PSWF120M40

1200V 29mΩ N-channel SiC Power MOSFET

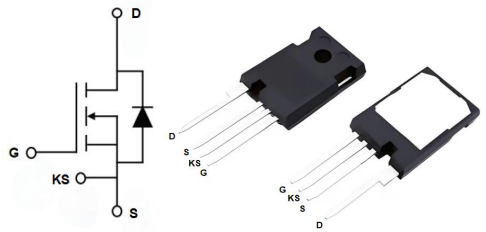
V_{DS}	1200	V
I_D	73	A
$R_{DS(on),Typ}$ @V_{GS}=18V	29	mΩ
$R_{DS(on),Typ}$ @V_{GS}=15V	36	mΩ

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-247-4L

Order Information

Product	Package	Marking	Tube	Carton
PSWF120M40	TO-247-4L	PSWF120M40	30PCS	1980PCS

Absolute Maximum Ratings

Symbol	Parameter		Rating	Unit
Common Ratings (T_j=25°C Unless Otherwise Specified)				
V_{DS}	Drain-Source Voltage		1200	V
E_{AS}	Non-Repetitive Avalanche Energy (Note1)		1163	mJ
V_{GS}	Gate-Source Voltage		-10 to +20	V
I_D	Continuous Drain current	T_C=25°C	73	A
I_{DM}	Pulse Drain Current Tested (Note2)	T_C=25°C	200	A
I_S	Reverse continuous current	T_C=25C	73	A
P_D	Maximum Power Dissipation	T_C=25°C	333	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	0.45	°C/W
$R_{\theta JA}$	Thermal Resistance Junction−to−Ambient (Note3)	40	°C/W

1200V 29mΩ 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	1200	--	--	V
I_{DSS}	Zero Gate Voltage Drain current	V_{DS}=1200V,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=35A	--	27	--	mΩ
		V_{GS}=18V, I_D=35A	--	29	37	mΩ
		V_{GS}=15V, I_D=35A	--	36	--	mΩ
G_{FS}	Forward transconductance	V_{DS}=10V, I_D=35A	--	9.5	--	S
Dynamic Electrical Characteristics @ T_j = 25°C (unless otherwise stated) (Note5)						
C_{iss}	Input Capacitance	V_{DS}=800V,	--	3295	--	pF
C_{oss}	Output Capacitance	V_{GS}=0V,	--	153	--	pF
C_{rss}	Reverse Transfer Capacitance	f=100kHz	--	7.1	--	pF
$C_{o(er)}$	Effective Output Capacitance, Energy Related(Note6)	V_{DS}=0V to 800V,	--	189	--	pF
$C_{o(tr)}$	Effective Output Capacitance, Time Related(Note7)	V_{GS}=0V	--	275	--	pF
Q_g	Total Gate Charge	V_{DS}=800V,	--	134	--	nC
Q_{gs}	Gate-Source Charge	I_D=35A,	--	42	--	nC
Q_{gd}	Gate-Drain Charge	V_{GS}=-5/+18V	--	56	--	nC
R_G	Gate resistance	f=1MHz	--	2.7	--	Ω
E_{oss}	C_{oss} Stored Energy	V_{DS}=0V to 800V,V_{GS}=0V	--	60	--	uJ
Q_{oss}	Output Charge	V_{DS}=0V to 800V,V_{GS}=0V	--	220	--	nC
Switching Characteristics (Note5)						
E_{on}	Turn - on switching loss	V_{DS} = 800 V, I_D = 35A, V_{GS} = -5/+18 V, R_G= 4 Ω L= 50 μH	--	220	--	uJ
E_{off}	Turn - off switching loss		--	60	--	uJ
$t_{d(on)}$	Turn-on Delay Time		--	28	--	ns
t_r	Turn-on Rise Time		--	18	--	ns
$t_{d(off)}$	Turn-off Delay Time		--	20	--	ns
t_f	Turn-off Fall Time		--	10	--	ns
Reverse conduction characteristics@ T_j = 25°C (unless otherwise stated)						
V_{SD}	Source-Drain reverse voltage	I_S=20A,V_{GS}=0V	--	3.9	--	V
I_{rr}	Peak Reverse Recovery Current	V_{DD}=800V, I_S=35A dif/dt = 1000 A/μs	--	6	--	A
T_{rr}	Reverse recovery time		--	20	--	ns
Q_{rr}	Reverse recovery charge		--	75	--	nC

Electrical characteristics diagrams

Fig1: Power dissipation Vs case temperature

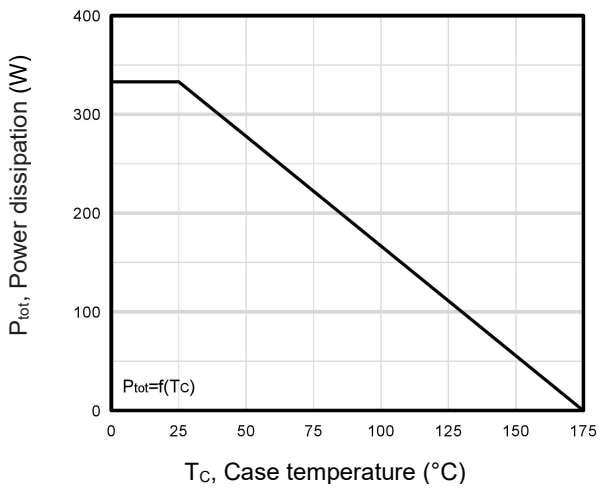


Fig2: Maximum drain current Vs case temperature

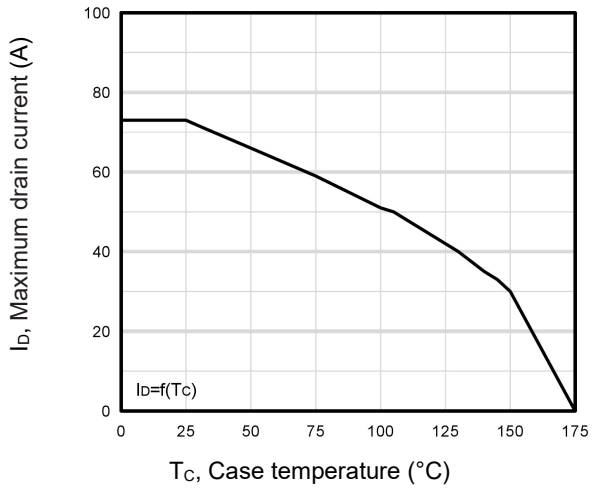


Fig3: Typical output characteristics

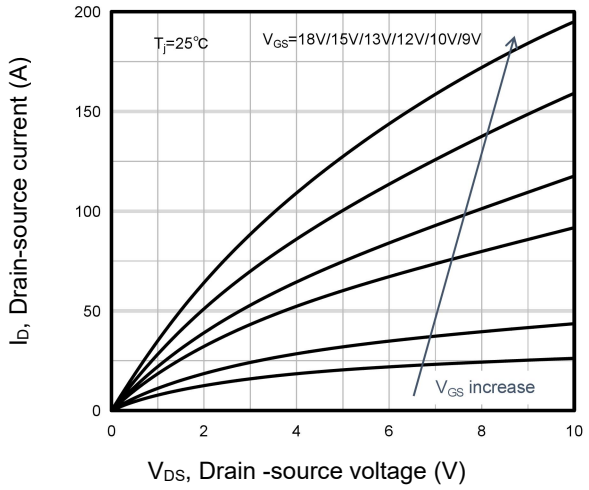


Fig4: Typical output characteristics

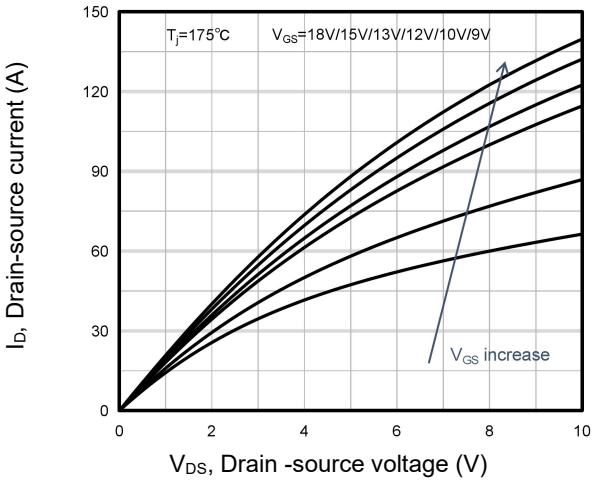


Fig5: Typical transfer characteristics

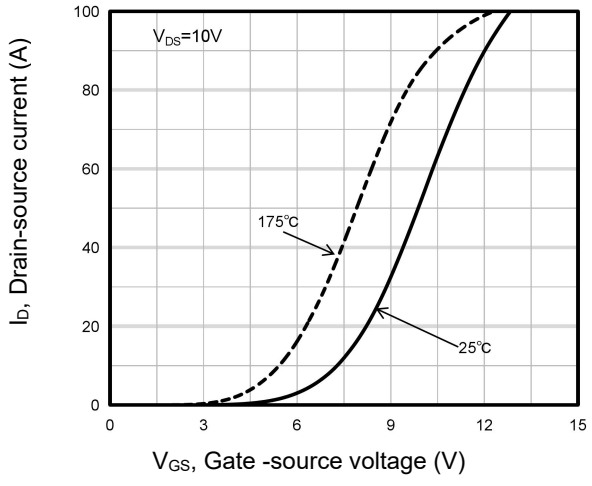


Fig6: Typical on resistance Vs gate-source

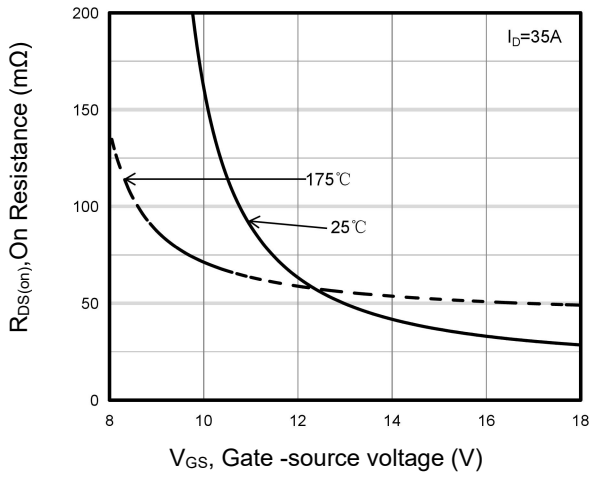


Fig7: Typical on-resistance Vs drain current

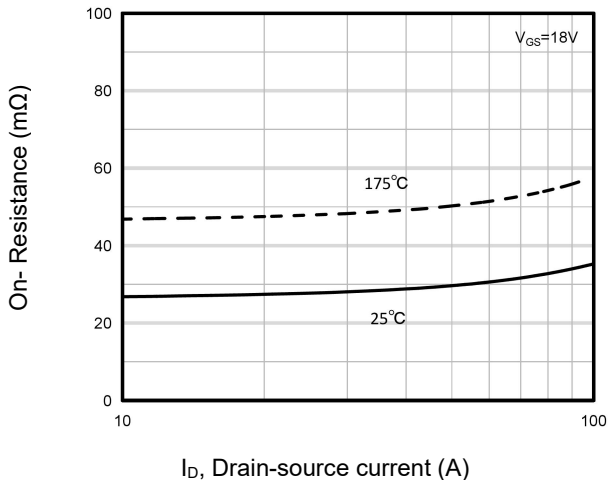


Fig8: Normalized on-resistance Vs junction temperature

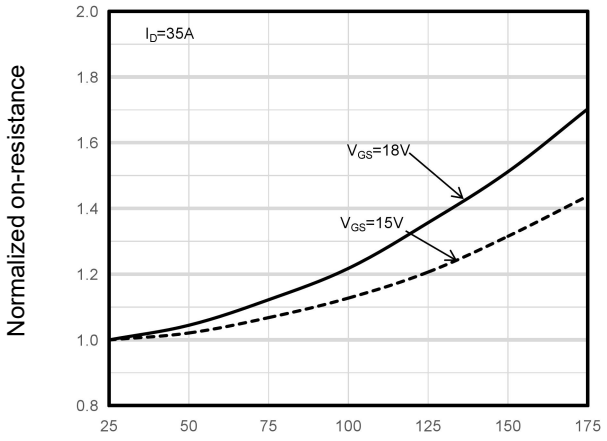


Fig9: Normalized $V_{(BR)DSS}$ Vs junction temperature

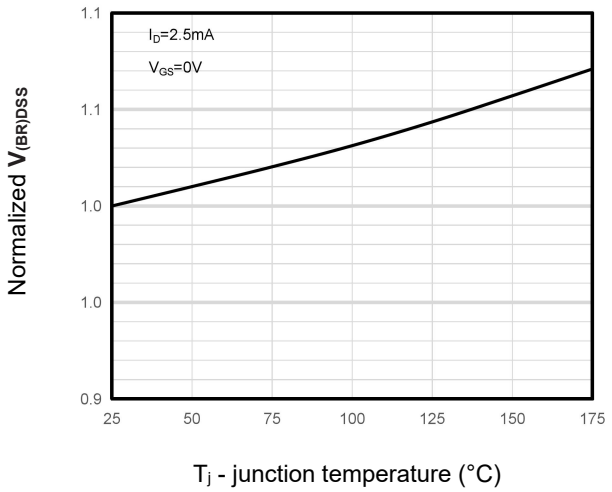


Fig10: Typical Gate-Source Voltage Vs junction temperature

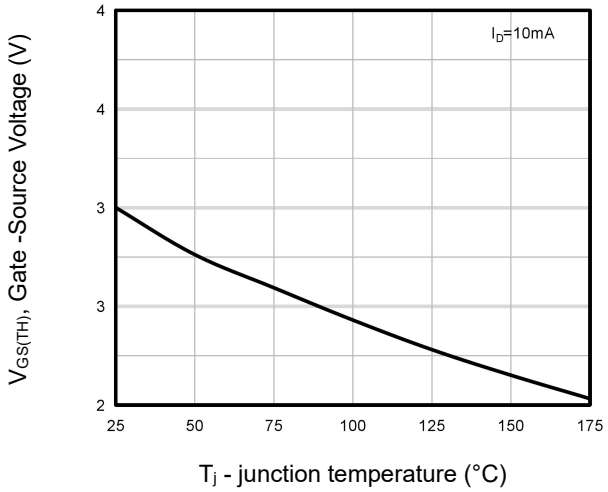


Fig11: Typical 3rd Quadrant Characteristics

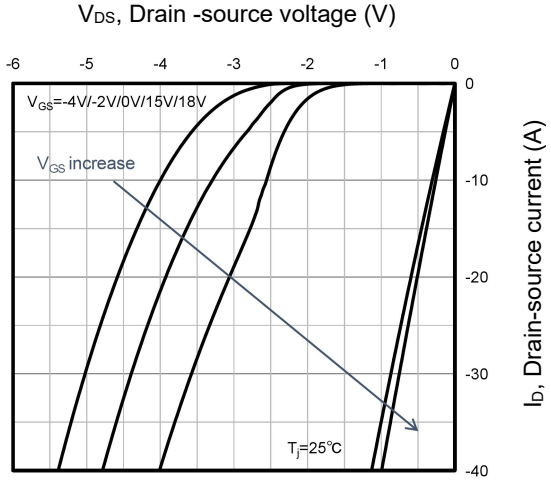


Fig12: Typical 3rd Quadrant Characteristics

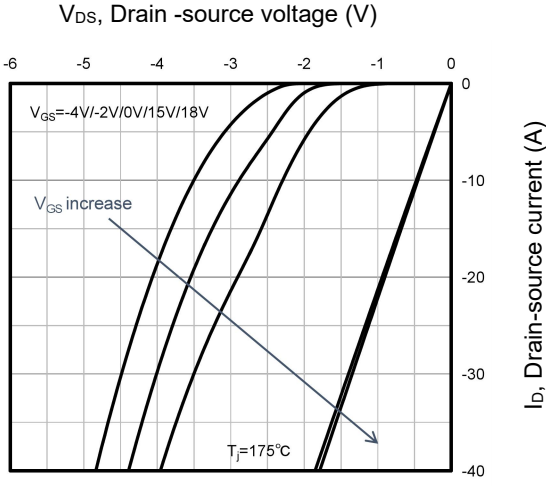


Fig13: Typical capacitance Vs drain-source voltage

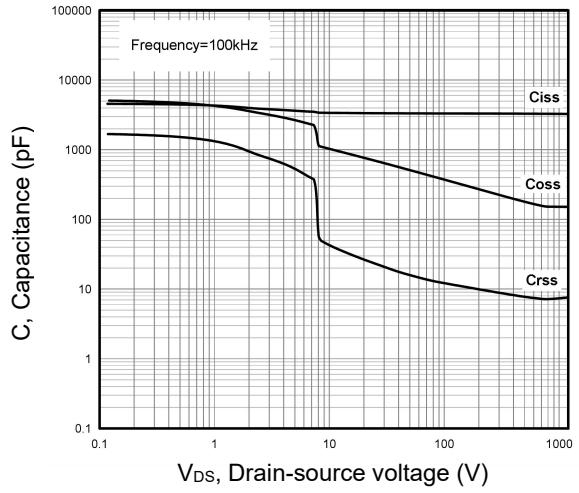


Fig14: Typical gate charge

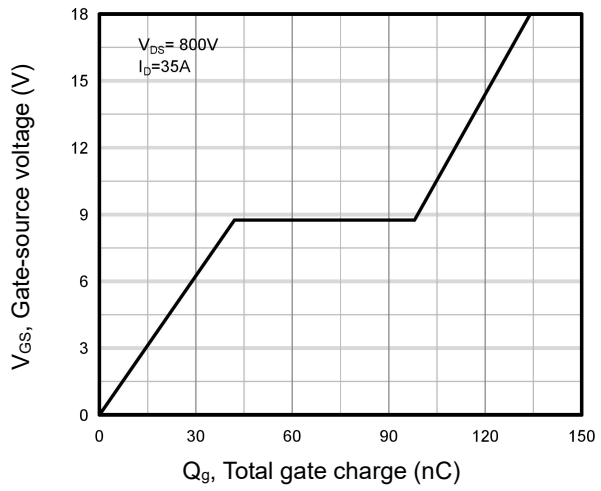


Fig15: Typical output charge

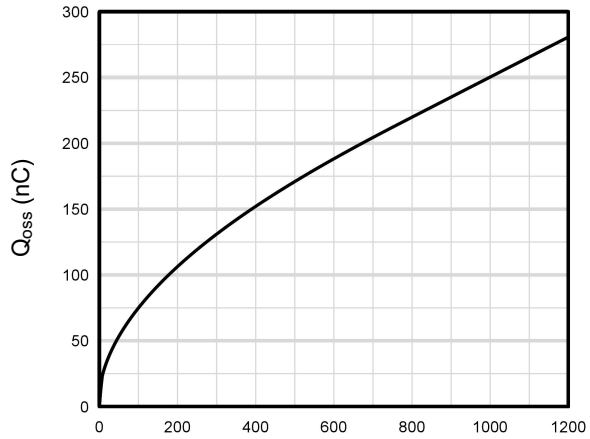


Fig16: Typical C_{oss} stored energy

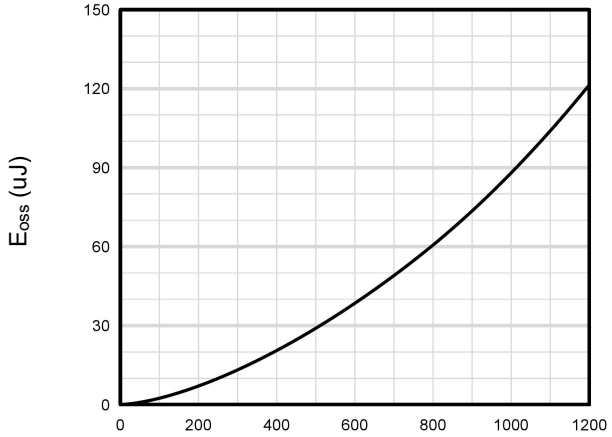


Fig17: Typical Switching Loss Vs Drain Current

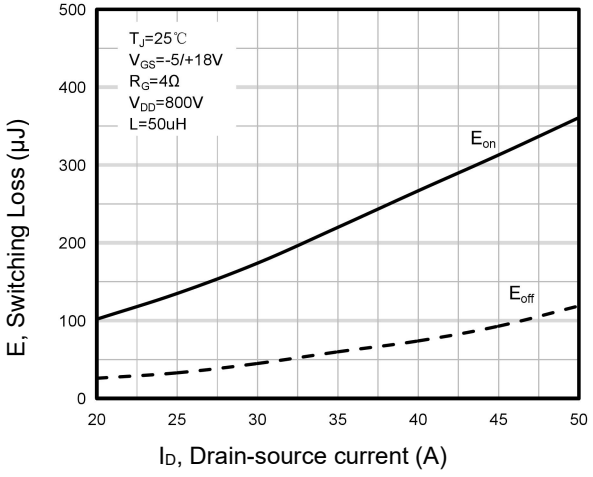


Fig18: Typical Switching Loss Vs External Gate Resistance

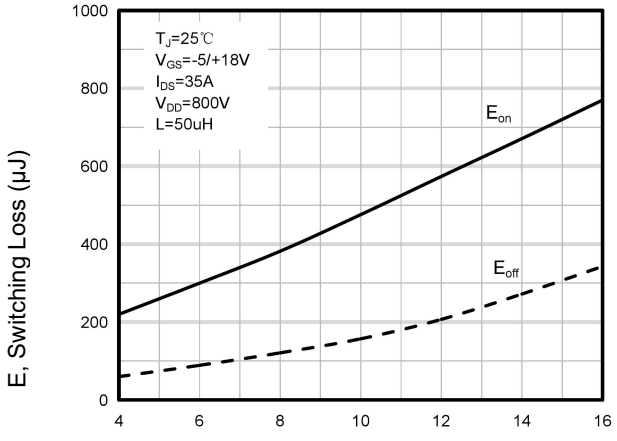


Fig19: Typical Switching Time Vs External Gate Resistance

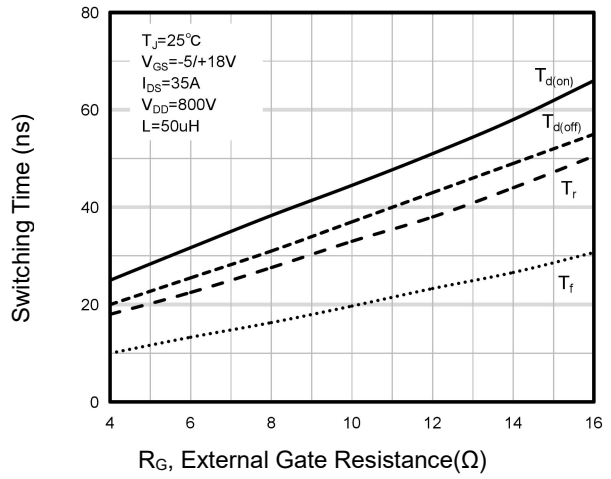


Fig20: Maximum safe operating area

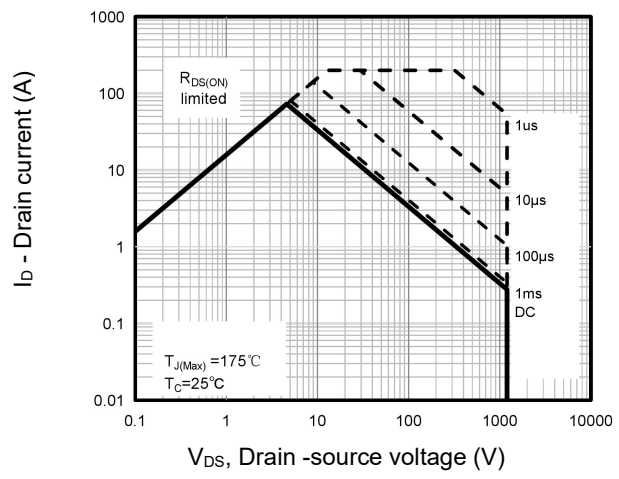
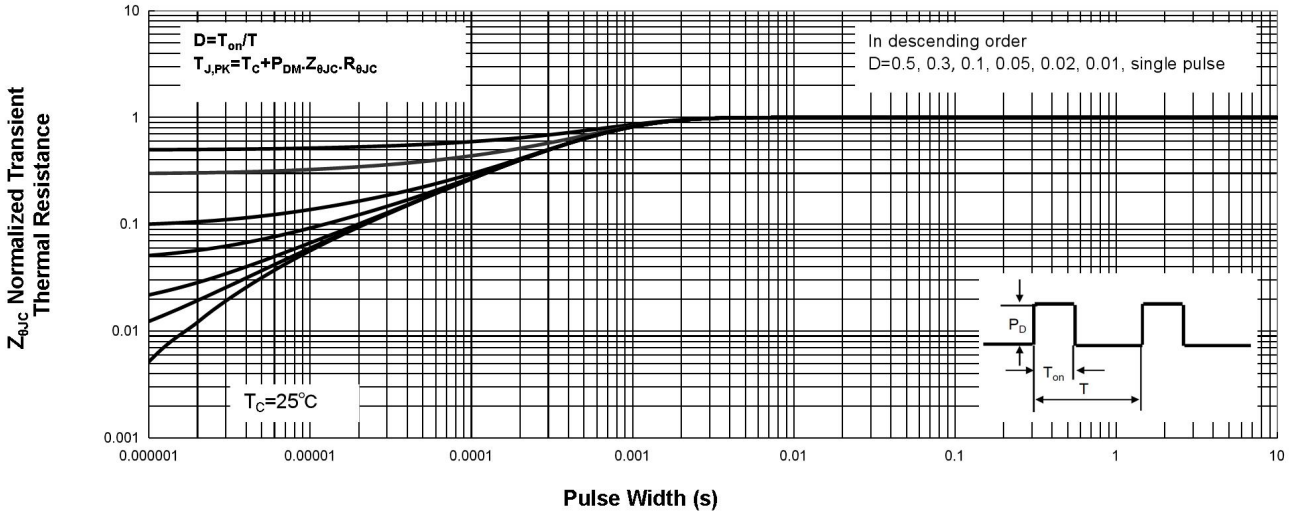


Fig21: Normalized Maximum Transient Thermal



Note:

1. T_J = 25° C, R_G = 25Ω, I_{AS} =35A, L =1.9mH
2. Repetitive Rating: Pulse width limited by maximum junction temperature
3. The value of $R_{θJA}$ 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 800V
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 800V

Fig22: Typical Switching times with inductive load

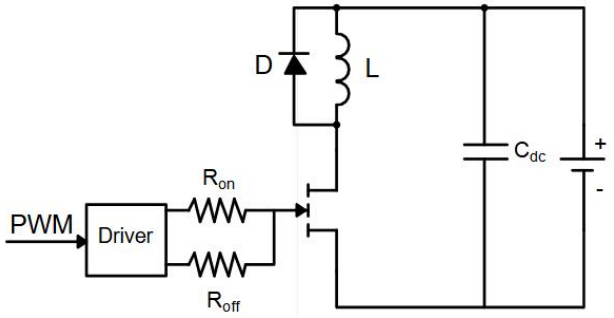


Fig23: Typical Switching times waveform

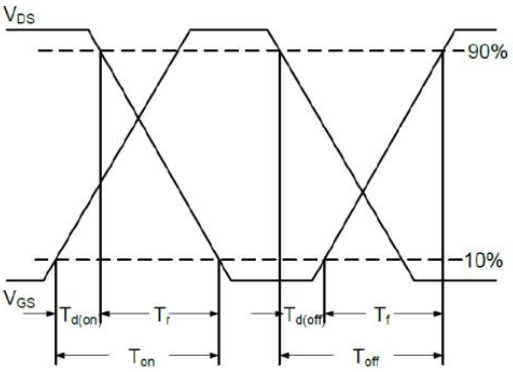


Fig24: Typical Reverse Recovery Time Measurement Circuit

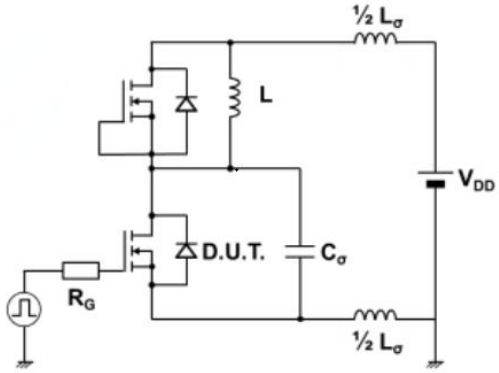


Fig25: Typical Reverse Recovery Waveform

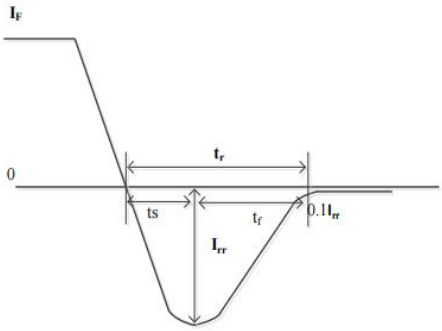


Fig26: Typical Gate Charge Measurement Circuit

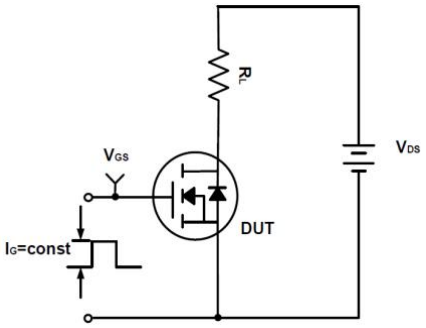


Fig27: Typical Gate Charge Waveform

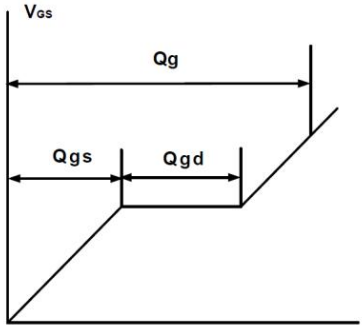
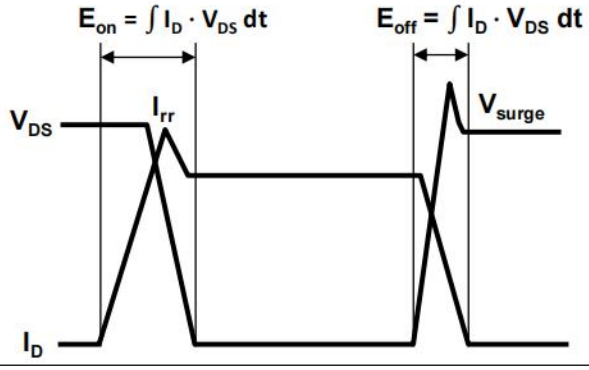
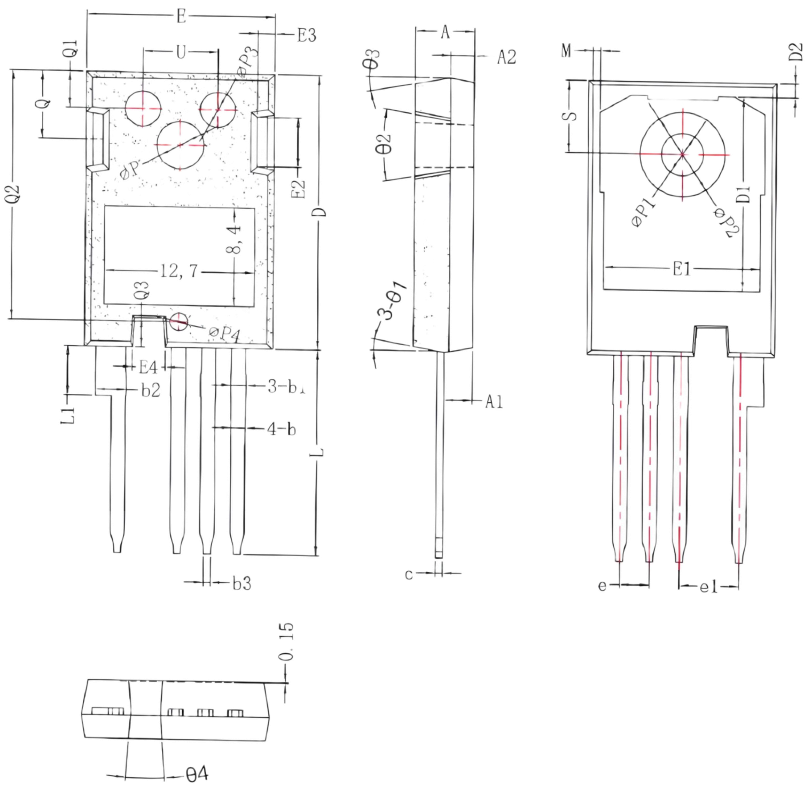


Fig28: Typical Waveforms for Switching Energy Loss



1200V 29mΩ N-channel SiC Power MOSFET

TO-247-4L Package Outline Dimensions (Units: mm)



SYMBOL	mm		
	MIN	NOM	MAX
*A	4.83	5.02	5.21
*A1	2.29	2.42	2.54
A2	1.91	2.00	2.16
*b	1.07	1.20	1.33
*b1	1.15	1.30	1.45
*b2	2.39	2.67	2.94
b3	0.45	0.60	0.75
*C	0.55	0.60	0.68
*D	23.30	23.45	23.60
D1	16.35	16.65	16.95
D2	0.95	1.19	1.25
*E	15.75	15.94	16.13
E1	13.10	13.25	13.40
E2	4.00	4.40	4.80
E3	1.00	1.45	1.90
E4	2.40	2.80	3.20
*e	2.50	2.54	5.28
*e1	5.03	5.08	5.13
*L	17.31	17.57	17.82
*L1	—	—	4.37
M	0.40	0.60	0.80
*ΦP	3.90	4.00	4.10
*ΦP1	3.51	3.61	3.71
ΦP2	7.03	7.18	7.33
ΦP3	2.80	3.00	3.20
ΦP4	1.30	1.50	1.70
Q	5.49	5.79	6.00
Q1	2.80	3.10	2.40
Q2	19.95	21.25	21.55
Q3	2.35	2.5	2.65
S	6.04	6.17	6.30
U	6.05	6.35	6.55
θ1	6°	10°	13°
θ2	16°	20°	24°
θ3	6°	10°	13°
θ4	5°	8°	11°