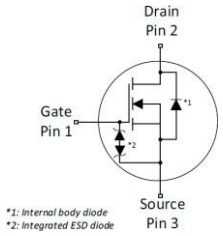
SR80R160

800V 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.

Features

•Multi-Epi process SJ-FET

•850V @TJ = 150 ℃

•Typ. RDS(on) = 0.138Ω

•Ultra Low Gate Charge (typ. Qg = 57.5nC)

•100% avalanche tested

•Integrated Zener diode for high ESD robustness(>2kV HBM)

Package Marking and Ordering Information:

Marking	Package	Part #	Hazardous Substance Control	Packing
SR80R160F	T0-220F-3L	SR80R160F	Pb free	Tube
SR80R160T	T0-220-3L	SR80R160T	Pb free	Tube

Absolute Maximum Ratings

Symbol	Parameter	SR80R160T	SR80R160F	Unit
V_{DSS}	Drain-Source Voltage	800		V
I_D	Drain Current -Continuous (TC = 25℃) -Continuous (TC = 100℃)	25* 15.8*		A
I_{DM}	Drain Current - Pulsed (Note 1)	75		A
V_{GSS}	Gate-Source voltage	±30		V
E_{AS}	Single Pulsed Avalanche Energy (Note 2)	960		mJ
I_{AS}	Avalanche current, repetitive or not-repetitive (pulse width limited by Tj max)	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
P_D	Power Dissipation (TC = 25℃)	190	37	W
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +150		℃
T_L	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	SR80R160T	SR80R160F	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	0.65	3.4	℃/W
$R_{\theta CS}$	Thermal Resistance, Case-to-Sink Typ.	0.5	-	℃/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	62	80	℃/W

Electrical Characteristics TC = 25℃ unless otherwise noted

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = 0V, I_D = 250μA, T_J = 25℃	800	-	-	V
		V_{GS} = 0V, I_D = 250μA, T_J = 150℃	850	-	-	V
$\Delta BV_{DSS}/\Delta T_J$	Breakdown Voltage Temperature Coefficient	I_D = 250μA, Referenced to 25℃	-	0.75	-	V/℃
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 800V, V_{GS} = 0V	-	-	1	μA
		-T_J = 125℃		-	100	μA
I_{GSSF}	Gate-Body Leakage Current, Forward	V_{GS} = 20V, V_{DS} = 0V	-	-	1	μA
I_{GSSR}	Gate-Body Leakage Current, Reverse	V_{GS} = -20V, V_{DS} = 0V	-	-	-1	μA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250μA	3.0	4.0	5.0	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	V_{GS} = 10V, I_D = 12A	-	0.138	0.16	Ω
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 50V, V_{GS} = 0V, f = 1.0MHz	-	2850	-	pF
C_{oss}	Output Capacitance		-	90	-	pF
C_{rss}	Reverse Transfer Capacitance		-	2.4	-	pF
E_{oss}	Stored Energy in Output Capacitance	V_{DS} = 0 to 600V, V_{GS} = 0V	-	10.9	-	μJ
$C_{o(er)}$	Energy Related Output Capacitance		-	61	-	pF
$C_{o(tr)}$	Time Related Output Capacitance		-	240	-	pF
Q_g	Total Gate Charge	V_{DS} = 400V, I_D = 12A, V_{GS} = 10V (Note 4)	-	57.5	-	nC
Q_{gs}	Gate-Source Charge		-	15.8	-	nC
Q_{gd}	Gate-Drain Charge		-	19.5	-	nC
$V_{plateau}$	Gate plateau voltage		-	5.6	-	V
Rg	Gate resistance	f=1 MHz, open drain	-	4.5	-	Ω
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DS} = 400V, I_D = 12A, R_G = 4.7Ω, V_{GS} = 10V (Note 4)	-	27	-	ns
t_r	Turn-On Rise Time		-	18	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	89	-	ns
t_f	Turn-Off Fall Time		-	15	-	ns
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain-Source Diode Forward Current		-	-	25	A
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current		-	-	75	A
V_{SD}	Drain-Source Diode Forward Voltage	V_{GS} = 0V, I_S = 25A	-	0.9	1.4	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0V, V_{DS} = 400V, I_S = 12A, dI_F/dt =100A/μs	-	400	-	ns
Q_{rr}	Reverse Recovery Charge		-	6.4	-	μC
Irrm	Peak Reverse Recovery Current		-	30	-	A

NOTES:

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

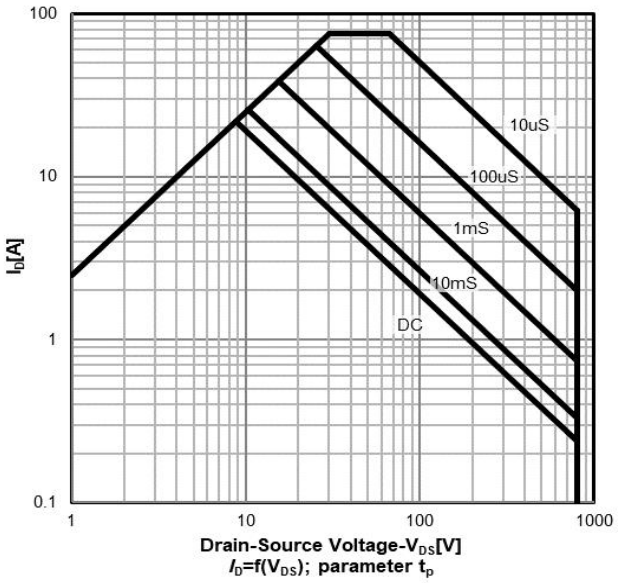
2.ID=IAS, VDD=50V, L=30mH，Starting TJ=25 ℃

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

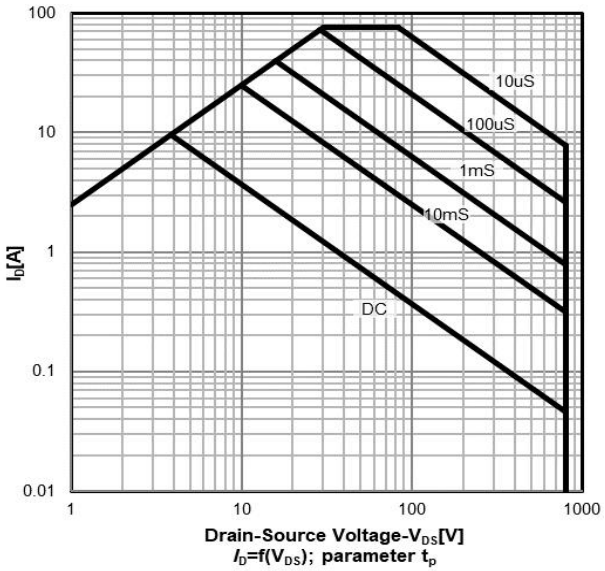
4.Essentially Independent of Operating Temperature Typical Characteristics

Typical Performance Characteristics

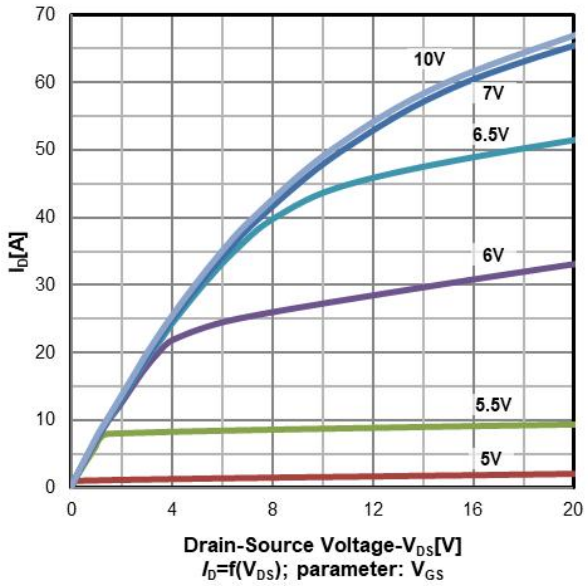
Typ.Safe operating area TC=25 ℃
TO-220/TO-252



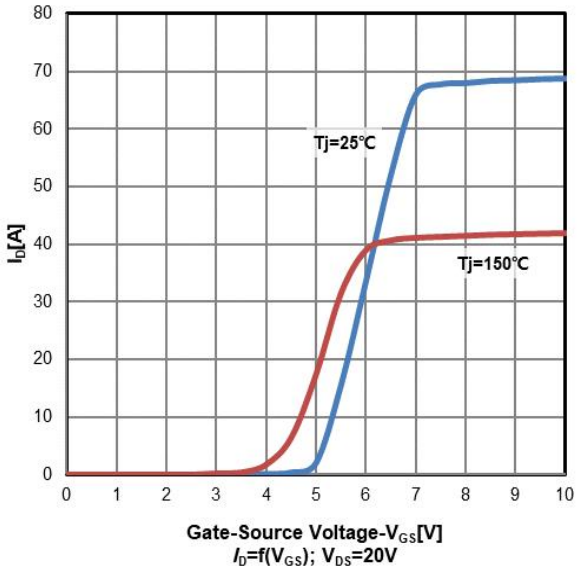
Typ.Safe operating area TC=25 ℃
TO-220FullPAK



Typ. output characteristics Tj=25 ℃

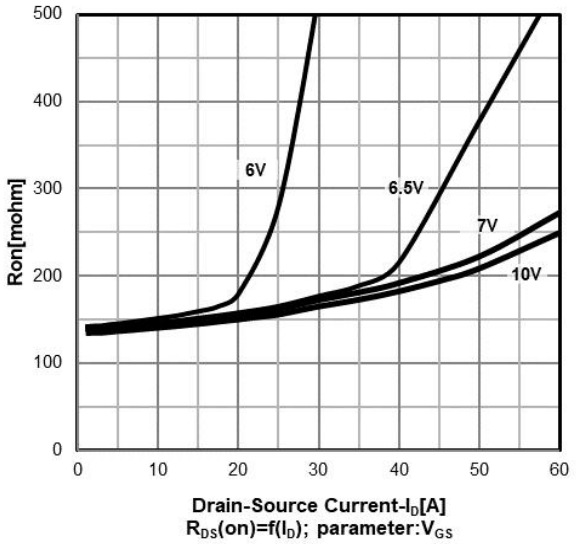


Typ.Transfer characteristics

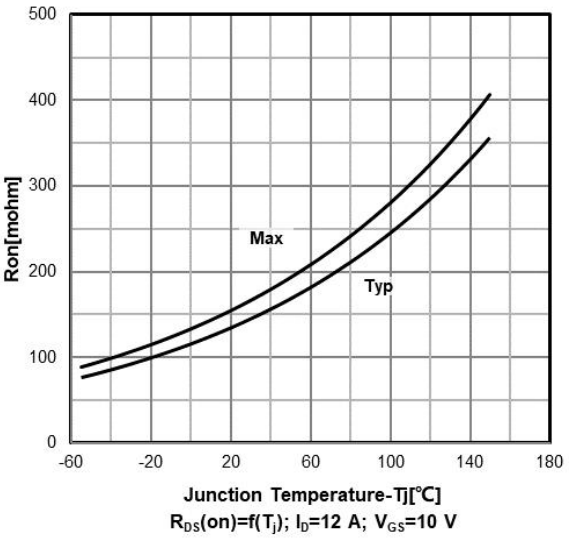


Typical Performance Characteristics

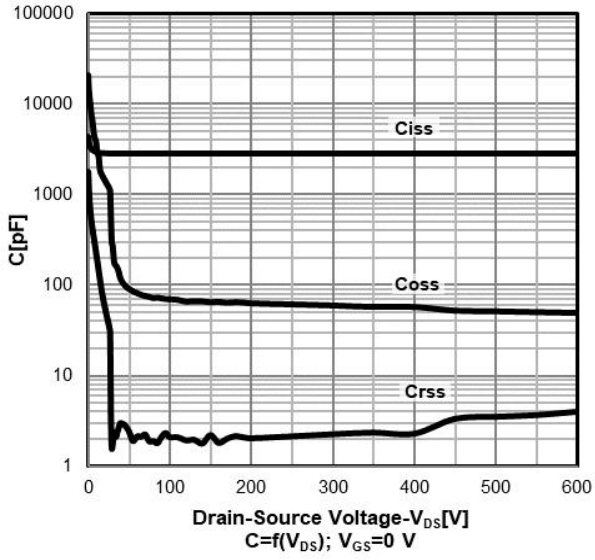
Typ. drain-source on-state resistance



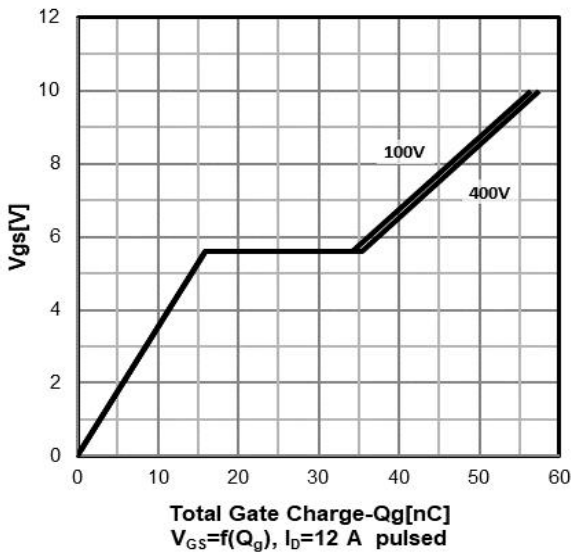
Typ.On-resistance vs temperature



Typ. capacitances

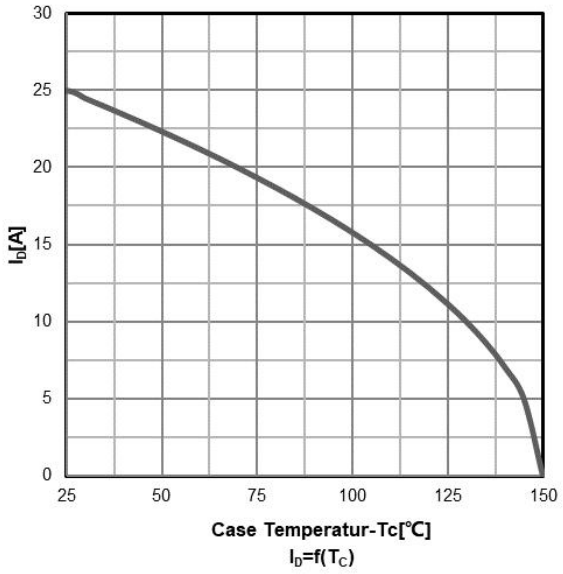


Typ. gate charge characteristics

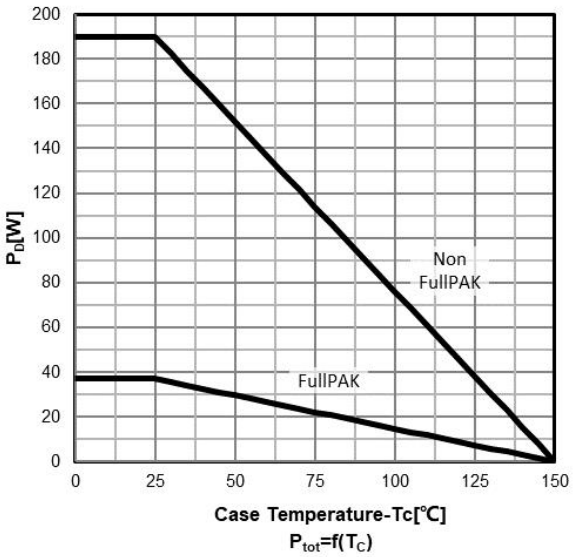


Typical Performance Characteristics

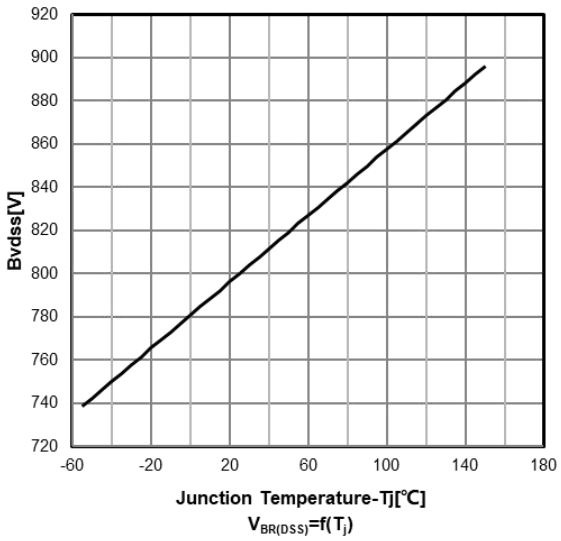
Typ.Drain current vs temperature



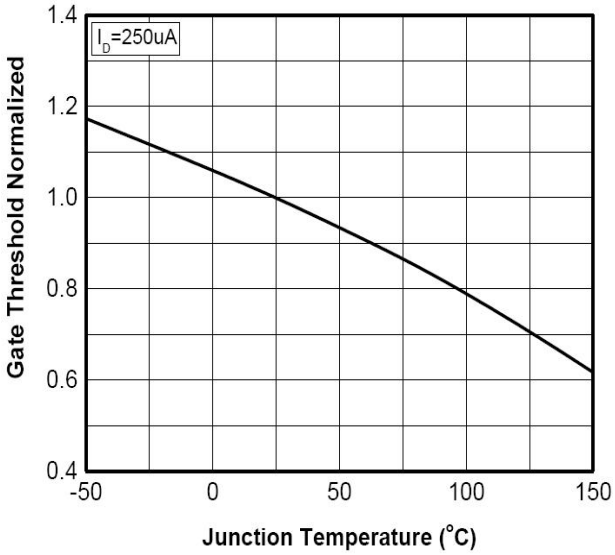
Typ.Power dissipation



Typ.Drain-source breakdown voltage

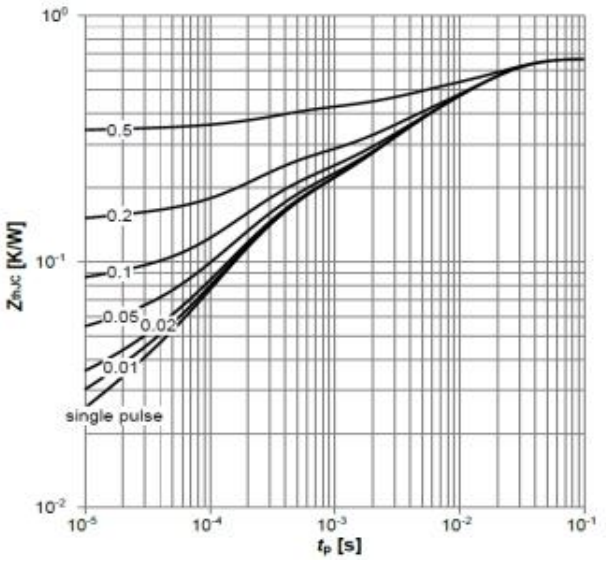


Typ.Normalized VGS(th) characteristics

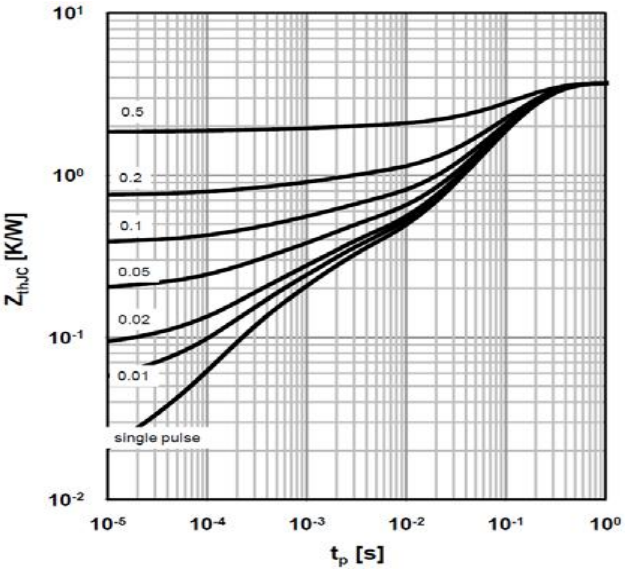


Typical Performance Characteristics

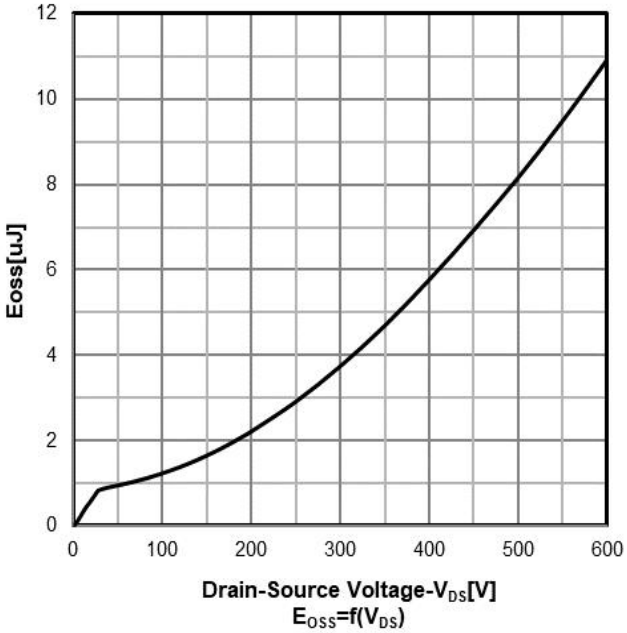
Max. transient thermal impedance TO-220



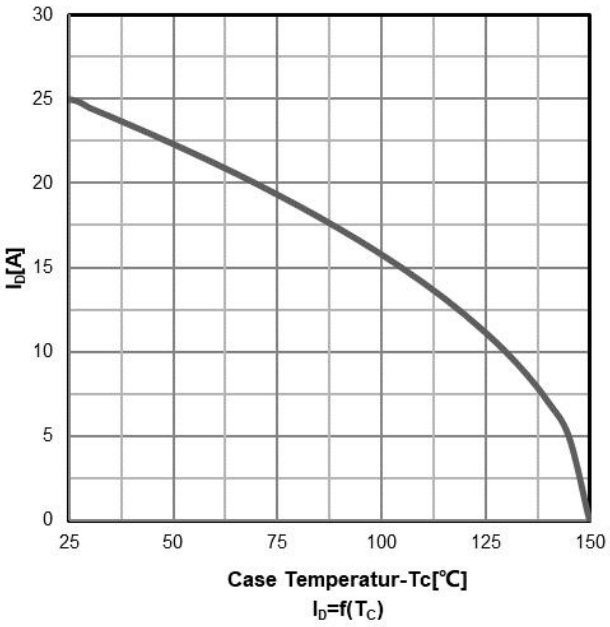
Max. transient thermal impedance TO-220FullPAK



Typ.Coss stored energy

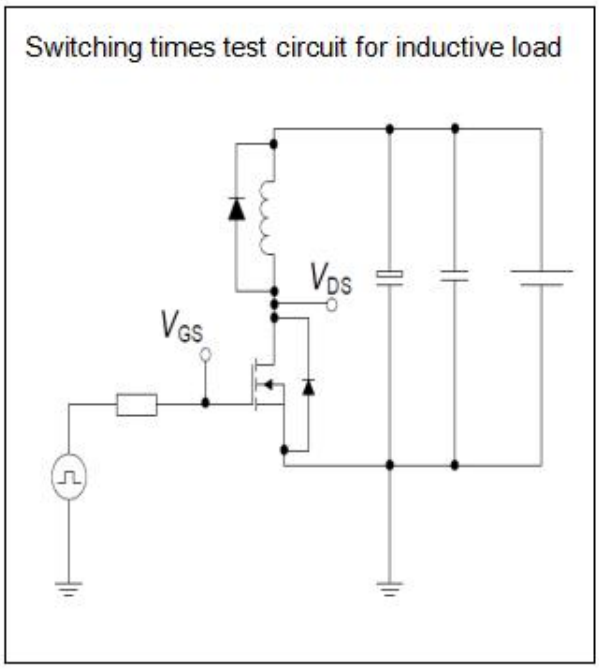


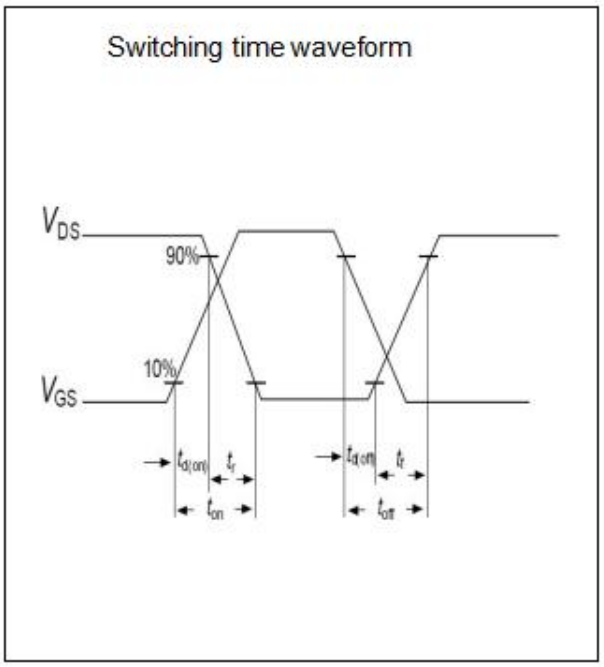
Typ.Forward characteristics of reverse diode



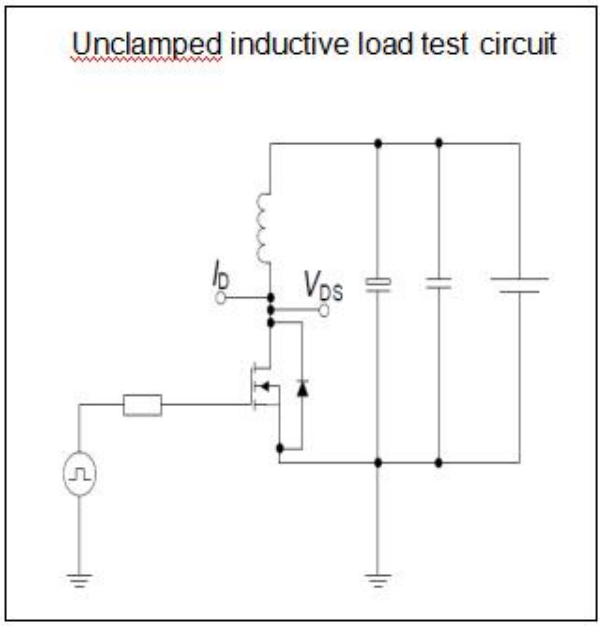
Test circuits

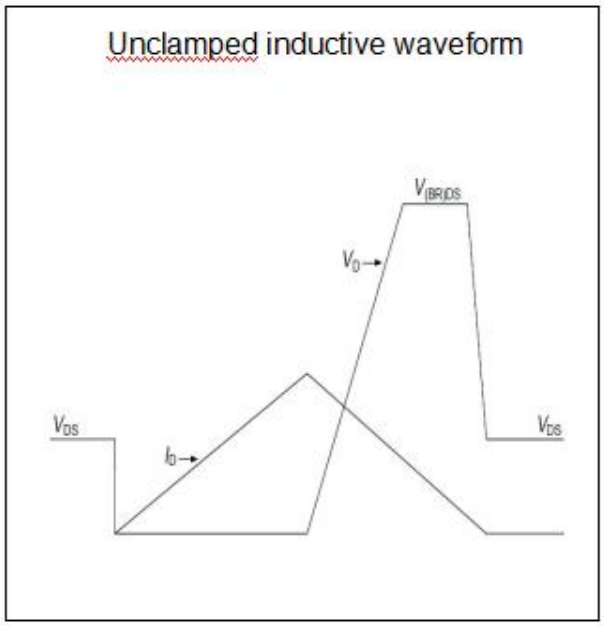
Switching times test circuit and waveform for inductive load





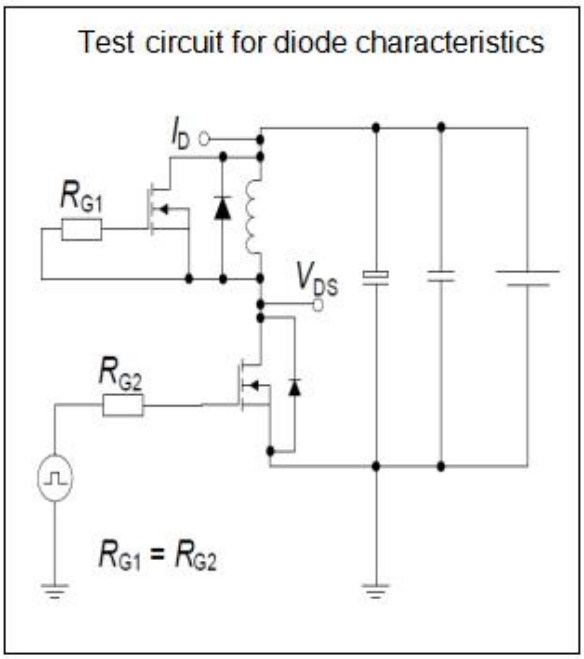
Unclamped inductive load test circuit and waveform

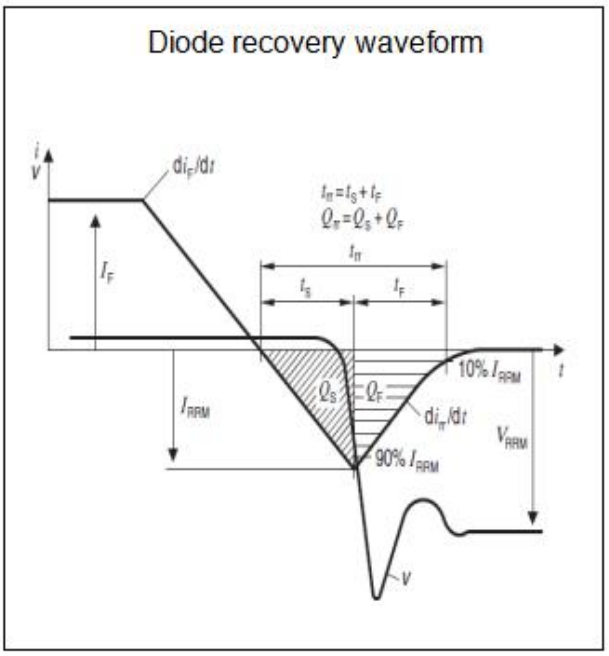




Test circuits

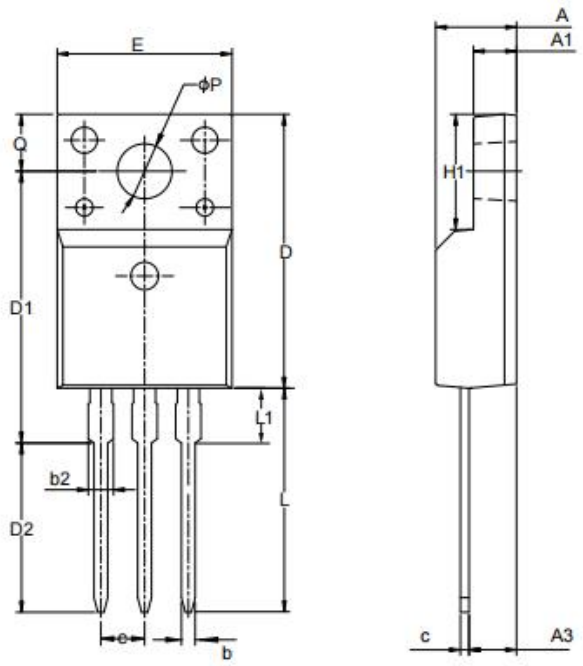
Test circuit and waveform for diode characteristics





Package Outline

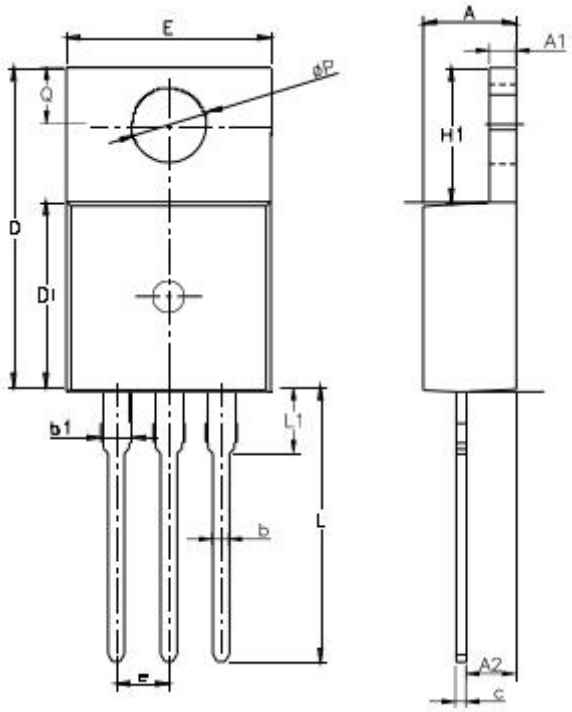
TO-220 Full PAK



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


E
øP
Q
D
D1
b1
L1
L
b
e
A
A1
H1
A2
c