Wuxi Unigroup Microelectronics CO.,LTD.

40V P-Channel Trench MOSFET(Preliminary)

General Description

- Trench Power technology
- Low $R_{DS(ON)}$
- Simple driver requirement
- Optimized for fast-switching applications

Applications

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

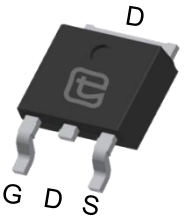
Product Summary

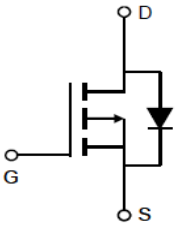
V_{DS}	-40V
I_D (at V_{GS}=-10V)	-50A
$R_{DS(ON)}$ (at V_{GS}=-10V)	< 14mΩ
$R_{DS(ON)}$ (at V_{GS}=-4.5V)	< 20mΩ

100% UIS Tested

RoHS

TO-252





Part Number	Package Type	Form	Marking
TTD50P04AT	TO-252	Tape & Reel	TTD50P04AT

Absolute Maximum Ratings (T_A =25°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]	T_C =25°C	I_D	-46	A
	T_C =100°C		-38	
Pulsed Drain Current [A]		I_{DM}	-150	A
Avalanche Current [A]		I_{AS}	-36	A
Single Pulse Avalanche Energy L =0.3mH [A]		E_{AS}	194.4	mJ
Power Dissipation [C]	T_C =25°C	P_D	75	W
	T_C =100°C		37.5	W
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 175	°C

Thermal Characteristics

Parameter		Symbol	Maximum	Units
Maximum Junction-to-Case	Steady-State	$R_{\theta JC}$	2	°C/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		-40			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} =-40V, V_{GS} =0V	T_J =25ºC			-1	μA
			T_J =125ºC			-100	
I_{GSS}	Gate-Body Leakage Current	V_{DS} =0V, V_{GS} =±20V				±100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} =V_{GS}, I_D =-250μA		-1	-1.6	-2.4	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS} =-10V, I_D =-30A			11	14	mΩ
		V_{GS} =-4.5V, I_D =-30A			15	20	mΩ
g_{FS}	Forward Transconductance	V_{DS} =-5V, I_D =-20A			48		S
V_{SD}	Diode Forward Voltage	I_S =-30A, V_{GS} =0V				-1	V
I_S	Maximum Body-Diode Continuous Current [B]					-46	A
DYNAMIC PARAMETERS							
C_{iss}	Input Capacitance	V_{GS} =0V, V_{DS} =-20V, f =1MH_Z			3098		pF
C_{oss}	Output Capacitance				320		
C_{rss}	Reverse Transfer Capacitance				261		
R_g	Gate Resistance	f =1MH_Z			6.5		Ω
SWITCHING PARAMETERS							
Q_g(-10V)	Total Gate Charge	V_{GS} =-10V,V_{DS} =-20V, I_D =-20A			60		nC
Q_g(-4.5V)	Total Gate Charge				32		
Q_{gs}	Gate Source Charge				10		
Q_{gd}	Gate Drain Charge				15		
$t_{D(on)}$	Turn-On Delay Time	V_{GS} =-10V,V_{DS} =-20V, I_D =-20A, R_G =3Ω			28		ns
t_r	Turn-On Rise Time				11		
$t_{D(off)}$	Turn-Off Delay Time				54		
t_f	Turn-Off Fall Time				13		
t_{rr}	Body Diode Reverse Recovery Time	I_F =-20A, di/dt =100A/μs			23		ns
Q_{rr}	Body Diode Reverse Recovery Charge				26		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

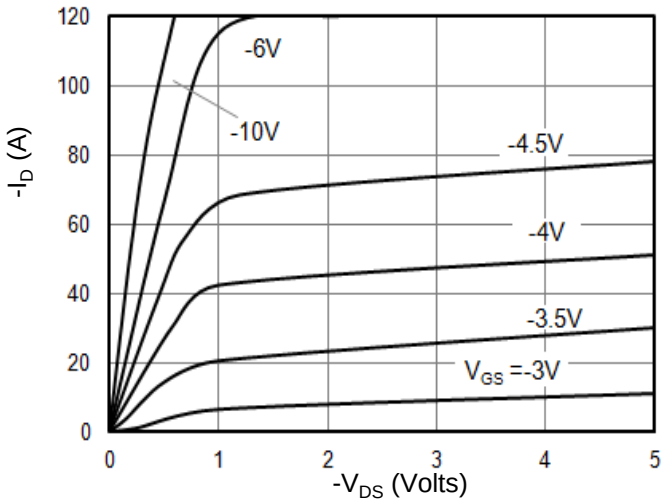


Figure 1: On-Region Characteristics

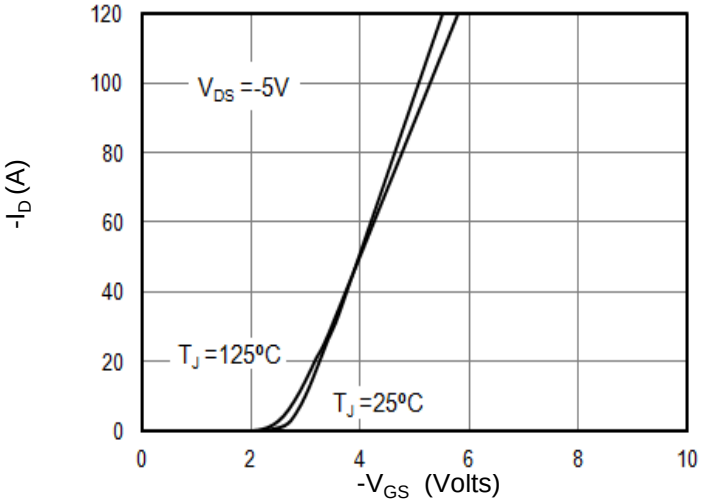


Figure 2: Transfer Characteristics

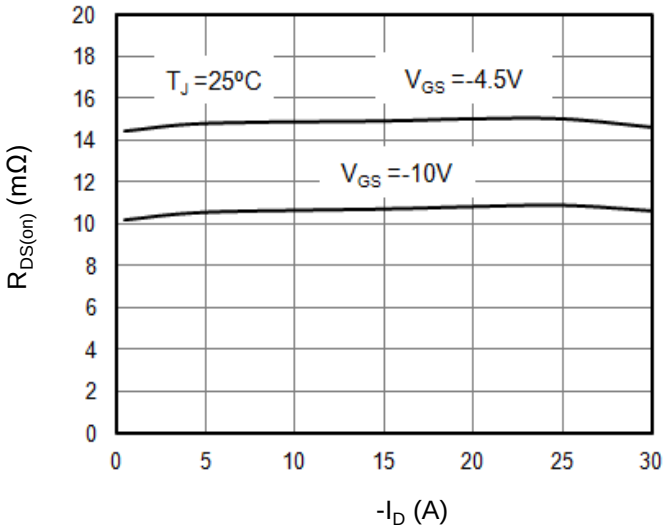


Figure 3: On-Resistance vs. Drain Current

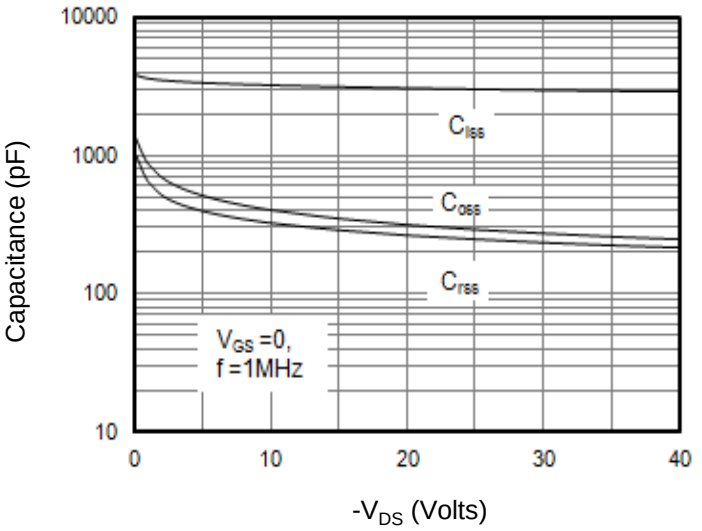


Figure 4: Capacitance Characteristics

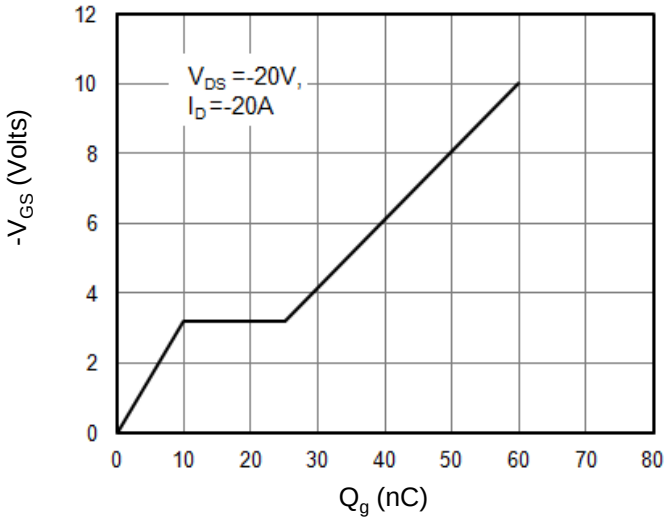


Figure 5: Gate Charge Characteristics

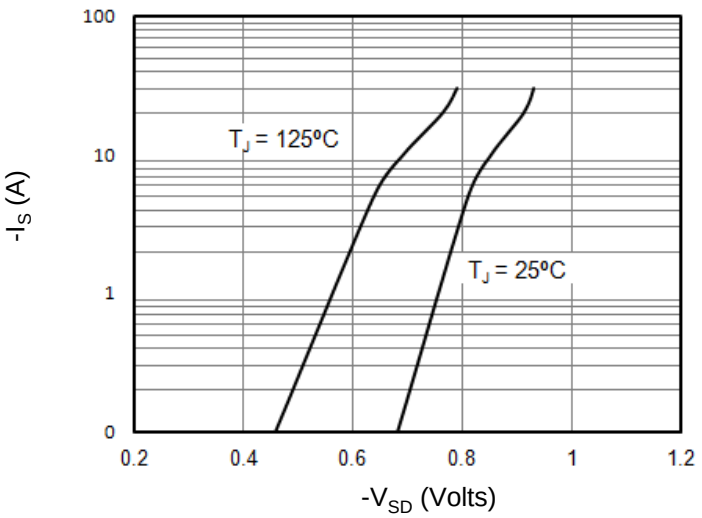


Figure 6: Body Diode Forward Voltage

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

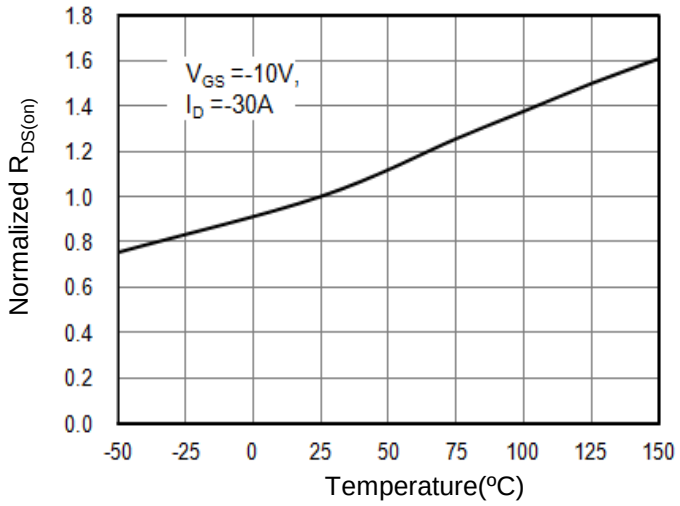


Figure 7: On-Resistance vs. Junction Temperature

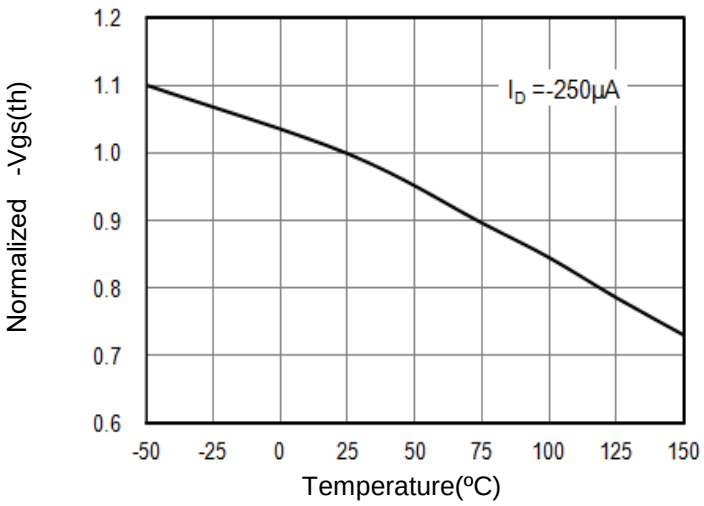


Figure 8: Vgs(th) vs. Junction Temperature

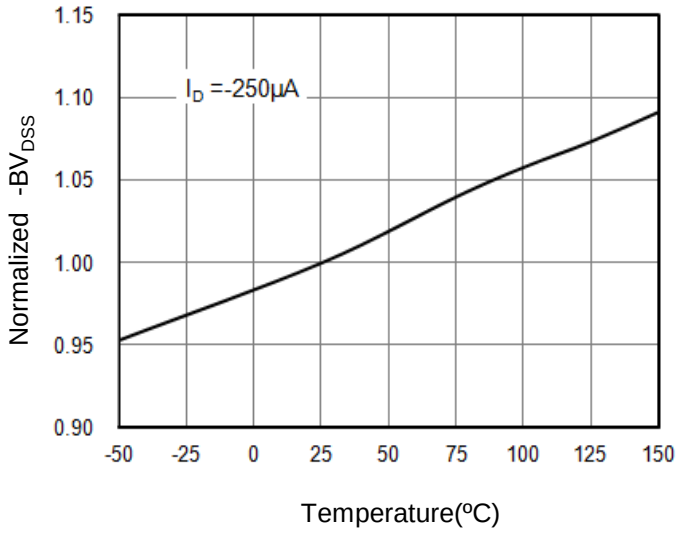


Figure 9: BV_{DSS} vs. Junction Temperature

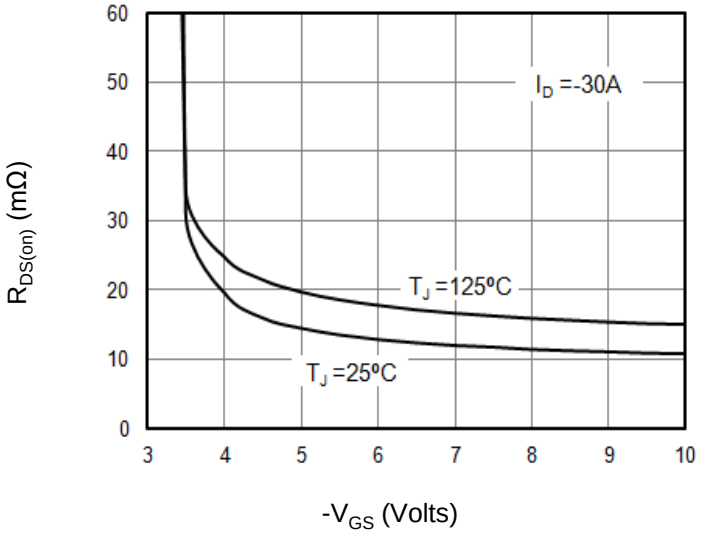


Figure 10: On-Resistance vs. Gate-Source Voltage

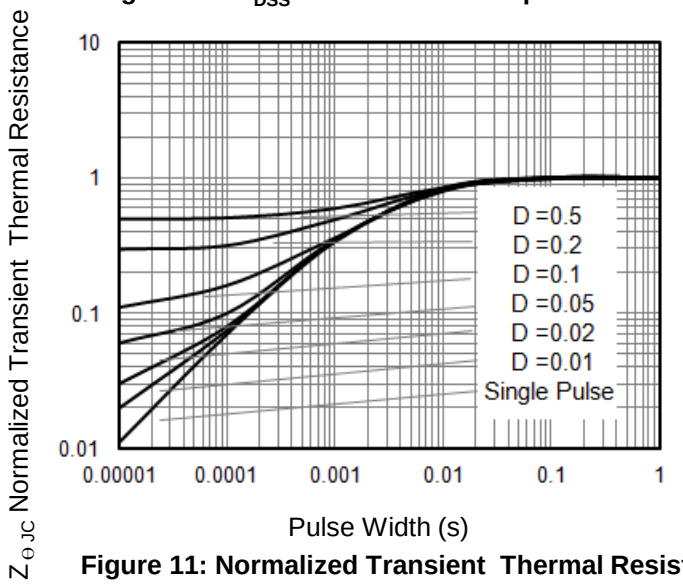


Figure 11: Normalized Transient Thermal Resistance

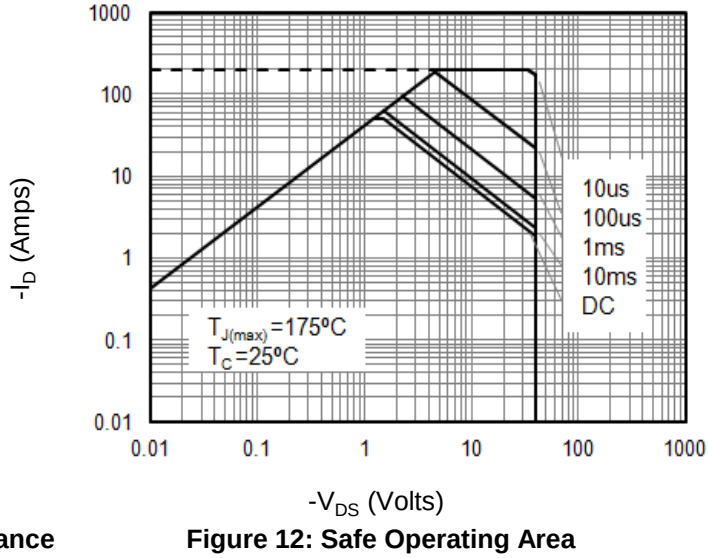


Figure 12: Safe Operating Area

Figure A：Gate Charge Test Circuit and Waveform

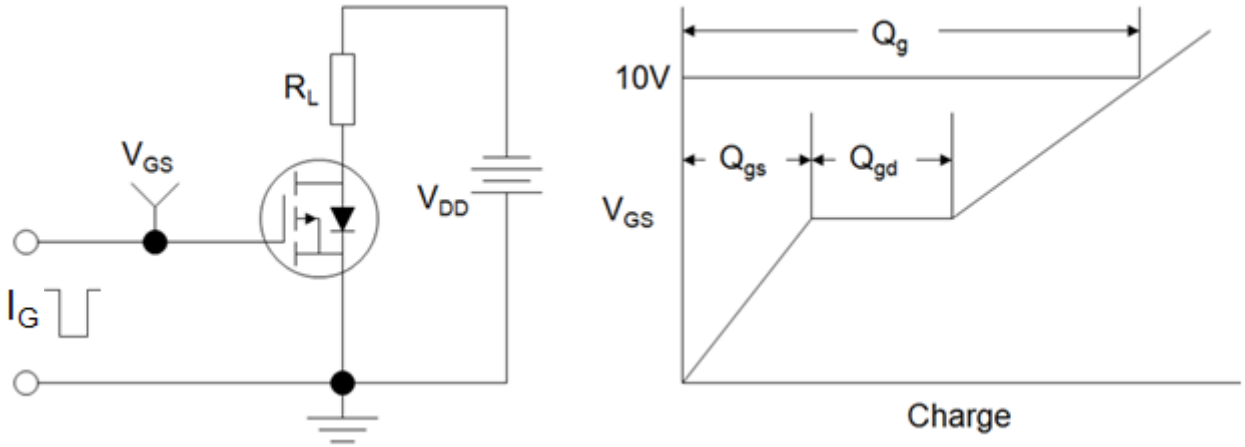


Figure B：Resistive Switching Test Circuit and Waveform

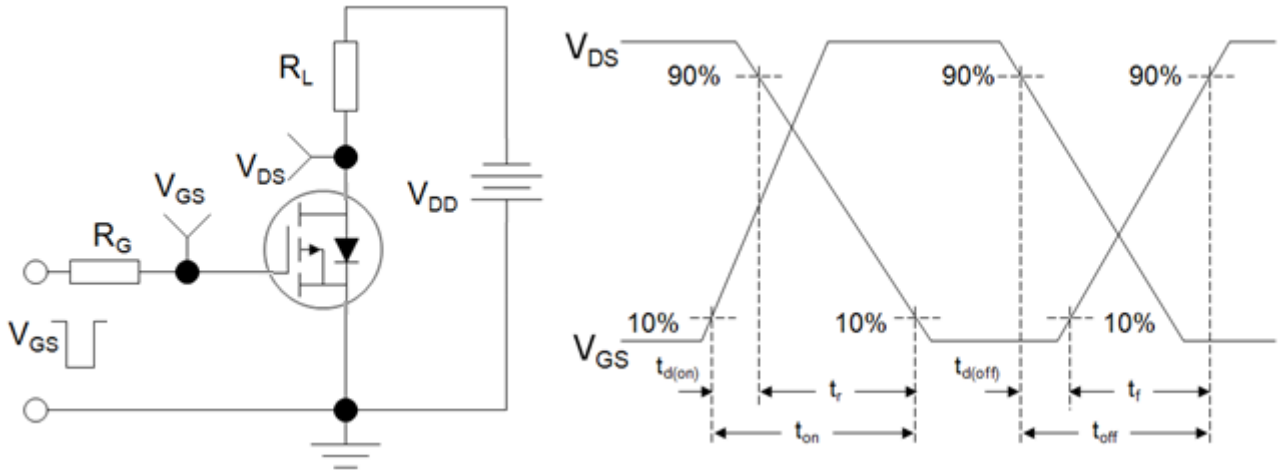
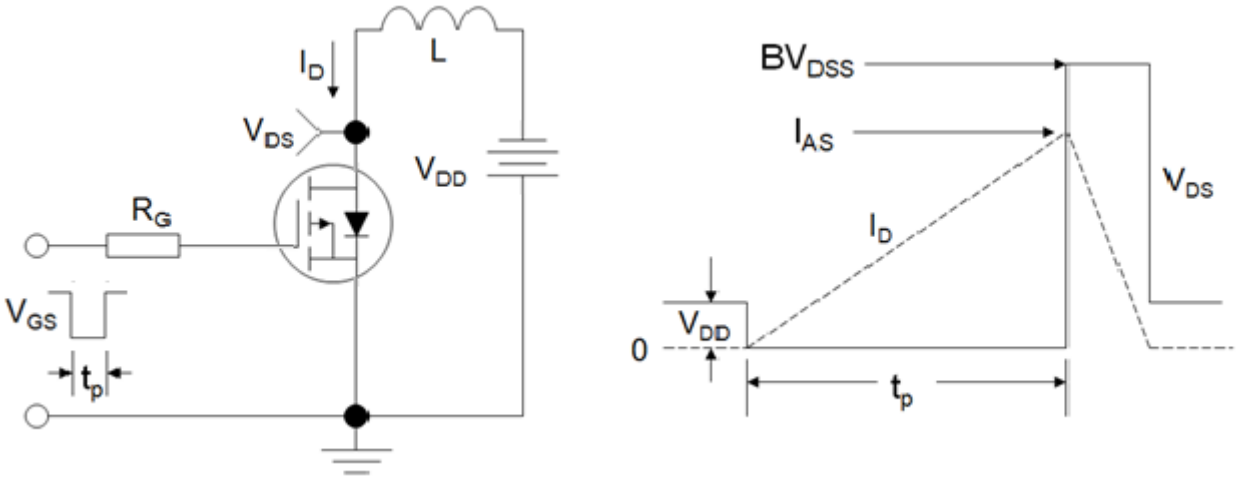
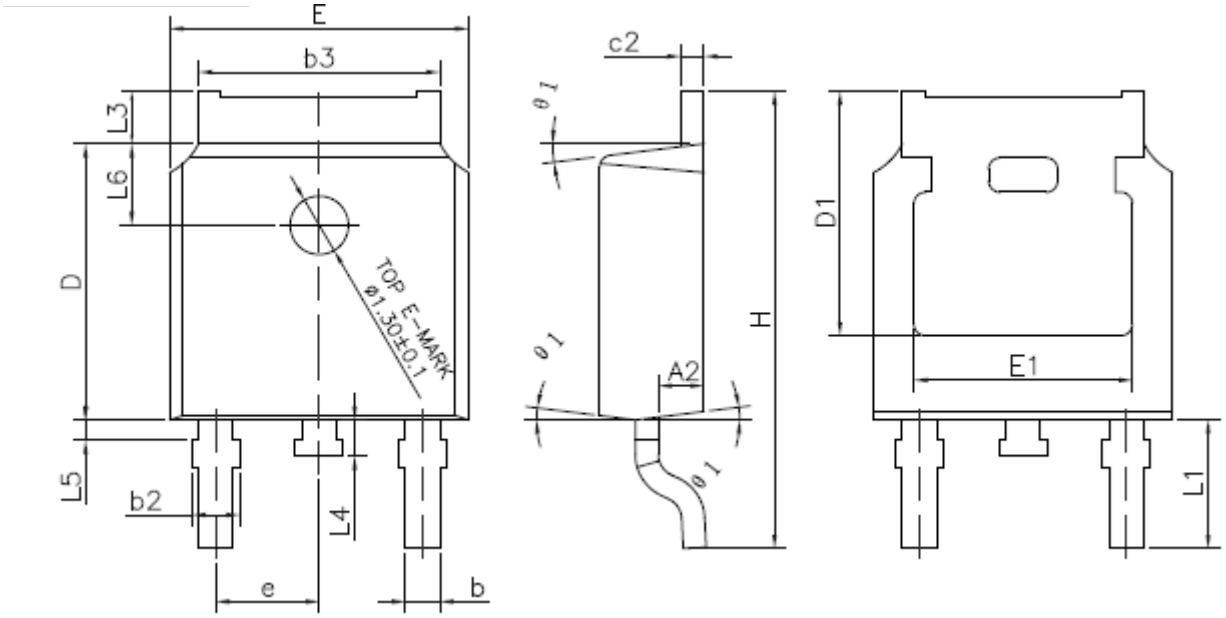
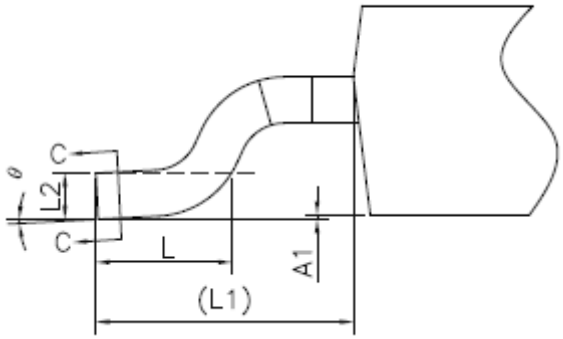


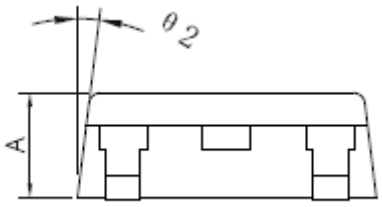
Figure C：Unclamped Inductive Switching Test Circuit and Waveform



TO-252(M)



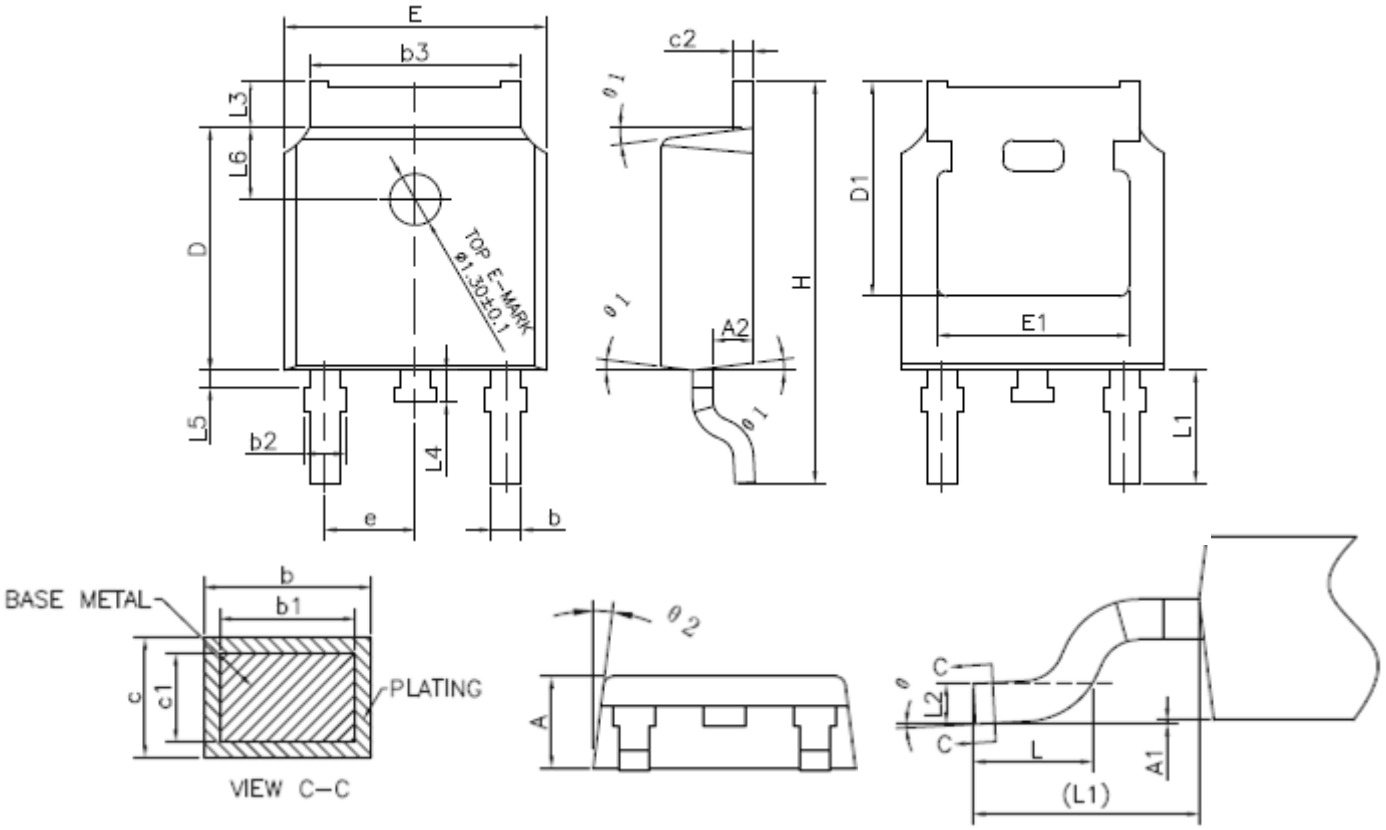




COMMON DIMENSIONS
(UNITS OF MEASURE =MILLIMETER)

SYMBOL	MIN	NOM	MAX
A	2.20	2.30	2.38
A1	0	—	0.10
A2	0.90	1.01	1.10
b	0.72	—	0.85
b1	0.71	0.76	0.81
b2	0.72	—	0.90
b3	5.13	5.33	5.46
c	0.47	—	0.60
c1	0.46	0.51	0.56
c2	0.47	—	0.60
D	6.00	6.10	6.20
D1	5.25	—	—
E	6.50	6.60	6.70
E1	4.70	—	—
e	2.186	2.286	2.386
H	9.80	10.10	10.40
L	1.40	1.50	1.70
L1	2.90 REF		
L2	0.508 BSC		
L3	0.90	—	1.25
L4	0.60	0.80	1.00
L5	0.15	—	0.75
L6	1.80 REF		
θ	0°	—	8°
θ1	5°	7°	9°
θ2	5°	7°	9°

TO-252（I）



SYMBOL	MIN	NOM	MAX
A	2,20	2,30	2,38
A1	0	—	0,10
A2	0,90	1,01	1,10
b	0.72	—	0.85
b1	0.71	0.76	0.81
b2	0.72	—	0.90
b3	5.13	5.33	5.46
c	0.47	—	0.60
c1	0,46	0,51	0,56
c2	0,47	—	0,60
D	6,00	6,10	6,20
D1	5,25	—	—
E	6.50	6.60	6.70
E1	4.70	—	—
e	2.186	2.286	2.386
H	9.80	10.10	10.40
L	1,40	1,50	1,70
L1	2,90 REF		
L2	0,508 BSC		
L3	0,90	—	1,25
L4	0,60	0,80	1,00
L5	0.15	—	0.75
L6	1.80 REF		
θ	0°	—	8°
θ1	5°	7°	9°
θ2	5°	7°	9°

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