STARPOWER

SEMICONDUCTOR **MOSFET**

MD150HCC120B3S

1200V/150A 4 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.

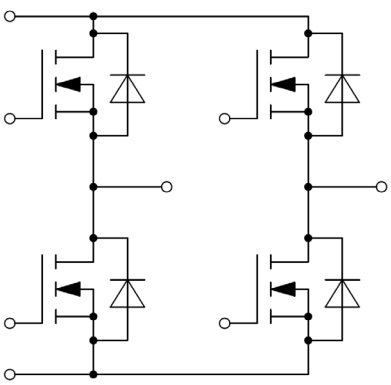
Features

- 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°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°C @ T_C=100°C	150 100	A
I_{DM}	Pulsed Drain Current	560	A
P_D	Maximum Power Dissipation @ T_j=175°C	474	W

Body Diode

Symbol	Description	Value	Unit
I_S	Source Current	150	A
I_{SM}	Pulsed Source Current	560	A

Module

Symbol	Description	Value	Unit
T_{jmax}	Maximum Junction Temperature	175	°C
T_{jop}	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 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=40A,V_{GS}=18V, T_j=25°C		20.0	29.3	mΩ
		I_D=40A,V_{GS}=18V, T_j=125°C		31.3		
$V_{GS(th)}$	Gate-Source Threshold Voltage	I_D=17.6mA,V_{DS}=10V, T_j=25°C	1.6		4.0	V
g_{fs}	Forward Transconductance	V_{DS}=10V,I_D=40A, T_j=25°C		14.8		S
I_{DSS}	Drain-Source Leakage Current	V_{DS}=V_{DSS},V_{GS}=0V, T_j=25°C			1.0	mA
I_{GSS}	Gate-Source Leakage Current	V_{GS}=V_{GSS},V_{DS}=0V, T_j=25°C			400	nA
R_{Gint}	Internal Gate Resistance			1.6		Ω
C_{iss}	Input Capacitance	V_{GS}=0V,V_{DS}=800V, f=1.0MHz		8280		pF
C_{oss}	Output Capacitance			308		pF
C_{rss}	Reverse Transfer Capacitance			64		pF
Q_g	Total Gate Charge	I_D=40A,V_{DS}=400V, V_{GS}=18V		424		nC
Q_{gs}	Gate-Source Charge			108		nC
Q_{gd}	Gate-Drain ("Miller") Charge			124		nC
$t_{d(on)}$	Turn-On Delay Time	V_{DS}=600V,I_D=40A, R_G=0Ω,V_{GS}=0/18V, T_j=25°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			700		μJ
E_{off}	Turn-Off Switching Loss			200		μJ

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=40A,V_{GS}=0V,T_j=25°C		4.60		V
t_{rr}	Diode Reverse Recovery Time	V_R=400V,I_S=40A, di/dt=600A/μs,V_{GS}=0V, T_j=25°C		31		ns
Q_r	Diode Reverse Recovery Charge			156		nC
I_{RM}	Peak Reverse Recovery Current			9.2		A

Module Characteristics T_C=25°C unless otherwise noted

Symbol	Parameter	Min.	Typ.	Max.	Unit
R_{thJC}	Junction-to-Case(MOSFET)			0.316	K/W
R_{thCH}	Case-to-Sink(MOSFET) Case-to-Sink(Per Module)		0.140 0.035		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

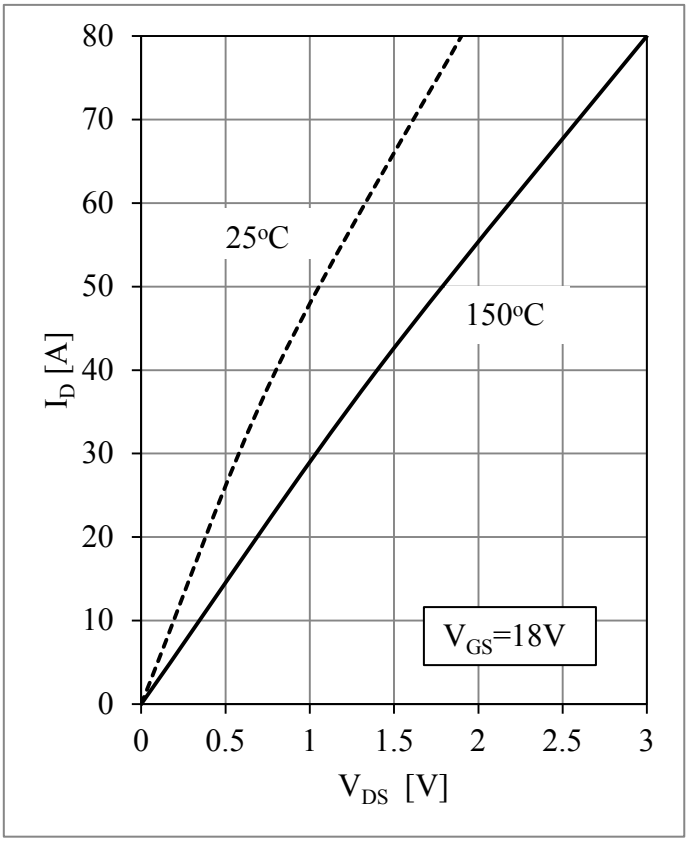


Fig 1. MOSFET Output Characteristics

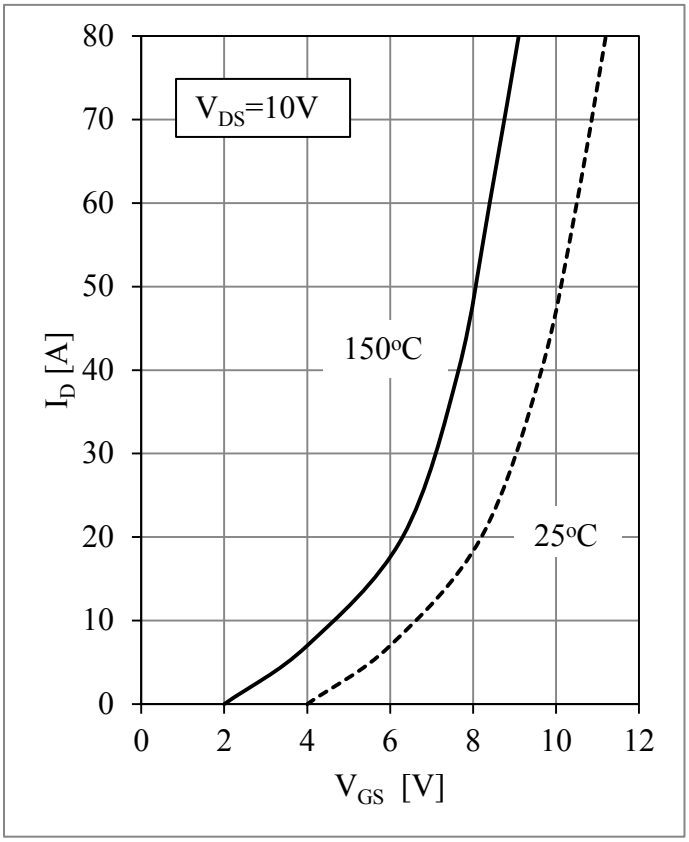


Fig 2. MOSFET Transfer Characteristics

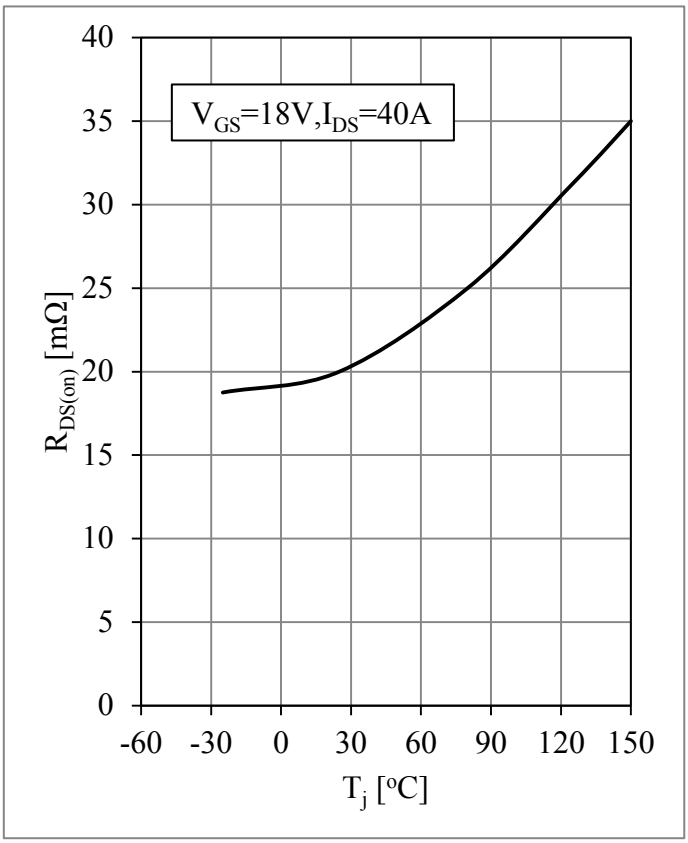


Fig 3. MOSFET On-Resistance vs. Temperature

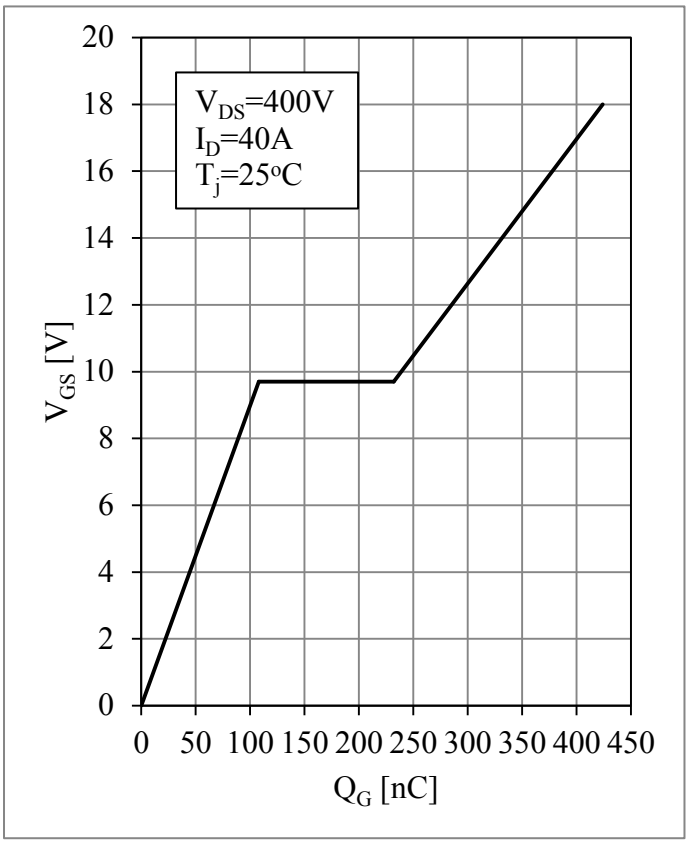


Fig 4. MOSFET Gate Charge Characteristic

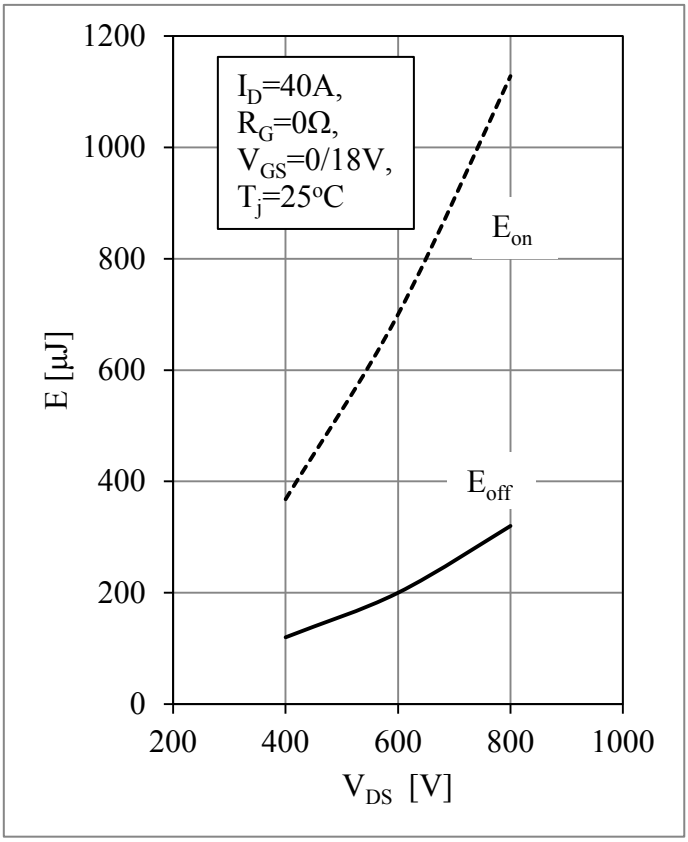


Fig 5. MOSFET Switching Loss vs. V_{DS}

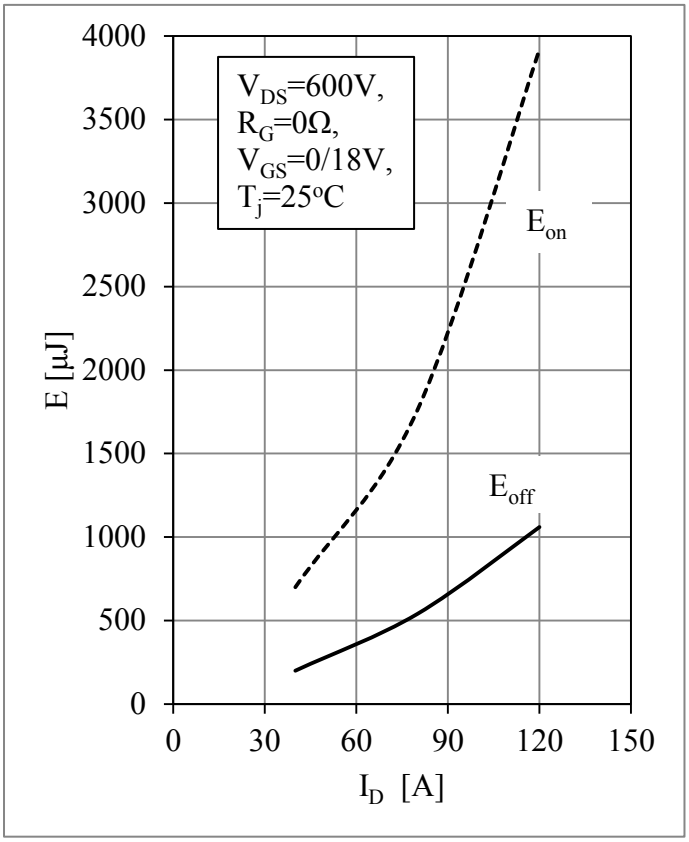


Fig 6. MOSFET Switching Loss vs. I_D

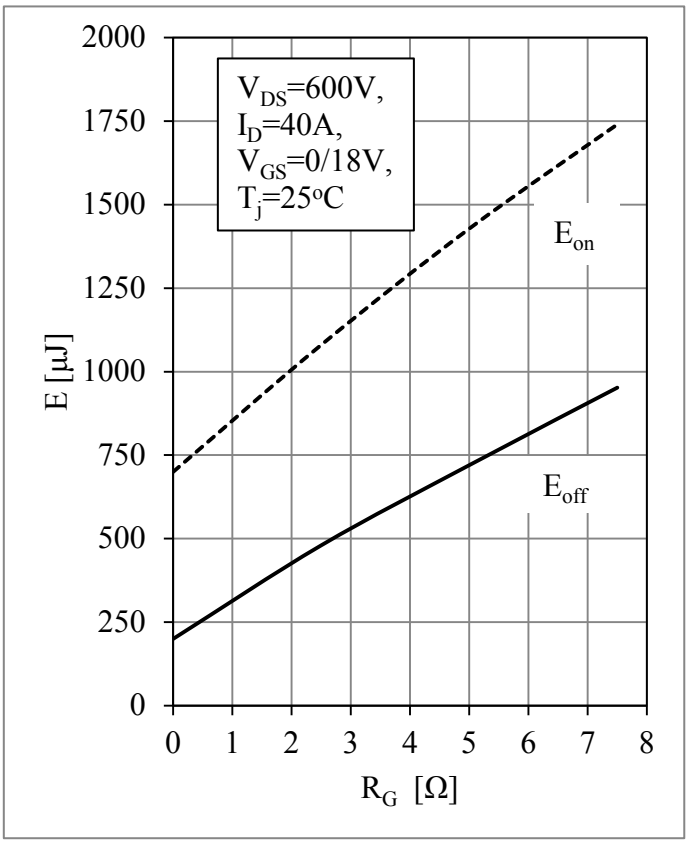


Fig 7. MOSFET Switching Loss vs. R_G

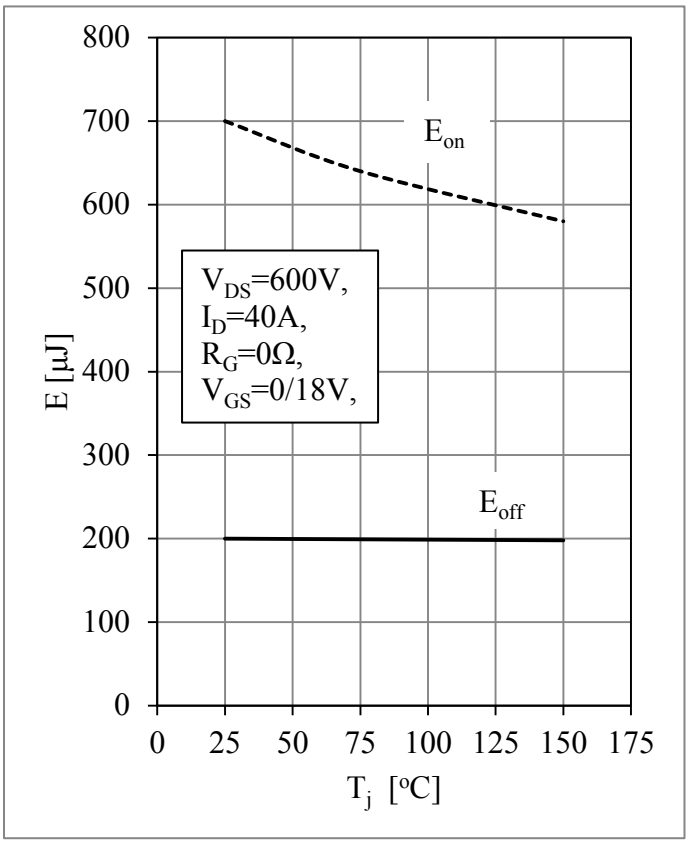


Fig 8. MOSFET Switching Loss vs. Temperature

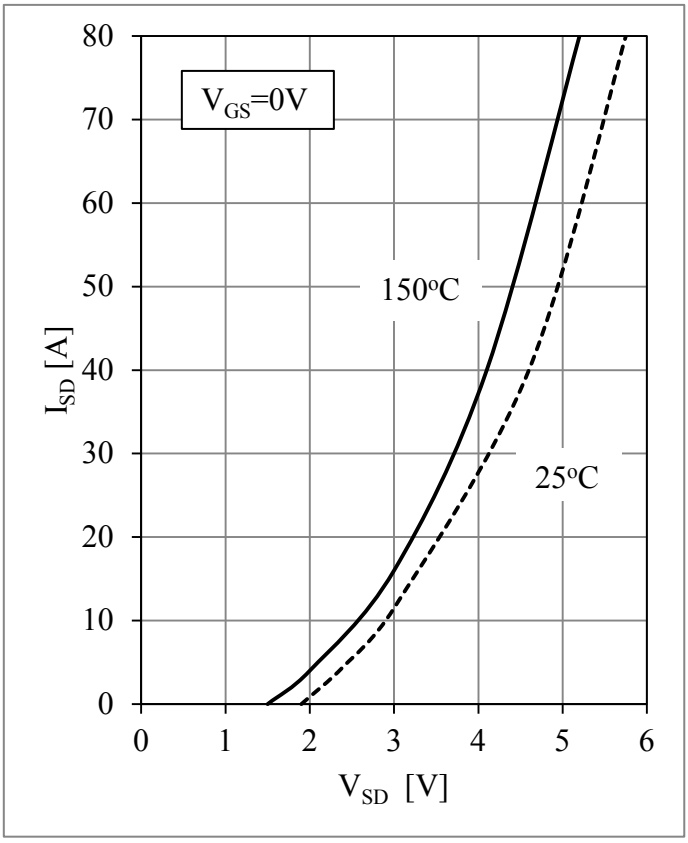


Fig 9. Body Diode Output Characteristics

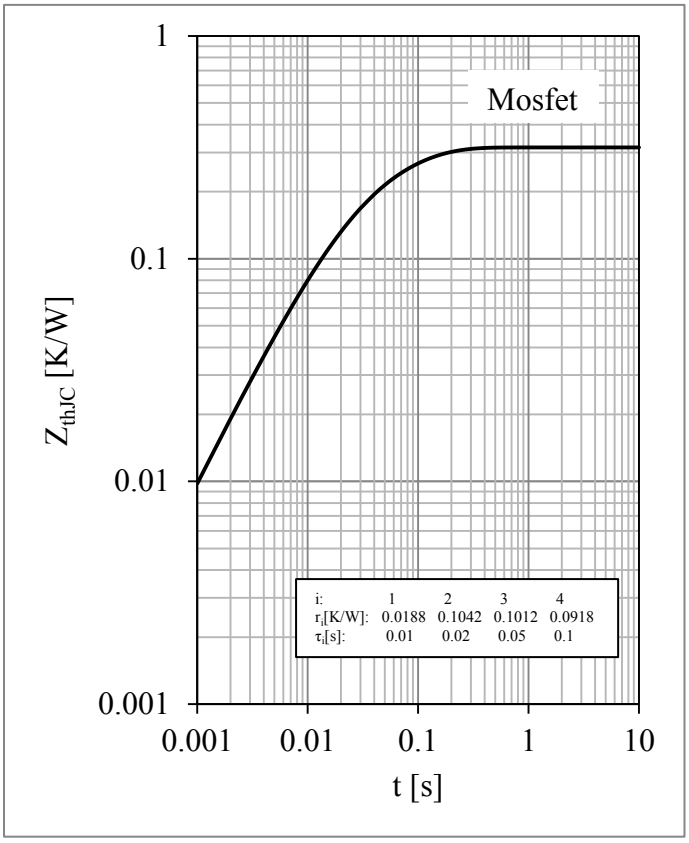
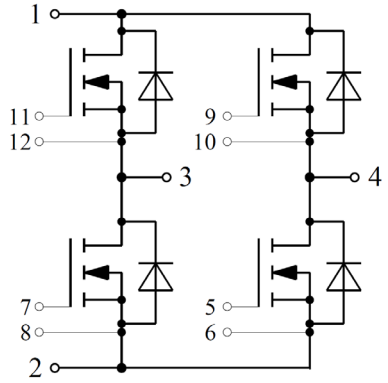


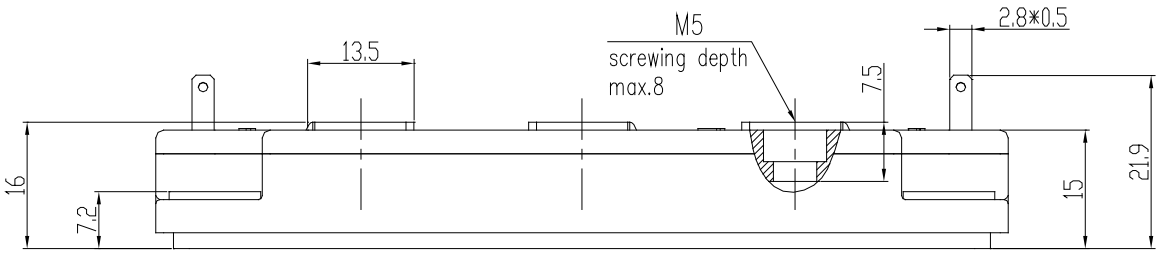
Fig 10. MOSFET Transient Thermal Impedance

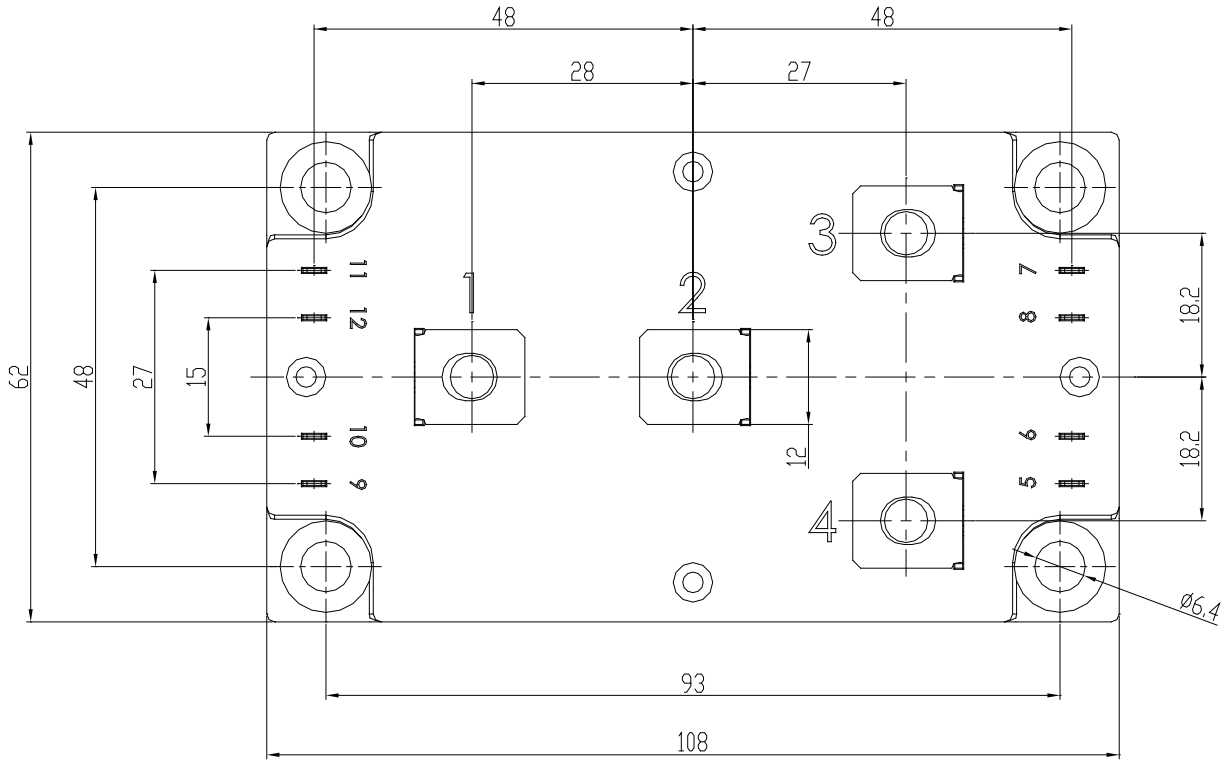
Circuit Schematic



Package Dimensions

Dimensions in Millimeters





Terms and Conditions of Usage

The data contained in this product datasheet is exclusively intended for technically trained staff. you and your technical departments will have to evaluate the suitability of the product for the intended application and the completeness of the product data with respect to such application.

This product data sheet is describing the characteristics of this product for which a warranty is granted. Any such warranty is granted exclusively pursuant the terms and conditions of the supply agreement. There will be no guarantee of any kind for the product and its characteristics.

Should you require product information in excess of the data given in this product data sheet or which concerns the specific application of our product, please contact the sales office, which is responsible for you (see www.powersemi.cc), For those that are specifically interested we may provide application notes.

Due to technical requirements our product may contain dangerous substances. For information on the types in question please contact the sales office, which is responsible for you.

Should you intend to use the Product in aviation applications, in health or live endangering or life support applications, please notify.

If and to the extent necessary, please forward equivalent notices to your customers.
Changes of this product data sheet are reserved.