RECTRON SEMICONDUCTOR
TECHNICAL SPECIFICATION

RSM33N120D7LV

N-Channel SiC Power MOSFET G2 MOSFET Technology

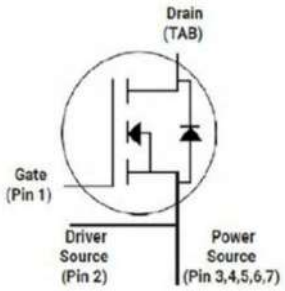
Features

- High Blocking Voltage with Low On-Resistance
- High Speed Switching with Low Capacitance
- Easy to Parallel and Simple to Drive
- P/N suffix V means AEC-Q101qualified, e.g:RSM33N1200D7LV

V_{DS}	=	1200	V
$R_{DS(on)}$	=	75	mΩ
I_D@25℃	=	33	A

Benefits

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



Applications

- Renewable Energy
- EV Battery Chargers
- High Voltage DC/DC Converters
- Switch Mode Power Supplies
- Halogen-free

Package Marking and Ordering Information

Device Marking	Device	Device Package	Packaging Code	Reel Size	Quantity(PCS)
33N120	RSM33N120D7LV	TO-263-7	-W	13inch	400

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	33	A	V_{GS}=18V, T_c=25℃	Fig. 19
		23.8		V_{GS}=18V, T_c=100℃	
$I_{D(pulse)}$	Pulsed Drain Current	80	A	Pulse width t_p limited by T_{Jmax}	Fig. 22
P_D	Power Dissipation	136	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=5mA	Fig. 11
		/	1.8	/		V_{DS}=V_{GS}, I_D=5mA, 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	/	75	95	mΩ	V_{GS}=18V, I_D=20A	Fig. 4,5,6
		/	120	/		V_{GS}=18V, I_D=20A, T_J=175℃	
g_{fs}	Transconductance	/	10.4	/	S	V_{DS}=20V, I_D=20A	Fig. 7
		/	9.2	/		V_{DS}=20V, I_D=20A, T_J=175℃	
C_{iss}	Input Capacitance	/	1200	/	pF	V_{GS}=0V V_{DS}=1000V f=1MHz V_{AC}=25mV	Fig. 17,18
C_{oss}	Output Capacitance	/	63	/			
C_{rss}	Reverse Transfer Capacitance	/	5.7	/			
E_{oss}	C_{oss} Stored Energy	/	41	/	μJ		Fig. 16
E_{ON}	Turn-On Switching Energy	/	586	/	μJ	V_{DS}=800V, V_{GS}=-4V/18V I_D=20A, $R_{G(ext)}$=2.5Ω, L=100μH	
E_{OFF}	Turn-Off Switching Energy	/	273	/			
$t_{d(on)}$	Turn-On Delay Time	/	13	/	ns	V_{DS}=800V, V_{GS}=-4V/18V, I_D=20A $R_{G(ext)}$=2.5Ω, R_L=20Ω	
t_r	Rise Time	/	12	/			
$t_{d(off)}$	Turn-Off Delay Time	/	16	/			
t_f	Fall Time	/	10	/			
$R_{G(int)}$	Internal Gate Resistance	/	5.5	/	Ω	f=1MHz, V_{AC}=25mV	
Q_{GS}	Gate to Source Charge	/	21.5	/	nC	V_{DS}=800V V_{GS}=-4V/18V I_D=20A	Fig. 12
Q_{GD}	Gate to Drain Charge	/	14.6	/			
Q_G	Total Gate Charge	/	68.1	/			

Reverse Diode Characteristics

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
V_{SD}	Diode Forward Voltage	4.2	/	V	V_{GS}=-4V, I_{SD}=10A	Fig. 8,9,10
		3.8	/		V_{GS}=-4V, I_{SD}=10A, T_J=175℃	
I_S	Continuous Diode Forward Current	/	33	A	T_C=25℃	
t_{rr}	Reverse Recover Time	28	/	ns	V_R=800V, I_{SD}=20A	
Q_{rr}	Reverse Recovery Charge	62	/	nC		
I_{rrm}	Peak Reverse Recovery Current	3.7	/	A		

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
$R_{θJC}$	Thermal Resistance from Junction to Case	0.84	/	℃/W		Fig. 21
$R_{θJA}$	Thermal Resistance from Junction to Ambient	/	40			

RATING AND CHARACTERISTICS CURVES (RSM33N120D7LV)

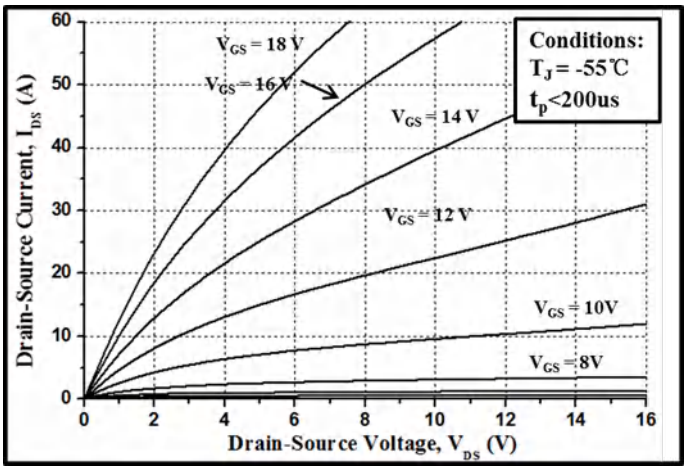


Figure 1. Output Characteristics T_J = -55℃

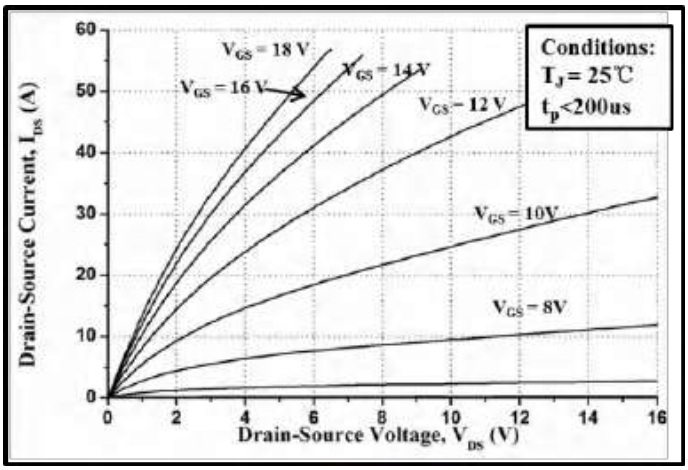


Figure 2. Output Characteristics T_J = 25℃

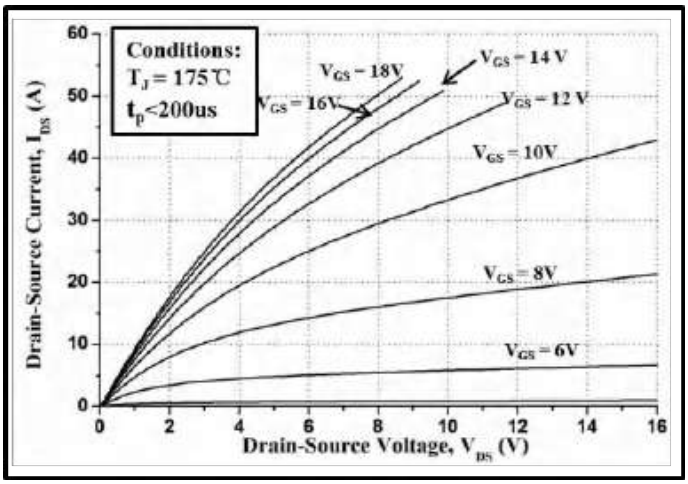


Figure 3. Output Characteristics T_J = 175℃

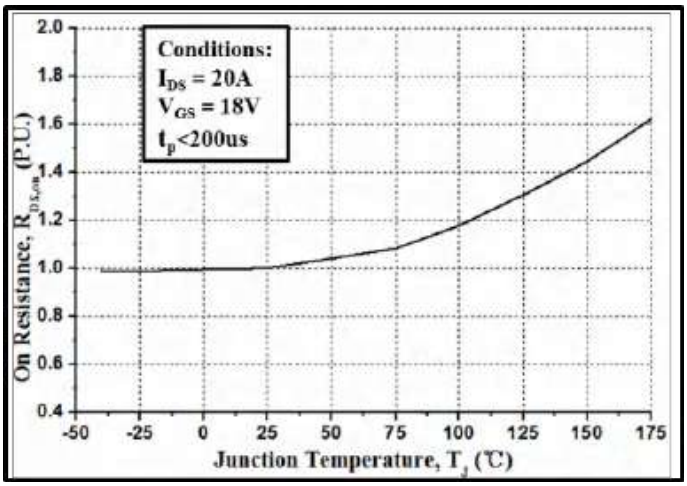


Figure 4. Normalized On-Resistance vs. Temperature

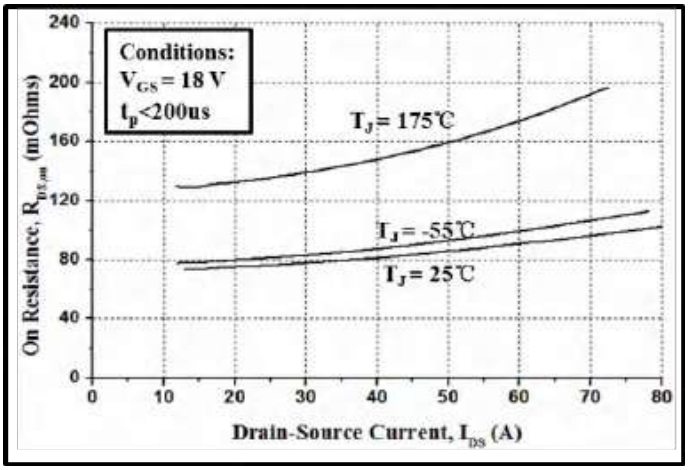


Figure 5. On-Resistance vs. Drain Current
For Various Temperatures

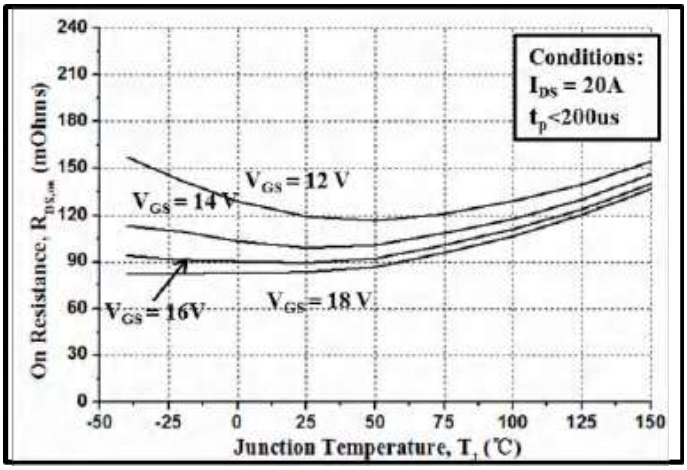


Figure 6. On-Resistance vs. Temperature
For Various Gate Voltage

RATING AND CHARACTERISTICS CURVES (RSM33N120D7LV)

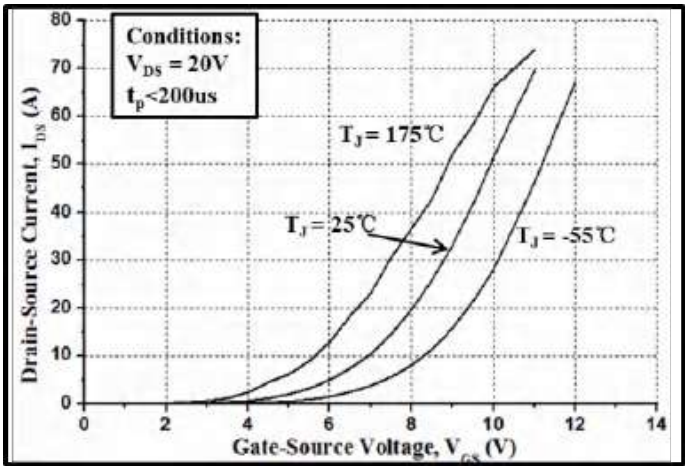


Figure 7. Transfer Characteristic for Various Junction Temperatures

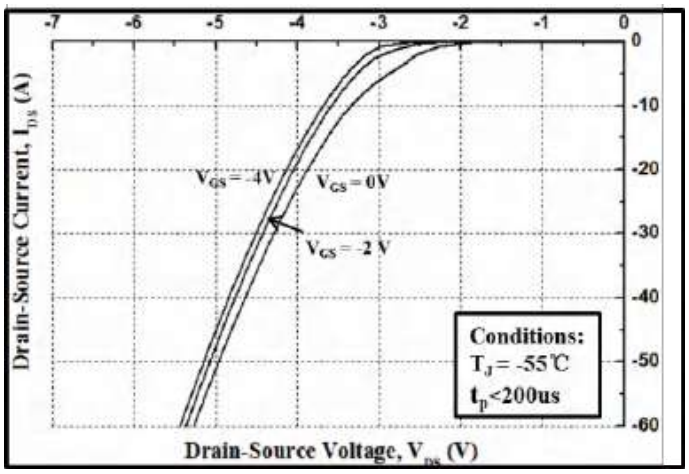


Figure 8. Body Diode Characteristic at -55℃

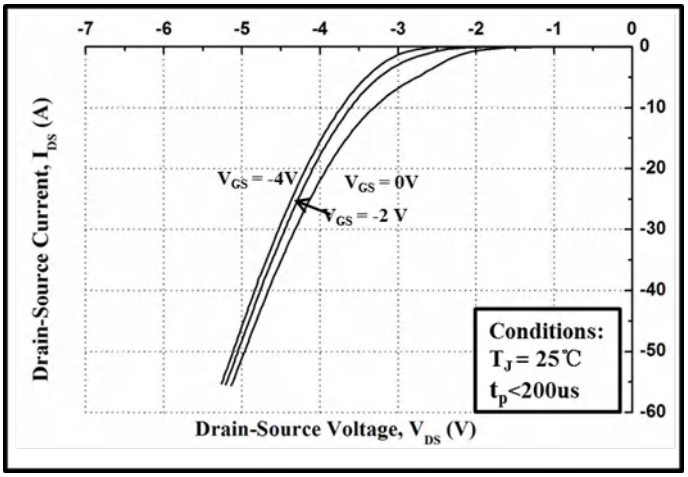


Figure 9. Body Diode Characteristic at 25℃

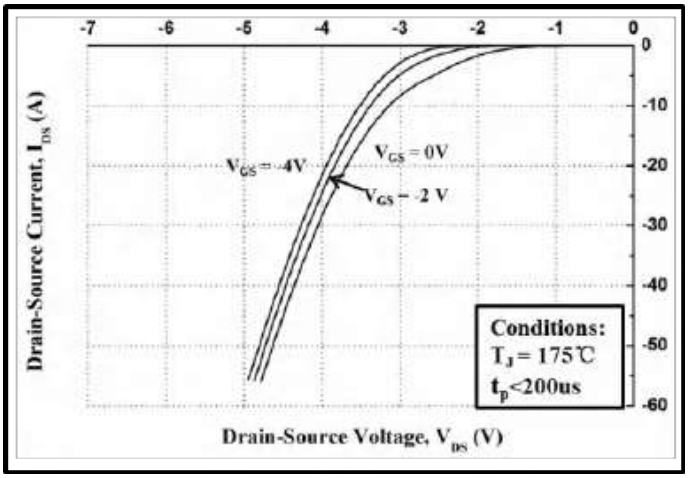


Figure 10. Body Diode Characteristic at 175℃

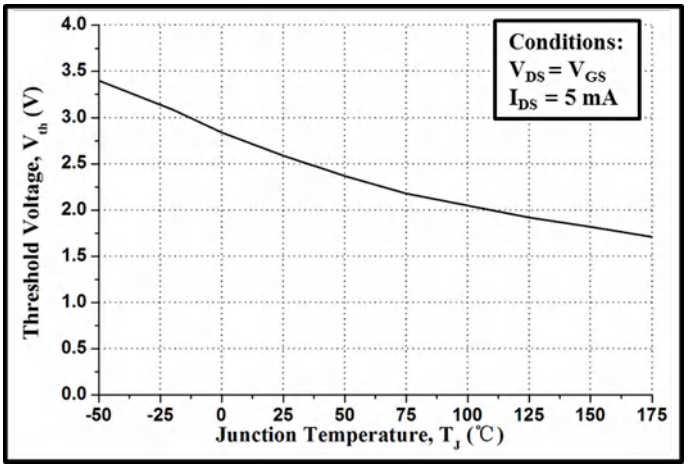


Figure 11. Threshold Voltage vs. Temperature

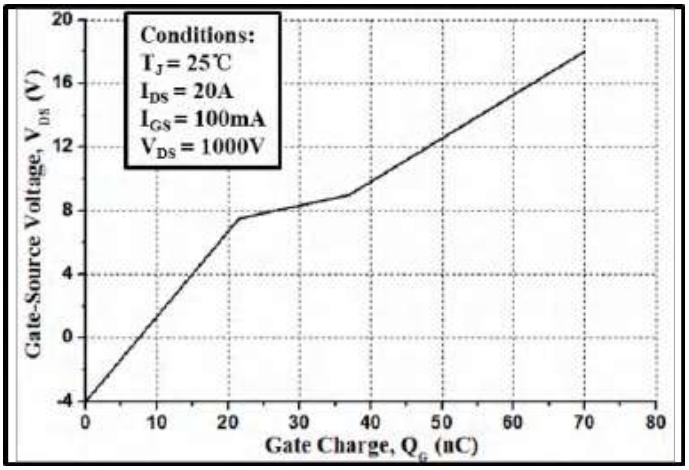


Figure 12. Gate Charge Characteristics

RATING AND CHARACTERISTICS CURVES (RSM33N120D7LV)

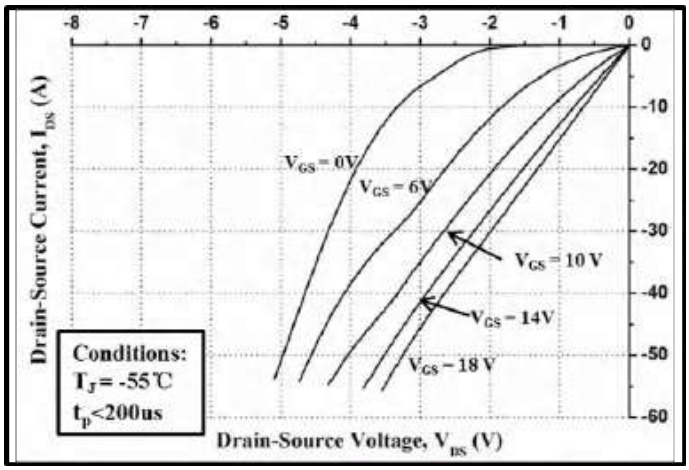


Figure 13. 3rd Quadrant Characteristic at -55℃

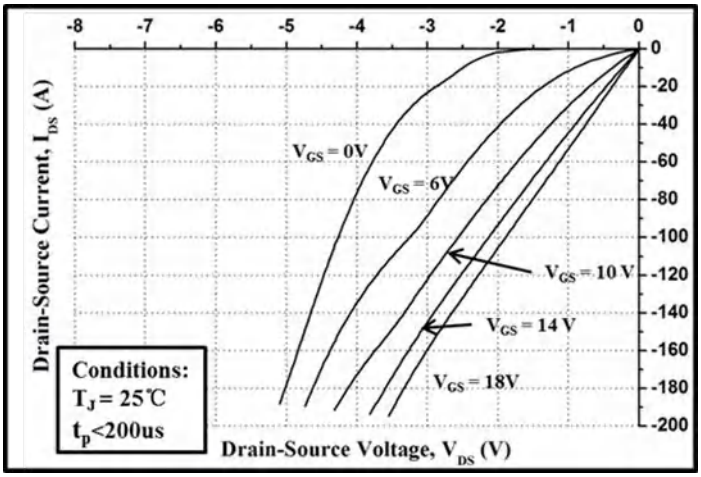


Figure 14. 3rd Quadrant Characteristic at 25℃

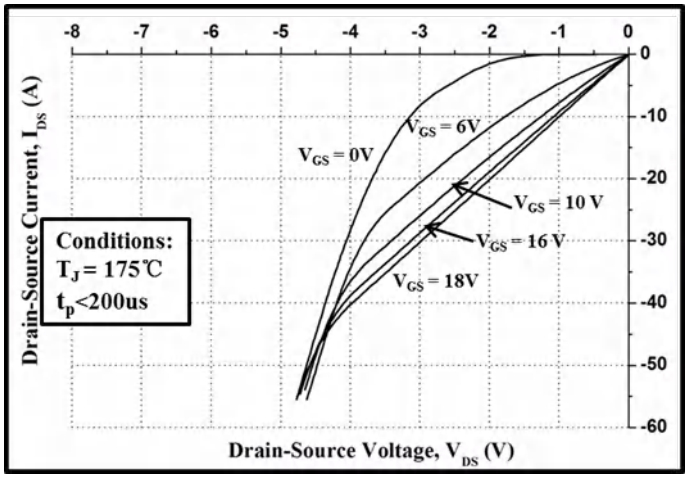


Figure 15. 3rd Quadrant Characteristic at 175 ℃

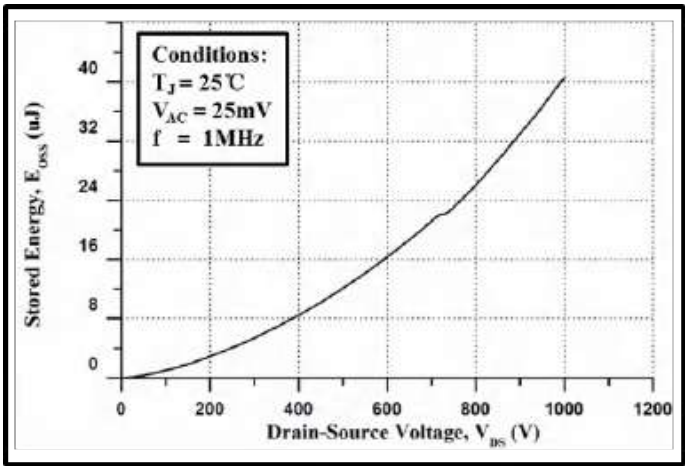


Figure16. Output Capacitor Stored Energy

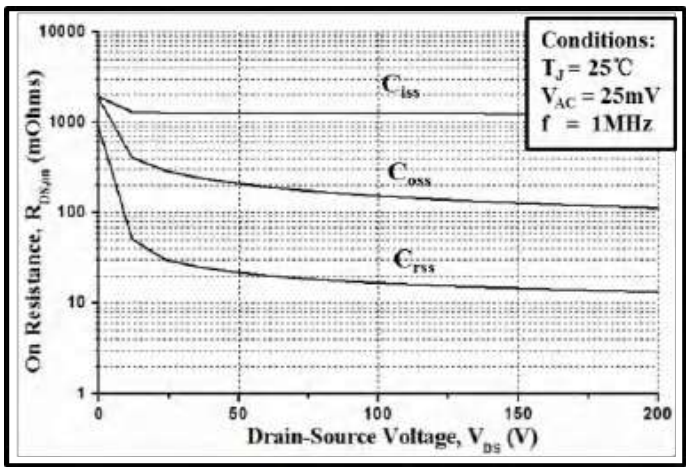


Figure 17. Capacitances vs. Drain-Source Voltage (0 - 200V)

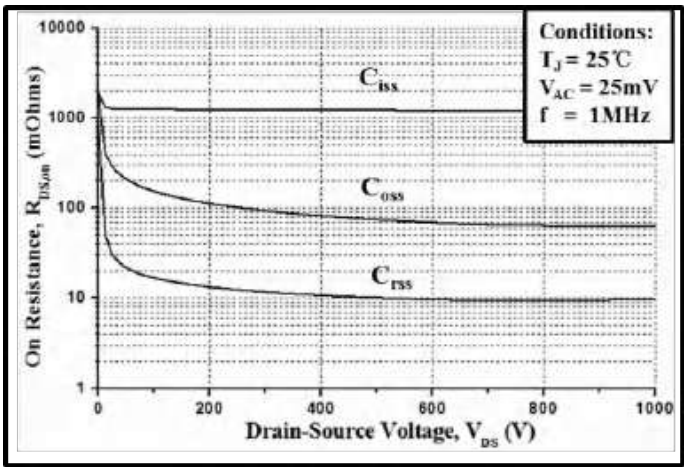


Figure 18. Capacitances vs. Drain-Source Voltage (0 - 1000V)

RATING AND CHARACTERISTICS CURVES (RSM33N120D7LV)

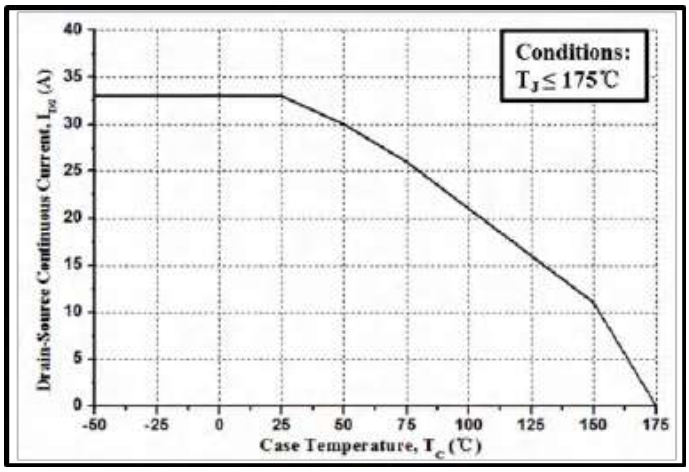


Figure 19. Continuous Drain Current Derating vs. Case Temperature

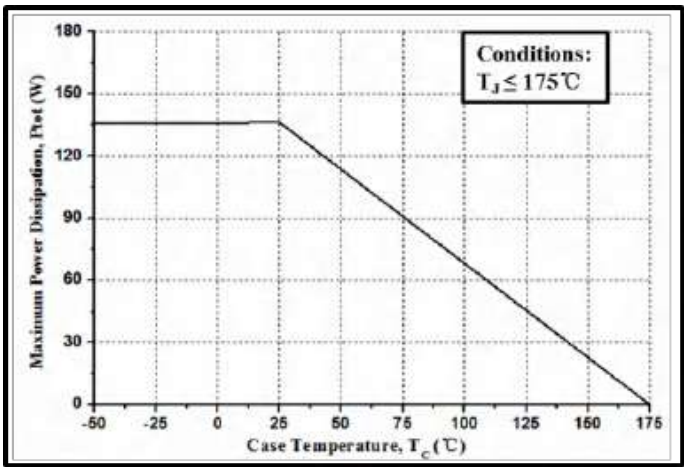


Figure 20. Maximum Power Dissipation Derating vs. Case Temperature

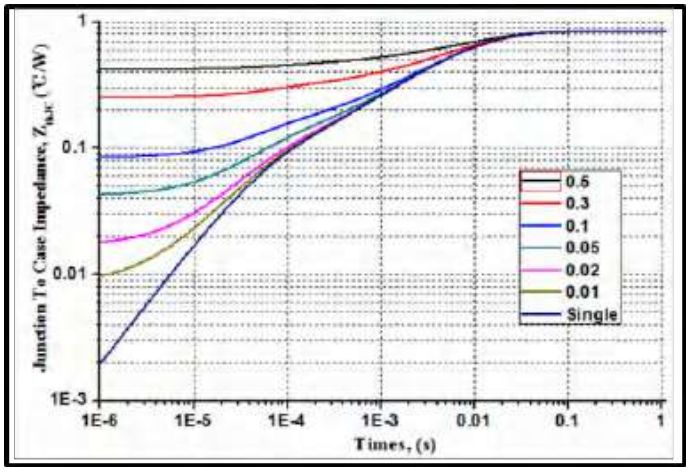


Figure 21. Transient Thermal Impedance (Junction - Case)

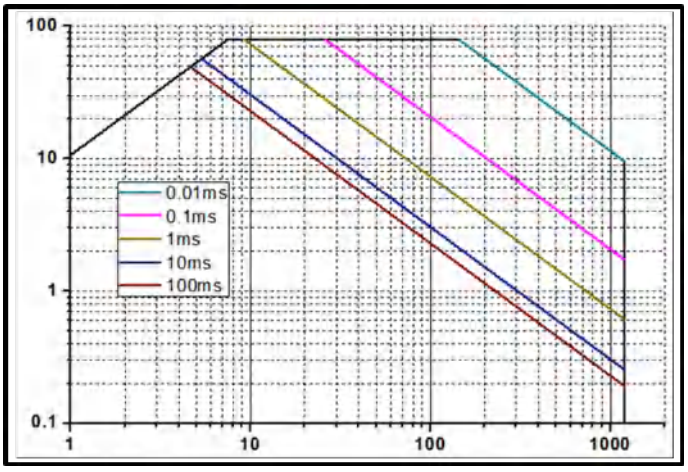


Figure22. Safe Operating Area

Test Circuit Schematic

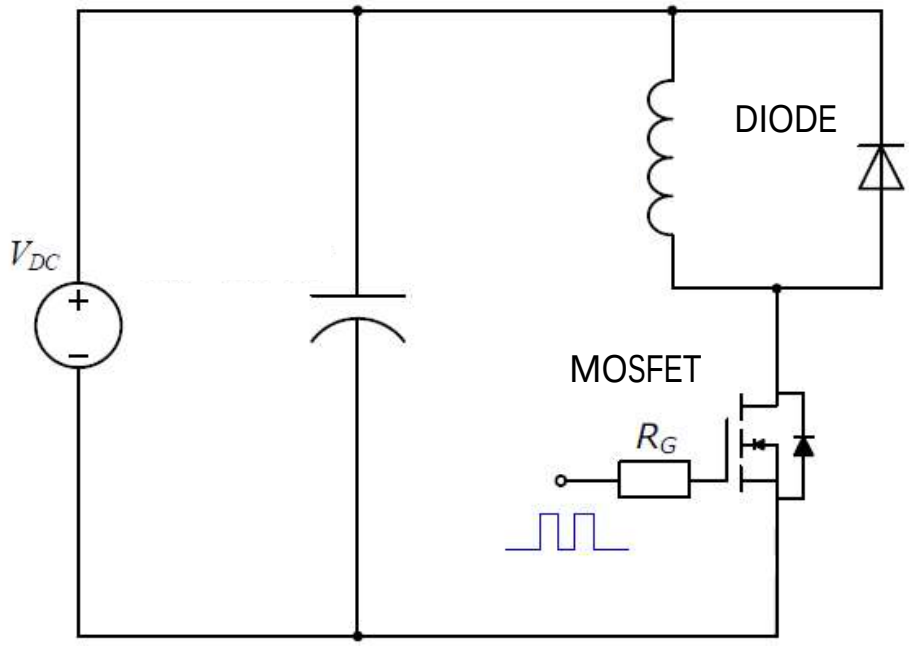


Figure 23. Clamped Inductive Switching Waveform Test Circuit

RECTRON

Marking on the body

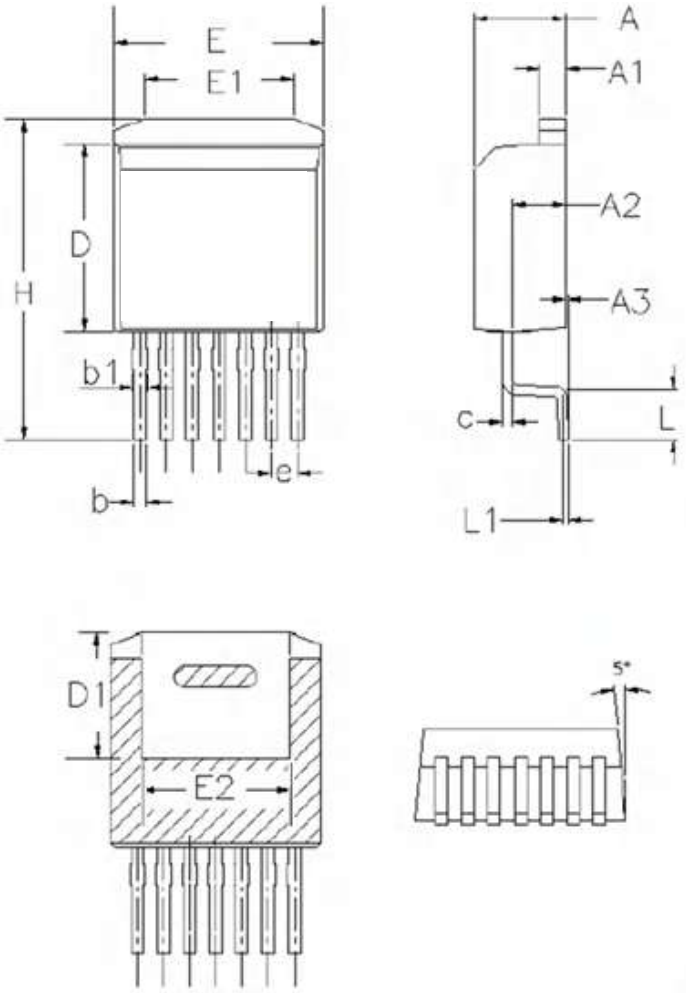
Rectron Logo →  Y Y W W

Year – Code
(Y:24-----2024
25-----2025.....)

Week – code
(WW:01~52)

3 3 N 1 2 0 ← Part No.

Package Dimensions



SYMBOLS	DIMENSIONS IN MILLMETERS		
	MIN	NOM	MAX
A	4.3	4.43	4.6
A1	1.2	1.3	1.4
A2	2.4	2.6	2.7
A3	0	0.13	0.25
b	0.5	0.6	0.7
b1	0.6	0.7	0.9
c	0.4	0.5	0.6
D	8.88	9.08	9.28
D1	6.15	6.45	6.65
e	1.27bsc		
E	10.08	10.18	10.28
E1	6.5	7	8.3
E2	7.3	7.82	7.97
H	14.8	15.5	16
L	1.9	2.2	2.75

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