

STARPOWER

SEMICONDUCTOR

MOSFET

MD22HTC120P6HE

1200V/2.18mΩ 6 in one-package

General Description

STARPOWER MOSFET Power Module provides very low $R_{DS(on)}$ as well as optimized intrinsic diode. It's designed for the applications such as hybrid and electric vehicle.

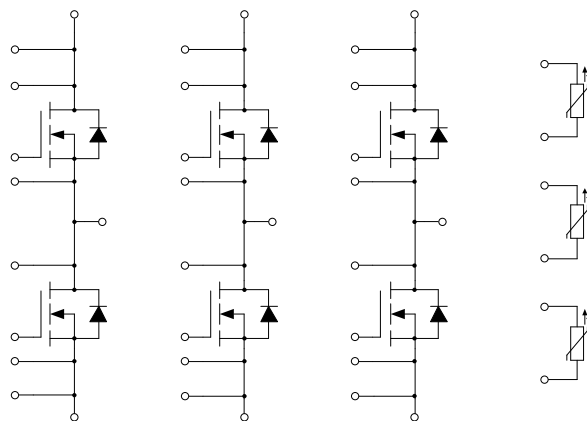
Features

- SiC power MOSFET
- Low $R_{DS(on)}$
- Optimized intrinsic reverse diode
- Low inductance case avoid oscillations
- Isolated copper pinfin baseplate using Si_3N_4 DBC technology

Typical Applications

- Automotive application
- Hybrid and electric vehicle
- Inverter for motor drive

Equivalent Circuit Schematic



Absolute Maximum Ratings $T_F=25^{\circ}\text{C}$ unless otherwise noted**MOSFET**

Symbol	Description	Value	Unit
V_{DSS}	Drain-Source Voltage	1200	V
V_{GSSmax}	Gate-Source Voltage	-8/+19	V
V_{GSSop}	Gate-Source Voltage	-4/+15	V
I_D	Drain Current @ $T_F=75^{\circ}\text{C}$	480	A
I_{DM}	Pulsed Drain Current, t_p limited by T_{jmax}	1360	A
P_D	Maximum Power Dissipation @ $T_F=75^{\circ}\text{C}$ $T_j=175^{\circ}\text{C}$	990	W

Body Diode

Symbol	Description	Value	Unit
I_S	Source Current @ $T_F=75^{\circ}\text{C}$	TBD	A
I_{SM}	Pulsed Source Current, t_p limited by T_{jmax}	TBD	A

Module

Symbol	Description	Value	Unit
T_{jmax}	Maximum Junction Temperature	175	$^{\circ}\text{C}$
T_{jop}	Operating Junction Temperature	-40 to +150	$^{\circ}\text{C}$
T_{STG}	Storage Temperature Range	-40 to +125	$^{\circ}\text{C}$
V_{ISO}	Isolation Voltage RMS, $f=50\text{Hz}$, $t=5\text{s}$	4000	V

MOSFET Characteristics $T_F=25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$R_{DS(on)}$	Static Drain-Source On-Resistance	$I_D=581\text{A}, V_{GS}=15\text{V}, T_j=25^\circ\text{C}$		2.18	2.75	$\text{m}\Omega$
		$I_D=581\text{A}, V_{GS}=15\text{V}, T_j=175^\circ\text{C}$		3.50		
$V_{GS(th)}$	Gate-Source Threshold Voltage	$I_D=160\text{mA}, V_{DS}=V_{GS}, T_j=25^\circ\text{C}$	1.8	2.5	3.6	V
g_{fs}	Forward Transconductance	$V_{DS}=20\text{V}, I_D=581\text{A}$		424		S
I_{DSS}	Drain-Source Leakage Current	$V_{DS}=V_{DSS}, V_{GS}=0\text{V}, T_j=25^\circ\text{C}$			256	μA
I_{GSS}	Gate-Source Leakage Current	$V_{GS}=15\text{V}, V_{DS}=0\text{V}, T_j=25^\circ\text{C}$			2000	nA
R_{Gint}	Internal Gate Resistance			0.9		Ω
C_{iss}	Input Capacitance	$V_{GS}=0\text{V}, V_{DS}=1000\text{V}, f=100\text{kHz}$		49.6		nF
C_{oss}	Output Capacitance			1.76		nF
C_{rss}	Reverse Transfer Capacitance			0.10		nF
Q_g	Total Gate Charge	$I_D=581\text{A}, V_{DS}=800\text{V}, V_{GS}=-4/15\text{V}$		1624		nC
Q_{gs}	Gate-Source Charge			512		nC
Q_{gd}	Gate-Drain ("Miller") Charge			528		nC

Body Diode Characteristics $T_F=25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_{SD}	Diode Forward Voltage	$I_S=290\text{A}, V_{GS}=-4\text{V}, T_j=25^\circ\text{C}$		4.90		V
		$I_S=290\text{A}, V_{GS}=-4\text{V}, T_j=175^\circ\text{C}$		4.40		
t_{rr}	Diode Reverse Recovery Time	$V_R=800\text{V}, I_S=581\text{A}, -di/dt=16000\text{A}/\mu\text{s}$		32.0		ns
Q_r	Diode Reverse Recovery Charge	$V_{GS}=-4\text{V}, T_j=25^\circ\text{C}$		12.0		μC

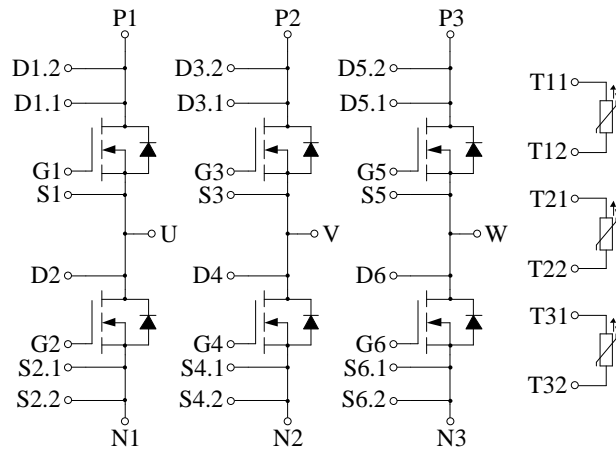
NTC Characteristics $T_F=25^{\circ}\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
R_{25}	Rated Resistance			5.0		$\text{k}\Omega$
$\Delta R/R$	Deviation of R_{100}	$T_j = 100^{\circ}\text{C}, R_{100} = 493.3\Omega$	-5		5	%
P_{25}	Power Dissipation				20.0	mW
$B_{25/50}$	B-value	$R_2 = R_{25} \exp[B_{25/50}(1/T_2 - 1/(298.15\text{K}))]$		3375		K
$B_{25/80}$	B-value	$R_2 = R_{25} \exp[B_{25/80}(1/T_2 - 1/(298.15\text{K}))]$		3411		K
$B_{25/100}$	B-value	$R_2 = R_{25} \exp[B_{25/100}(1/T_2 - 1/(298.15\text{K}))]$		3433		K

Module Characteristics $T_F=25^{\circ}\text{C}$ unless otherwise noted

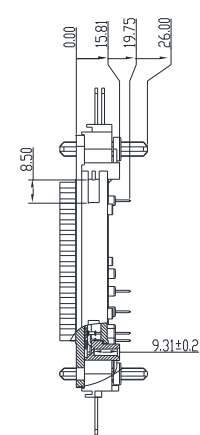
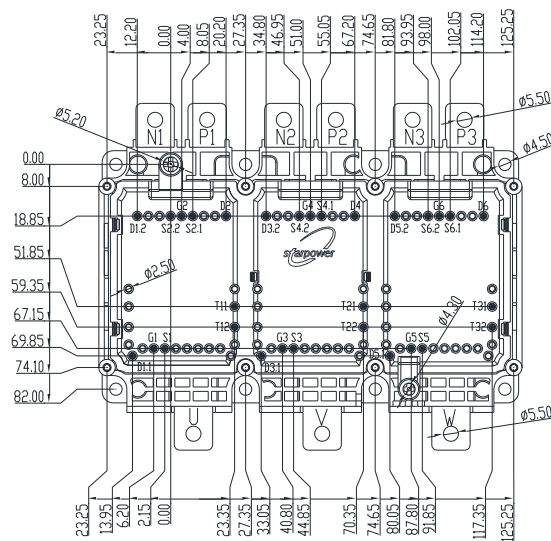
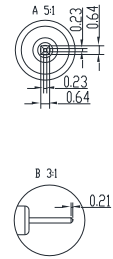
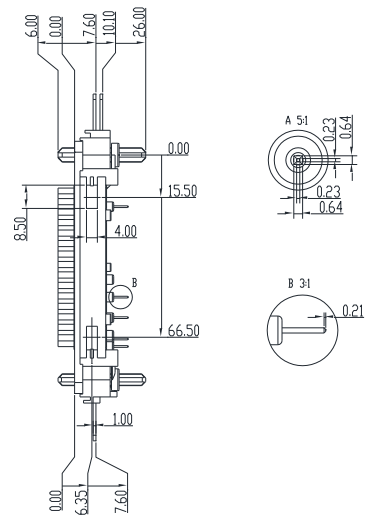
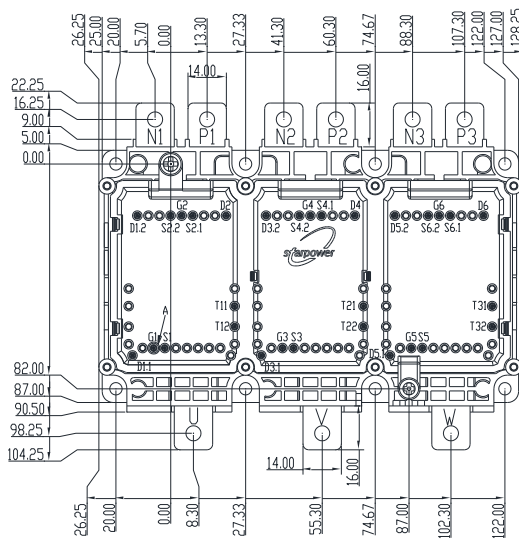
Symbol	Parameter	Min.	Typ.	Max.	Unit
L_{CE}	Stray Inductance		8		nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal to Chip		0.75		$\text{m}\Omega$
Δp	$\Delta V/\Delta t = 10.0\text{dm}^3/\text{min}, T_F = 75^{\circ}\text{C}$		64		mbar
p	Maximum Pressure In Cooling Circuit			2.5	bar
R_{thJF}	Junction-to-Cooling Fluid (per MOSFET) $\Delta V/\Delta t = 10.0\text{dm}^3/\text{min}, T_F = 75^{\circ}\text{C}$			0.101	K/W
M	Terminal Connection Torque, Screw M5	3.6		4.4	N.m
	Mounting Torque, Screw M4	1.8		2.2	
G	Weight of Module		750		g

Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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