STARPOWER

SEMICONDUCTOR™

IGBT

GD400SGK120C2S

Molding Type Module

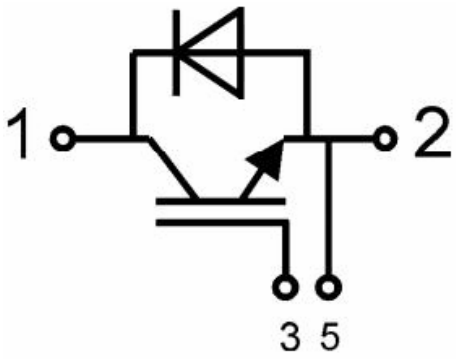
1200V/400A 1 in one-package

General Description

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

Features

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



Equivalent Circuit Schematic

Typical Applications

- UPS
- Switching mode power supplies
- Electronic welders at f_{SW} up to 25kHz

Absolute Maximum Ratings T_C=25℃ unless otherwise noted

Symbol	Description	GD400SGK120C2S	Units
V_{CES}	Collector-Emitter Voltage	1200	V

Symbol	Description	GD400SGK120C2S	Units
V_{GES}	Gate-Emitter Voltage	±20V	V
I_C	Collector Current @ T_C=25℃	550	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=150℃	2500	W
T_{SC}	Short Circuit Withstand Time @ T_j=125℃	10	μs
T_j	Operating Junction Temperature	-40 to +150	℃
T_{STG}	Storage Temperature Range	-40 to +125	℃
I^2t-value, Diode	V_R=0V, t=10ms, T_j=125℃	27500	A^2s
V_{ISO}	Isolation Voltage RMS, f=50Hz, t=1min	2500	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 6.0	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
BV_{CES}	Collector-Emitter Breakdown Voltage	T_j=25℃	1200			V
I_{CES}	Collector Cut-Off Current	V_{CE}=V_{CES},V_{GE}=0V, T_j=25℃			5.0	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=5.0mA,V_{CE}=V_{GE}, T_j=25℃	4.5	5.1	5.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C=400A,V_{GE}=15V,T_j=25℃		2.2		V
		I_C=400A,V_{GE}=15V, T_j=125℃		2.5		

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=400A,		258		ns
t_r	Rise Time	R_G=3.3Ω, V_{GE} =±15V,		110		ns
$t_{d(off)}$	Turn-Off Delay Time	T_j= 25℃		285		ns

t_f	Fall Time	V_{CC}=600V,I_C=400A, R_G=3.3Ω, V_{GE} =±15V, T_j= 25℃		70		ns
E_{on}	Turn-On Switching Loss			45		mJ
E_{off}	Turn-Off Switching Loss			26		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=400A, R_G=3.3Ω, V_{GE} =±15V, T_j= 125℃		260		ns
t_r	Rise Time			120		ns
$t_{d(off)}$	Turn-Off Delay Time			300		ns
t_f	Fall Time			80		ns
E_{on}	Turn-On Switching Loss			60		mJ
E_{off}	Turn-Off Switching Loss			40		mJ
C_{ies}	Input Capacitance	V_{CE} =25V, f=1.0MHz, V_{GE} =0V		74.7		nF
C_{oes}	Output Capacitance			3.3		nF
C_{res}	Reverse Transfer Capacitance			0.64		nF
I_{SC}	SC Data	t_{SC}≤10μs, V_{GE}=15V, T_j=125℃, V_{CC}=900V, V_{CEM}≤1200V		2400		A
L_{CE}	Stray Inductance			16		nH
$R_{CC'+EE'}$	Module lead resistance, terminal to chip	T_C=25℃		0.50		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℃		2.0	2.3	V
			T_j=125℃		2.2	2.5	
Q_r	Diode Reverse Recovery Charge	I_F=400A, V_R=600V, di/dt=-4100A/μs, V_{GE}=-15V	T_j=25℃		31		μC
			T_j=125℃		66		
I_{RM}	Diode Peak Reverse Recovery Current		T_j=25℃		300		A
			T_j=125℃		410		
E_{rec}	Reverse Recovery Energy		T_j=25℃		12		mJ
			T_j=125℃		28		

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case (IGBT Part, per 1/2 Module)		0.05	K/W
$R_{\theta JC}$	Junction-to-Case (DIODE Part, per 1/2 Module)		0.08	K/W
$R_{\theta CS}$	Case-to-Sink (Conductive grease applied)	0.035		K/W
Weight	Weight of Module	340		g

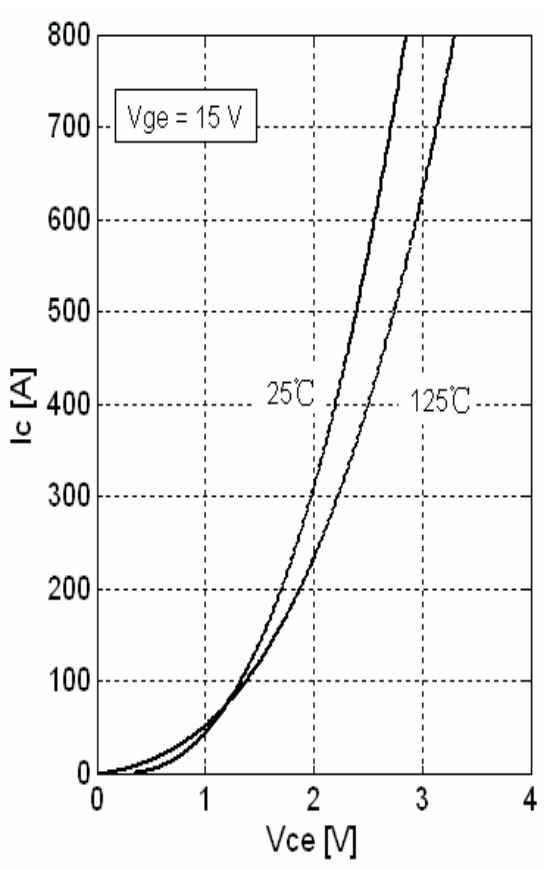


Fig 1. Typical Output Characteristics

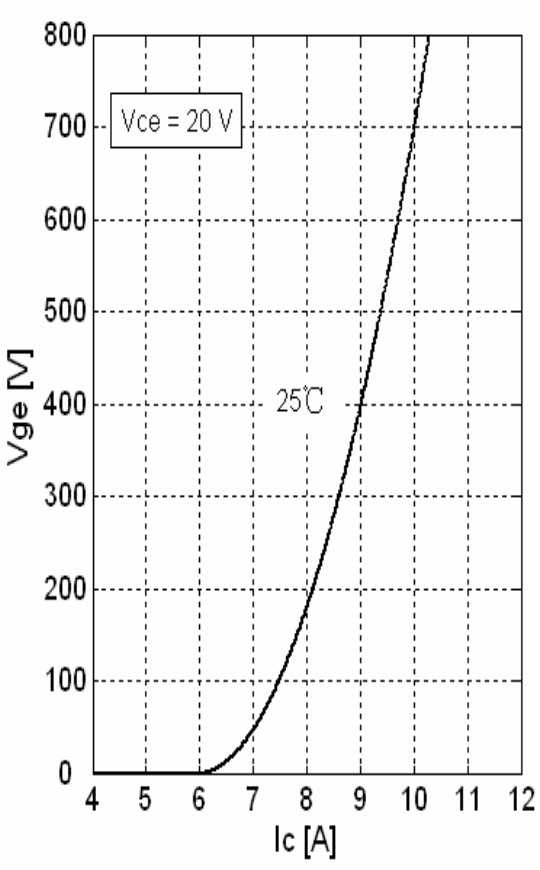


Fig 2. Typical Transfer Characteristics

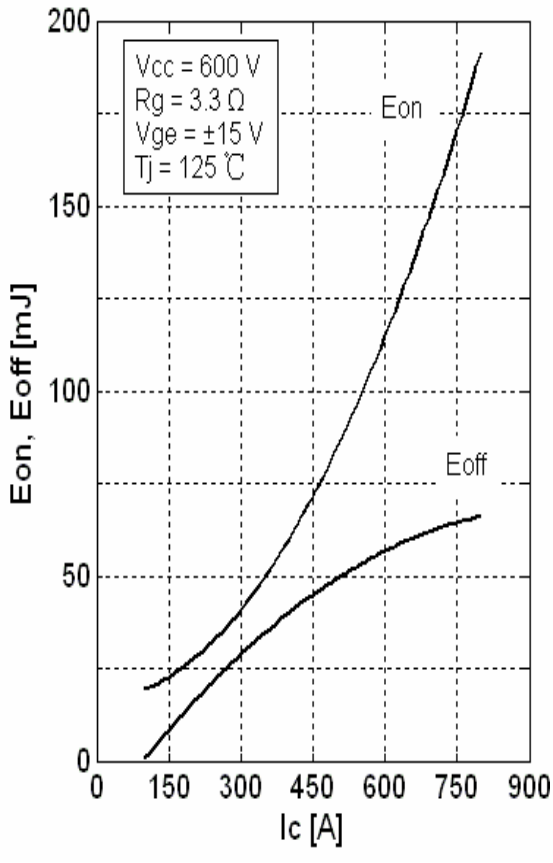


Fig 3. Switching Loss vs Collector Current

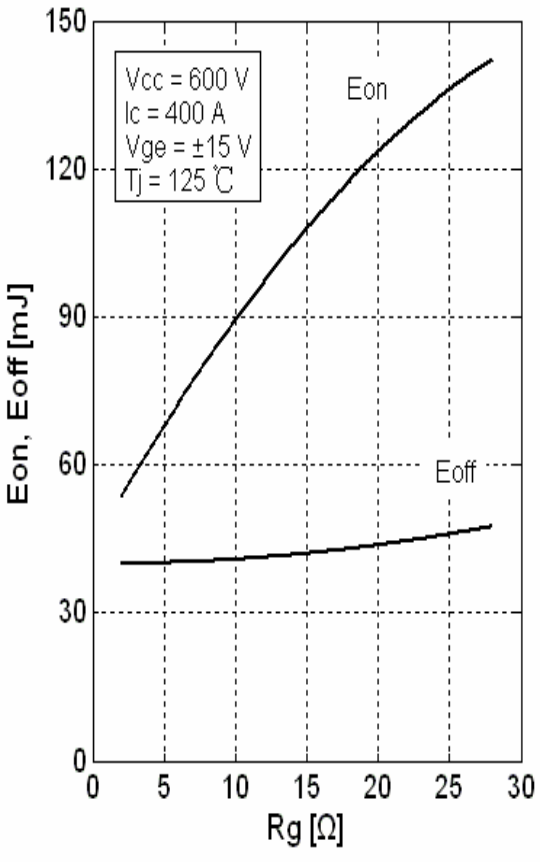


Fig 4. Switching Loss vs Gate Resistor

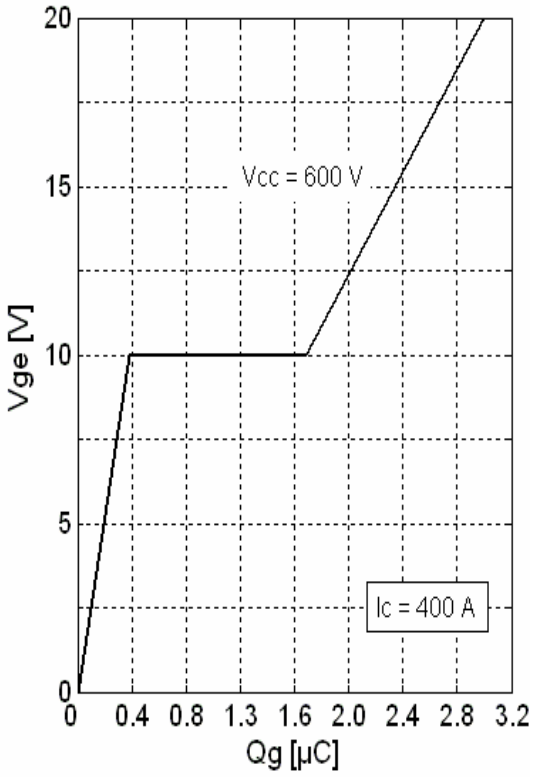


Fig 5. Gate Charge Characteristics

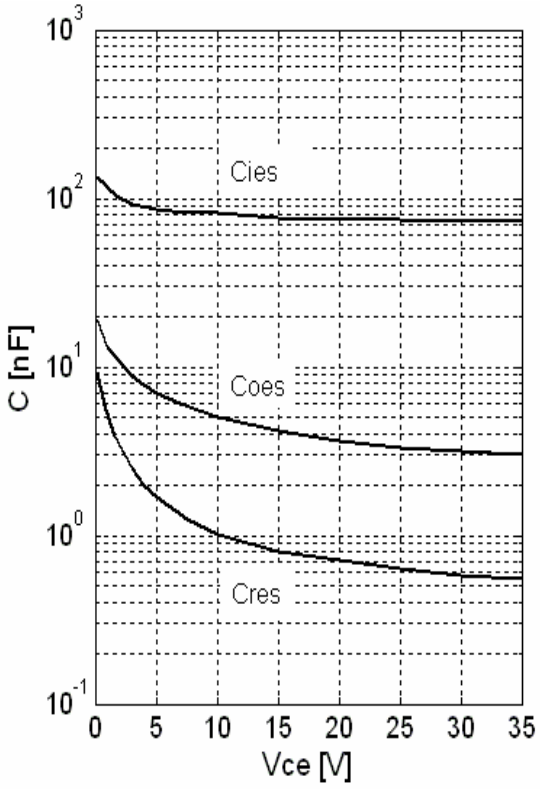


Fig 6. Typical Capacitance vs Collector-Emitter Voltage

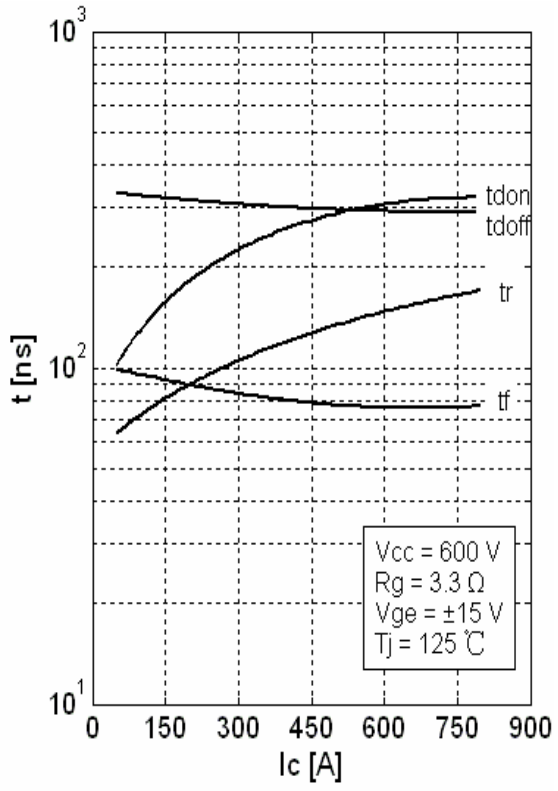


Fig 7. Typical Switching Times vs I_C

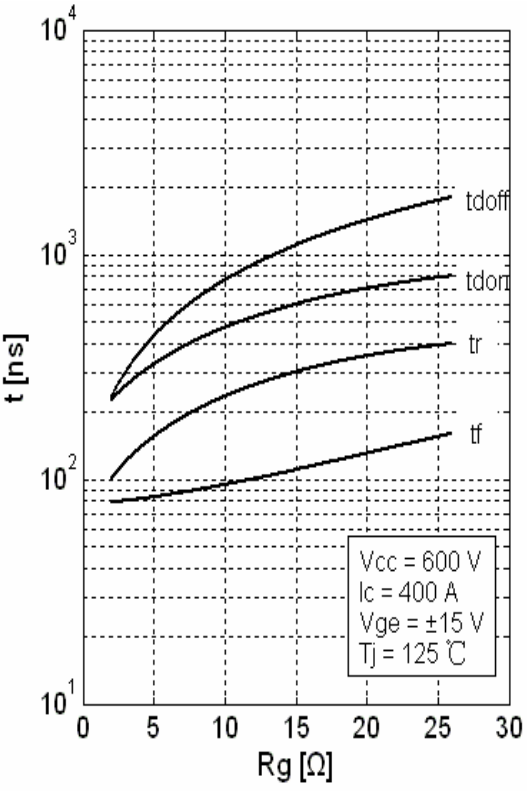


Fig 8. Typical Switching Times vs Gate Resistance R_G

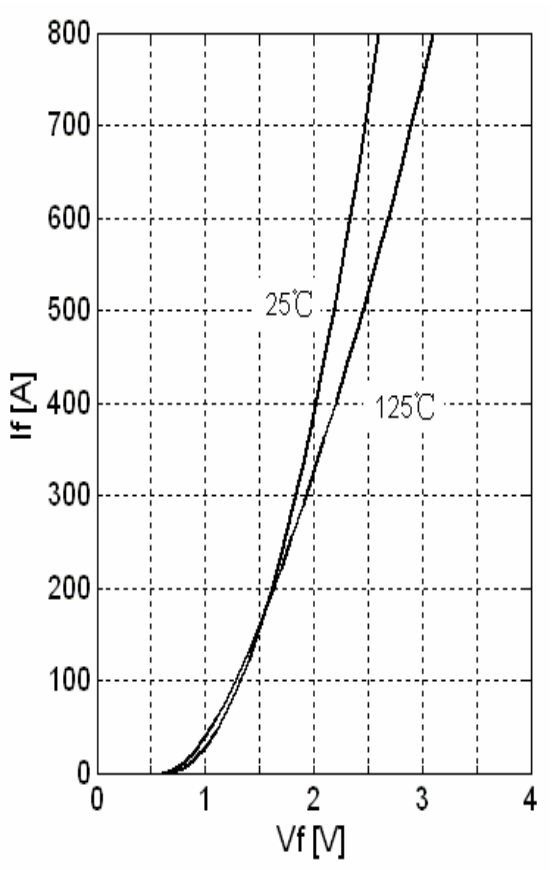


Fig 9. Typical Forward Characteristics (diode)

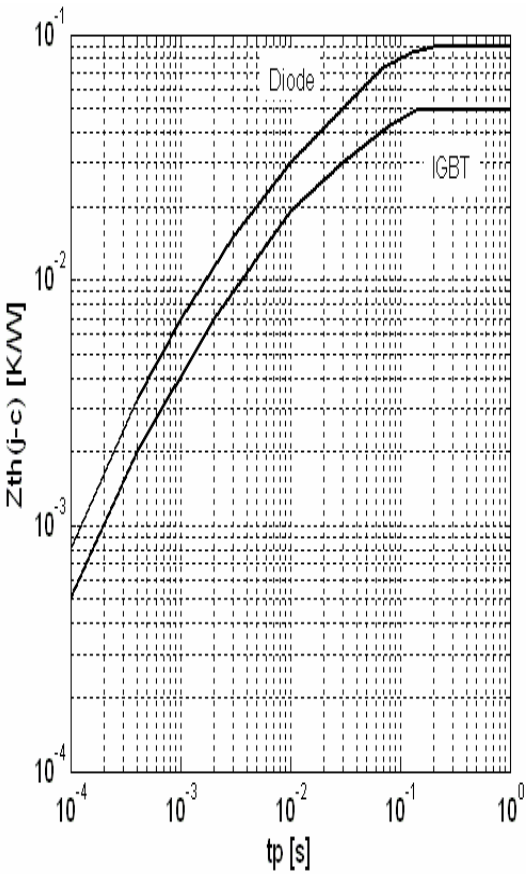
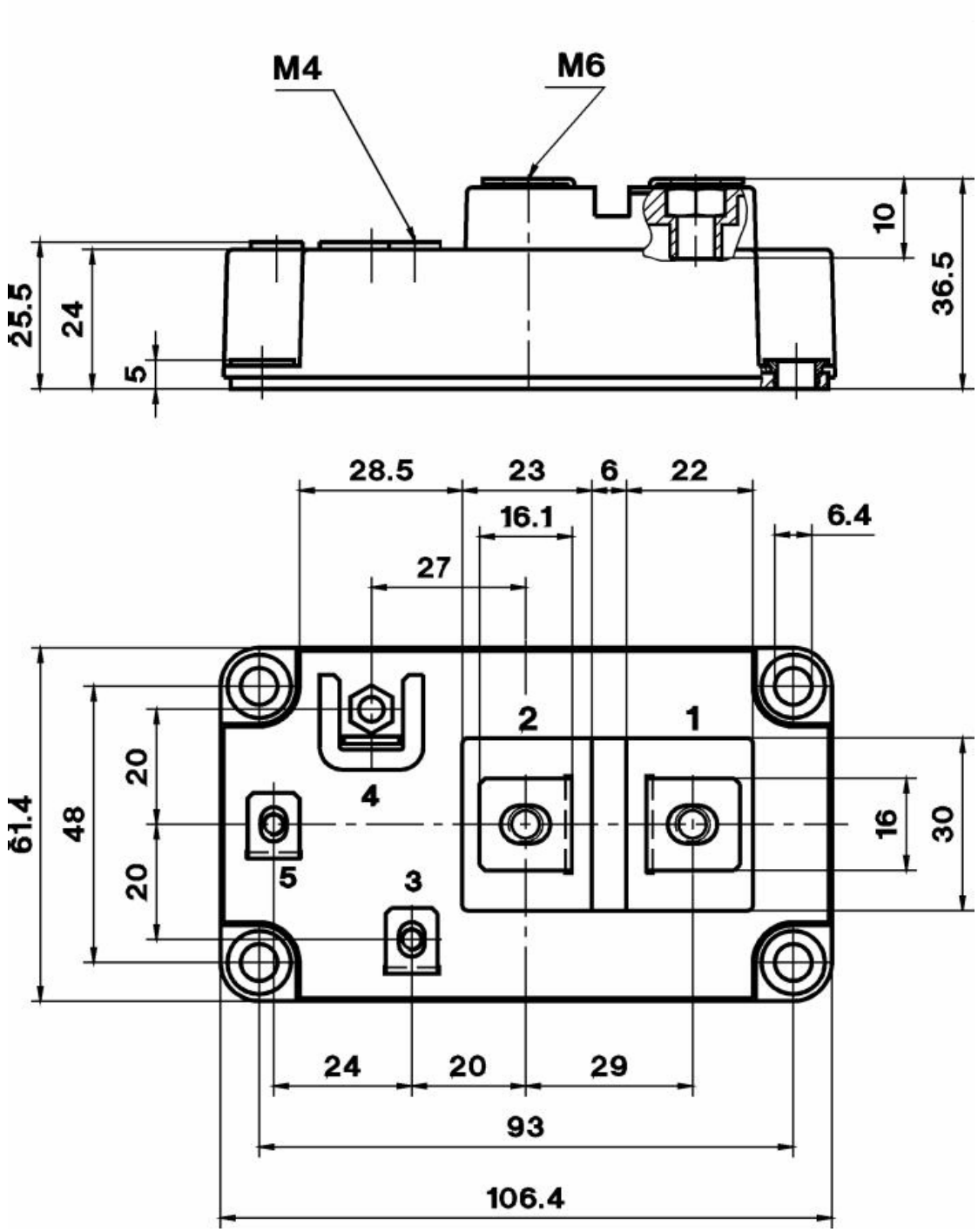


Fig 10. Transient thermal impedance

Package Dimension

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.com), 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.