N Channel MOSFET

Lead Free Package and Finish

Applications:

•PWM applications

•Load switch

•Power management

I_D	$R_{DS(ON)}$(Max.)	V_{DSS}
120A	3.3mΩ	40V

Features:

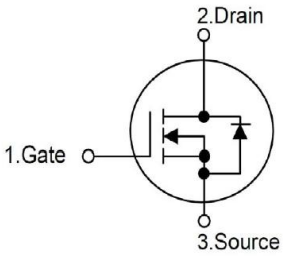
•V_{DS}=40V; I_D=120A
$R_{DS(ON)}$<4.5mΩ @ V_{GS}=4.5V
$R_{DS(ON)}$ < 3.3mΩ @ V_{GS} =10V

•Ultra Low On-Resistance

•High UIS and UIS 100% Test

•RoHS Compliant

TO-220 Top view



Not to Scale

Ordering Information

Part Number	Package	Marking
RS40N120T	TO-220	RS40N120T

Absolute Maximun Ratings Tc=25℃ unless otherwise specified

Symbol	Parameter	RS40N120T	Units
VDSS	Drain-to-Source Voltage	40	V
ID	Continuous Drain Current（Tc=25℃）	120	A
	Continuous Drain Current Tc=100℃	77	
IDM	Pulsed Drain Current (Note*1)	440	
PD	Power Dissipation（Tc=25℃）	187	W
VGS	Gate-to-Source Voltage	±20	V
EAS	Single Pulse Avalanche Engergy	625	mJ
TL TPKG	Maximum Temperature for Soldering Leads at 0.063in(1.6mm)from Case for 10 seconds Package Body for 10 seconds	300 260	℃
TJ and TSTG	Operating Junction and Storage Temperature Range	-55 to 175	

*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	RS40N120T	Units	Test Conditions
RθJC	Junction-to-Case	0.8	℃/W	Drain lead soldered to water cooled heatsink,PD adjusted for a peak junction temperature of +175℃.

OFF Characteristics TJ=25℃ unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
BVDSS	Drain-to-source Breakdown Voltage	40	--	--	V	VGS=0V,ID=250μA
IDSS	Drain-to-Source Leakage Current	--	--	1	μA	VDS=40V,VGS=0V
IGSS	Gate-to-Source Forward Leakage	--	--	100	nA	VGS=+20V VDS=0V
	Gate-to-Source Reverse Leakage	--	--	-100		VGS=-20V VDS=0V

ON Characteristics TJ=25℃ unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
RDS(on)	Static Drain-to-Source On-Resistance	--	2.8	3.3	mΩ	VGS=10V,ID=4.5A
			3.5	4.3	mΩ	VGS=4.5V,ID=4.5A
VGS(TH)	Gate Threshold Voltage	0.8	1.4	2.0	V	VGS=VDS,ID=250μA

Resistive Switching Characteristics Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
td(ON)	Turn-on Delay Time	--	20	--	nS	VDS=30V VGS=10V RL=2.5Ω RG=3.0Ω
trise	Rise Time	--	25	--		
td(OFF)	Turn-OFF Delay Time	--	34	--		
tfall	Fall Time	--	14	--		

Dynamic Characteristics Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
Ciss	Input Capacitance	--	5952	--	pF	VGS=0V VDS=25V f=1.0MHz
Coss	Output Capacitance	--	568	--		
Crss	Reverse Transfer Capacitance	--	382	--		
Qg	Total Gate Charge	--	77	--	nC	VDS=30V ID=15A VGS=10V
Qgs	Gate-to-Source Charge	--	28	--		
Qgd	Gate-to-Drain("Miller"）Charge	--	31	--		

Source-Drain Diode Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
I_{SD}	Source-Drain Current(Body Diode)	--	120	--	A	
I_{SDM}	Pulsed Source-Drain Current(Body Diode)		440	--	A	
V_{SD}	Diode Forward Voltage (Note*1)	--	0.8	0.99	V	IS=1A,VGS=0V
trr	Reverse Recovery Time (Note*1)	--	28	--	nS	VGS=0V I_F=15A,di/dt=100A/μs
Qrr	Reverse Recovery Charge (Note*1)	--	22	--	nC	

Notes:

*1.Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 1.5%, Starting TJ=25℃

Typical Feature curve

Figure1. Output Characteristics

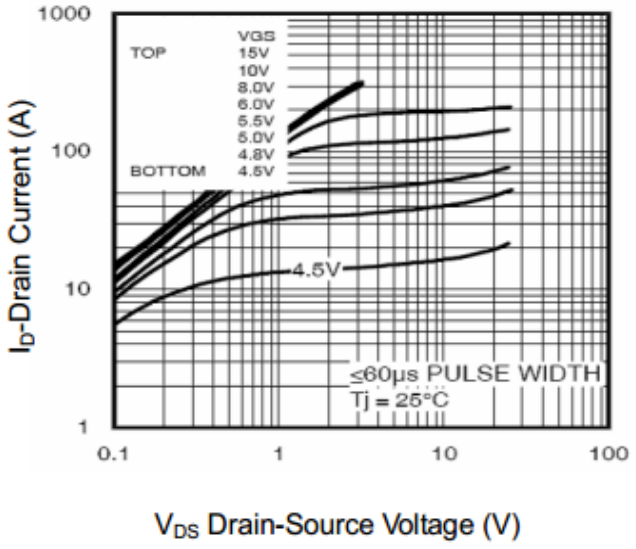


Figure2. Transfer Characteristics

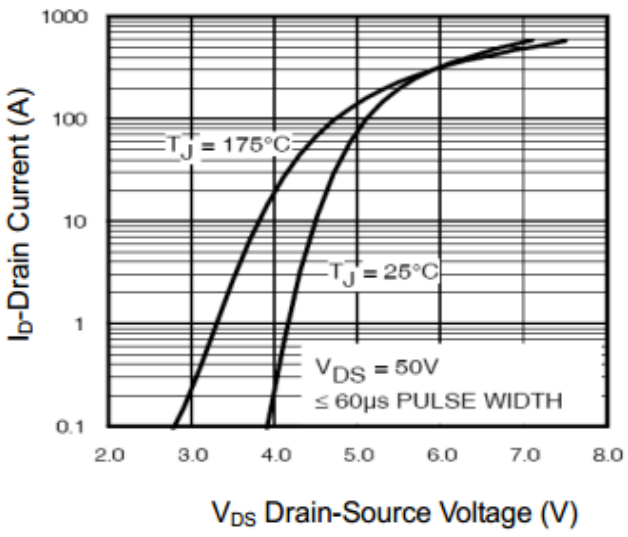


Figure3. BVDSS vs Junction Temperature

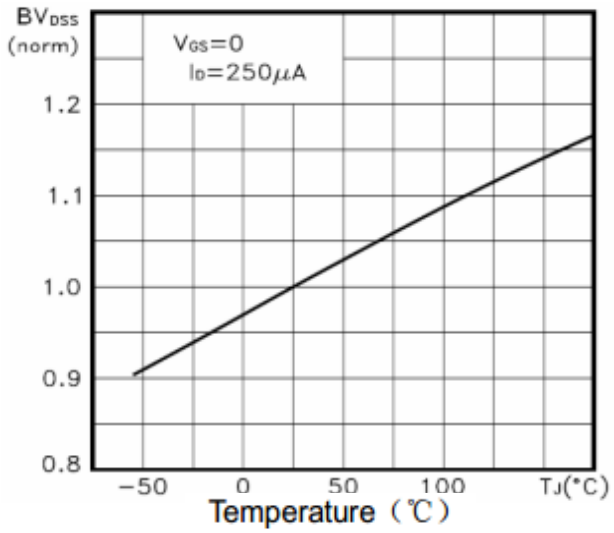


Figure4. ID vs Junction Temperature

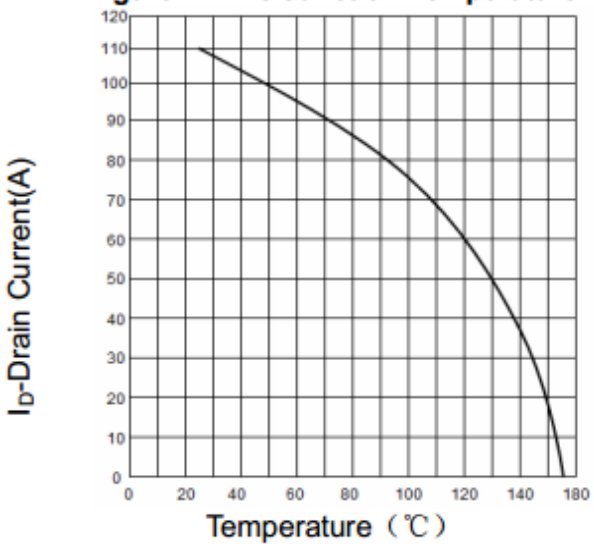


Figure5. VGS(th) vs Junction Temperature

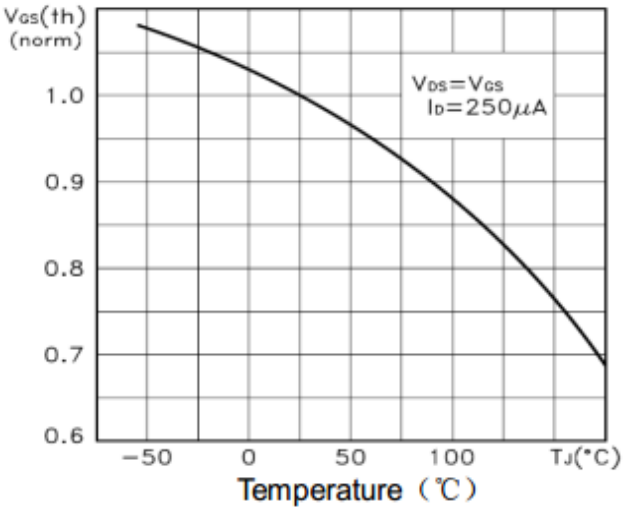


Figure6. Rdson Vs Junction Temperature

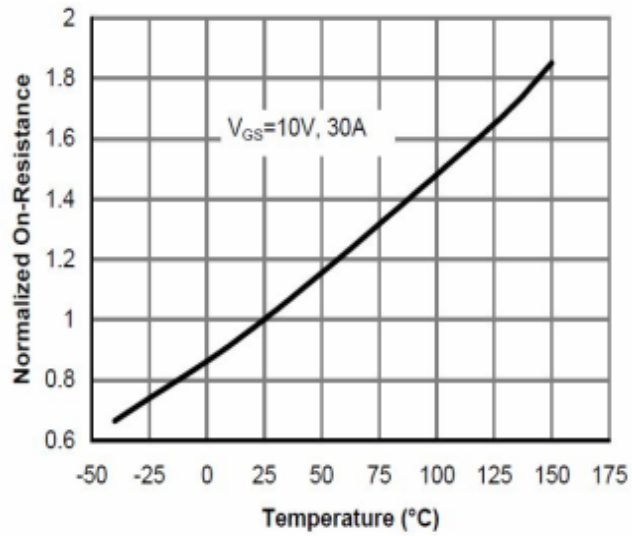


Figure7. Gate Charge

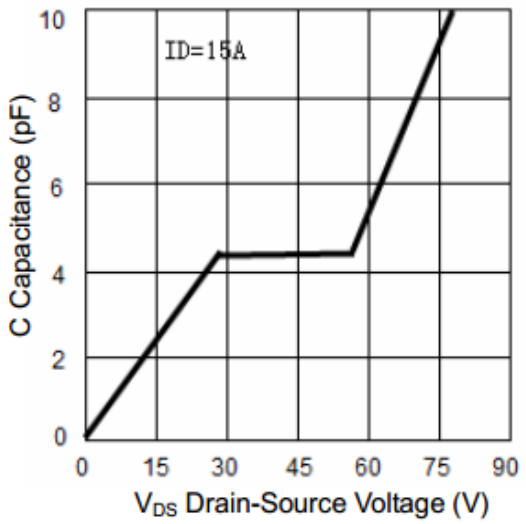


Figure8. Capacitance vs Vds

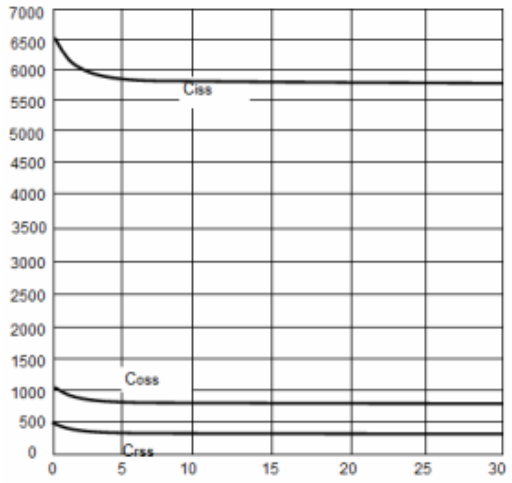


Figure9. Source- Drain Diode Forward

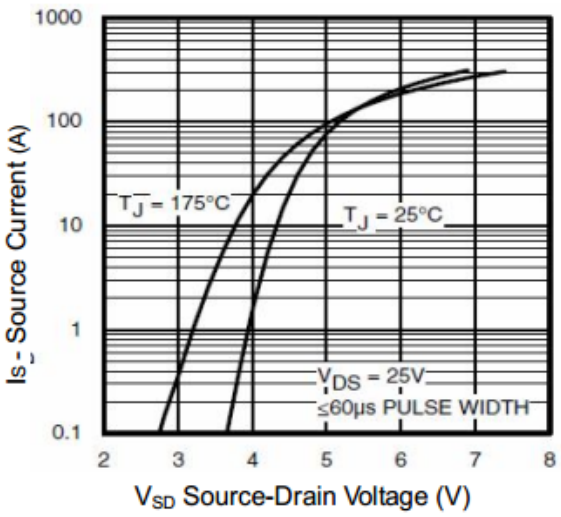


Figure10. Safe Operation Area

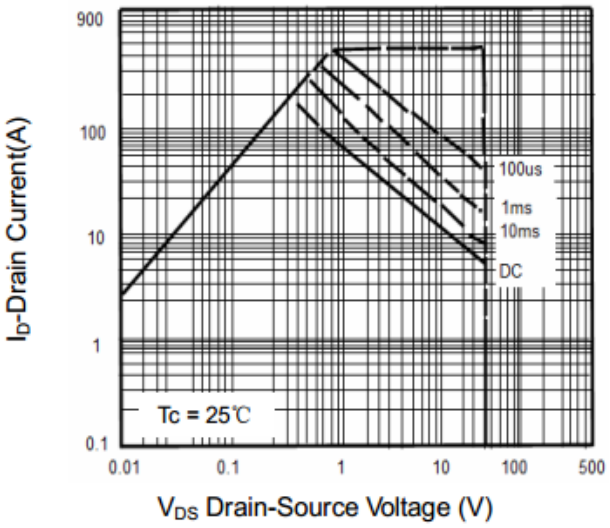
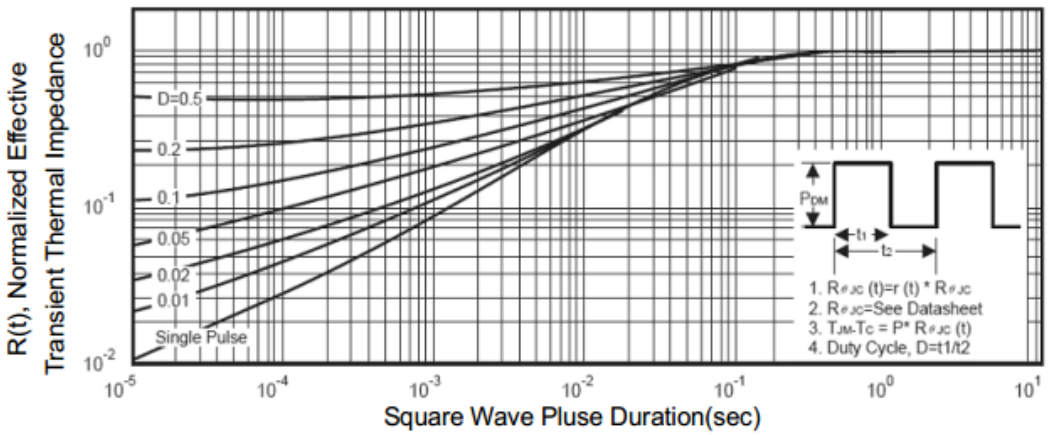


Figure11. Normalized Maximum Transient Thermal Impedance



Test Circuits and Waveforms

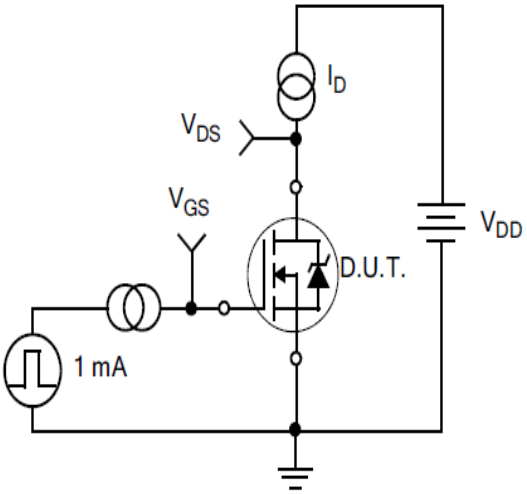


Figure A.
Gate Charge Test Circuit

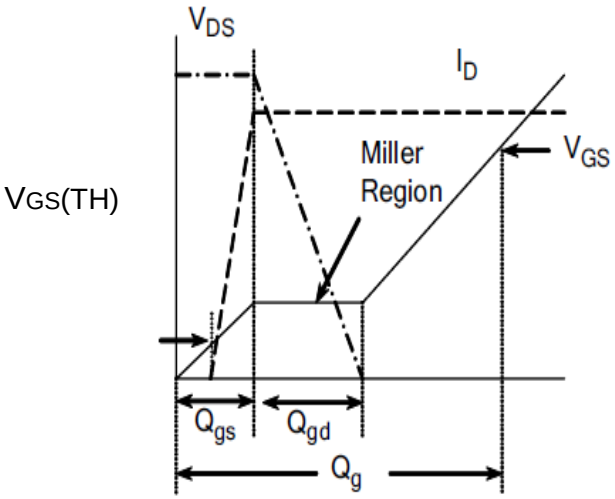


Figure B.
Gate Charge Waveform

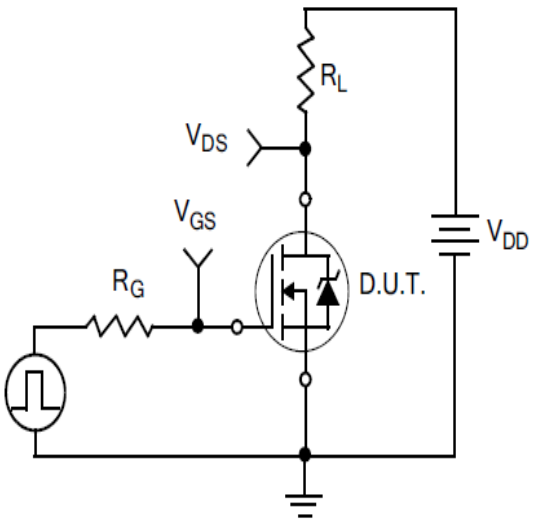


Figure C.
Resistive Switching Test Circuit

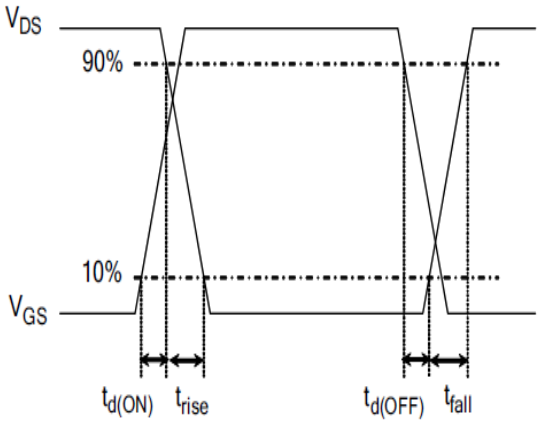


Figure D.
Resistive Switching Waveforms

Test Circuits and Waveforms

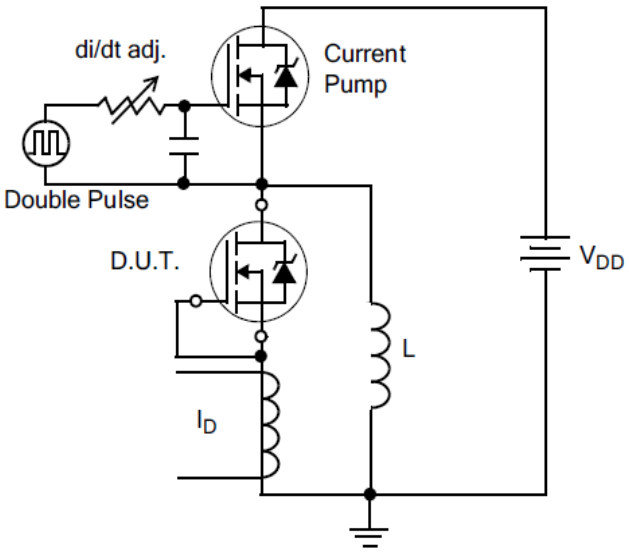


Figure E.Diode Reverse Recovery Test Circuit

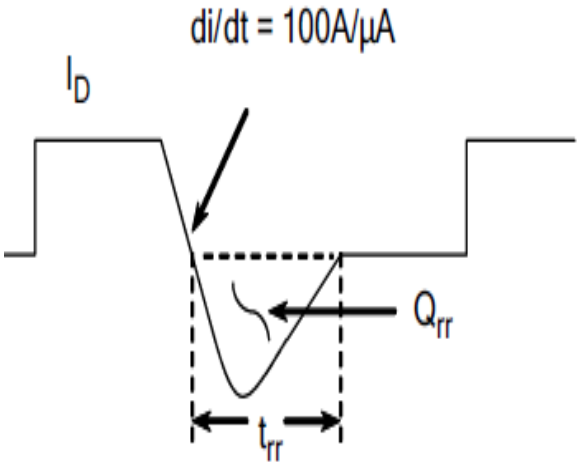


Figure F.Diode Reverse Recovery Waveform

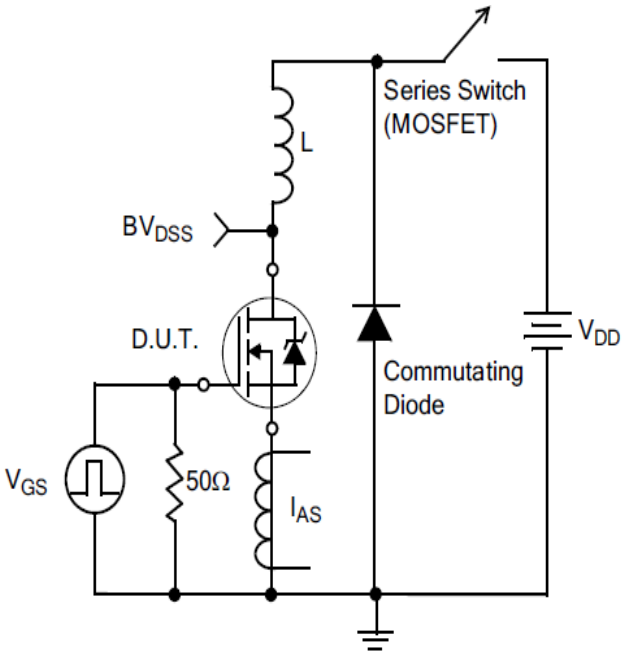
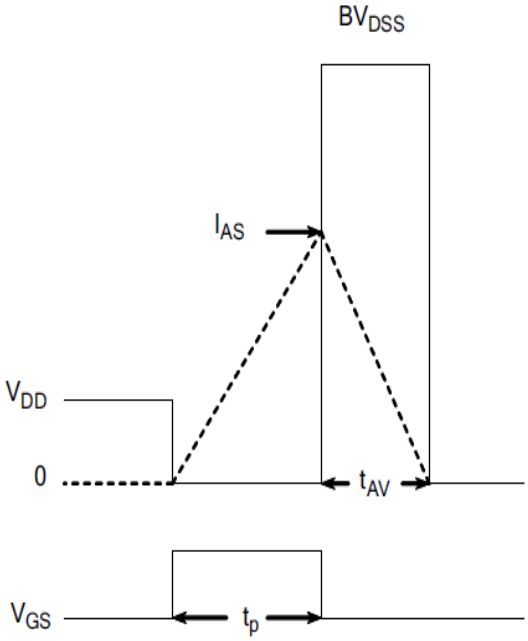


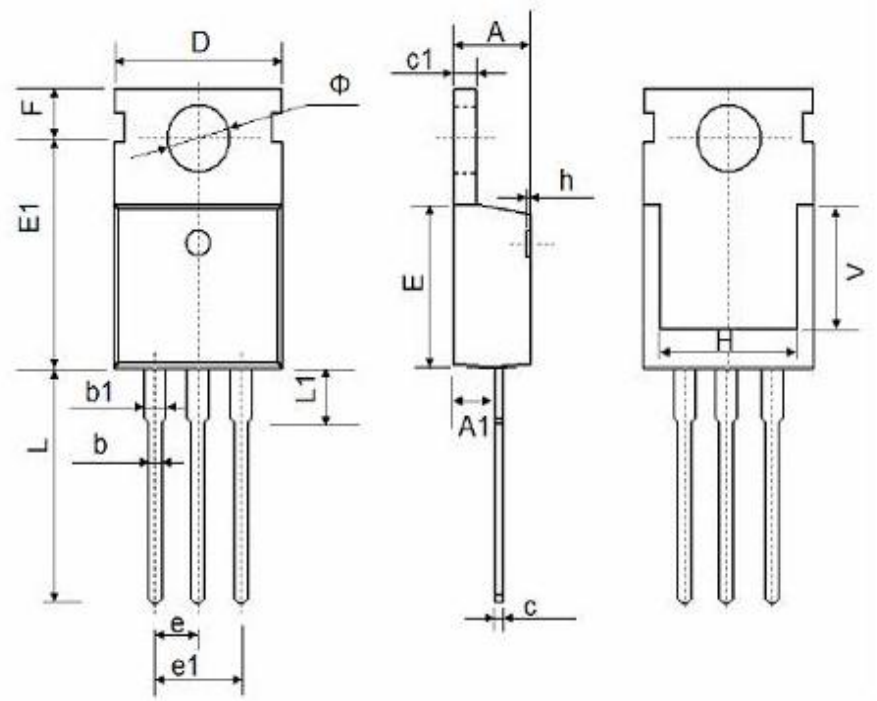
Figure G.Unclamped Inductive Switching Test Circuit



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

Figure H.Unclamped Inductive Switching Waveforms

Package outline drawing



TO-220

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.400	4.600	0.173	0.181
A1	2.250	2.550	0.089	0.100
b	0.710	0.910	0.028	0.036
b1	1.170	1.370	0.046	0.054
c	0.330	0.650	0.013	0.026
c1	1.200	1.400	0.047	0.055
D	9.910	10.250	0.390	0.404
E	8.9500	9.750	0.352	0.384
E1	12.650	12.950	0.498	0.510
e	2.540 TYP.		0.100 TYP.	
e1	4.980	5.180	0.196	0.204
F	2.650	2.950	0.104	0.116
H	7.900	8.100	0.311	0.319
h	0.000	0.300	0.000	0.012
L	12.900	13.400	0.508	0.528
L1	2.850	3.250	0.112	0.128
V	7.500 REF.		0.295 REF.	
Φ	3.400	3.800	0.134	0.150

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