STARPOWER

SEMICONDUCTOR **SiC MOSFET**

MD43HFS120B3S

1200V/4.25mΩ 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.

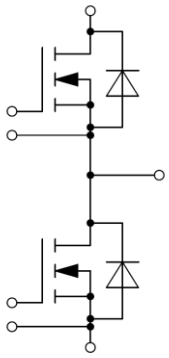
Features

- SiC power MOSFET
- Low $R_{DS(on)}$
- Optimized intrinsic reverse diode
- Low inductance case avoid oscillations
- Chip sintering technology
- Isolated copper baseplate using AlN 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°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_C=75°C	300	A
I_{DRM}	Repetitive Peak Drain Current tp limited by T_{vjop}	600	A
P_D	Maximum Power Dissipation @ T_C=75°C T_{vj}=150°C	833	W

Body Diode

Symbol	Description	Value	Unit
I_S	Source Current	319	A

Module

Symbol	Description	Value	Unit
T_{vjmax}	Maximum Junction Temperature	175	°C
T_{vjop}	Operating Junction Temperature	-40 to +150	°C
T_{STG}	Storage Temperature Range	-40 to +125	°C
V_{ISO}	Isolation Voltage RMS,f=50Hz,t=1min	2500	V

MOSFET Characteristics T_C=25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$R_{DS(on)}$	Static Drain-Source On-Resistance	I_D=300A,V_{GS}=15V, T_{vj}=25°C		4.25		mΩ
		I_D=300A,V_{GS}=15V, T_{vj}=125°C		6.25		
		I_D=300A,V_{GS}=15V, T_{vj}=150°C		6.60		
$V_{GS(th)}$	Gate-Source Threshold Voltage	I_D=83.6mA,V_{DS}=V_{GS}, T_{vj}=25°C		3.10		V
I_{DSS}	Drain-Source Leakage Current	V_{DS}=V_{DSS},V_{GS}=0V, T_{vj}=25°C			500	μA
I_{GSS}	Gate-Source Leakage Current	V_{GS}=19V,V_{DS}=0V, T_{vj}=25°C			1000	nA
R_{Gint}	Internal Gate Resistance			1.83		Ω
C_{iss}	Input Capacitance	V_{GS}=0V,V_{DS}=800V, f=100kHz		25.0		nF
C_{oss}	Output Capacitance			1.48		nF
C_{rss}	Reverse Transfer Capacitance			0.08		nF
Q_g	Total Gate Charge	I_D=300A,V_{DS}=800V, V_{GS}=-4/+15V		0.66		μC
$t_{d(on)}$	Turn-On Delay Time	V_{DS}=600V,I_D=300A, R_G=0.5Ω,L_S=34nH, V_{GS}=-4/+15V, T_{vj}=25°C		53		ns
t_r	Rise Time			26		ns
$t_{d(off)}$	Turn-Off Delay Time			65		ns
t_f	Fall Time			24		ns
E_{on}	Turn-On Switching Loss			3.80		mJ
E_{off}	Turn-Off Switching Loss			2.62		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{DS}=600V,I_D=300A, R_G=0.5Ω,L_S=34nH, V_{GS}=-4/+15V, T_{vj}=125°C		59		ns
t_r	Rise Time			35		ns
$t_{d(off)}$	Turn-Off Delay Time			108		ns
t_f	Fall Time			31		ns
E_{on}	Turn-On Switching Loss			6.96		mJ
E_{off}	Turn-Off Switching Loss			3.88		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{DS}=600V,I_D=300A, R_G=0.5Ω,L_S=34nH, V_{GS}=-4/+15V, T_{vj}=150°C		62		ns
t_r	Rise Time			37		ns
$t_{d(off)}$	Turn-Off Delay Time			120		ns
t_f	Fall Time			34		ns
E_{on}	Turn-On Switching Loss			7.92		mJ
E_{off}	Turn-Off Switching Loss			4.12		mJ

Body Diode Characteristics T_C=25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_{SD}	Diode Forward Voltage	I_S=152A,V_{GS}=-4V, T_{vj}=25°C		4.15		V
		I_S=152A,V_{GS}=-4V, T_{vj}=150°C		3.60		V

Module Characteristics T_C=25°C unless otherwise noted

Symbol	Parameter	Min.	Typ.	Max.	Unit
L_{CE}	Stray Inductance			11	nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal to Chip		0.40		mΩ
R_{thJC}	Junction-to-Case(per MOSFET)		0.082	0.090	K/W
R_{thCH}	Case-to-Heatsink (per MOSFET) Case-to-Heatsink (per Module)		0.020 0.010		K/W
M	Terminal Connection Torque, Screw M5 Mounting Torque, Screw M6	2.5 3.0		5.0 5.0	N.m
G	Weight of Module		300		g

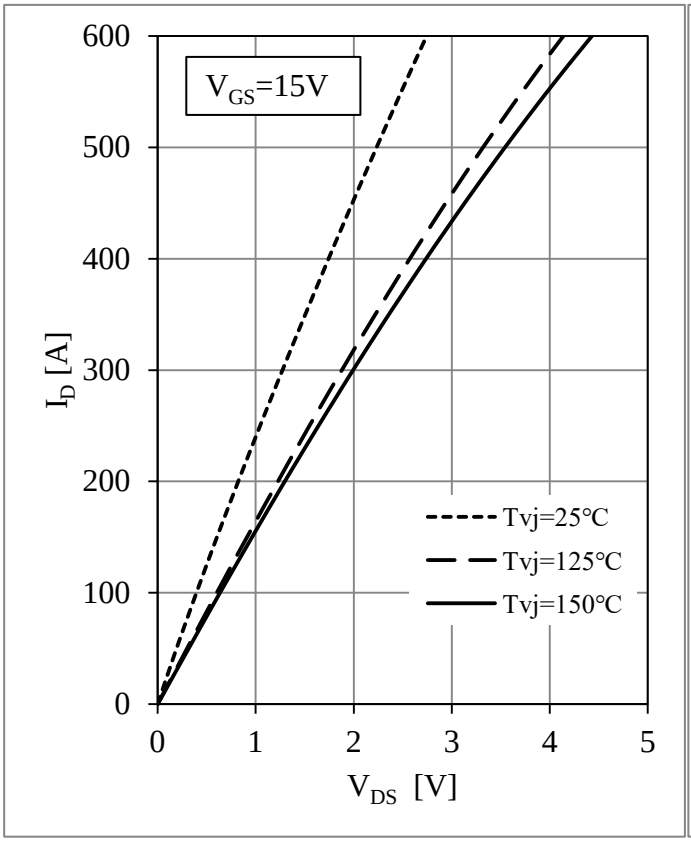


Fig 1. MOSFET Output Characteristics

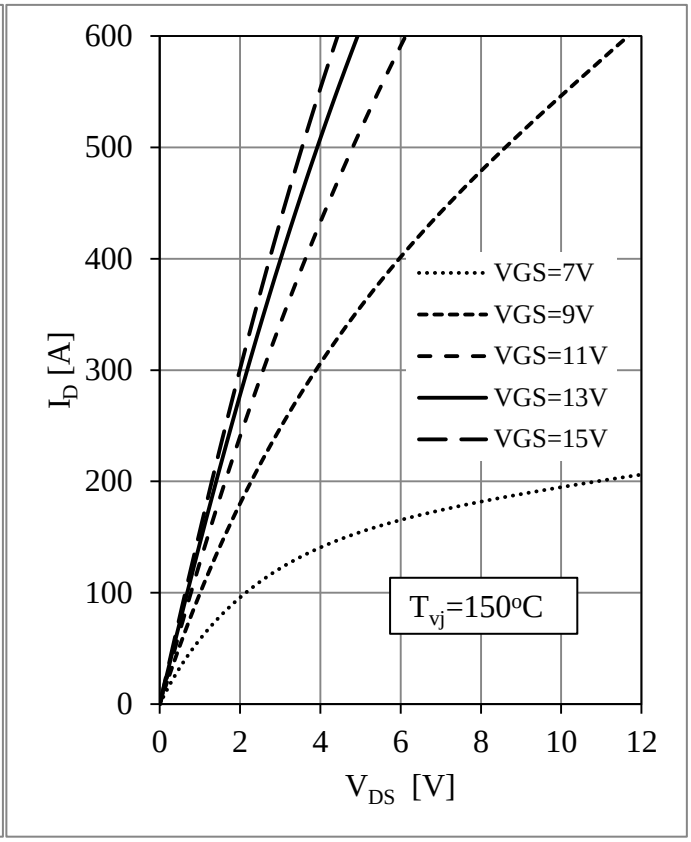


Fig 2. MOSFET Output Characteristics

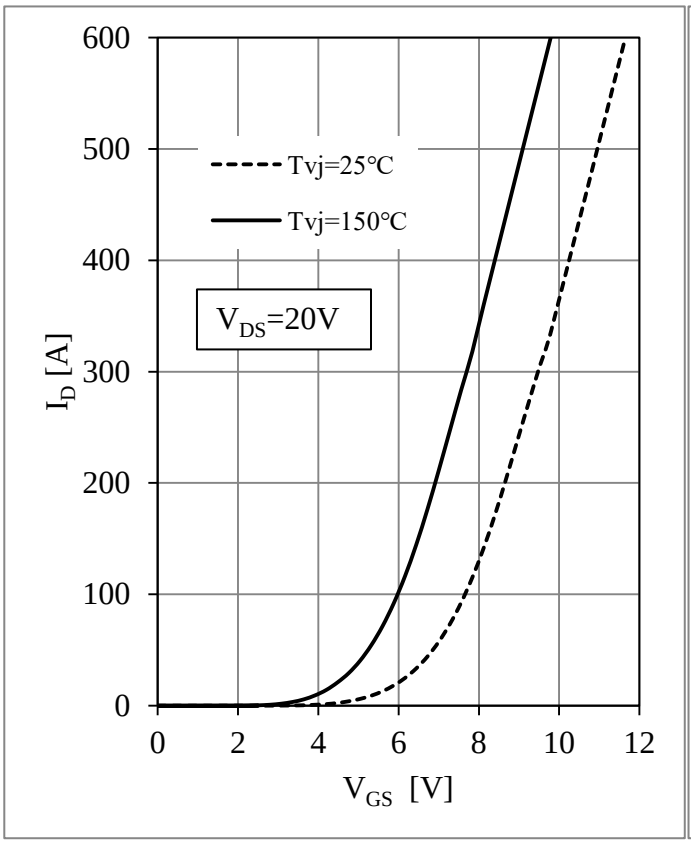


Fig 3. MOSFET Transfer Characteristics

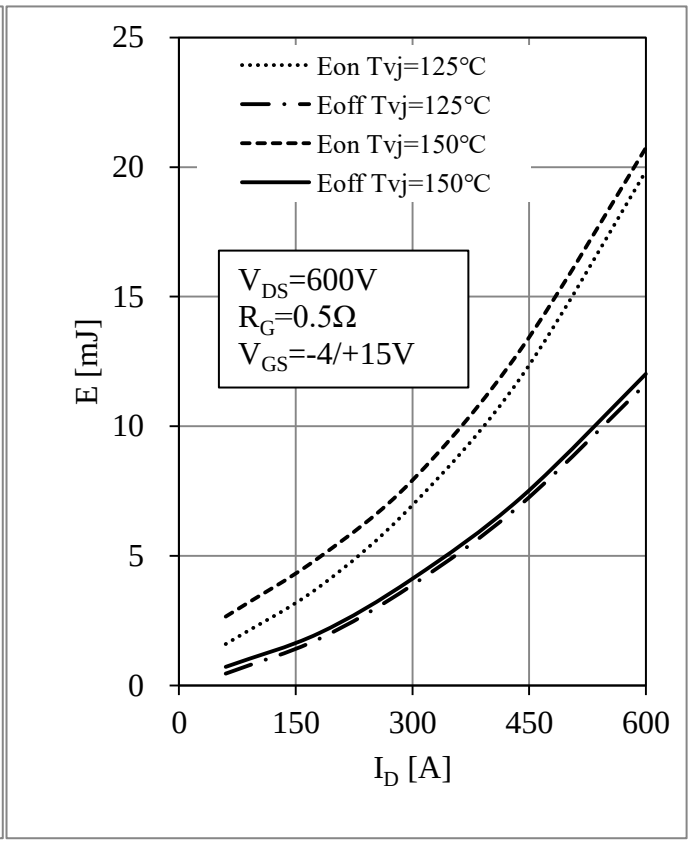


Fig 4. MOSFET Switching Loss vs. I_{DS}

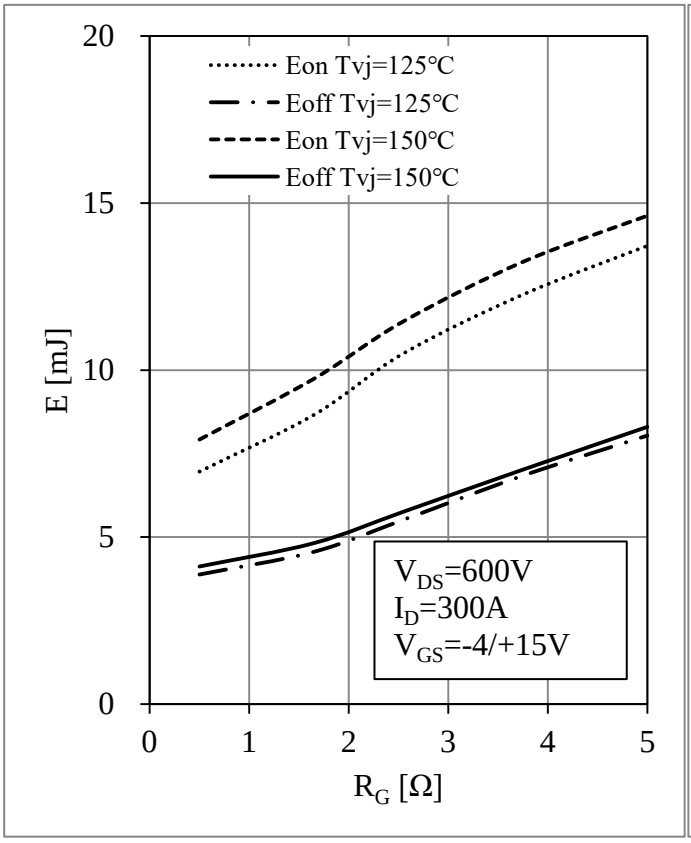


Fig 5. MOSFET Switching Loss vs.R_G

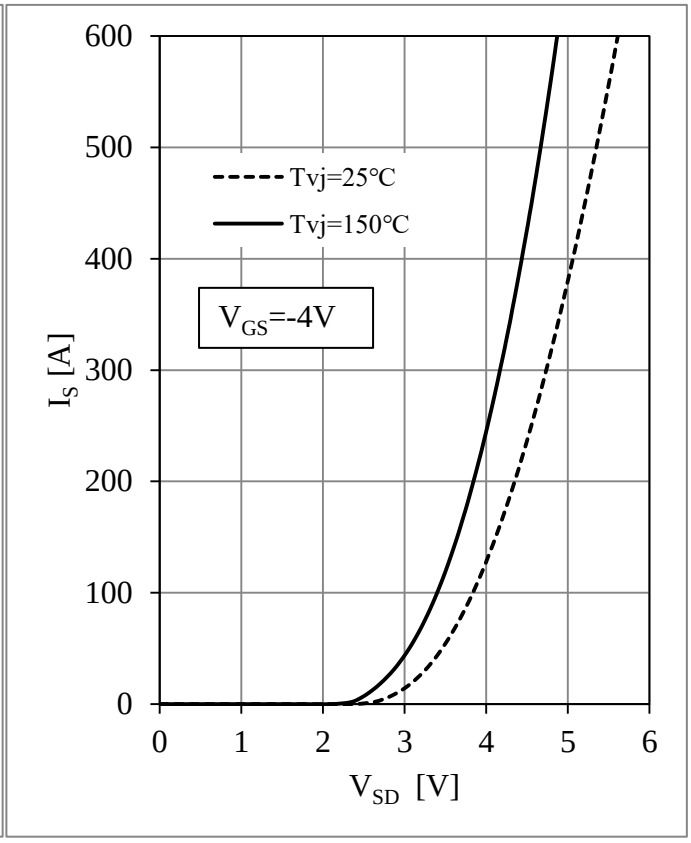


Fig 6. Body Diode Characteristics

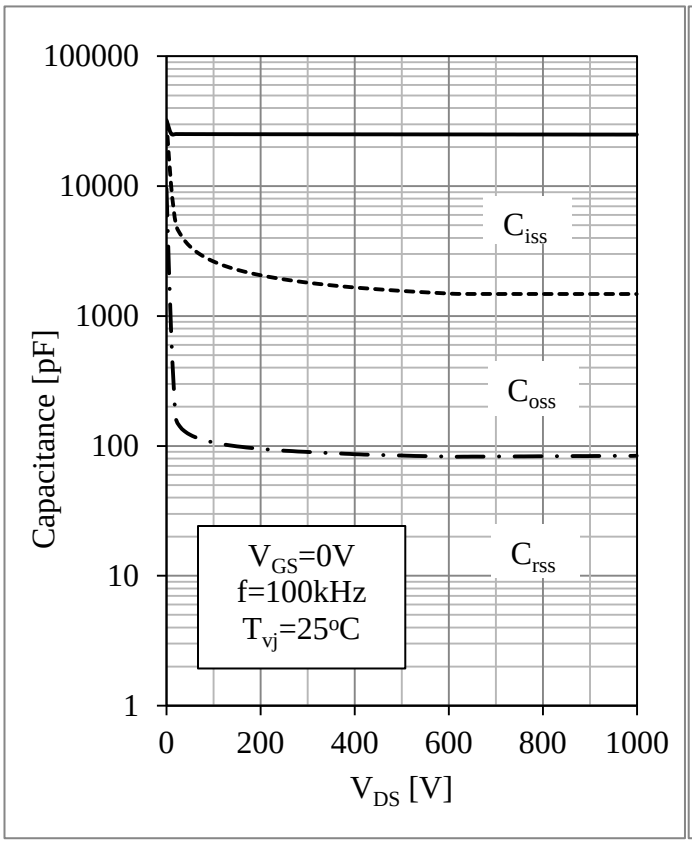


Fig 7. Capacitance vs.V_{DS}

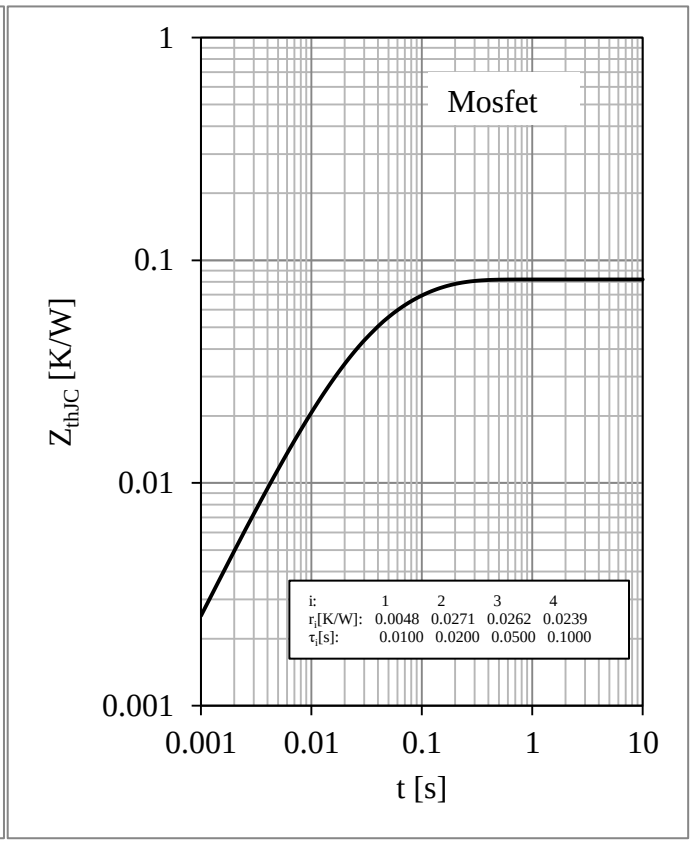
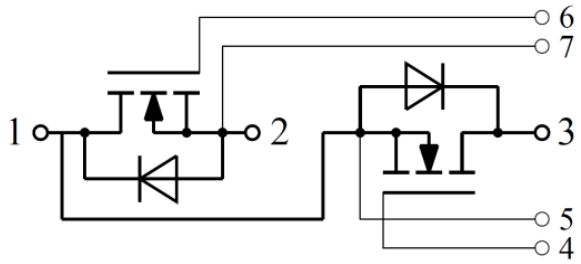


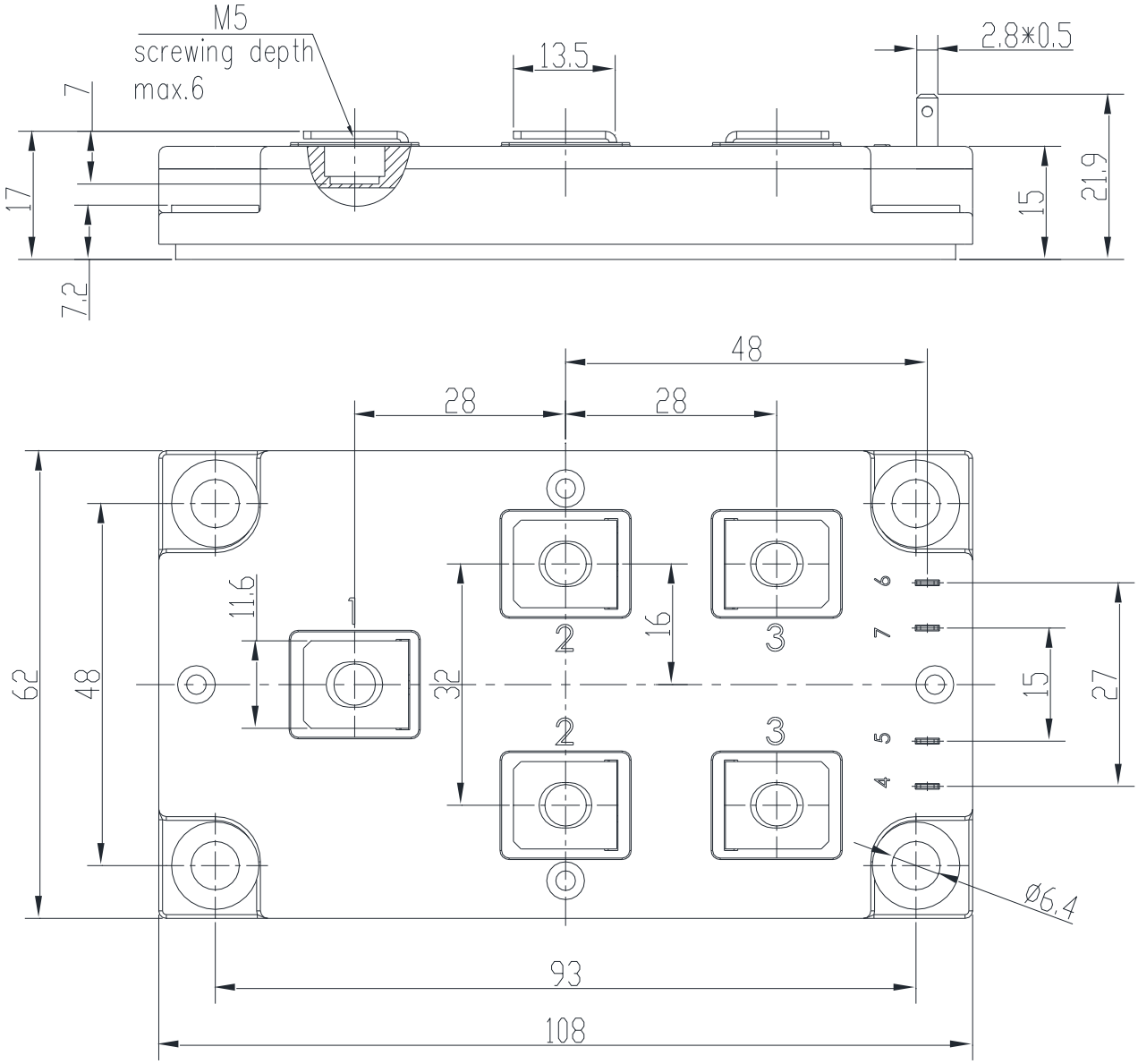
Fig 8. MOSFET Transient Thermal Impedance

Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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