
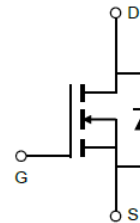


**40V N-Channel Trench MOSFET(Preliminary)**

<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>70A</td> </tr> <tr> <td>$R_{DS(ON)}$ (at $V_{GS}=10V$)</td> <td>< 6.4mΩ</td> </tr> <tr> <td>$R_{DS(ON)}$ (at $V_{GS}=4.5V$)</td> <td>< 9.4mΩ</td> </tr> </table> <p>100% UIS Tested</p> 	V_{DS}	40V	I_D (at $V_{GS}=10V$)	70A	$R_{DS(ON)}$ (at $V_{GS}=10V$)	< 6.4m Ω	$R_{DS(ON)}$ (at $V_{GS}=4.5V$)	< 9.4m Ω
V_{DS}	40V								
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TO-252



Part Number	Package Type	Form	Marking
TTD70N04AT	TO-252	Tape&Reel	70N04AT

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	$T_C = 25^\circ\text{C}$	46
		$T_C = 100^\circ\text{C}$	46
Pulsed Drain Current ^A	I_{DM}	210	A
Avalanche Current ^A	I_{AS}	21	A
Single Pulse Avalanche Energy	E_{AS}	66.2	mJ
Power Dissipation ^C	P_D	$T_C = 25^\circ\text{C}$	108
		$T_C = 100^\circ\text{C}$	70
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	$R_{\theta JC}$	1.32	$^\circ\text{C/W}$
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
			$T_J = 100^\circ\text{C}$		25	
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	1.7	2.4	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = 10\text{V}, I_D = 30\text{A}$		4.7	6.4	$\text{m}\Omega$
		$V_{GS} = 4.5\text{V}, I_D = 30\text{A}$		7	9.4	$\text{m}\Omega$
g_{FS}	Forward Transconductance	$V_{DS} = 10\text{V}, I_D = 20\text{A}$		26.4		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				46	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	$V_{GS} = 0\text{V}, V_{DS} = 20\text{V}, f = 1\text{MHz}$		3286		pF
C_{oss}	Output Capacitance			560		
C_{rss}	Reverse Transfer Capacitance			370		
SWITCHING PARAMETERS						
$Q_g(10\text{V})$	Total Gate Charge	$V_{GS} = 10\text{V}, V_{DS} = 20\text{V}, I_D = 30\text{A}$		57		nC
Q_{gs}	Gate Source Charge			10		
Q_{gd}	Gate Drain Charge			10		
$t_{D(on)}$	Turn-On Delay Time	$V_{GS} = 10\text{V}, V_{DS} = 20\text{V}, I_D = 30\text{A}, R_G = 3\Omega$		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 $T_{J(MAX)} = 175^\circ\text{C}$, 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

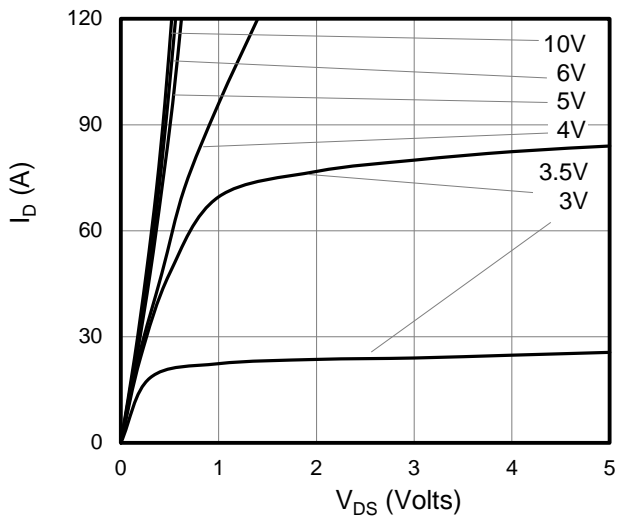


Figure 1: On-Region Characteristics

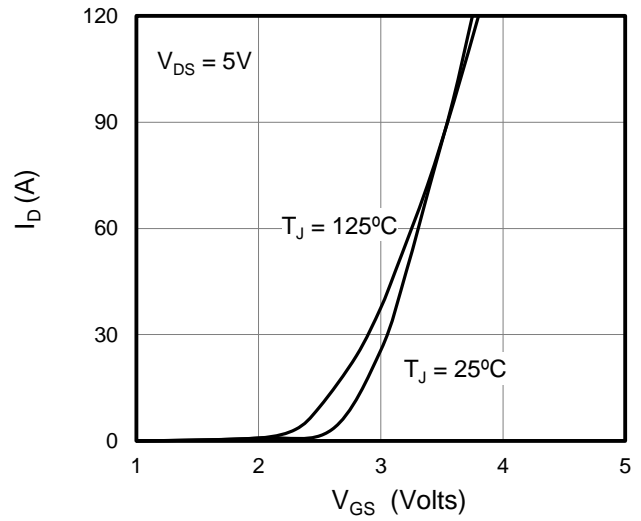


Figure 2: Transfer Characteristics

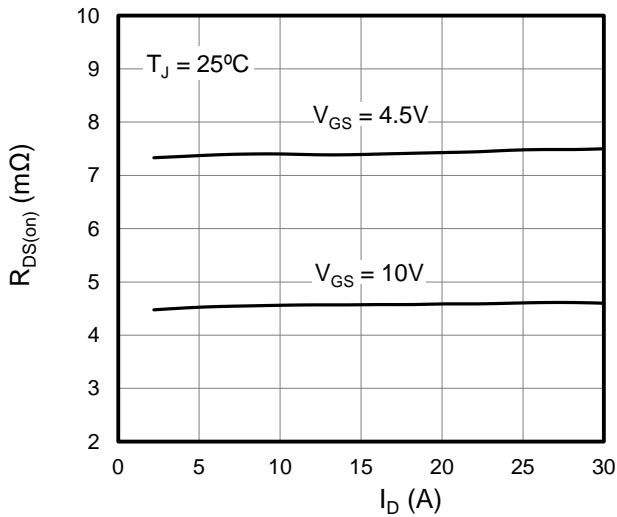


Figure 3: On-Resistance vs. Drain Current

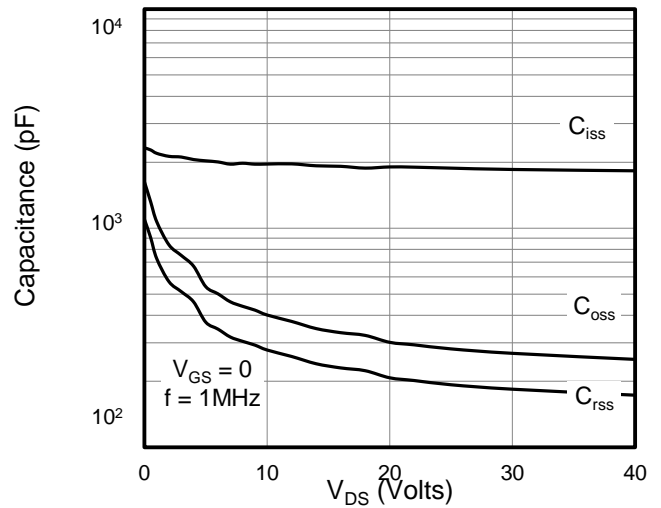


Figure 4: Capacitance Characteristics

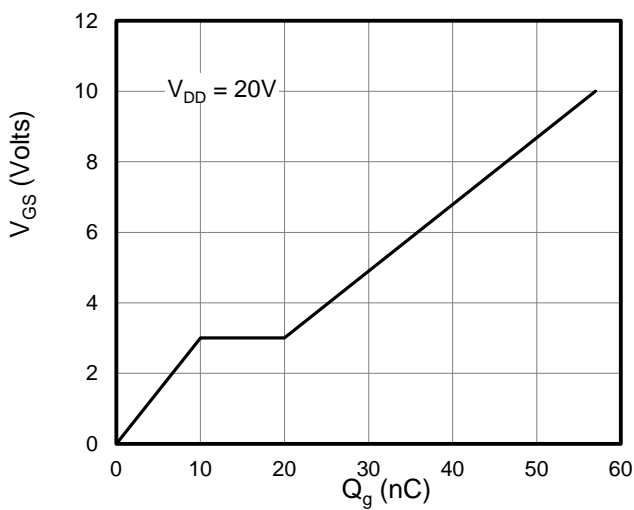


Figure 5: Gate Charge Characteristics

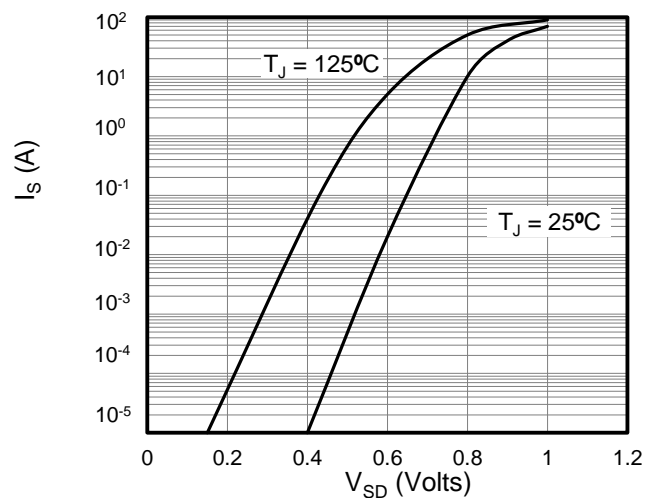


Figure 6: Body Diode Forward Voltage



TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

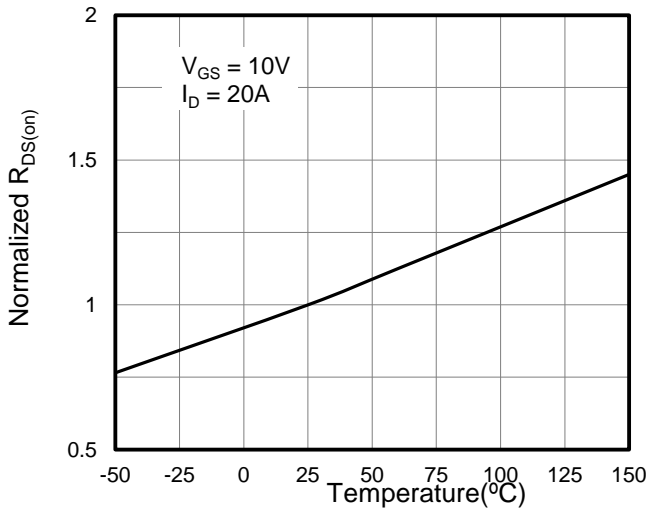


Figure 7: On-Resistance vs. Junction Temperature

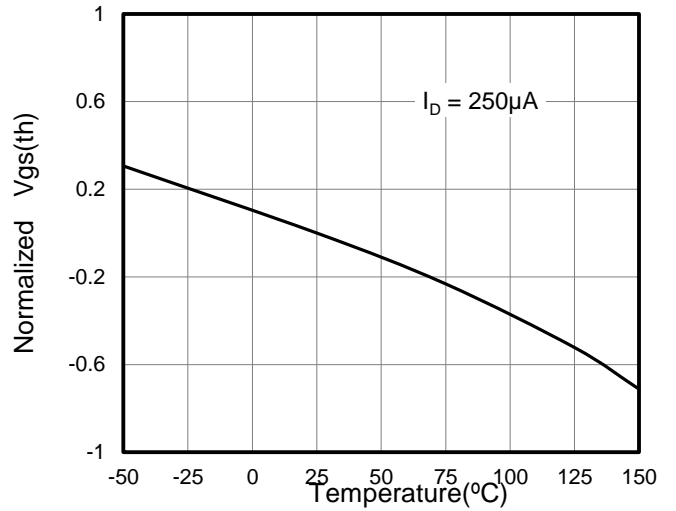


Figure 8: $V_{GS(th)}$ vs. Junction Temperature

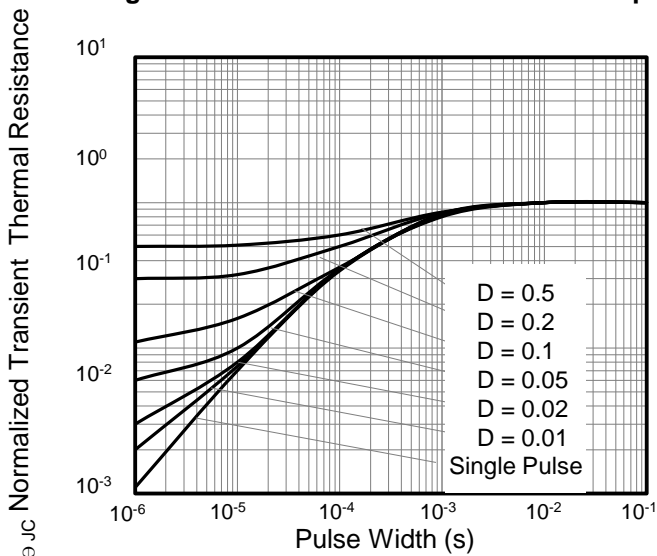


Figure 11: Normalized Transient Thermal Resistance

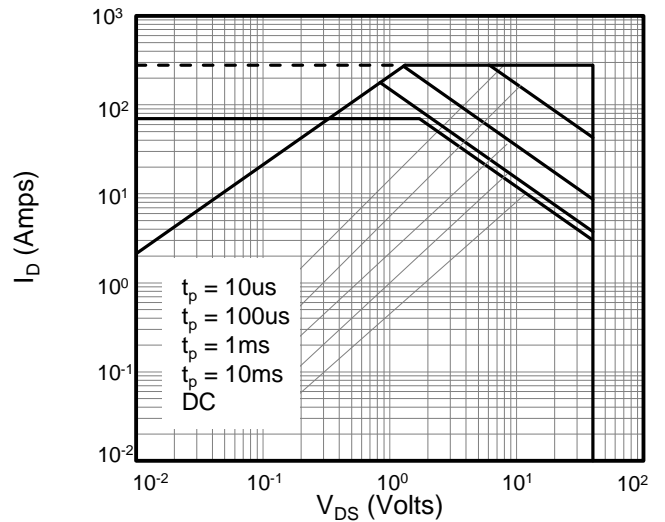


Figure 12: Safe Operating Area

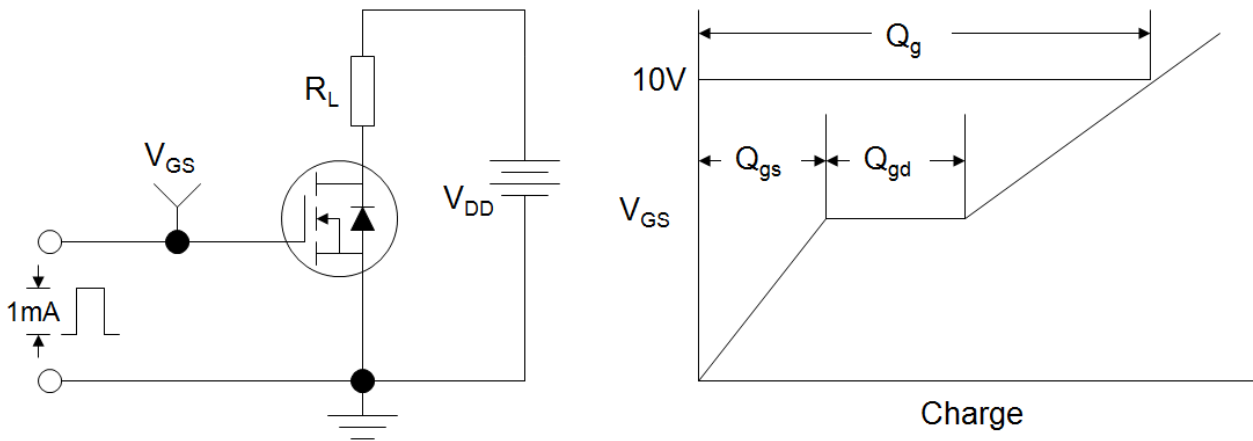


Figure A: Gate Charge Test Circuit and Waveforms

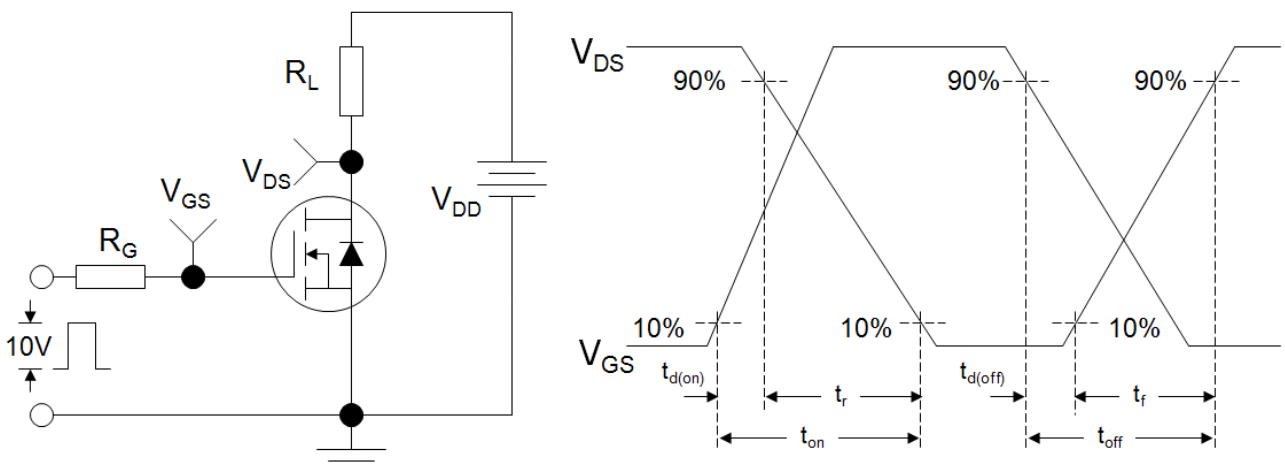


Figure B: Resistive Switching Test Circuit and Waveforms

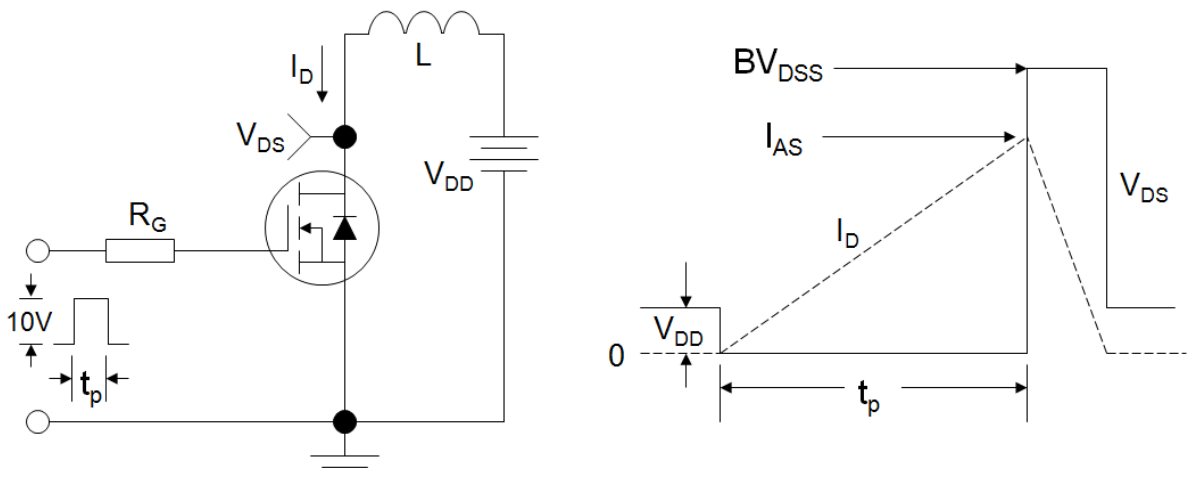
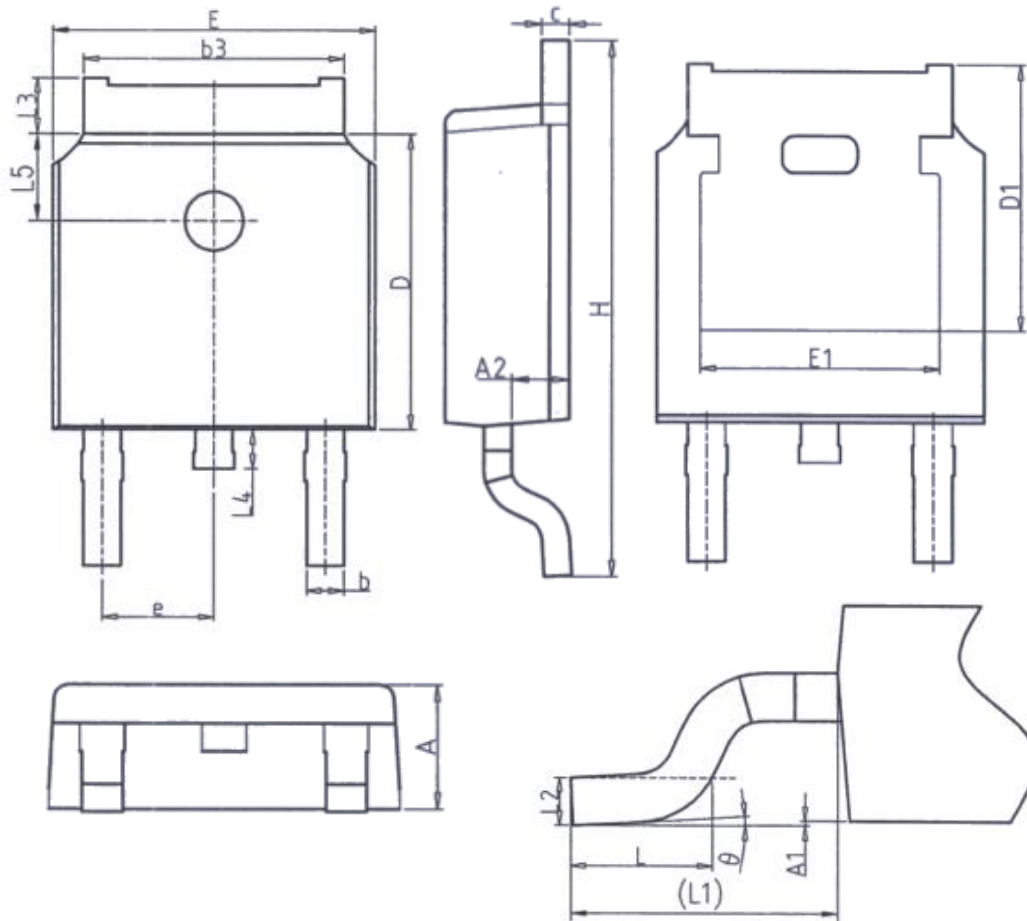


Figure C: Unclamped Inductive Switching (UIS) Test Circuit and Waveforms



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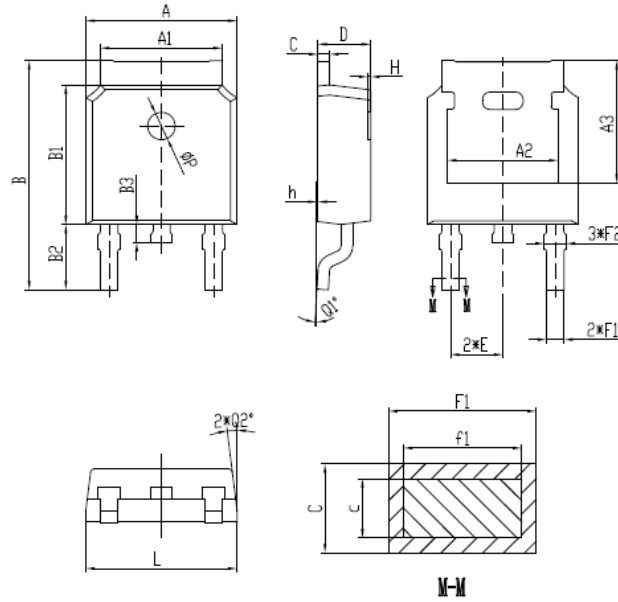


Unit: mm		
Symbol	Min.	Max.
A	2.20	2.40
A1	0.00	0.20
A2	0.97	1.17
b	0.68	0.90
b3	5.20	5.50
c	0.43	0.63
D	5.98	6.22
D1	5.30REF	
E	6.40	6.80
E1	4.63	-

Unit: mm		
Symbol	Min.	Max.
e	2.286BSC	
H	9.40	10.50
L	1.38	1.75
L1	2.90REF	
L2	0.51BSC	
L3	0.88	1.28
L4	-	1.00
L5	1.65	1.95
theta	0°	8°



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SYMBOL	MIN	NOM	MAX
A	6.50	6.60	6.70
A1	5.16	5.31	5.46
A2	4.83 REF		
A3	5.30 REF		
B	9.77	9.97	10.17
B1	6.00	6.10	6.20
B2	2.60	2.80	3.00
B3	0.70	0.80	0.90
C	0.41	—	0.61
c	0.40	0.50	0.60
D	2.20	2.30	2.40
E	2.186	2.286	2.386
F1	0.67	—	0.87
f1	0.66	0.76	0.86
F2	0.76	0.86	0.96
H	0.00	—	0.30
h	0.00	—	0.20
L	6.50	6.60	6.70
øP	1.10	1.20	1.30
Q1°	0°	—	8°
Q2°	6°	7°	8°



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