

M4M-0040-120K

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

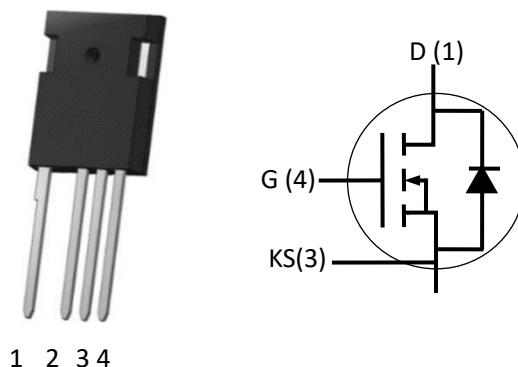
Benefits

- 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
M4M-0040-120K	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/+20	V	Absolute maximum values	
V_{GSop}	Gate - Source Voltage	-5/+18	V	Recommended operational values	
I_D	Continuous Drain Current	60 40	A	$V_{GS}=20V, T_c=25^\circ\text{C}$ $V_{GS}=20V, T_c=100^\circ\text{C}$	
I_{DM}	Pulse Drain Current	100	A	Pulse width limited by T_{jmax}	
P_D	Power Dissipation	313	W	$T_c=25^\circ\text{C}, T_J=175^\circ\text{C}$	Fig. 11
T_J, T_{stg}	Operating Junction and Storage Temperature	-55 to +175	$^\circ\text{C}$		

Electrical Characteristics

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	2.1	3.1	4.0	V	$V_{GS}=V_{DS}, I_{DS}=10mA, T_C=25^\circ C$	Fig. 6
			2.0			$V_{GS}=V_{DS}, I_{DS}=10mA, T_C=150^\circ C$	
I_{DSS}	Zero Gate Voltage Drain Current		1	100	μA	$V_{DS}=1200V, V_{GS}=0V$	
I_{GSS}	Gate-Source Leakage Current			200	nA	$V_{GS}=20V, V_{DS}=0V$	
$R_{DS(on)}$	Drain-Source on-state Resistance		45	59	m Ω	$V_{GS}=18V, I_D=33A, T_C=25^\circ C$	Fig. 4
			67		m Ω	$V_{GS}=18V, I_D=33A, T_C=175^\circ C$	
g_{fs}	Transconductance		20		S	$V_{GS}=20V, I_D=33A, T_J=25^\circ C$	Fig. 5
			18.1		S	$V_{GS}=20V, I_D=33A, T_J=175^\circ C$	
C_{iss}	Input Capacitance		2990		pF	$V_{GS}=0V, V_{DS}=1000V, f=1MHz, V_{AC}=25mV$	Fig. 9
C_{oss}	Output Capacitance		116				
C_{rss}	Reverse Transfer Capacitance		11.5				
E_{ON}	Turn-On Switching Energy		1.19		mJ	$V_{DS}=800V, V_{GS}=-5/18V, I_D=33A, R_{G(ext)}=5\Omega, L=80\mu H$	
E_{OFF}	Turn-Off Switching Energy		0.43				
$t_{d(on)}$	Turn-On Delay Time		60		ns	$V_{DD}=800V, V_{GS}=-5/18V, I_D=33A, R_{G(ext)}=5\Omega, \text{Timing relative to } V_{DS}$	
t_r	Rise Time		140				
$t_{d(off)}$	Turn-Off Delay Time		50				
t_f	Fall Time		42				
$R_{G(int)}$	Internal Gate Resistance		2.0		Ω	$f=1MHz, V_{AC}=25mV$	
Q_{gs}	Gate to Source Charge		40		nC	$V_{DD}=800V, V_{GS}=-5/18V, I_D=33A$	Fig. 10
Q_{gd}	Gate to Drain Charge		36				
Q_g	Total Gate Charge		128				

Reverse Diode Characteristics

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
V_{SD}	Diode Forward Voltage	3.6		V	$V_{GS}=-5V, I_{SD}=20A, T_J=25^\circ C$	Fig. 7
		3.3		V	$V_{GS}=-5V, I_{SD}=20A, T_J=150^\circ C$	Fig. 8
I_S	Continuous Diode Forward Current		60	A	$T_C=25^\circ C$	
t_{rr}	Reverse Recovery time	37		ns	$V_{GS}=-5V, I_{SD}=33A, V_R=800V, di/dt=1200A/\mu s;$	
Q_{rr}	Reverse Recovery Charge	165		nC		
I_{rrm}	Peak Reverse Recovery Current	16		A		

Thermal Characteristics

Symbol	Parameter	Typ.	Unit	Test Conditions	Note
$R_{\theta JC}$	Thermal Resistance from Junction to Case	0.48	$^{\circ}\text{C}/\text{W}$		Fig. 12
$R_{\theta JA}$	Thermal Resistance From Junction to Ambient	42			

Typical Performance

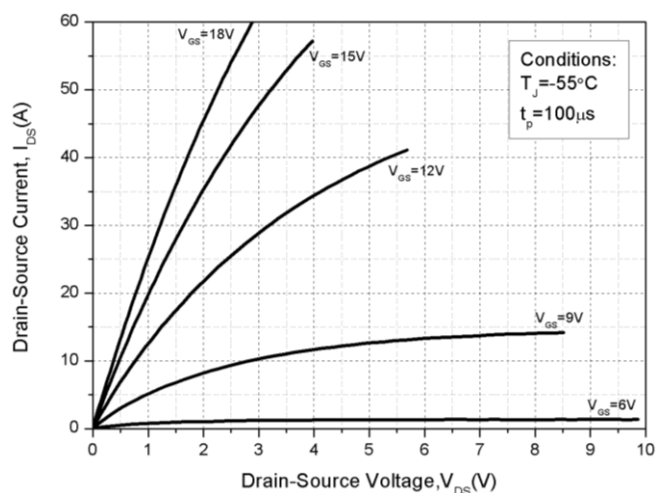


Figure 1. Output Characteristics $T_J = -55^{\circ}\text{C}$

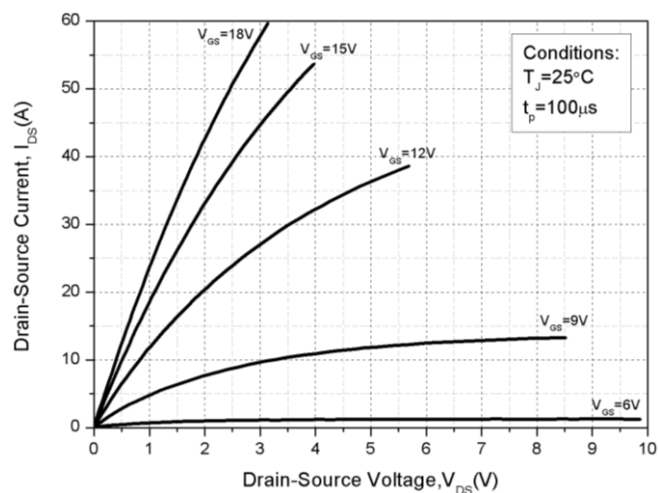


Figure 2. Output Characteristics $T_J = 25^{\circ}\text{C}$

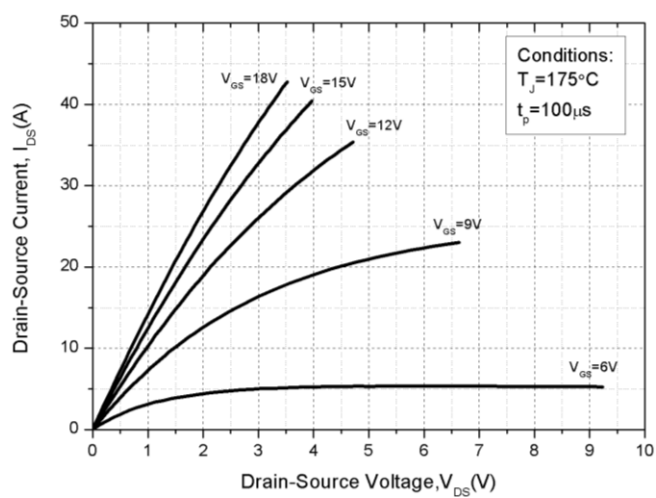


Figure 3. Output Characteristics $T_J = 150^{\circ}\text{C}$

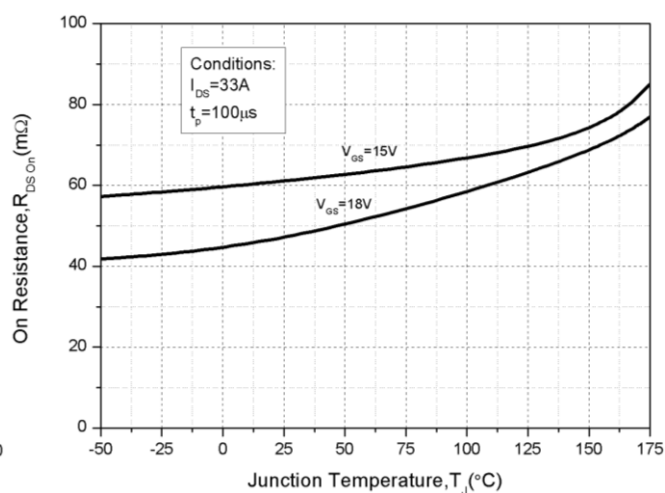


Figure 4. On-Resistance For Various Gate Voltage

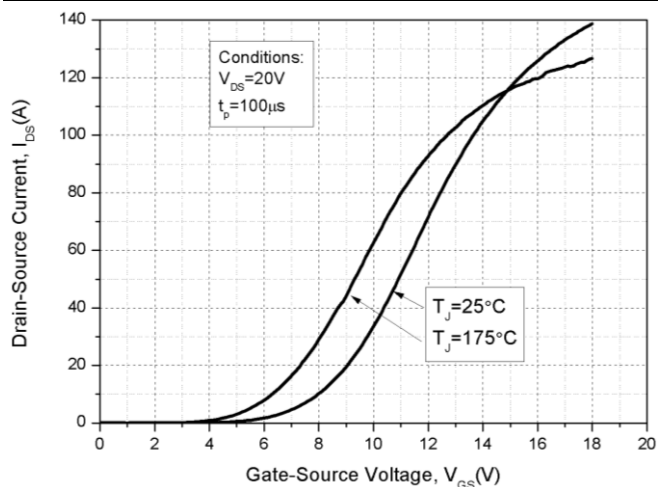


Figure 5. Transfer Characteristic for Various Junction Temperatures

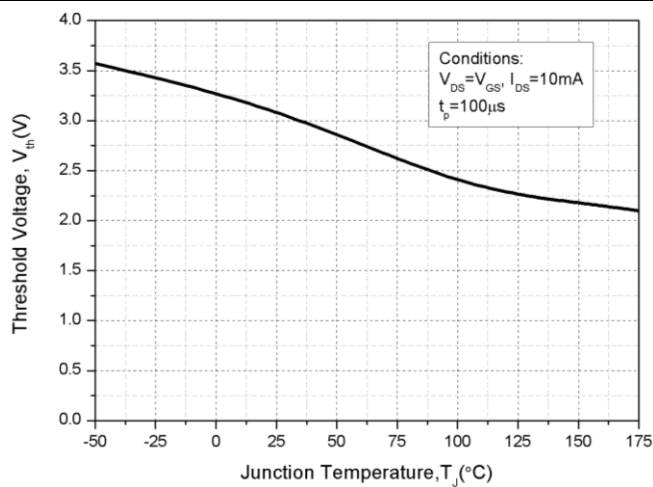


Figure 6. Threshold Voltage vs. Temperature

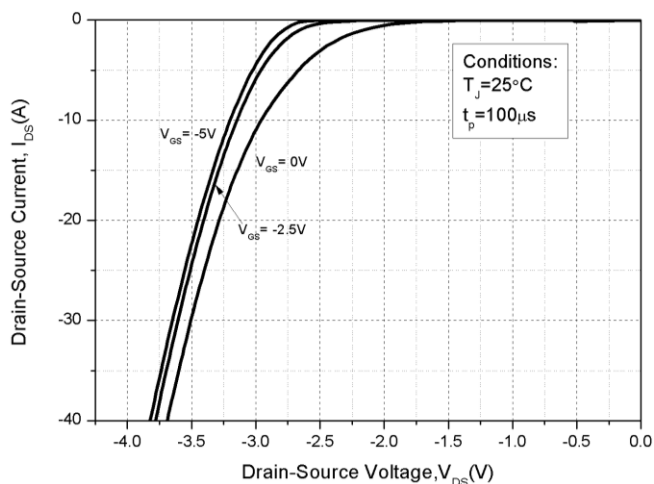


Figure 7. Body Diode Characteristics

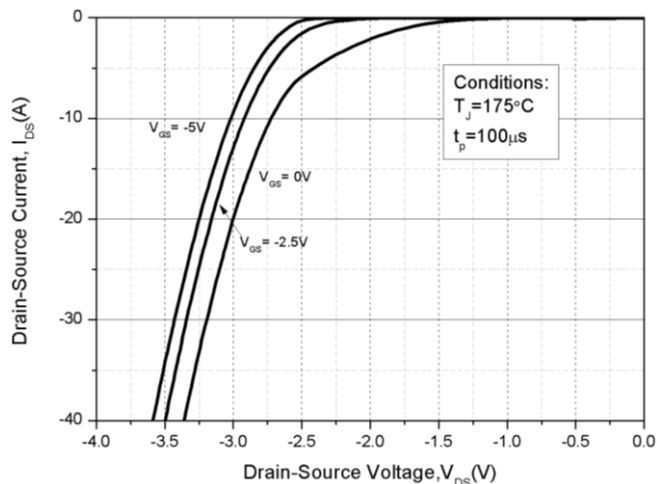


Figure 8. Body Diode Characteristics

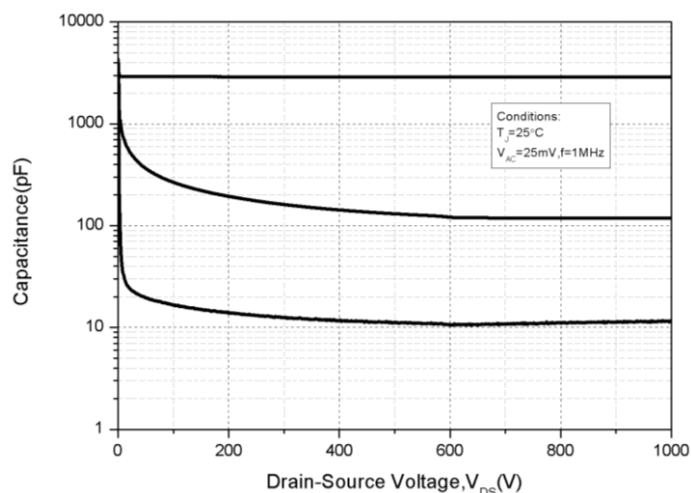


Figure 9. Capacitances vs. Drain-Source Voltage

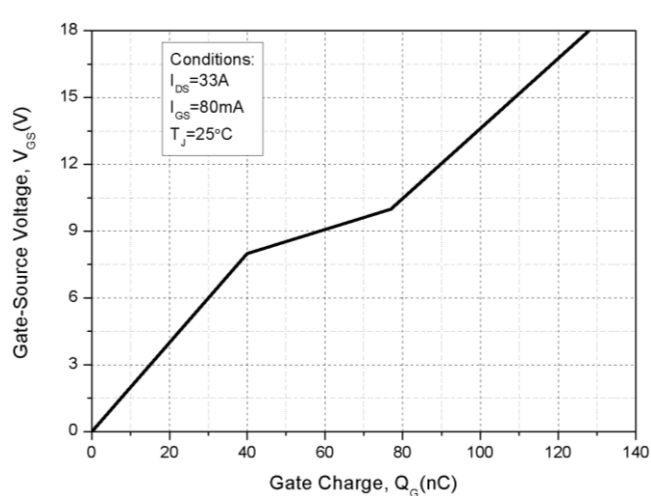


Figure 10. Gate Charge Characteristics

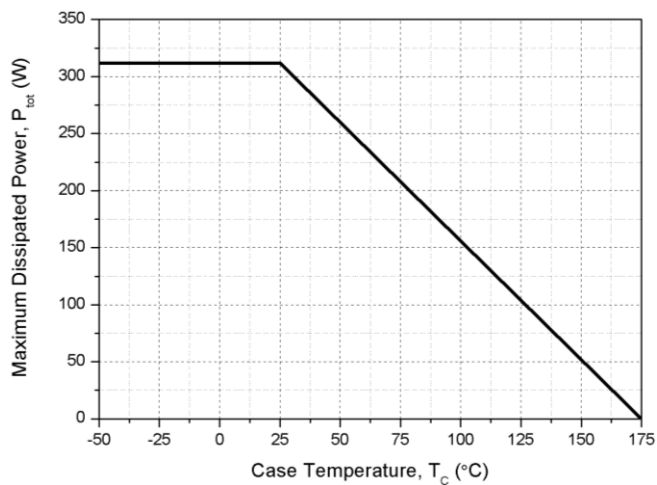


Figure 11. Power Dissipation Derating

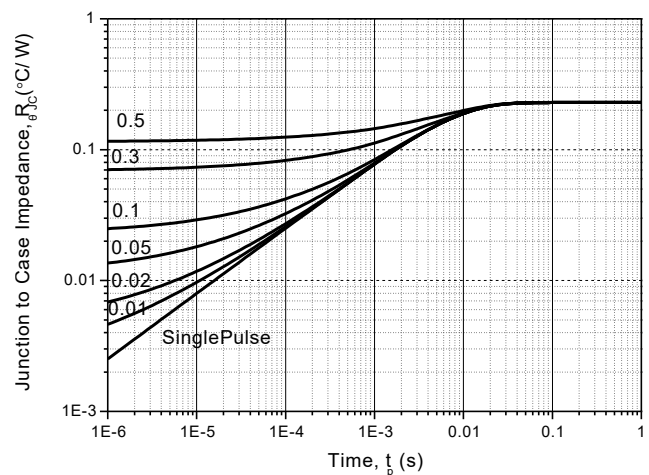


Figure 12. Transient Thermal Impedance

Package Dimensions: TO-247-4L

