STARPOWER

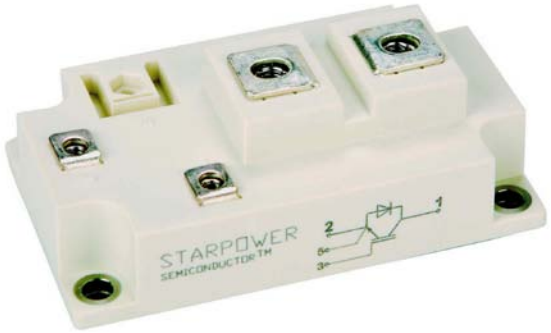
SEMICONDUCTOR™

IGBT

GD400SGT170C2S

Molding Type Module

1700V/400A 1 in one-package

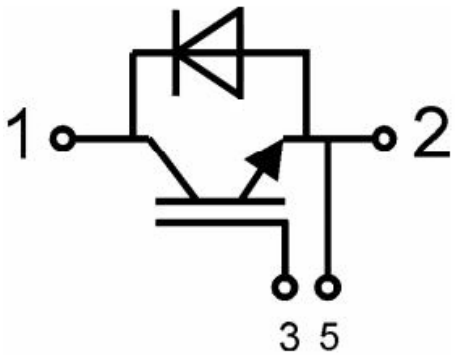


General Description

STARPOWER IGBT Power Module provides ultra low conduction loss as well as short circuit ruggedness. They are designed for the applications such as Inverters and UPS.

Features

- Low $V_{CE(sat)}$ trench IGBT technology
- Low switching losses
- 10μs short circuit capability
- $V_{CE(sat)}$ with positive temperature coefficient
- Low inductance case
- Fast & soft reverse recovery anti-parallel FWD
- Isolated copper baseplate using DBC technology



Equivalent Circuit Schematic

Typical Applications

- AC inverter drives
- Switching mode power supplies

Absolute Maximum Ratings T_C=25℃ unless otherwise noted

Symbol	Description	GD400SGT170C2S	Units
V_{CES}	Collector-Emitter Voltage	1700	V
V_{GES}	Gate-Emitter Voltage	±20	V

Symbol	Description	GD400SGT170C2S	Units
I_C	Collector Current @ T_C=25℃	700	A
	@ T_C=80℃	400	
$I_{CM(1)}$	Pulsed Collector Current t_p=1ms	800	A
I_F	Diode Continuous Forward Current	400	A
I_{FM}	Diode Maximum Forward Current	800	A
P_D	Maximum Power Dissipation @ T_j=175℃	3000	W
T_{SC}	Short Circuit Withstand Time @ T_j=125℃	10	μs
T_{jmax}	Maximum Junction Temperature	175	℃
T_{STG}	Storage Temperature Range	-40 to +125	℃
I^2t-value,Diode	V_R=0V,t=10ms,T_j=125℃	25500	A^2s
V_{ISO}	Isolation Voltage RMS,f=50Hz,t=1min	4000	V
Mounting Torque	Power Terminal Screw:M4	1.1 to 2.0	N.m
	Power Terminal Screw:M6	2.5 to 5.0	
	Mounting Screw:M6	3.0 to 5.0	N.m

Notes:

(1) Repetitive rating: Pulse width limited by max. junction temperature

Electrical Characteristics of IGBT T_C=25℃ unless otherwise noted

Off Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{(BR)CES}$	Collector-Emitter Breakdown Voltage	V_{GE}=0V, I_C=14mA, T_j=25℃	1700			V
I_{CES}	Collector Cut-Off Current	V_{CE}=V_{CES},V_{GE}=0V, T_j=25℃			3.0	mA
I_{GES}	Gate-Emitter Leakage Current	V_{GE}=V_{GES},V_{CE}=0V, T_j=25℃			400	nA

On Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=16mA,V_{CE}=V_{GE}, T_j=25℃	5.2	5.8	6.4	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C=400A,V_{GE}=15V, T_j=25℃		2.00	2.45	V
		I_C=400A,V_{GE}=15V, T_j=125℃		2.40		

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=900V,I_C=400A,		278		ns
t_r	Rise Time	R_G=3.6Ω,V_{GE}=±15V,		81		ns
$t_{d(off)}$	Turn-Off Delay Time	T_j=25℃		802		ns

t_f	Fall Time	V_{CC}=900V,I_C=400A, R_G=3.6Ω,V_{GE}=±15V, T_j=25℃		119		ns
E_{on}	Turn-On Switching Loss			104		mJ
E_{off}	Turn-Off Switching Loss			86		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=900V,I_C=400A, R_G=3.6Ω,V_{GE}=±15V, T_j=125℃		302		ns
t_r	Rise Time			99		ns
$t_{d(off)}$	Turn-Off Delay Time			1002		ns
t_f	Fall Time			198		ns
E_{on}	Turn-On Switching Loss			136		mJ
E_{off}	Turn-Off Switching Loss			124		mJ
C_{ies}	Input Capacitance	V_{CE}=25V,f=1MHz, V_{GE}=0V		36		nF
C_{oes}	Output Capacitance			1.5		nF
C_{res}	Reverse Transfer Capacitance			1.2		nF
I_{SC}	SC Data	t_{SC}≤10μs,V_{GE}=15V, T_j=125℃,V_{CC}=1000V, V_{CEM}≤1700V		1600		A
R_{Gint}	Internal Gate Resistance			1.9		Ω
L_{CE}	Stray Inductance				20	nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal to Chip	T_C=25℃		0.18		mΩ

Electrical Characteristics of DIODE T_C=25℃ unless otherwise noted

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Units
V_F	Diode Forward Voltage	I_F=400A	T_j=25℃		1.80	2.20	V
			T_j=125℃		1.90		
Q_r	Diode Reverse Recovery Charge	I_F=400A, V_R=900V, di/dt=-4250A/μs, V_{GE}=-15V	T_j=25℃		99		μC
			T_j=125℃		172		
I_{RM}	Diode Peak Reverse Recovery Current		T_j=25℃		441		A
			T_j=125℃		478		
E_{rec}	Reverse Recovery Energy		T_j=25℃		53		mJ
			T_j=125℃		97		

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{θJC}$	Junction-to-Case (IGBT Part, per Module)		0.05	K/W
$R_{θJC}$	Junction-to-Case (DIODE Part, per Module)		0.09	K/W
$R_{θCS}$	Case-to-Sink (Conductive grease applied)	0.035		K/W
Weight	Weight of Module	300		g

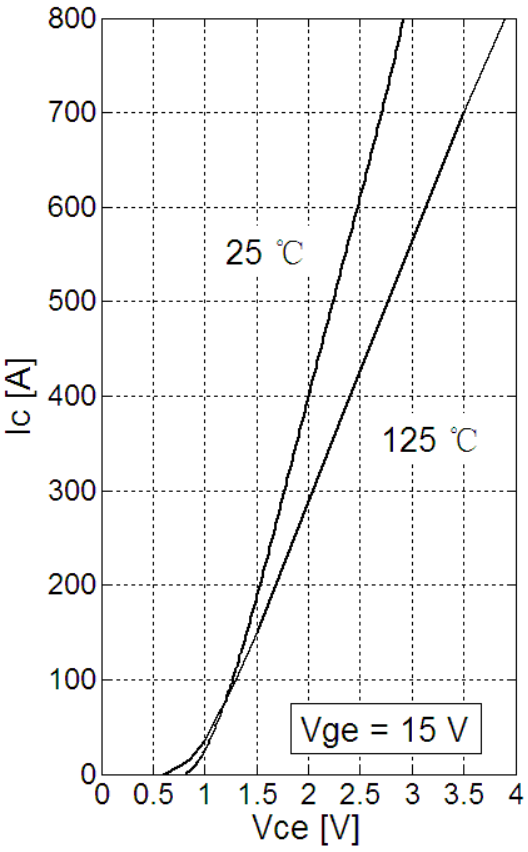


Fig 1. IGBT Typical Output Characteristics

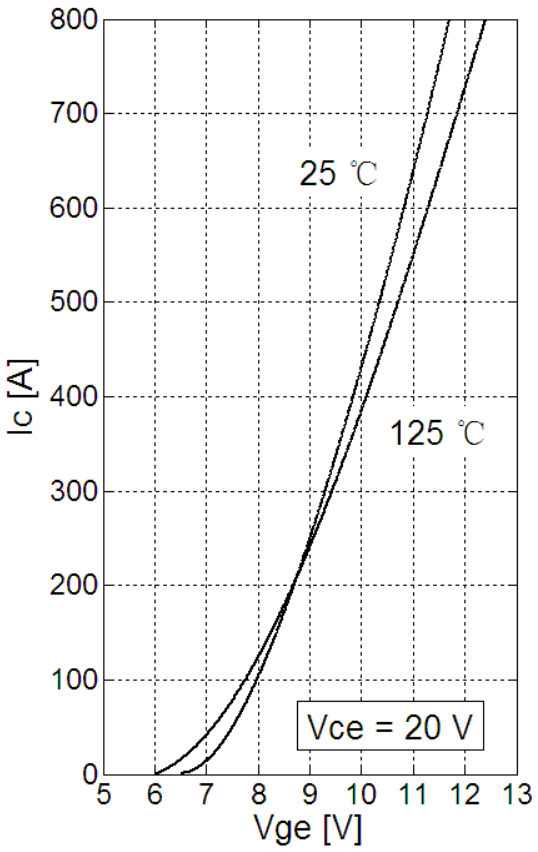


Fig 2. IGBT Typical Transfer Characteristics

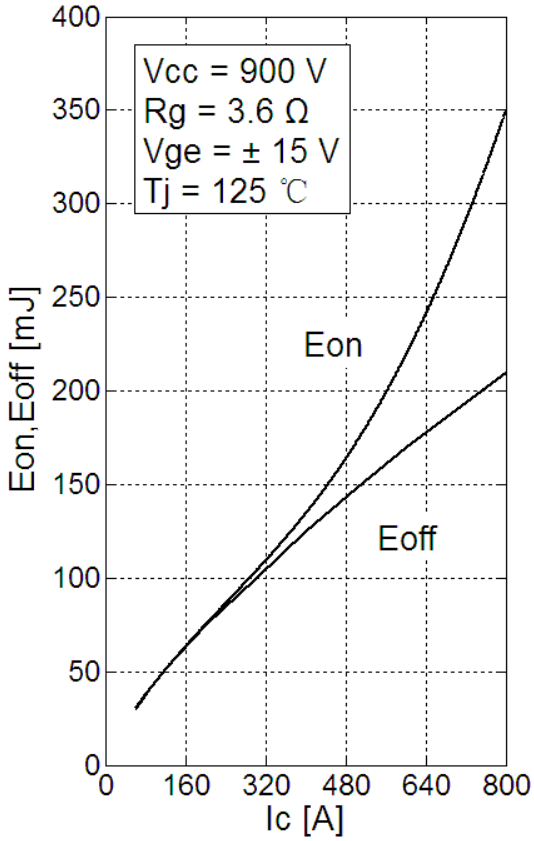


Fig 3. IGBT Switching Loss vs. I_C

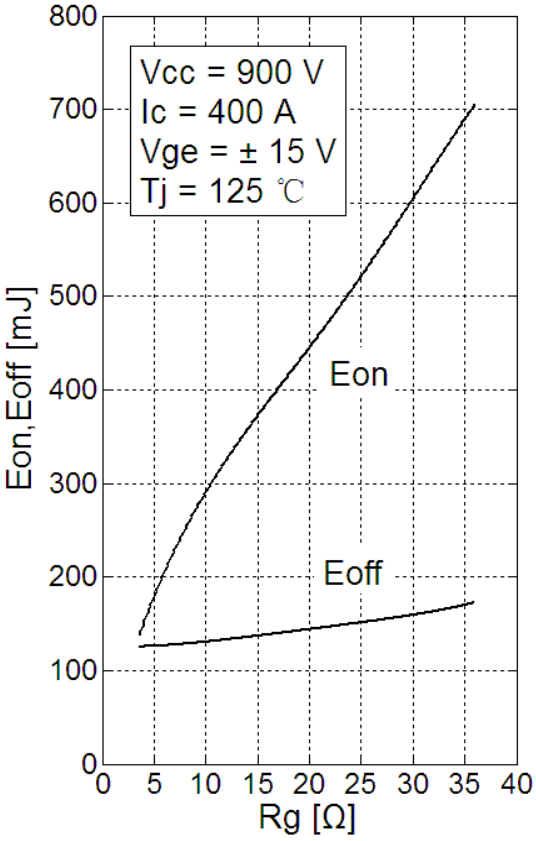


Fig 4. IGBT Switching Loss vs. R_G

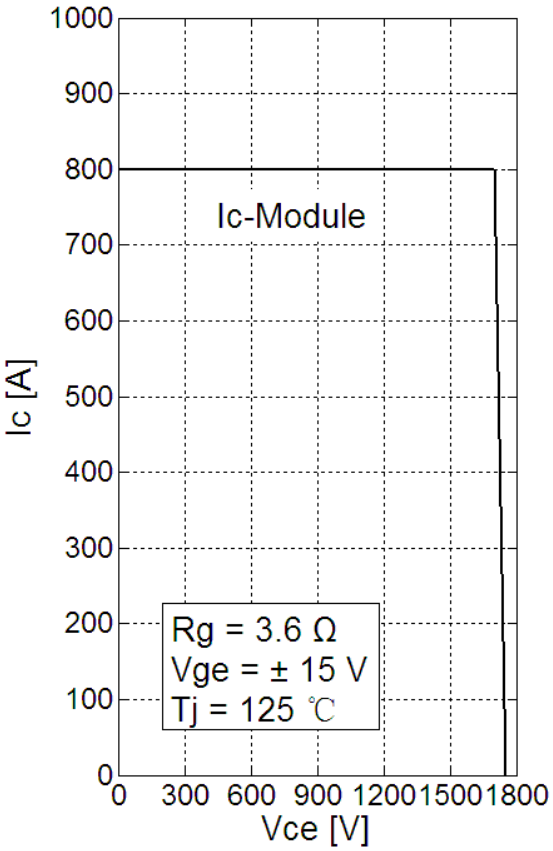


Fig 5. RBSOA

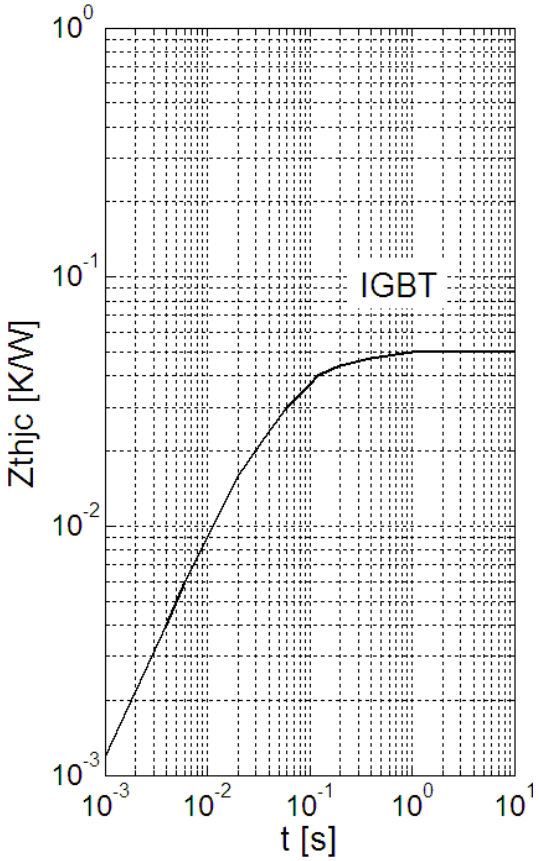


Fig 6. IGBT Transient Thermal Impedance

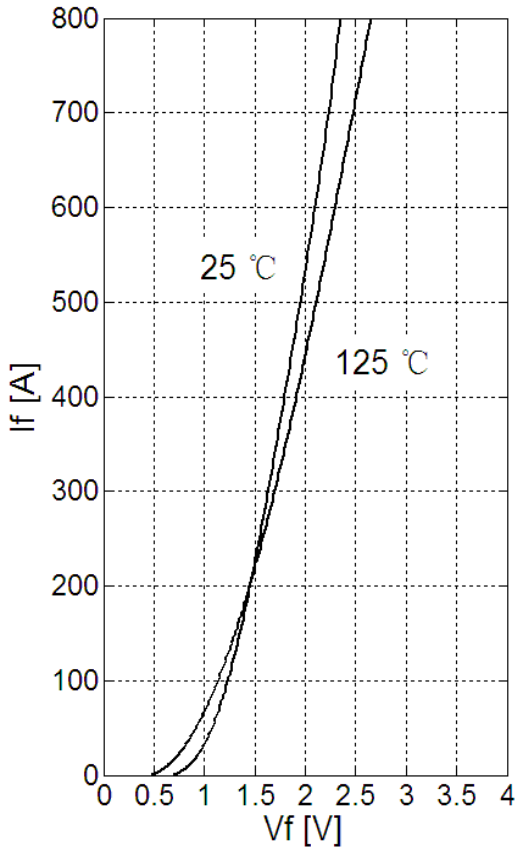


Fig 7. Diode Forward Characteristics

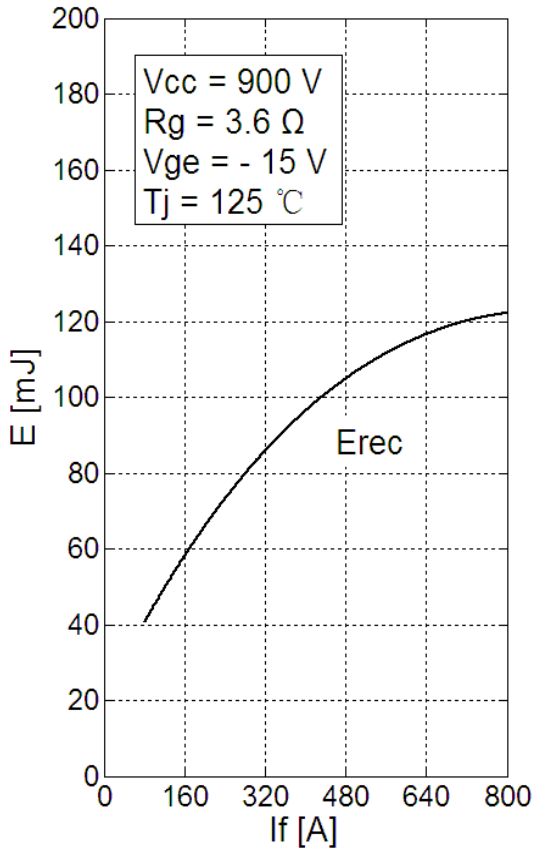


Fig 8. Diode Switching Loss vs. I_F

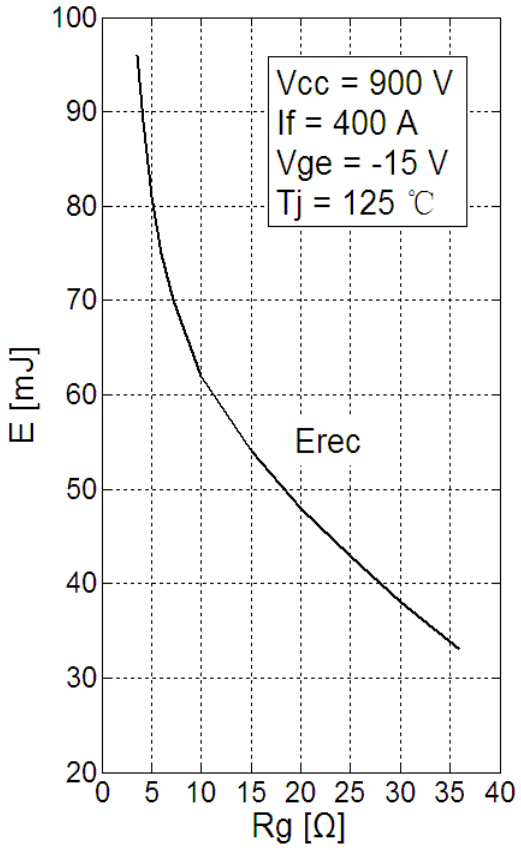


Fig 9. Diode Switching Loss vs. R_G

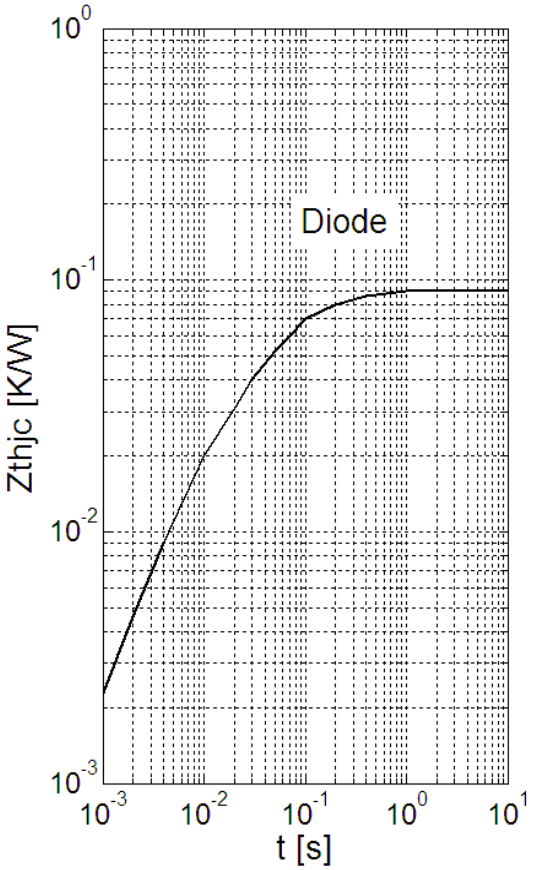
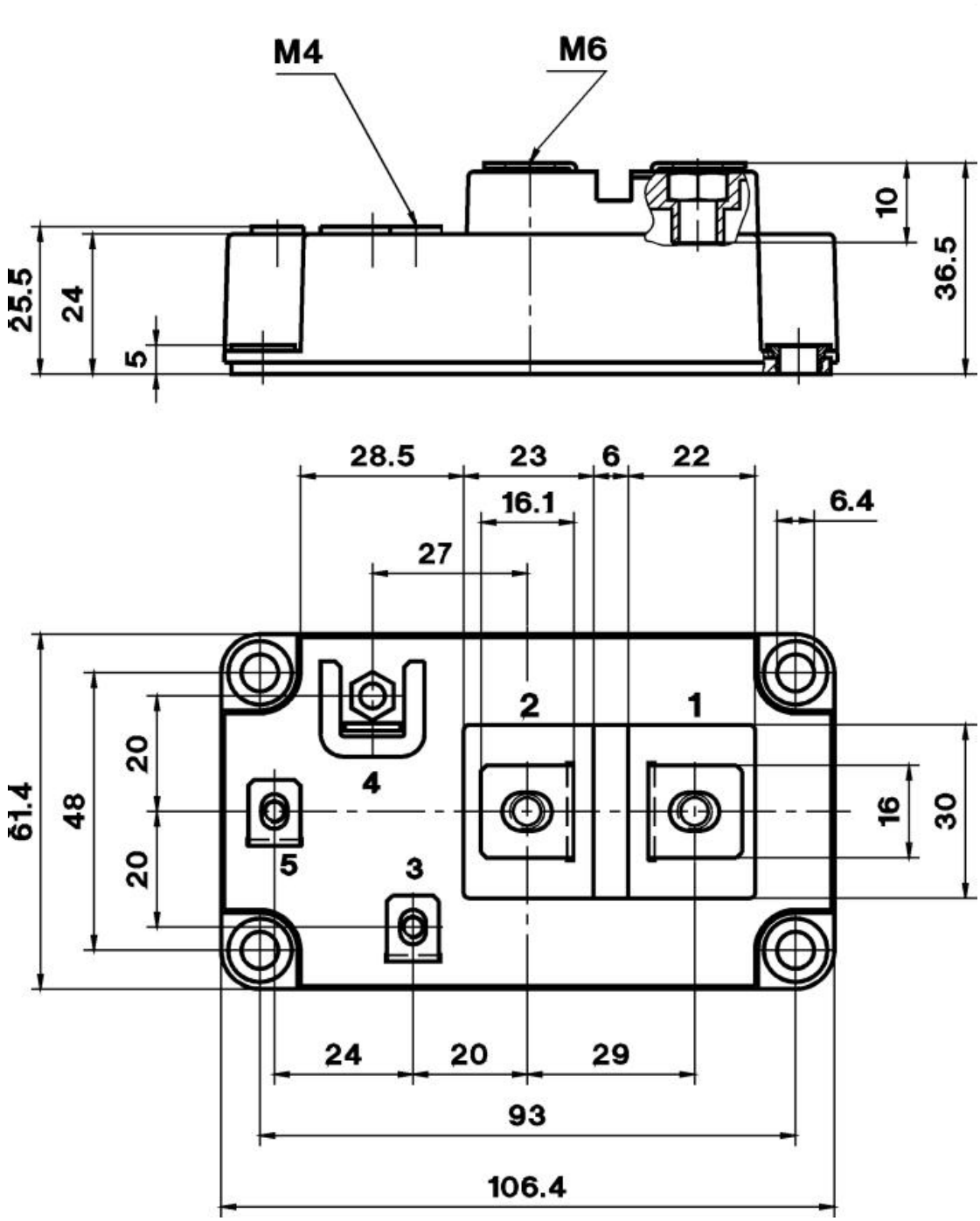


Fig 10. Diode Transient Thermal Impedance

Package Dimension

Dimensions in Millimeters



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