STARPOWER

SEMICONDUCTOR **MOSFET**

MD300HFC170C2S

1700V/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 SMPS and DC drives.

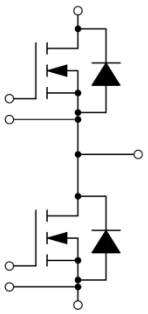
Features

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

Typical Applications

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

Equivalent Circuit Schematic



Absolute Maximum Ratings

MOSFET

Symbol	Description	Value	Unit
V_{DSS}	Drain-Source Voltage	1700	V
V_{GSSmax}	Gate-Source Voltage	-8/+19	V
V_{GSSop}	Gate-Source Voltage	-4/+15	V
I_D	Drain Current @ T_C=25°C @ T_C=100°C	553 300	A

Body Diode

Symbol	Description	Value	Unit
I_S	Source Current @ T_C=100°C	296	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	4000	V

MOSFET Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$R_{DS(on)}$	Static Drain-Source On-Resistance	I_D=600A,V_{GS}=15V, T_{vj}=25°C		3.33	4.33	mΩ
		I_D=600A,V_{GS}=15V, T_{vj}=125°C		5.97		
		I_D=600A,V_{GS}=15V, T_{vj}=150°C		7.05		
$V_{GS(th)}$	Gate-Source Threshold Voltage	I_D=159mA,V_{DS}=V_{GS}, T_{vj}=25°C	1.8	2.5	3.6	V
I_{DSS}	Drain-Source Leakage Current	V_{DS}=V_{DSS},V_{GS}=0V, T_{vj}=25°C			240	μA
I_{GSS}	Gate-Source Leakage Current	V_{GS}=V_{GSS},V_{DS}=0V, T_{vj}=25°C			600	nA
R_{Gint}	Internal Gate Resistance			0.4		Ω
C_{iss}	Input Capacitance	V_{GS}=0V,V_{DS}=1000V, f=100kHz		42.4		nF
C_{oss}	Output Capacitance			1.11		nF
C_{rss}	Reverse Transfer Capacitance			0.04		nF
Q_g	Total Gate Charge	I_D=600A,V_{DS}=1200V, V_{GS}=-4/+15V		1170		nC
$t_{d(on)}$	Turn-On Delay Time	V_{DS}=900V,I_D=300A, R_G=8.2Ω,L_S=60nH, V_{GS}=-4/+15V, T_{vj}=25°C		214		ns
t_r	Rise Time			98		ns
$t_{d(off)}$	Turn-Off Delay Time			792		ns
t_f	Fall Time			82		ns
E_{on}	Turn-On Switching Loss			36.7		mJ
E_{off}	Turn-Off Switching Loss			21.8		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{DS}=900V,I_D=300A, R_G=8.2Ω,L_S=60nH, V_{GS}=-4/+15V, T_{vj}=125°C		210		ns
t_r	Rise Time			93		ns
$t_{d(off)}$	Turn-Off Delay Time			807		ns
t_f	Fall Time			85		ns
E_{on}	Turn-On Switching Loss			36.8		mJ
E_{off}	Turn-Off Switching Loss			21.8		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{DS}=900V,I_D=300A, R_G=8.2Ω,L_S=60nH, V_{GS}=-4/+15V, T_{vj}=150°C		245		ns
t_r	Rise Time			111		ns
$t_{d(off)}$	Turn-Off Delay Time			711		ns
t_f	Fall Time			86		ns
E_{on}	Turn-On Switching Loss			36.7		mJ
E_{off}	Turn-Off Switching Loss			21.3		mJ

Body Diode Characteristics T_F=25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_{SD}	Diode Forward Voltage	I_{SD}=300A,V_{GS}=-4V, T_{vj}=25°C		4.60	5.60	V
		I_{SD}=300A,V_{GS}=-4V, T_{vj}=125°C		4.60		
		I_{SD}=300A,V_{GS}=-4V, T_{vj}=150°C		4.60		
Q_r	Recovered Charge	V_R=900V,I_{SD}=300A, -di/dt=3900A/μs, V_{GS}=-4V,L_S=60nH, T_{vj}=25°C		5.94		μC
I_{RM}	Peak Reverse Recovery Current			130		A
E_{rec}	Reverse Recovery Energy			0.92		mJ
Q_r	Recovered Charge	V_R=900V,I_{SD}=300A, -di/dt=3800A/μs, V_{GS}=-4V,L_S=60nH, T_{vj}=125°C		7.71		μC
I_{RM}	Peak Reverse Recovery Current			148		A
E_{rec}	Reverse Recovery Energy			0.70		mJ
Q_r	Recovered Charge	V_R=900V,I_{SD}=300A, -di/dt=3600A/μs, V_{GS}=-4V,L_S=60nH, T_{vj}=150°C		2.3		μC
I_{RM}	Peak Reverse Recovery Current			87		A
E_{rec}	Reverse Recovery Energy			0.75		mJ

Module Characteristics T_C=25°C unless otherwise noted

Symbol	Parameter	Min.	Typ.	Max.	Unit
R_{thJC}	Junction-to-Case(Mosfet)			0.055	K/W
R_{thCH}	Case-to-Heatsink (Mosfet) Case-to-Heatsink (per Module)		0.020 0.010		K/W
M	Terminal Connection Torque, Screw M6 Mounting Torque, Screw M6	2.5 3.0		5.0 5.0	N.m
G	Weight of Module		300		g

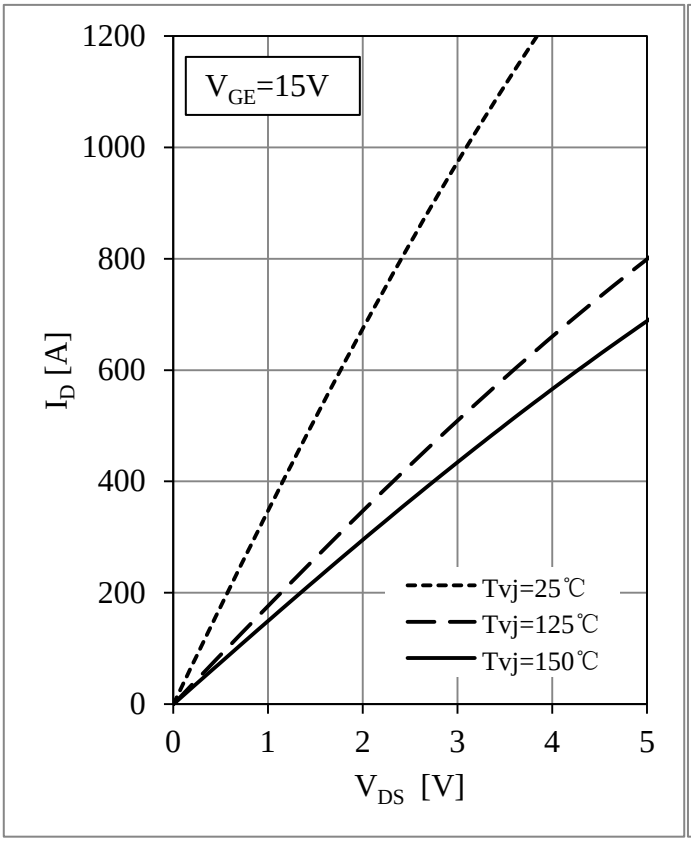


Fig 1. MOSFET Output Characteristics

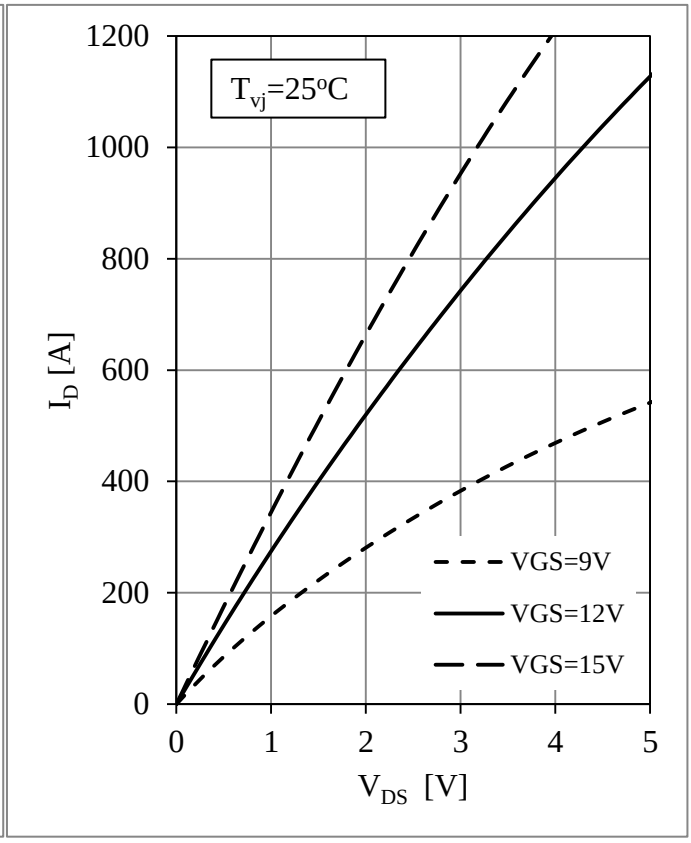


Fig 2. MOSFET Output Characteristics

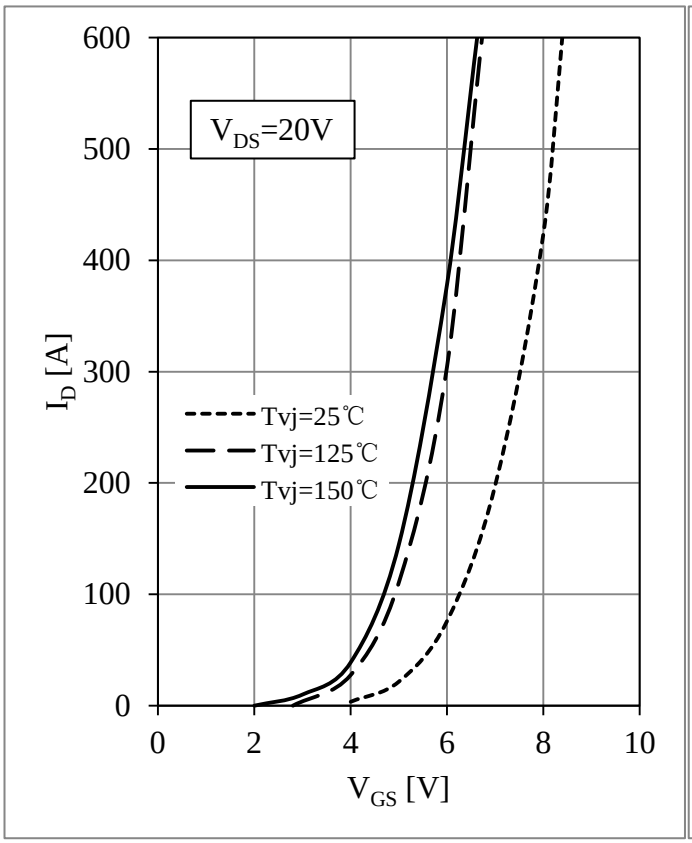


Fig 3. MOSFET Transfer Characteristics

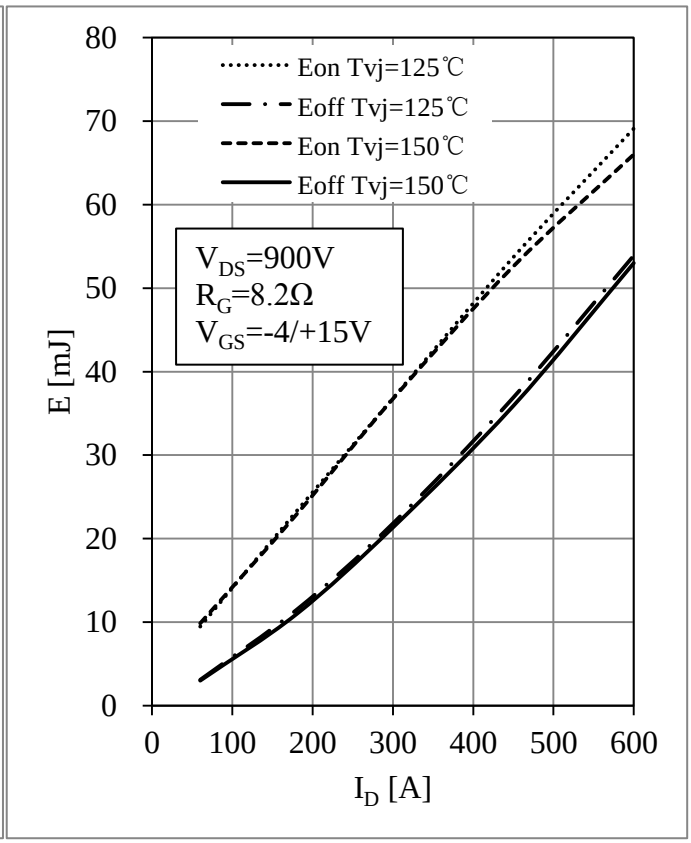


Fig 4. MOSFET Switching Loss vs. I_{DS}

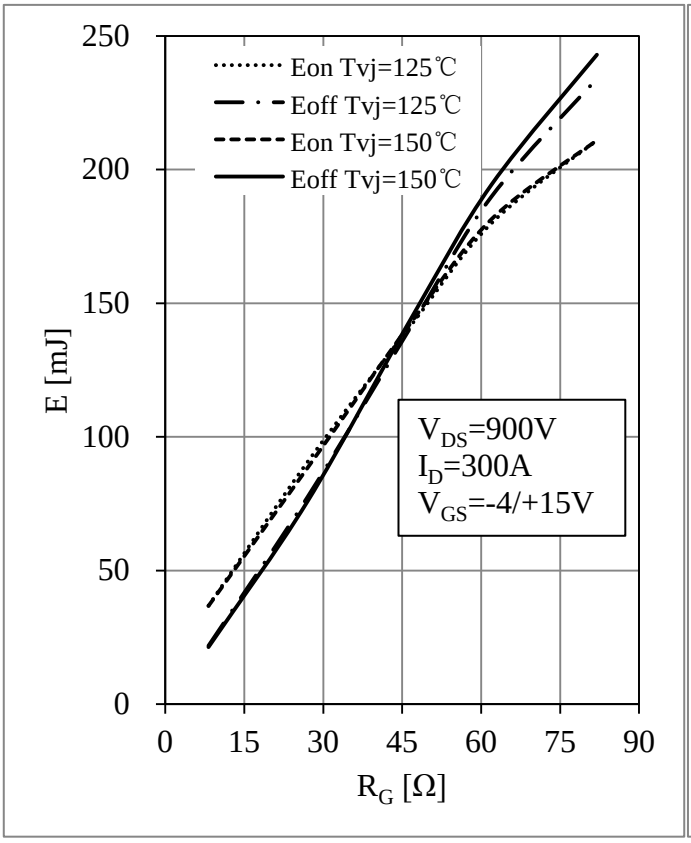


Fig 5. MOSFET Switching Loss vs.R_G

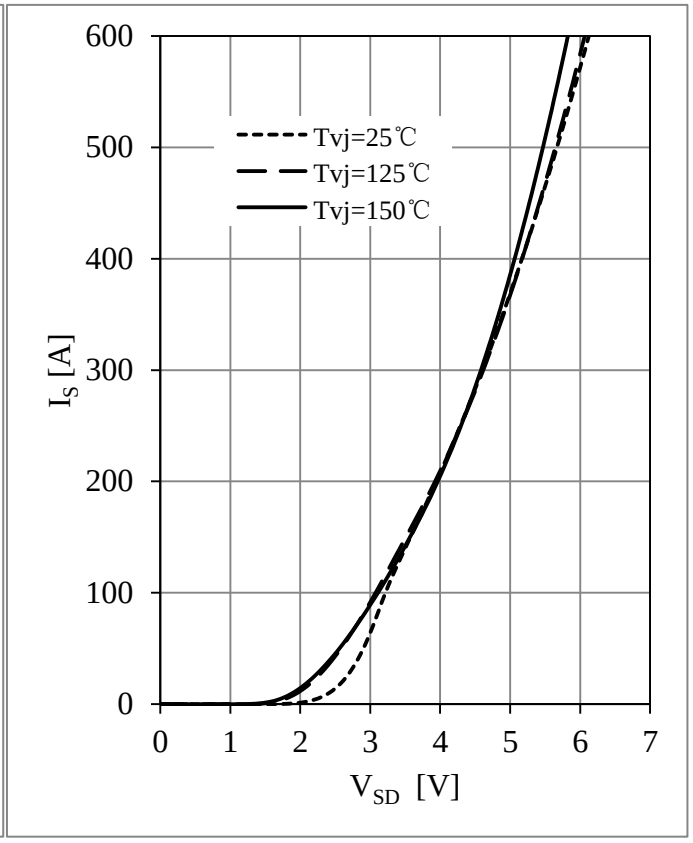


Fig 6. Body Diode Characteristics

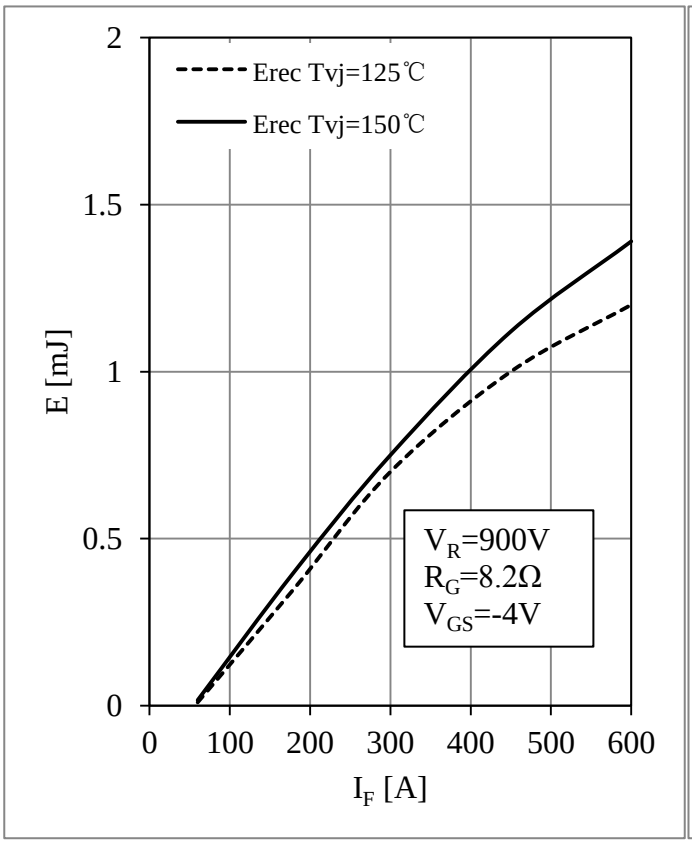


Fig 7. Body Diode Switching Loss vs. I_S

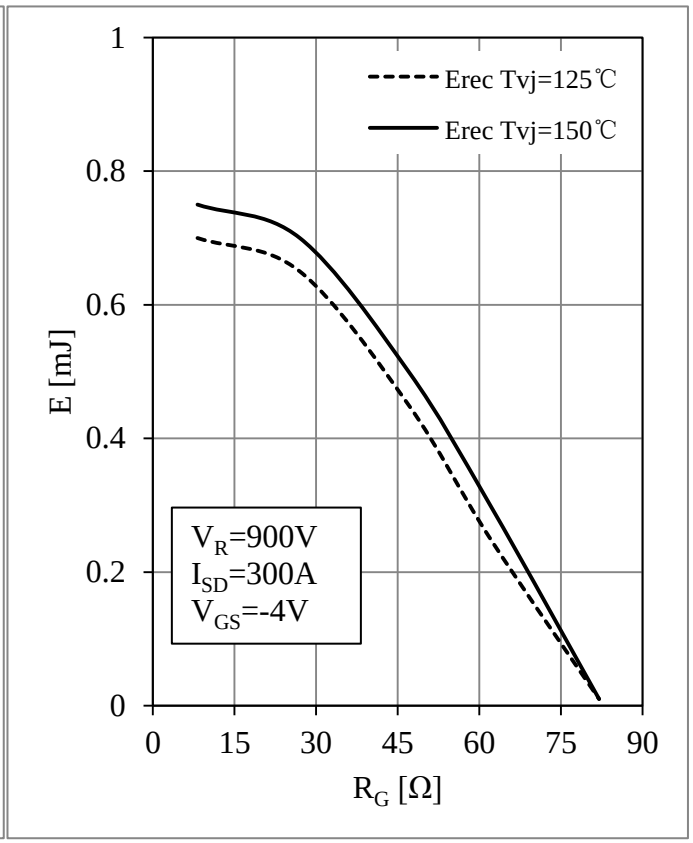


Fig 8. Body Diode Switching Loss vs. R_G

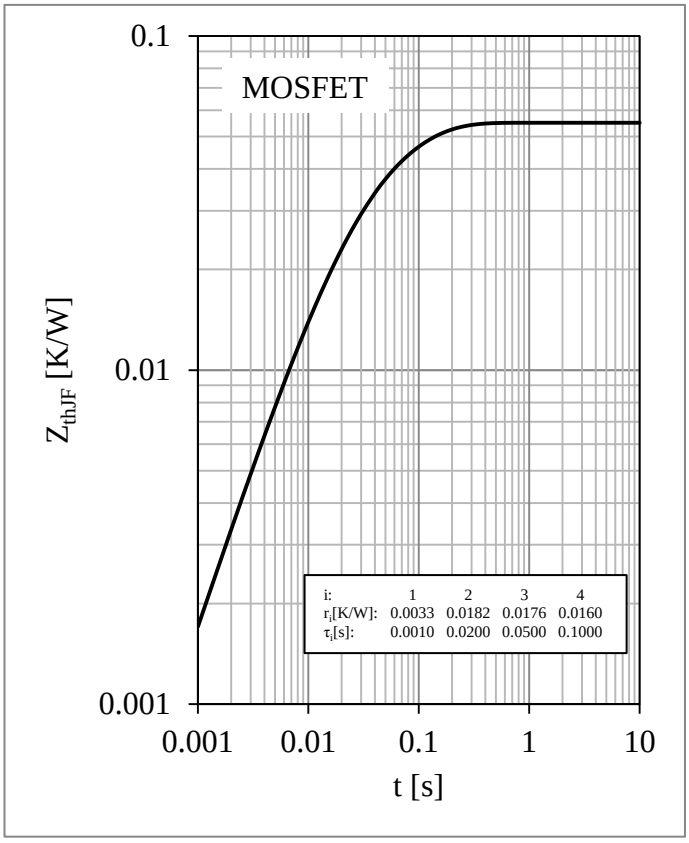
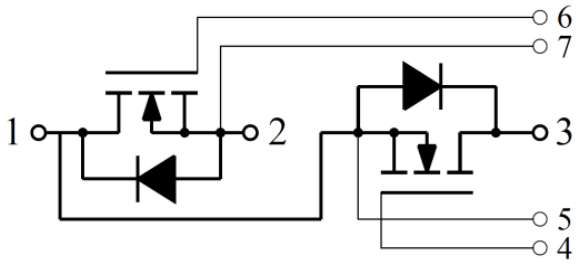


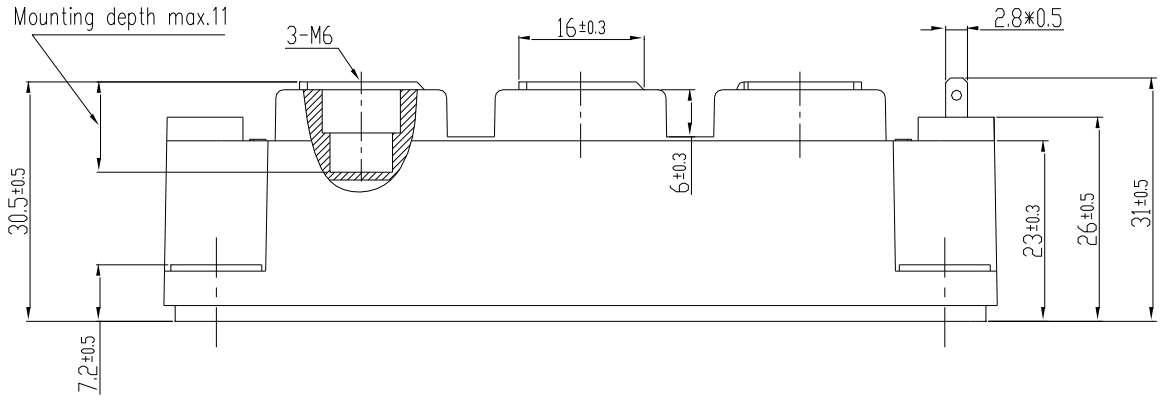
Fig 9. MOSFET Transient Thermal Impedance

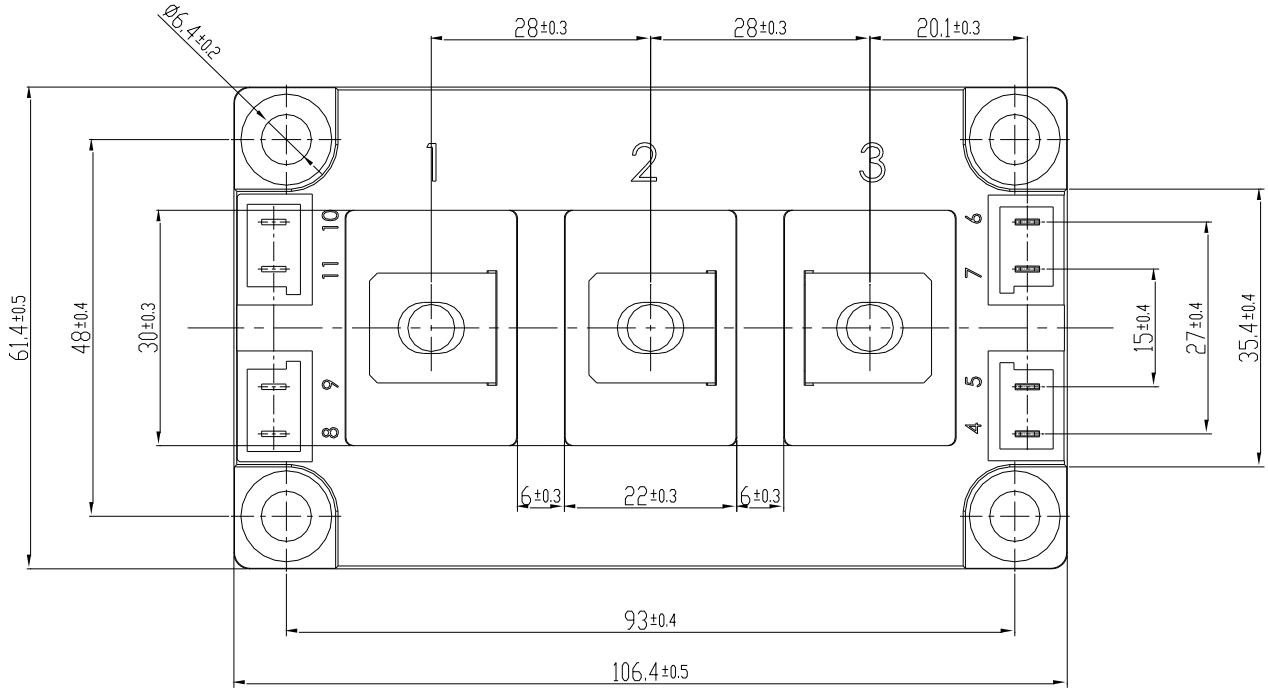
Circuit Schematic



Package Dimensions

Dimensions in Millimeters





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