

# M4D-1200-0040

## Silicon Carbide MOSFET Bare Die

### 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

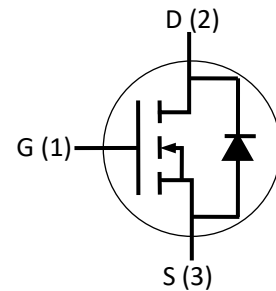
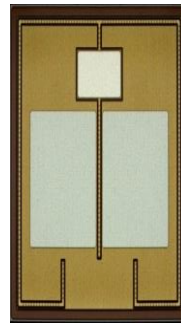
#### Benefits

- 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
M4D-1200-0040	2.88*4.83

#### 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	$V_{GS}=18V, T_C=25^\circ\text{C}$ $V_{GS}=18V, T_C=100^\circ\text{C}$	
$T_J, T_{stg}$	Operating Junction and Storage Temperature	-55 to +175	$^\circ\text{C}$		

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**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	$V_{GS}=V_{DS}, I_{DS}=10mA, T_C=25^\circ C$	
			2.0			$V_{GS}=V_{DS}, I_{DS}=10mA, T_C=175^\circ C$	
$I_{DSS}$	Zero Gate Voltage Drain Current		1	100	$\mu A$	$V_{DS}=1200V, V_{GS}=0V$	
$I_{GSS}$	Gate-Source Leakage Current			200	nA	$V_{GS}=18V, V_{DS}=0V$	
$R_{DS(on)}$	Drain-Source on-state Resistance		45	60	$m\Omega$	$V_{GS}=18V, I_D=33A, T_C=25^\circ C$	
			68		$m\Omega$	$V_{GS}=18V, I_D=33A, T_C=175^\circ C$	
$g_{fs}$	Transconductance		14.1		S	$V_{GS}=18V, I_D=33A, T_J=25^\circ C$	
			12.5		S	$V_{GS}=18V, I_D=33A, T_J=150^\circ C$	
$C_{iss}$	Input Capacitance		2200		pF	$V_{GS}=0V, V_{DS}=1000V, f=1MHz, V_{AC}=25mV$	
$C_{oss}$	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	$V_{DD}=800V, V_{GS}=-5/18V, I_D=35A, R_{G(ext)}=2.5\Omega, \text{Timing relative to } V_{DS}$	
$t_r$	Rise Time		140				
$t_{d(off)}$	Turn-Off Delay Time		50				
$t_f$	Fall Time		42				
$R_{G(int)}$	Internal Gate Resistance		1.0		$\Omega$	$f=1MHz, V_{AC}=25mV$	
$Q_{gs}$	Gate to Source Charge		40		nC	$V_{DD}=800V, V_{GS}=-5/20V, I_D=35A$	
$Q_{gd}$	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	$V_{GS}=-5V, I_{SD}=20A, T_J=25^\circ C$	
		5.2		V	$V_{GS}=-5V, I_{SD}=20A, T_J=150^\circ C$	
$I_S$	Continuous Diode Forward Current		60	A	$T_C=25^\circ C$	
$t_{rr}$	Reverse Recovery time	37		ns	$V_{GS}=-5V, I_{SD}=35A, V_R=800V, dif/dt=1200A/\mu s;$	
$Q_{rr}$	Reverse Recovery Charge	165		nC		
$I_{rrm}$	Peak Reverse Recovery Current	16		A		

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**Mechanical Parameters**

Parameter	Typ.	Unit
Die Size	2.88 x 4.83	mm
Source Pad Size	3.75*1.00	mm
Gate Pad Size	0.78*0.48	mm
Thickness	180 ± 10%	μm
Wafer Size	150	mm
Top Side Metallization (Al)	4	μm
Bottom Side Metallization (Ni/Ag)	1.5	μm

