

M4M-0040-120D

Silicon Carbide 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

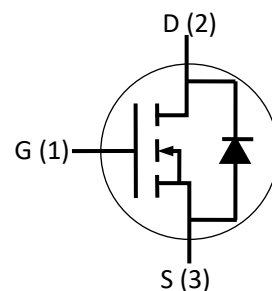
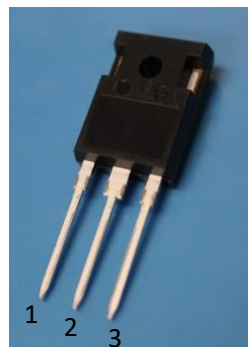
Benefits

- 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-0040-120D	TO-247-3

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	-8/+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	140	A	Pulse width limited by T_{jmax}	
P_D	Power Dissipation	310	W	$T_c=25^\circ\text{C}, T_J=150^\circ\text{C}$	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	2.0	3.2	4.0	V	$V_{GS}=V_{DS}, I_{DS}=10mA, T_C=25^\circ C$	Fig. 6
			2.0			$V_{GS}=V_{DS}, I_{DS}=10mA, T_C=175^\circ C$	
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	60	m Ω	$V_{GS}=18V, I_D=33A, T_C=25^\circ C$	Fig. 4
			68		m Ω	$V_{GS}=18V, I_D=33A, T_C=175^\circ C$	
g_{fs}	Transconductance		14.1		S	$V_{GS}=18V, I_D=33A, T_J=25^\circ C$	Fig. 5
			12.5		S	$V_{GS}=18V, I_D=33A, T_J=150^\circ C$	
C_{iss}	Input Capacitance		2200		pF	$V_{GS}=0V, V_{DS}=1000V, f=1MHz, V_{AC}=25mV$	Fig. 9
C_{oss}	Output Capacitance		113				
C_{rss}	Reverse Transfer Capacitance		30				
E_{ON}	Turn-On Switching Energy		1.5		mJ	$V_{DS}=800V, V_{GS}=-5/18V, I_D=40A, R_{G(ext)}=5\Omega, L=80\mu H$	
E_{OFF}	Turn-Off Switching Energy		0.7				
$t_{d(on)}$	Turn-On Delay Time		60		ns	$V_{DD}=800V, V_{GS}=-5/18V, I_D=35A, R_{G(ext)}=2.5\Omega, R_L=20\Omega, \text{Timing relative to } V_{DS}$	
t_r	Rise Time		140				
$t_{d(off)}$	Turn-Off Delay Time		50				
t_f	Fall Time		42				
$R_{G(int)}$	Internal Gate Resistance		1.0		Ω	$f=1MHz, V_{AC}=25mV$	
Q_{gs}	Gate to Source Charge		40		nC	$V_{DD}=800V, V_{GS}=-5/20V, I_D=35A$	Fig. 10
Q_{gd}	Gate to Drain Charge		55				
Q_g	Total Gate Charge		160				

Reverse Diode Characteristics

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
V_{SD}	Diode Forward Voltage	5.5		V	$V_{GS}=-5V, I_{SD}=20A, T_J=25^\circ C$	Fig. 7
		5.2		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	$V_{GS}=-5V, I_{SD}=40A, V_R=800V, \text{d}i/\text{d}t=1200A/\mu s;$	
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	0.40	$^{\circ}\text{C}/\text{W}$		Fig. 12
$R_{\theta JA}$	Thermal Resistance From Junction to Ambient	38			

Typical Performance

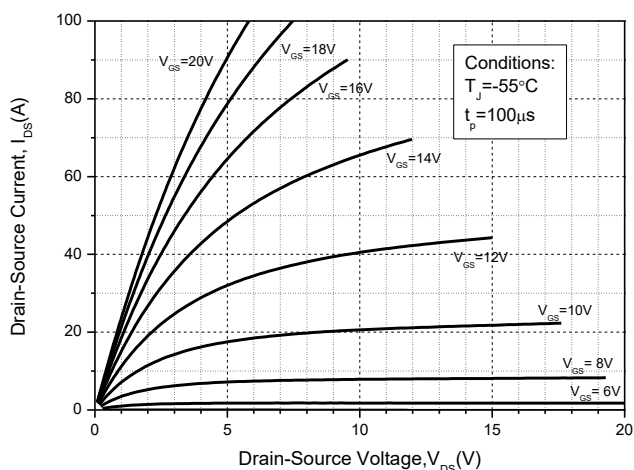


Figure 1. Output Characteristics $T_J = -55^{\circ}\text{C}$

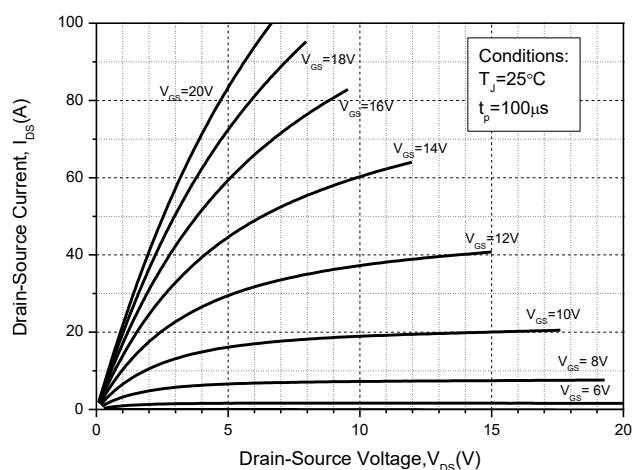


Figure 2. Output Characteristics $T_J = 25^{\circ}\text{C}$

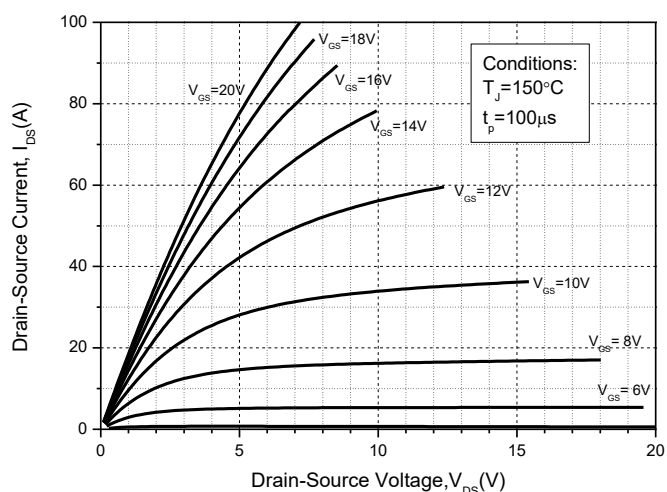


Figure 3. Output Characteristics $T_J = 150^{\circ}\text{C}$

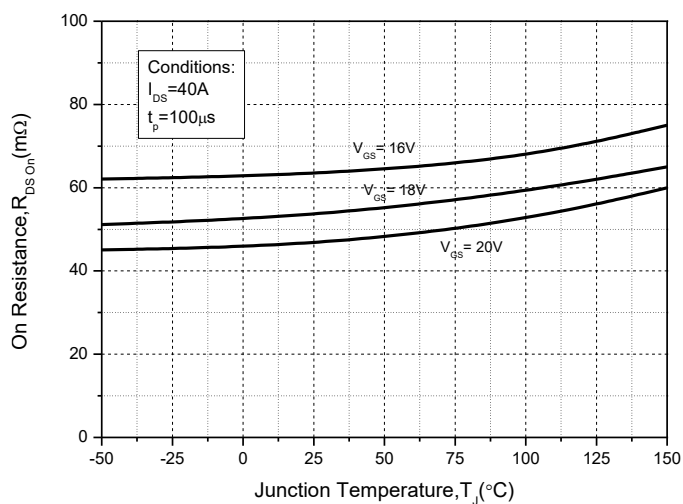


Figure 4. On-Resistance For Various Gate Voltage

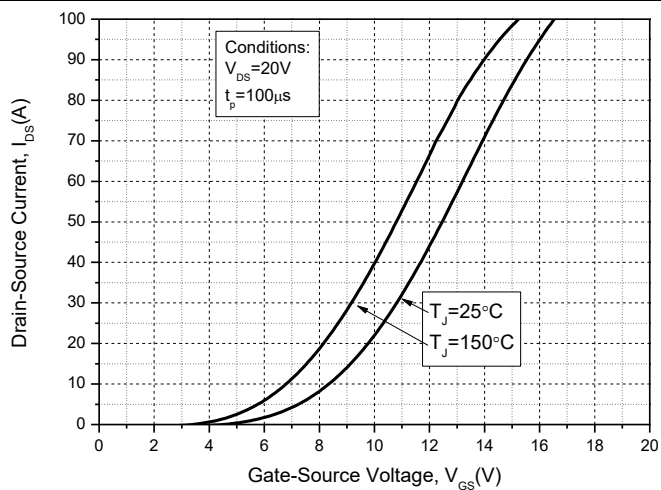


Figure 5. Transfer Characteristic

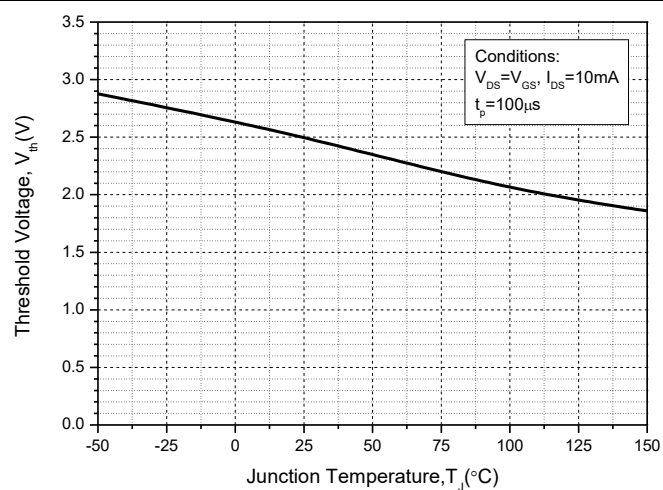


Figure 6. Threshold Voltage vs. Temperature for Various Junction Temperatures

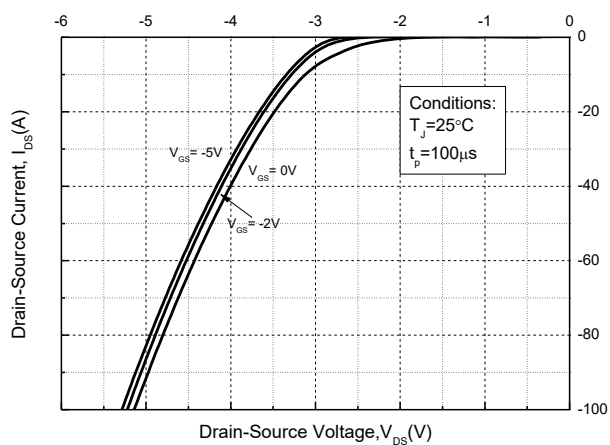


Figure 7. Body Diode Characteristics

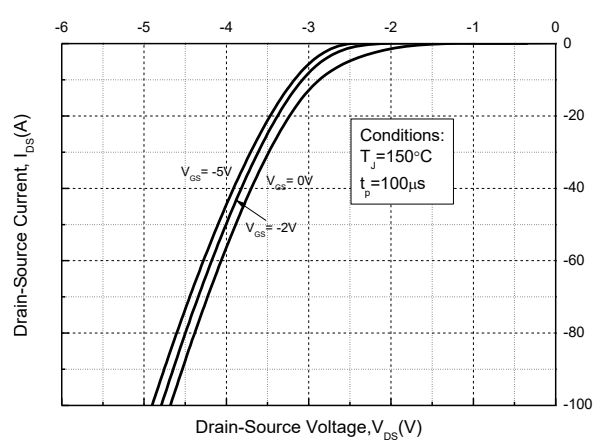


Figure 8. Body Diode Characteristics

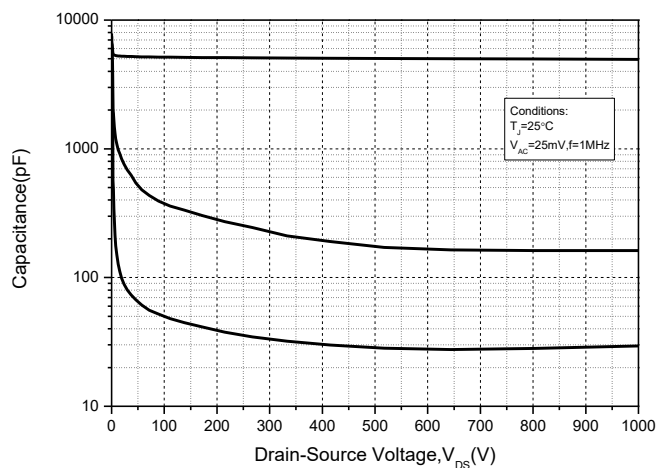


Figure 9. Capacitances vs. Drain-Source Voltage

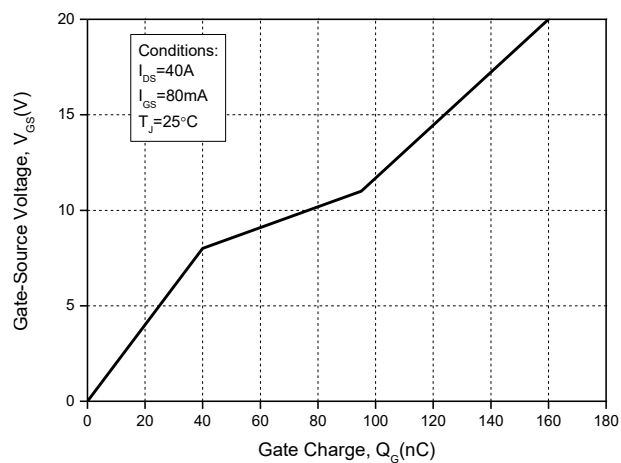


Figure 10. Gate Charge Characteristics

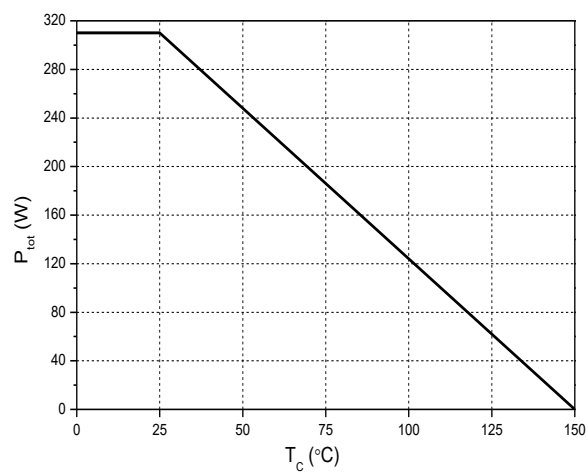


Figure 11. Power Dissipation Derating

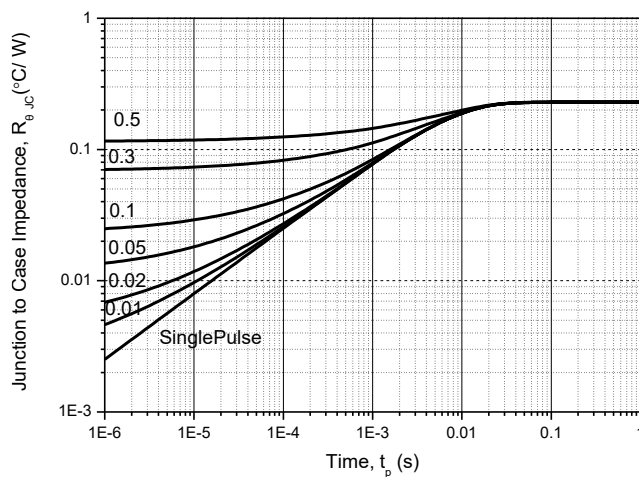


Figure 12. Transient Thermal Impedance

Package Dimensions: TO-247-3L

