STARPOWER

SEMICONDUCTOR

IGBT

GD400SGL120C2S

Molding Type Module

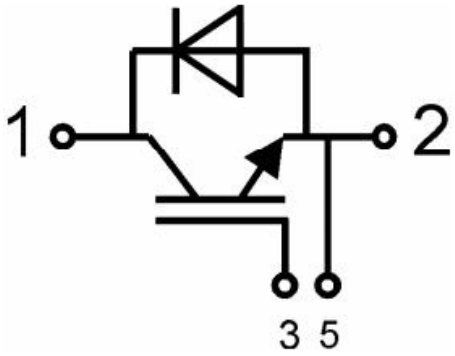
1200V/400A 1 in one-package

General Description

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

Features

- High short circuit capability, self limiting to 6*I_C
- 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
- Electronic welders at f_{SW} up to 20kHz

Absolute Maximum Ratings T_C=25℃ unless otherwise noted

Symbol	Description	GD400SGL120C2S	Units
V_{CES}	Collector-Emitter Voltage	1200	V

Symbol	Description	GD400SGL120C2S	Units
V_{GES}	Gate-Emitter Voltage	±20	V
I_C	Collector Current @ T_C=25℃	650	A
	@ T_C=100℃	400	
$I_{CM(1)}$	Pulsed Collector Current	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_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:M6	2.5 to 5	N.m
	Mounting Screw:M6	3 to 6	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=8mA,V_{CE}=V_{GE}, T_j=25℃	5.0	6.2	7.0	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C=400A,V_{GE}=15V, T_j=25℃		1.9		V
		I_C=400A,V_{GE}=15V, T_j=125℃		2.1		

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=400A,		100		ns
t_r	Rise Time	R_G=4Ω, V_{GE} =±15V,		60		ns

$t_{d(off)}$	Turn-Off Delay Time	T_j=25℃		420		ns
t_f	Fall Time	V_{CC}=600V,I_C=400A, R_G=4Ω, V_{GE} =±15V, T_j=25℃		60		ns
E_{on}	Turn-On Switching Loss			33		mJ
E_{off}	Turn-Off Switching Loss			42		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=400A, R_G=4Ω, V_{GE} =±15V, T_j=125℃		120		ns
t_r	Rise Time			60		ns
$t_{d(off)}$	Turn-Off Delay Time			490		ns
t_f	Fall Time			75		ns
E_{on}	Turn-On Switching Loss			35		mJ
E_{off}	Turn-Off Switching Loss			46		mJ
C_{ies}	Input Capacitance	V_{CE} =25V, f=1MHz, V_{GE} =0V		30		nF
C_{oes}	Output Capacitance			4		nF
C_{res}	Reverse Transfer Capacitance			3		nF
I_{SC}	SC Data	t_{SC}≤10μs, V_{GE}=15 V, T_j=125℃, V_{CC}=900V, V_{CEM}≤1200V		1900		A
R_{Gint}	Internal Gate Resistance			0.5		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℃		2.1	2.2	V
			T_j=125℃		2.2	2.3	
Q_r	Diode Reverse Recovery Charge	I_F=400A, V_R=600V, di/dt=-4000A/μs, V_{GE}=-15V	T_j=25℃		40		μC
			T_j=125℃		48		
I_{RM}	Diode Peak Reverse Recovery Current		T_j=25℃		320		A
			T_j=125℃		400		
E_{rec}	Reverse Recovery Energy		T_j=25℃		12		mJ
			T_j=125℃		20		

Thermal Characteristics

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

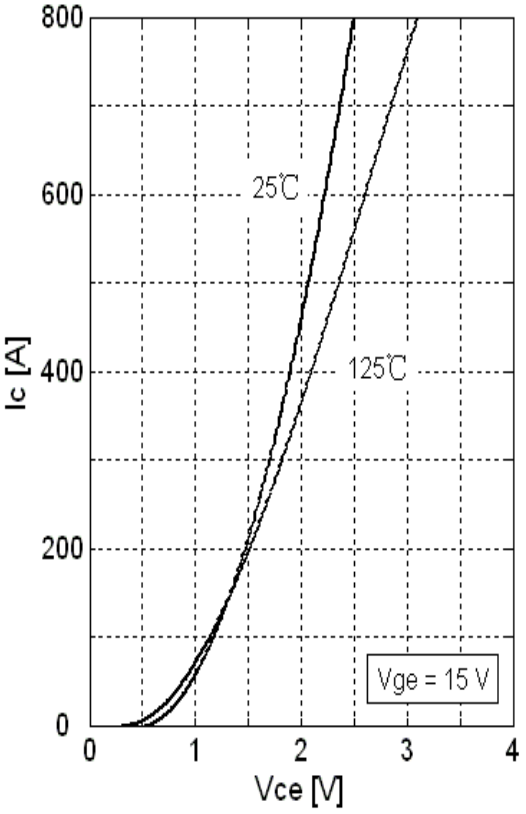


Fig 1. Typical Output Characteristics

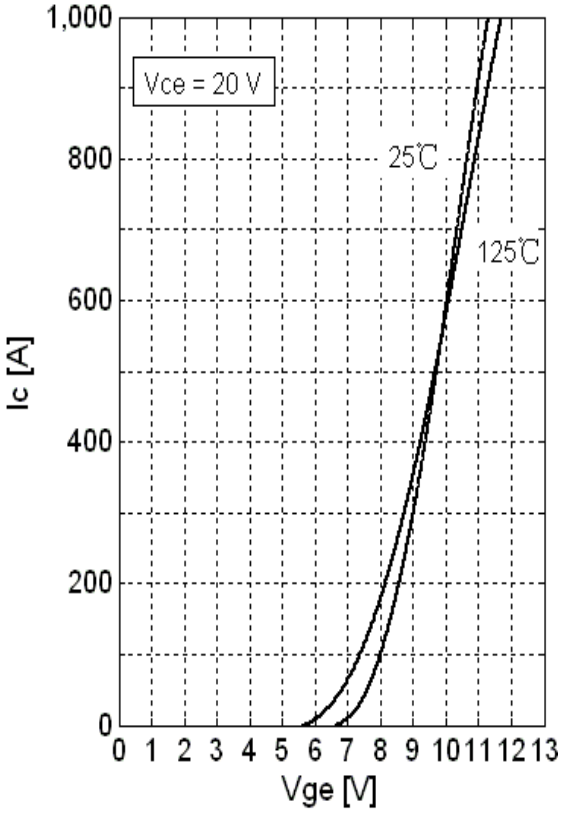


Fig 2. Typical Transfer Characteristics

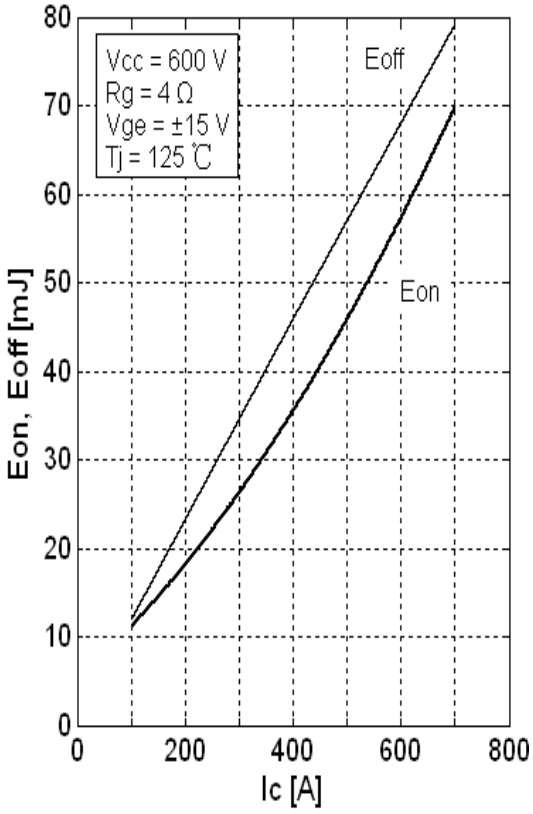


Fig 3.Switching Loss vs Collector Current

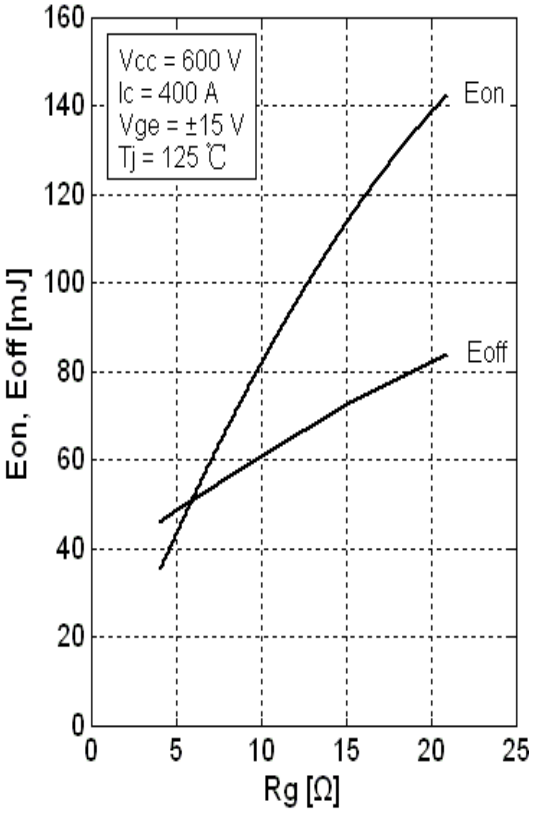


Fig 4. Switching Loss vs Gate Resistor

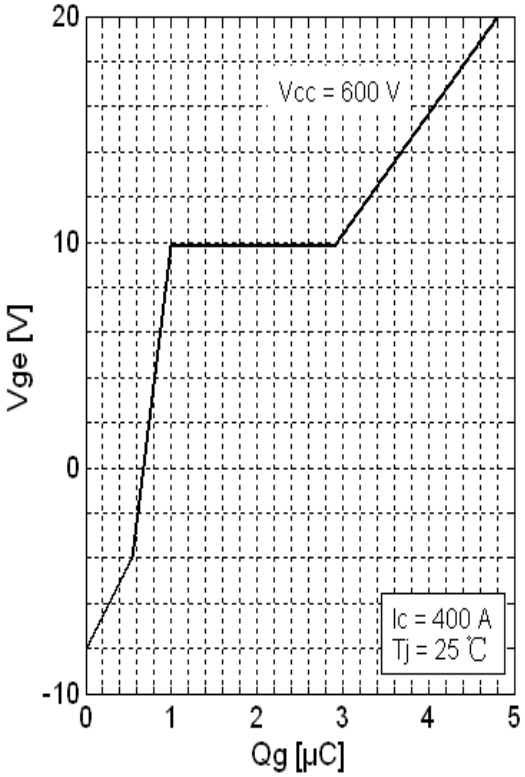


Fig 5. Gate Charge Characteristics.

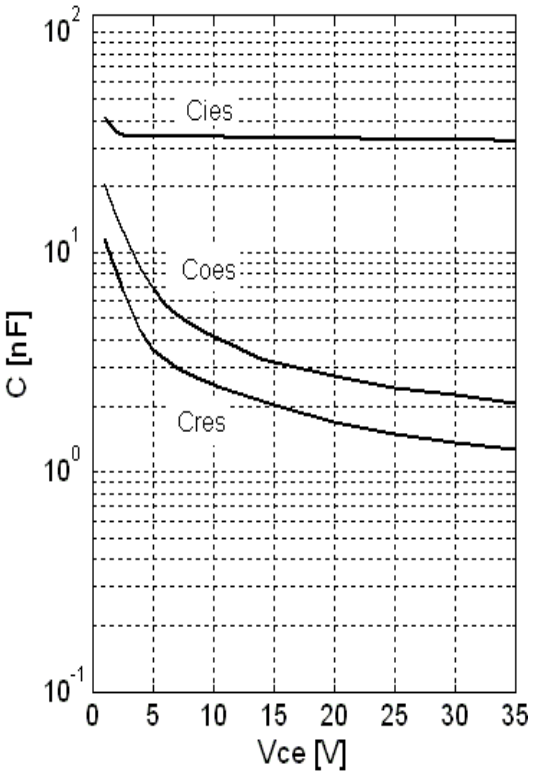


Fig 6. Typical Capacitance vs Collector-Emitter Voltage

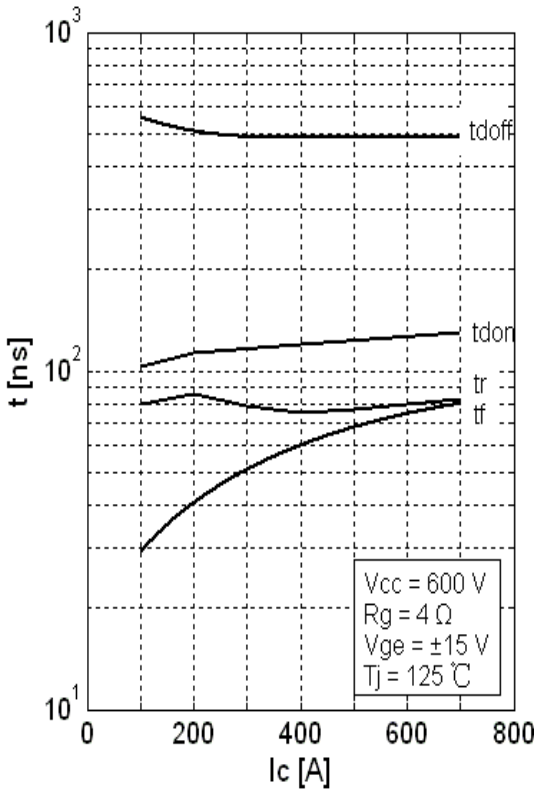


Fig 7. Typical Switching Times vs I_C

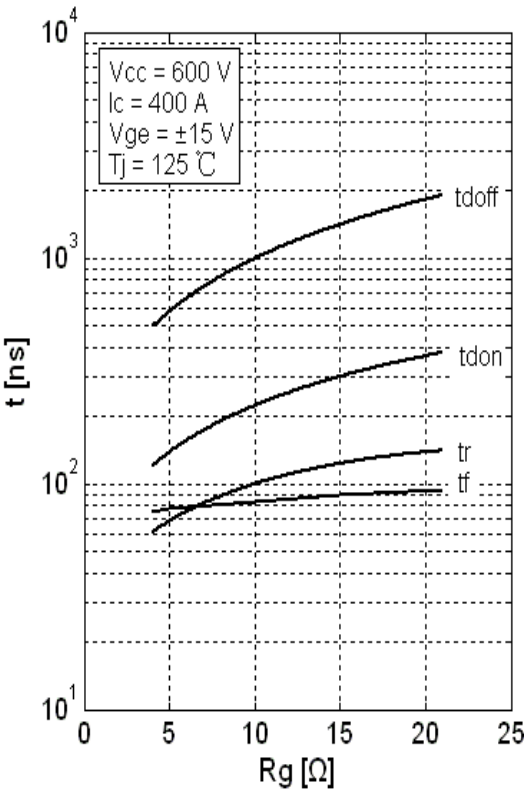


Fig 8. Typical Switching Times vs Gate Resistance R_G

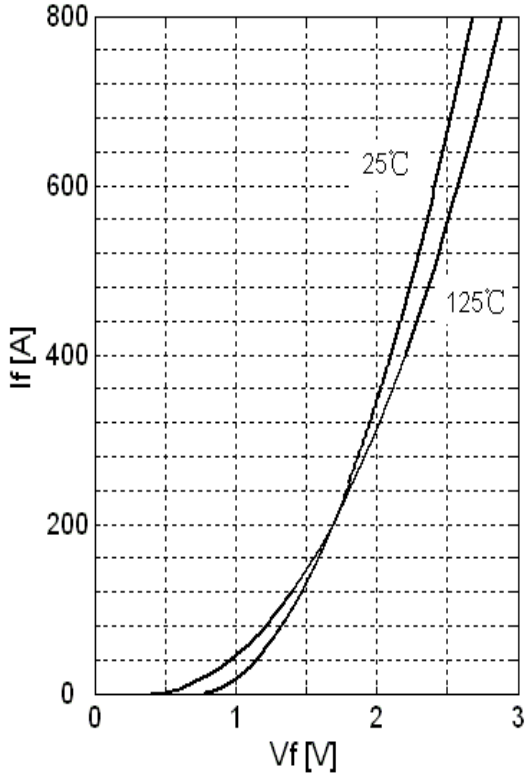


Fig 9.Typical Forward Characteristics (diode)

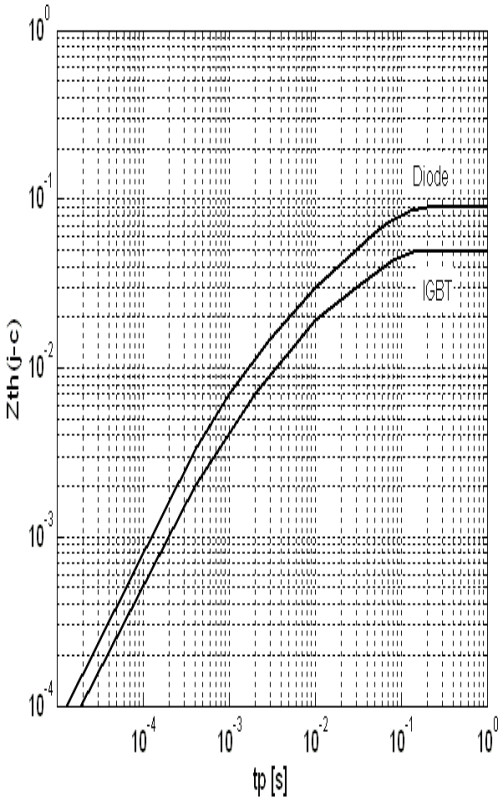
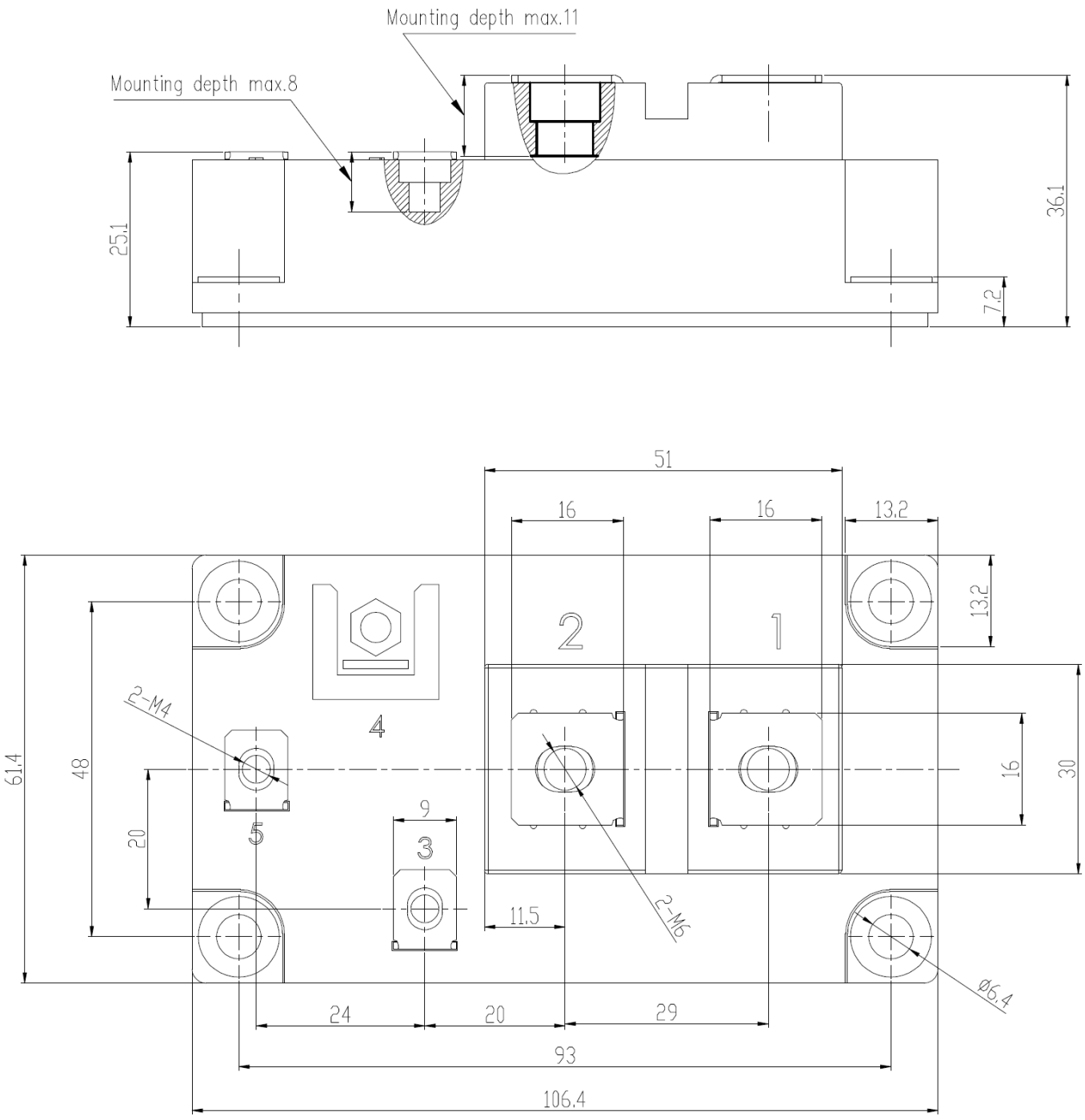


Fig 10. Transient thermal impedance

Package Dimension

Dimensions in Millimeters



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