



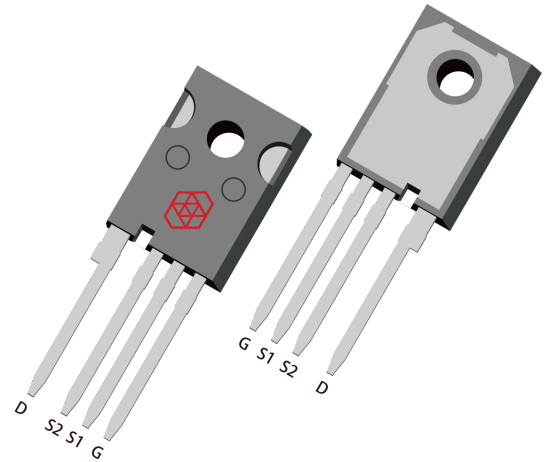
X2M120075T4B

N-channel 1200V SiC Power MOSFET

Features

V_{DS}	$R_{DS(on)}$	$I_c@25^{\circ}C$
1200V	75m Ω	40A

- 2nd Generation SiC MOSFET Technology
- High Blocking Voltage with Low On-Resistance
- High Speed Switching with Low Capacitance
- Fast Intrinsic Diode with Low Reverse Recovery



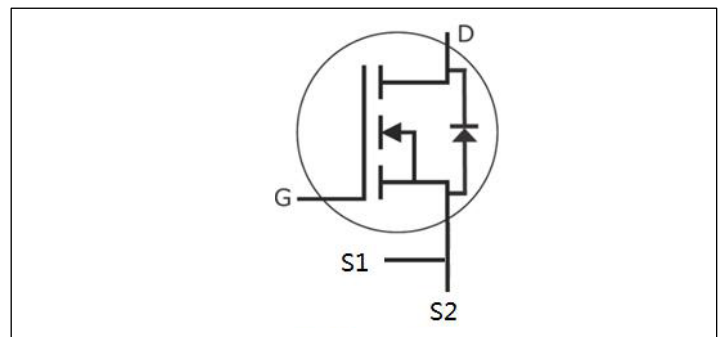
Applications

- EV Charging
- Solar PV Inverters
- DC/DC Converters
- Server Power Supplies
- UPS

Description

Package pin definition

- Pin D: Drain
- Pin G: Gate
- Pin S1: Driver Source
- Pin S2: Power Source



Type	Package	Qty
X2M120075T4B	TO-247-4	30

X2M120075T4B

N-channel 1200V SiC Power MOSFET

MOSFET

1.MOSFET

Absolute Max. Ratings ($T_c=25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Value	Unit	Test Conditions
V_{DSmax}	Drain-Source Voltage	1200	V	$V_{GS}=0V$ $I_D=100\mu A$
V_{GSmax}	Gate-Source Voltage	-8/+22	V	Absolute maximum values
V_{GSop}	Gate-Source Voltage	-4/+18	V	Recommended operational values
I_D	Continuous Drain Current	40	A	$V_{GS}=18V$, $T_c=25^\circ\text{C}$
		28		$V_{GS}=18V$, $T_c=100^\circ\text{C}$
$I_{DS(pluse)}$	pulsed collector current, t_p limited by T_{Jmax}	102	A	Pulse width t_p limited by T_{Jmax}
P_D	Power dissipation	210	W	$T_c=25^\circ\text{C}$, $T_J=175^\circ\text{C}$

Electrical Characteristics ($T_c=25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
$V_{(BR)DSS}$ ①	Drain-Source Breakdown voltage	1200			V	$V_{GS}=0V$ $I_D=100\mu A$
$V_{GS(th)}$	Gate Threshold Voltage	1.8	2.5	3.6	V	$V_{DS}=V_{GS}$ $I_D=15mA$
			2.0			$V_{DS}=V_{GS}$ $I_D=15mA$ $T_J=175^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current			100	μA	$V_{DS}=1200V$ $V_{GS}=0V$
$I_{GSS(-)}$	Gate-Source Leakage Current			250	nA	$V_{DS}=0V$ $V_{GS}=22V$
$I_{GSS(+)}$	Gate-Source Leakage Current			250		$V_{DS}=0V$ $V_{GS}=-8V$
$R_{DS(on)}$	Drain-Source On-State Resistance		75	112	m Ω	$V_{GS}=18V$ $I_D=30A$
			129			$V_{GS}=18V$ $I_D=30A$ $T_J=175^\circ\text{C}$

(table continues.....)

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gfs	Transconductance		3.5		s	$V_{GS}=18V$ $I_D=30A$
C_{iss}	Input Capacitance		1208		pF	$V_{GS}=0V$ $V_{DS}=0$ to 1000V $F=1MHz$
C_{oss}	Output Capacitance		60			
C_{rss}	Reverse Transfer Capacitance		6.5			
E_{ON}	Turn-On Switching Energy		306		μJ	
E_{OFF}	Turn-Off Switching Energy		34			
$t_{d(on)}$	Turn-On Delay Time		12		ns	$V_{DS}=800V, V_{GS}=-4/18V,$ $I_D=30A, R_g=2.5\Omega,$ $L=135uH$
t_r	Rise Time		13			
$t_{d(off)}$	Turn-Off Delay Time		23			
t_f	Fall time		7			
$R_{G(int)}$	Internal Gate Resistance		5.1		Ω	$F=1MHz$
Q_{gs}	Gate to Source Charge		14		nC	$V_{DS}=800V$ $I_D=30A$ $V_{GS}=-4/18V$
Q_{gd}	Gate to Drain Charge		21			
Q_g	Total Gate Charge		57			

Thermal Characteristics (Typical)

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions
$R_{\theta JC}$	Thermal Resistance from Junction to Case	0.7	/	°C/W	
$R_{\theta JA}$	Thermal Resistance from Junction to Ambient	/	40		

Note: ① The recommended Maximum Voltage is less than 1300V。

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diode

2.Diode

Absolute **Max.** Ratings ($T_C=25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions
I_s	Continuous Diode Forward Current		22	A	$V_{GS}=-4V$ $T_C=25^\circ\text{C}$
$I_{s, pulse}$	Diode pulse Current		80	A	$V_{GS}=-4V$

Electrical Characteristics ($T_C=25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions
VSD	Diode Forward Voltage	3.7		V	$V_{GS}=-4V$ $I_{SD}=8A$ $T_J=25^\circ\text{C}$
		3.0			$V_{GS}=-4V$ $I_{SD}=8A$ $T_J=175^\circ\text{C}$
t_{rr}	Reverse Recover Time	15		ns	$V_{GS}=-4V$ $I_D=30A$ $V_R=400V$ $di/dt=4000A/\mu s$ $T_J=175^\circ\text{C}$
Q_{rr}	Reverse Recovery Charge	246		nC	
I_{rrm}	Peak Reverse Recovery Current	27		A	

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Characteristics Diagrams

3. Characteristics Diagrams

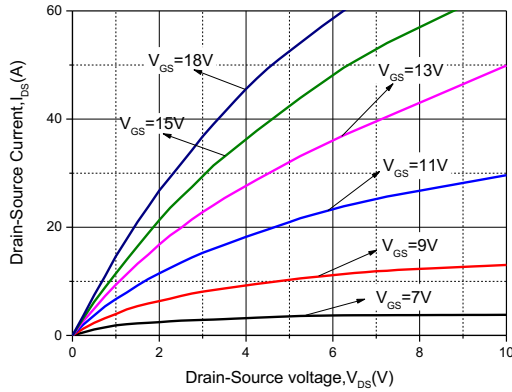


Figure 1. Output Characteristics $T_j=25^\circ\text{C}$

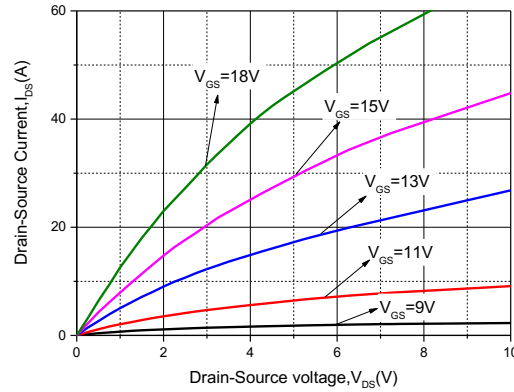


Figure 2. Output Characteristics $T_j=-40^\circ\text{C}$

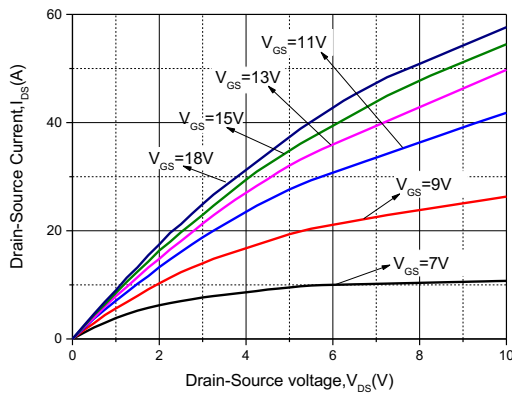


Figure 3. Output Characteristics $T_j=150^\circ\text{C}$

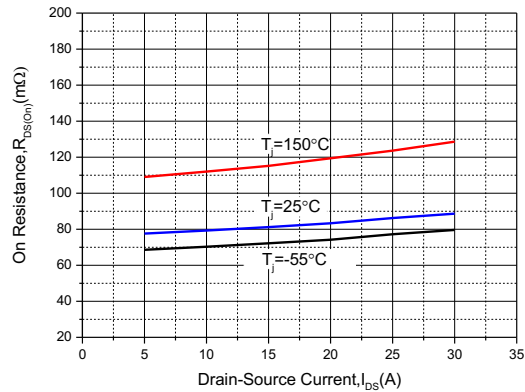


Figure 4. On-resistance vs. Drain Current For Various Temperature

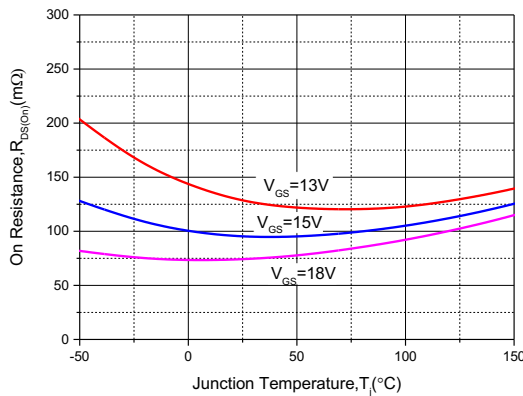


Figure 5. On-resistance vs. Temperature For Various Gate Voltage

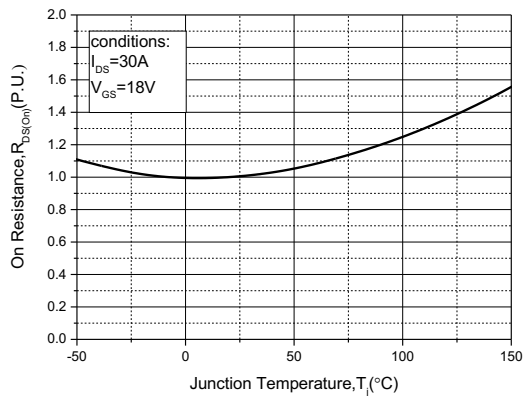


Figure 6. Normalized On-Resistance vs. Temperature

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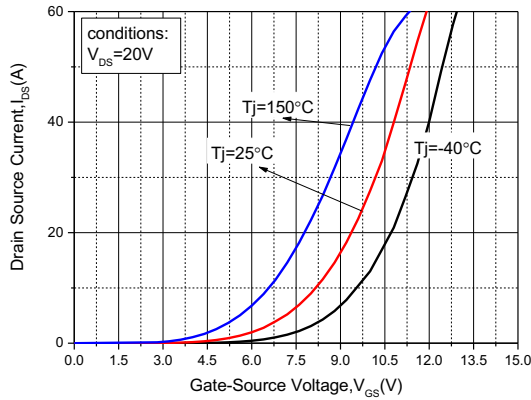


Figure 7. Transfer Characteristic for Various Junction Temperature

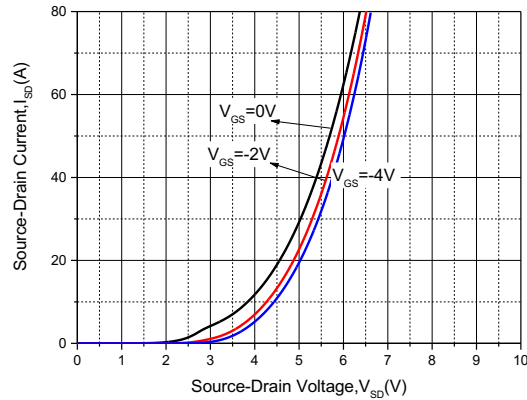


Figure 8. Body Diode Characteristic @ -55°C

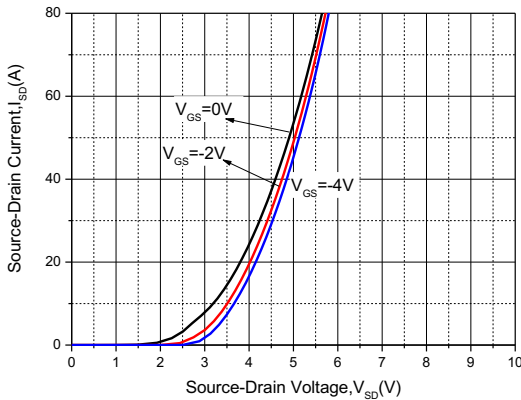


Figure 9. Body Diode Characteristic @ 25°C

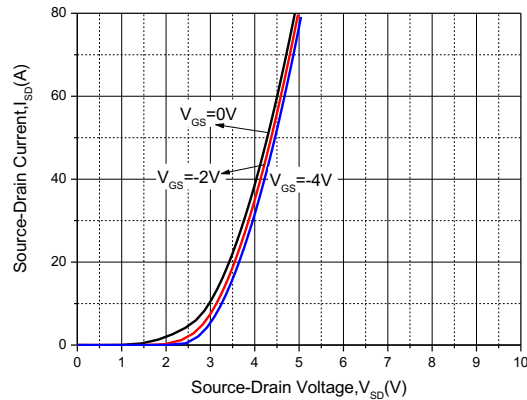


Figure 10. Body Diode Characteristic @ 175°C

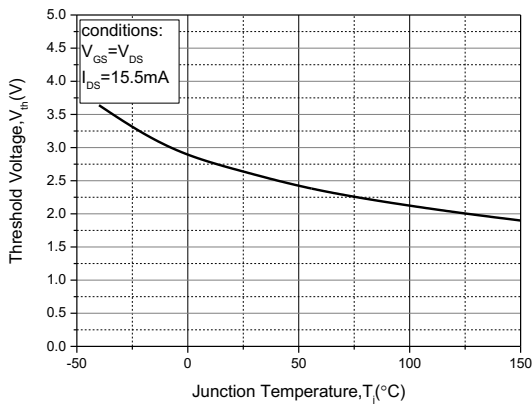


Figure 11. Threshold Voltage vs. Temperature

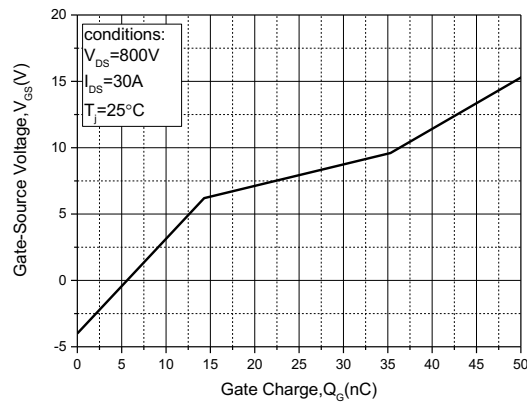


Figure 12. Gate Charge Characteristics

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Characteristics Diagrams

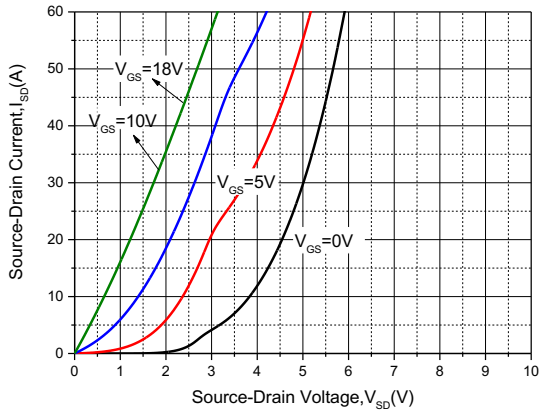


Figure 13.3rd Quadrant Characteristic @-55°C

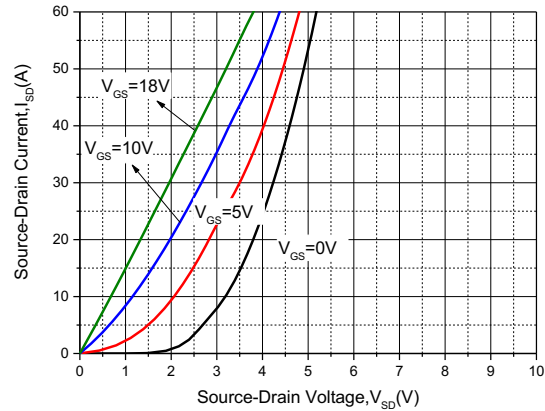


Figure 14.3rd Quadrant Characteristic @25°C

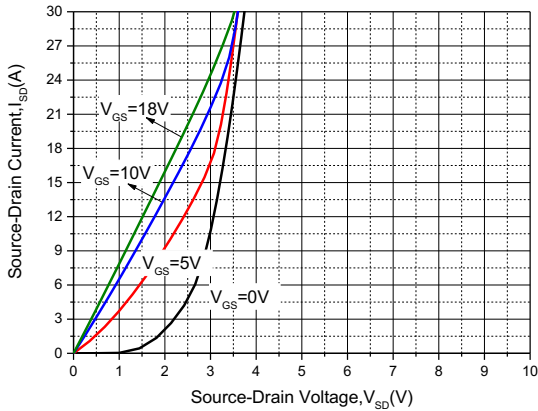


Figure 15.3rd Quadrant Characteristic @175°C

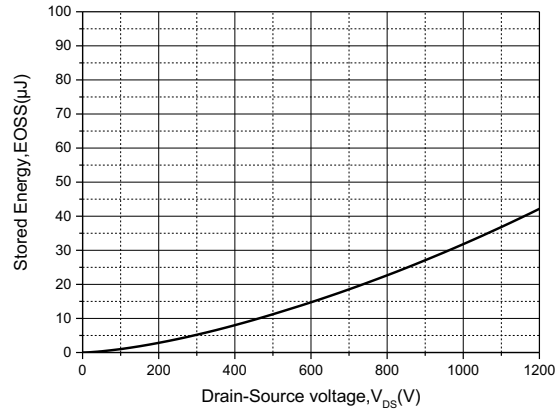


Figure 16. Output Capacitor Stored Energy

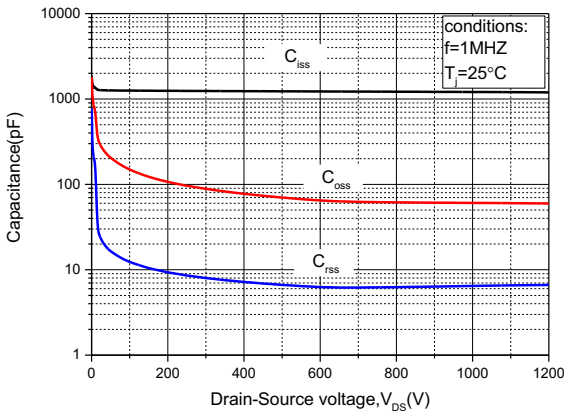


Figure 17. Capacitances vs. Drain-Source Voltage (0-1200V)

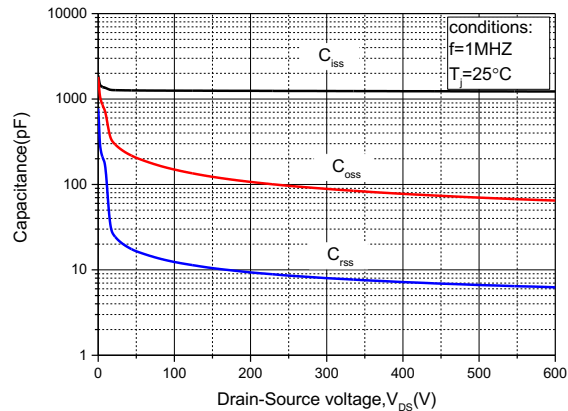


Figure 18. Capacitances vs. Drain-Source Voltage (0-600V)

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Characteristics Diagrams

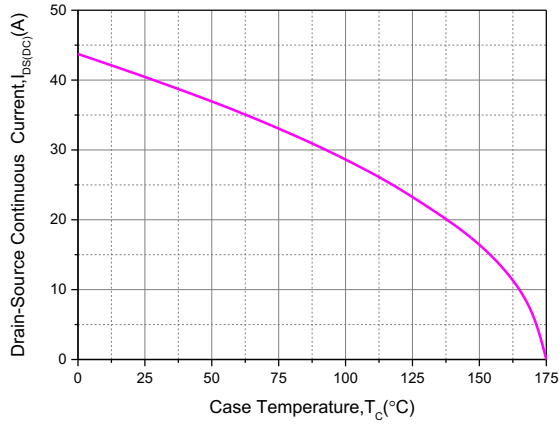


Figure 19. Continuous Drain Current Derating vs. Case Temperature

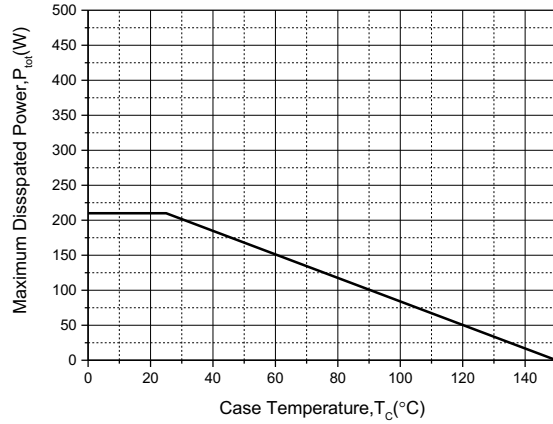


Figure 20. Maximum Power Dissipation Derating vs. Case Temperature

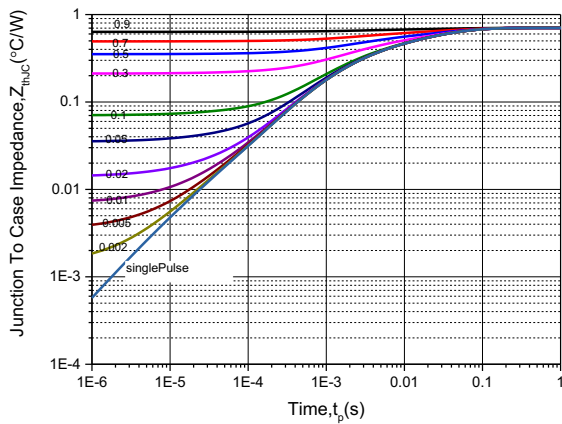


Figure 21. Transient Thermal Impedance (Junction-Case)

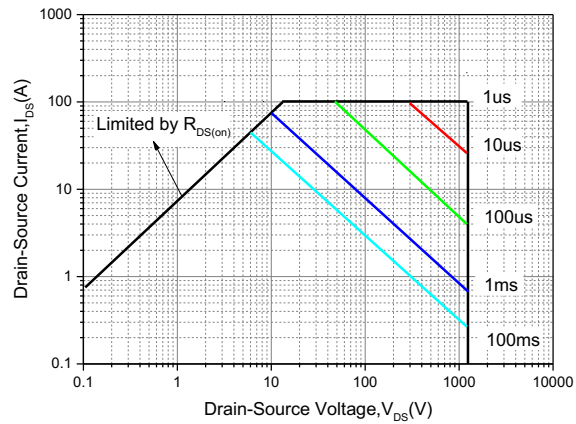


Figure 22. Safe Operating Area

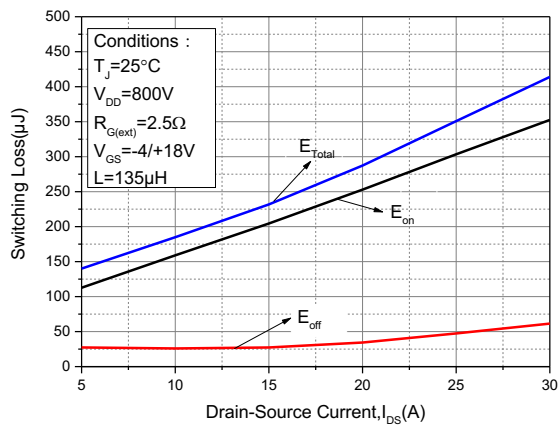


Figure 23. Clamped Inductive Switching Energy vs. Drain Current @25°C

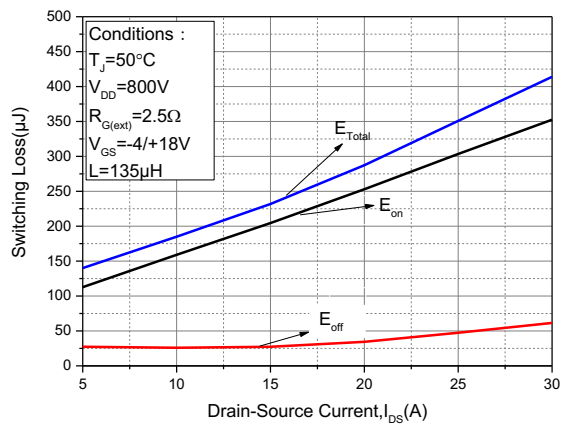


Figure 24. Clamped Inductive Switching Energy vs. Drain Current @50°C

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Characteristics Diagrams

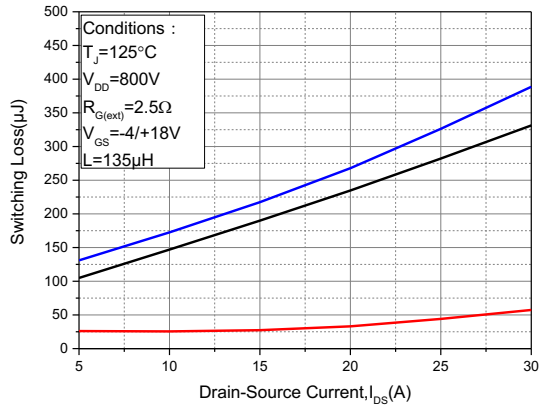


Figure 25. Clamped Inductive Switching Energy vs. Drain Current @ 125°C

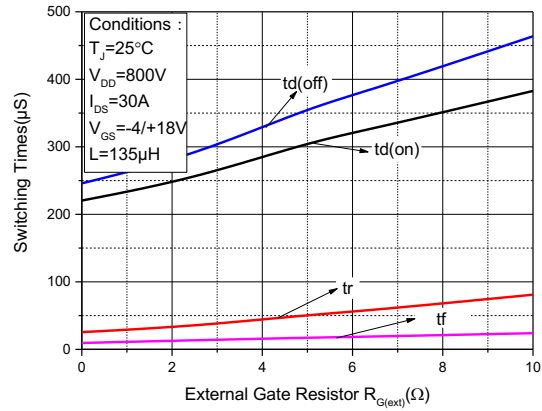


Figure 26. Clamped Inductive Switching Energy vs. $R_{G(\text{ext})}$

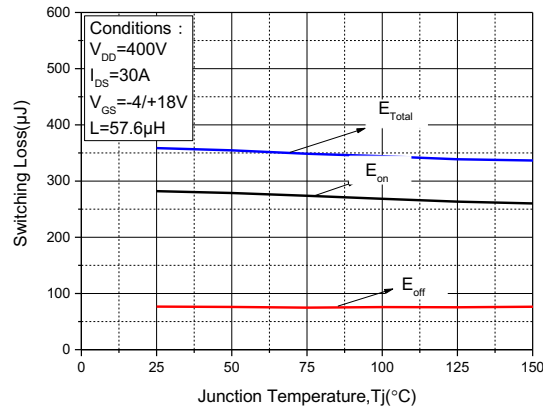


Figure 27. Clamped Inductive Switching Energy vs. Temperature

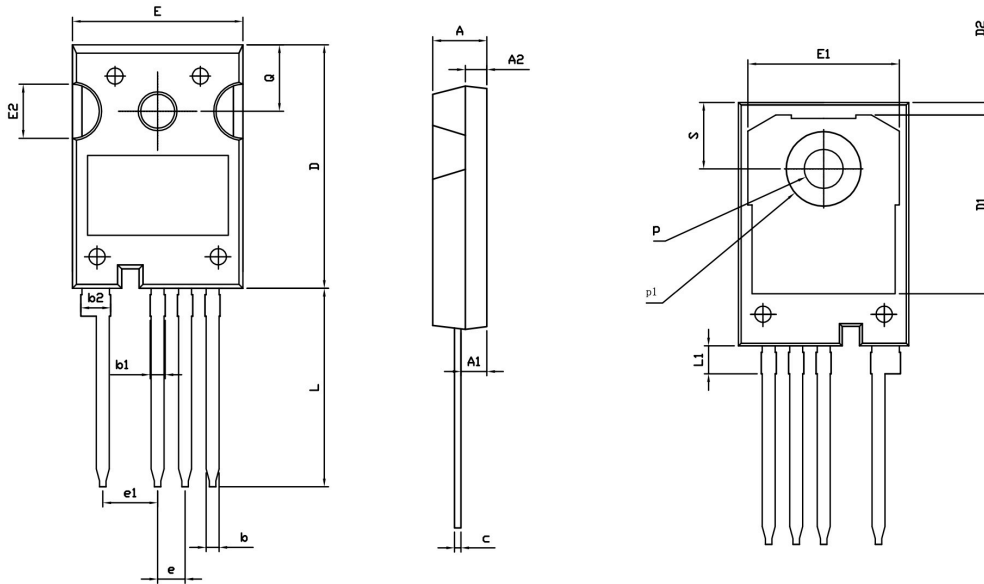
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Package Dimensions

4.Package Dimensions

Package TO-247-4



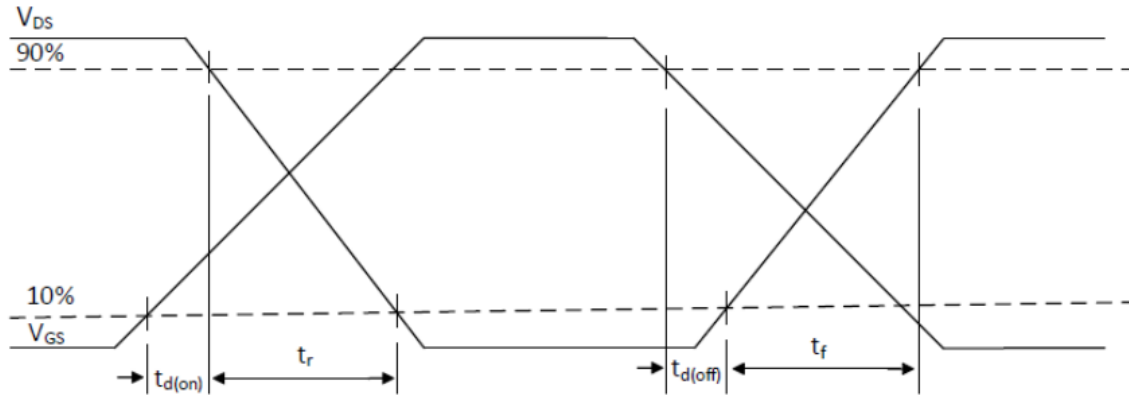
	MIN	NOM	MAX
A	4.80	5.00	5.20
A1	2.25	2.40	2.45
A2	1.85	2.00	2.15
b	1.05	1.20	1.35
b1	1.00	1.30	1.60
b2	2.35	2.65	2.95
c	0.50	0.60	0.70
D	22.34	22.54	22.74
D1	16.00	16.50	17.00
D2	0.97	1.17	1.37
e	2.34	2.54	2.74
e1	4.88	5.08	5.28
E	15.60	15.80	16.00
E1	13.50	14.00	14.50
E2	4.80	5.00	5.20
L	18.08	18.38	18.68
L1	2.38	2.58	2.78
p	3.50	3.60	3.70
p1	6.60	6.80	7.00
Q	6.00	6.15	6.30
S	6.00	6.15	6.30

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Testing Conditions

5. Testing Conditions



Switching Time Waveform

X2M120075T4B

N-channel 1200V SiC Power MOSFET



Revision History

Revision History

Document revision	Date	Description of changes
1.0	2022.8	Target datasheet
2.0	2023.3.8	First design vision datasheet
3.0	2023.9.18	Second design vision datasheet

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