Lead Free Package and Finish

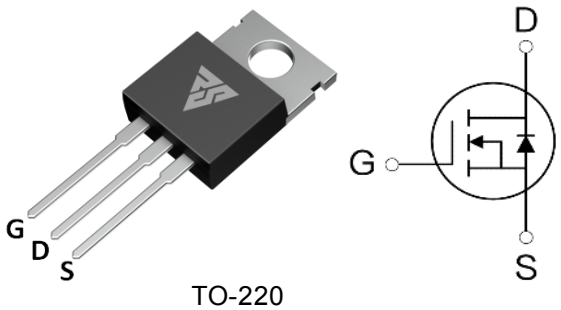
Applications:

- DC-DC converter
- Portable Equipment
- Power management

I_D	$R_{DS(ON)}$(Typ)	V_{DSS}
174A	3.0mΩ	135V

Features:

- Low Reverse transfer capacitances
- Fast switching speed
- Low Gate Charge and RDS(on)



TO-220

Not to Scale

Ordering Information

Part Number	Package	Marking
RS135N170T	TO-220	RS135N170T

Absolute Maximun Ratings Tc=25℃unless otherwise specified

Symbol	Parameter	RS135N170T	Units
VDSS	Drain-to-Source Voltage	135	V
ID	Continuous Drain Current TC = 25 °C	174	A
	Continuous Drain Current TC = 100 °C	105	
IDM	Pulsed Drain Current	640	
VGS	Gate-to-Source Voltage	±20	V
EAS	Single Pulse Avalanche Engergy L=0.5mH VDD=70V RG=25ΩTJ=25℃	1225	mJ
IAR	Single pulse avalanche current	70	A
PD	Total Power Dissipation @ TC=25℃	250	W
TL	Maximum Temperature for Soldering	300	℃
TPKG	Leads at 0.063in(1.6mm)from Case for 10 seconds Package Body for 10 seconds	260	
TJ and TSTG	Operating Junction and Storage Temperature Range	-55 to 150	

* Drain Current Limited by Maximum Junction Temperature

Caution: Stresses greater than those listed in the "Absolute Maximum Ratings" Table may cause permanent damage to the device.

Thermal Resistance

Symbol	Parameter	RS135N170T	Units	Test Conditions
RθJC	Junction-to-Case	0.5	℃/ W	Drain lead soldered to water cooled heatsink, PD adjusted for a peak junction temperature of +150℃
RθJA	Junction-to-Ambient	60		1 cubic foot chamber, free air.

OFF Characteristics TJ=25℃ unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
BV_{DSS}	Drain-to-source Breakdown Voltage	135	--	--	V	V_{GS}=0V,I_D=250μA
I_{DSS}	Drain-to-Source Leakage Current	--	--	1.0	μA	V_{DS}=135V,V_{GS}=0V
I_{GSS}	Gate-to-Source Forward Leakage	--	--	100	nA	V_{GS}=20V ,V_{DS}=0V
	Gate-to-Source Reverse Leakage	--	--	-100		V_{GS}=-20V ,V_{DS}=0V

ON Characteristics **TJ=25℃ unless otherwise specified**

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
$R_{DS(on)}$	Static Drain-to-Source On-Resistance (Note*2)	--	3.0	3.6	mΩ	V_{GS}=10V,I_D=20A
$V_{GS(TH)}$	Gate Threshold Voltage	2.5	--	3.5	V	V_{GS}=V_{DS},I_D=250μA

Resistive Switching Characteristics Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
$t_{d(ON)}$	Turn-on Delay Time	--	25	--	nS	V_{DS}=70V I_D=20A V_{GS}=10V R_G=5Ω
t_{rise}	Rise Time	--	33	--		
$t_{d(OFF)}$	Turn-OFF Delay Time	--	95	--		
t_{fall}	Fall Time	--	75	--		

Dynamic Characteristics Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
C_{iss}	Input Capacitance	--	8362	--	pF	V_{GS}=0V V_{DS}=70V f=1.0MHz
C_{oss}	Output Capacitance	--	863	--		
C_{rss}	Reverse Transfer Capacitance	--	14.2	--		
Q_g	Total Gate Charge	--	138	--	nC	V_{DS}=70V I_D=20A V_{GS}=10V
Q_{gs}	Gate-to-Source Charge	--	34	--		
Q_{gd}	Gate-to-Drain("Miller") Charge	--	32	--		

Source- Drain Diode Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
I_S	Continuous Source Current	--	--	174	A	Integral pn-diode in MOSFET
I_{SM}	Maximum Pulsed Current	--	--	640	A	
V_{SD}	Diode Forward Voltage	--	--	1.2	V	I_S=20A,V_{GS}=0V
t_{rr}	Reverse Recovery Time	--	130	--	nS	V_{GS}=0V I_S=20A,di/dt=100A/μs
Q_{rr}	Reverse Recovery Charge	--	500	--	nC	

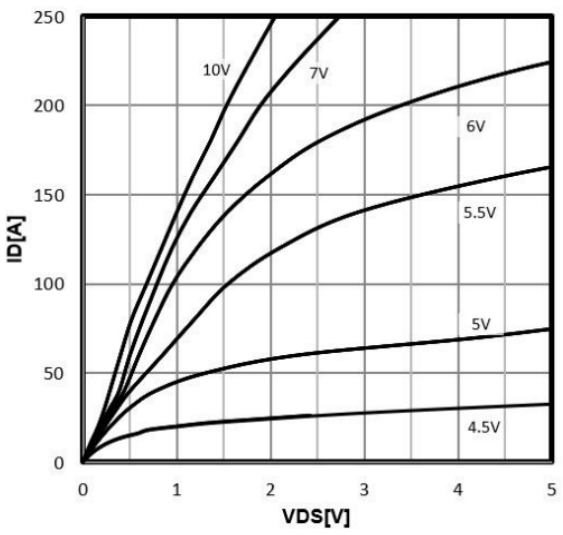
Notes:

*1. Repetitive rating; pulse width limited by maximum junction temperature.

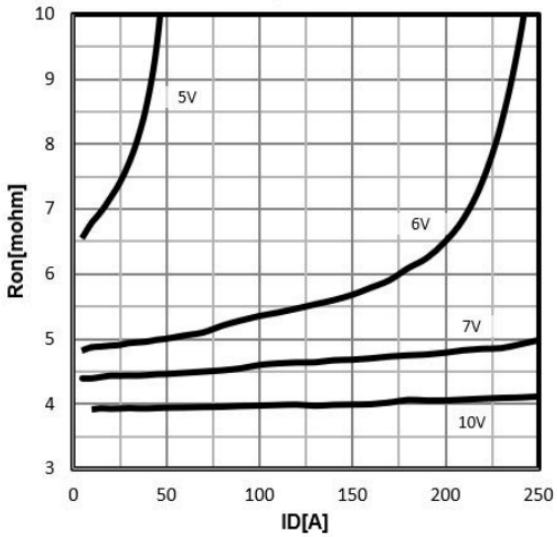
*2. Pulse Test: Pulse width ≤ 300μs, Duty Cycle ≤ 1%

Typical Feature curve

Typ. output characteristics
$I_D=f(V_{DS})$

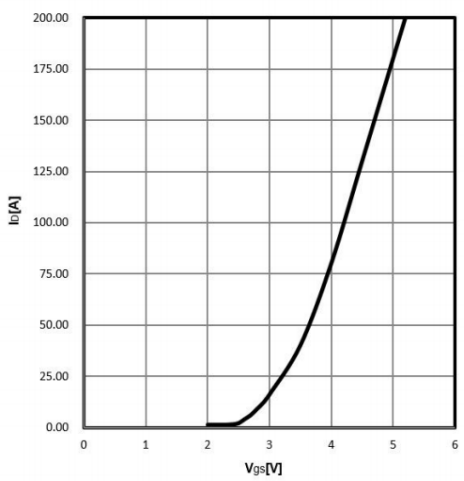


Typ. drain-source on resistance
$R_{DS(on)}=f(I_D)$



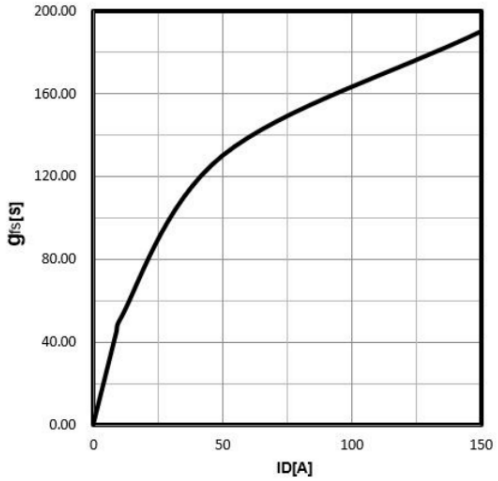
Typ. transfer characteristics

$I_D=f(V_{GS})$



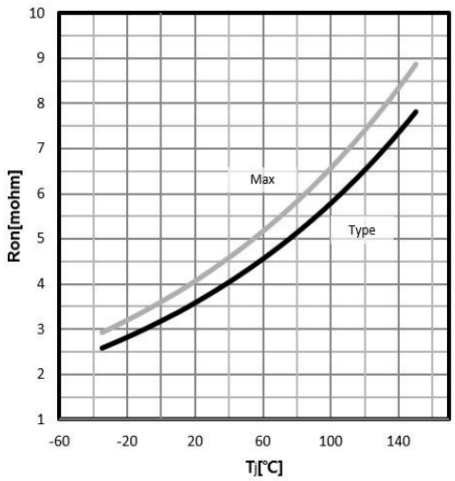
Typ. forward transconductance

$g_{fs}=f(I_D)$



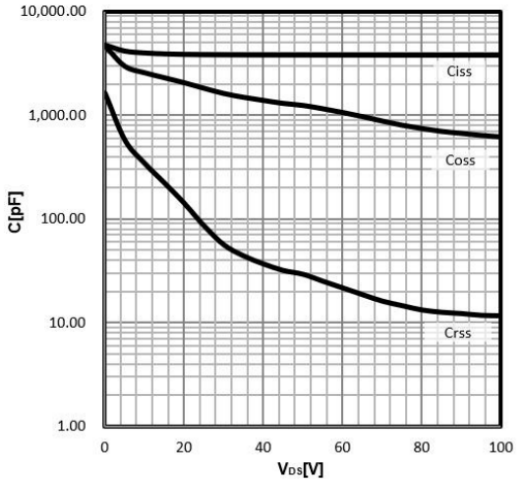
Drain-source on-state resistance

$R_{DS(on)}=f(T_j)$; I_D=80A; V_{GS}=10V



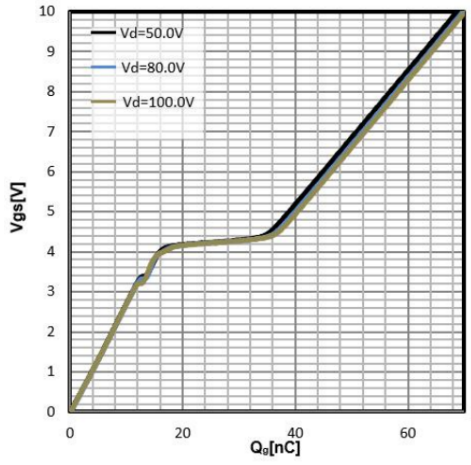
Typ. capacitances

C =f(V_{DS}); V_{GS}=0V; f =1MHz



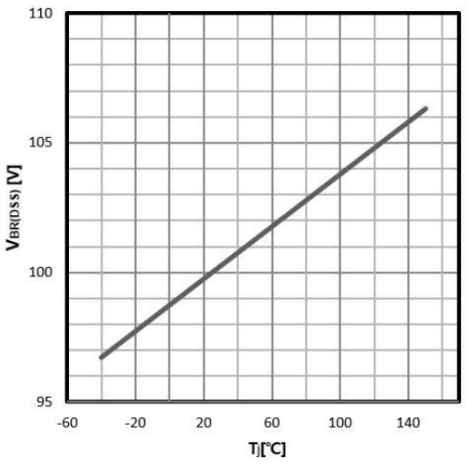
Typ. gate charge

$V_{GS}=f(Q_{gate})$; I_D=20A



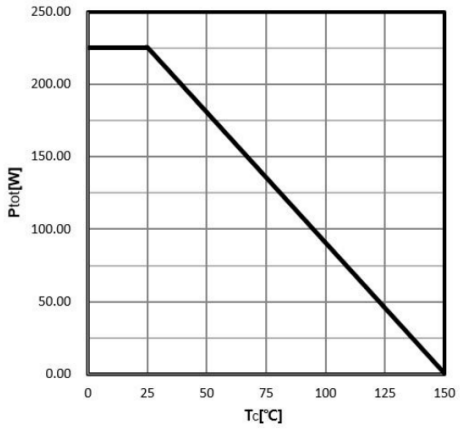
Drain-source breakdown voltage

$V_{BR(DSS)}=f(T_j)$; I_D=250uA



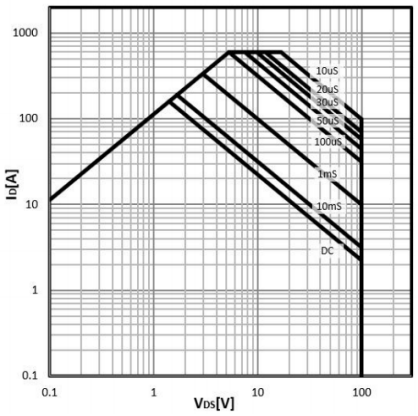
Power Dissipation

$P_{tot}=f(T_C)$



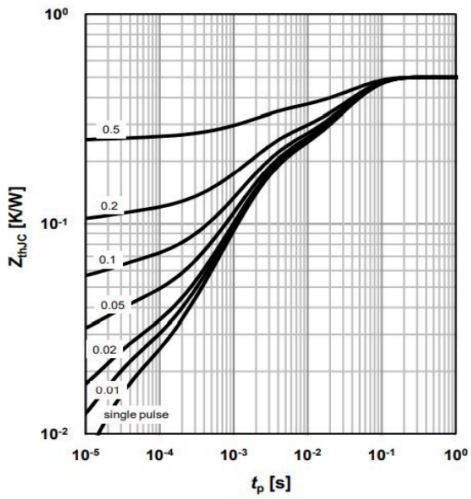
Safe operating area

$I_D=f(V_{DS})$



Max. transient thermal impedance

$Z_{thJC}=f(t_p)$



Test Circuits and Waveforms

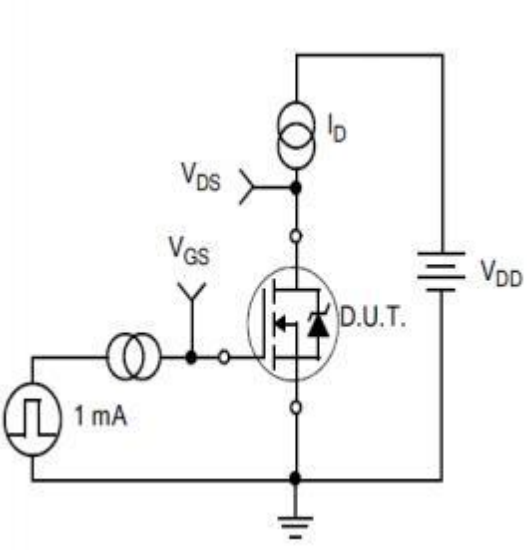


Figure A.
Gate Charge Test Circuit

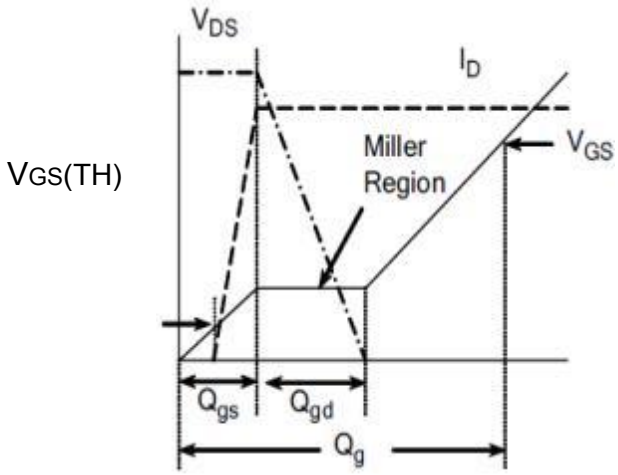


Figure B.
Gate Charge Waveform

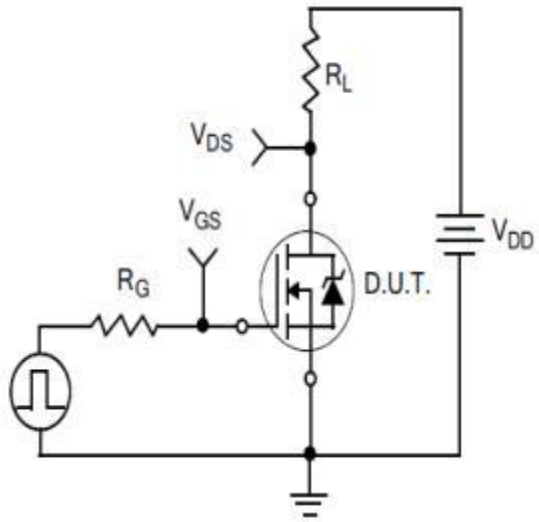


Figure C.
Resistive Switching Test Circuit

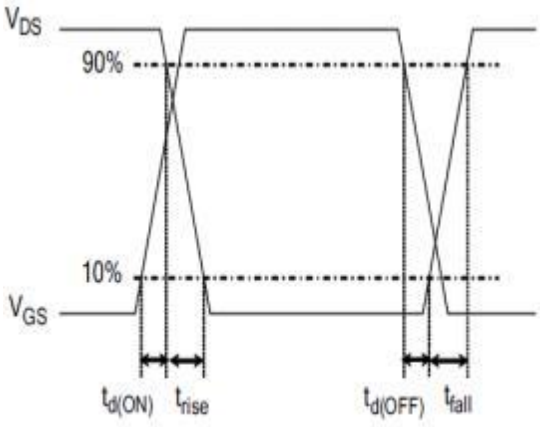


Figure D.
Resistive Switching Waveforms

Test Circuits and Waveforms

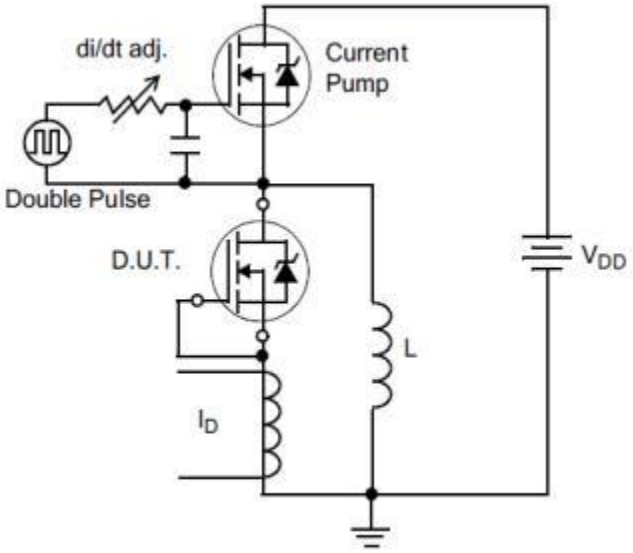


Figure E.Diode Reverse Recovery Test Circuit

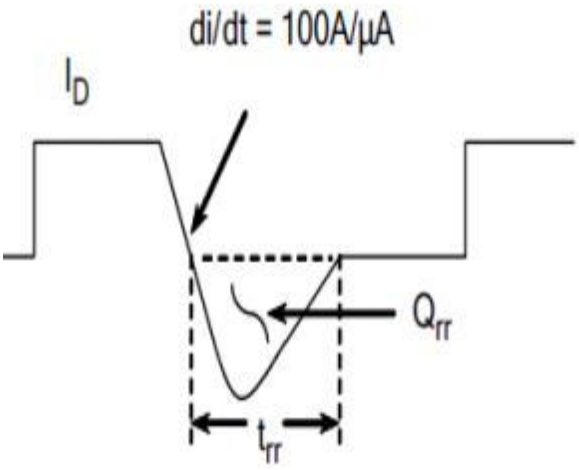


Figure F.Diode Reverse Recovery Waveform

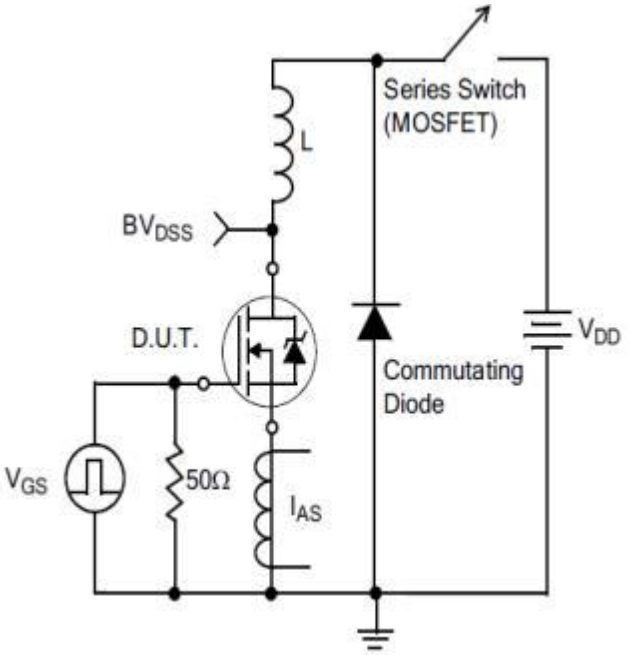
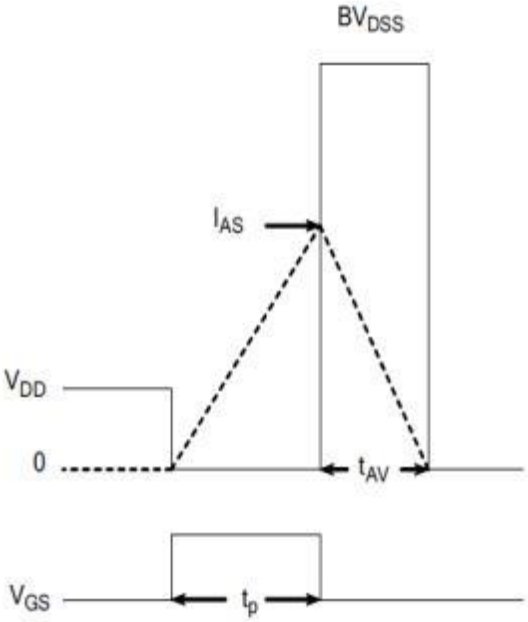


Figure G.Unclamped Inductive Switching Test Circuit



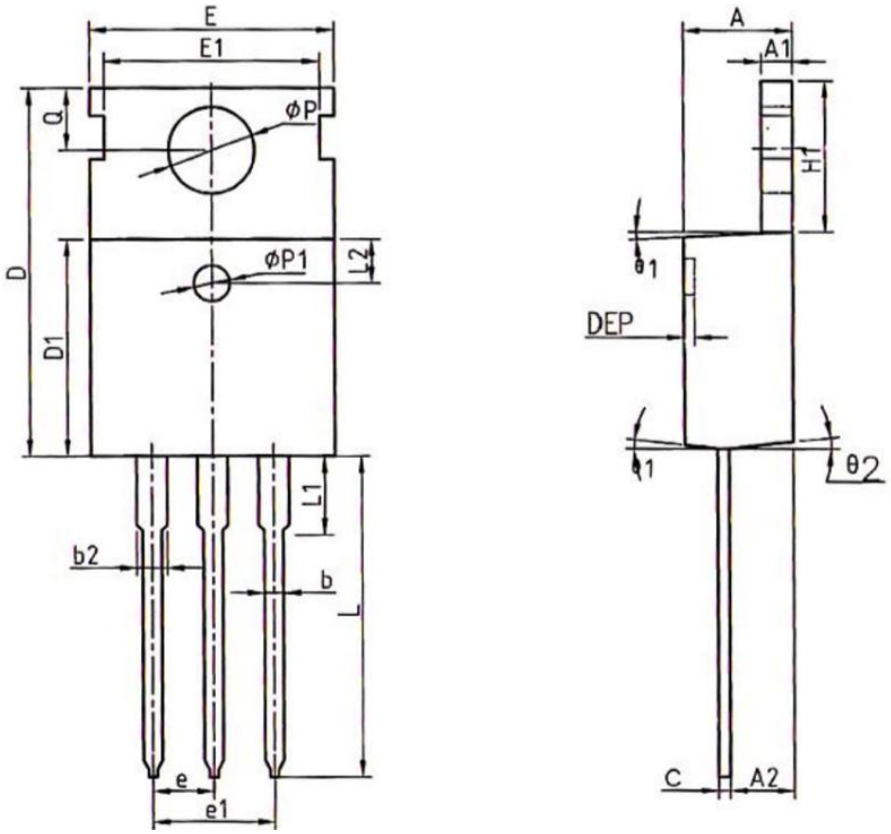
$$E_{AS}=\frac{I_{AS}^2 L}{2}$$

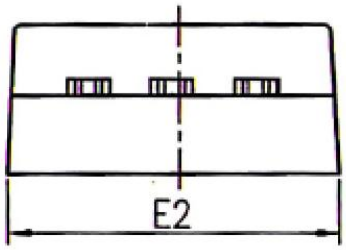
Figure H.Unclamped Inductive Switching Waveforms

Package outline drawing

TO-220

Unit:mm





COMMON DIMENIONS

SYMBOL	MM		
	MIN	NOM	MAX
A	4.40	4.57	4.70
A1	1.27	1.30	1.37
A2	2.35	2.40	2.50
b	0.77	0.80	0.90
b2	1.17	1.27	1.36
c	0.48	0.50	0.56
D	15.40	15.60	15.80
D1	9.00	9.10	9.20
DEP	0.05	0.10	0.20
E	9.80	10.00	10.20
E1	–	8.70	–
E2	9.80	10.00	10.20
ΦP1	1.40	1.50	1.60
e	2.54BSC		
e1	5.08BSC		
H1	6.40	6.50	6.60
L	12.75	13.50	13.65
L1	–	3.10	3.30
L2		2.50REF	
ΦP	3.50	3.60	3.63
Q	2.73	2.80	2.87
θ1	5°	7°	9°
θ2	1°	3°	5°
θ3	1°	3°	5°

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