STARPOWER

SEMICONDUCTOR **MOSFET**

MD75HFC120B3S

1200V/75A 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.

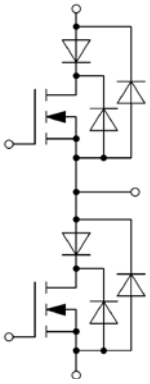
Features

- SiC power MOSFET
- Low $R_{DS(on)}$
- Optimized intrinsic reverse diode
- 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℃ 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℃ @ T_C=100℃	75 50	A
I_{DM}	Pulsed Drain Current	160	A
P_D	Maximum Power Dissipation @ T_j=175℃	259	W

Body Diode

Symbol	Description	Value	Unit
I_S	Source Current	75	A
I_{SM}	Pulsed Source Current	160	A

Forward Diode

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1200	V
I_F	Diode Continuous Forward Current	150	A
I_{FM}	Diode Maximum Forward Current	300	A

Reverse Diode

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1200	V
I_F	Diode Continuous Forward Current	150	A
I_{FM}	Diode Maximum Forward Current	300	A

Module

Symbol	Description	Value	Unit
T_{jmax}	Maximum Junction Temperature	175	℃
T_{jop}	Operating Junction Temperature	-40 to +150	℃
T_{STG}	Storage Temperature Range	-40 to +125	℃
V_{ISO}	Isolation Voltage RMS,f=50Hz,t=1min	4000	V

MOSFET Characteristics T_C=25℃ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$R_{DS(on)}$	Static Drain-Source On-Resistance	I_D=20A,V_{GS}=18V, T_j=25℃		40.0	58.5	mΩ
		I_D=20A,V_{GS}=18V, T_j=150℃		62.5		
$V_{GS(th)}$	Gate-Source Threshold Voltage	I_D=8.8mA,V_{DS}=10V, T_j=25℃	1.6		4.1	V
g_{fs}	Forward Transconductance	V_{DS}=10V,I_D=20A, T_j=25℃		7.4		S
I_{DSS}	Drain-Source Leakage Current	V_{DS}=V_{DSS},V_{GS}=0V, T_j=25℃			400	μA
I_{GSS}	Gate-Source Leakage Current	V_{GS}=V_{GSS},V_{DS}=0V, T_j=25℃			100	nA
R_{Gint}	Internal Gate Resistance			4.5		Ω
C_{iss}	Input Capacitance	V_{GS}=0V,V_{DS}=800V, f=1.0MHz		3700		pF
C_{oss}	Output Capacitance			350		pF
C_{rss}	Reverse Transfer Capacitance			40		pF
Q_g	Total Gate Charge	I_D=20A,V_{DS}=400V, V_{GS}=18V		212		nC
Q_{gs}	Gate-Source Charge			54.0		nC
Q_{gd}	Gate-Drain ("Miller") Charge			62.0		nC
$t_{d(on)}$	Turn-On Delay Time	V_{DS}=400V,I_D=20A, R_G=0Ω,V_{GS}=18V, T_j=25℃		38		ns
t_r	Rise Time			34		ns
$t_{d(off)}$	Turn-Off Delay Time			70		ns
t_f	Fall Time			28		ns

Body Diode Characteristics T_C=25℃ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_{SD}	Diode Forward Voltage	I_S=20A,V_{GS}=0V,T_j=25℃		1.30	1.75	V
t_{rr}	Diode Reverse Recovery Time	V_R=400V,I_S=20A, di/dt=300A/μs,V_{GS}=0V, T_j=25℃		38		ns
Q_r	Diode Reverse Recovery Charge			120		nC
I_{RM}	Peak Reverse Recovery Current			4.8		A

Forward Diode Characteristics T_C=25℃ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_F	Diode Forward Voltage	I_F=150A,V_{GS}=0V,T_j=25℃		2.45	2.90	V
t_{rr}	Diode Reverse Recovery Time	V_R=600V,I_F=150A, di/dt=1500A/μs,V_{GS}=0V T_j=25℃		110		ns
Q_r	Recovered Charge			8.1		μC
I_{RM}	Peak Reverse Recovery Current			133		A

Reverse Diode Characteristics T_C=25℃ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_F	Diode Forward Voltage	I_F=150A,V_{GS}=0V,T_j=25℃		2.45	2.90	V
t_{rr}	Diode Reverse Recovery Time	V_R=600V,I_F=150A, di/dt=1500A/μs,V_{GS}=0V T_j=25℃		110		ns
Q_r	Recovered Charge			8.1		μC
I_{RM}	Peak Reverse Recovery Current			133		A

Module Characteristics T_C=25℃ unless otherwise noted

Symbol	Parameter	Min.	Typ.	Max.	Unit
$R_{\theta JC}$	Junction-to-Case(MOSFET) Junction-to-Case(Forward Diode) Junction-to-Case(Reverse Diode)			0.579 0.267 0.267	K/W
$R_{\theta CS}$	Case-to-Sink(MOSFET) Case-to-Sink(Forward Diode) Case-to-Sink(Reverse Diode)		0.374 0.172 0.172		K/W
$R_{\theta CS}$	Case-to-Sink		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

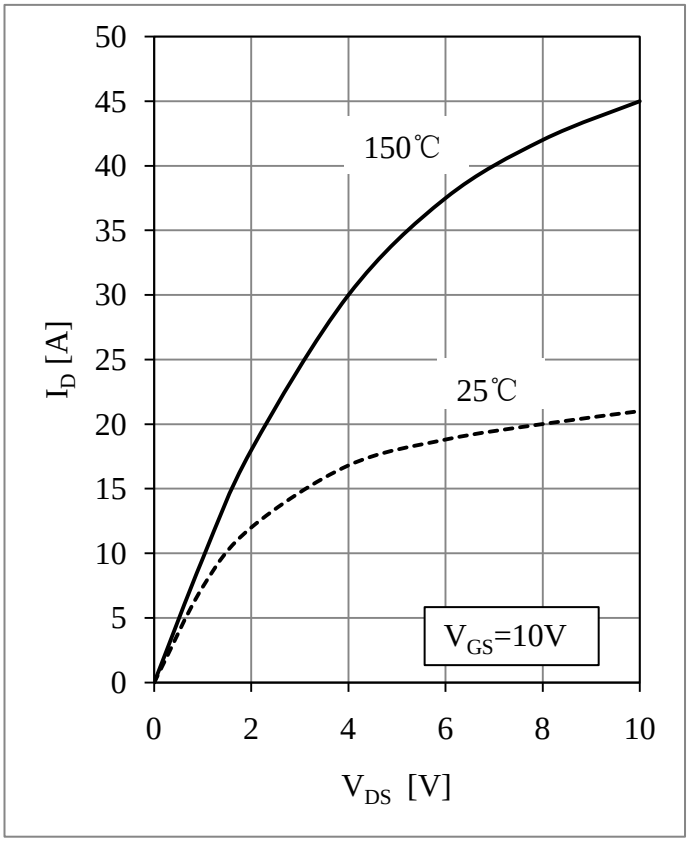


Fig 1. MOSFET Output Characteristics

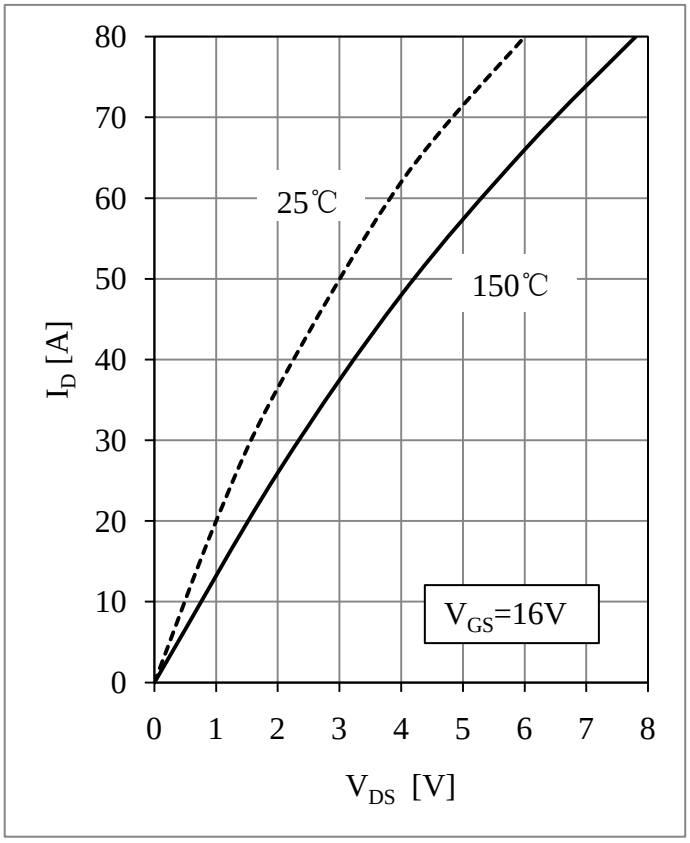


Fig 2. MOSFET Output Characteristics

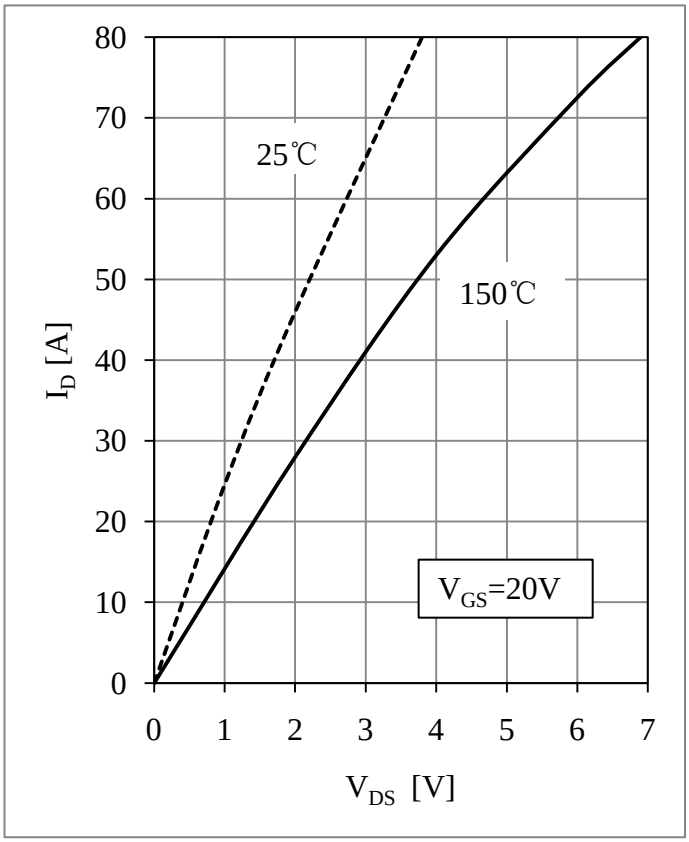


Fig 3. MOSFET Output Characteristics

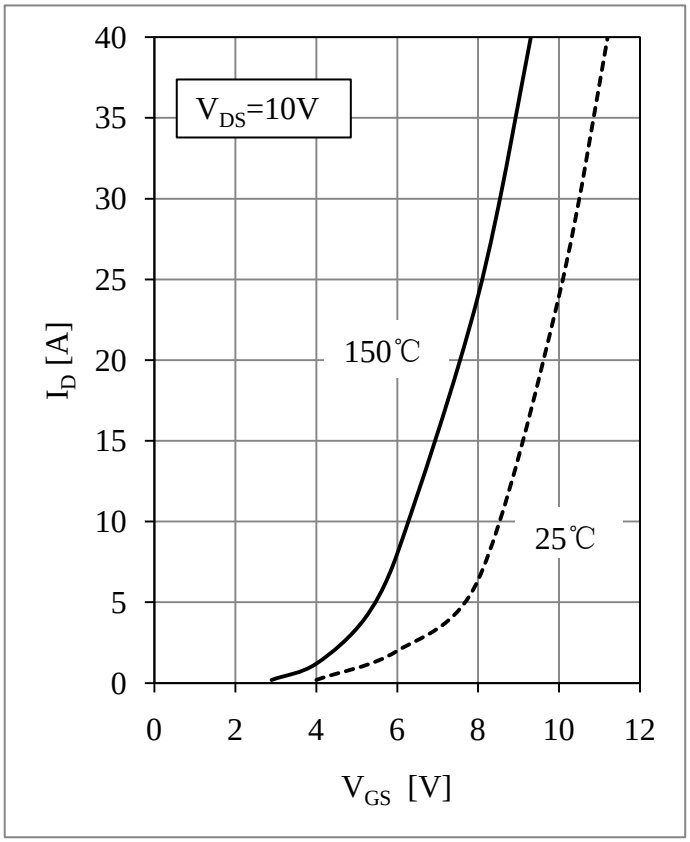


Fig 4. MOSFET Transfer Characteristics

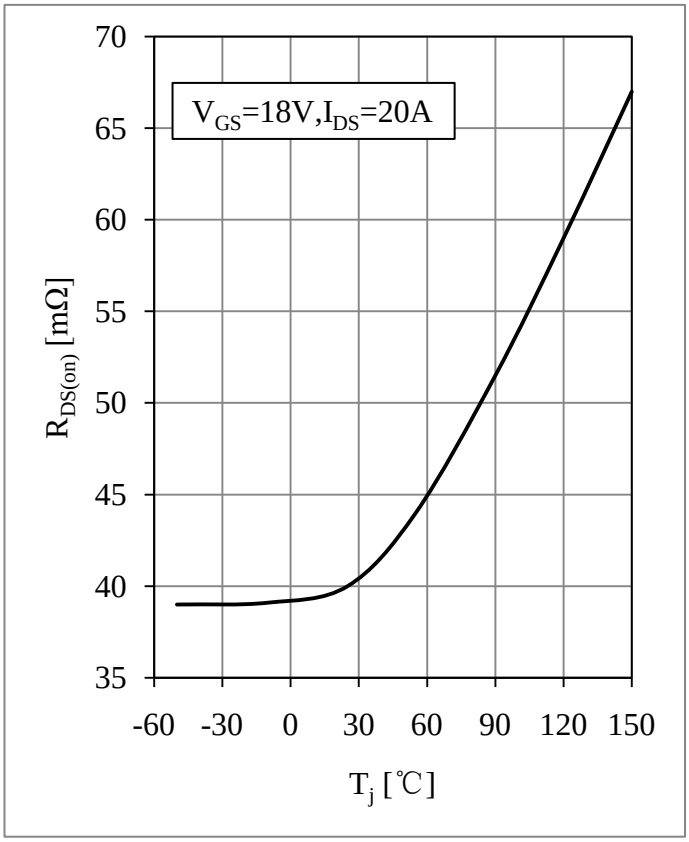


Fig 5. MOSFET On-Resistance vs. Temperature

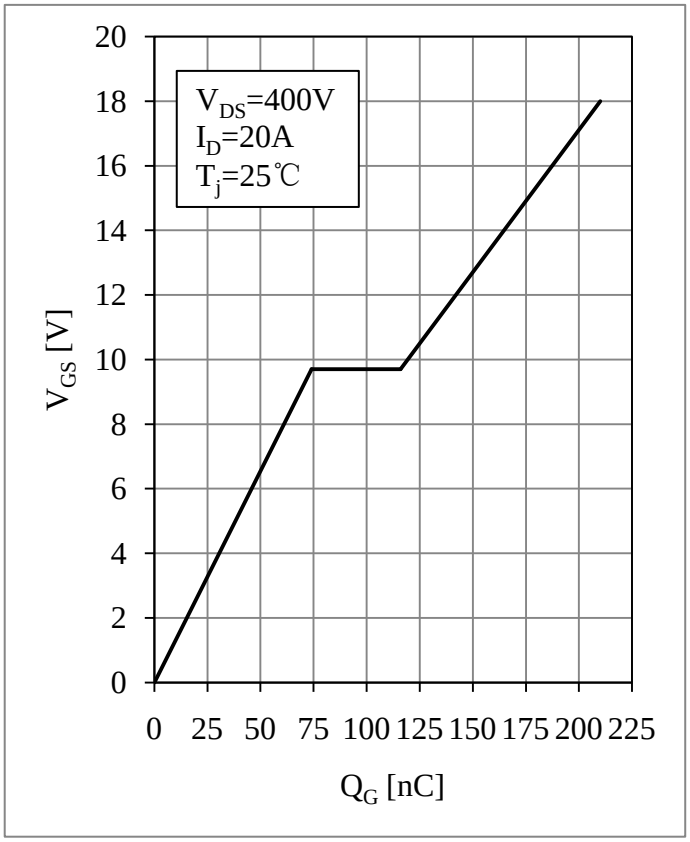


Fig 6. MOSFET Gate Charge Characteristic

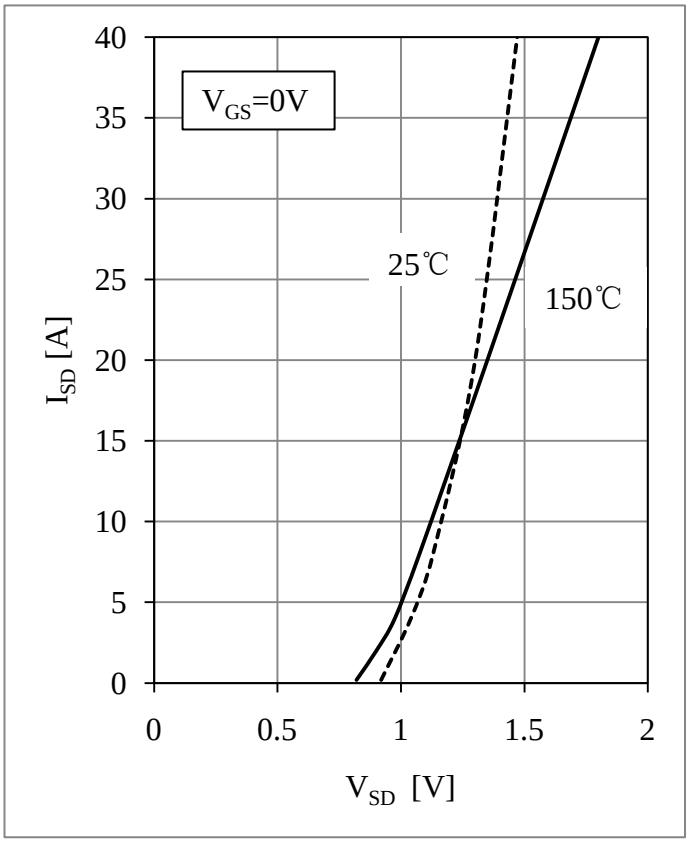


Fig 7. Body Diode Output Characteristics

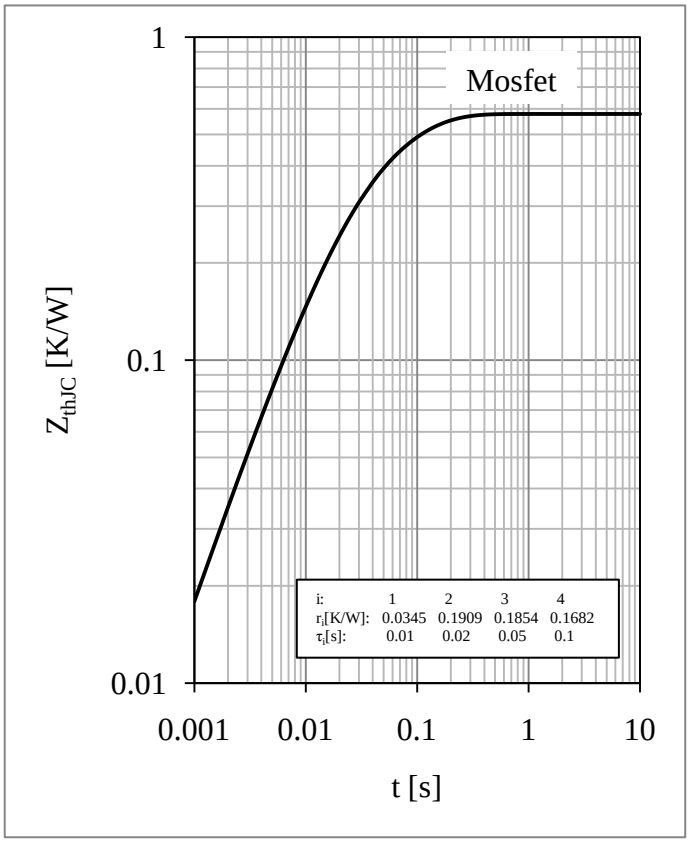


Fig 8. MOSFET Transient Thermal Impedance

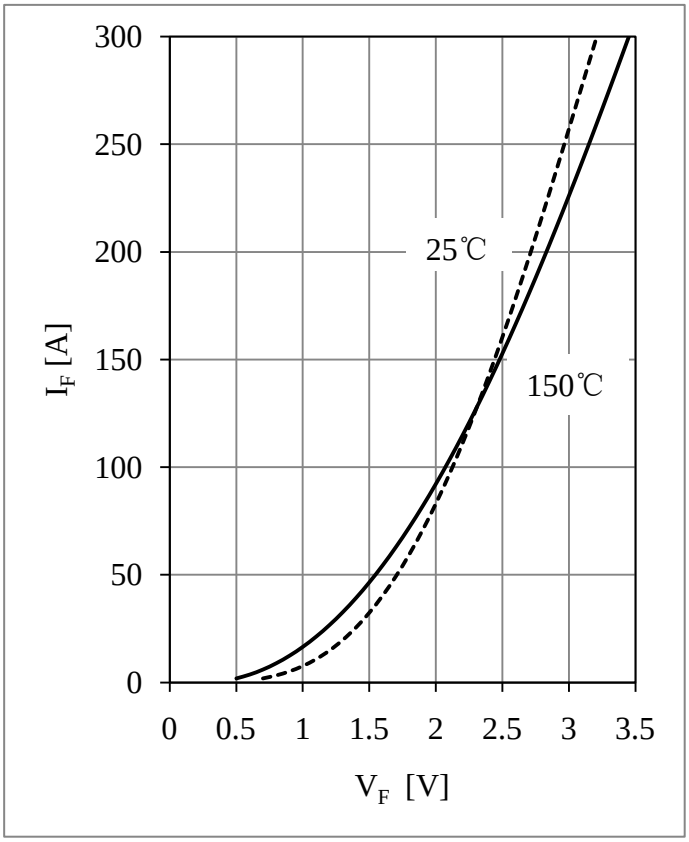


Fig 9. Forward Diode Forward Characteristics

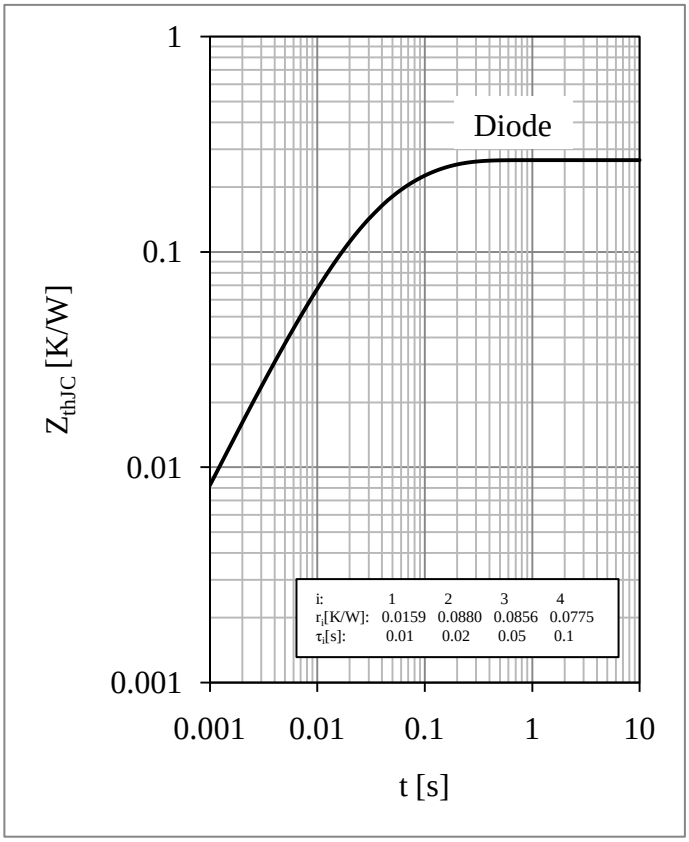


Fig 10. Forward Diode Transient Thermal Impedance

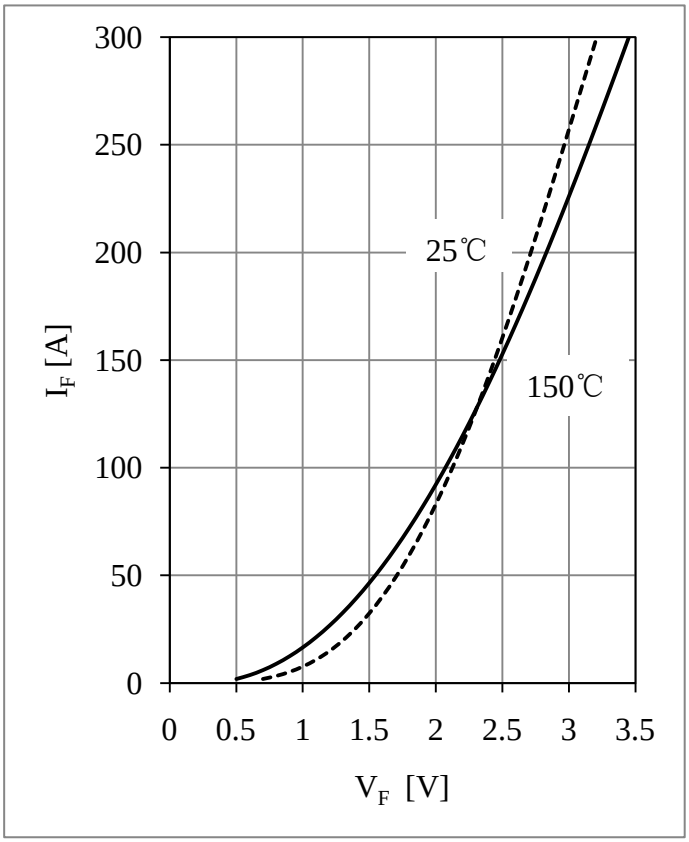


Fig 11. Reverse Diode Forward Characteristics

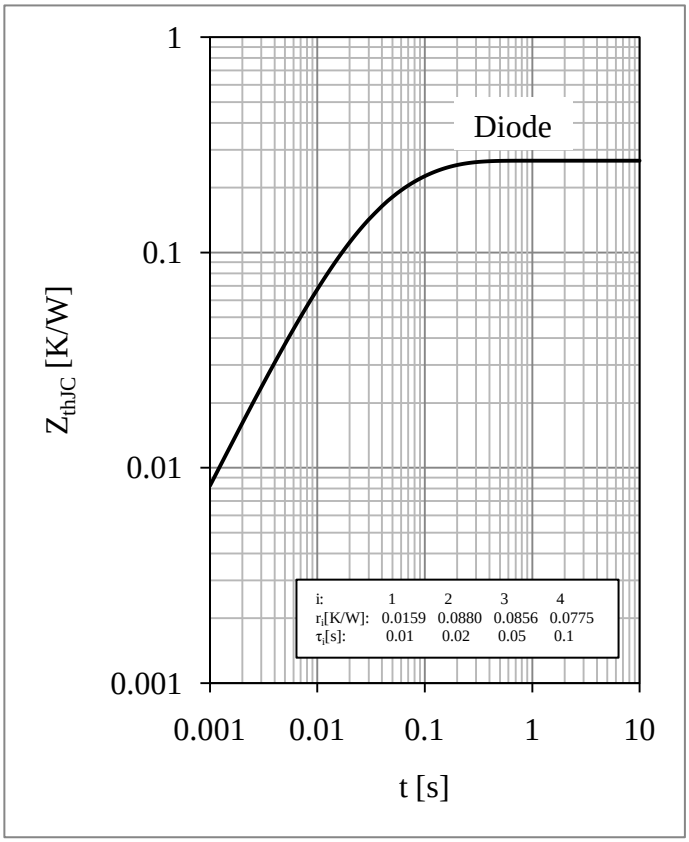
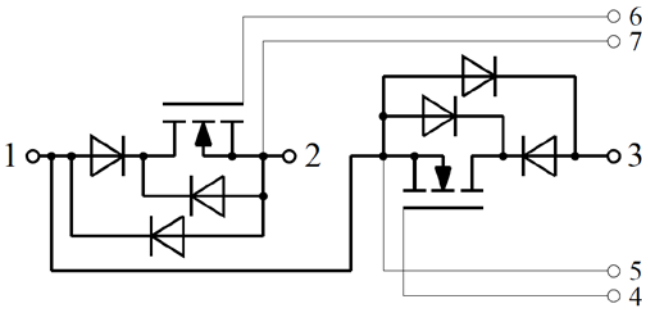


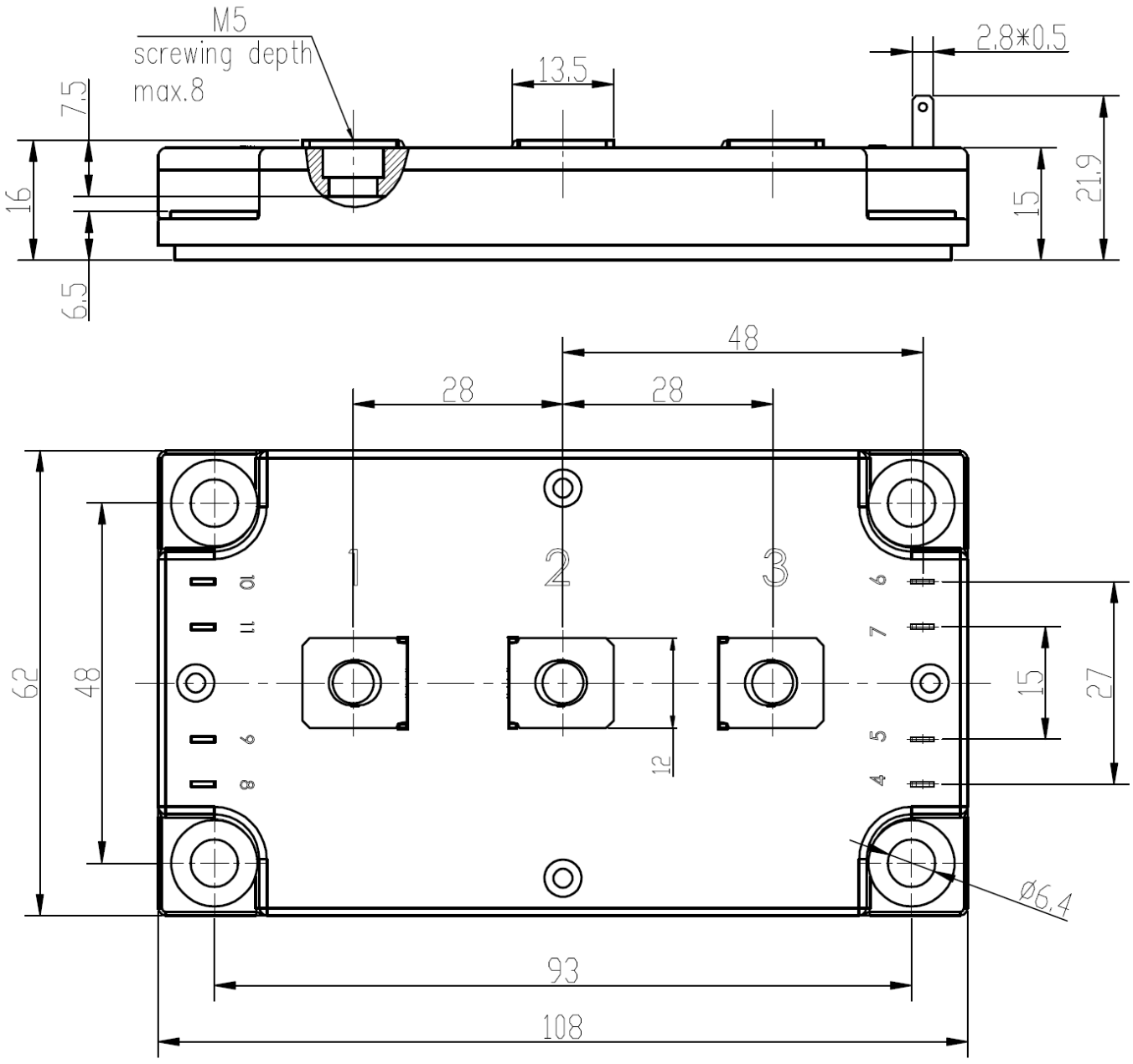
Fig 12. Reverse Diode Transient Thermal Impedance

Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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