Wuxi Unigroup Microelectronics CO.,LTD.

20V N-Channel Trench MOSFET(Preliminary)

General Description

- Trench Power technology
- Low $R_{DS(ON)}$
- Low Gate Charge
- Optimized for fast-switching applications

Applications

- Synchronous Rectification in DC/DC and AC/DC Converters
- Isolated DC/DC Converters in Telecom and Industrial

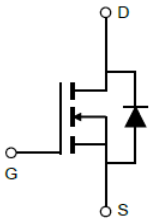
Product Summary

V_{DS}	20V
I_D (at V_{GS}=10V)	35A
$R_{DS(ON)}$ (at V_{GS}=10V)	< 8mΩ
$R_{DS(ON)}$ (at V_{GS}=4.5V)	< 9mΩ
$R_{DS(ON)}$ (at V_{GS}=2.5V)	< 12mΩ

100% UIS Tested

RoHS

TO-252



Part Number	Package Type	Form	Marking
TTD35N02AV	TO-252	Tape & Reel	TTD35N02AV

Absolute Maximum Ratings (T_A =25ºC 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	T_C =25ºC	I_D	35	A
	T_C =100ºC		30	
Pulsed Drain Current A		I_{DM}	105	A
Avalanche Current A		I_{AS}	16	A
Single Pulse Avalanche Energy L =0.3mH A		E_{AS}	38.4	mJ
Power Dissipation C	T_C =25ºC	P_D	28.8	W
	T_C =100ºC		14.4	W
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 175	ºC

Thermal Characteristics

Parameter		Symbol	Maximum	Units
Maximum Junction-to-Case	Steady-State	$R_{\theta JC}$	5.2	ºC/W
Maximum Junction-to-Ambient	Steady-State	$R_{\theta JA}$	100	

Electrical Characteristics(T_J =25ºC unless otherwise noted)

Symbol	Parameter	Conditions		Value			Units
				Min	Typ	Max	
STATIC PARAMETERS							
BV_{DSS}	Drain-Source Breakdown Voltage	I_D =250μA,V_{GS} =0V		20			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} =20V, V_{GS} =0V	T_J =25ºC			1	μA
			T_J =125ºC			100	
I_{GSS}	Gate-Body Leakage Current	V_{DS} =0V, V_{GS} =±12V				±100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} =V_{GS}, I_D =250μA		0.4	0.7	1	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS} =10V, I_D =30A			6.6	8	mΩ
		V_{GS} =4.5V, I_D =30A			7.4	9	mΩ
		V_{GS} =2.5V, I_D =20A			9.4	12	mΩ
g_{FS}	Forward Transconductance	V_{DS} =5V, I_D =20A			45		S
V_{SD}	Diode Forward Voltage	I_S =30A, V_{GS} =0V				1	V
I_S	Maximum Body-Diode Continuous Current [B]					35	A
DYNAMIC PARAMETERS							
C_{iss}	Input Capacitance	V_{GS} =0V, V_{DS} =10V, f =1MH_Z			967		pF
C_{oss}	Output Capacitance				183		
C_{rss}	Reverse Transfer Capacitance				166		
R_g	Gate Resistance	f =1MH_Z			1.4		Ω
SWITCHING PARAMETERS							
Q_g(10V)	Total Gate Charge	V_{GS} =10V,V_{DS} =10V, I_D =20A			27.4		nC
Q_g(4.5V)	Total Gate Charge				14		
Q_{gs}	Gate Source Charge				1.6		
Q_{gd}	Gate Drain Charge				4.6		
$t_{D(on)}$	Turn-On Delay Time	V_{GS} =10V,V_{DS} =10V, I_D =20A, R_G =1.8Ω			31		ns
t_r	Turn-On Rise Time				3.2		
$t_{D(off)}$	Turn-Off Delay Time				55		
t_f	Turn-Off Fall Time				4		
t_{rr}	Body Diode Reverse Recovery Time	I_F =20A, di/dt =100A/μs			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 $T_{J(MAX)}$ =175ºC, 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

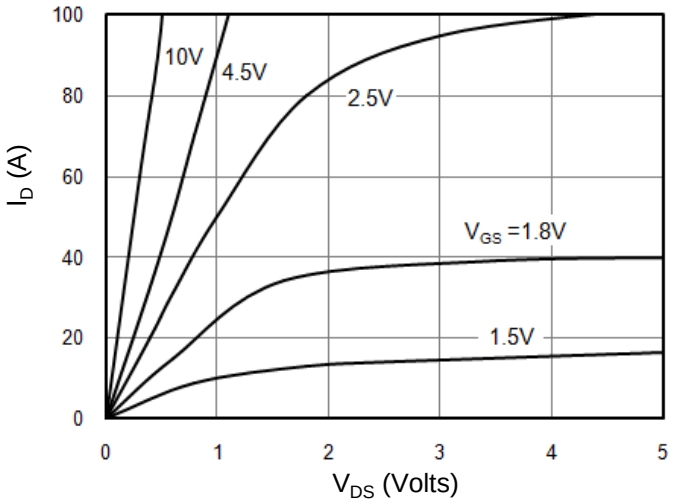


Figure 1: On-Region Characteristics

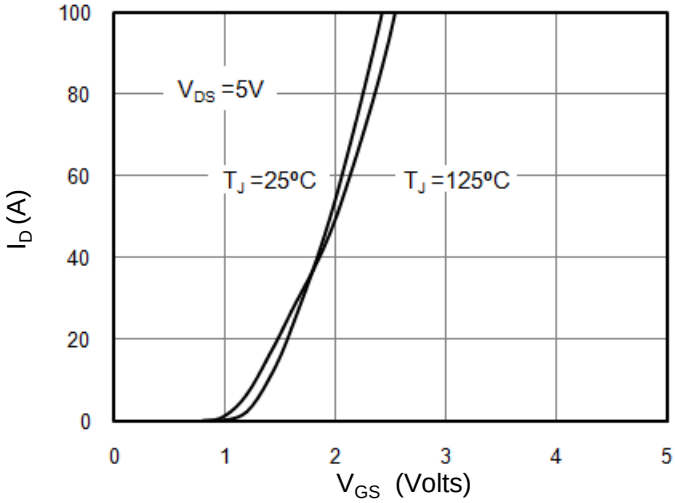


Figure 2: Transfer Characteristics

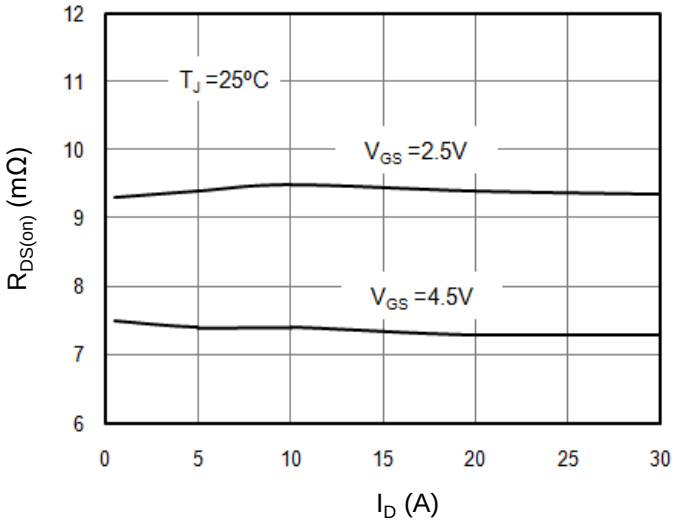


Figure 3: On-Resistance vs. Drain Current

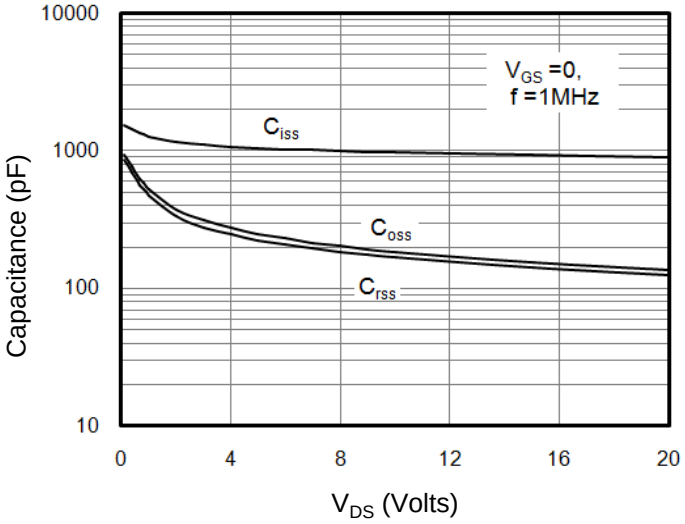


Figure 4: Capacitance Characteristics

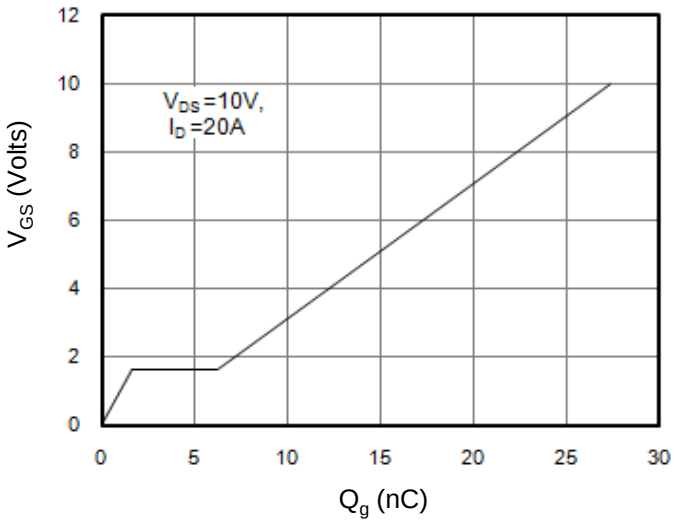


Figure 5: Gate Charge Characteristics

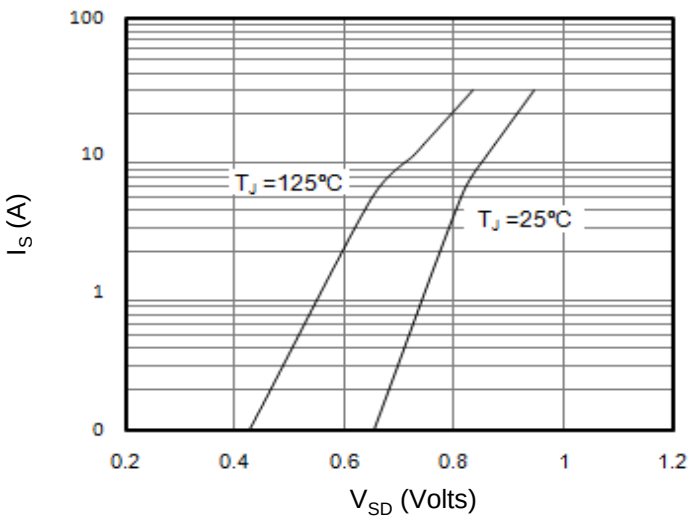


Figure 6: Body Diode Forward Voltage

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

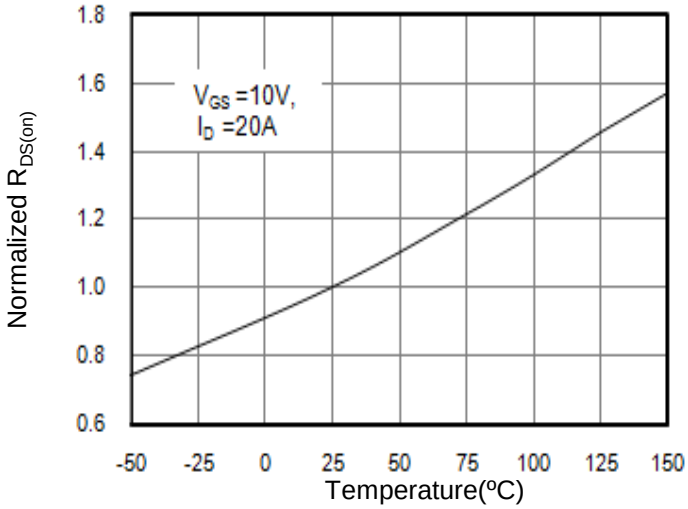


Figure 7: On-Resistance vs. Junction Temperature

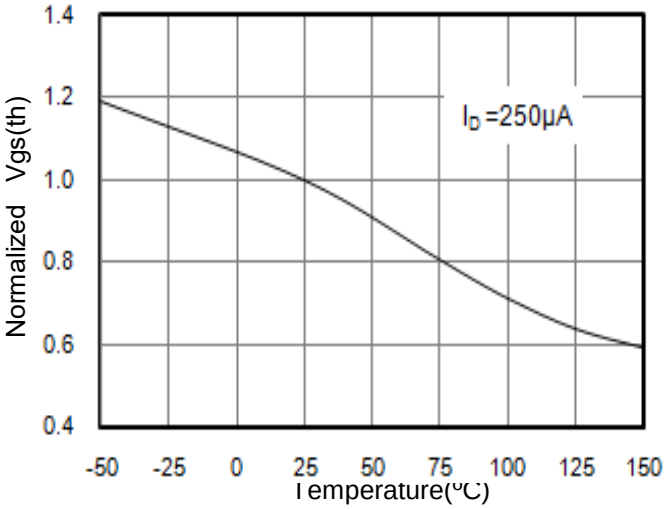


Figure 8: Vgs(th) vs. Junction Temperature

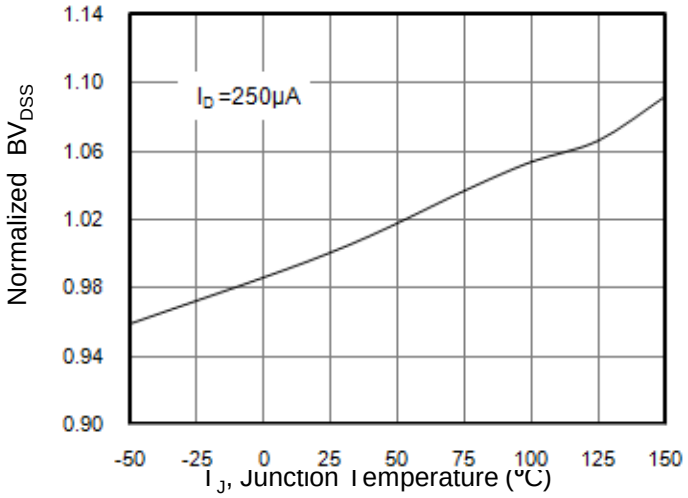


Figure 9: BV_{DSS} vs. Junction Temperature

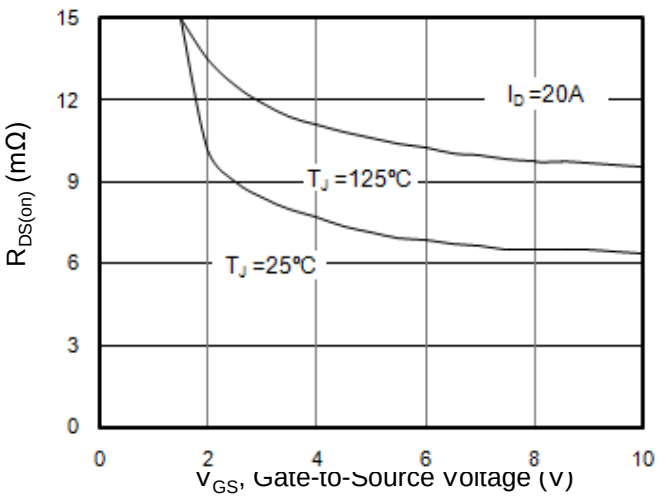


Figure 10: On-Resistance vs. Gate-Source Voltage

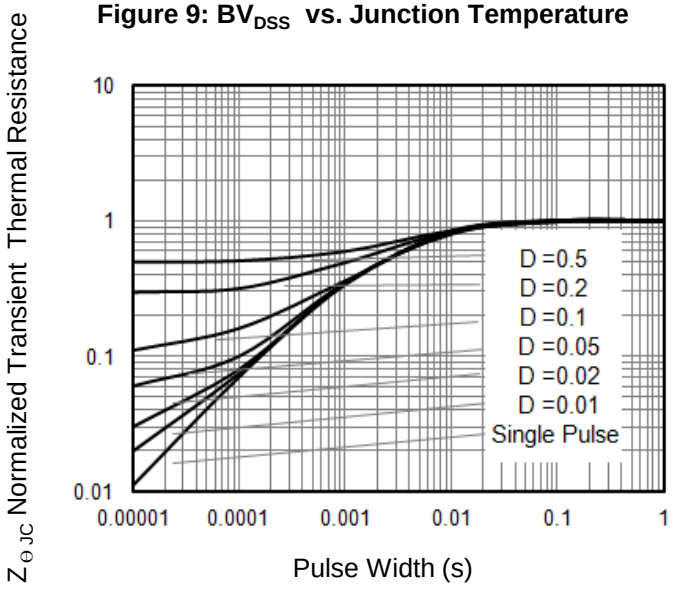


Figure 11: Normalized Transient Thermal Resistance

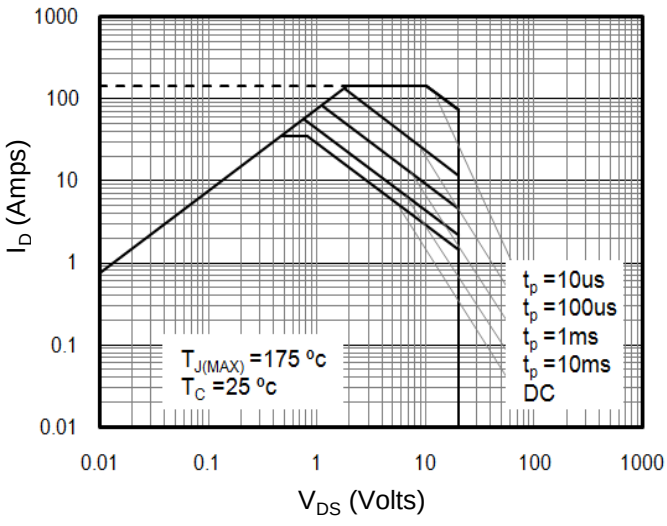


Figure 12: Safe Operating Area

Figure A：Gate Charge Test Circuit and Waveforms

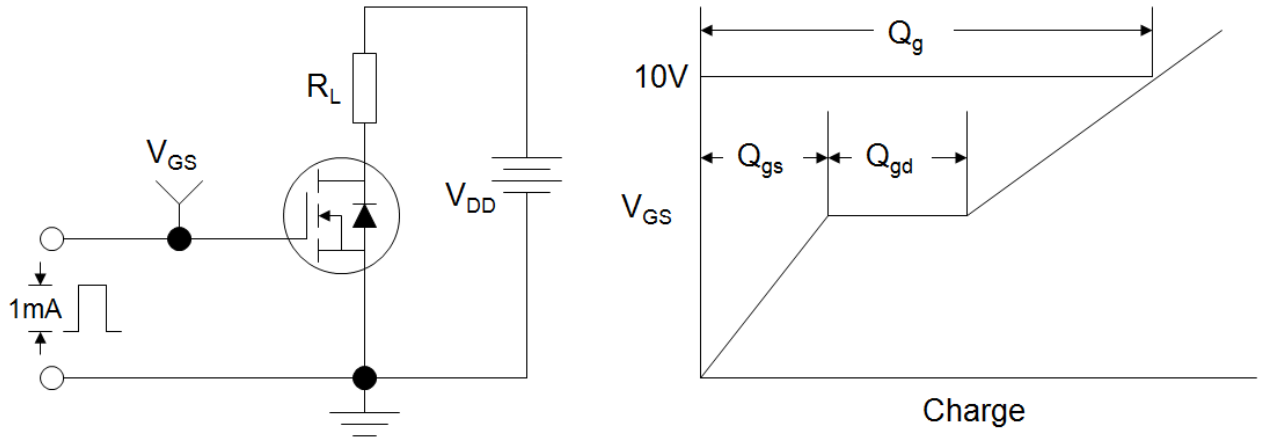


Figure B：Resistive Switching Test Circuit and Waveforms

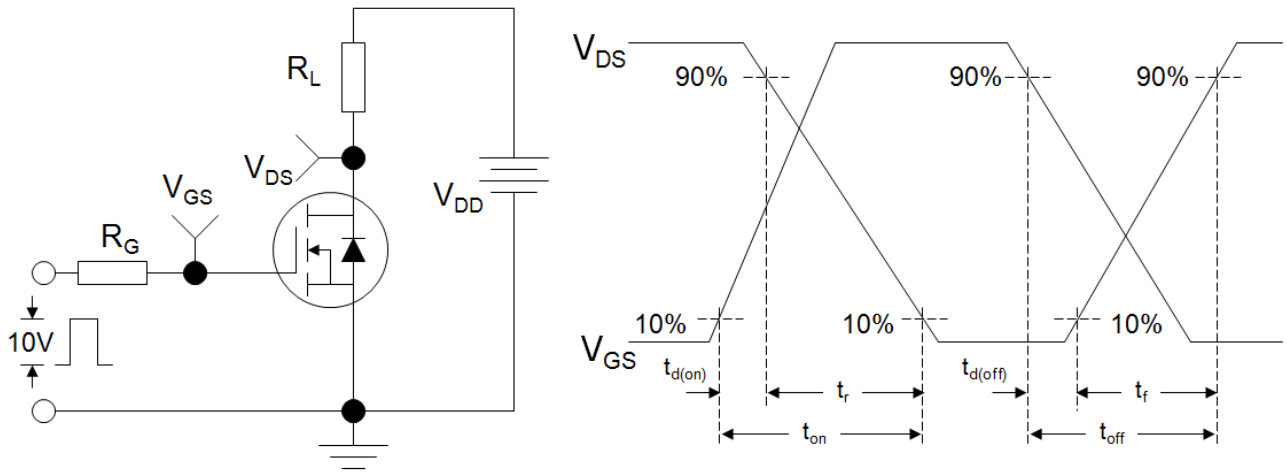
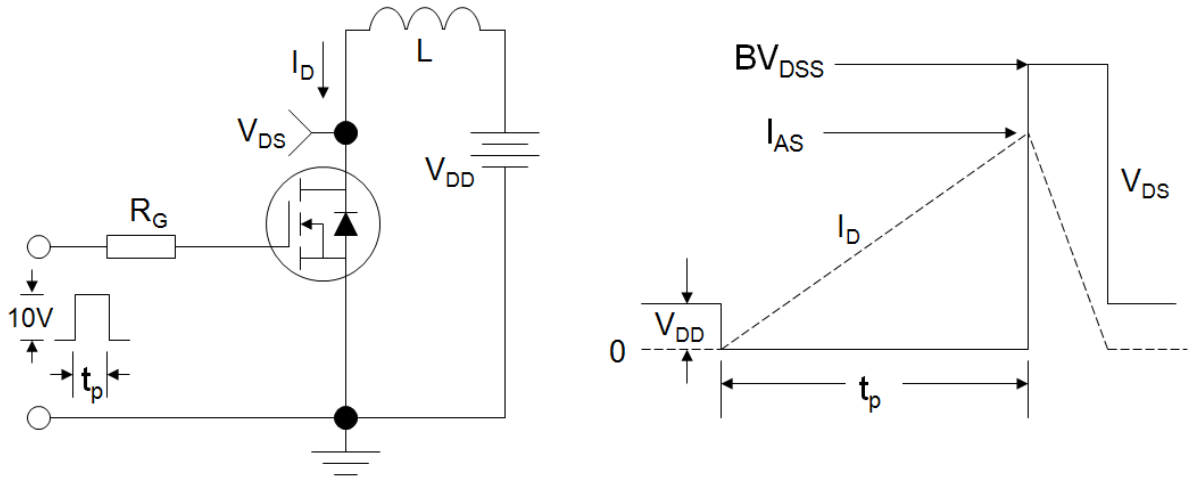


Figure C：Unclamped Inductive Switching (UIS) Test Circuit and Waveforms



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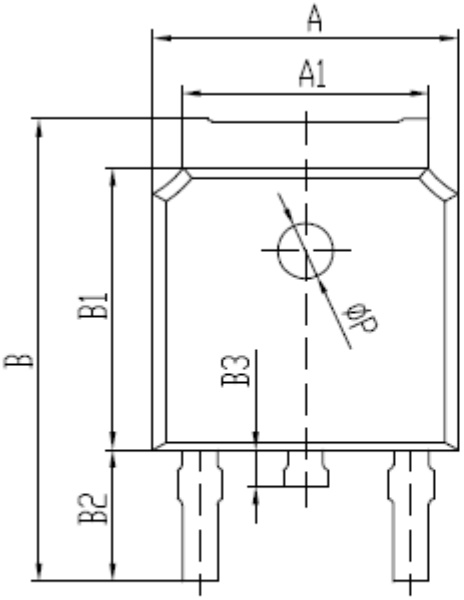

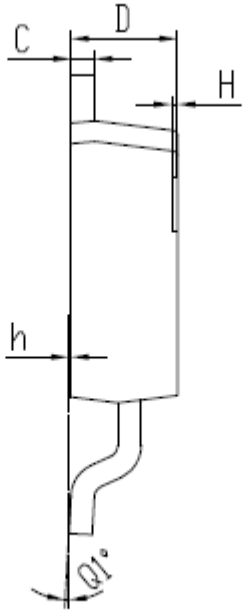

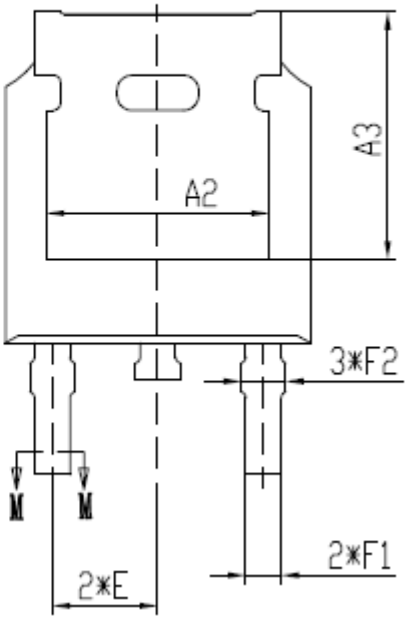

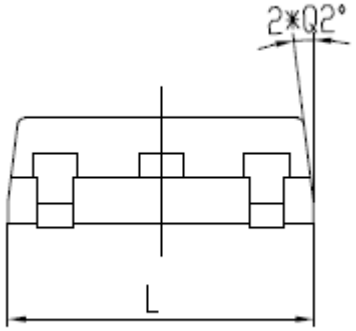

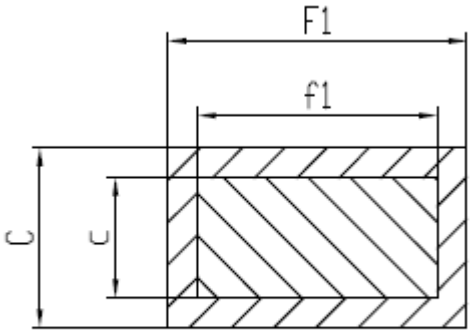

M-M

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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