PSF065M240

650V 150mΩ N-channel SiC Power MOSFET

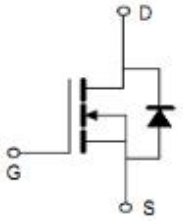
V_{DS}	650	V
I_D	19	A
$R_{DS(on),Typ}$ @V_{GS}=18V	150	mΩ
$R_{DS(on),Typ}$ @V_{GS}=15V	190	mΩ

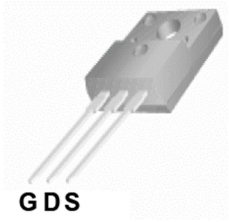
Features

- Low on-resistance
- Fast reverse recovery
- Fast switching speed
- RoHS, Halogen-Free

Applications

- Switch mode power supplies
- DC-DC converters
- UPS
- Motor Drives
- Solar Inverters





TO-220F

Order Information

Product	Package	Marking	Tube	Carton
PSF065M240	TO-220F	PSF065M240	50PCS	5000PCS

Absolute Maximum Ratings

Symbol	Parameter		Rating	Unit
Common Ratings (T_j=25°C Unless Otherwise Specified)				
V_{DS}	Drain-Source Voltage		650	V
E_{AS}	Non-Repetitive Avalanche Energy (Note1)		95	mJ
V_{GS}	Gate-Source Voltage		-10 to +20	V
I_D	Continuous Drain current	T_C=25°C	19	A
I_{DM}	Pulse Drain Current Tested (Note2)	T_C=25°C	43	A
I_S	Reverse continuous current	T_C=25C	19	A
P_D	Maximum Power Dissipation	T_C=25°C	33	W
T_J	Operating junction temperature range		-55 to 175	°C
T_{STG}	Storage Temperature Range			°C

Thermal characteristics

$R_{\theta JC}$	Thermal Resistance Junction−to−Case	4.5	°C/W
$R_{\theta JA}$	Thermal Resistance Junction−to−Ambient (Note3)	65	°C/W

650V 150mΩ N-channel SiC Power MOSFET

Electrical Characteristics

Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
Static Electrical Characteristics @ T_j = 25°C (unless otherwise stated)						
$V_{(BR)DSS}$	Drain - Source breakdown voltage	V_{GS} = 0 V, I_D = 2.5mA	650	--	--	V
I_{DSS}	Zero Gate Voltage Drain current	V_{DS}=650V,V_{GS}=0V	--	--	5	μA
I_{GSS}	Gate-Body Leakage Current	V_{GS}=+20/-10V,V_{DS}=0V	--	--	±100	nA
$V_{GS(TH)}$	Gate Threshold Voltage	V_{DS}=V_{GS},I_D=10mA	2	--	4.5	V
$R_{DS(ON)}$	Drain-Source On-State Resistance (Note4)	V_{GS}=20V, I_D=5A	--	132	--	mΩ
		V_{GS}=18V, I_D=5A	--	150	190	mΩ
		V_{GS}=15V, I_D=5A	--	190	--	mΩ
G_{FS}	Forward transconductance	V_{DS}=15V, I_D=5A	--	3.6	--	S
Dynamic Electrical Characteristics @ T_j = 25°C (unless otherwise stated) (Note5)						
C_{iss}	Input Capacitance	V_{DS}=400V,	--	409	--	pF
C_{oss}	Output Capacitance	V_{GS}=0V,	--	37	--	pF
C_{rss}	Reverse Transfer Capacitance	f=1MHz	--	3	--	pF
$C_{o(er)}$	Effective Output Capacitance, Energy Related(Note6)	V_{DS}=0V to 400V,	--	47	--	pF
$C_{o(tr)}$	Effective Output Capacitance, Time Related(Note7)	V_{GS}=0V	--	63	--	pF
Q_g	Total Gate Charge	V_{DS}=400V,	--	18.3	--	nC
Q_{gs}	Gate-Source Charge	I_D=5A,	--	5.1	--	nC
Q_{gd}	Gate-Drain Charge	V_{GS}=-4/+18V	--	8.4	--	nC
R_G	Gate resistance	f=1MHz	--	3	--	Ω
E_{oss}	C_{oss} Stored Energy	V_{DS}=0V to 400V,V_{GS}=0V	--	3.7	--	uJ
Q_{oss}	Output Charge	V_{DS}=0V to 400V,V_{GS}=0V	--	25	--	nC
Switching Characteristics (Note5)						
E_{on}	Turn - on switching loss	V_{DS} = 400 V, I_D = 5A, V_{GS} = -4/+18 V, R_G= 3 Ω L= 500 μH	--	50	--	uJ
E_{off}	Turn - off switching loss		--	33	--	uJ
$t_{d(on)}$	Turn-on Delay Time		--	5	--	ns
t_r	Turn-on Rise Time		--	6	--	ns
$t_{d(off)}$	Turn-off Delay Time		--	8.2	--	ns
t_f	Turn-off Fall Time		--	9.4	--	ns
Reverse conduction characteristics@ T_j = 25°C (unless otherwise stated)						
V_{SD}	Source-Drain reverse voltage	I_S=5A,V_{GS}=-4V	--	4	--	V
I_{rr}	Peak Reverse Recovery Current	V_{DD}=400V, I_S=5A dif/dt = 1000 A/μs	--	4.4	--	A
T_{rr}	Reverse recovery time		--	15	--	ns
Q_{rr}	Reverse recovery charge		--	33	--	nC

Electrical characteristics diagrams

Fig1: Power dissipation Vs case temperature

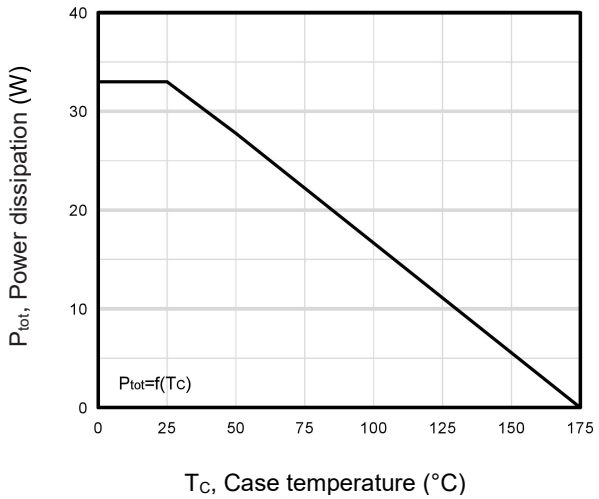


Fig2: Maximum drain current Vs case temperature

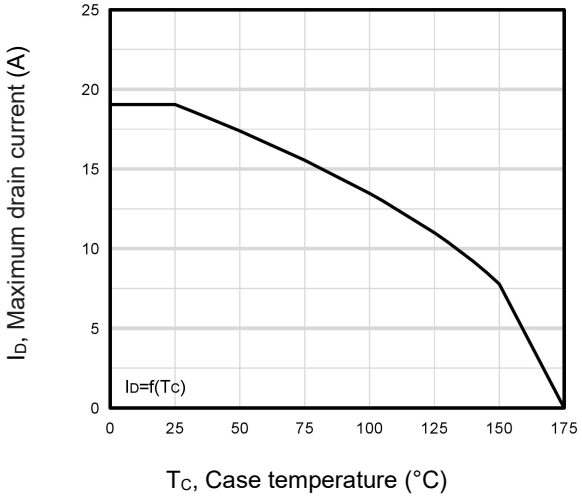


Fig3: Typical output characteristics

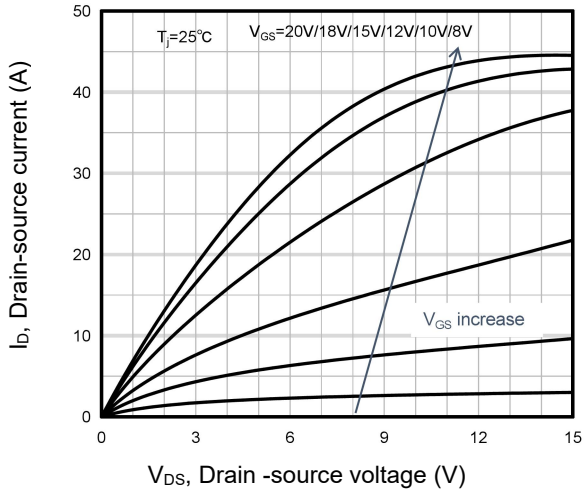


Fig4: Typical output characteristics

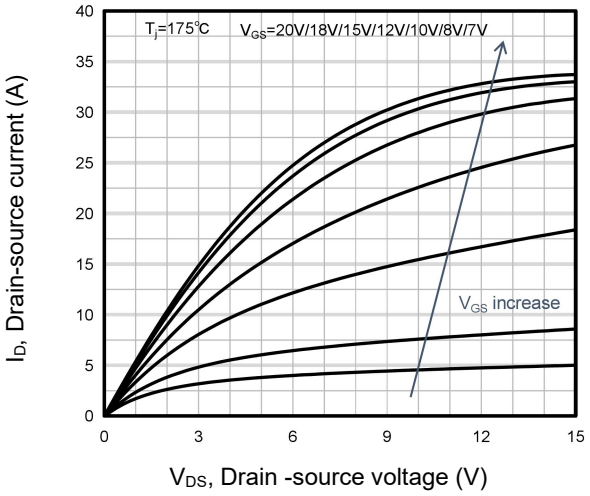


Fig5: Typical transfer characteristics

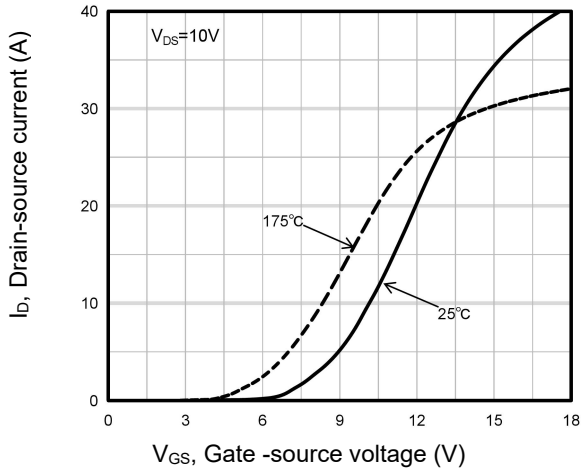


Fig6: Typical on resistance Vs gate-source

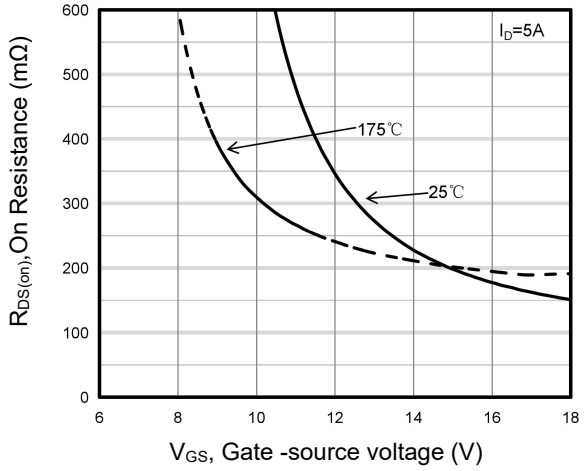


Fig7: Typical on-resistance Vs drain current

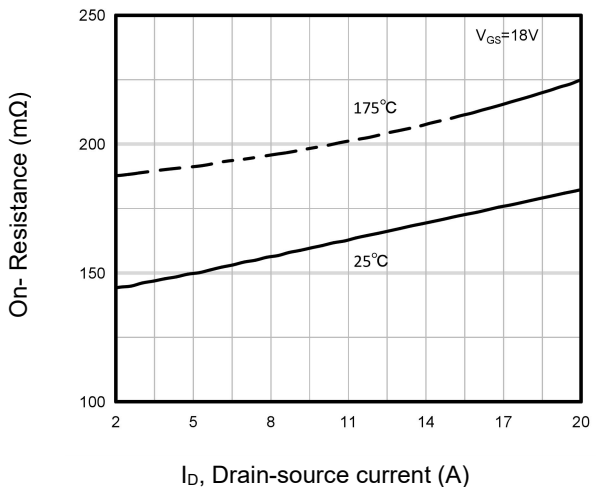


Fig8: Normalized on-resistance Vs junction temperature

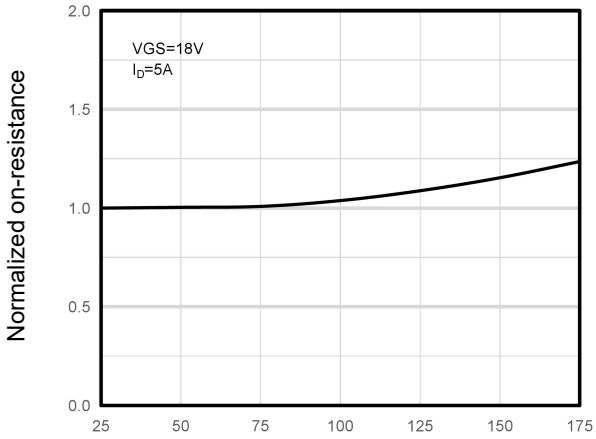


Fig9: Normalized $V_{(BR)DSS}$ Vs junction temperature

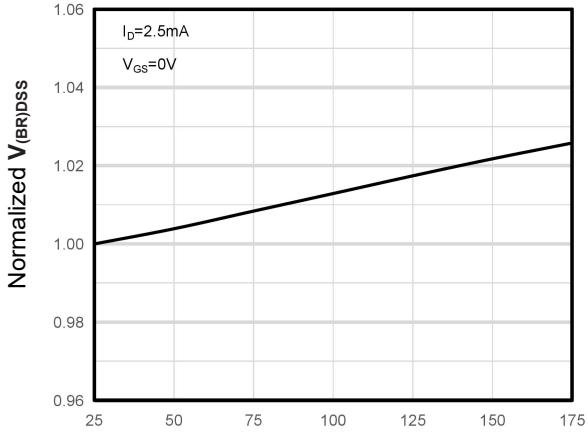


Fig10: Typical Gate-Source Voltage Vs junction temperature

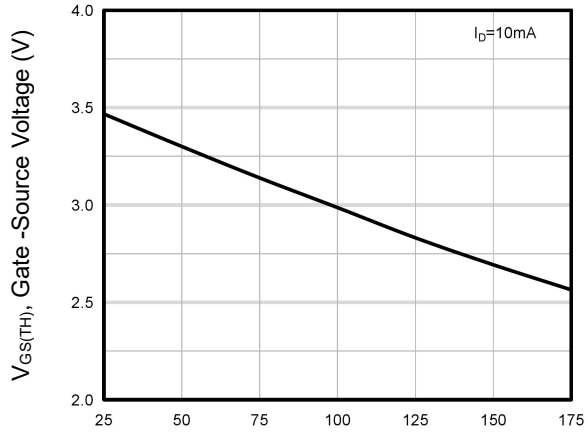


Fig11: Typical 3rd Quadrant Characteristics

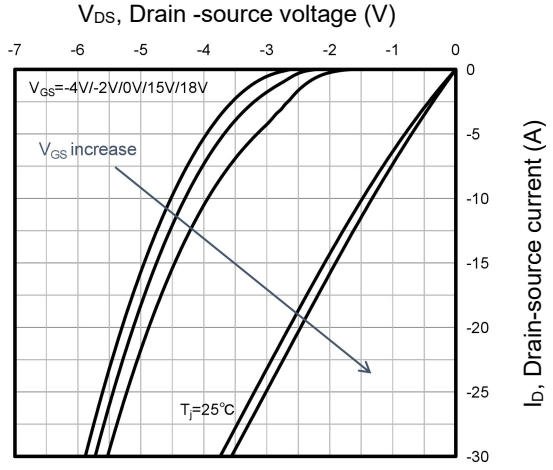


Fig12: Typical 3rd Quadrant Characteristics

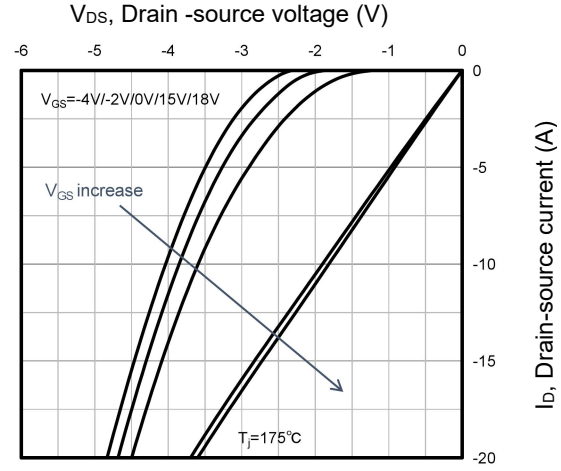
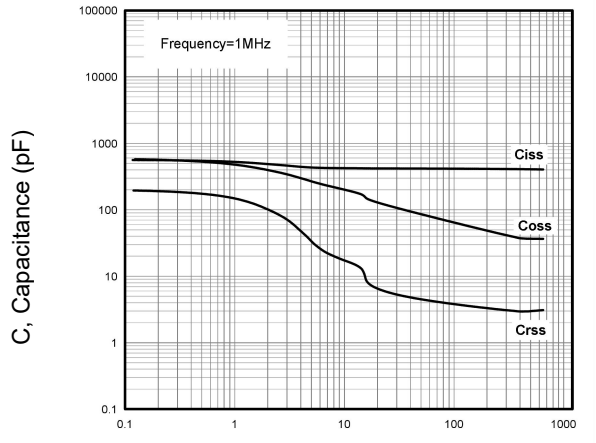
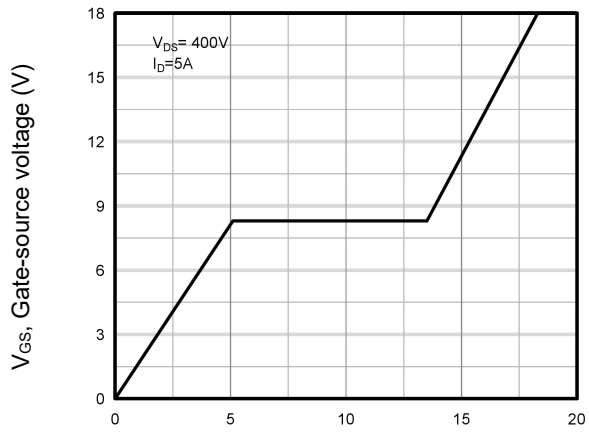


Fig13: Typical capacitance Vs drain-source voltage



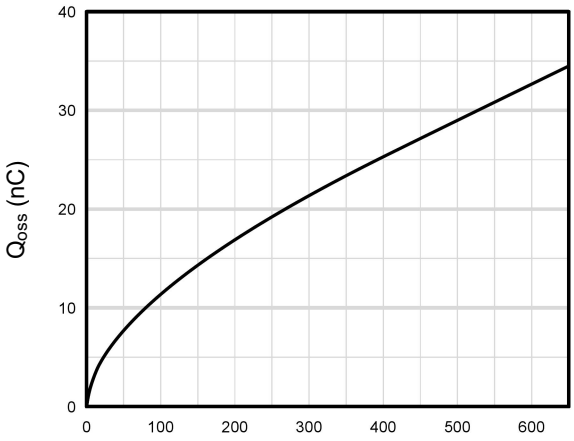
V_{DS}, Drain-source voltage (V)

Fig14: Typical gate charge



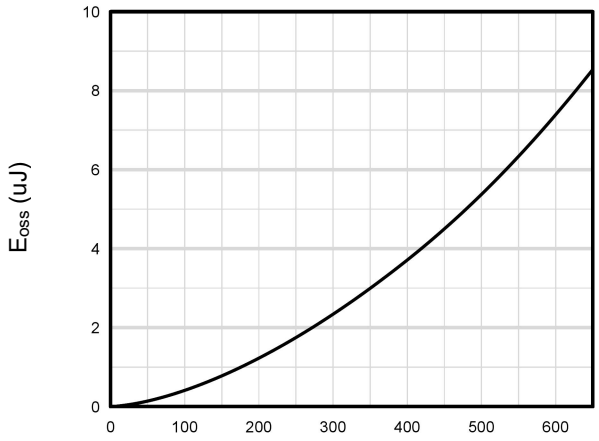
Q_g, Total gate charge (nC)

Fig15: Typical output charge



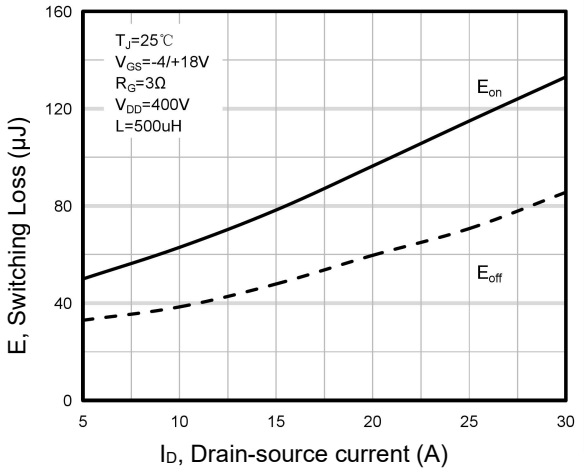
V_{DS}, Drain-source voltage (V)

Fig16: Typical C_{oss} stored energy



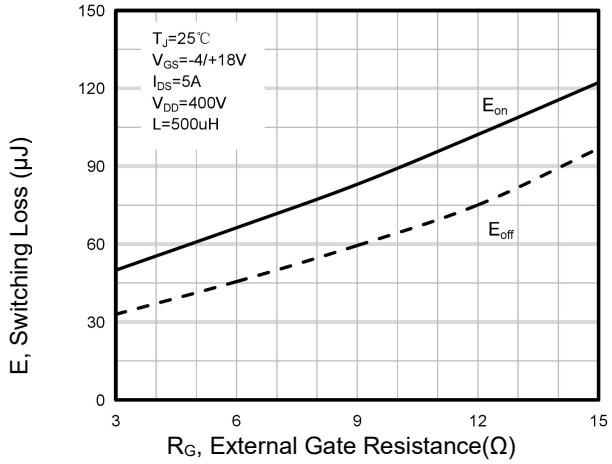
V_{DS}, Drain-source voltage (V)

Fig17: Typical Switching Loss Vs Drain Current



I_D, Drain-source current (A)

Fig18: Typical Switching Loss Vs External Gate Resistance



R_G, External Gate Resistance(Ω)

Fig19: Typical Switching Time Vs External Gate Resistance

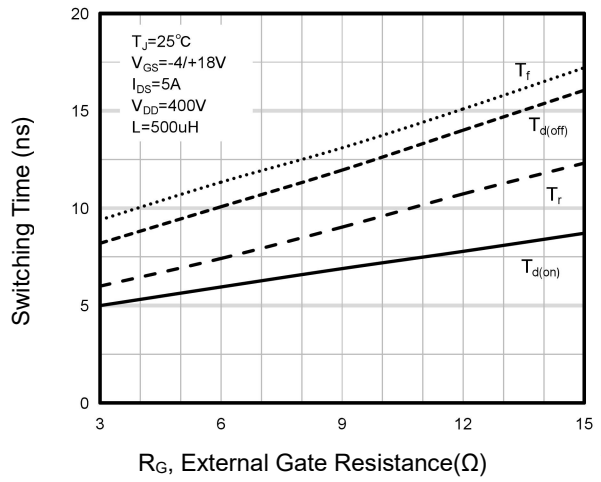


Fig20: Maximum safe operating area

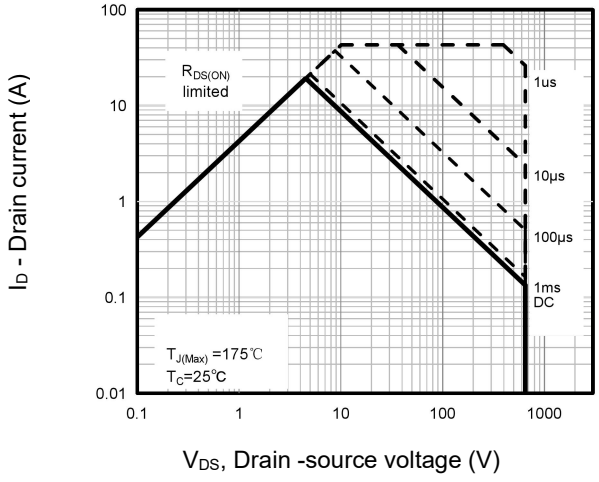
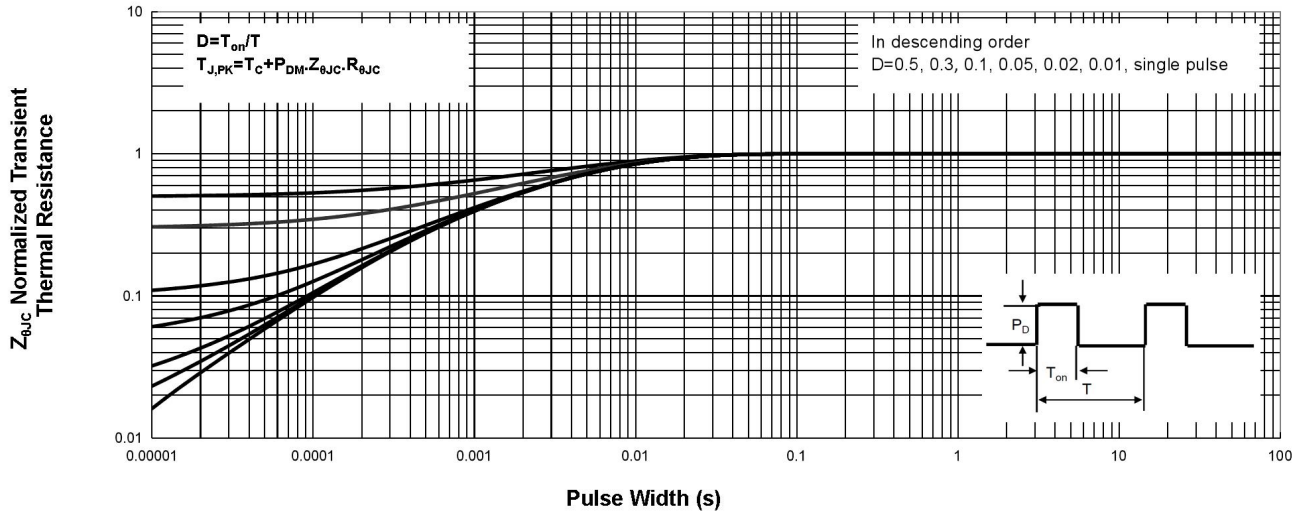


Fig21: Normalized Maximum Transient Thermal



Note:

1. T_J = 25° C, R_G = 25Ω, I_{AS} =10A, L =1.9mH
2. Repetitive Rating: Pulse width limited by maximum junction temperature
3. The value of $R_{\theta JA}$ is measured with the device in a still air environment with T_A =25°C
4. Pulse Test: pulse width ≤ 300 us, duty cycle ≤ 2%
5. Guranteed by design, Not subject to production testing
6. $C_{o(er)}$ is a constant capacitance value that gives the same stored energy as C_{oss} while V_{DS} is rising from 0V to 400V
7. $C_{o(tr)}$ is a constant capacitance value that gives the same charging time as C_{oss} while V_{DS} is rising from 0V to 400V

Fig22: Typical Switching times with inductive load

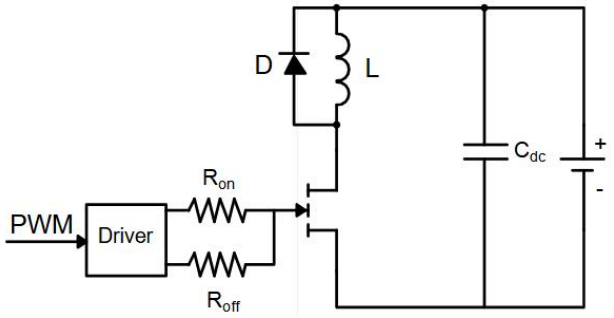


Fig23: Typical Switching times waveform

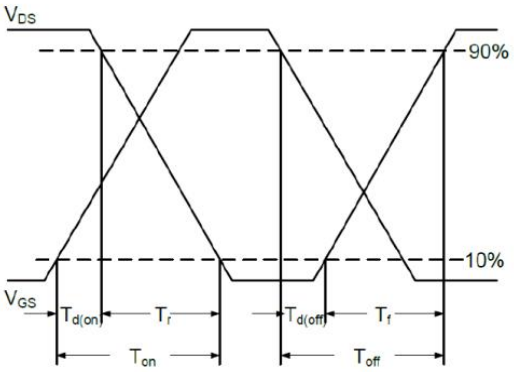


Fig24: Typical Reverse Recovery Time Measurement Circuit

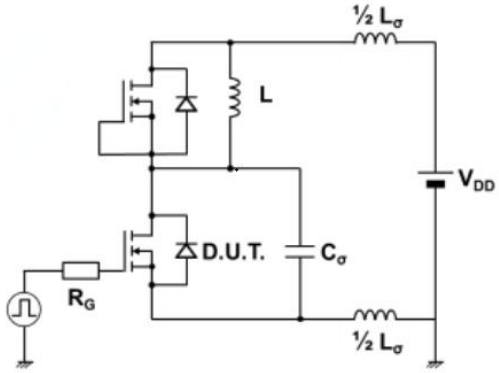


Fig25: Typical Reverse Recovery Waveform

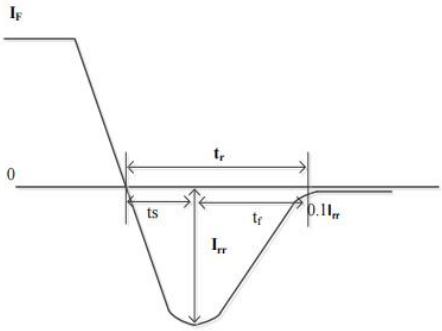


Fig26: Typical Gate Charge Measurement Circuit

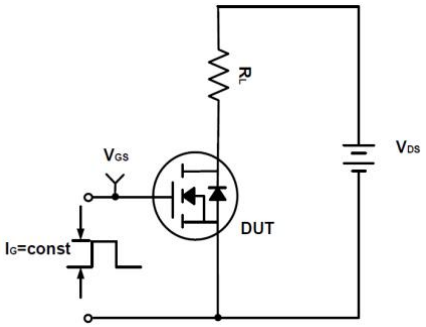


Fig27: Typical Gate Charge Waveform

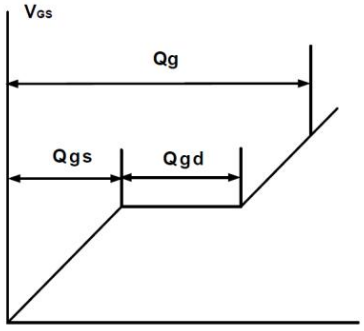
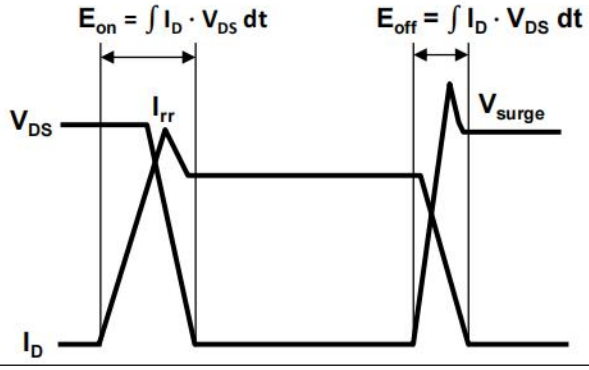
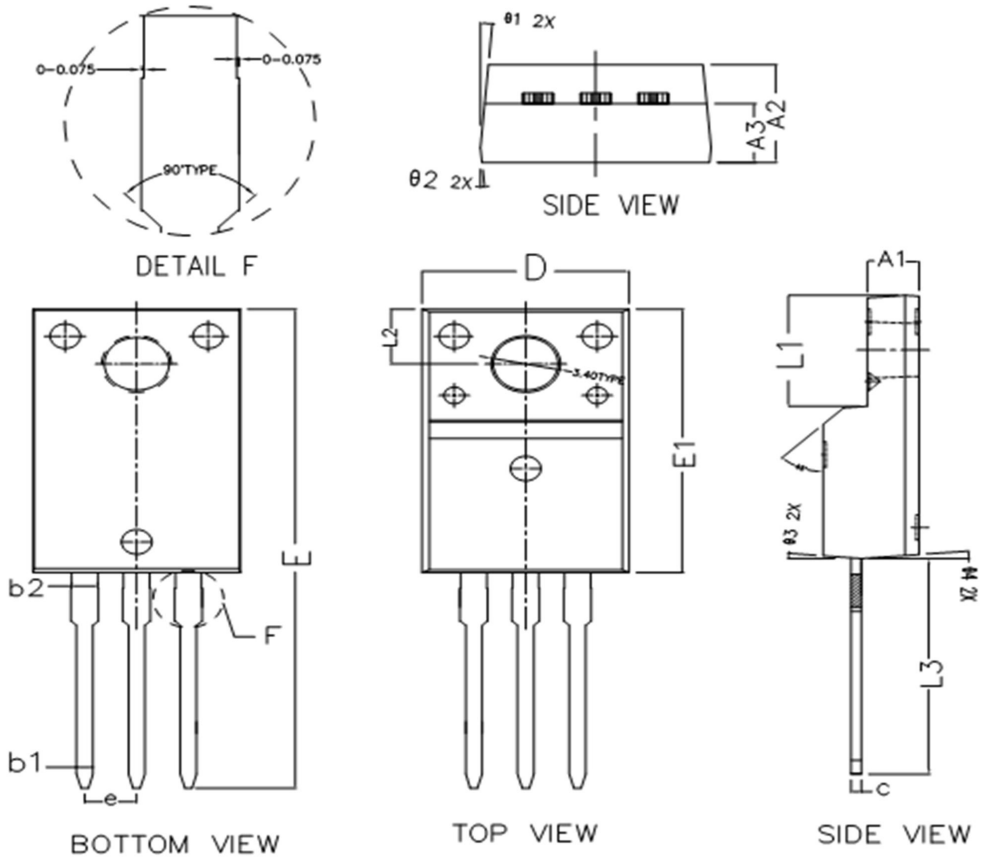


Fig28: Typical Waveforms for Switching Energy Loss



650V 150mΩ N-channel SiC Power MOSFET

TO-220F Package Outline Dimensions (Units: mm)



COMMON DIMENSIONS (UNITS OF MEASURE IS mm)			
	MIN	NORMAL	MAX
A1	2.440	2.540	2.640
A2	4.600	4.700	4.800
A3	2.730	2.830	2.930
b1	0.750	0.800	0.850
b2	1.230	1.280	1.330
c	0.450	0.500	0.550
D	10.060	10.160	10.260
E	28.650	28.850	29.050
E1	15.770	15.870	15.970
e	2.54TYPE		
L1	6.68REF		
L2	3.30REF		
L3	12.830	12.980	13.130
θ1	5° TYPE		
θ2	5° TYPE		
θ3	5° TYPE		
θ4	5° TYPE		