

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

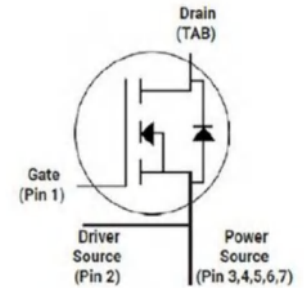
Benefits

- 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

V_{DS}	=	1200	V
$R_{DS(on)}$	=	75	mΩ
$I_D @ 25^{\circ}C$	=	33	A



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

Symbol	Parameter	Value	Unit	Test Conditions	Note
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	33	A	$V_{GS}=18V, T_c=25^{\circ}C$	Fig. 19
		23.8		$V_{GS}=18V, T_c=100^{\circ}C$	
$I_{D(pulse)}$	Pulsed Drain Current	80	A	Pulse width t_p limited by T_{Jmax}	Fig. 22
P_D	Power Dissipation	136	W	$T_c=25^{\circ}C, T_J=175^{\circ}C$	Fig. 20
T_J, T_{STG}	Operating Junction and Storage Temperature	-55 to +175	$^{\circ}C$		
T_L	Solder Temperature, 1.6mm from case for 10s	260	$^{\circ}C$		
M_d	Mounting Torque, (M3 or 6-32 screw)	1	Nm		
		8.8	lbf-in		

Electrical Characteristics (T_C=25°C 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°C	
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°C	
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	
C _{iss}	Input Capacitance	/	1200	/	pF	V _{GS} =0V	Fig. 17,18
C _{oss}	Output Capacitance	/	63	/		V _{DS} =1000V	
C _{rss}	Reverse Transfer Capacitance	/	5.7	/		f=1MHz	
E _{oss}	C _{oss} Stored Energy	/	41	/	μJ	V _{AC} =25mV	Fig. 16
E _{ON}	Turn-On Switching Energy	/	586	/	μJ	V _{DS} =800V, V _{GS} =-4V/18V	
E _{OFF}	Turn-Off Switching Energy	/	273	/		I _D =20A, R _{G(ext)} =2.5Ω, L=100μH	
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	Fig. 12
Q _{GD}	Gate to Drain Charge	/	14.6	/		V _{GS} =-4V/18V	
Q _G	Total Gate Charge	/	68.1	/		I _D =20A	

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°C	
I _S	Continuous Diode Forward Current	/	33	A	T _C =25°C	
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	/	°C/W		Fig. 21
R _{θJA}	Thermal Resistance from Junction to Ambient	/	40			

RATING AND CHARACTERISTICS CURVES (RSM33N120D7LV)

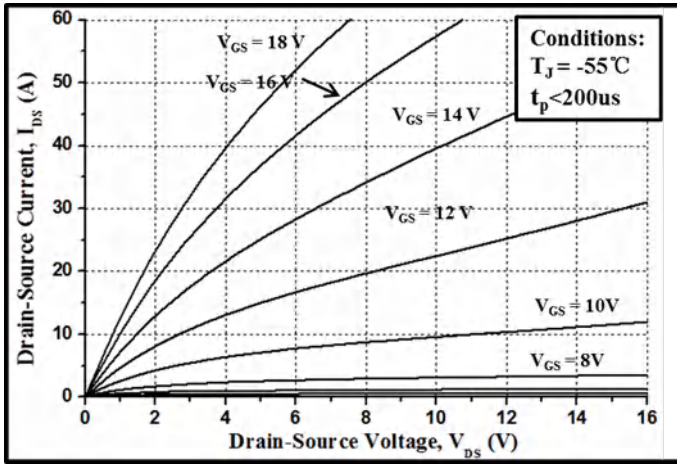


Figure 1. Output Characteristics $T_J = -55^\circ\text{C}$

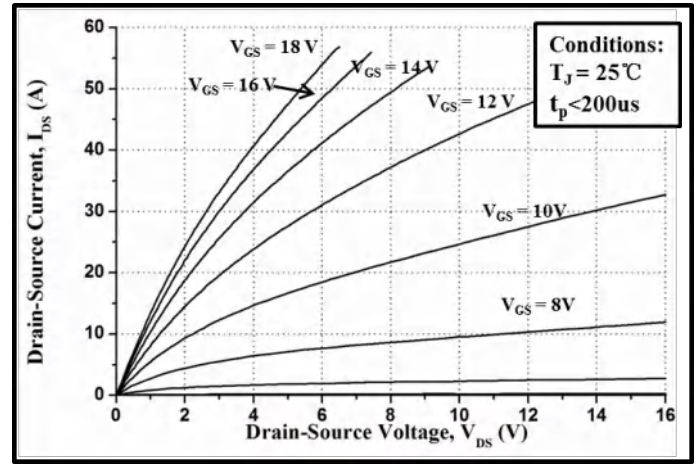


Figure 2. Output Characteristics $T_J = 25^\circ\text{C}$

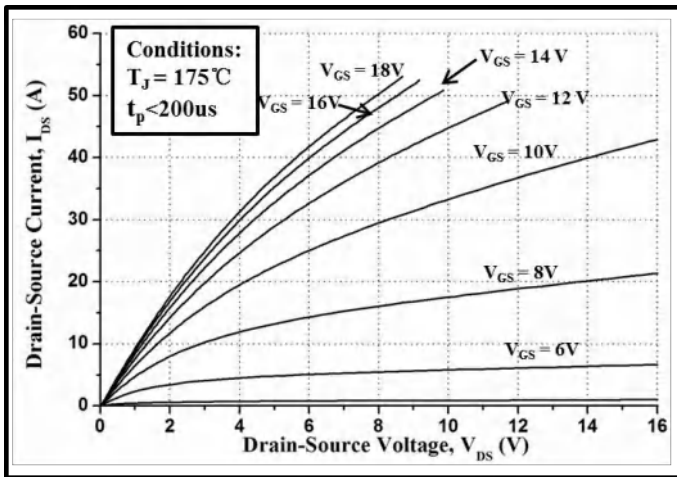


Figure 3. Output Characteristics $T_J = 175^\circ\text{C}$

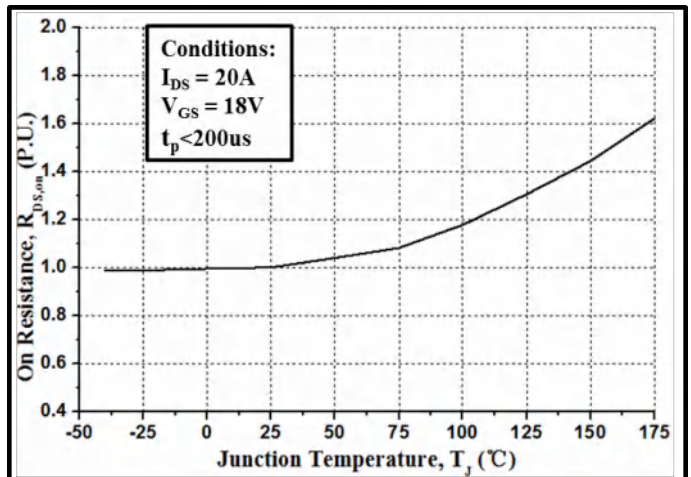


Figure 4. Normalized On-Resistance vs. Temperature

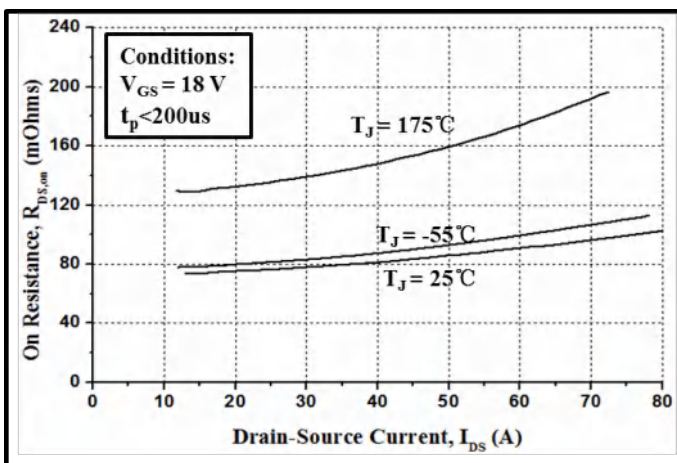


Figure 5. On-Resistance vs. Drain Current
For Various Temperatures

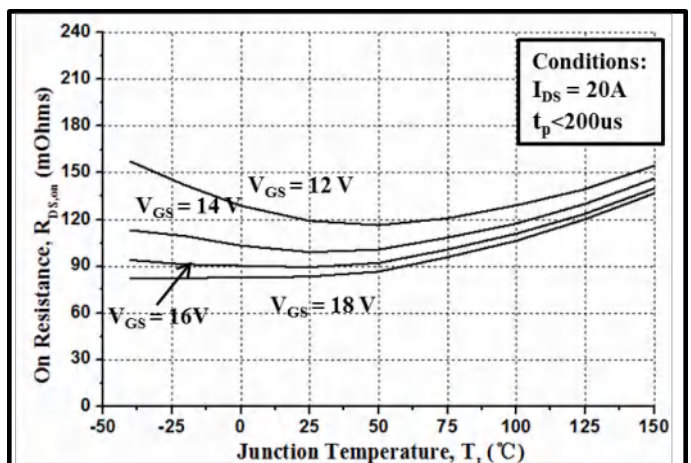


Figure 6. On-Resistance vs. Temperature
For Various Gate Voltage

RATING AND CHARACTERISTICS CURVES(RSM33N120D7LV)

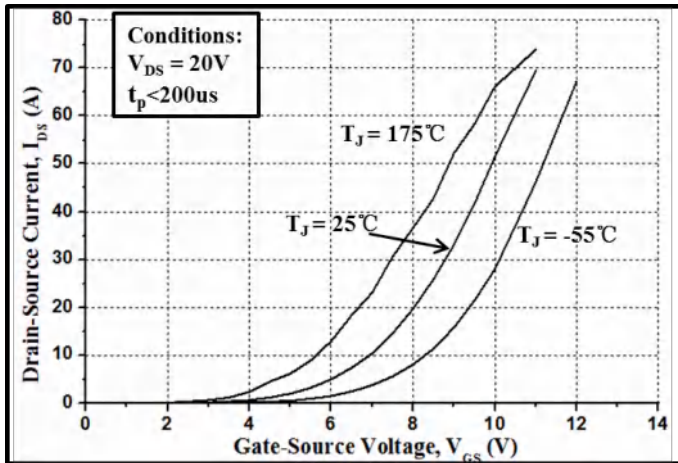


Figure 7. Transfer Characteristic for Various Junction Temperatures

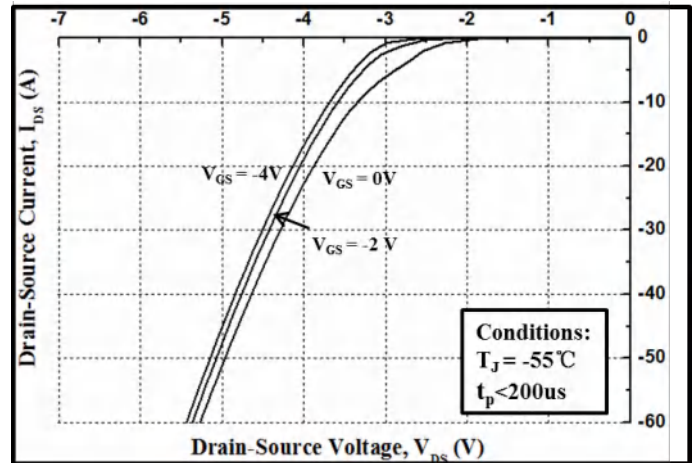


Figure 8. Body Diode Characteristic at $-55^\circ C$

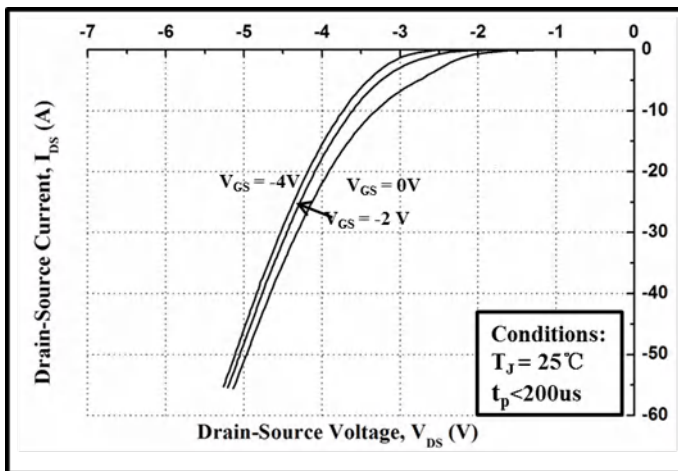


Figure 9. Body Diode Characteristic at $25^\circ C$

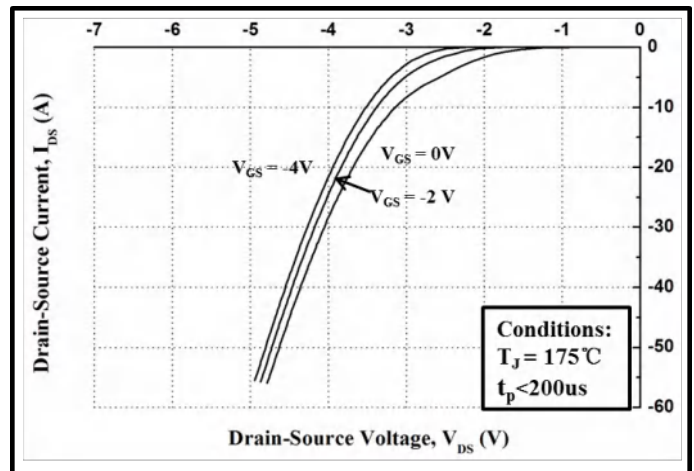


Figure 10. Body Diode Characteristic at $175^\circ C$

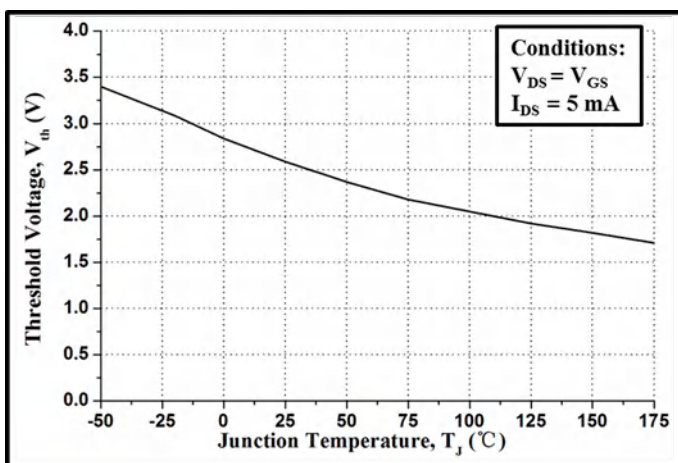


Figure 11. Threshold Voltage vs. Temperature

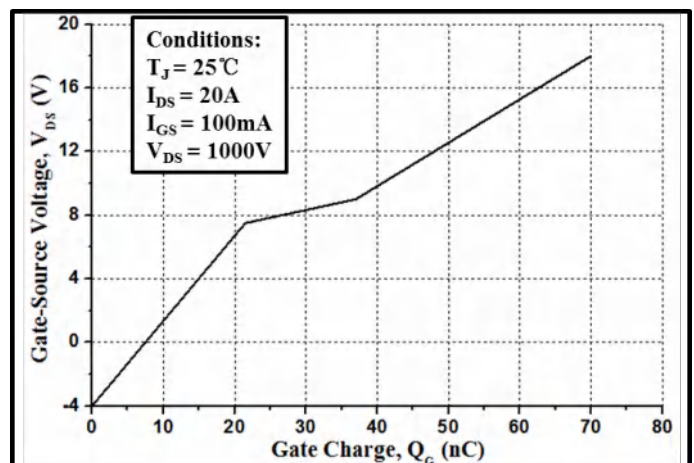


Figure 12. Gate Charge Characteristics

RATING AND CHARACTERISTICS CURVES (RSM33N120D7LV)

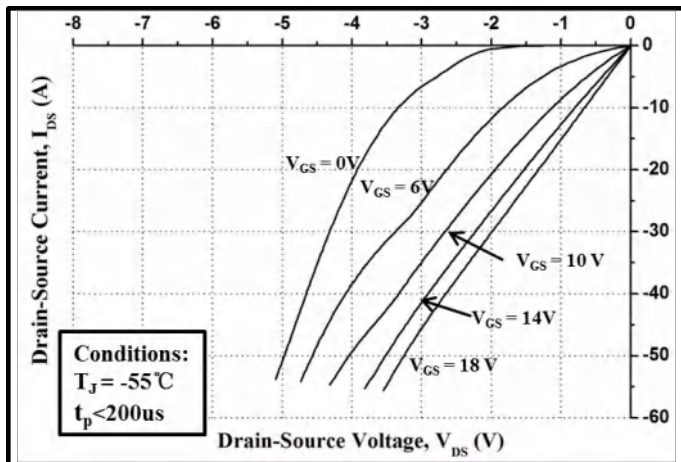


Figure 13. 3rd Quadrant Characteristic at -55°C

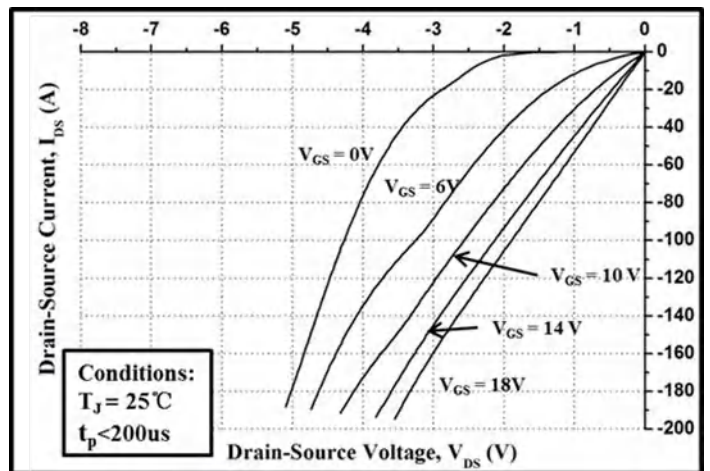


Figure 14. 3rd Quadrant Characteristic at 25°C

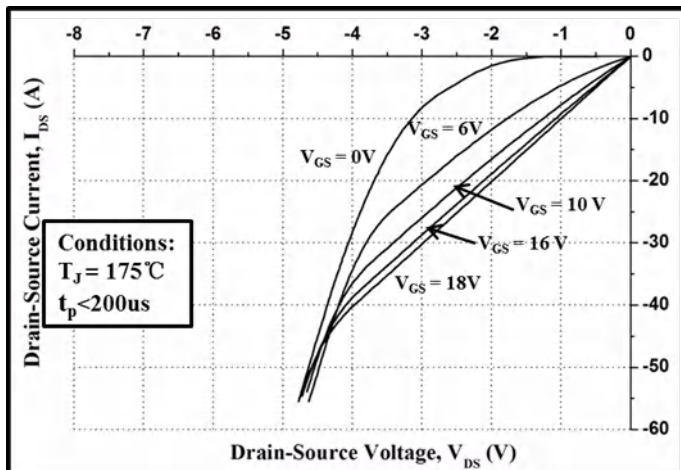


Figure 15. 3rd Quadrant Characteristic at 175°C

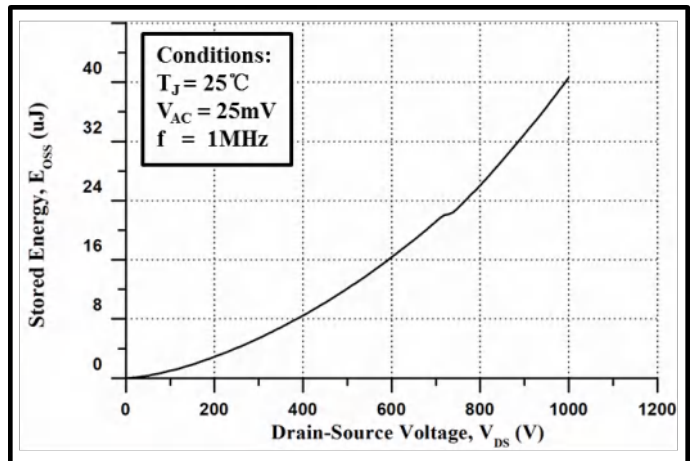


Figure 16. Output Capacitor Stored Energy

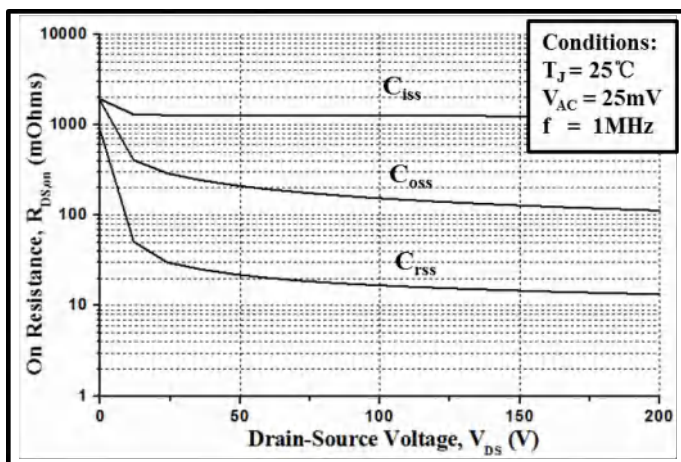


Figure 17. Capacitances vs. Drain-Source Voltage (0 - 200V)

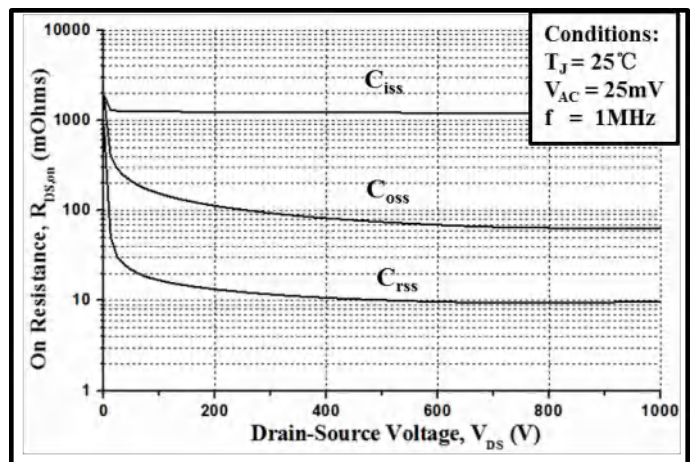


Figure 18. Capacitances vs. Drain-Source Voltage (0 - 1000V)

RATING AND CHARACTERISTICS CURVES (RSM33N120D7LV)

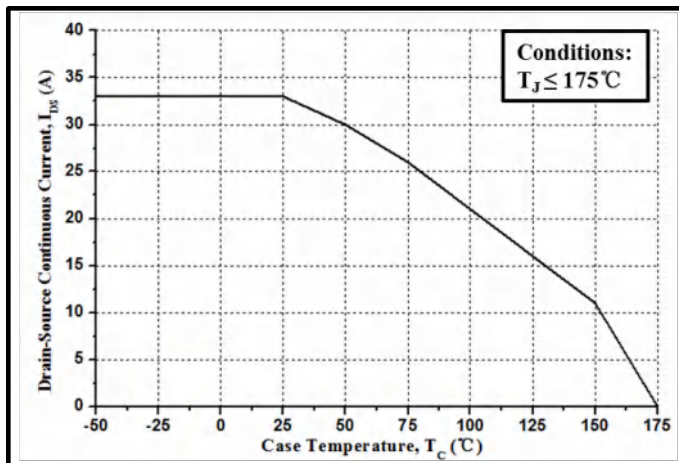


Figure 19. Continuous Drain Current Derating vs. Case Temperature

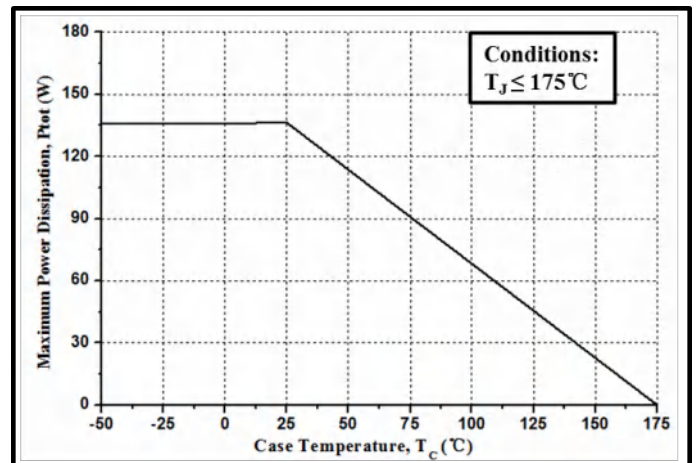


Figure 20. Maximum Power Dissipation Derating vs. Case Temperature

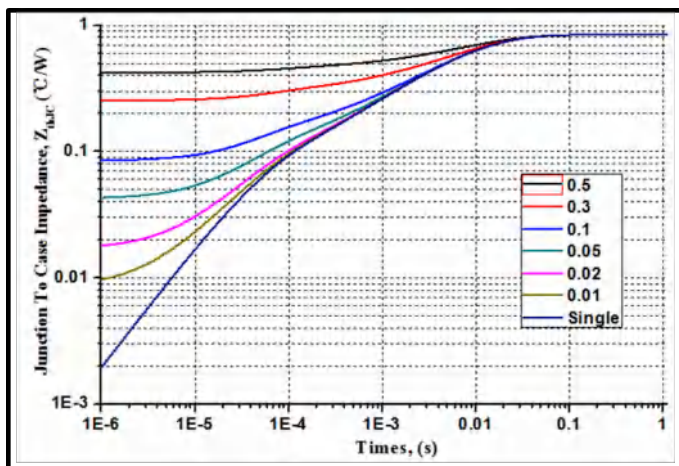


Figure 21. Transient Thermal Impedance (Junction - Case)

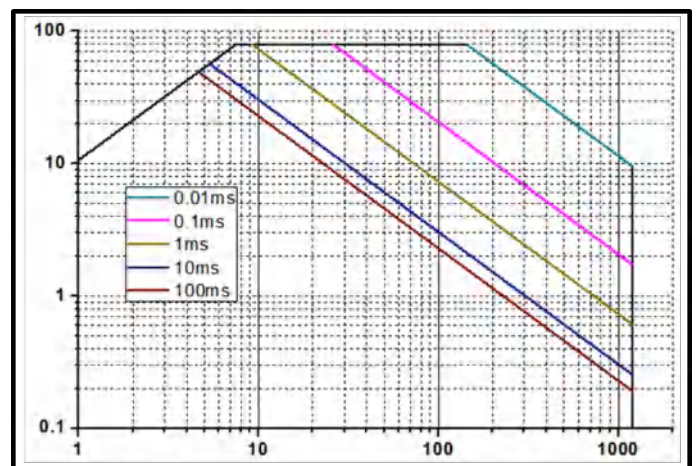


Figure 22. Safe Operating Area

Test Circuit Schematic

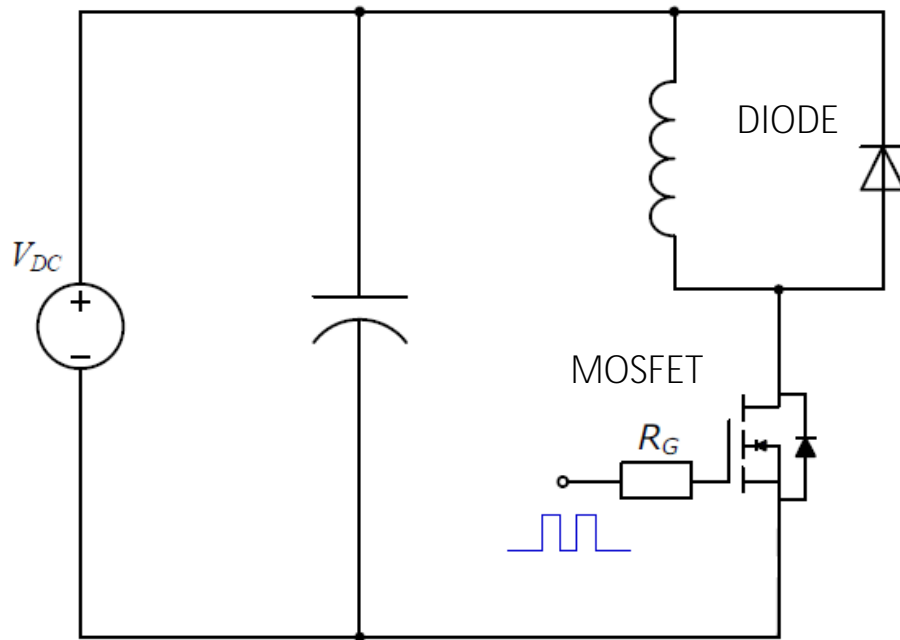
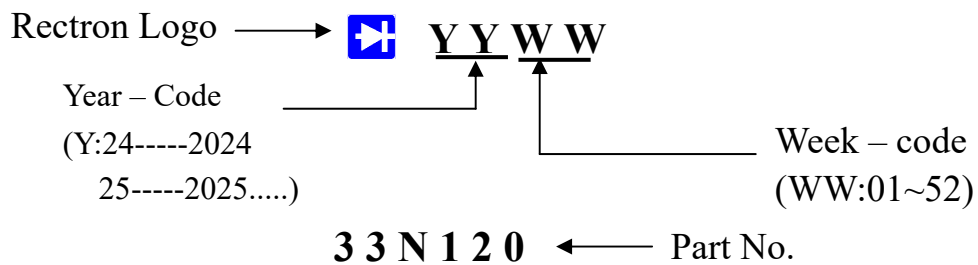


Figure 23. Clamped Inductive Switching
Waveform Test Circuit

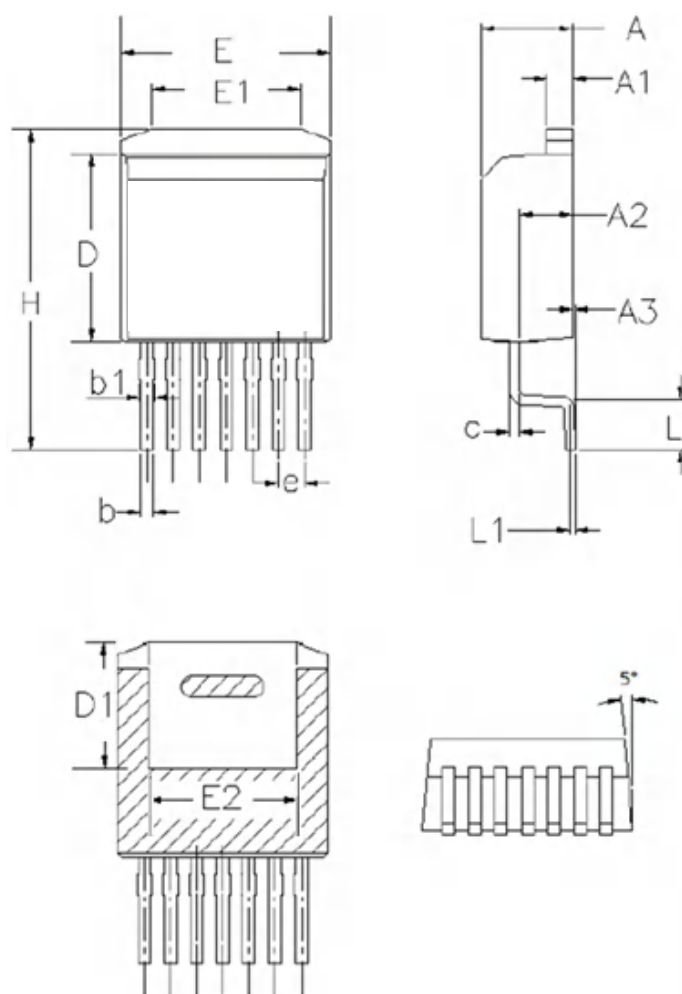


RECTRON

Marking on the body



Package Dimensions



SYMBOLS	DIMENSIONS IN MILLIMETERS		
	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	1.27 _{bsc}		
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

DISCLAIMER NOTICE

Rectron Inc reserves the right to make changes without notice to any product specification herein, to make corrections, modifications, enhancements or other changes. Rectron Inc or anyone on its behalf assumes no responsibility or liability for any errors or inaccuracies. Data sheet specifications and its information contained are intended to provide a product description only. "Typical" parameters which may be included on RECTRON data sheets and/ or specifications can and do vary in different applications and actual performance may vary over time. Rectron Inc does not assume any liability arising out of the application or use of any product or circuit.

Rectron products are not designed, intended or authorized for use in medical, life-saving implant or other applications intended for life-sustaining or other related applications where a failure or malfunction of component or circuitry may directly or indirectly cause injury or threaten a life without expressed written approval of Rectron Inc. Customers using or selling Rectron components for use in such applications do so at their own risk and shall agree to fully indemnify Rectron Inc and its subsidiaries harmless against all claims, damages and expenditures.