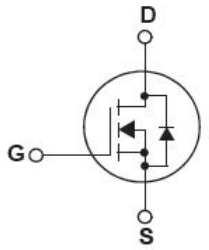
650V N-Channel Super-Junction MOSFET Gen-II

Description

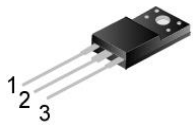
SJ-FET is new generation of high voltage MOSFET family that is utilizing an advanced charge balance mechanism for outstanding low on-resistance and lower gate charge performance.

This advanced technology has been tailored to minimize conduction loss,provide superior switchingperformance, and withstand extreme dv/dt rate and higher avalanche energy.

SJ-FET is suitable for various AC/DC power conversion in switching mode operation for higher efficiency.



1.Gate 2.Drain 3.Source



TO-220F-3L

Features

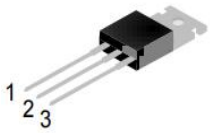
•Multi-Epi process SJ-FET

•700V@TJ=150℃

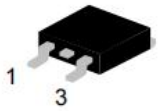
•Typ.RDS(on)=0.55Ω

•Ultra Low Gate Charge(typ.Qg=13.6nc)

•100% avalanche tseted



TO-220-3L



TO-252-2L

Package Marking and Ordering Information:

Marking	Package	Part #	Hazardous Substance Control	Packing
SR65R650F	T0-220F-3L	SR65R650F	Pb free	Tube
SR65R650T	T0-220-3L	SR65R650T	Pb free	Tube
SR65R650D	TO-252-2L	SR65R650D	Halogen free	Reel

Absolute Maximum Ratings

Symbol	Parameter	SR65R650T/D	SR65R650F	Unit
VDSS	Drain-Source Voltage	650		V
ID	Drain Current-Continuous(TC=25℃） -Continuous(TC=100℃）	7.8* 4.9*		A
IDM	Drain Current-Pulsed(Note1)	31.2*		A
VGSS	Gate-Source Voltage	±30		V
EAS	Single Pulsed Avalanche Energy(Note2)	106		mJ
IAS	Avalanche current,repetitive or not-repetitive (pulse width limited by Tj max)	2.7		A
DV/DT	Peak Diode Recovery DV/DT(Note3)	15		V/ns
DV/DS/DT	Drain Source Voltage Slope(Vds=640V)	50		V/ns
PD	Power Dissipation(TC=25℃）	80	30	W
TJ,TSTG	Operating and Storage Temperature Range	-55to+150		℃
TL	Maximun Lead Temperature for Soldring Purpose,1/8”from Case for 5 Seconds	260		℃

* Drain current limited by maximum junction temperature . Maximum duty cycle D=0.75.

Thermal Characteristics

Symbol	Parameter	SR65R650T/D	SR65R650F	Unit
RθJC	Thermal Resistance,Junction-to-Case	1.55	4.2	℃/W
RθCS	Thermal Resistance,Case-to-Sink Typ	0.5	-	℃/W
RθJA	Thermal Resistance,Junction-to-Ambient	62	80	℃/W

Electrical Characteristics TC = 25℃ unless otherwise noted

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Off Characteristics						
BVDSS	Drain-Source Breakdown Voltage	VGS=0V,ID=250uA Tj=25℃	650	-	-	V
		VGS=0V,ID=250uA Tj=150℃	-	700	-	V
BVDSS/TJ	Breakdown Voltage Temperature Coefficient	ID=250uA,Referenced to 25℃	-	0.6	-	V/℃
IDSS	Zero Gate Voltage Drain Currernt	VDS=650V,VGS=0V	-	- -	1 100	uA uA
		TC=125℃				
IGSSF	Gate-Body Leakage Current,Forward	VGS=30V,VDS=0V	-	-	100	nA
IGSSR	Gate-Body Leakage Current,Reverse	VGS=-30V,VDS=0V	-	-	-100	nA
On Characteristics						
VGS(th)	Gate Threshold Voltage	VDS=VGS,ID=250uA	2.0	3.0	4.0	V
Rg	Gate resitance	f=1MHz,open drain	-	9.6	-	Ω
RDS(on)	Static Drain-Source On-Resistance	VGS=10V,ID=3.5A (TO-220/TO-220F)	-	0.55	0.65	Ω
		VGS=10V,ID=3.5A (TO-252)	-	0.56	0.67	Ω
Dynamic Characteristics						
Ciss	Input Capacitance	VDS=100V,VGS=0V, f=1.0MHz	-	480	-	pF
Coss	Output Capacitance		-	22	-	pF
Crss	Reverse Transfer Capacitance		-	1.1	-	pF
Switching Characteristics						
td(on)	Turn-On Delay Time	VDS=400V,ID=3.9A RG=10Q,VGS=10V (Note4)	-	11	-	ns
tr	Turn-On Rise Time		-	21	-	ns
td(off)	Turn-Off Delay Time		-	40	-	ns
tf	Turn-Off Fall Time		-	31	-	ns
Qg	Total Gate Charge	VDS=400V,ID=7.8A VGS=10V,(Note4)	-	13.6	-	nc
Qgs	Gate-Source Charge		-	3.2	-	nc
Qgd	Gate-Drain Charge		-	5.6	-	nc
Drain-Source Diode Characteristics and Maximum Ratings						
IS	Maximum Continuous Drain-Source Diode Forward Current		-	-	7.8	A
ISM	Maximum Pulsed Drain-Source Diode Forward Current		-	-	31.2	A
VSD	Drain-Source Diode Forward voltage	VGS=0V,IS=7.8A	-	0.9	1.4	V
Trr	Reverse Recovery Time	VGS=0V,VDS=400V, IS=3.9A, dIF/dt=100A/us	-	205	-	ns
Qrr	Reverse Recovery Charge		-	1.4	-	uC
Irrm	Peak Reverse Recovery Current		-	12	-	A

NOTES:

1.Repetitive Rating:Pulse width limited by maximum junction temperature.

2.ID=IAS,VDD=50V,Starting TJ=25℃.

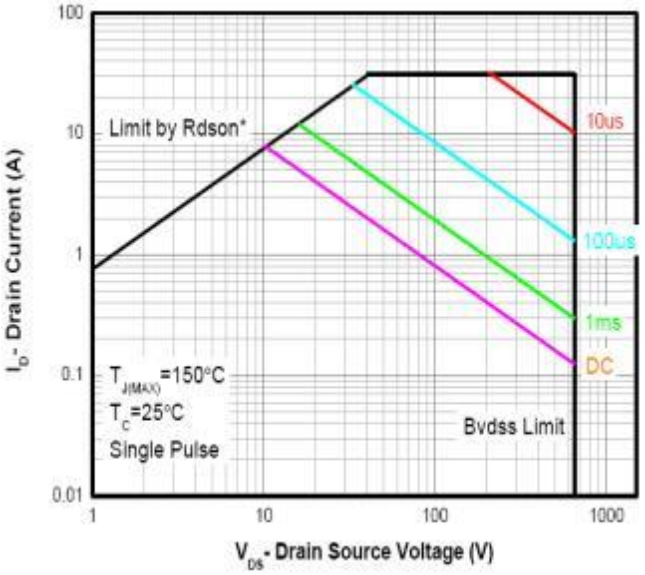
3.ISD≤ID,di/dt≤200A/us,VDD≤BVDSS,Starting TJ=25℃.

4.Essentially Independent of Operating Temperature Typical Characteristics.

Typical Performance Characteristics

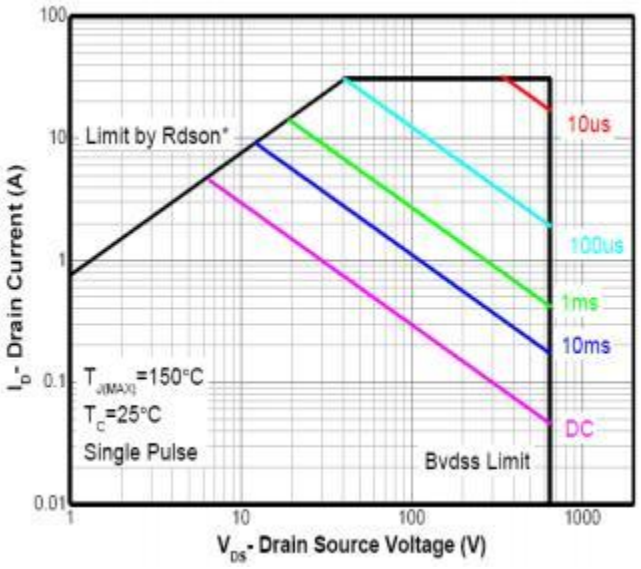
Safe operating area TC=25℃

TO-220.TO-252

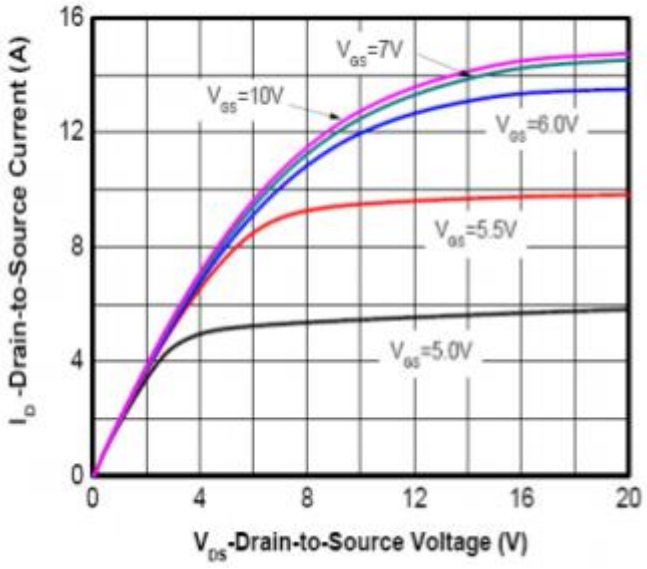


Safe operating area TC=25℃

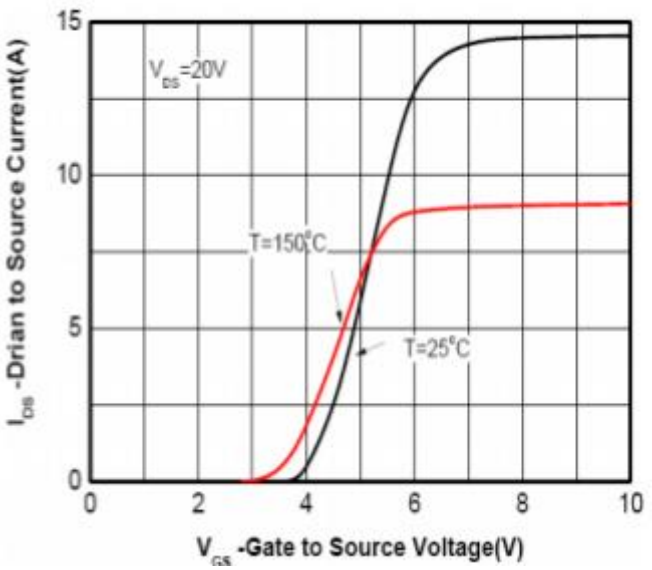
TO-220FullPAK



Typ.output characteristics T_j=25 ℃

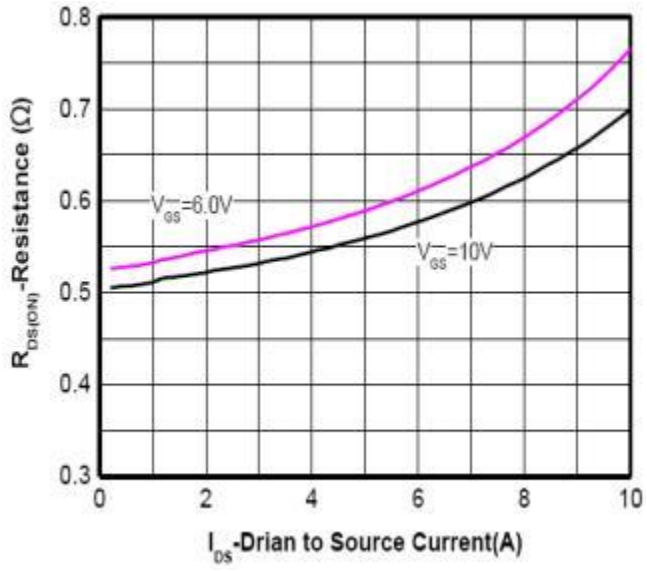


Typ. transfer characteristics

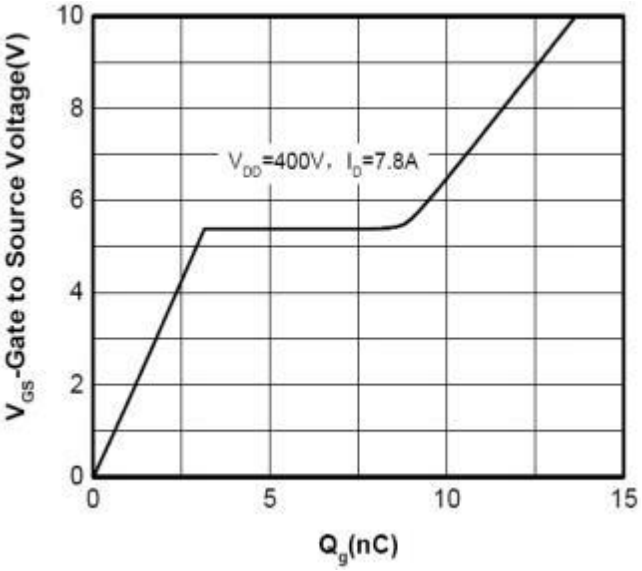


Typical Performance Characteristics

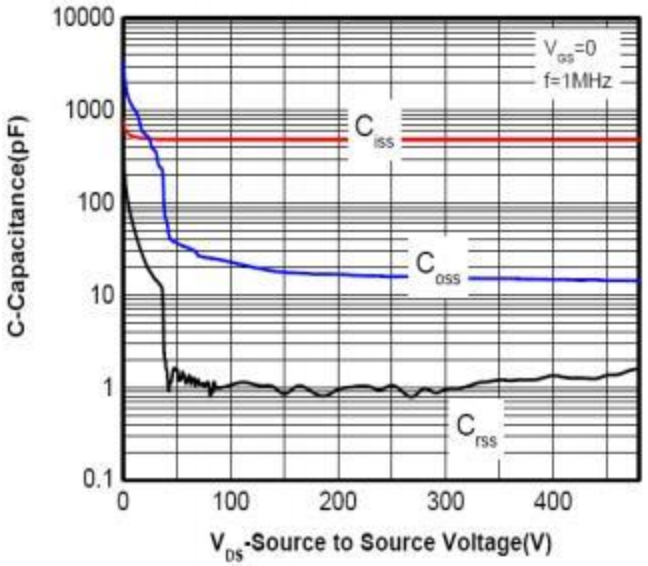
Typ. Drain-source on-state resistance



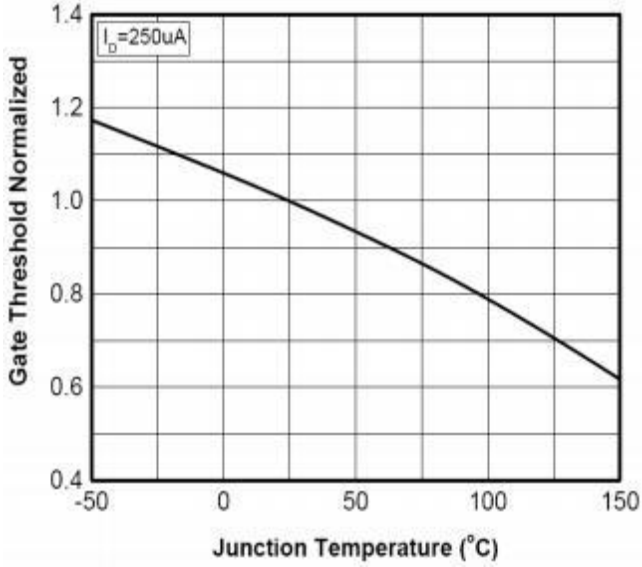
Typ.gate charge characteristics



Typ.capacitances

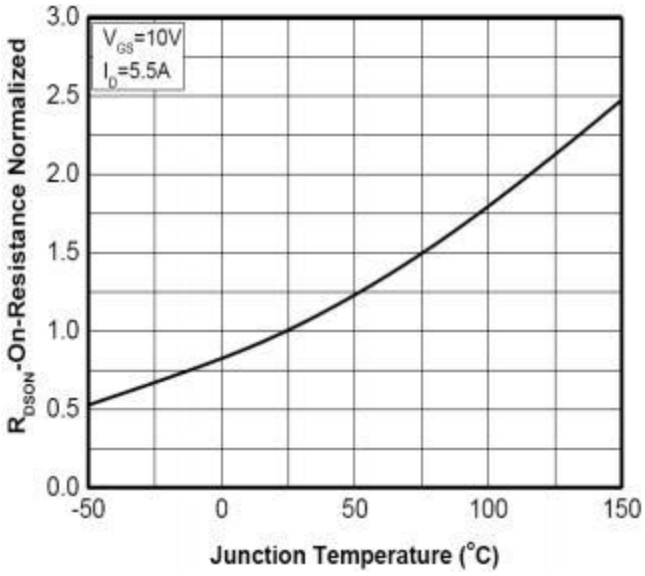


Normalized VGS(th) characteristics

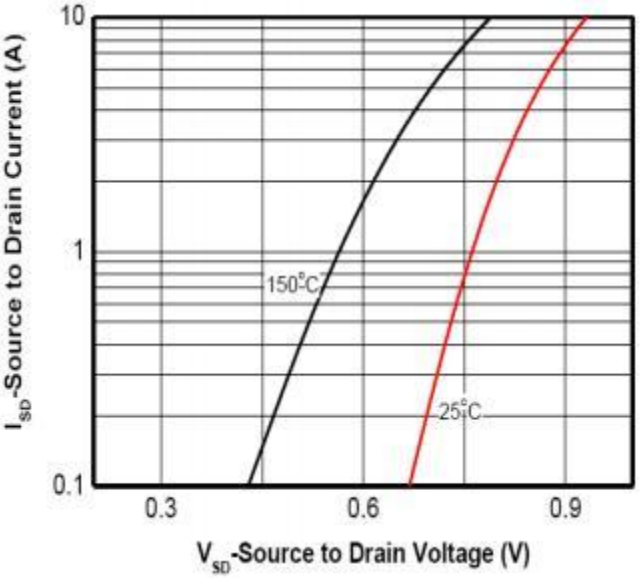


Typical Performance Characteristics

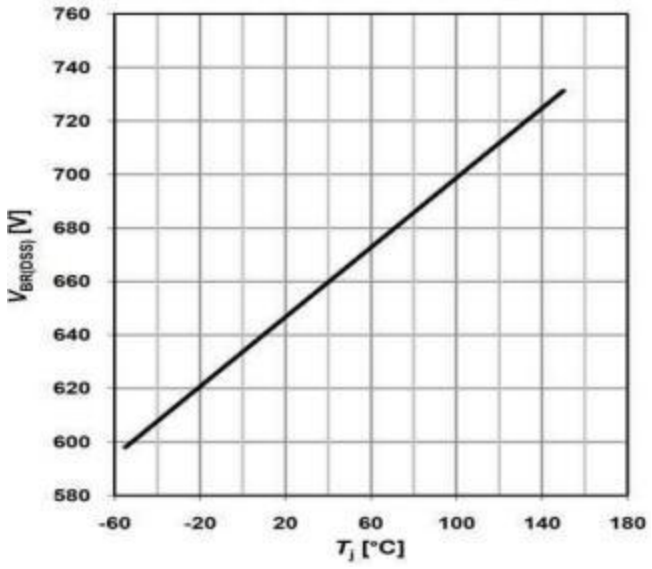
Normalized on-resistance vs temperature



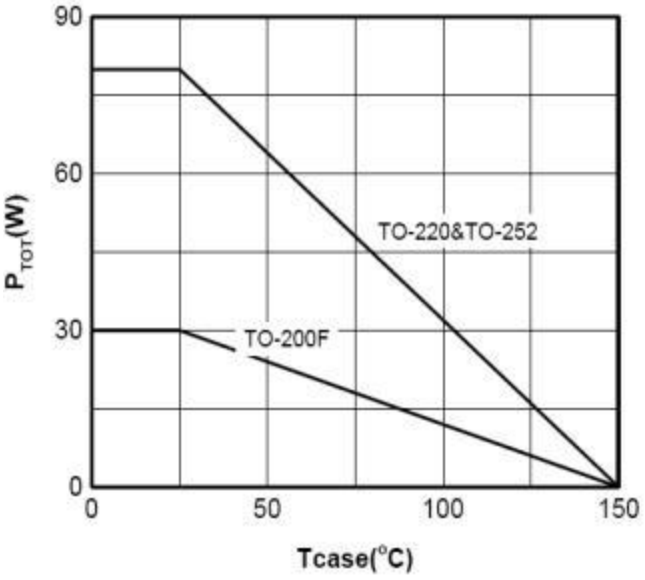
Forward characteristics of reverse diode



Drain-source breakdown voltage



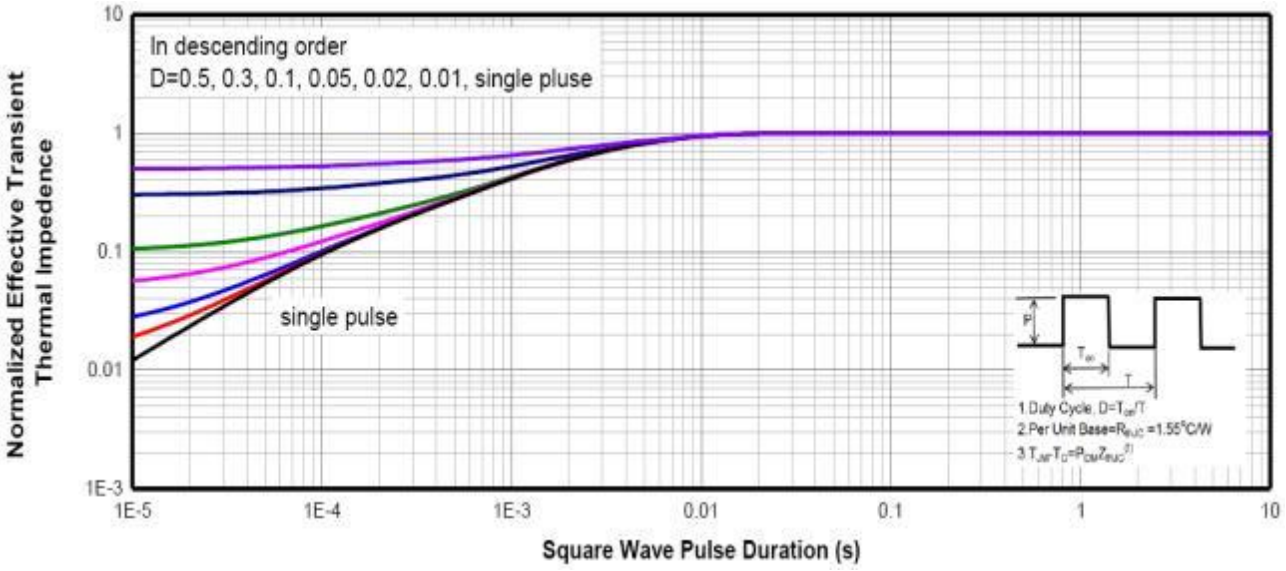
Power dissipation



Typical Performance Characteristics

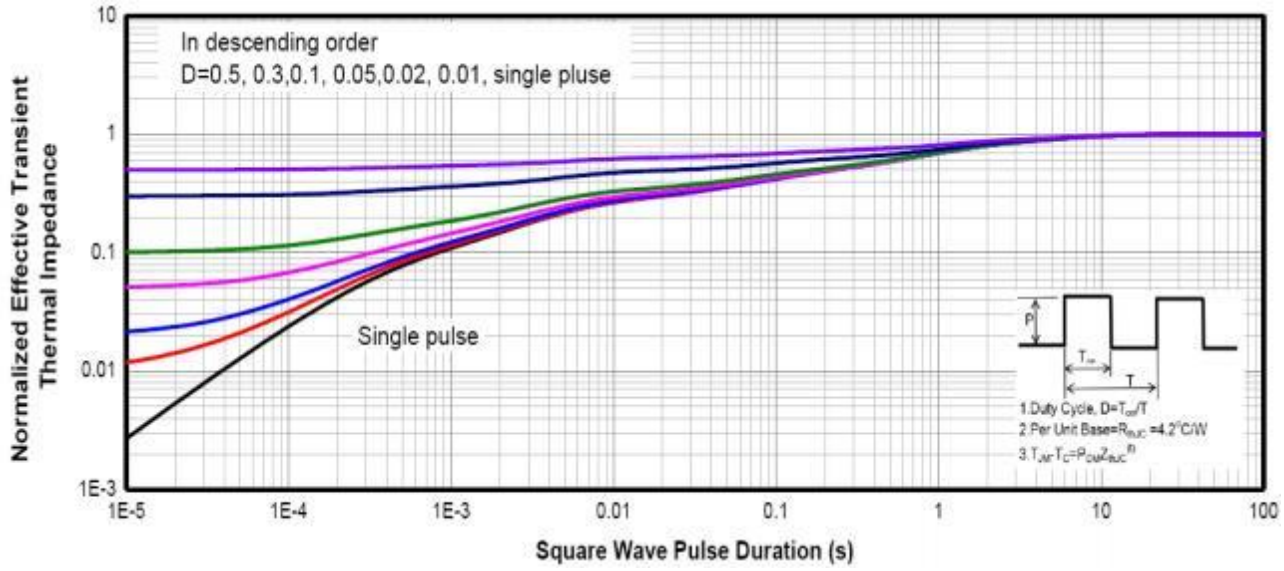
Max. transient thermal impedance

TO-220,TO-252



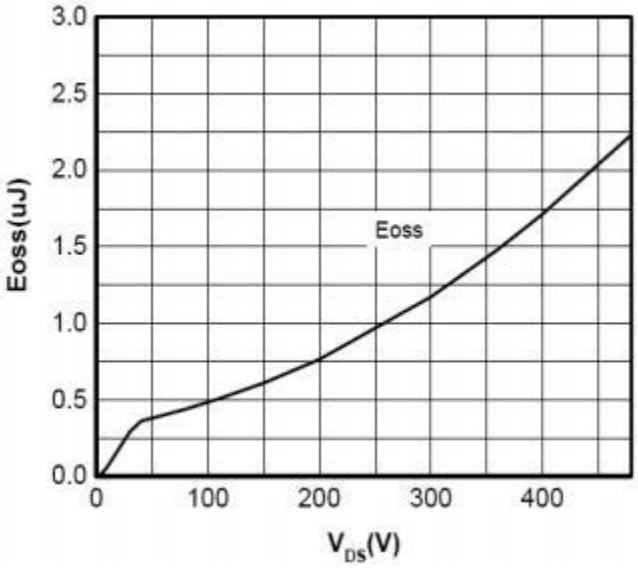
Max. transient thermal impedance

TO-220FullPAK



Typical Performance Characteristics

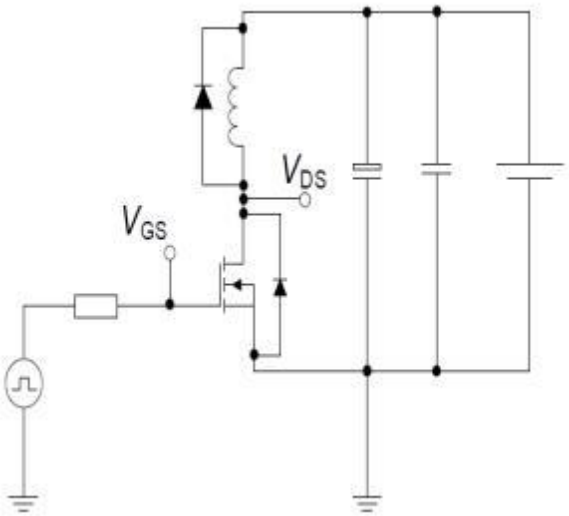
Coss stored energy



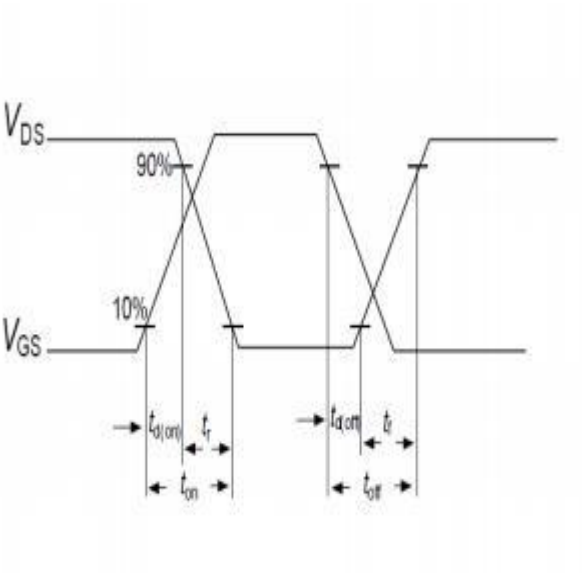
Test circuits

Switching times test circuit and waveform for inductive load

Switching times test circuit for inductive load

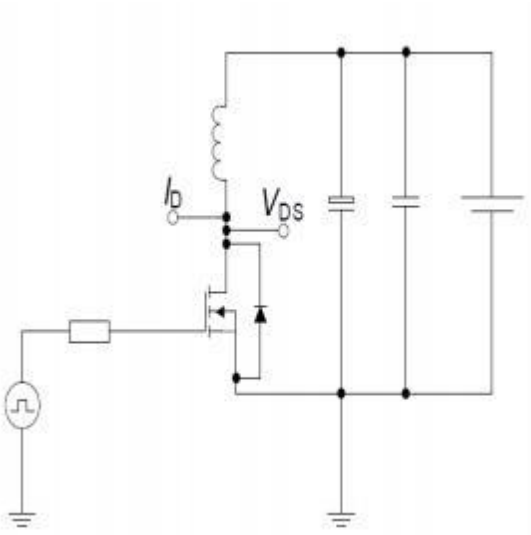


Switching time waveform

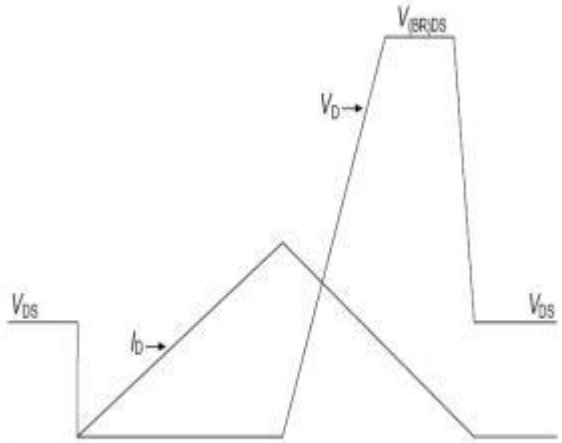


Unclamped inductive load test circuit waveform

Unclamped inductive load test circuit



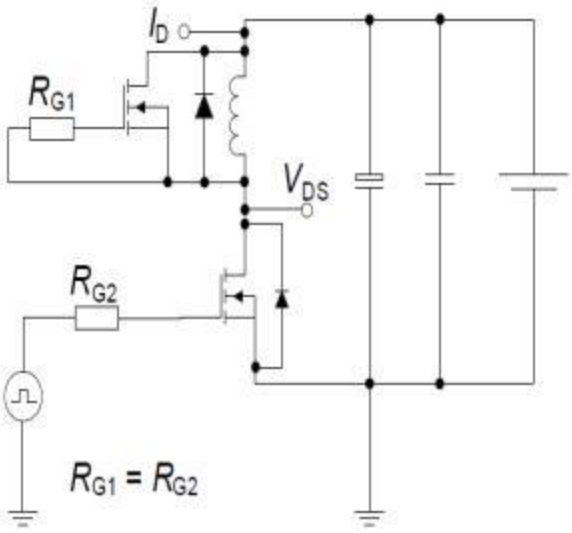
Unclamped inductive waveform



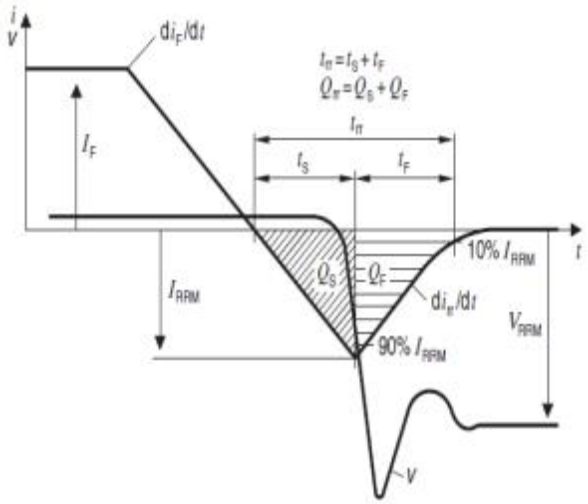
Test circuits

Test circuit and waveform for diode characteristics

Test circuit for diode characteristics

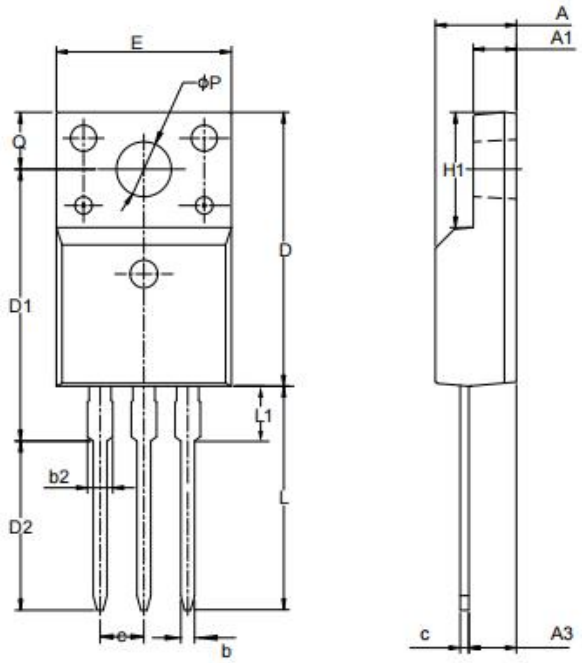


Diode recovery waveform



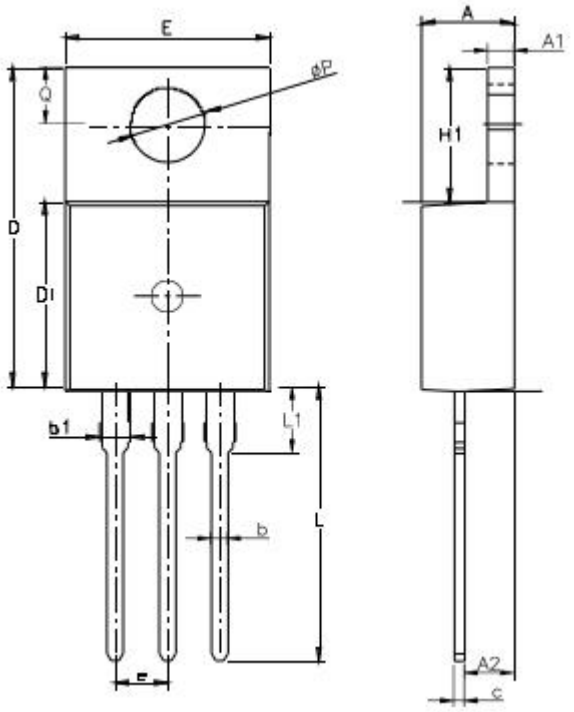
Package Outline

TO-220 Full PAK



COMMON DIMENSIONS			
Items	**Values(mm)**		
	MIN	NOM	MAX
A	4.42	4.7	5.02
A1	2.3	2.54	2.8
A3	2.5	2.76	3.1
b	0.7	0.8	0.9
b2	--	--	1.47
c	0.35	0.5	0.65
D	15.25	15.87	16.25
D1	15.3	15.75	16.3
D2	9.3	9.8	10.3
E	9.73	10.16	10.36
e	2.54BSC		
H1	6.4	6.68	7
L	12.48	12.98	13.48
L1	--	--	3.5
øP	3	3.18	3.4
Q	3.05	3.3	3.55

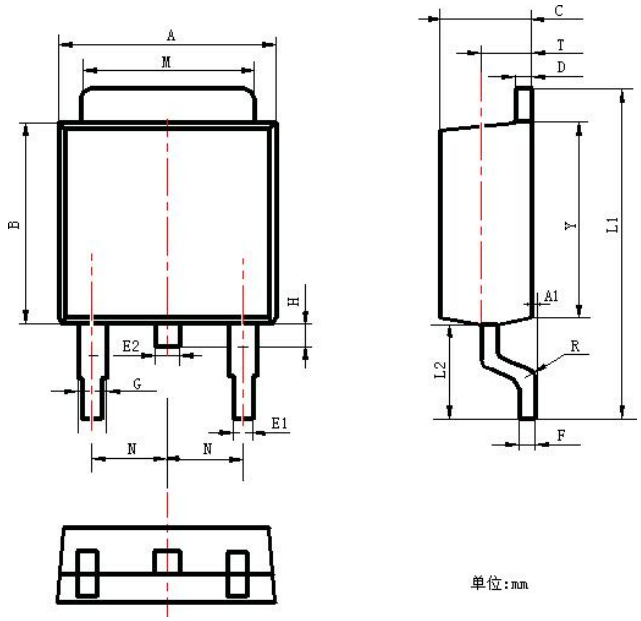
TO-220-3L



COMMON DIMENSIONS			
Items	**Values(mm)**		
	MIN	NOM	WAX
A	4.3	4.5	4.7
A1	1	1.3	1.5
A2	1.8	2.4	2.8
b	0.6	0.8	1
b1	1	-	1.6
c	0.3	-	0.7
D	15.1	15.7	16.1
D1	8.1	9.2	10
F	9.6	9.9	10.4
e	2.54BSC		
H1	6.1	6.5	7
L	12.6	13.08	13.6
L1			3.95
ΦP	3.4	3.7	3.9
Q	2.6		3.2

Package Outline

TO-252-2L



COMMON DIMENSIONS			
Items	**Values(mm)**		
	MIN	NOW	MAX
A	6.3	6.5	6.9
A1	0	-	0.16
B	5.7	-	6.3
C	2.1	2.3	2.5
D	0.3	0.5	0.7
E1	0.6	0.65	0.9
E2	0.7	0.65	1
F	0.3	0.5	0.6
G	0.7	0.9	1.2
L1	9.6	10	10.5
L2	2.7	-	3.1
H	0.4	-	1
M	5.1	5.2	5.5
N	2.09	2.2	2.49
R		0.3	
T	1.4	-	1.6
Y	5.1	5.9	6.3