PSY065M240

650V 140mΩ N-channel SiC Power MOSFET

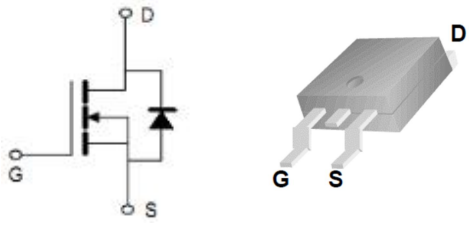
V_{DS}	650	V
I_D	20	A
$R_{DS(on),Typ}$ @V_{GS}=18V	140	mΩ
$R_{DS(on),Typ}$ @V_{GS}=15V	180	mΩ

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-263

Order Information

Product	Package	Marking	Reel	Carton
PSY065M240	TO-263	PSY065M240	800PCS	6400PCS

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)		126	mJ
V_{GS}	Gate-Source Voltage		-10 to +20	V
I_D	Continuous Drain current	T_C=25°C	20	A
I_{DM}	Pulse Drain Current Tested (Note2)	T_C=25°C	46	A
I_S	Reverse continuous current	T_C=25C	20	A
P_D	Maximum Power Dissipation	T_C=25°C	88	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	1.7	°C/W
$R_{\theta JA}$	Thermal Resistance Junction−to−Ambient (Note3)	60	°C/W

650V 140mΩ 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	--	125	--	mΩ
		V_{GS}=18V, I_D=5A	--	140	180	mΩ
		V_{GS}=15V, I_D=5A	--	180	--	mΩ
G_{FS}	Forward transconductance	V_{DS}=15V, I_D=5A	--	3.3	--	S
Dynamic Electrical Characteristics @ T_j = 25°C (unless otherwise stated) (Note5)						
C_{iss}	Input Capacitance	V_{DS}=400V,	--	395	--	pF
C_{oss}	Output Capacitance	V_{GS}=0V,	--	34	--	pF
C_{rss}	Reverse Transfer Capacitance	f=1MHz	--	0.5	--	pF
$C_{o(er)}$	Effective Output Capacitance, Energy Related(Note6)	V_{DS}=0V to 400V,	--	45	--	pF
$C_{o(tr)}$	Effective Output Capacitance, Time Related(Note7)	V_{GS}=0V	--	62	--	pF
Q_g	Total Gate Charge	V_{DS}=400V,	--	19	--	nC
Q_{gs}	Gate-Source Charge	I_D=5A,	--	5.5	--	nC
Q_{gd}	Gate-Drain Charge	V_{GS}=-4/+18V	--	8.4	--	nC
R_G	Gate resistance	f=1MHz	--	5	--	Ω
E_{oss}	C_{oss} Stored Energy	V_{DS}=0V to 400V,V_{GS}=0V	--	3.6	--	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	--	4.2	--	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

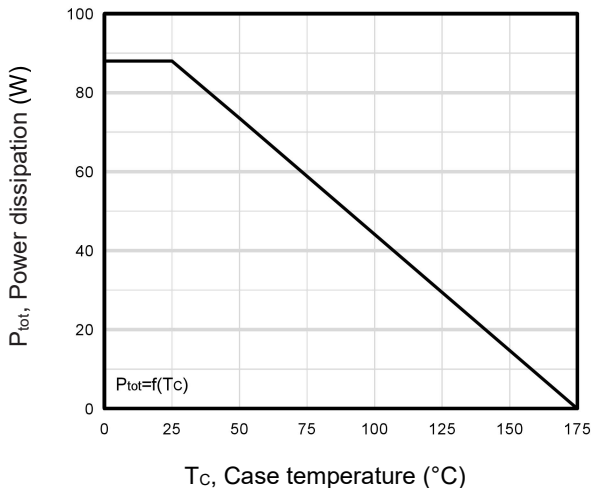


Fig2: Maximum drain current Vs case temperature

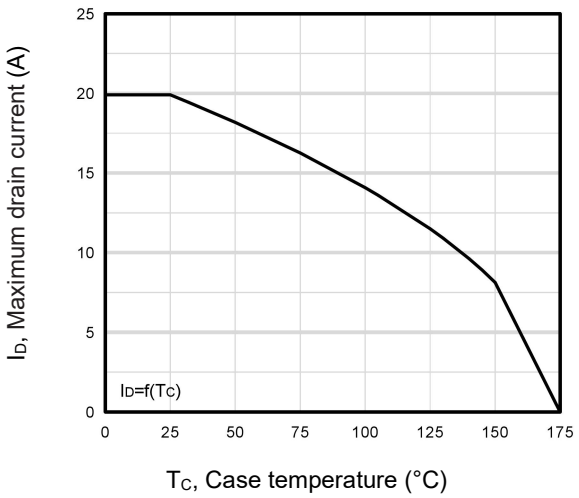


Fig3: Typical output characteristics

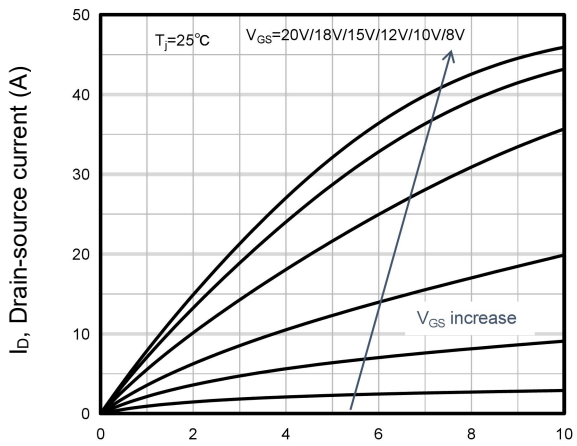


Fig4: Typical output characteristics

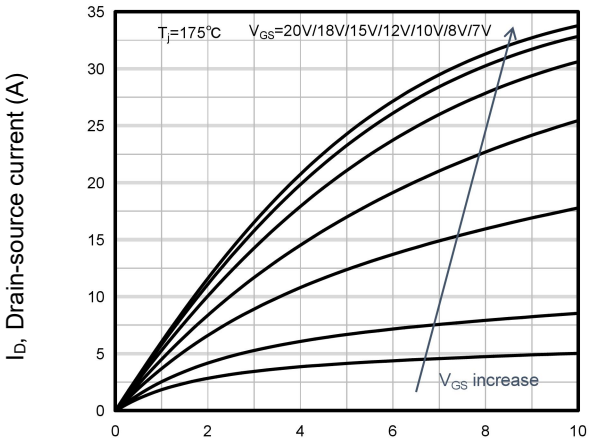


Fig5: Typical transfer characteristics

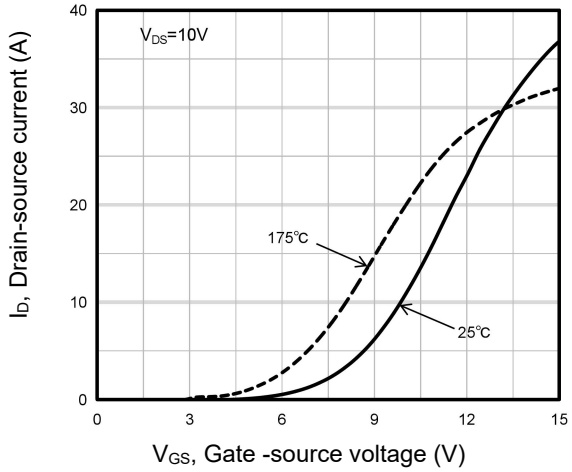


Fig6: Typical on resistance Vs gate-source

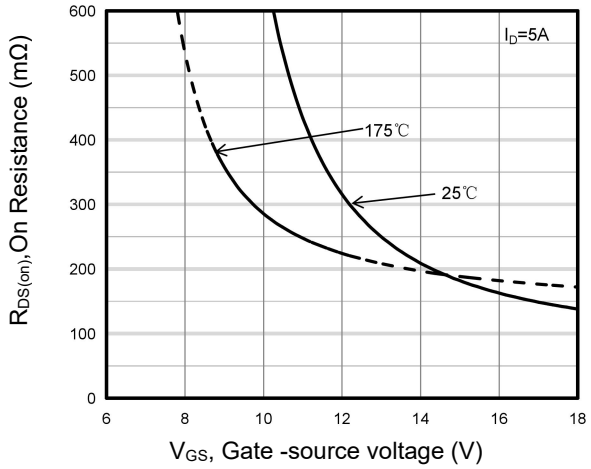


Fig7: Typical on-resistance Vs drain current

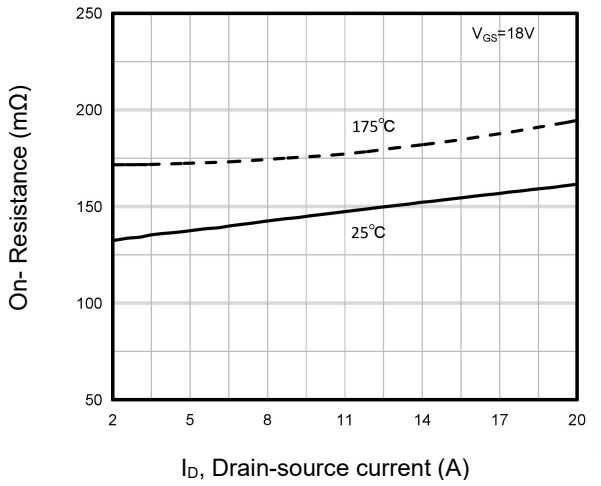


Fig8: Normalized on-resistance Vs junction temperature

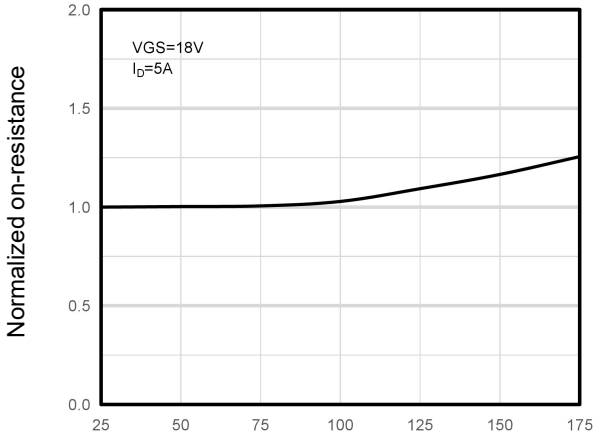


Fig9: Normalized $V_{(BR)DSS}$ Vs junction temperature

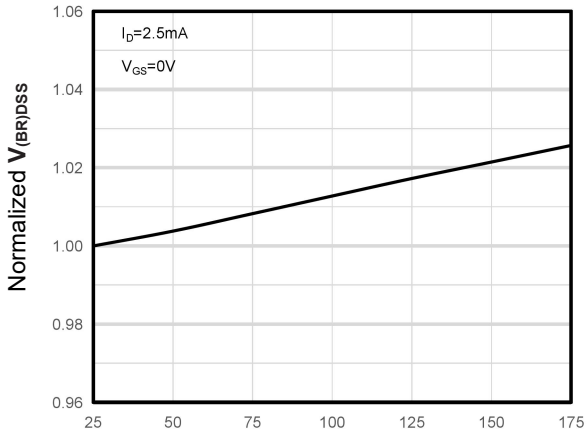


Fig10: Typical Gate-Source Voltage Vs junction temperature

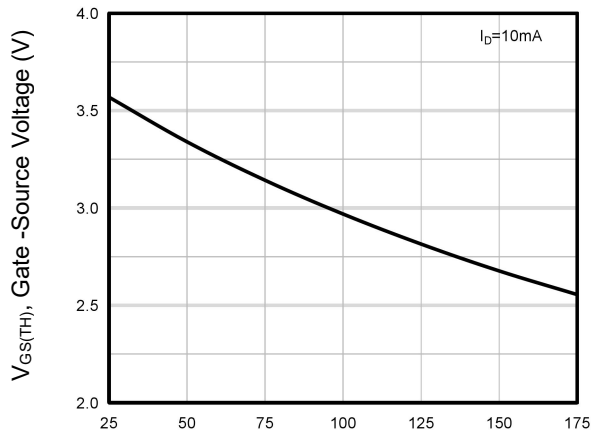


Fig11: Typical 3rd Quadrant Characteristics

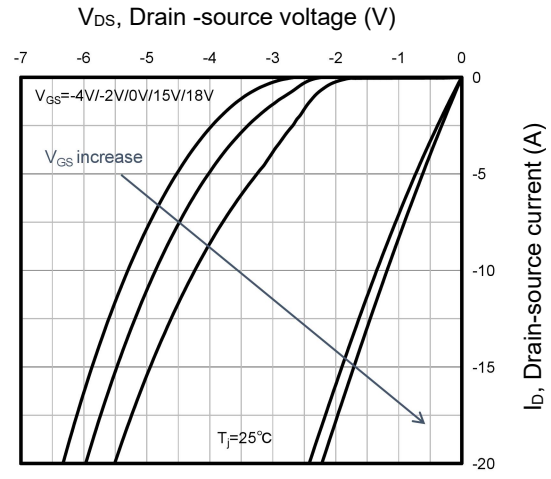


Fig12: Typical 3rd Quadrant Characteristics

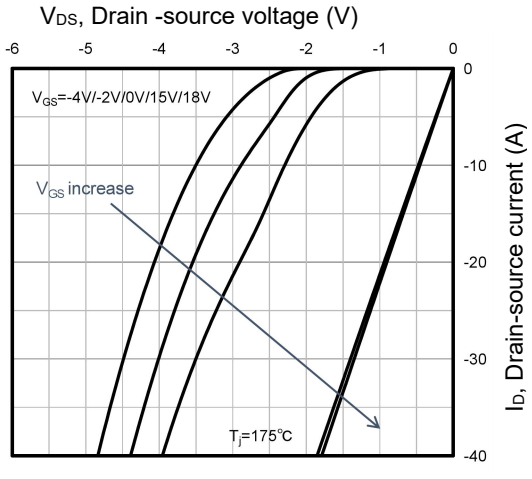


Fig13: Typical capacitance Vs drain-source voltage

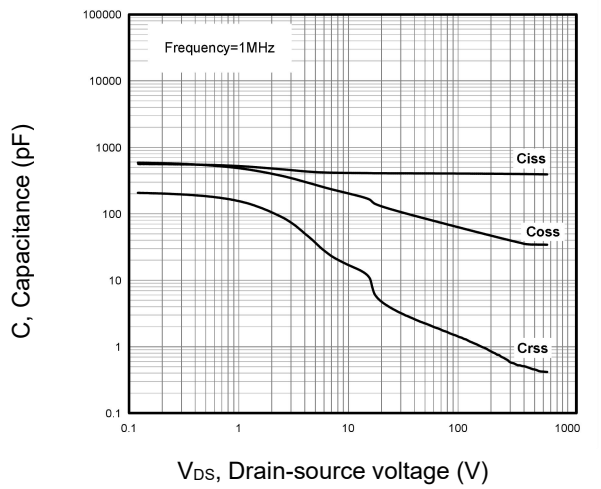


Fig14: Typical gate charge

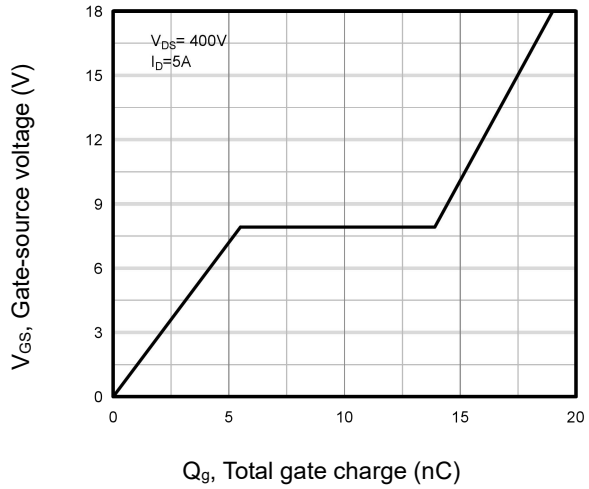


Fig15: Typical output charge

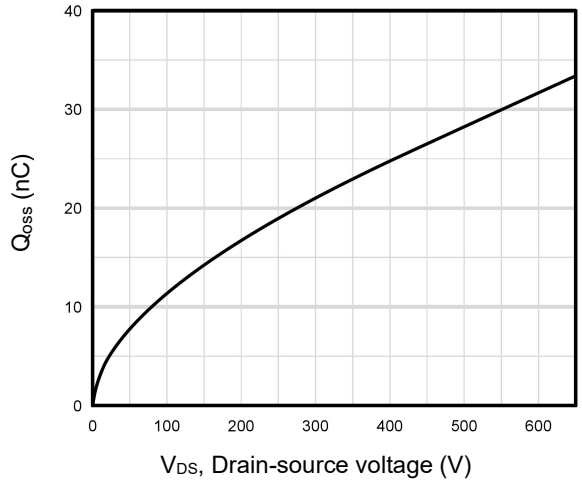


Fig16: Typical C_{oss} stored energy

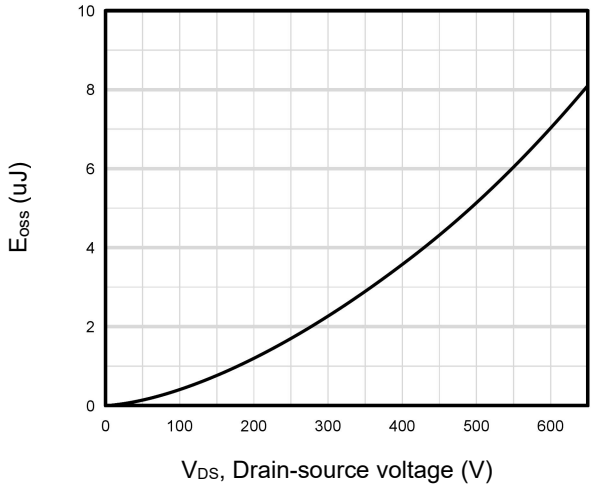


Fig17: Typical Switching Loss Vs Drain Current

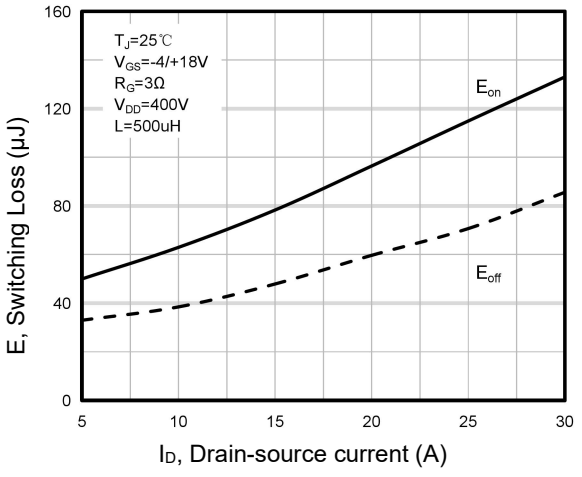


Fig18: Typical Switching Loss Vs External Gate Resistance

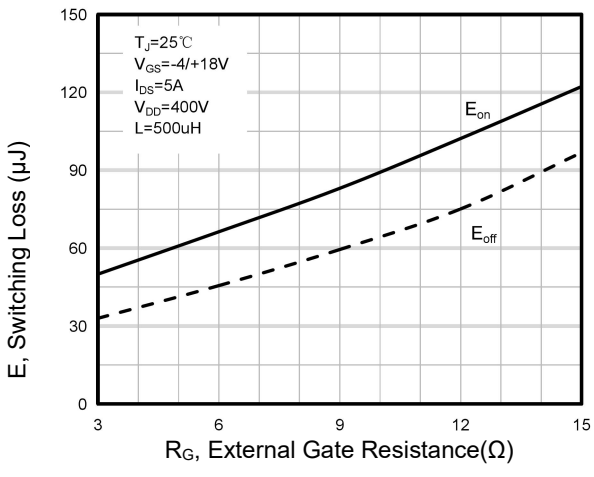


Fig19: Typical Switching Time Vs External Gate Resistance

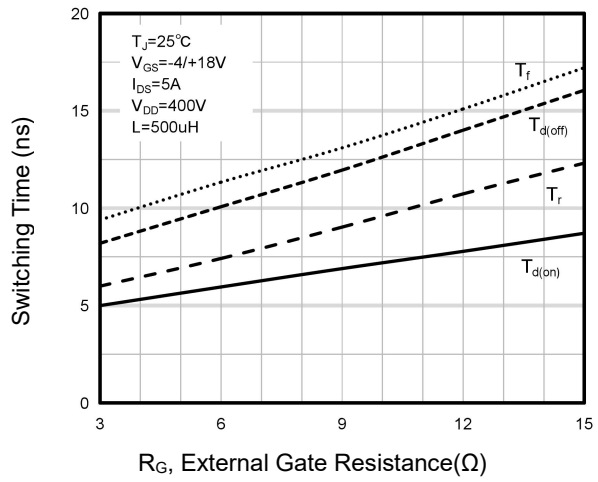


Fig20: Maximum safe operating area

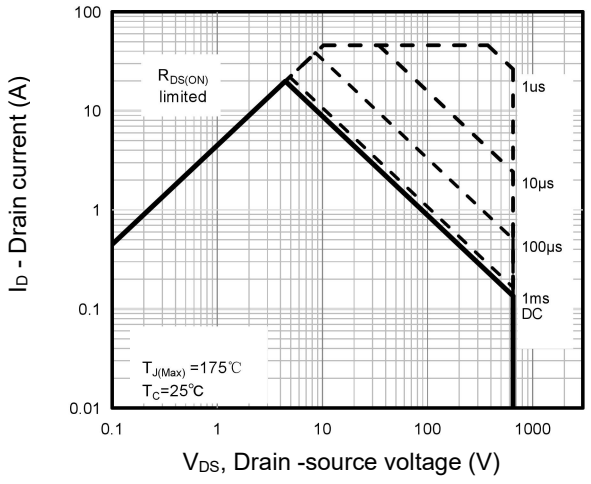
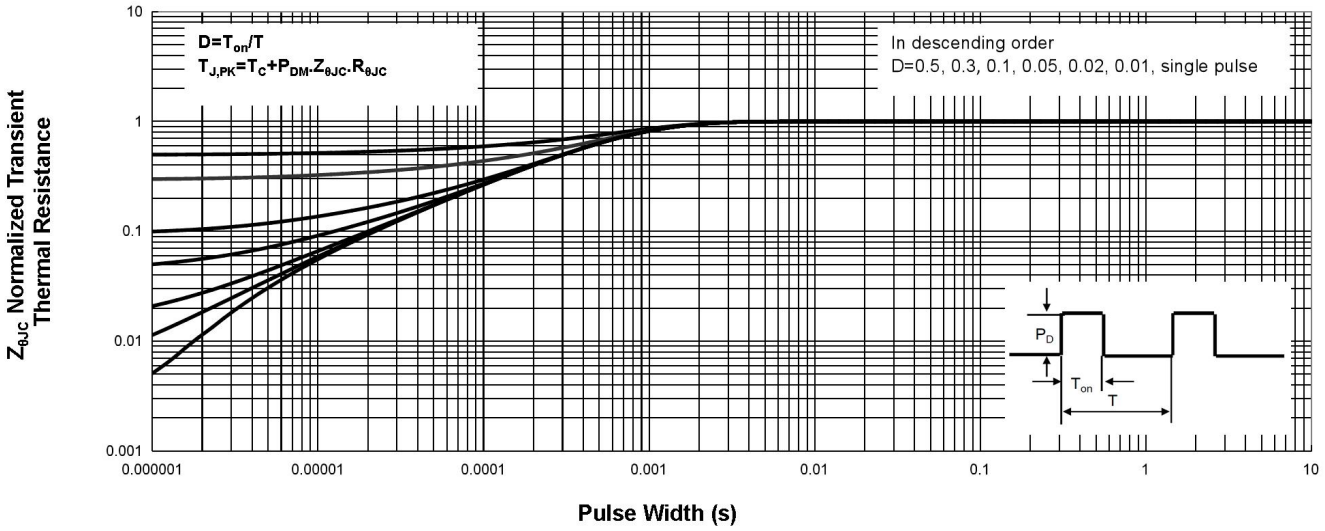


Fig21: Normalized Maximum Transient Thermal



Note:

1. T_J = 25° C, R_G = 25Ω, I_{AS} =11.5A, 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

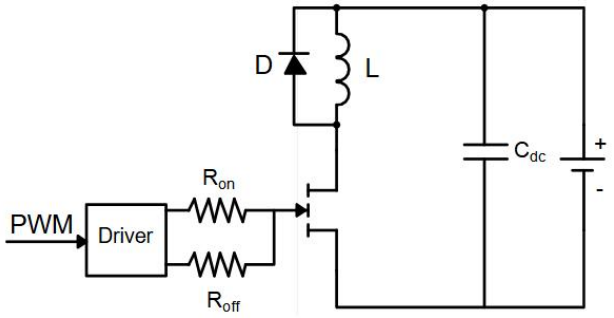


Fig23: Typical Switching times waveform

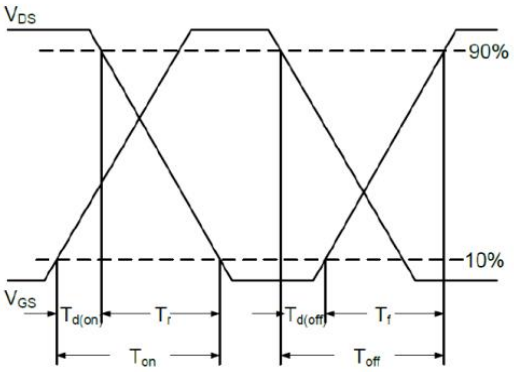


Fig24: Typical Reverse Recovery Time Measurement Circuit

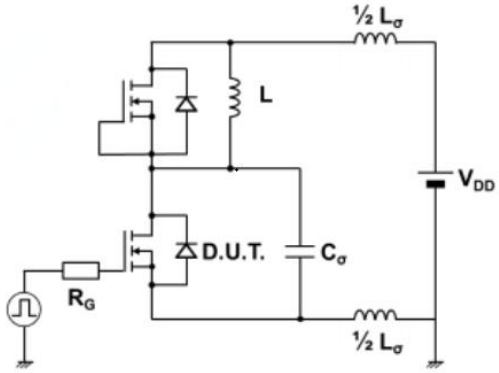


Fig25: Typical Reverse Recovery Waveform

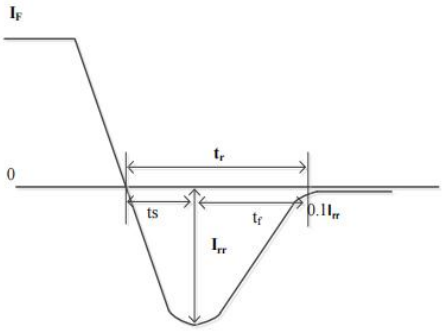


Fig26: Typical Gate Charge Measurement Circuit

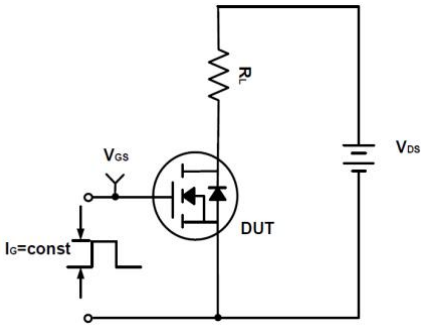


Fig27: Typical Gate Charge Waveform

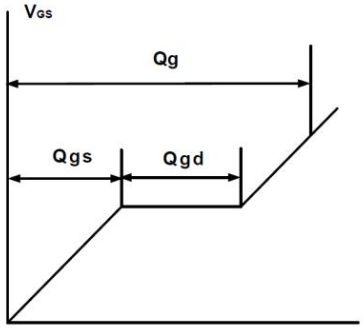
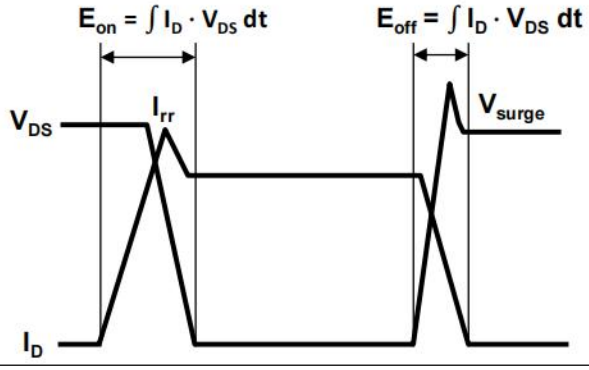
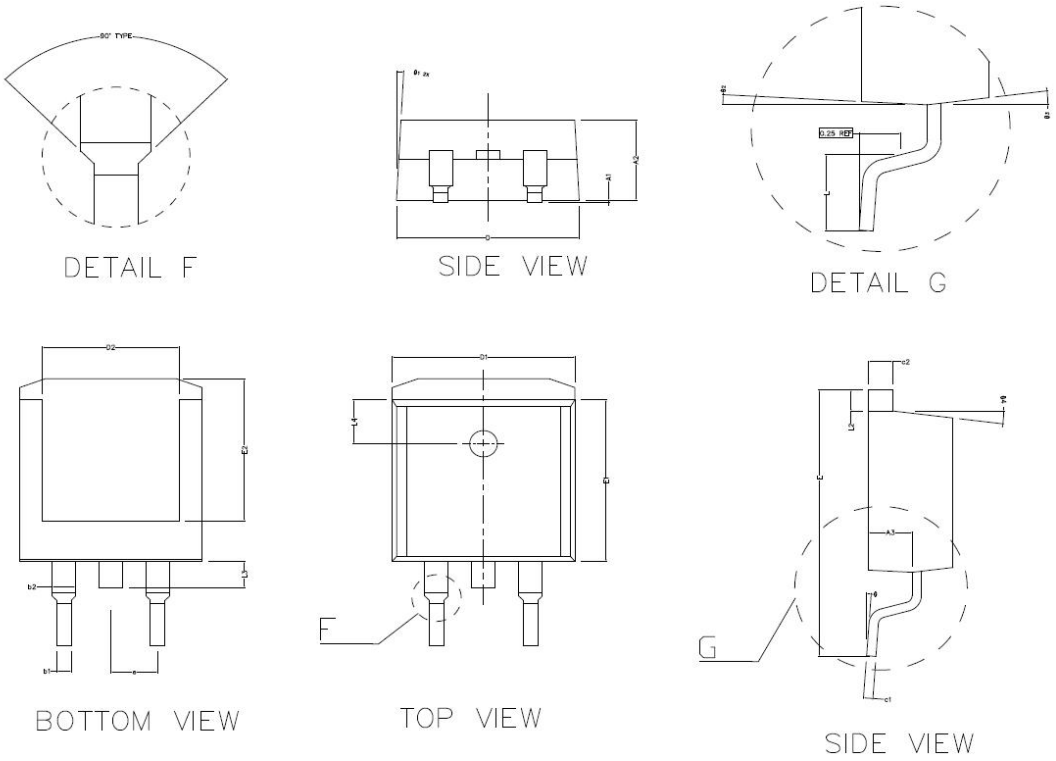


Fig28: Typical Waveforms for Switching Energy Loss



650V 140mΩ N-channel SiC Power MOSFET

TO-263 Package Outline Dimensions (Units: mm)



COMMON DIMENSIONS (UNITS OF MEASURE IS mm)			
	MIN	NORMAL	MAX
A1	0.020	0.100	0.200
A2	4.470	4.570	4.670
A3	2.300	2.350	2.400
b1	0.750	0.800	0.850
b2	1.220	1.270	1.320
c1	0.450	0.500	0.550
c2	1.250	1.300	1.350
D	9.900	10.000	10.100
D1	9.880REF		
D2	7.400REF		
E	14.900	15.100	15.300
E1	9.000	9.100	9.200
E2	8.100REF		
e	2.540TYPE		
L	2.100	2.300	2.500
L2	1.100	1.200	1.300
L3	1.300	1.500	1.700
L4	2.50 TYPE		
θ1	3° TYPE		
θ2	3° TYPE		
θ3	7° TYPE		
θ4	7° TYPE		
θ	0 ~ 8°		