

N2M120007PB11

Silicon Carbide Power MOSFET

N-Channel Enhancement Mode

V_{DS}	1200V
$I_D @ 25^\circ\text{C}$	310A
$R_{DS(ON)}$	7m Ω

Features

- Low On-Resistance
- Low Capacitances
- Low Switching Losses
- Easy to Parallel and Simple to Drive

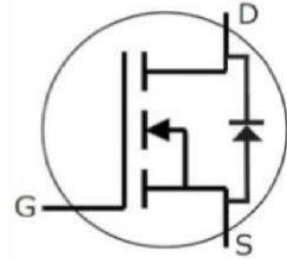
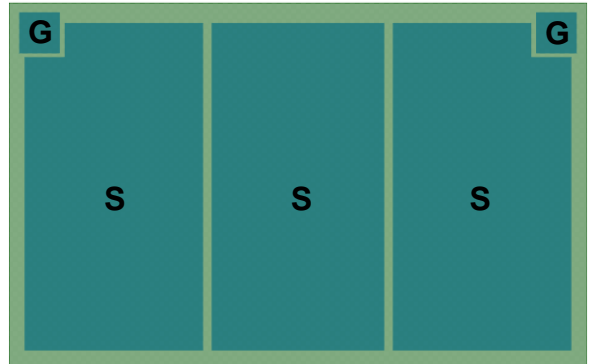
Benefits

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

Applications

- General Purpose Drives (GPD)
- EV-Charging
- UPS
- String Inverter
- Solar Power Optimizer

Chip Outline



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

Symbol	Parameter	Value	Unit	Test Conditions	Note
V_{DSmax}	Drain - Source Voltage	1200	V	$V_{GS} = 0\text{ V}, I_D = 100\ \mu\text{A}$	
V_{GSmax}	Gate - Source Voltage	-8/+22	V	Absolute maximum values, AC ($f > 1\text{ Hz}$)	
V_{GSop}	Gate - Source Voltage	-4/+18	V	Recommended operational values	
I_D	Continuous Drain Current	310	A	$V_{GS} = 18\text{ V}, T_C = 25^\circ\text{C}$	Note 1
		219	A	$V_{GS} = 18\text{ V}, T_C = 100^\circ\text{C}$	
$I_{D(pulse)}$	Pulsed Drain Current	1400	A	Pulse width t_p ($t_p = 10\ \mu\text{s}$) limited by T_{jmax}	
T_J, T_{stg}	Operating Junction and Storage Temperature	-55 to + 175	$^\circ\text{C}$		

Note (1): Assumes a $R_{\theta JC} < 0.12\text{ K/W}$

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

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions	Note
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	1200			V	$V_{GS}=0V, I_D=100\mu A$	
$V_{GS(th)}$	Gate Threshold Voltage	1.8	2.4	3.0	V	$V_{DS}=V_{GS}, I_D=45mA$	Fig. 11
			1.7		V	$V_{DS}=V_{GS}, I_D=45mA, T_J=175^\circ\text{C}$	
I_{DSS}	Zero Gate Voltage Drain Current			100	μA	$V_{DS}=1200V, V_{GS}=0V$	
I_{GSS}	Gate-Source Leakage Current			250	nA	$V_{GS}=+22V, V_{DS}=0V$	
				-250		$V_{GS}=-8V, V_{DS}=0V$	
$R_{DS(on)}$	Drain-Source On-State Resistance		7	10	m Ω	$V_{GS}=18V, I_D=100A$	Fig. 4, 5, 6
			12			$V_{GS}=18V, I_D=100A, T_J=175^\circ\text{C}$	
			9	12		$V_{GS}=15V, I_D=100A$	
			14			$V_{GS}=15V, I_D=100A, T_J=175^\circ\text{C}$	
g_{fs}	Transconductance		77		S	$V_{DS}=20V, I_{DS}=100A$	Fig. 7
			68			$V_{DS}=20V, I_{DS}=100A, T_J=175^\circ\text{C}$	
C_{iss}	Input Capacitance		11500		pF	$V_{GS}=0V, V_{DS}=1000V, f=100kHz, V_{AC}=25mV$	Fig. 17, 18
C_{oss}	Output Capacitance		563				
C_{rss}	Reverse Transfer Capacitance		37				
E_{oss}	C_{oss} Stored Energy		315		μJ		Fig. 16
$R_{G(int)}$	Internal Gate Resistance		1.6		Ω	$f=1MHz, V_{AC}=25mV$	
Q_{gs}	Gate to Source Charge		207		nC	$V_{DS}=800V, V_{GS}=-4/18V, I_D=100A$	Fig. 12
Q_{gd}	Gate to Drain Charge		30				
Q_g	Total Gate Charge		515				

Reverse Diode Characteristics

Symbol	Parameter	Typ.	Max.	Unit	Test conditions	Note
V_{SD}	Diode Forward Voltage	4.1		V	$V_{GS}=-4V, I_{SD}=100A$	Fig. 8, 9, 10
		3.5		V	$V_{GS}=-4V, I_{SD}=100A, T_J=175^\circ\text{C}$	
I_S	Continuous Diode Forward Current		310	A	$T_C=25^\circ\text{C}$	
t_{rr}	Reverse Recovery time	29		ns	$V_{GS}=-4V, I_{SD}=100A, V_R=800V, dif/dt=3000A/\mu s$	
Q_{rr}	Reverse Recovery Charge	839		nC		
I_{rrm}	Peak Reverse Recovery Current	51		A		

Typical Performance

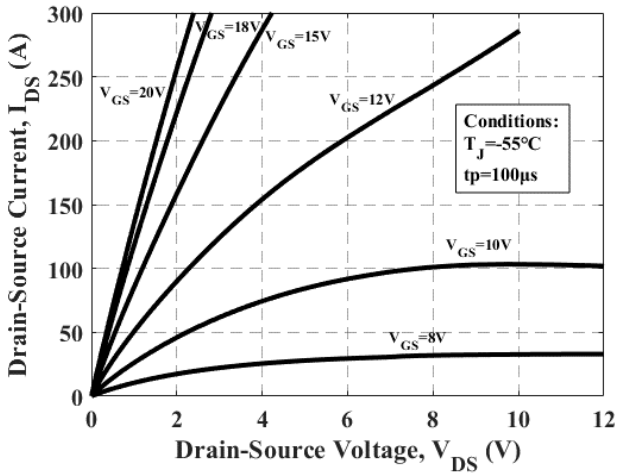


Figure 1. Output Characteristics $T_J = -55\text{ }^\circ\text{C}$

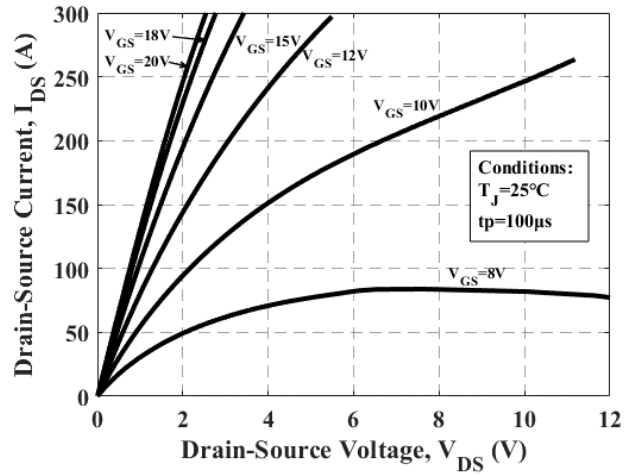


Figure 2. Output Characteristics $T_J = 25\text{ }^\circ\text{C}$

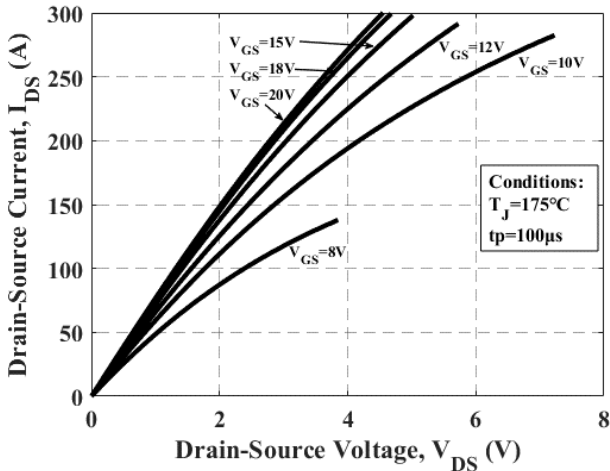


Figure 3. Output Characteristics $T_J = 175\text{ }^\circ\text{C}$

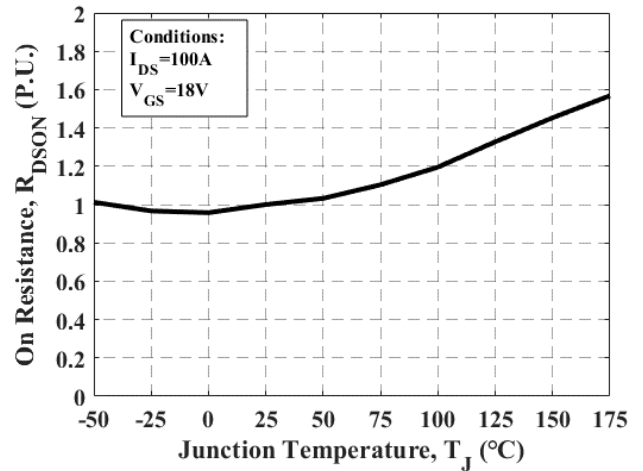


Figure 4. Normalized On-Resistance vs. Temperature

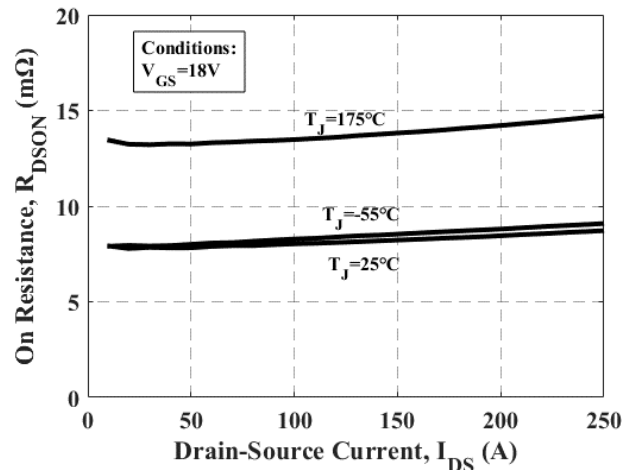


Figure 5. On-Resistance vs. Drain Current for Various Temperatures

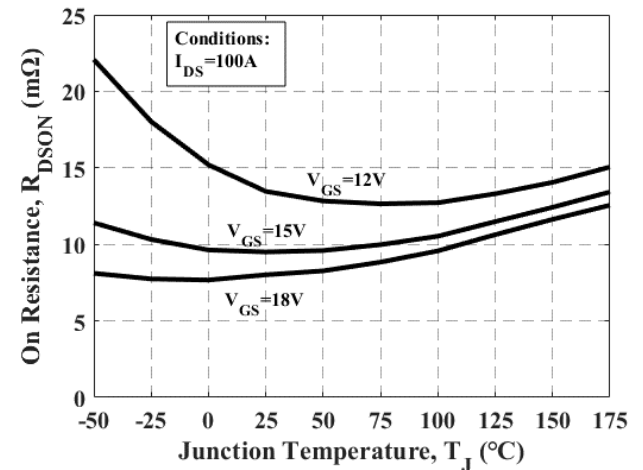


Figure 6. On-Resistance vs. Temperature for Various Gate Voltages

Typical Performance

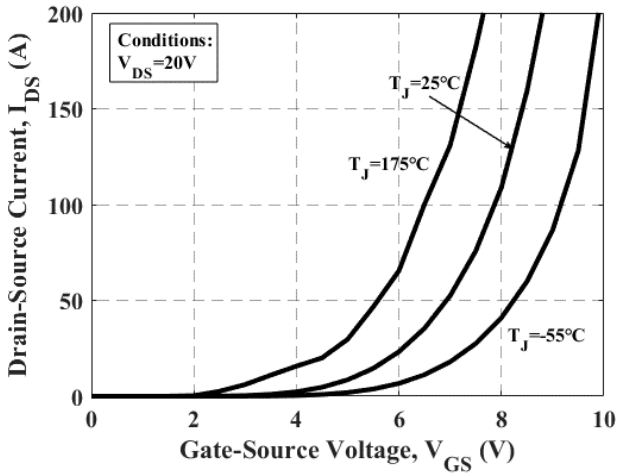


Figure 7. Transfer Characteristics for Various Junction Temperatures

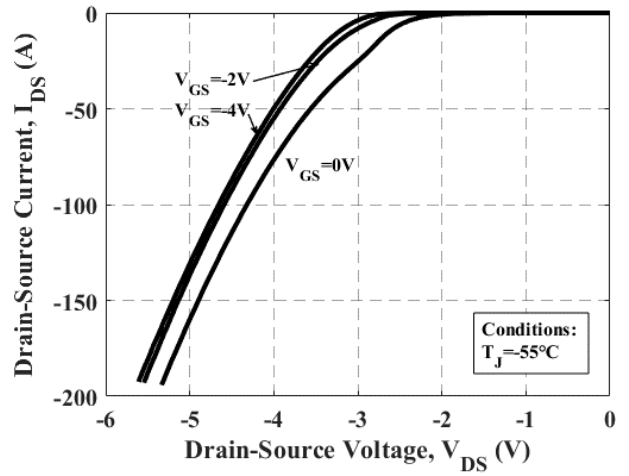


Figure 8. Body Diode Characteristics at -55 °C

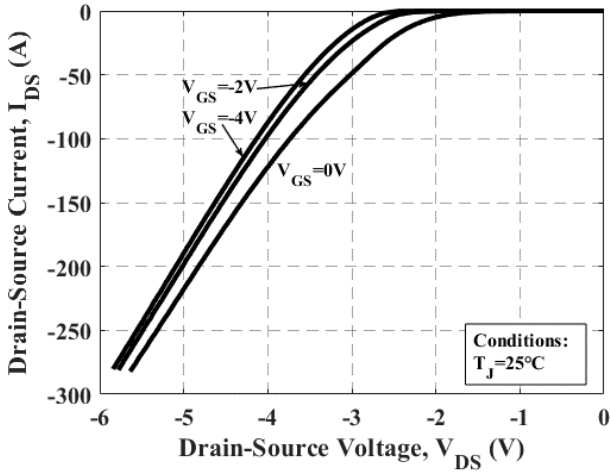


Figure 9. Body Diode Characteristics at 25 °C

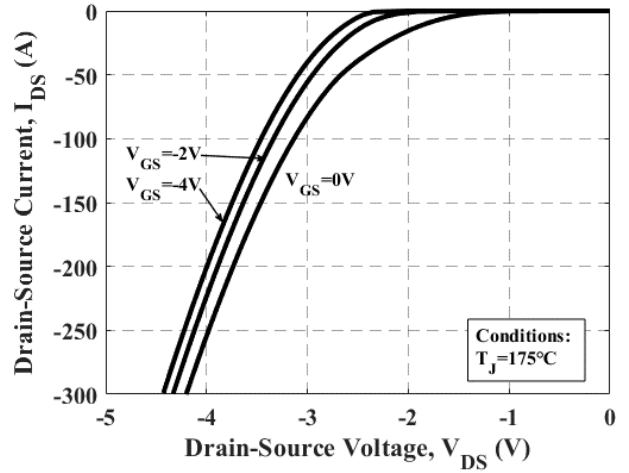


Figure 10. Body Diode Characteristics at 175 °C

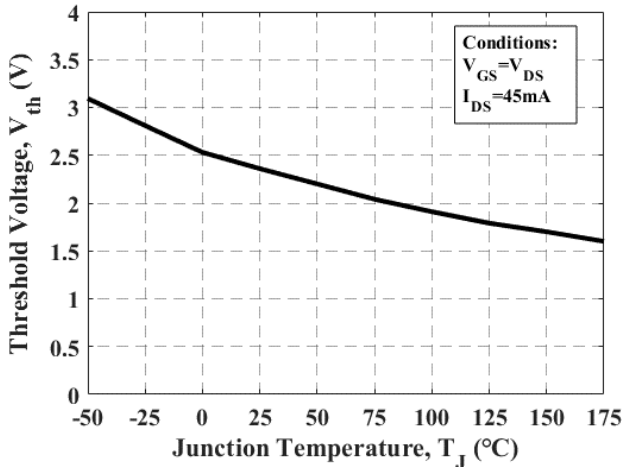


Figure 11. Threshold Voltage vs. Temperature

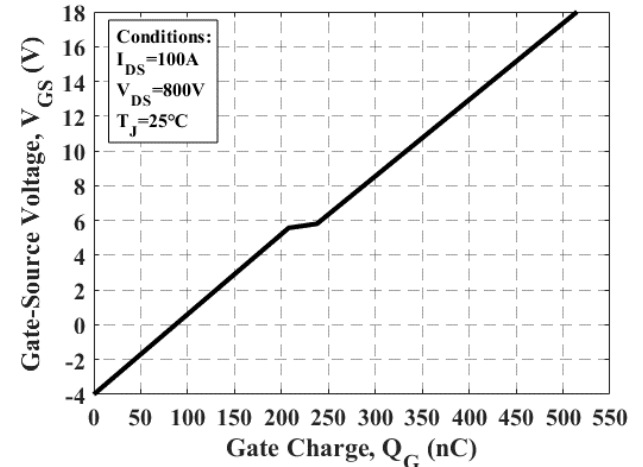


Figure 12. Gate Charge Characteristics

Typical Performance

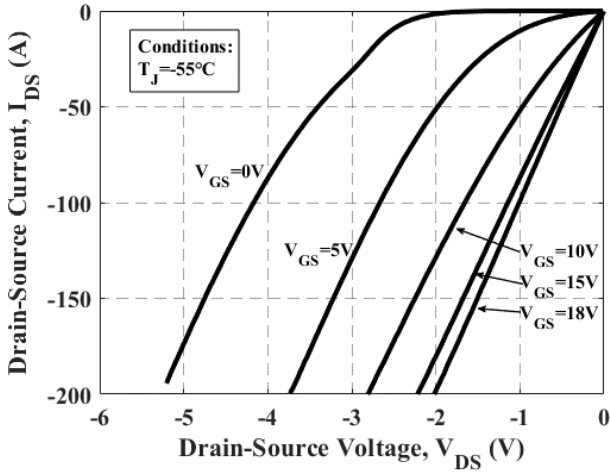


Figure 13. 3rd Quadrant Characteristics at -55 °C

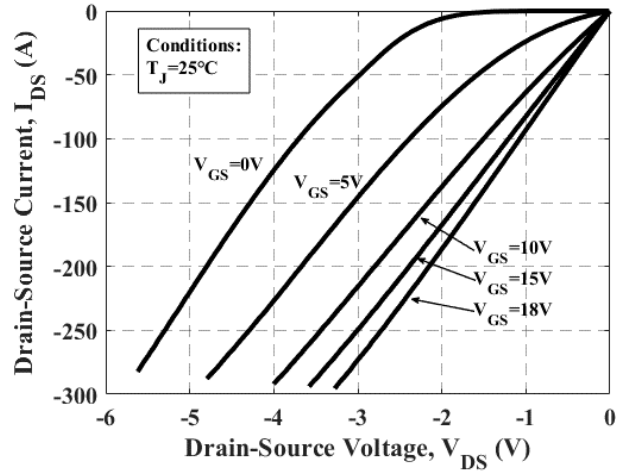


Figure 14. 3rd Quadrant Characteristics at 25 °C

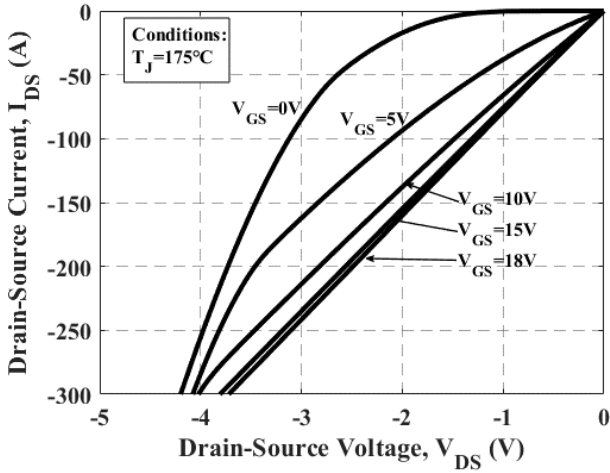


Figure 15. 3rd Quadrant Characteristics at 175 °C

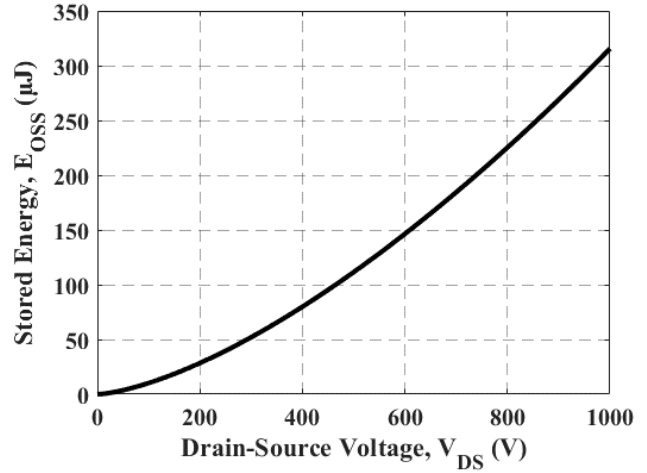


Figure 16. Output Capacitor Stored Energy

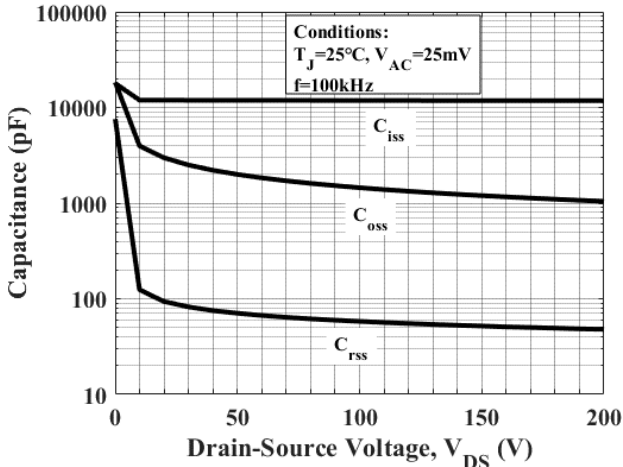


Figure 17. Capacitances vs. Drain-Source Voltage (0 - 200V)

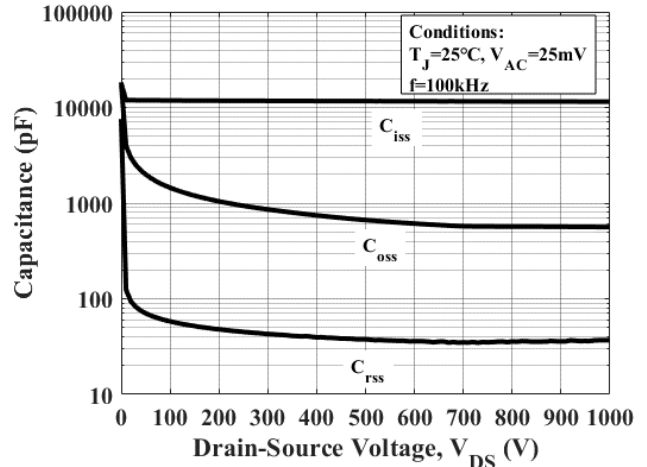


Figure 18. Capacitances vs. Drain-Source Voltage (0 - 1000V)