RECTRON SEMICONDUCTOR
TECHNICAL SPECIFICATION

RSM120N120T7

N-Channel SiC Power MOSFET

V_{DS}	=	1200	V
$R_{DS(on)}$	=	16	mΩ
I_D@25℃	=	120	A

Features

- High Blocking Voltage with Low On-Resistance
- High Speed Switching with Low Capacitance
- Easy to Parallel and Simple to Drive

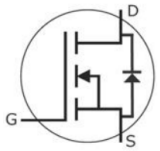
Benefits

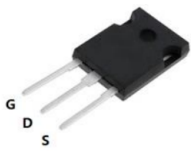
- Higher System Efficiency
- Reduced Cooling Requirements
- Increased Power Density
- Increased System Switching Frequency

Package RoHS

Applications

- Solar and UPS inverters
- EV motor drive
- High voltage DC/DC converters
- Switched mode power supplies
- Load switch
- Halogen-free





Part Number	Package	Marking
RSM120N120T7	TO-247-3	120N120

Maximum Ratings (T_C=25℃ unless otherwise specified)

Symbol	Parameter	Value	Unit	Test Conditions	Note
V_{DSmax}	Drain-Source Voltage	1200	V	V_{GS}=0V, I_D=100μA	
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	120	A	V_{GS}=18V, T_c=25℃	Fig. 19
		85		V_{GS}=18V, T_c=100℃	
$I_{D(pulse)}$	Pulsed Drain Current	250	A	Pulse width t_p limited by T_{Jmax}	Fig. 22
P_D	Power Dissipation	375	W	T_c=25℃, T_J=175℃	Fig. 20
T_J, T_{STG}	Operating Junction and Storage Temperature	-55 to +175	℃		
T_L	Solder Temperature, 1.6mm from case for 10s	260	℃		
M_d	Mounting Torque, (M3 or 6-32 screw)	1 8.8	Nm lbf-in		

Electrical Characteristics (T_C=25℃ unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions	Note
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	1200	/	/	V	V_{GS}=0V, I_D=100μA	
$V_{GS(th)}$	Gate Threshold Voltage	1.9	2.6	4.0	V	V_{DS}=V_{GS}, I_D=23mA	Fig. 11
		/	1.8	/		V_{DS}=V_{GS}, I_D=23mA, T_J=175℃	
I_{DSS}	Zero Gate Voltage Drain Current	/	1	100	μA	V_{DS}=1200V, V_{GS}=0V	
I_{GSS+}	Gate-Source Leakage Current	/	10	250	nA	V_{DS}=0V, V_{GS}=22V	
I_{GSS-}	Gate-Source Leakage Current	/	10	250	nA	V_{DS}=0V, V_{GS}=-8V	
$R_{DS(on)}$	Drain-Source On-State Resistance	/	16	22.3	mΩ	V_{GS}=18V, I_D=75A	Fig. 4,5,6
		/	28	/		V_{GS}=18V, I_D=75A, T_J=175℃	
g_{fs}	Transconductance	/	41.4	/	S	V_{DS}=20V, I_{DS}=75A	Fig. 7
		/	36.5	/		V_{DS}=20V, I_{DS}=75A, T_J=175℃	
C_{iss}	Input Capacitance	/	4817	/	pF	V_{GS}=0V V_{DS}=1000V f=1MHz	Fig. 17,18
C_{oss}	Output Capacitance	/	207	/			
C_{rss}	Reverse Transfer Capacitance	/	45	/			
E_{oss}	C_{oss} Stored Energy	/	104	/	μJ	V_{AC}=25mV	Fig. 16
E_{ON}	Turn-On Switching Energy	/	2.1	/	mJ	V_{DS}=800V, V_{GS}=-4V/18V	
E_{OFF}	Turn-Off Switching Energy	/	1.6	/		I_D=30A, $R_{G(ext)}$=2.5Ω, L=100μH	
$t_{d(on)}$	Turn-On Delay Time	/	150	/	ns	V_{DS}=800V, V_{GS}=-4V/18V, I_D=30A $R_{G(ext)}$=2.5Ω, R_L=20Ω	
t_r	Rise Time	/	38	/			
$t_{d(off)}$	Turn-Off Delay Time	/	108	/			
t_f	Fall Time	/	35	/			
$R_{G(int)}$	Internal Gate Resistance	/	4.5	/	Ω	f=1MHz, V_{AC}=25mV	
Q_{GS}	Gate to Source Charge	/	66	/	nC	V_{DS}=800V V_{GS}=-4V/18V I_D=30A	Fig. 12
Q_{GD}	Gate to Drain Charge	/	48	/			
Q_G	Total Gate Charge	/	269	/			

Reverse Diode Characteristics

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
V_{SD}	Diode Forward Voltage	4.2	/	V	V_{GS}=-4V, I_{SD}=37.5A, T_J=25℃	Fig. 8,9,10
		3.9	/		V_{GS}=-4V, I_{SD}=37.5A, T_J=175℃	
I_S	Continuous Diode Forward Current	/	120	A	T_C=25℃	
t_{rr}	Reverse Recover Time	54	/	ns	V_R=800V, I_{SD}=30A	
Q_{rr}	Reverse Recovery Charge	630	/	nC		
I_{rrm}	Peak Reverse Recovery Current	19	/	A		

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
$R_{θJC}$	Thermal Resistance from Junction to Case	0.23	/	℃/W		Fig. 21
$R_{θJA}$	Thermal Resistance from Junction to Ambient	/	40			

RATING AND CHARACTERISTICS CURVES (RSM120N120T7)

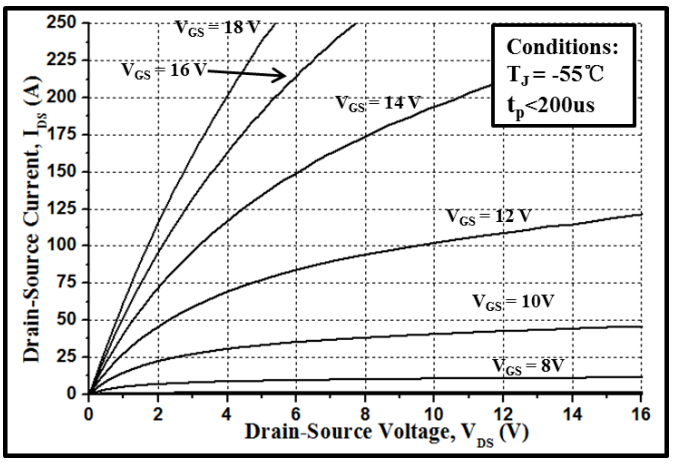


Figure 1. Output Characteristics T_J = -55℃

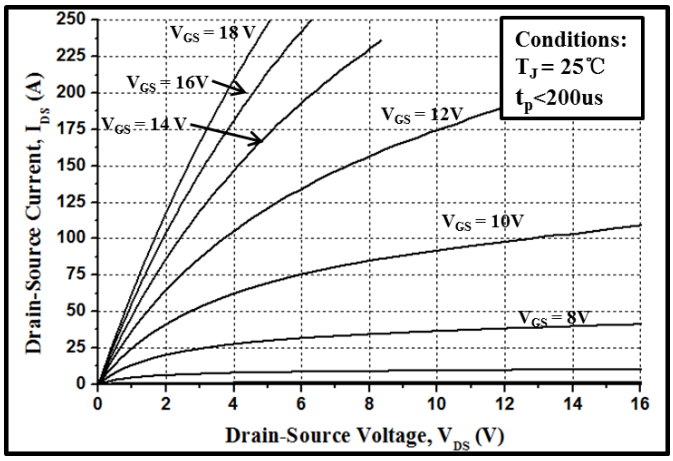


Figure 2. Output Characteristics T_J = 25℃

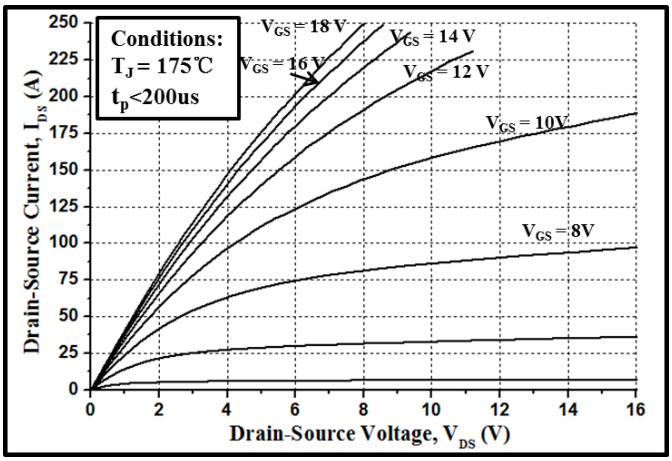


Figure 3. Output Characteristics T_J = 175℃

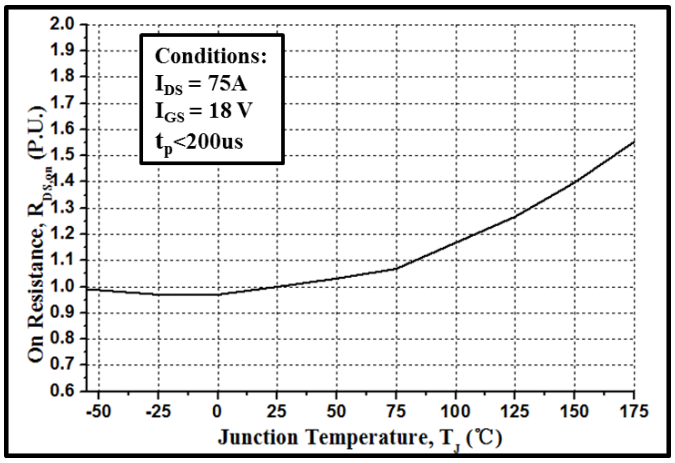


Figure 4. Normalized On-Resistance vs. Temperature

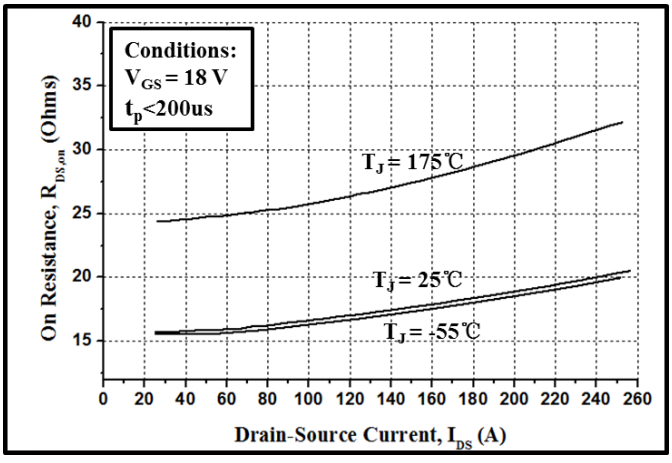


Figure 5. On-Resistance vs. Drain Current
For Various Temperatures

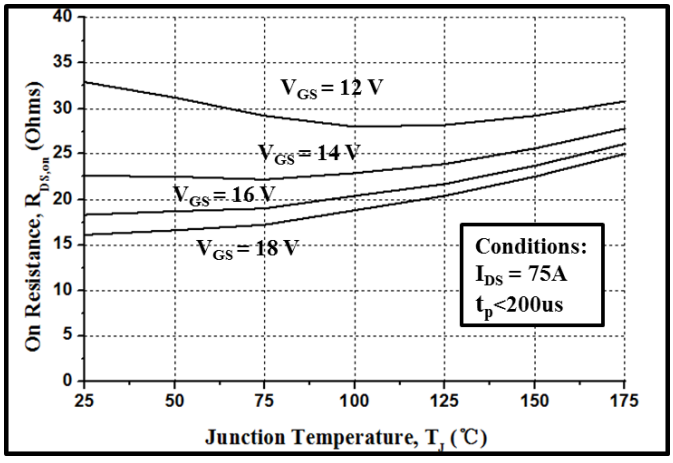


Figure 6. On-Resistance vs. Temperature
For Various Gate Voltage

RATING AND CHARACTERISTICS CURVES (RSM120N120T7)

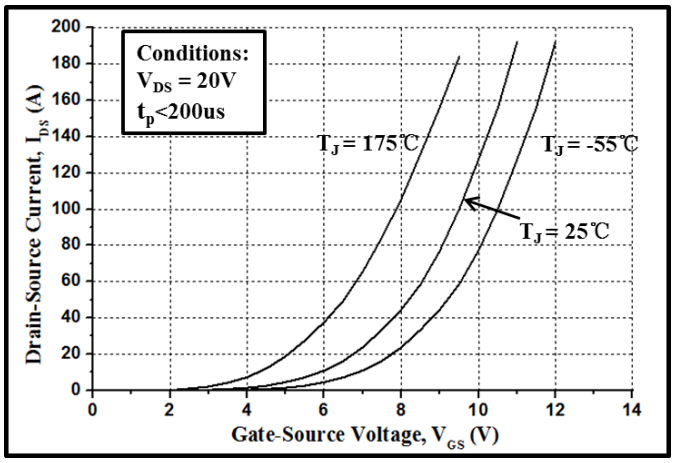


Figure 7. Transfer Characteristic for Various Junction Temperatures

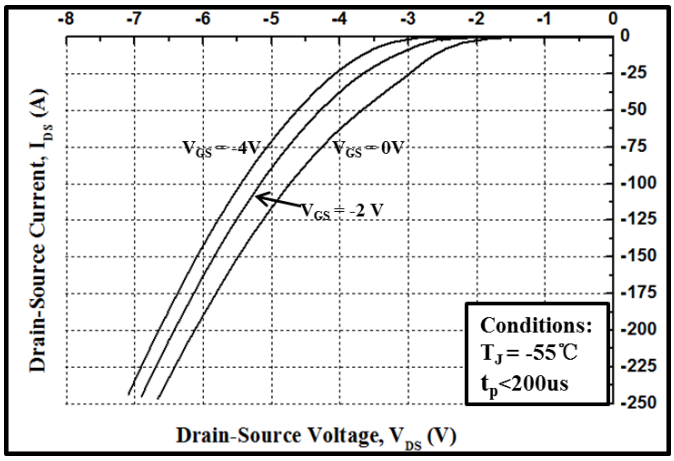


Figure 8. Body Diode Characteristic at -55℃

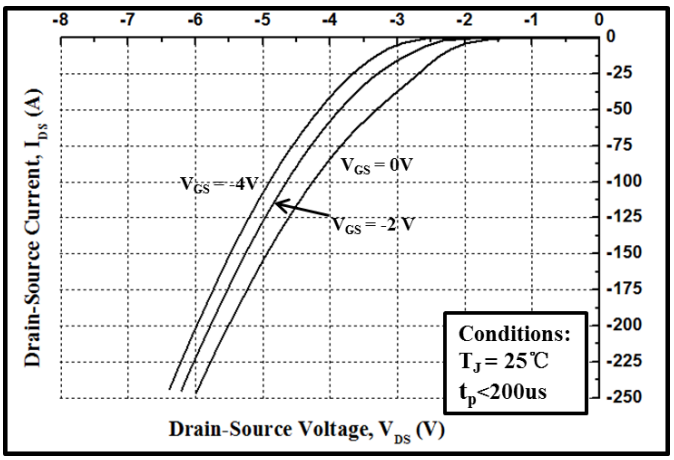


Figure 9. Body Diode Characteristic at 25℃

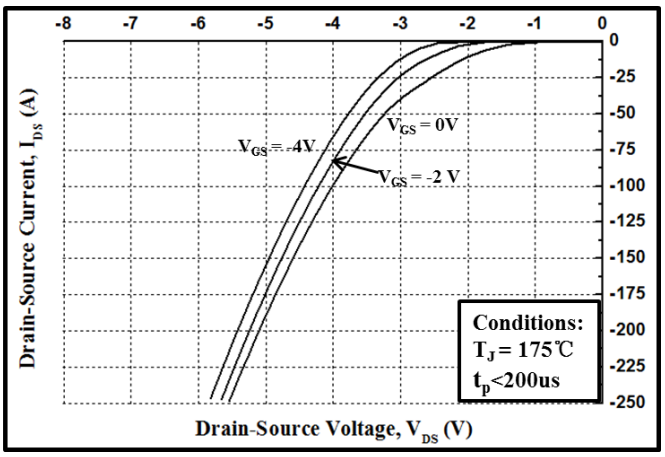


Figure 10. Body Diode Characteristic at 175℃

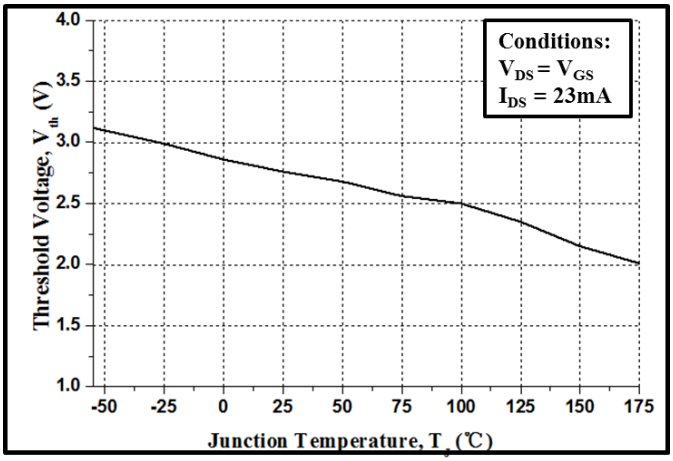


Figure 11. Threshold Voltage vs. Temperature

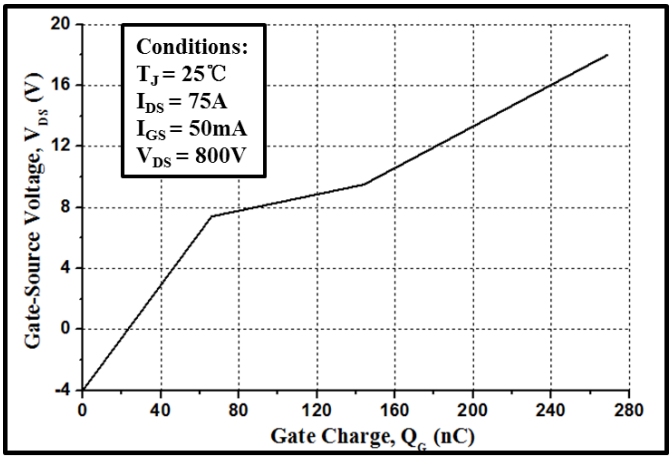


Figure 12. Gate Charge Characteristics

RATING AND CHARACTERISTICS CURVES (RSM120N120T7)

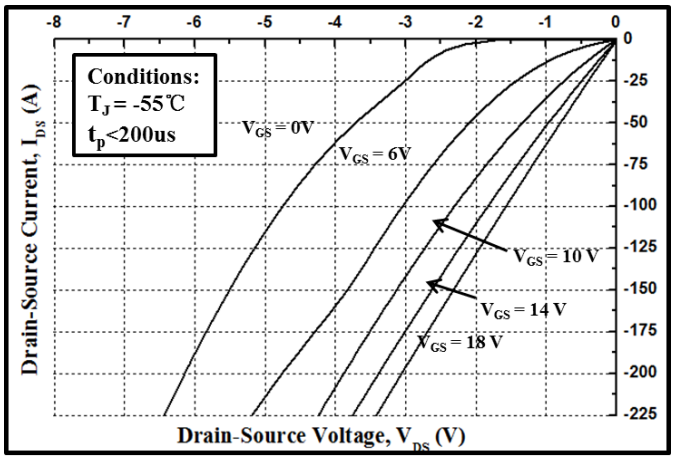


Figure 13. 3rd Quadrant Characteristic at -55℃

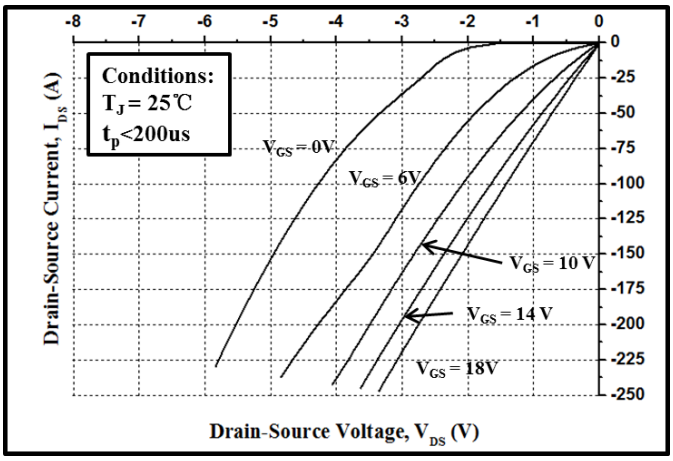


Figure 14. 3rd Quadrant Characteristic at 25℃

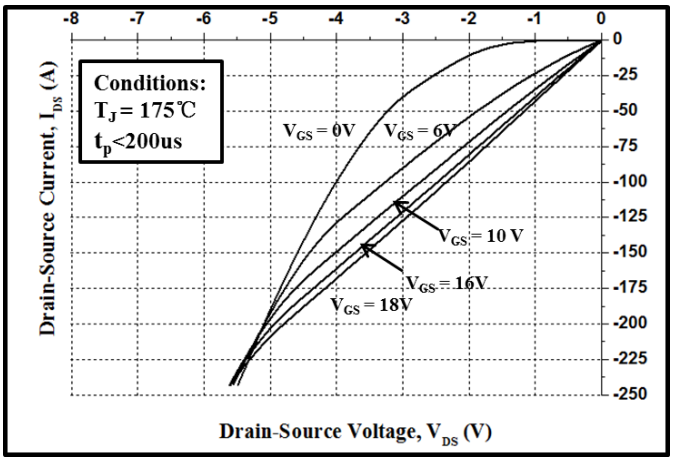


Figure 15. 3rd Quadrant Characteristic at 175℃

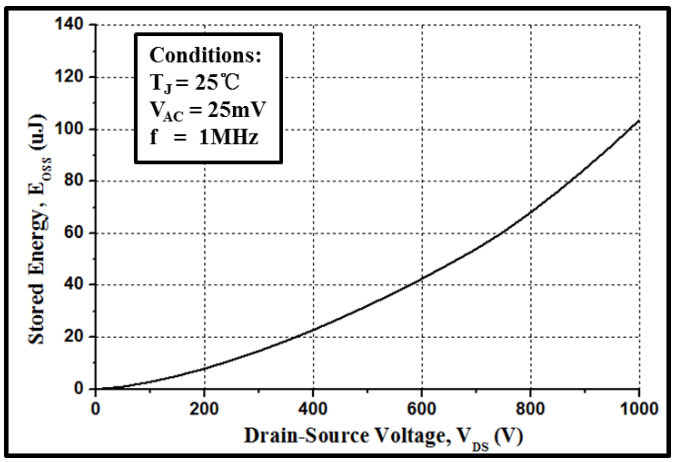


Figure 16. Output Capacitor Stored Energy

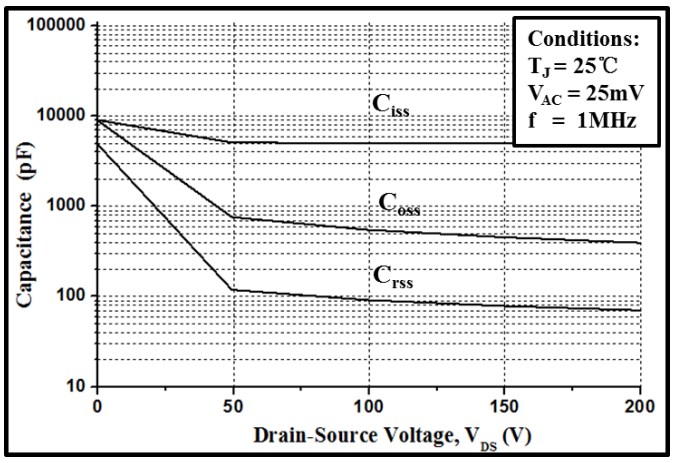


Figure 17. Capacitances vs. Drain-Source Voltage (0 - 200V)

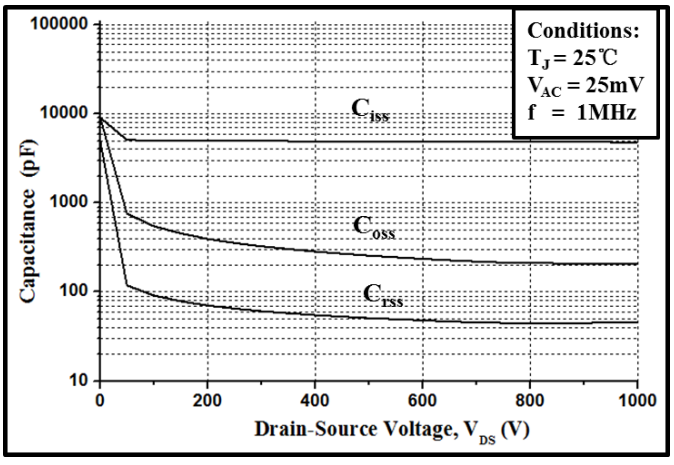


Figure 18. Capacitances vs. Drain-Source Voltage (0 - 1000V)

RATING AND CHARACTERISTICS CURVES (RSM120N120T7)

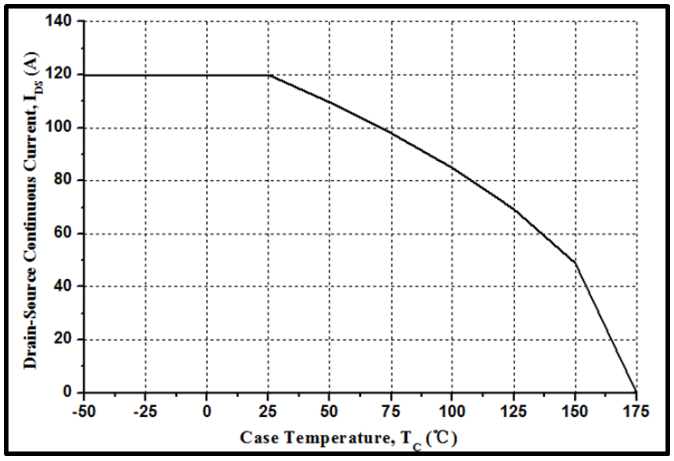


Figure 19. Continuous Drain Current vs. Case Temperature

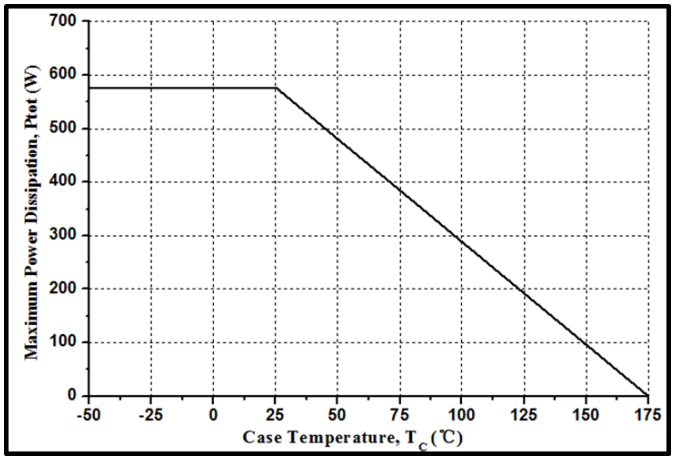


Figure 20. Maximum Power Dissipation vs. Case Temperature

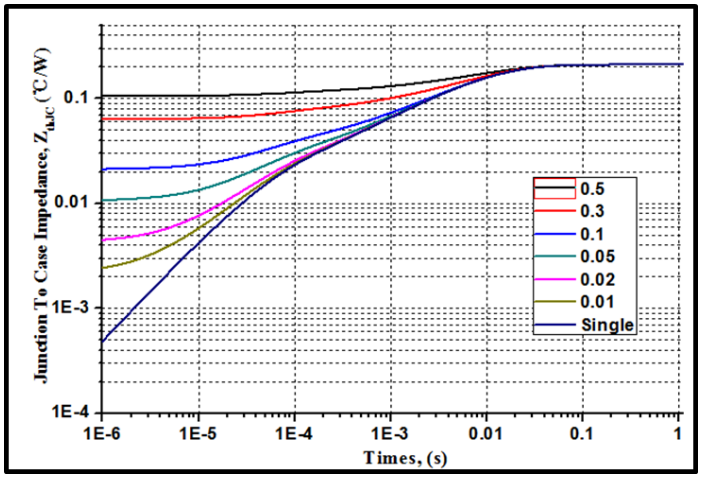


Figure 21. Transient Thermal Impedance (Junction - Case)

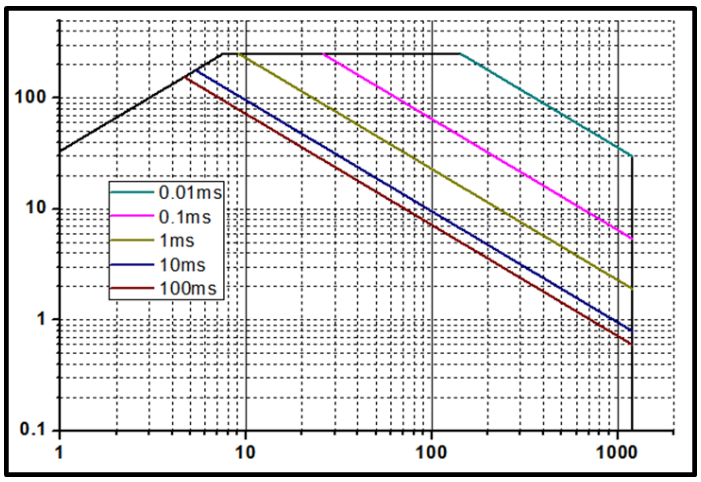


Figure22. Safe Operating Area

Test Circuit Schematic

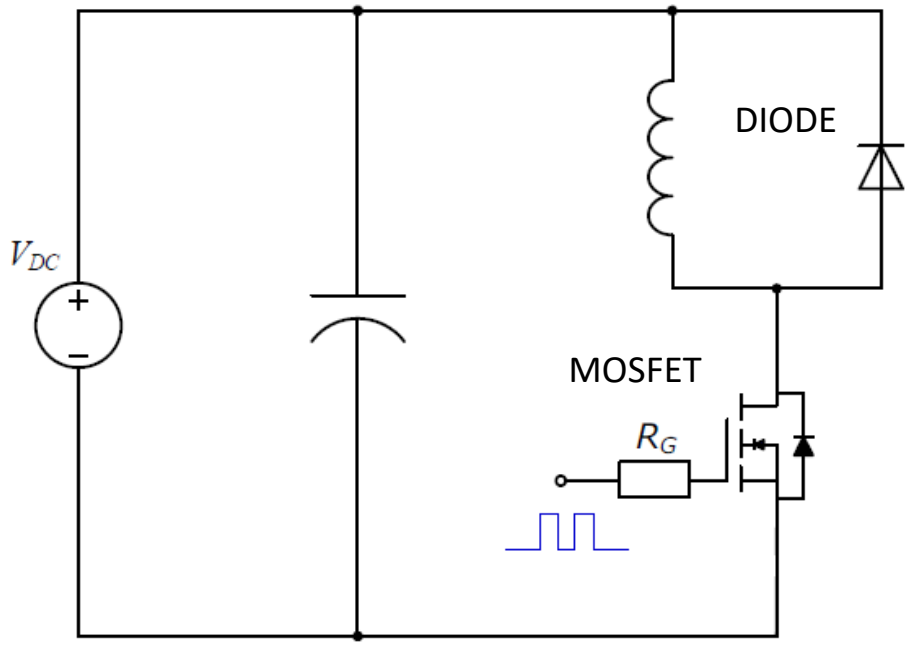
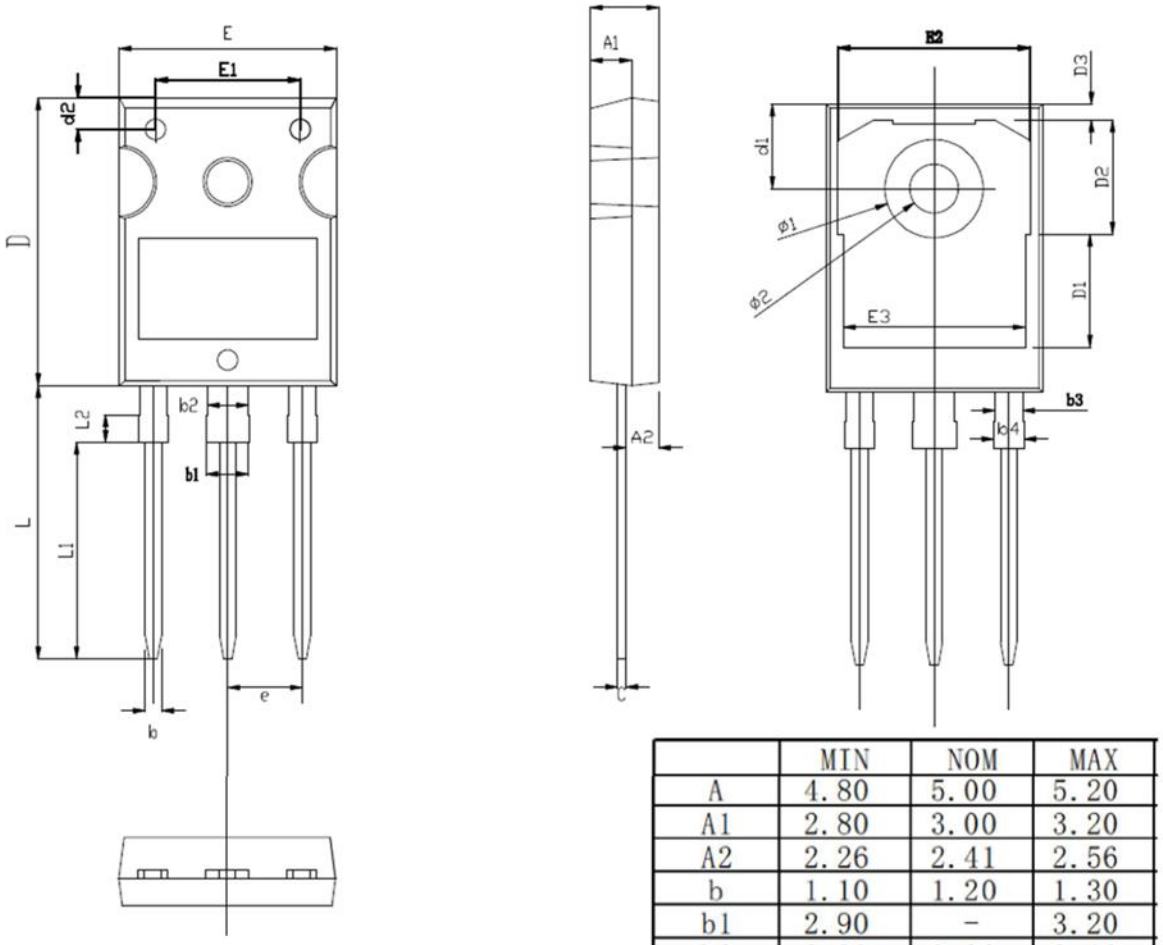
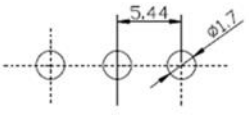


Figure 23. Clamped Inductive Switching Waveform Test Circuit

Package Dimensions



RECOMMENDED LAND PATTERN



UNIT: mm

	MIN	NOM	MAX
A	4.80	5.00	5.20
A1	2.80	3.00	3.20
A2	2.26	2.41	2.56
b	1.10	1.20	1.30
b1	2.90	-	3.20
b2	2.90	3.00	3.10
b3	1.90	2.00	2.10
b4	2.00	-	2.20
c	0.50	0.60	0.70
D	20.80	21.00	21.20
D1		8.23	
D2		8.32	
D3		1.17	
d1	6.00	6.15	6.30
d2	2.20	2.30	2.40
E	15.60	15.80	16.00
E1		10.50	
E2		14.02	
E3		13.50	
e	5.34	5.44	5.54
L	19.72	19.92	20.12
L1		15.79	
L2		1.98	
ø1	7.10	7.19	7.30
ø2	3.50	3.60	3.70

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