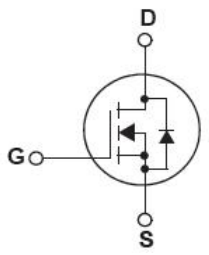
650V N-Channel Super-Junction MOSFET Gen-Ⅱ

Description

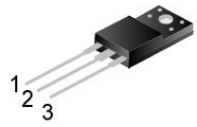
SJ-FET is new generation of high voltage MOSFET family that is utilizing an advanced charge balance mechanism for outstanding low on-resistance and lower gate charge performance.

This advanced technology has been tailored to minimize conduction loss, provide superior switching performance, 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

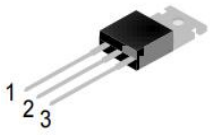


TO-220F-3L

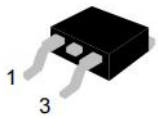
Features

- Multi-Epi process sj-fet
- 650V@TJ=150℃
- Typ.RDS(on)=0.22Ω
- Ultra Low Gate Charge(typ.Qg=28nc)
- 100% avalanche tseted

RoHS



TO-220-3L



TO-263-2L

Package Marking and Ordering Information:

Marking	Package	Part #	Hazardous Substance Control	Packing
SR60R260F	T0-220F-3L	SR60R260F	Pb free	Tube
SR60R260T	T0-220-3L	SR60R260T	Pb free	Tube
SR60R260S	T0-263-2L	SR60R260S	Halogen free	Reel

Absolute Maximum Ratings

Symbol	Parameter	SR60R260T/S	SR60R260F	Unit
VDSS	Drain-Source Voltage	600		V
ID	Drain Current-Continuous(TC=25℃) Continuous(TC=100℃)	16* 10*		A
IDM	Drain Current - Pulsed (Note 1)	60		A
VGSS	Gate-Source voltage	±30		V
EAS	Single Pulsed Avalanche Energy (Note 2)	235		mJ
IAS	Avalanche current, repetitive or not-repetitive (pulse width limited by Tj max)	2.8		A
dv/dt	Peak Diode Recovery dv/dt (Note 3)	15		V/ns
dVds/dt	Drain Source voltage slope (Vds=480V)	50		V/ns
PD	Power Dissipation (TC = 25℃)	120	32	W
TJ，TSTG	Operating and Storage Temperature Range	55 to +150		℃
TL	Maximum Lead Temperature for Soldering Purpose, 1/16”from Case for 10 Seconds	260		℃

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

Thermal Characteristics

Symbol	Parameter	SR60R260T/S	SR60R260F	Unit
RθJC	Thermal Resistance, Junction-to-Case	1	3.9	℃/W
RθCS	Thermal Resistance, Case-to-Sink Typ.	0.5	-	℃/W
RθJA	Thermal Resistance, Junction-to-Ambient	62	80	℃/W

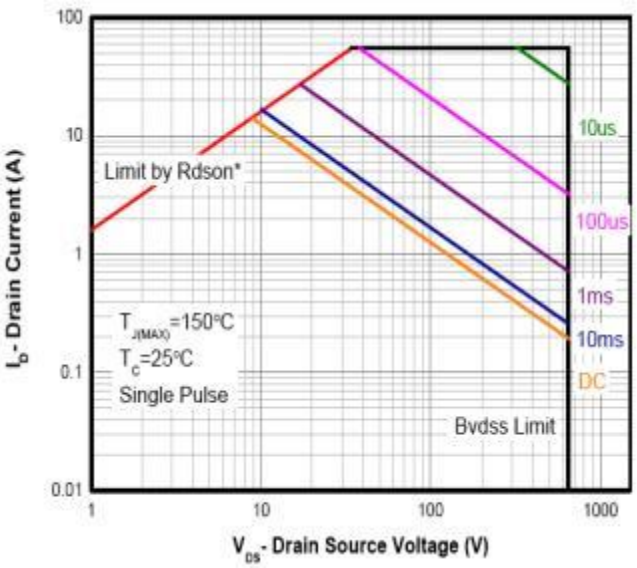
Electrical Characteristics TC = 25℃ unless otherwise noted

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Off Characteristics						
BVDSS	Drain-Source Breakdown Voltage	VGS = 0V, ID = 250μA, TJ = 25℃	600	-	-	V
		VGS = 0V, ID = 250μA, TJ = 150℃	-	650	-	V
ΔBVDSS/ΔTJ	Breakdown Voltage Temperature Coefficient	ID = 250μA, Referenced to 25℃	-	0.6	-	V/℃
IDSS	Zero Gate Voltage Drain Current	VDS = 600V, VGS = 0V	-	-	1	μA
		-TC = 125℃		-	100	μA
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 = 250μA	2.0	3.0	4.0	V
RDS(on)	Static Drain-Source On-Resistance	VGS = 10V, ID = 8A	-	0.22	0.26	Q
Dynamic Characteristics						
Ciss	Input Capacitance	VDS = 100V, VGS = 0V,	-	1050	-	pF
Coss	Output Capacitance	f = 1.0MHz	-	37	-	pF
Crss	Reverse Transfer Capacitance		-	1.1	-	pF
Qg	Total Gate Charge	VDS = 400V, ID = 8A,	-	28	-	nC
Qgs	Gate-Source Charge	VGS = 10V (Note 4)	-	6.2	-	nC
Qgd	Gate-Drain Charge		-	9.8	-	nC
Rg	Gate resistance	f=1 MHz, open drain	-	13	-	Q
Switching Characteristics						
td(on)	Turn-On Delay Time	VDS = 400V, ID = 8A	-	17	-	ns
tr	Turn-On Rise Time	RG = 15Q, VGS = 12V	-	18	-	ns
td(off)	Turn-Off Delay Time	(Note 4)	-	89	-	ns
tf	Turn-Off Fall Time		-	20	-	ns
Drain-Source Diode Characteristics and Maximum Ratings						
IS	Maximum Continuous Drain-Source Diode Forward Current		-	-	16	A
ISM	Maximum Pulsed Drain-Source Diode Forward Current		-	-	60	A
VSD	Drain-Source Diode Forward Voltage	VGS = 0V, IS = 16A	-	0.9	1.4	V
trr	Reverse Recovery Time	VGS = 0V, VDS = 400V,	-	285	-	ns
Qrr	Reverse Recovery Charge	IS = 8A, dIF/dt =100A/μs	-	3.1	-	μC
Irrm	Peak Reverse Recovery Current		-	22	-	A

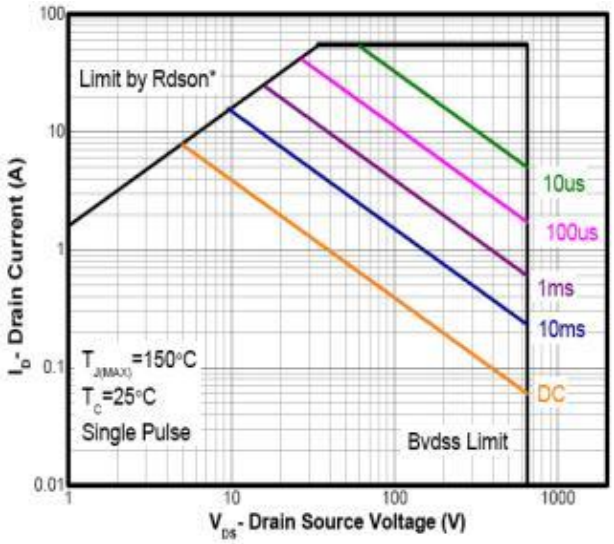
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. ID=I_{AS} , VDD=50V, Starting TJ=25℃.
3. I_{SD}≤ID, di/dt ≤ 200A/us, V_{DD} ≤ BV_{DSS} , Starting TJ = 25℃.
4. Essentially Independent of Operating Temperature Typical Characteristics.

Typical Performance Characteristics

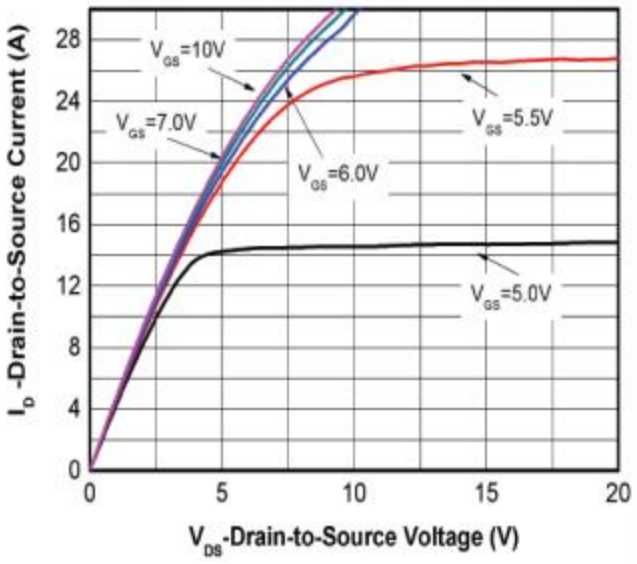
Safe operating area TC=25℃
Non FullPAK



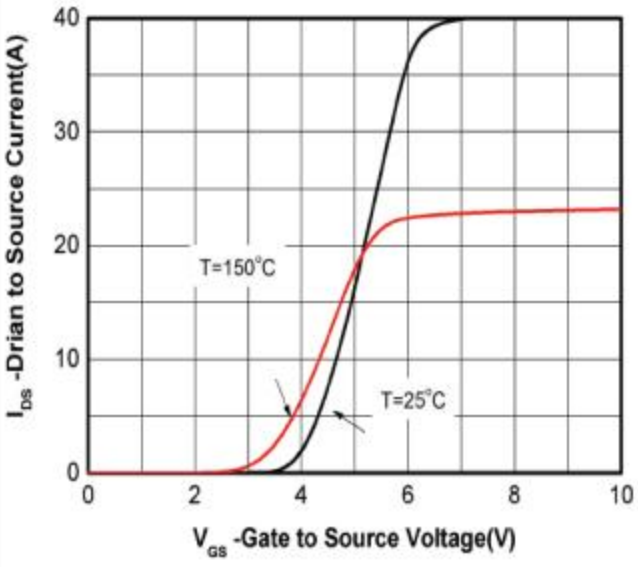
Safe operating area TC=25℃
TO-220FullPAK



Typ.output characteristics T_j=25 ℃

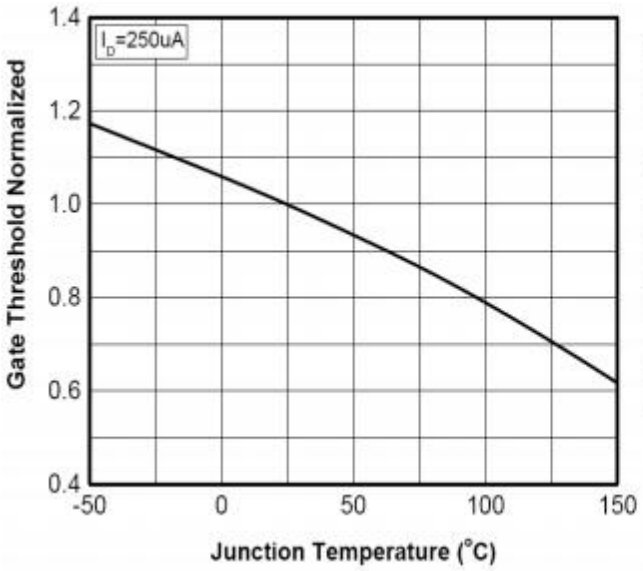


Typ. transfer characteristics

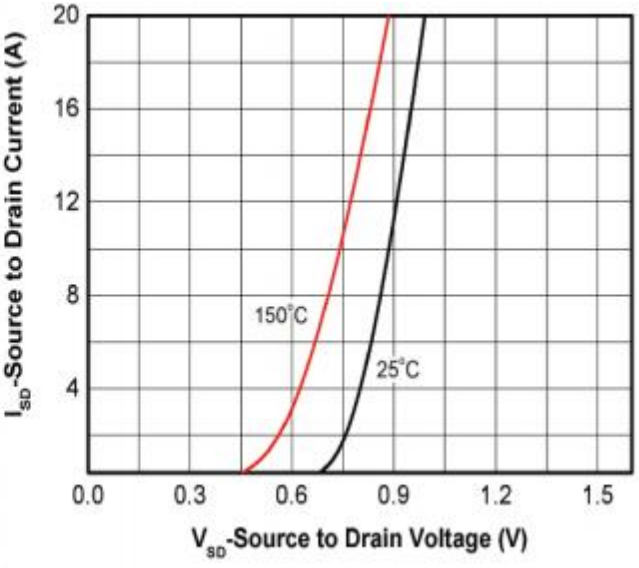


Typical Performance Characteristics

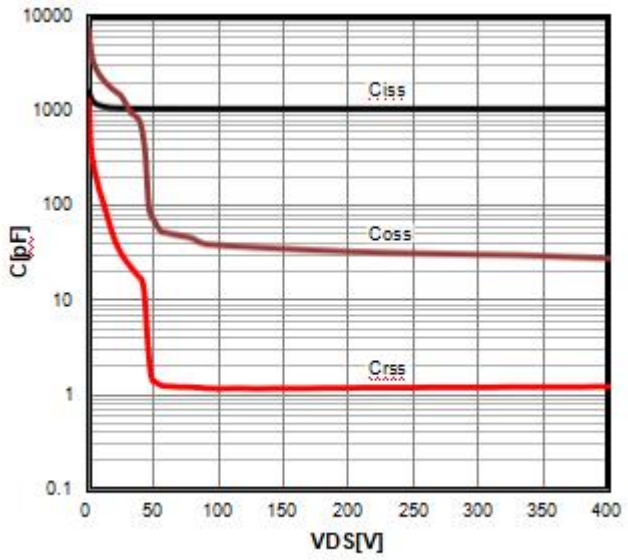
Typ1. Drain-source on-state resistance



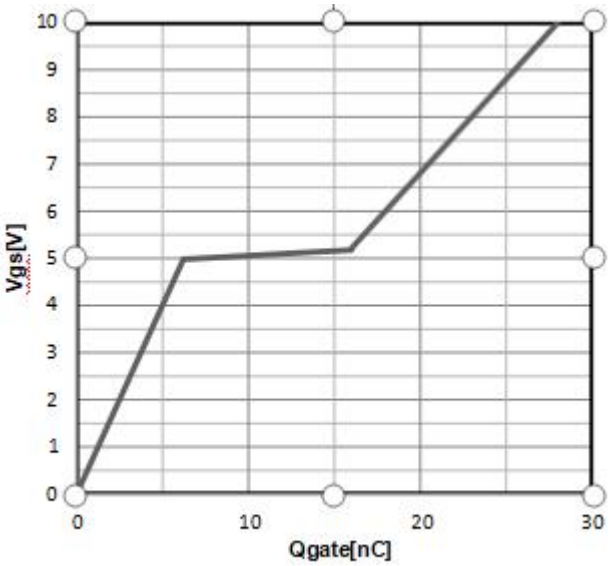
Typ2.Normalized on resistance vs temperature



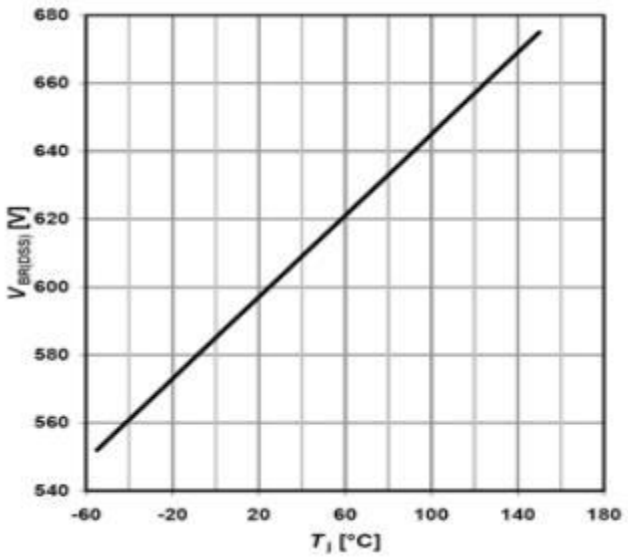
Typ3.Normalized VGS (th) characteristics



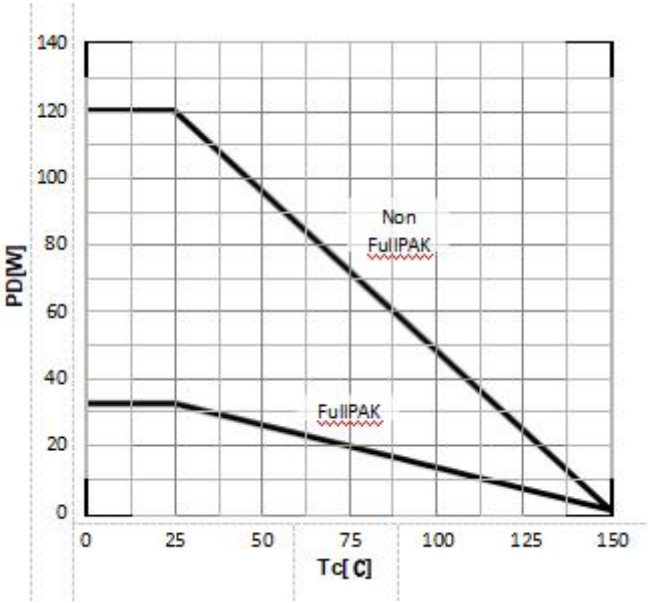
Typ4.Forward characteristics of reverse diode



Typ5.Drain-source breakdown voltage



Typ6.Power dissipation

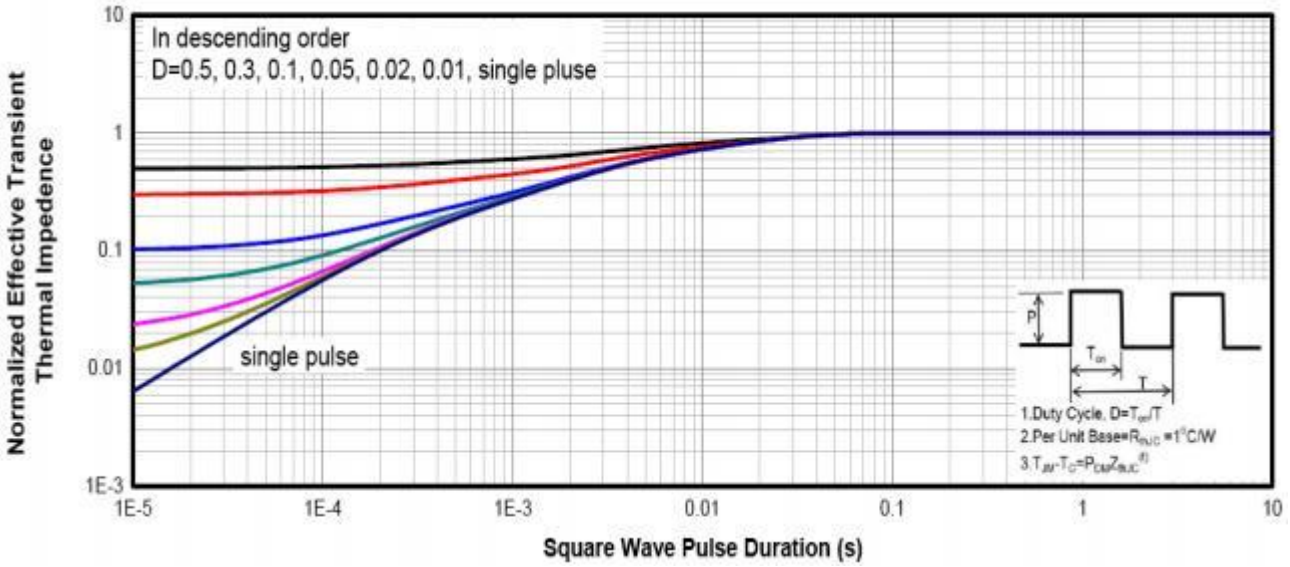


Typical Performance Characteristics

Typ7.

Max. transient thermal impedance

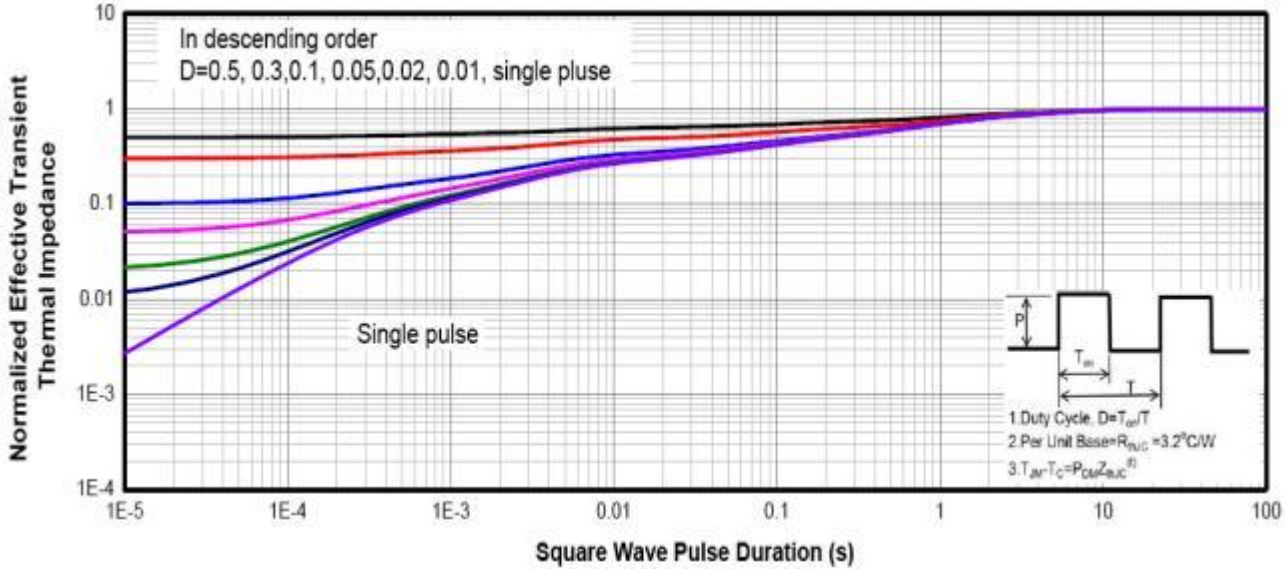
Non FullPAK



Typ8.

Max. transient thermal impedance

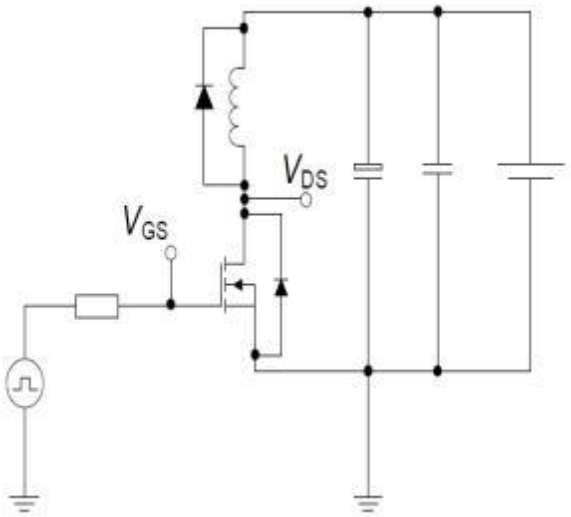
TO-220FullPAK



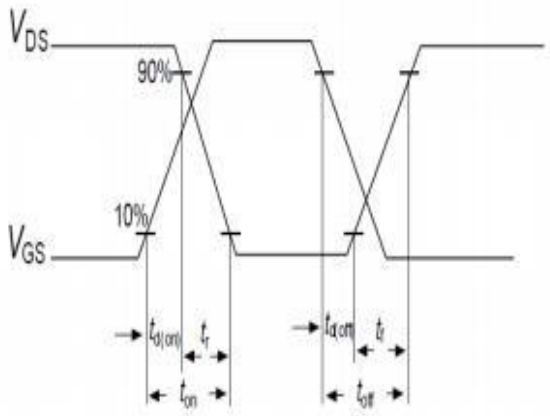
Test circuits

Switching times test circuit and waveform for inductive load

Switching times test circuit for inductive load

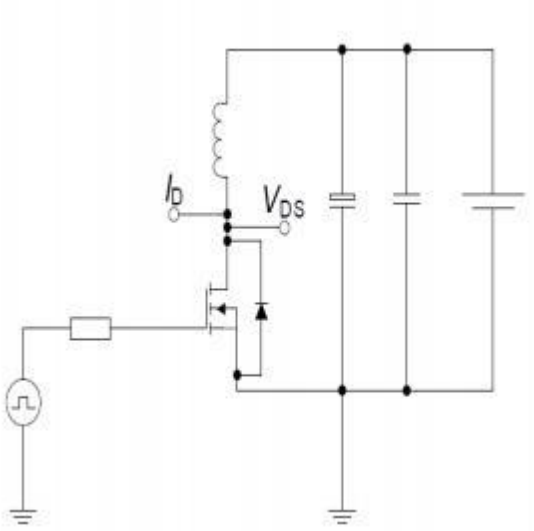


Switching time waveform

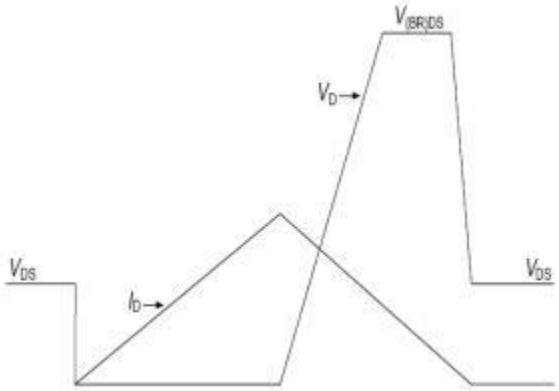


Unclamped inductive load test circuit and waveform

Unclamped inductive load test circuit



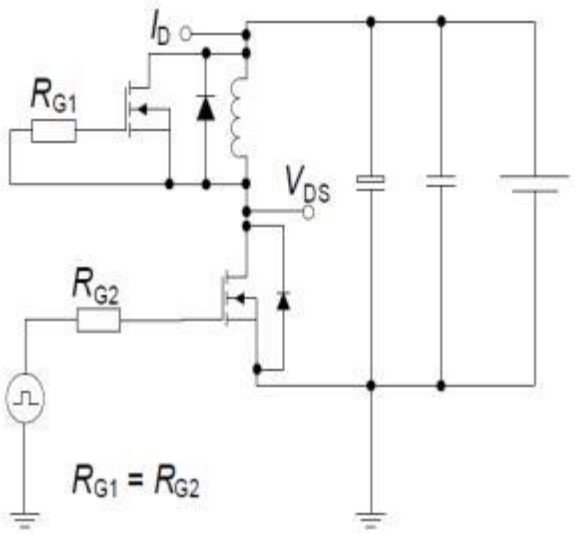
Unclamped inductive waveform



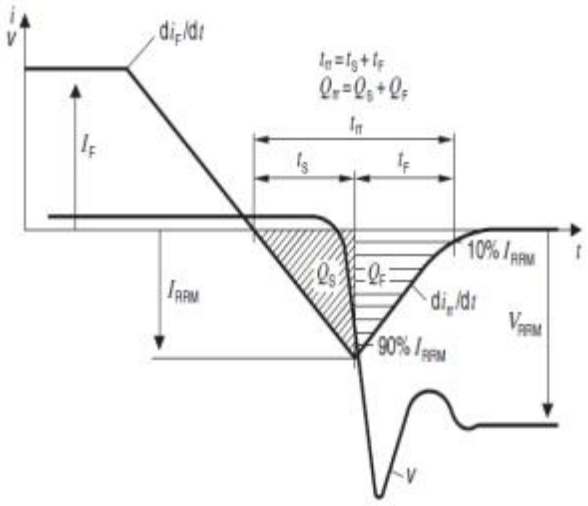
Test circuits

Test circuit and waveform for diode characteristics

Test circuit for diode characteristics

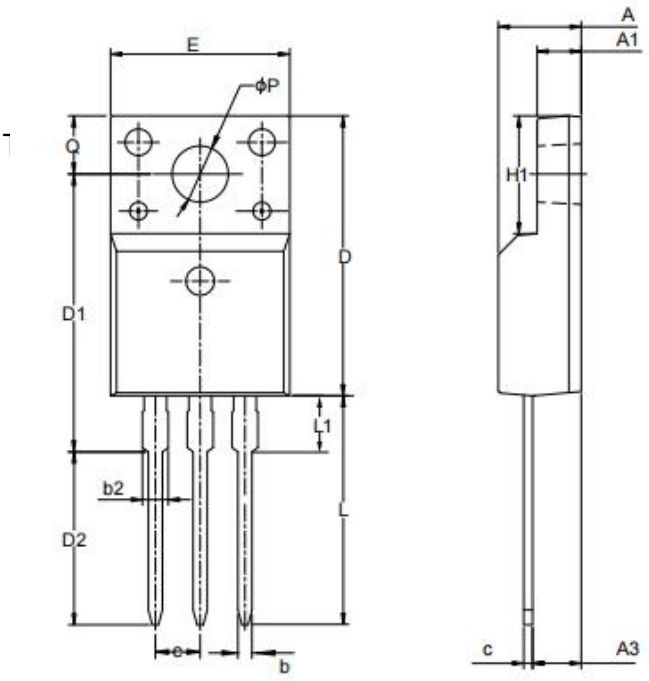


Diode recovery waveform



Package Outline

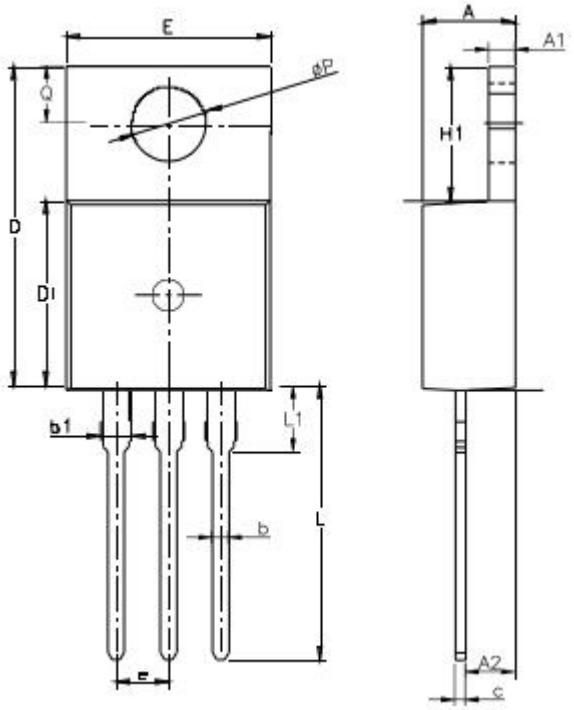
TO-220 Full PAK



COMMON DIMENSIONS

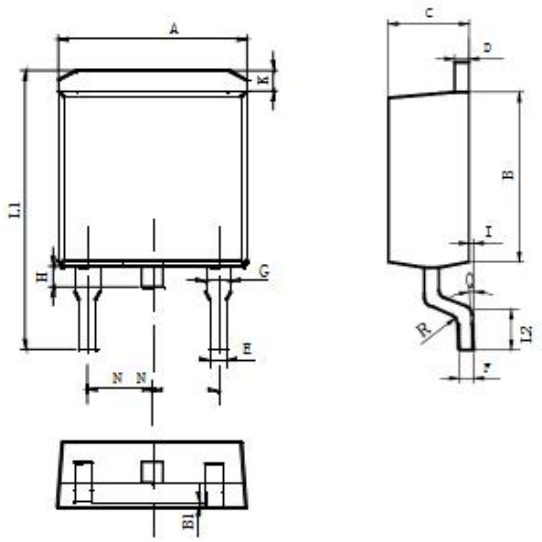
Items	Values(mm)		
	MIN	NOM	MAX
A	4.42	4.7	5.02
A1	2.3	2.54	2.8
A3	2.5	2.76	3.1
b	0.7	0.8	0.9
b2	--	--	1.47
c	0.35	0.5	0.65
D	15.25	15.87	16.25
D1	15.3	15.75	16.3
D2	9.3	9.8	10.3
E	9.73	10.16	10.36
e	2.54BSC		
H1	6.4	6.68	7
L	12.48	12.98	13.48
L1	--	--	3.5
øP	3	3.18	3.4
Q	3.05	3.3	3.55

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



Items	Values(mm)		
	MIN	NOW	MAX
A	9.8	10	10.4
B	8.9	9.6	9.5
B1	0	-	0.1
C	4.4	4.5	4.8
D	1.16	1.4	1.5
E	0.7	0.75	0.95
F	0.3	0.45	0.6
G	1.07	1.38	1.47
H	1.3	-	1.8
K	0.95	1	1.37
L1	14.5	15.2	16.5
L2	1.6	2	2.3
I	0	-	0.2
Q	0°	3°	8°
R	0.4		
N	2.35	2.4	2.7