

General Description

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

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

Symbol	Description	Value	Unit
V_{DSS}	Drain-Source Voltage	1200	V
V_{GSSmax}	Gate-Source Voltage	-6/+20	V
V_{GSSop}	Gate-Source Voltage	-4/+15,18	V
I_D	Drain Current @ $T_F=75^{\circ}\text{C}$	420	A
I_{DM}	Pulsed Drain Current, t_P limited by T_{jmax}	2040	A
P_D	Maximum Power Dissipation @ $T_F=75^{\circ}\text{C}$ $T_j=175^{\circ}\text{C}$	787	W

Body Diode

Symbol	Description	Value	Unit
I_{SN}	Implemented Source Current	420	A
I_S	Source Current @ $T_F=75^{\circ}\text{C}$	420	A
I_{SM}	Pulsed Source Current, t_P limited by T_{jmax}	840	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

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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	$I_D=420\text{A}, V_{GS}=15\text{V}, T_j=25^\circ\text{C}$		2.21	2.71	m Ω
		$I_D=420\text{A}, V_{GS}=15\text{V}, T_j=150^\circ\text{C}$		4.29		
$V_{GS(th)}$	Gate-Source Threshhold	$I_D=211\text{mA}, V_{DS}=10\text{V}, T_j=25^\circ\text{C}$	1.5	-	4.5	V
I_{DSS}	Drain-Source Leakage Current	$V_{DS}=V_{DSS}, V_{GS}=0\text{V}, T_j=25^\circ\text{C}$			600	μA
I_{GSS}	Gate-Source Leakage Current	$V_{GS}=-6/+15\text{V}, V_{DS}=0\text{V}, T_j=25^\circ\text{C}$			600	nA
R_{Gint}	Internal Gate Resistance				1.0	Ω
C_{iss}	Input Capacitance			44.6		nF
C_{oss}	Output Capacitance	$V_{GS}=0\text{V}, V_{DS}=800\text{V}, f=1\text{MHz}$		1.07		nF
C_{rss}	Reverse Transfer Capacitance			0.11		nF
Q_g	Total Gate Charge			1440		nC
Q_{gs}	Gate-Source Charge	$I_D=420\text{A}, V_{DS}=600\text{V}, V_{GS}=15\text{V}$		400		nC
Q_{gd}	Gate-Drain ("Miller") Charge			400		nC
E_{on}	Turn-On Switching Loss	$V_{DS}=600\text{V}, I_D=420\text{A}, R_G=0\Omega,$		19.5		mJ
E_{off}	Turn-Off Switching Loss	$V_{GS}=0/+15\text{V}, T_j=25^\circ\text{C}$		17.6		mJ

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	$I_S=150\text{A}, V_{GS}=0\text{V}, T_j=25^\circ\text{C}$		2.1		V
		$I_S=120\text{A}, V_{GS}=0\text{V}, T_j=150^\circ\text{C}$		2.9		
t_{rr}	Diode Reverse Recovery Time	$V_R=600\text{V}, I_S=420\text{A}, -di/dt=TBDA/\mu\text{s},$		30		ns
Q_r	Diode Reverse Recovery Charge	$V_{GS}=0\text{V},$		11.5		μC
E_{rec}	Reverse Recovery Energy	$T_j=25^\circ\text{C}$		0.9		mJ

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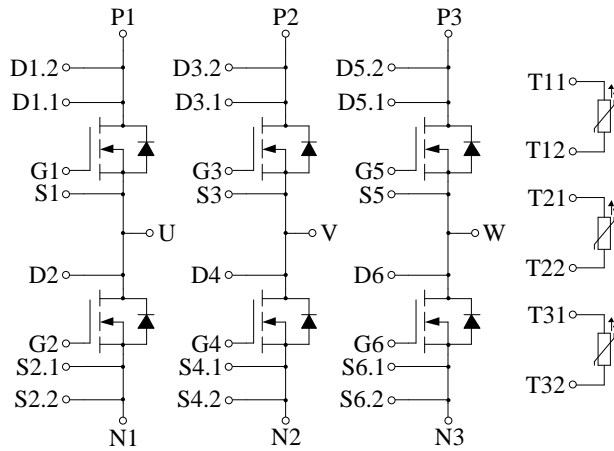
NTC Characteristics $T_F=25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
R_{25}	Rated Resistance			5.0		k Ω
$\Delta R/R$	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	$R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298.15\text{K}))]$		3365		K
$B_{25/80}$	B-value	$R_2=R_{25}\exp[B_{25/80}(1/T_2-1/(298.15\text{K}))]$		3442		K
$B_{25/100}$	B-value	$R_2=R_{25}\exp[B_{25/100}(1/T_2-1/(298.15\text{K}))]$		3426		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		m Ω
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) $\Delta V/\Delta t=10.0\text{dm}^3/\text{min}, T_F=75^\circ\text{C}$			0.127	K/W
M	Terminal Connection Torque, Screw M5 Mounting Torque, Screw M4	3.6 1.8		4.4 2.2	N.m
G	Weight of Module		750		g

Circuit Schematic



Package Dimensions

Dimensions in Millimeters

