

M2M-0030-120K

Silicon Carbide Power MOSFET

N-Channel Enhancement Mode

Features

- High Blocking Voltage with Low On-Resistance
- High Speed Switching with Low Capacitances
- Easy to Parallel and Simple to Drive
- Avalanche Ruggedness
- Halogen Free, RoHS Compliant

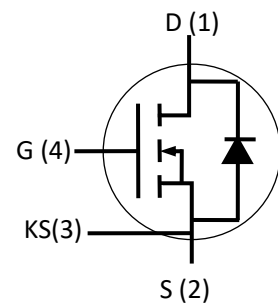
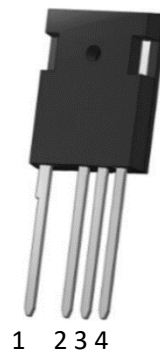
Benefits

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

Applications

- Solar Inverters
- Switch Mode Power Supplies
- High Voltage DC/DC Converters
- Battery Chargers
- Motor Drives
- Pulsed Power applications

Package



Part Number	Package
M2M-0030-120K	TO-247-4

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	$V_{GS}=0V, I_D=100\mu A$	
V_{GSmax}	Gate - Source Voltage	-10/+22	V	Absolute maximum values	
V_{GSop}	Gate - Source Voltage	-6/+18	V	Recommended operational values	
I_D	Continuous Drain Current	76 68	A	$V_{GS}=20V, T_c=25^\circ\text{C}$ $V_{GS}=20V, T_c=100^\circ\text{C}$	
I_{DM}	Pulse Drain Current	120	A	Pulse width limited by T_{jmax}	
P_D	Power Dissipation	375	W	$T_c=25^\circ\text{C}, T_j=150^\circ\text{C}$	
T_j, T_{stg}	Operating Junction and Storage Temperature	-55 to +175	$^\circ\text{C}$		

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	2.2	3.2	4.5	V	$V_{GS}=V_{DS}, I_{DS}=11.5mA, T_c=25^\circ\text{C}$	
			2.2			$V_{GS}=V_{DS}, I_{DS}=11.5mA, T_j=175^\circ\text{C}$	
I_{DSS}	Zero Gate Voltage Drain Current		5	50	μA	$V_{DS}=1200V, V_{GS}=0V$	
I_{GSS}	Gate-Source Leakage Current			100	nA	$V_{GS}=18V, V_{DS}=0V$	
$R_{DS(on)}$	Drain-Source on-state Resistance	20	30	40	m Ω	$V_{GS}=18V, I_D=40A, T_c=25^\circ\text{C}$	
			48			$V_{GS}=18V, I_D=40A, T_j=175^\circ\text{C}$	
g_{fs}	Transconductance		27		S	$V_{DS}=20V, I_D=40A, T_c=25^\circ\text{C}$	
			17		S	$V_{DS}=20V, I_D=40A, T_j=175^\circ\text{C}$	
C_{iss}	Input Capacitance		2940		pF	$V_{GS}=0V, V_{DS}=800V, f=100KHz$ $V_{AC}=25mV$	
C_{oss}	Output Capacitance		129				
C_{rss}	Reverse Transfer Capacitance		15				
E_{ON}	Turn-On Switching Energy		1616		μJ	$V_{DS}=800V, V_{GS}=-5/18V, I_D=40A,$ $R_{G(ext)}=2.5\Omega, L=99\mu H$	
E_{OFF}	Turn-Off Switching Energy		178				
$t_{d(on)}$	Turn-On Delay Time		14		ns	$V_{DS}=800V, V_{GS}=-5/18V$ $I_D=40A, R_{G(ext)}=2.5\Omega,$	
t_r	Rise Time		31				
$t_{d(off)}$	Turn-Off Delay Time		32				
t_f	Fall Time		12				
$R_{G(int)}$	Internal Gate Resistance		2.2		Ω	$f=1MHz, V_{AC}=25mV$	
Q_{gs}	Gate to Source Charge		34		nC	$V_{DS}=800V, V_{GS}=-5/18V$ $I_D=40A$	
Q_{gd}	Gate to Drain Charge		35				
Q_g	Total Gate Charge		138				

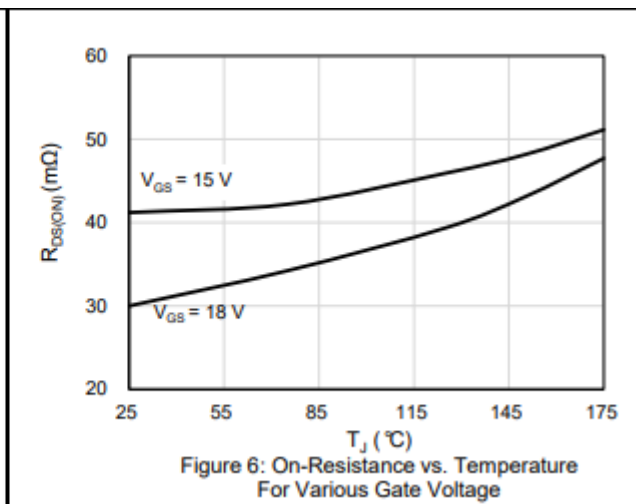
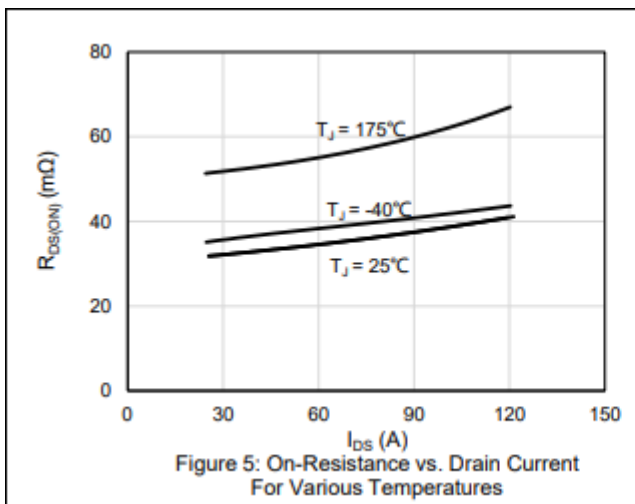
Reverse Diode Characteristics ($T_c = 25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
V_{SD}	Diode Forward Voltage	4.9		V	$V_{GS}=-4V, I_{SD}=20A, T_j=25^\circ\text{C}$	
		4.4		V	$V_{GS}=-4V, I_{SD}=20A, T_j=175^\circ\text{C}$	
I_S	Continuous Diode Forward Current	68		A	$T_c=25^\circ\text{C}$	
t_{rr}	Reverse Recovery time	61		ns	$V_{GS}=-4V, I_{SD}=40A, V_R=800V,$ $di/dt=1150A/\mu s;$	
Q_{rr}	Reverse Recovery Charge	367		nC		
I_{rrm}	Peak Reverse Recovery Current	20		A		

Thermal Characteristics

Symbol	Parameter	Typ.	Unit	Test Conditions	Note
$R_{\theta JC}$	Thermal Resistance from Junction to Case	0.4	°C/W		
$R_{\theta JA}$	Thermal Resistance From Junction to Ambient	36			

Typical Performance



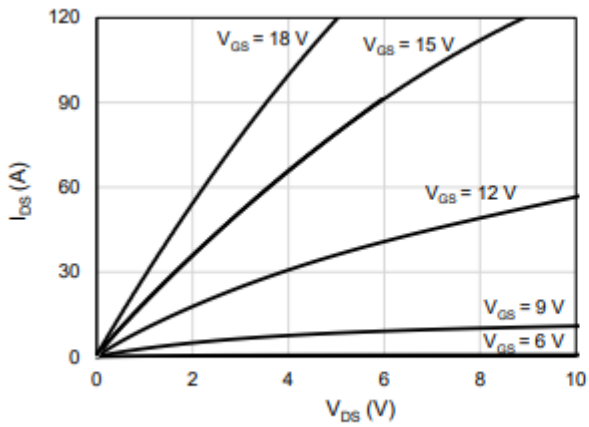


Figure 1: Output Characteristics $T_J = -40^\circ\text{C}$

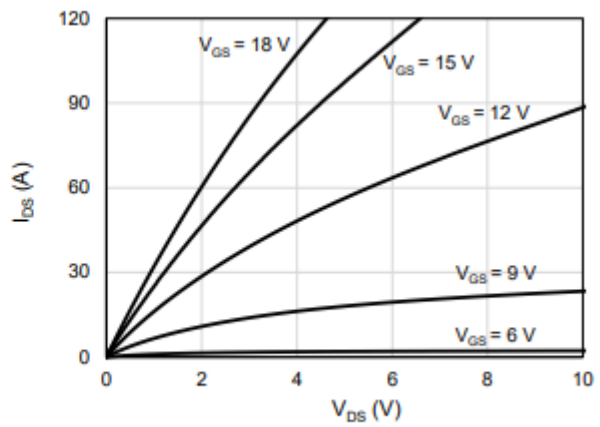


Figure 2: Output Characteristics $T_J = 25^\circ\text{C}$

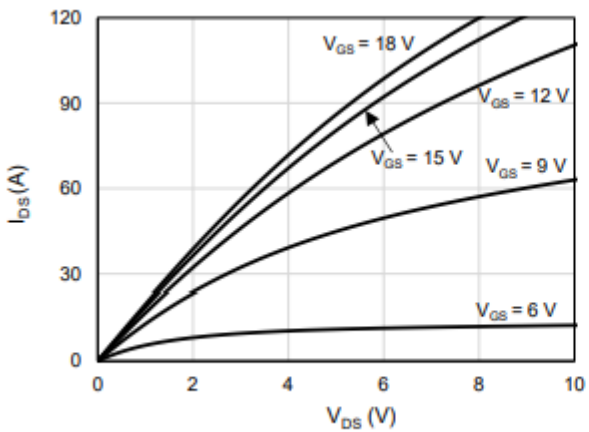


Figure 3: Output Characteristics $T_J = 175^\circ\text{C}$

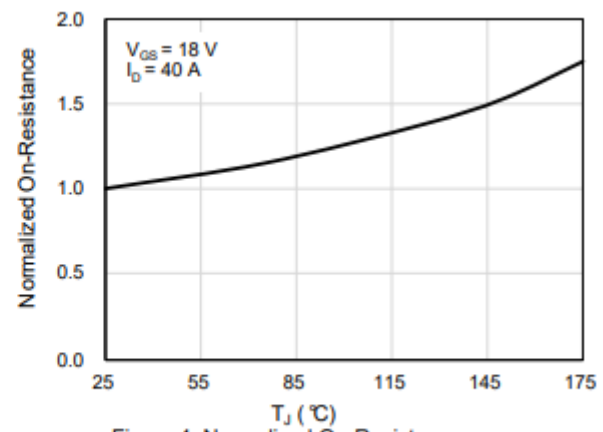


Figure 4: Normalized On-Resistance vs. Temperature

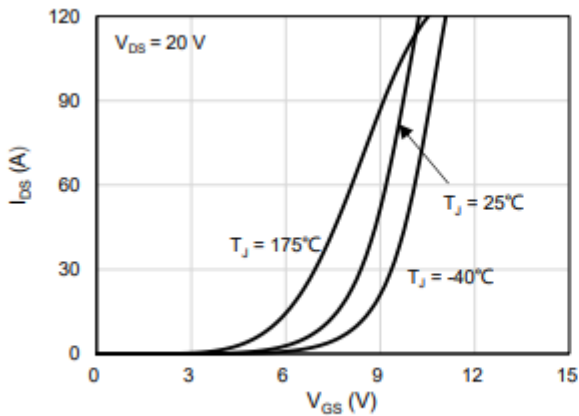


Figure 7: Transfer Characteristics For Various Junction Temperature

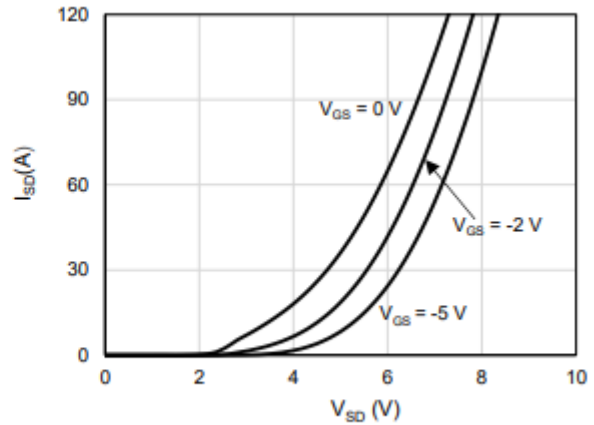


Figure 8: Body Diode Characteristics at -40°C

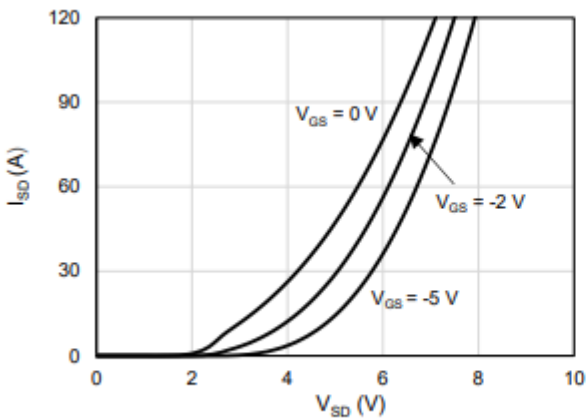


Figure 9: Body Diode Characteristics at 25°C

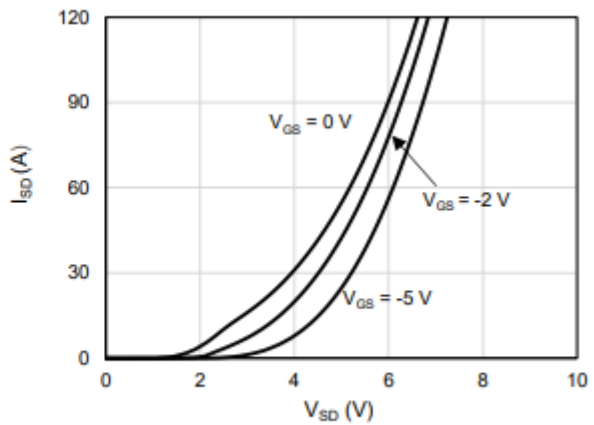


Figure 10: Body Diode Characteristics at 175°C

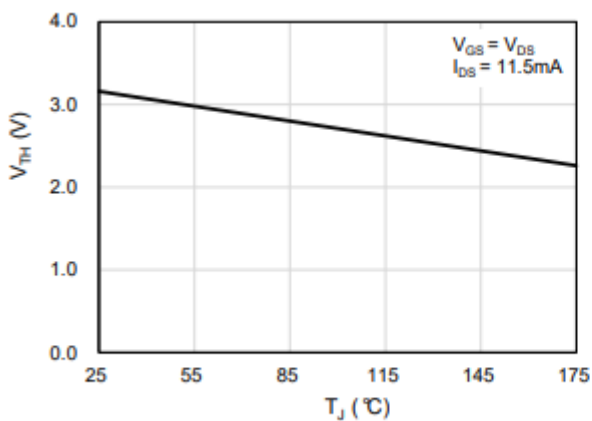


Figure 11: Threshold Voltage vs. Temperature

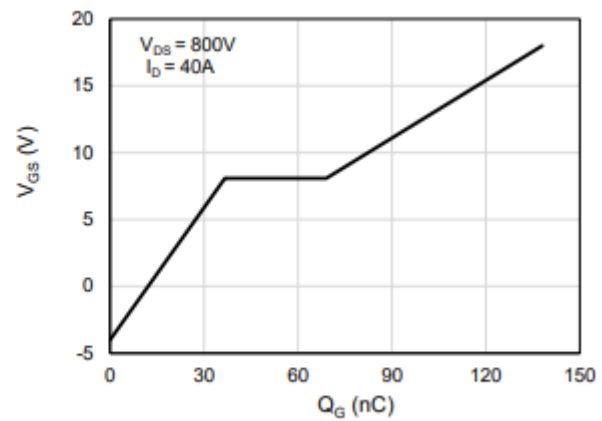


Figure 12: Gate-Charge Characteristics

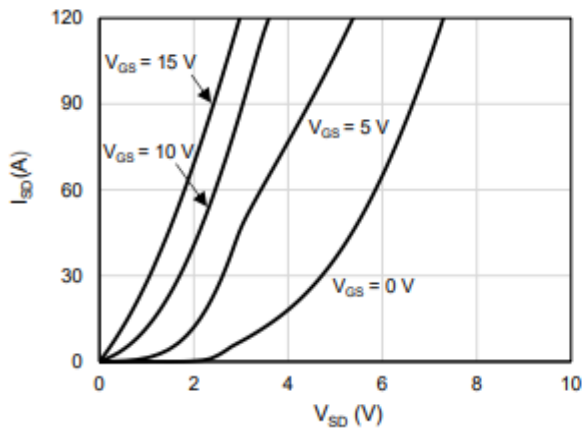


Figure 13: 3rd Quadrant Characteristics at -40°C

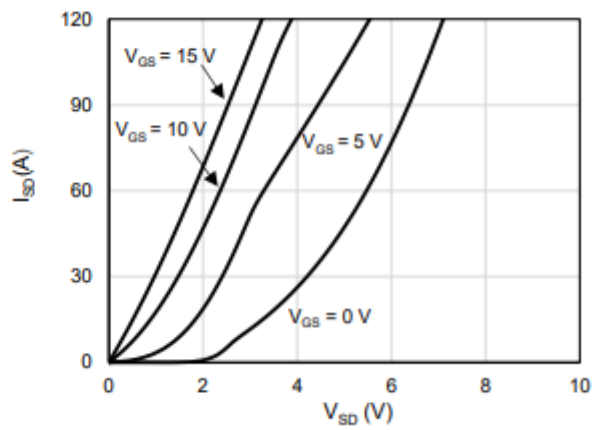


Figure 14: 3rd Quadrant Characteristics at 25°C

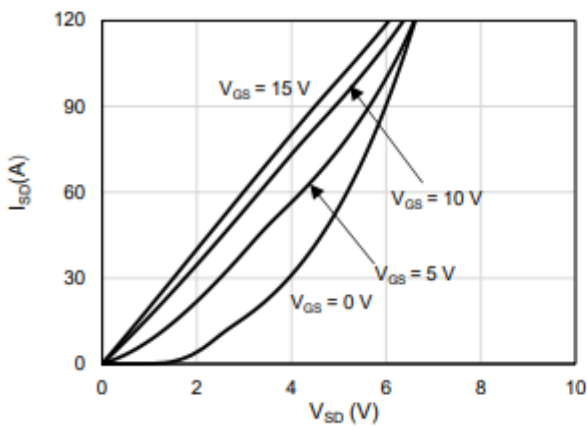


Figure 15: 3rd Quadrant Characteristics at 175°C

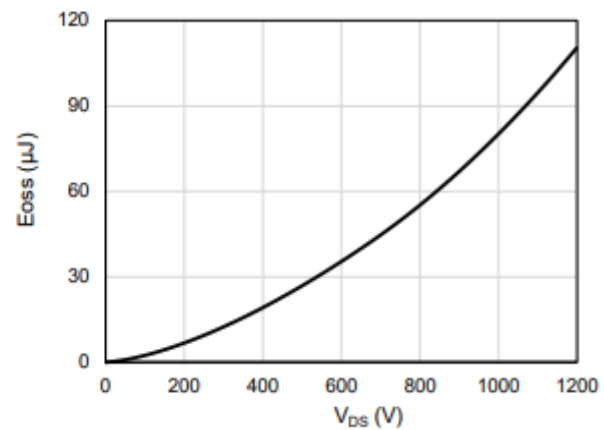


Figure 16: Output Capacitor Stored Energy

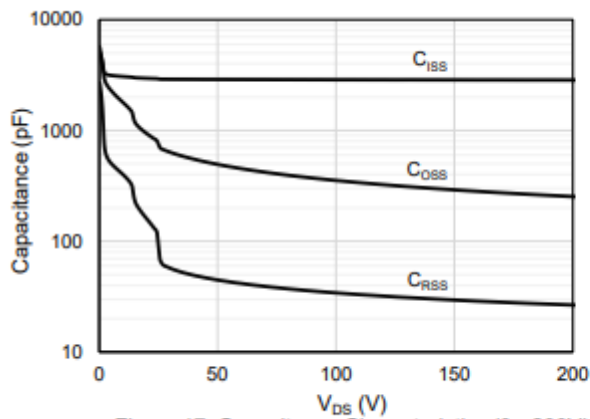


Figure 17: Capacitance Characteristics (0 - 200V)

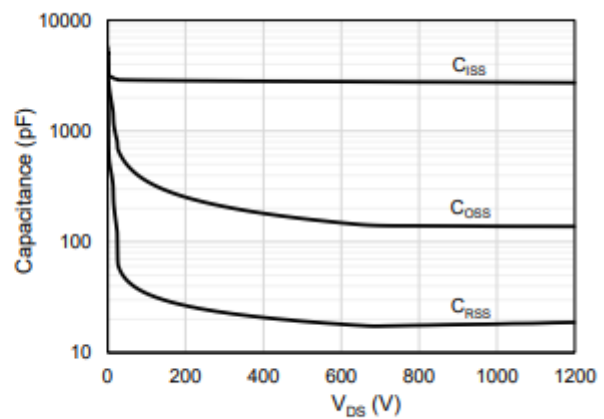


Figure 18: Capacitance Characteristics (0-1200V)

