

STARPOWER

SEMICONDUCTOR

MOSFET

MD300HFC120B3S

1200V/300A 2 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 SMPS and DC drives.

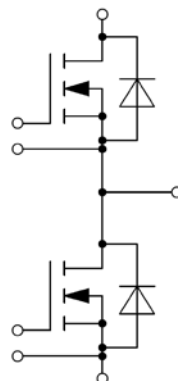
Features

- SiC power MOSFET
- Low $R_{DS(on)}$
- Optimized intrinsic reverse diode
- Low inductance case avoid oscillations
- Kelvin source terminals for easy drive
- Isolated copper baseplate using DBC technology

Typical Applications

- Main and auxiliary AC drives of electric vehicles
- DC servo and robot drives
- Battery vehicles
- Plasma cutting

Equivalent Circuit Schematic



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

Symbol	Description	Value	Unit
V_{DSS}	Drain-Source Voltage	1200	V
V_{GSS}	Gate-Source Voltage	-6/+22	V
I_D	Drain Current @ $T_C=25^{\circ}\text{C}$ @ $T_C=100^{\circ}\text{C}$	424	A
		300	
I_{DM}	Pulsed Drain Current	960	A
P_D	Maximum Power Dissipation @ $T_j=175^{\circ}\text{C}$	2343	W

Body Diode

Symbol	Description	Value	Unit
I_S	Source Current	480	A
I_{SM}	Pulsed Source Current	960	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, $f=50\text{Hz}$, $t=1\text{min}$	4000	V

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$R_{DS(on)}$	Static Drain-Source On-Resistance	$I_D=120\text{A}, V_{GS}=18\text{V}, T_j=25^\circ\text{C}$		6.67	9.75	$\text{m}\Omega$
		$I_D=120\text{A}, V_{GS}=18\text{V}, T_j=125^\circ\text{C}$		10.4		
$V_{GS(th)}$	Gate-Source Threshold Voltage	$I_D=52.8\text{mA}, V_{DS}=10\text{V}, T_j=25^\circ\text{C}$	1.6		4.0	V
g_{fs}	Forward Transconductance	$V_{DS}=10\text{V}, I_D=120\text{A}, T_j=25^\circ\text{C}$		44.4		S
I_{DSS}	Drain-Source Leakage Current	$V_{DS}=V_{DSS}, V_{GS}=0\text{V}, T_j=25^\circ\text{C}$			1.0	mA
I_{GSS}	Gate-Source Leakage Current	$V_{GS}=V_{GSS}, V_{DS}=0\text{V}, T_j=25^\circ\text{C}$			400	nA
R_{Gint}	Internal Gate Resistance			0.69		Ω
C_{iss}	Input Capacitance	$V_{GS}=0\text{V}, V_{DS}=800\text{V}, f=1.0\text{MHz}$		25.0		nF
C_{oss}	Output Capacitance			0.92		nF
C_{rss}	Reverse Transfer Capacitance			1.96		nF
Q_g	Total Gate Charge	$I_D=120\text{A}, V_{DS}=400\text{V}, V_{GS}=18\text{V}$		1272		nC
Q_{gs}	Gate-Source Charge			324		nC
Q_{gd}	Gate-Drain ("Miller") Charge			372		nC
$t_{d(on)}$	Turn-On Delay Time	$V_{DS}=600\text{V}, I_D=120\text{A}, R_G=0\Omega, V_{GS}=0/18\text{V}, T_j=25^\circ\text{C}$		35		ns
t_r	Rise Time			36		ns
$t_{d(off)}$	Turn-Off Delay Time			76		ns
t_f	Fall Time			22		ns
E_{on}	Turn-On Switching Loss				2.09	
E_{off}	Turn-Off Switching Loss			0.61		mJ

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit	
V_{SD}	Diode Forward Voltage	$I_S=120\text{A}, V_{GS}=0\text{V}, T_j=25^\circ\text{C}$		4.60		V	
t_{rr}	Diode Reverse Recovery Time	$V_R=400\text{V}, I_S=120\text{A}, di/dt=1800\text{A}/\mu\text{s}, V_{GS}=0\text{V}, T_j=25^\circ\text{C}$		31		ns	
Q_r	Diode Reverse Recovery Charge				528		nC
I_{RM}	Peak Reverse Recovery Current				27.6		A

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

Symbol	Parameter	Min.	Typ.	Max.	Unit
R_{thJC}	Junction-to-Case(per MOSFET)			0.064	K/W
R_{thCH}	Case-to-Heatsink (per MOSFET)		0.020		K/W
	Case-to-Heatsink (per Module)		0.010		
M	Terminal Connection Torque, Screw M5	2.5		5.0	N.m
	Mounting Torque, Screw M6	3.0		5.0	
G	Weight of Module		300		g

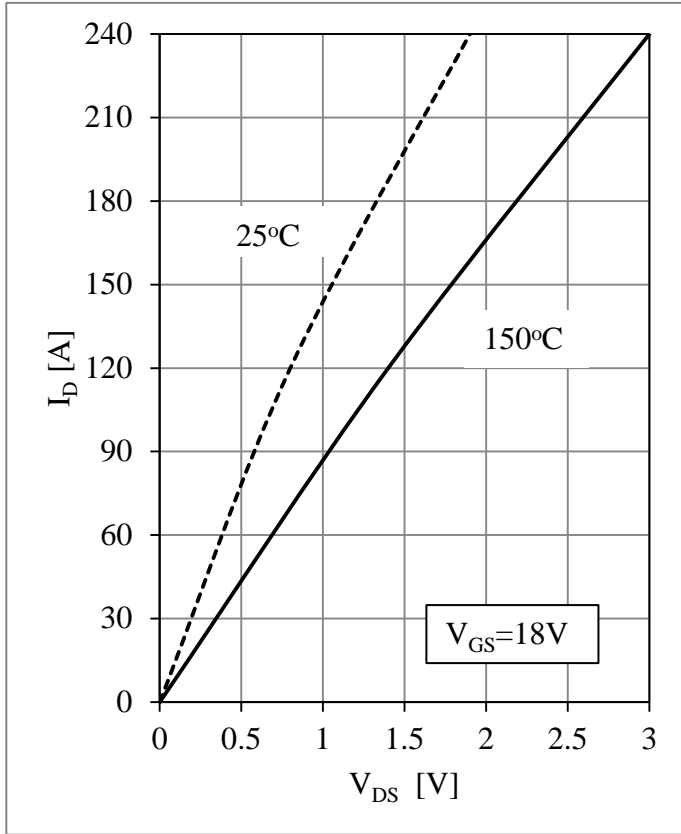


Fig 1. MOSFET Output Characteristics

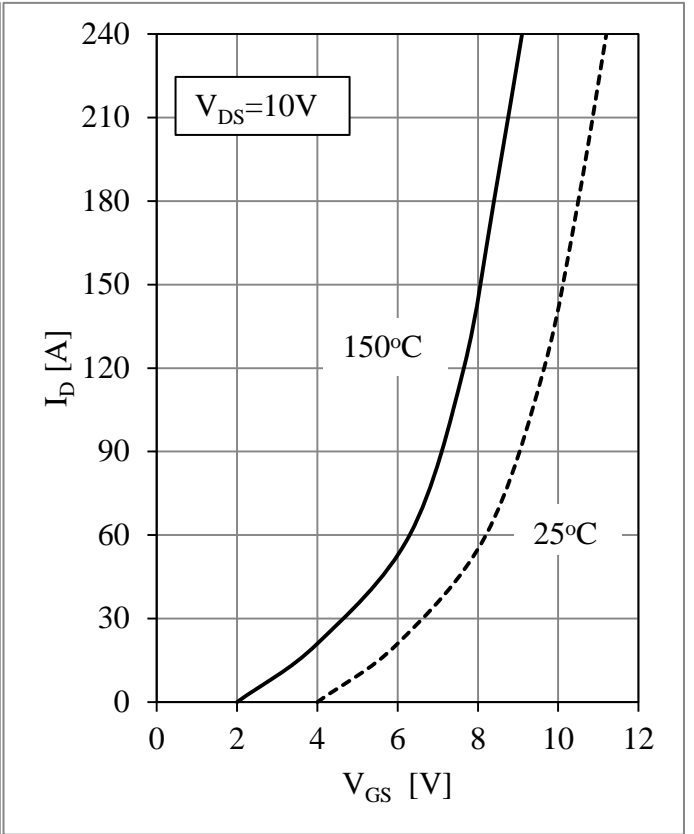


Fig 2. MOSFET Transfer Characteristics

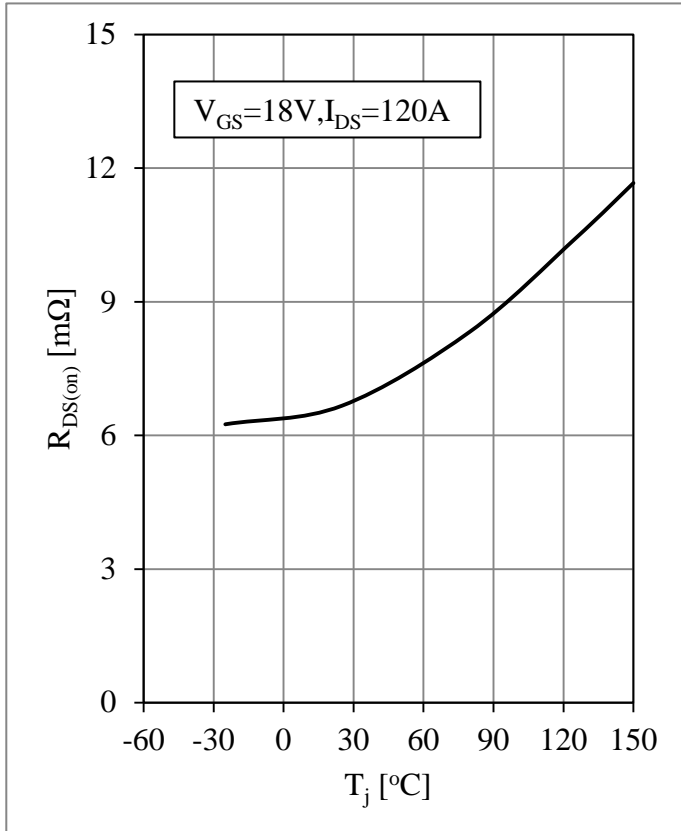


Fig 3. MOSFET On-Resistance vs. Temperature

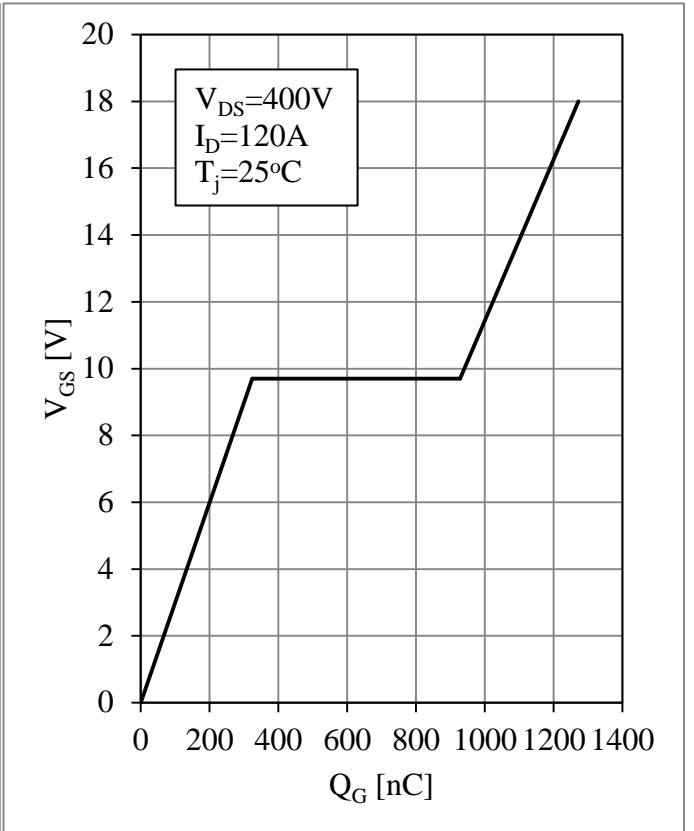


Fig 4. MOSFET Gate Charge Characteristic

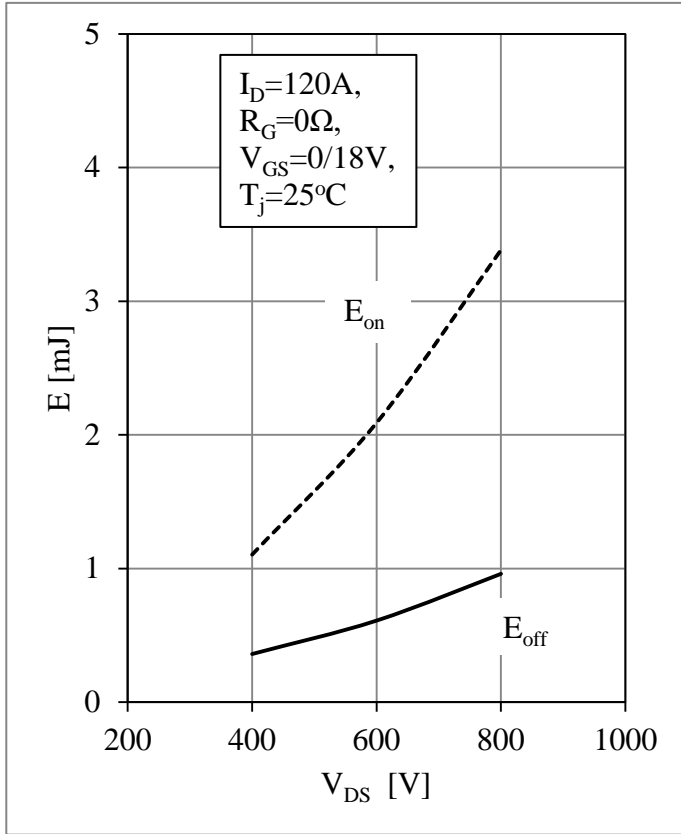


Fig 5. MOSFET Switching Loss vs. V_{DS}

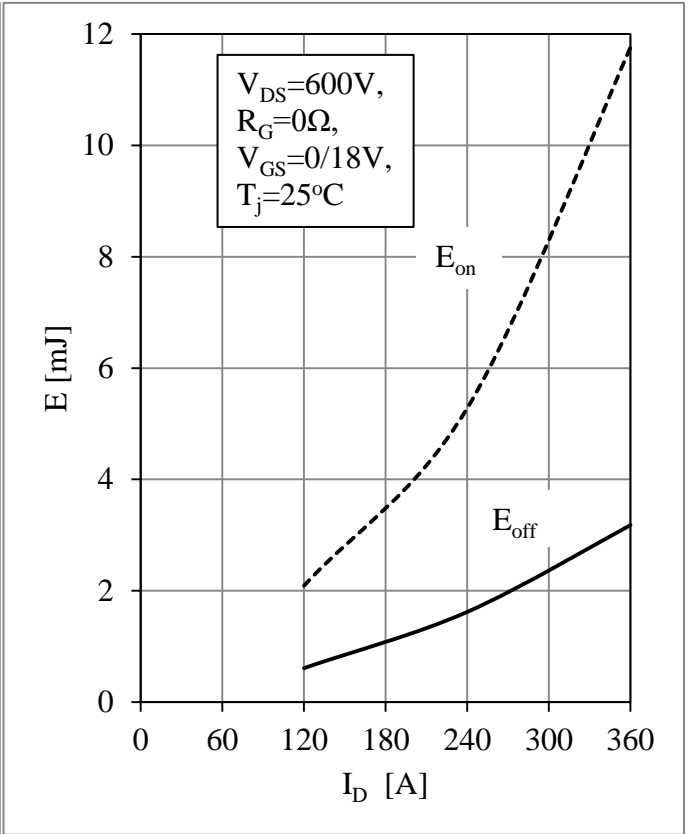


Fig 6. MOSFET Switching Loss vs. I_D

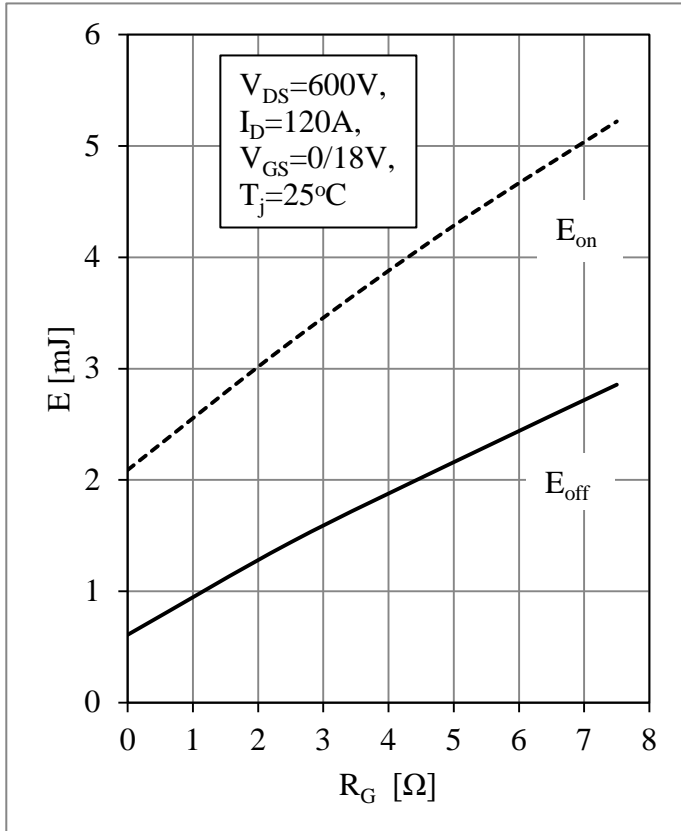


Fig 7. MOSFET Switching Loss vs. R_G

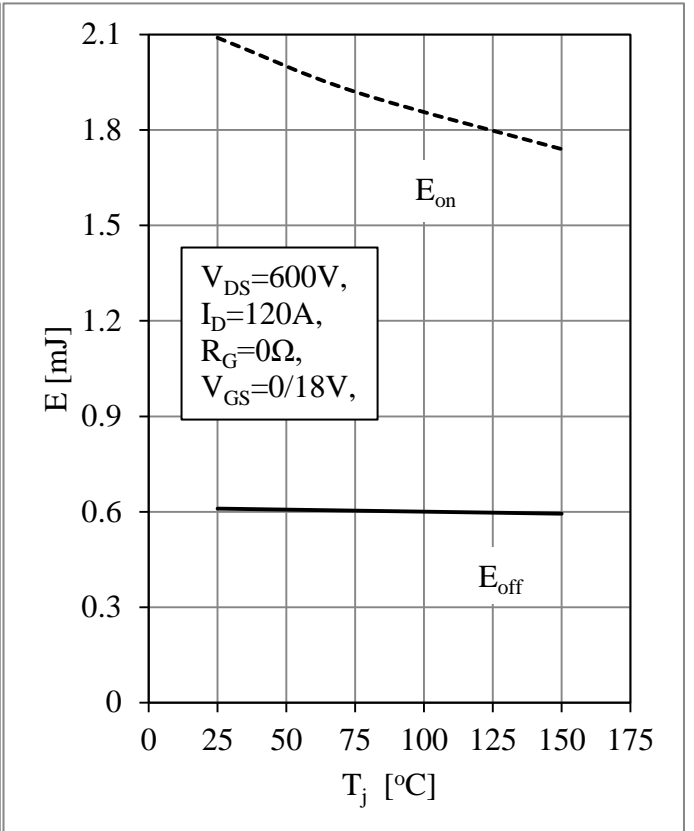


Fig 8. MOSFET Switching Loss vs. Temperature

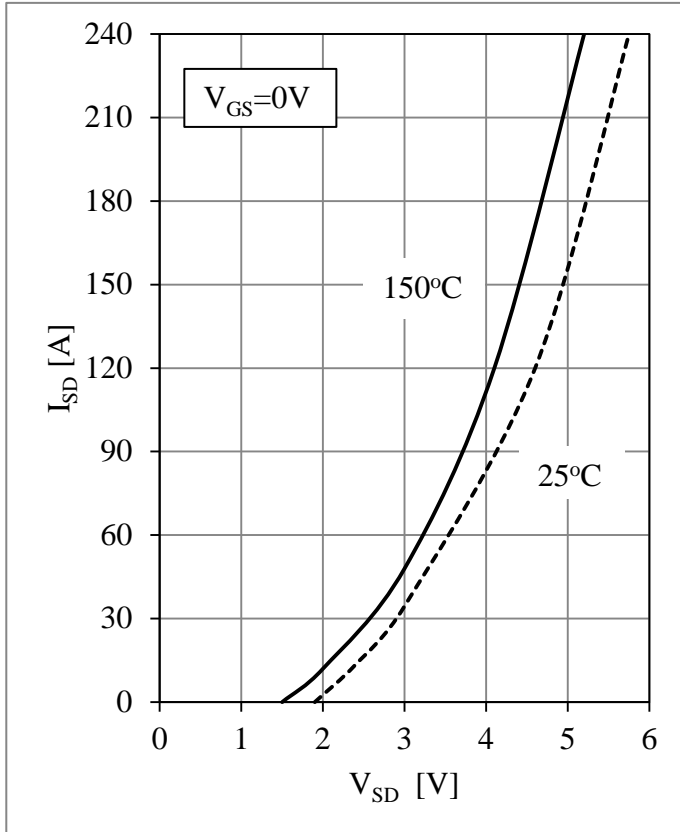


Fig 9. Body Diode Output Characteristics

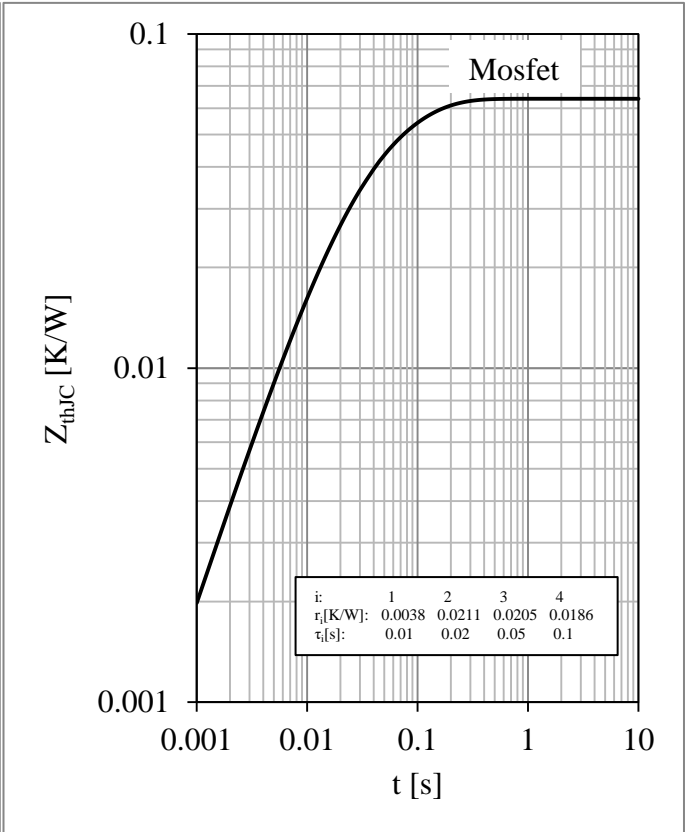
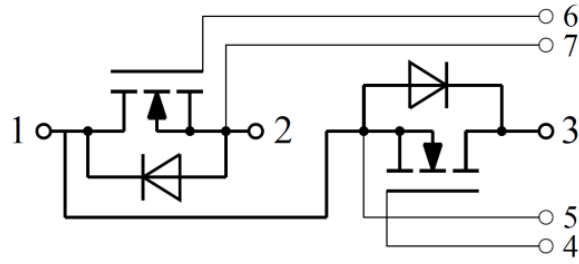


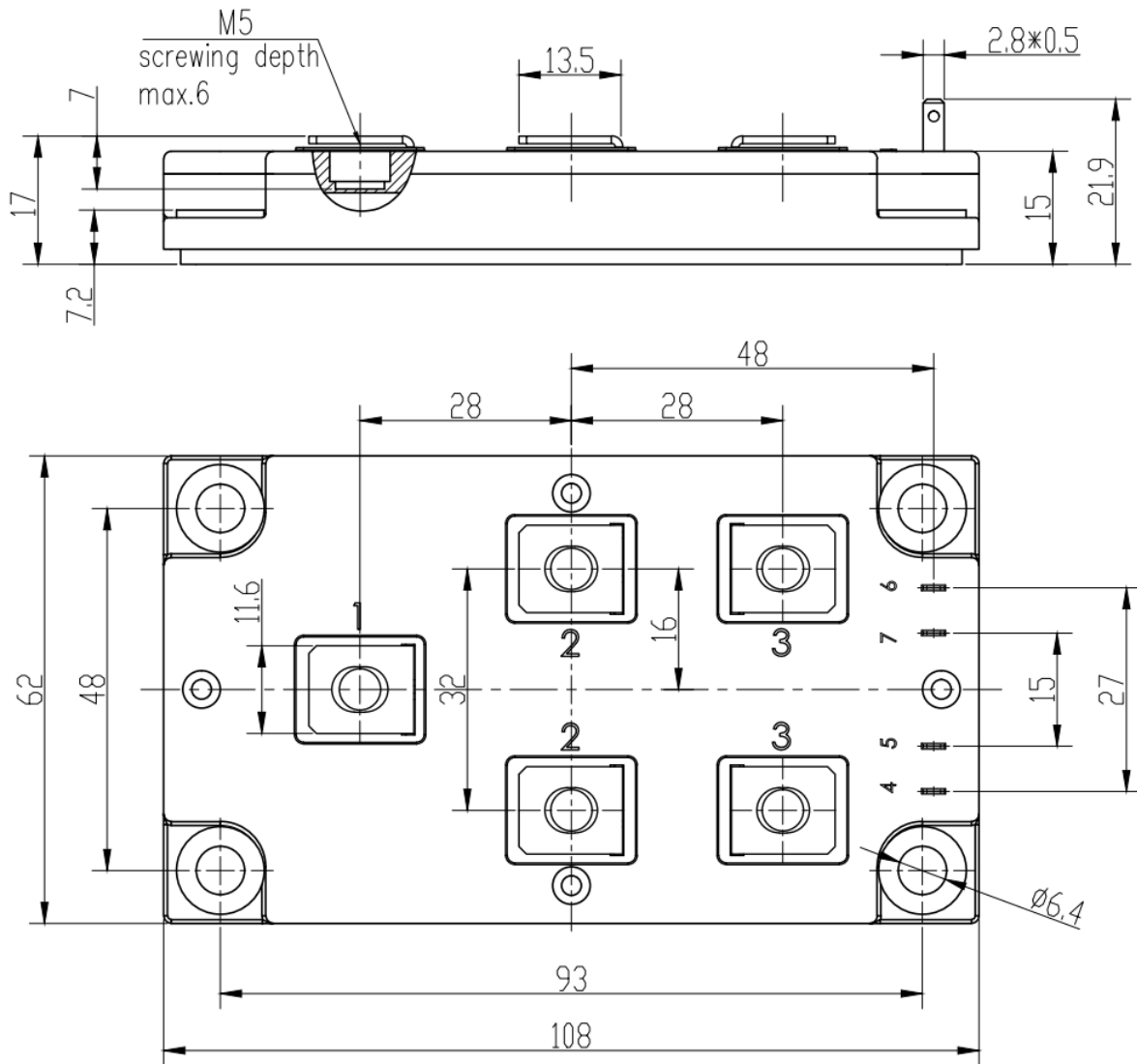
Fig 10. MOSFET Transient Thermal Impedance

Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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