

晁元國際半導體股份有限公司  
MaxPower SiC Semiconductor Co., Ltd.

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**Change History:**

Date	Version	Change Item	Author
2023/7/28	V1.0	First release.	John Ruan

## M1P-1200-400E

### All Silicon Carbide Power Module

#### 1200V/400A 62mm SiC MOSFET Power Module

#### Features

- Low  $R_{DS(on)}$
- Low surge, low switching loss
- High-speed switching possible
- Halogen Free, RoHS Compliant

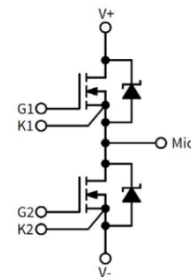
#### Benefits

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

#### Applications

- Motor drive
- Electrified vehicle traction inverter
- Photovoltaics, wind power generation
- Induction heating equipment

#### Equivalent Circuit Schematic



#### 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		
$V_{GSmax}$	Gate - Source Voltage	-8/+25	V	Absolute maximum values	
$V_{GSop}$	Gate - Source Voltage	-5/+20	V	Recommended operational values	
$I_D$	Continuous Drain Current	400 300	A	$V_{GS}=20\text{V}$ , $T_{VJ} = 25^\circ\text{C}$ $V_{GS}=20\text{V}$ , $T_{VJ} = 150^\circ\text{C}$	
$I_{D,peak}$	Repetitive peak drain current	800	A	Pulsed Drain Current, $t_p$ limited by $T_{jmax}$	
$T_{VJ}$ , $T_{stg}$	Operating Junction and Storage Temperature	-55 to +175	$^\circ\text{C}$		
$V_{ISO}$	Isolation Test Voltage	4200		AC, 50Hz, 1 min.	

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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	2.50	4.0	V	$V_{GS}=V_{DS}, I_{DS}=150mA, T_{VJ}=25^\circ C$	
			1.80			$V_{GS}=V_{DS}, I_{DS}=150mA, T_{VJ}=150^\circ C$	
$I_{DSS}$	Zero Gate Voltage Drain Current		48	360	$\mu A$	$V_{DS}=1200V, V_{GS}=0V$	
$I_{GSS}$	Gate-Source Leakage Current		120	540	nA	$V_{GS}=20V, V_{DS}=0V$	
$R_{DS(on)}$	Drain-Source on-state Resistance		3.35	3.9	m $\Omega$	$V_{GS}=20V, I_D=300A, T_{VJ}=25^\circ C$	
			4.53		m $\Omega$	$V_{GS}=20V, I_D=300A, T_{VJ}=150^\circ C$	
$C_{iss}$	Input Capacitance		21.2		nF	$V_{GS}=0V, V_{DS}=800V, f=1MHz, V_{AC}=25mV$	
$C_{oss}$	Output Capacitance		136				
$C_{rss}$	Reverse Transfer Capacitance		1.2				
$E_{ON}$	Turn-On Switching Energy		17.5		mJ	$V_{DS}=800V, V_{GS}=-5/20V, I_D=300A, R_{G(ext)}=5\Omega, L=80\mu H, di/dt=4kA/\mu s$	
$E_{OFF}$	Turn-Off Switching Energy		15.4				
$t_{d(on)}$	Turn-On Delay Time		66		ns	$V_{DS}=800V, V_{GS}=-5/20V, I_D=300A, R_{G(ext)}=5\Omega,$	
$t_r$	Rise Time		62				
$t_{d(off)}$	Turn-Off Delay Time		218				
$t_f$	Fall Time		53				
$Q_{gs}$	Gate to Source Charge		280		nC	$V_{DS}=800V, V_{GS}=-5/20V, I_D=300A$	
$Q_{gd}$	Gate to Drain Charge		370				
$Q_g$	Total Gate Charge		1120				

**Reverse Diode Characteristics**

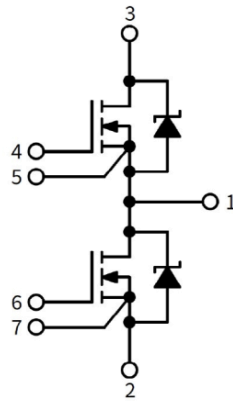
Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
$V_{SD}$	Diode Forward Voltage	3.7		V	$V_{GS}=-5V, I_{SD}=300A, T_{VJ}=25^\circ C$	
		3.4		V	$V_{GS}=-5V, I_{SD}=300A, T_{VJ}=150^\circ C$	
$I_S$	Continuous Diode Forward Current		400	A	$V_{GS}=-5V, T_{VJ}=25^\circ C$	
			165	A	$V_{GS}=-5V, T_{VJ}=150^\circ C$	
$I_{rrm}$	Peak reverse recovery current		210	A	$V_{GS}=-5V, I_{SD}=300A, V_{R,DS}=800V, T_{VJ}=25^\circ C$	
			445	A	$V_{GS}=-5V, I_{SD}=300A, V_{R,DS}=800V, T_{VJ}=150^\circ C$	
$Q_{rr}$	Reverse recovery charge		13.8	nC	$V_{GS}=-5V, I_{SD}=300A, V_{R,DS}=800V, T_{VJ}=25^\circ C$	
			26.1	nC	$V_{GS}=-5V, I_{SD}=300A, V_{R,DS}=800V, T_{VJ}=150^\circ C$	

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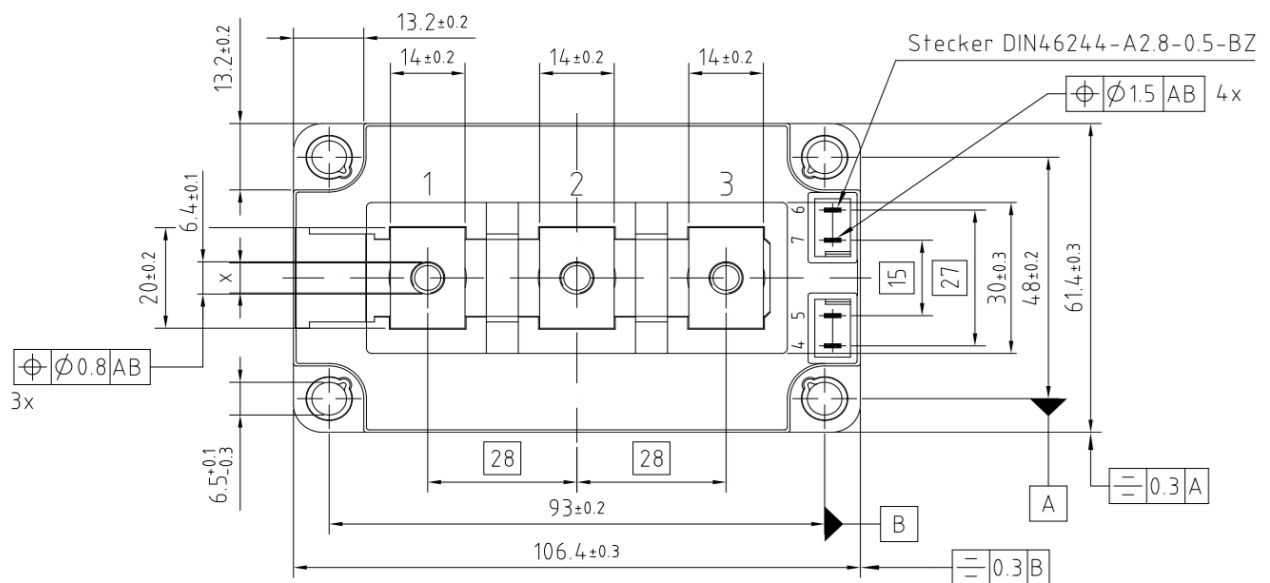
**Package Characteristics**

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions	Note
$L_{s,DS}$	Stray inductance of module		10.5		nH	$T_c = 25^\circ\text{C}$	
$M_C$	Mounting torque for module mounting	4.0	5.0	6.0	Nm	Screw M6 baseplate to heatsink	
$M_T$	Mounting torque for module power terminal	3.0	4.0	5.0	Nm	Screw M6 power terminal to bus bar	
$W_p$	Weight		325		g		

**Circuit Schematic**



**Package Dimension**



x: M5/M6 depending on type  
x: M5/M6 je nach Typ

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