	I_D (at $V_{GS}=10V$)	12A	$R_{DS(ON)}$ (at $V_{GS}=10V$)	<10m Ω	$R_{DS(ON)}$ (at $V_{GS}=4.5V$)	<14m Ω
V_{DS}	40V								
I_D (at $V_{GS}=10V$)	12A								
$R_{DS(ON)}$ (at $V_{GS}=10V$)	<10m Ω								
$R_{DS(ON)}$ (at $V_{GS}=4.5V$)	<14m Ω								



Part Number	Package Type	Form	Marking
TTJ12N04AT	SOP-8	Tape & Reel	12N04AT

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	$T_A = 25^\circ\text{C}$	12
		$T_A = 70^\circ\text{C}$	10.3
Pulsed Drain Current ^A	I_{DM}	36	A
Avalanche Current ^A	I_{AS}	21	A
Single Pulse Avalanche Energy	E_{AS}	66	mJ
Power Dissipation ^C	P_D	$T_A = 25^\circ\text{C}$	2.5
		$T_A = 70^\circ\text{C}$	1.6
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	$R_{\theta JL}$	30	$^\circ\text{C/W}$
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	1.6	2.4	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = 10\text{V}, I_D = 6\text{A}$		8	10	$\text{m}\Omega$
		$V_{GS} = 4.5\text{V}, I_D = 6\text{A}$		10.5	14	$\text{m}\Omega$
g_{FS}	Forward Transconductance	$V_{DS} = 5\text{V}, I_D = 12\text{A}$		15.6		S
V_{SD}	Diode Forward Voltage	$I_S = 12\text{A}, V_{GS} = 0\text{V}$			1	V
I_S	Maximum Body-Diode Continuous Current ^B				12	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	$V_{GS} = 0\text{V}, V_{DS} = 20\text{V}, f = 1\text{MHz}$		2025		pF
C_{oss}	Output Capacitance			190		
C_{rss}	Reverse Transfer Capacitance			177		
R_g	Gate Resistance	$f = 1\text{MHz}$		1.5		Ω
SWITCHING PARAMETERS						
$Q_g(10\text{V})$	Total Gate Charge	$V_{GS} = 10\text{V}, V_{DS} = 20\text{V}, I_D = 12\text{A}$		46		nC
$Q_g(4.5\text{V})$	Total Gate Charge			23		
Q_{gs}	Gate Source Charge			6.5		
Q_{gd}	Gate Drain Charge			8		
$t_{D(on)}$	Turn-On Delay Time	$V_{GS} = 10\text{V}, V_{DS} = 20\text{V}, I_D = 12\text{A}, R_G = 2.5\Omega$		7		ns
t_r	Turn-On Rise Time			4		
$T_{D(off)}$	Turn-Off Delay Time			25		
t_f	Turn-Off Fall Time			5		
t_{rr}	Body Diode Reverse Recovery Time	$I_F = 20\text{A}, di/dt = 100\text{A}/\mu\text{s}$		15.5		ns
Q_{rr}	Body Diode Reverse Recovery Charge			31		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

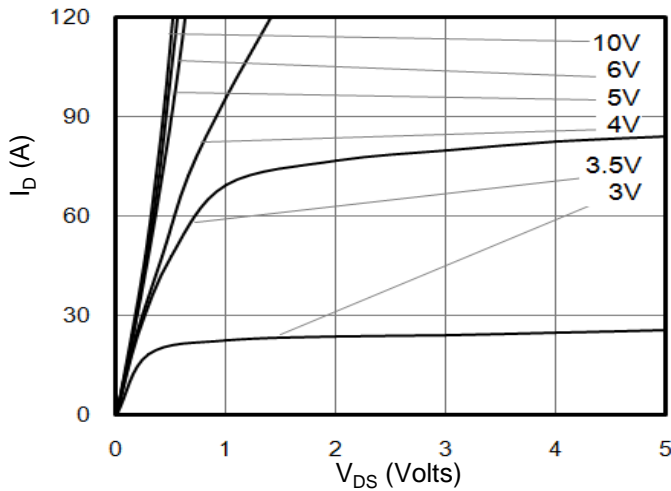


Figure 1: On-Region Characteristics

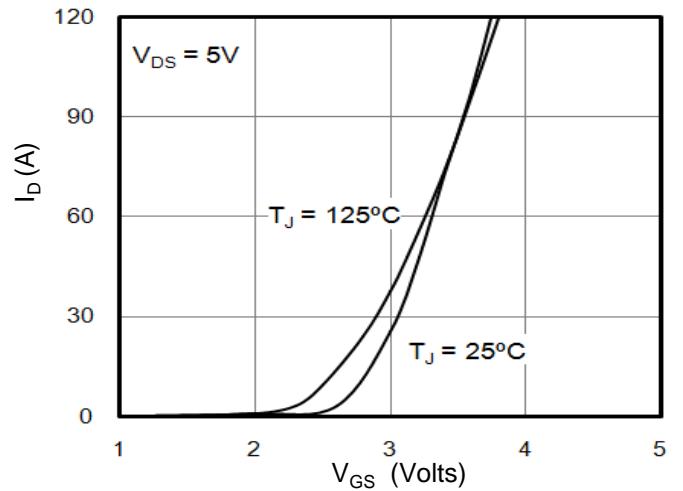


Figure 2: Transfer Characteristics

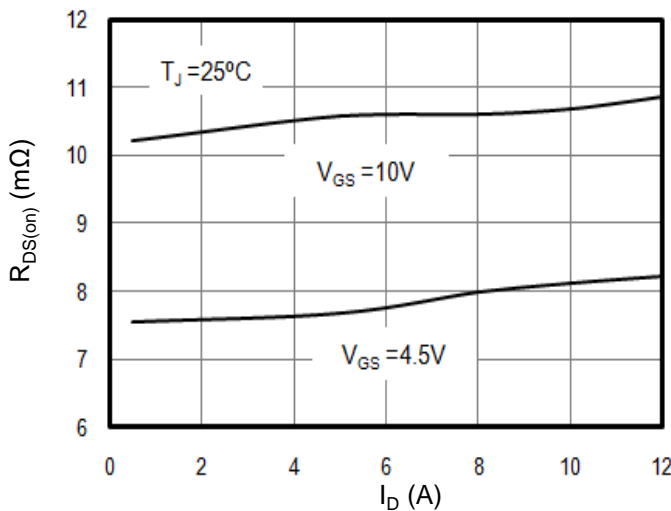


Figure 3: On-Resistance vs. Drain Current

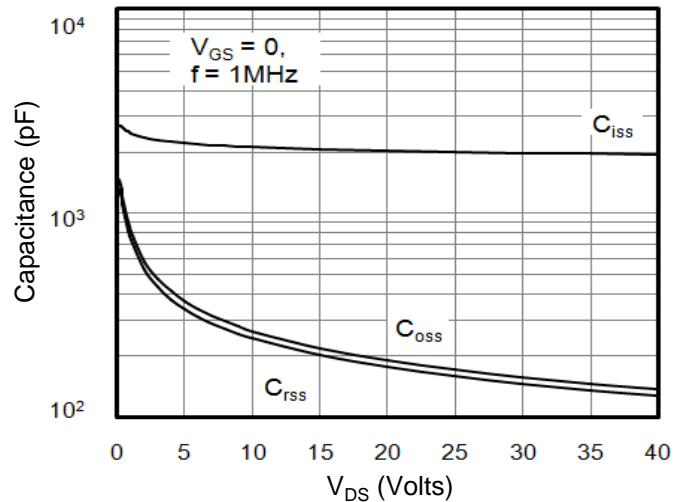


Figure 4: Capacitance Characteristics

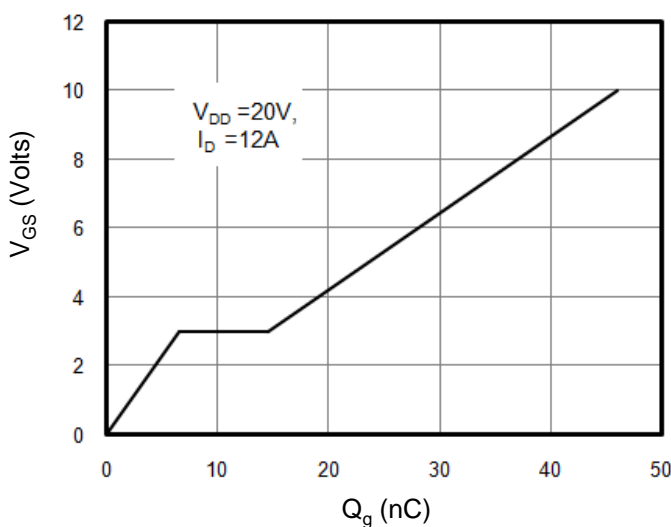


Figure 5: Gate Charge Characteristics

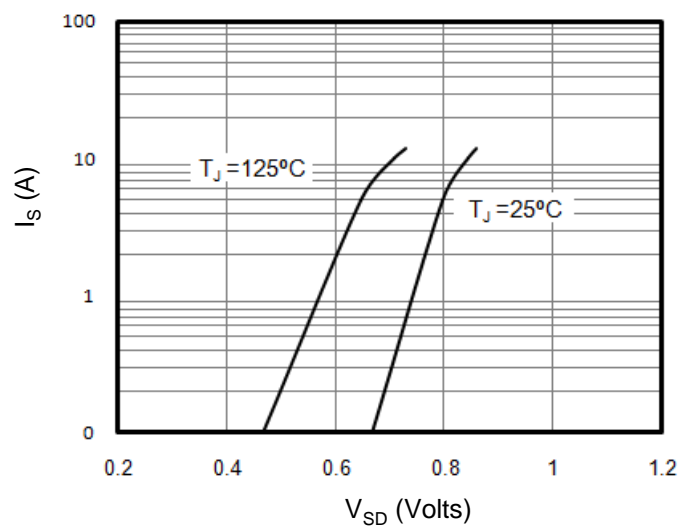


Figure 6: Body Diode Forward Voltage



TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

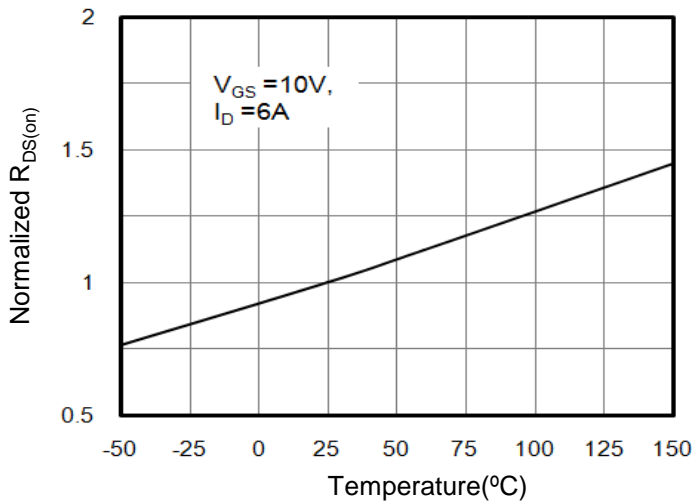


Figure 7: On-Resistance vs. Junction Temperature

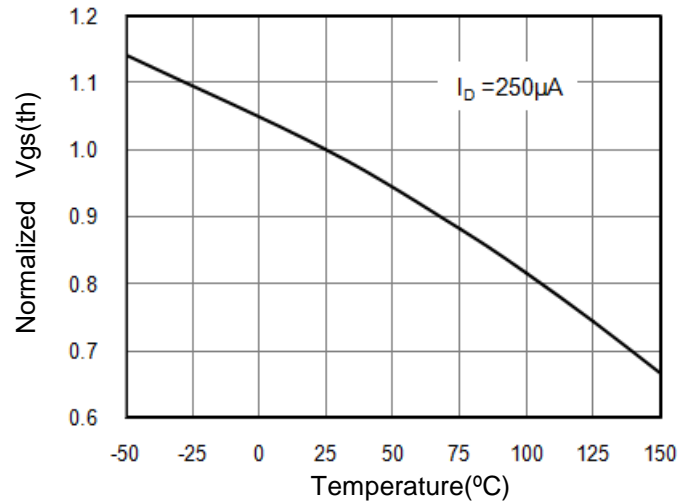


Figure 8: V_GS(th) vs. Junction Temperature

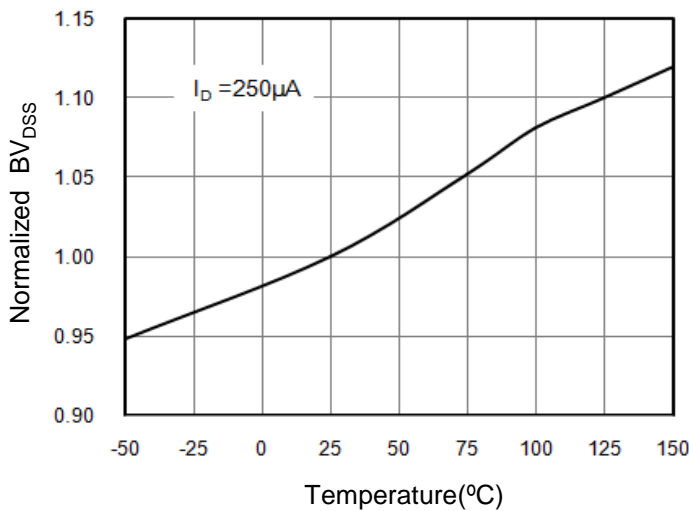


Figure 9: BV_DS vs. Junction Temperature

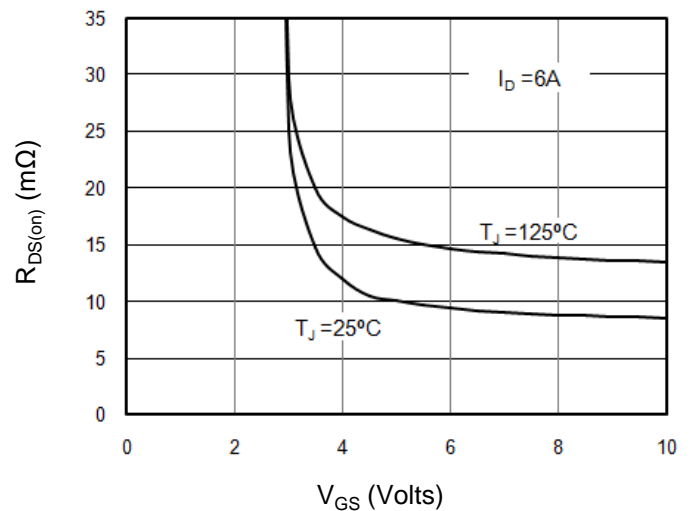


Figure 10: On-Resistance vs. Gate-Source Voltage

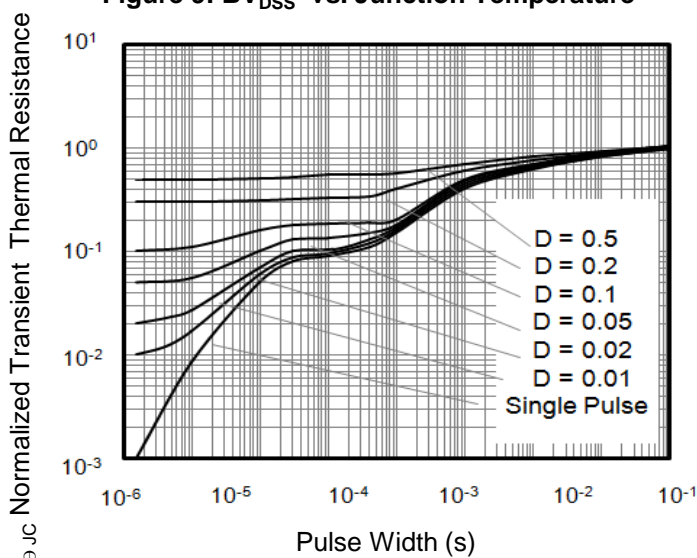


Figure 11: Normalized Transient Thermal Resistance

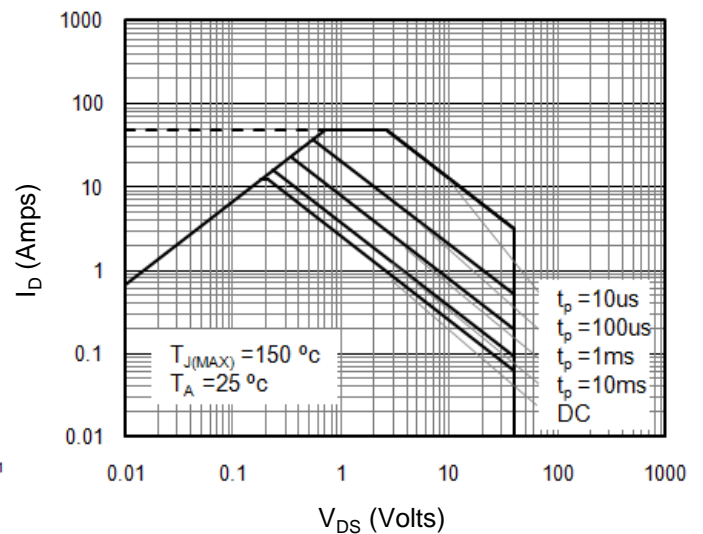


Figure 12: Safe Operating Area



Figure A: Gate Charge Test Circuit and Waveforms

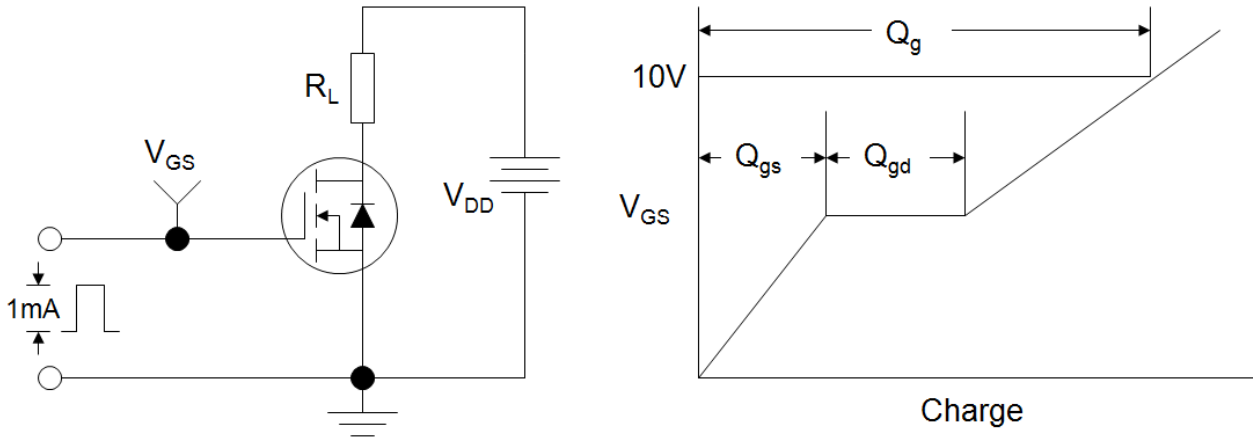


Figure B: Resistive Switching Test Circuit and Waveforms

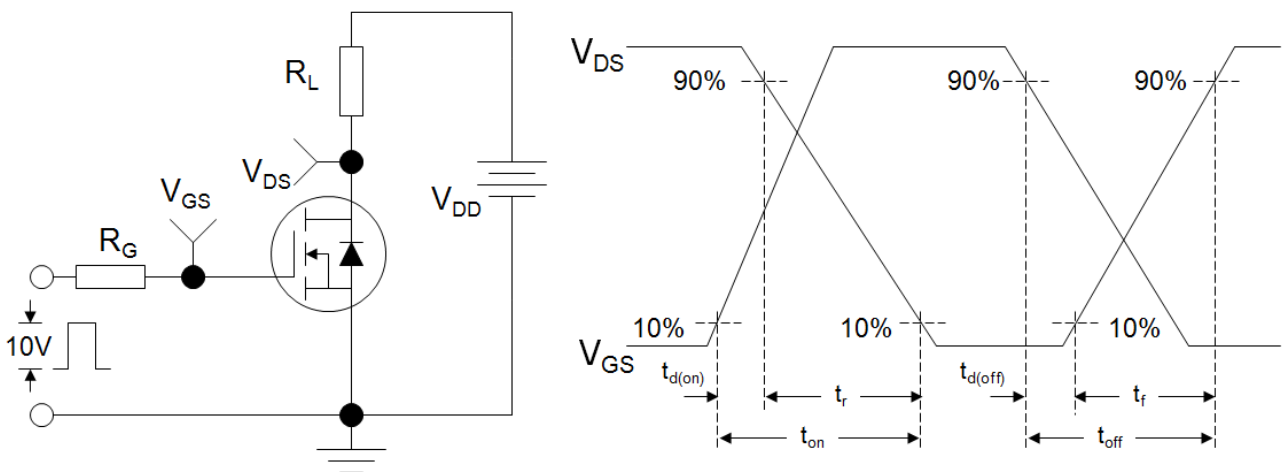
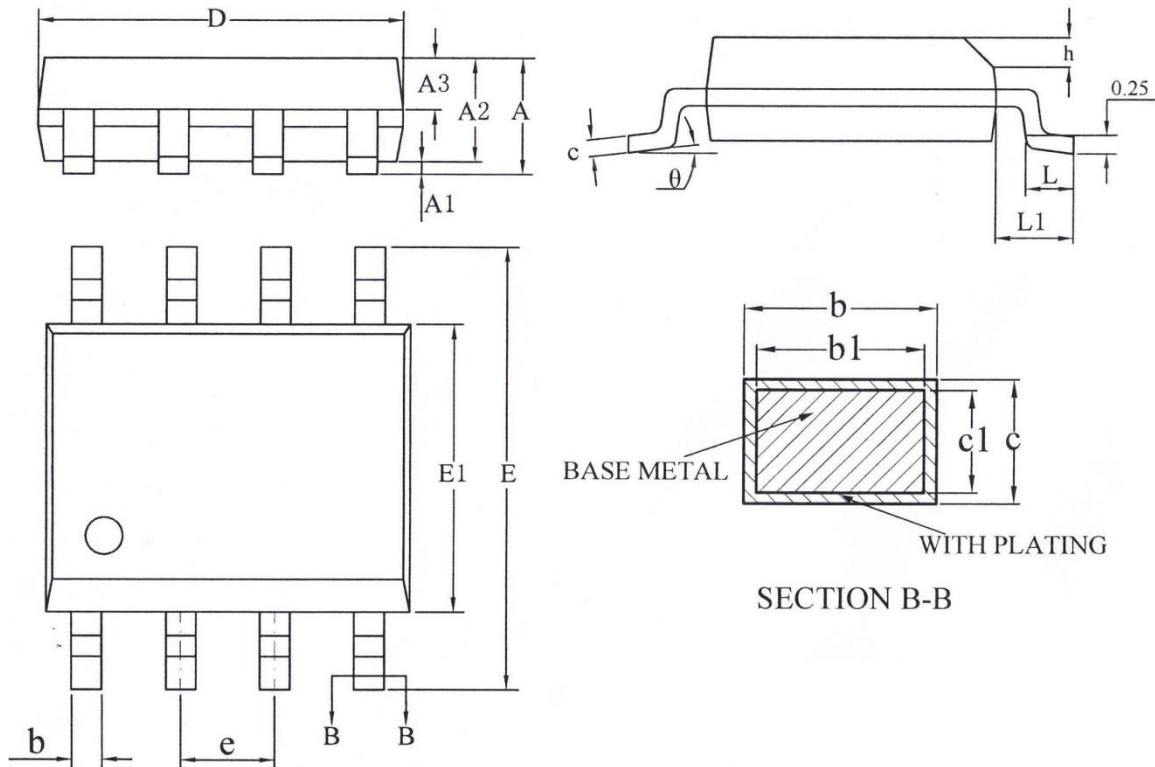


Figure C: Unclamped Inductive Switching (UIS) Test Circuit and Waveforms





SOP-8(华天)



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	—	—	1.75
A1	0.10	—	0.225
A2	1.30	1.40	1.50
A3	0.60	0.65	0.70
b	0.39	—	0.48
b1	0.38	0.41	0.43
c	0.21	—	0.26
c1	0.19	0.20	0.21

SYMBOL	MILLIMETER		
	MIN	NOM	MAX
D	4.70	4.90	5.10
E	5.80	6.00	6.20
E1	3.70	3.90	4.10
e	1.27BSC		
h	0.25	—	0.50
L	0.50	—	0.80
L1	1.05BSC		
θ	0	—	8°



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