

STARPOWER

SEMICONDUCTOR

IGBT

GD400SGL170C2S

Molding Type Module

1700V/400A 1 in one-package

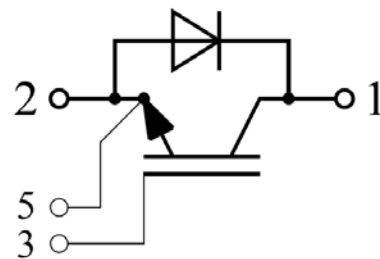
General Description

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



Features

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



Equivalent Circuit Schematic

Typical Applications

- Inverter for motor drive
- AC and DC servo drive amplifier
- Uninterruptible power supply

Absolute Maximum Ratings $T_C=25^{\circ}\text{C}$ unless otherwise noted

Symbol	Description	GD400SGL170C2S	Units
V_{CES}	Collector-Emitter Voltage	1700	V
V_{GES}	Gate-Emitter Voltage	± 20	V
I_C	Collector Current @ $T_C=25^{\circ}\text{C}$	585	A
	@ $T_C=95^{\circ}\text{C}$	400	
I_{CM}	Pulsed Collector Current $t_p=1\text{ms}$	800	A
I_F	Diode Continuous Forward Current	400	A
I_{FM}	Diode Maximum Forward Current $t_p=1\text{ms}$	800	A
P_D	Maximum Power Dissipation @ $T_j=175^{\circ}\text{C}$	2778	W
T_{jmax}	Maximum Junction Temperature	175	$^{\circ}\text{C}$
T_{jop}	Operating Junction Temperature	-40 to +150	$^{\circ}\text{C}$
T_{stg}	Storage Temperature Range	-40 to +125	$^{\circ}\text{C}$
V_{ISO}	Isolation Voltage RMS, $f=50\text{Hz}, t=1\text{min}$	4000	V
M	Terminal Connection Torque, Screw M4	1.1 to 2.0	N.m
	Terminal Connection Torque, Screw M6	2.5 to 5.0	
	Mounting Torque, Screw M6	3.0 to 5.0	
G	Weight of Module	300	g

Electrical Characteristics of IGBT $T_C=25^{\circ}\text{C}$ unless otherwise noted**Off Characteristics**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{(BR)CES}$	Collector-Emitter Breakdown Voltage	$T_j=25^{\circ}\text{C}$	1700			V
I_{CES}	Collector Cut-Off Current	$V_{CE}=V_{CES}, V_{GE}=0\text{V}, T_j=25^{\circ}\text{C}$			5.0	mA
I_{GES}	Gate-Emitter Leakage Current	$V_{GE}=V_{GES}, V_{CE}=0\text{V}, T_j=25^{\circ}\text{C}$			400	nA

On Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=16.0\text{mA}, V_{CE}=V_{GE}, T_j=25^{\circ}\text{C}$	5.4	6.2	7.4	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C=400\text{A}, V_{GE}=15\text{V}, T_j=25^{\circ}\text{C}$		2.50	2.95	V
		$I_C=400\text{A}, V_{GE}=15\text{V}, T_j=125^{\circ}\text{C}$		3.00		

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=900V, I_C=400A,$ $R_G=3.4\Omega, V_{GE}=\pm 15V,$ $T_j=25^\circ C$		402		ns
t_r	Rise Time			129		ns
$t_{d(off)}$	Turn-Off Delay Time			371		ns
t_f	Fall Time			383		ns
E_{on}	Turn-On Switching Loss			149		mJ
E_{off}	Turn-Off Switching Loss			72.2		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=900V, I_C=400A,$ $R_G=3.4\Omega, V_{GE}=\pm 15V,$ $T_j=125^\circ C$		716		ns
t_r	Rise Time			133		ns
$t_{d(off)}$	Turn-Off Delay Time			757		ns
t_f	Fall Time			500		ns
E_{on}	Turn-On Switching Loss			175		mJ
E_{off}	Turn-Off Switching Loss			129		mJ
C_{ies}	Input Capacitance	$V_{CE}=25V, f=1MHz,$ $V_{GE}=0V$		24.0		nF
C_{res}	Reverse Transfer Capacitance			0.92		nF
I_{SC}	SC Data	$t_p \leq 10\mu s, V_{GE}=15V,$ $T_j=125^\circ C, V_{CC}=1300V,$ $V_{CEM} \leq 1700V$		1240		A
Q_G	Gate Charge	$V_{CC}=900V, I_C=400A,$ $V_{GE}=-15 \dots +15V$		3.08		μC
L_{CE}	Stray Inductance				20	nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal To Chip			0.18		m Ω

Electrical Characteristics of Diode $T_C=25^\circ C$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
V_F	Diode Forward Voltage	$I_F=400A$	$T_j=25^\circ C$	1.80	2.25	V
			$T_j=125^\circ C$	1.95		
Q_r	Recovered Charge	$I_F=400A,$	$T_j=25^\circ C$	102		μC
			$T_j=125^\circ C$	140		
I_{RM}	Peak Reverse Recovery Current	$V_R=900V,$ $R_G=3.4\Omega,$	$T_j=25^\circ C$	286		A
			$T_j=125^\circ C$	380		
E_{rec}	Reverse Recovery Energy	$V_{GE}=-15V$	$T_j=25^\circ C$	56.9		mJ
			$T_j=125^\circ C$	76.6		

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case (per IGBT)		0.054	K/W
$R_{\theta JC}$	Junction-to-Case (per Diode)		0.089	K/W
$R_{\theta CS}$	Case-to-Sink (Conductive grease applied)	0.035		K/W

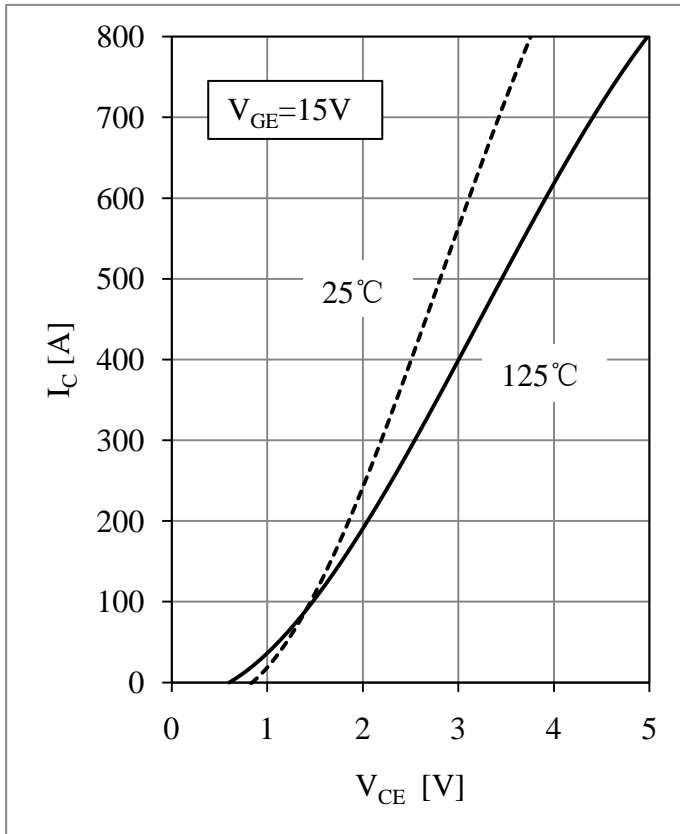


Fig 1. IGBT Output Characteristics

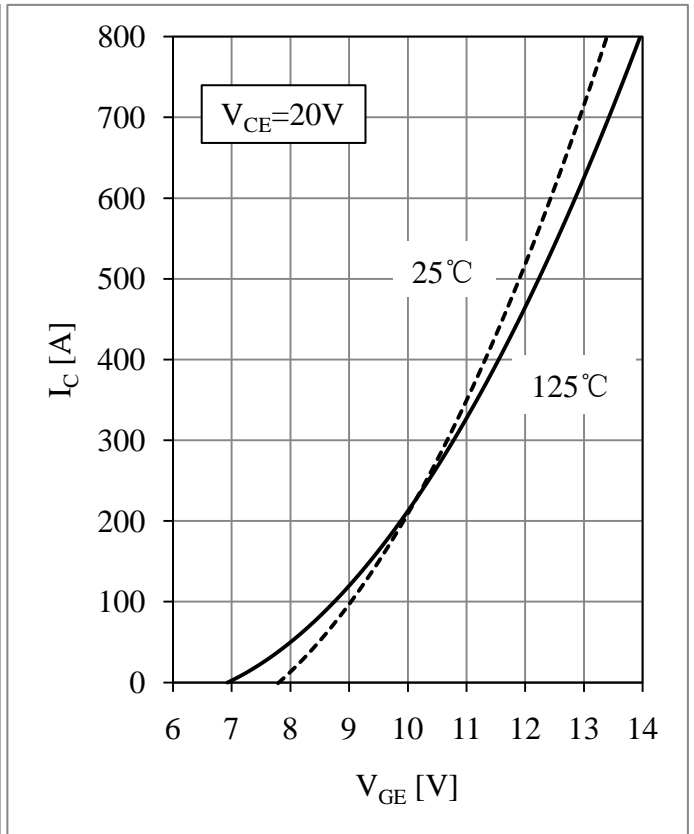


Fig 2. IGBT Transfer Characteristics

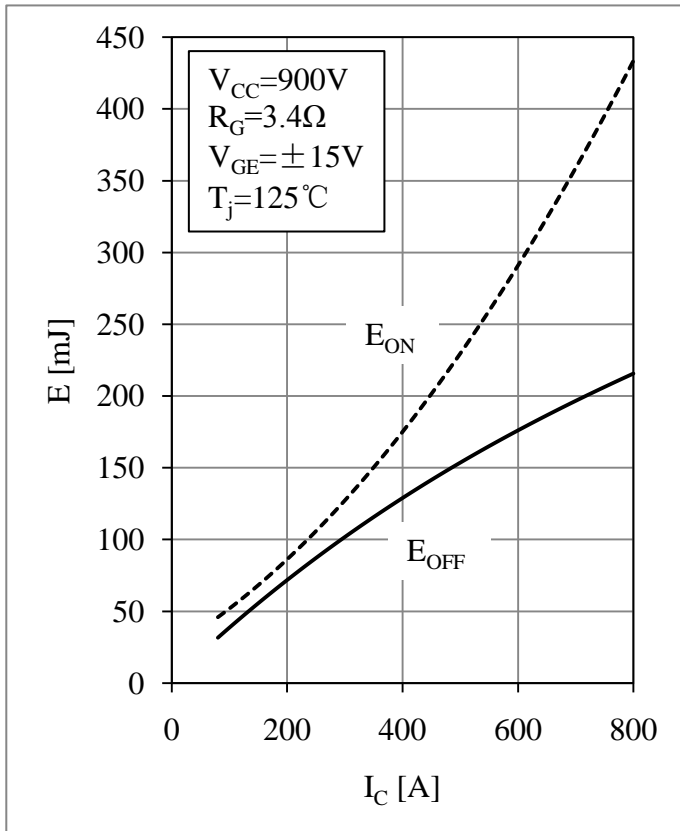


Fig 3. IGBT Switching Loss vs. I_C

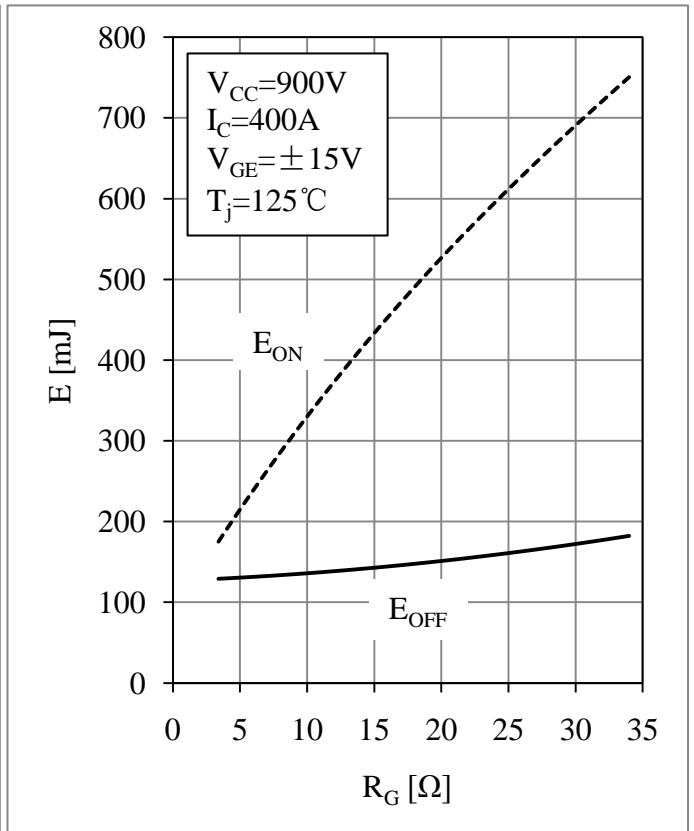


Fig 4. IGBT Switching Loss vs. R_G

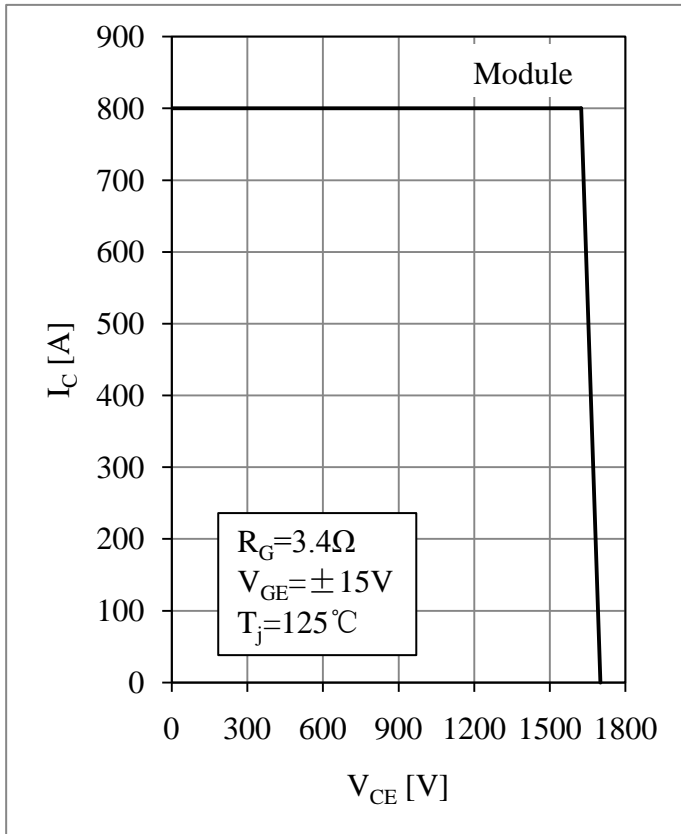


Fig 5. RBSOA

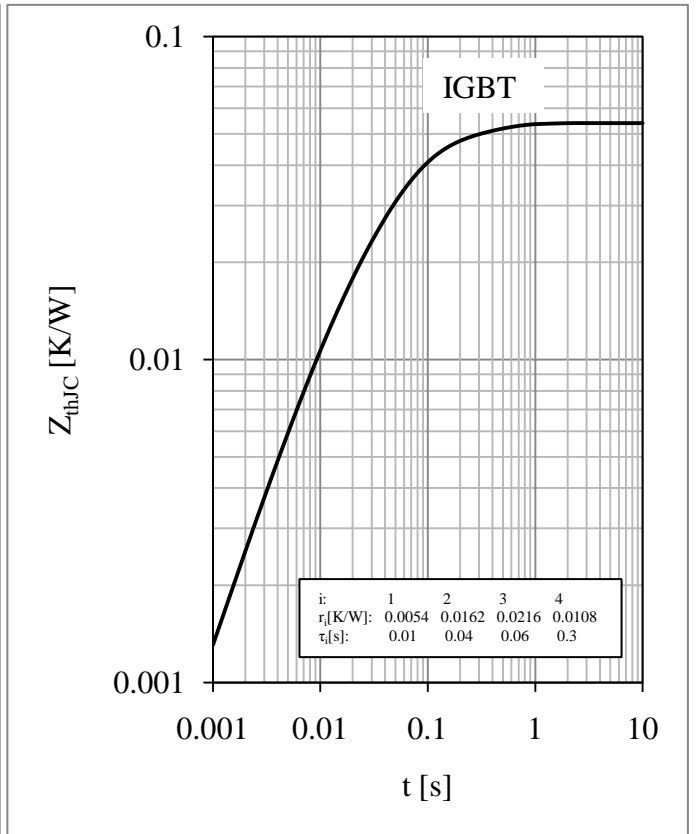


Fig 6. IGBT Transient Thermal Impedance

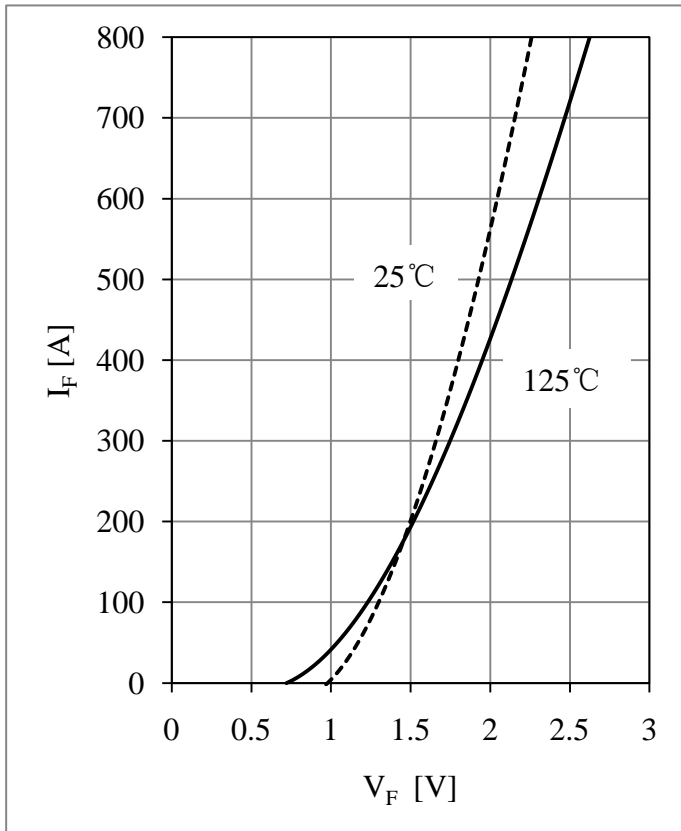


Fig 7. Diode Forward Characteristic

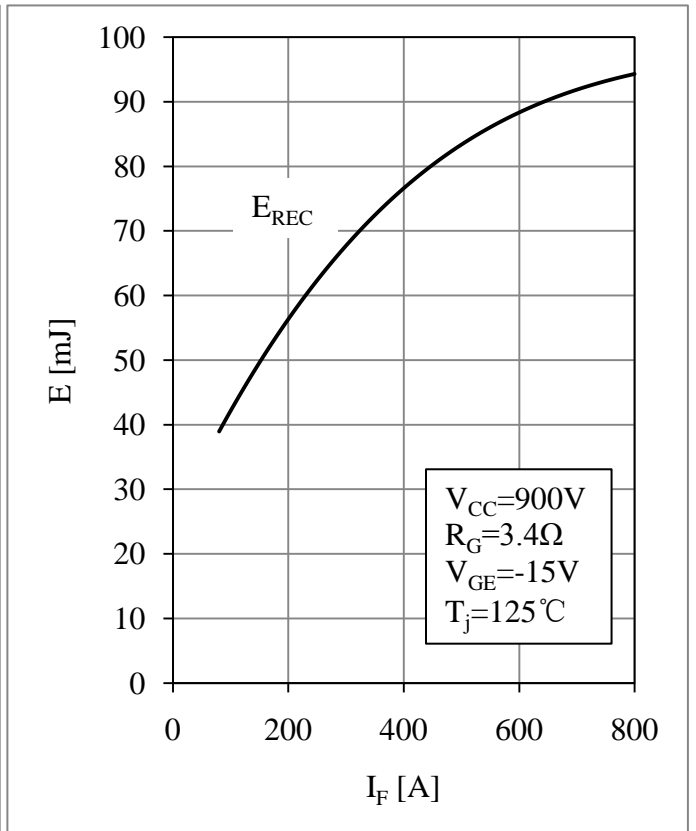


Fig 8. Diode Switching Loss vs. I_F

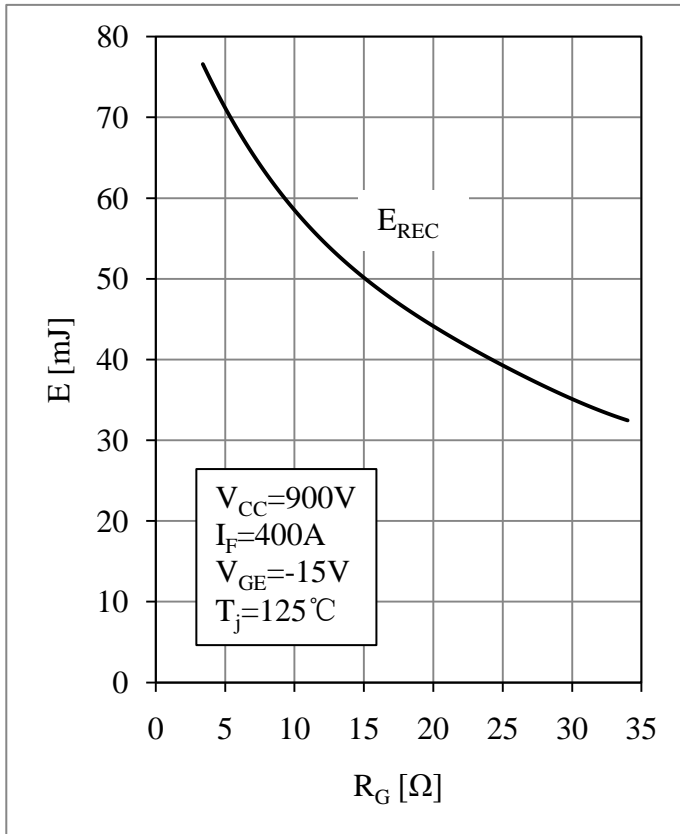


Fig 9. Diode Switching Loss vs. R_G

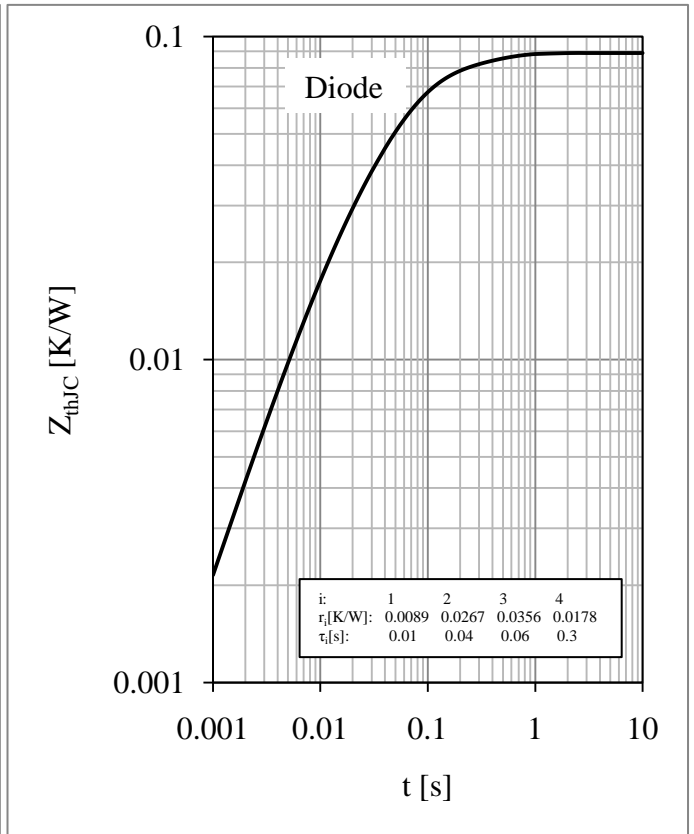
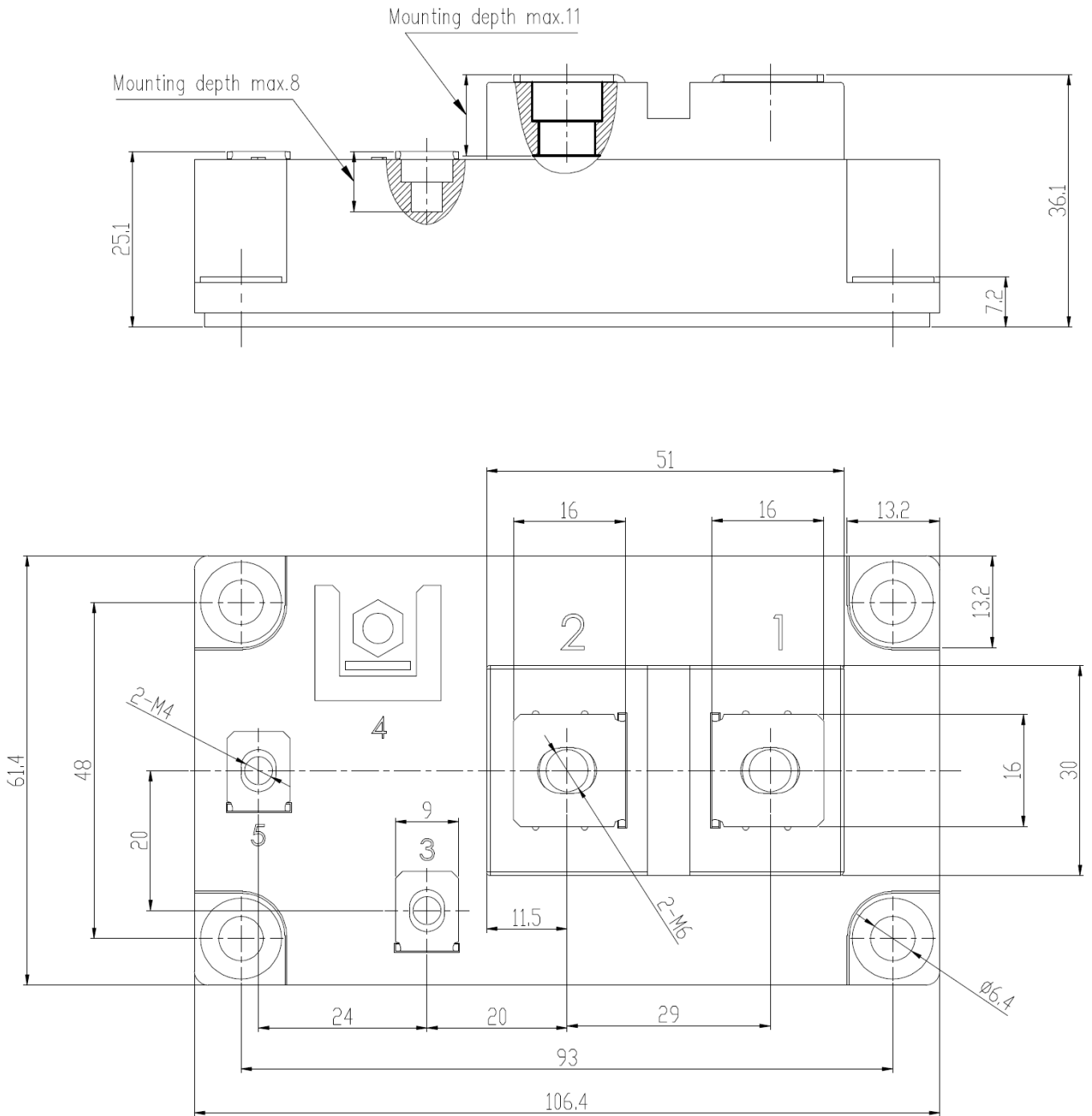


Fig 10. Diode Transient Thermal Impedance

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.