STARPOWER

SEMICONDUCTOR **IGBT**

GD600SGL170C2SG

1700V/600A 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 inverter and UPS.

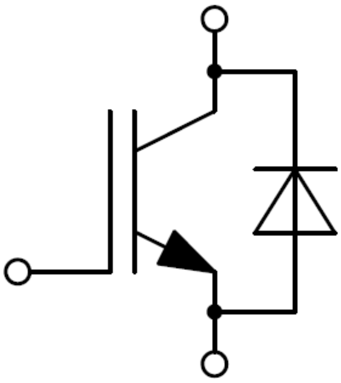
Features

- Low $V_{CE(sat)}$ SPT+ IGBT technology
- 10μs short circuit capability
- $V_{CE(sat)}$ with positive temperature coefficient
- Maximum junction temperature 175℃
- Low inductance case
- Fast & soft reverse recovery anti-parallel FWD
- AlN substrate for low thermal resistance

Typical Applications

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

Equivalent Circuit Schematic



Absolute Maximum Ratings T_C=25℃ unless otherwise noted

IGBT

Symbol	Description	Value	Unit
V_{CES}	Collector-Emitter Voltage	1700	V
V_{GES}	Gate-Emitter Voltage	±20	V
I_C	Collector Current @ T_C=25℃ @ T_C=110℃	1050 600	A
I_{CM}	Pulsed Collector Current t_p=1ms	1200	A
P_D	Maximum Power Dissipation @ T_j=175℃	5769	W

Diode

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1700	V
I_F	Diode Continuous Forward Current	600	A
I_{FM}	Diode Maximum Forward Current t_p=1ms	1200	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	6800	V
V_{ISO}	Partial Discharge Extinction Voltage IEC1287,RMS,f=50Hz,Q_{PD}≤10pC	2600	V

IGBT Characteristics T_C=25℃ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C=600A,V_{GE}=15V, T_j=25℃		2.50	2.95	V
		I_C=600A,V_{GE}=15V, T_j=125℃		3.00		
		I_C=600A,V_{GE}=15V, T_j=150℃		3.10		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=24.0mA,V_{CE}=V_{GE}, T_j=25℃	5.4	6.2	7.4	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
R_{Gint}	Internal Gate Resistance			0.5		Ω
C_{ies}	Input Capacitance	V_{CE}=25V,f=1MHz, V_{GE}=0V		40.0		nF
C_{res}	Reverse Transfer Capacitance			1.44		nF
Q_G	Gate Charge	V_{GE}=-15…+15V		3.60		μC
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=900V,I_C=600A, R_G=2.0Ω,V_{GE}= ±15V, T_j=25℃		235		ns
t_r	Rise Time			110		ns
$t_{d(off)}$	Turn-Off Delay Time			390		ns
t_f	Fall Time			145		ns
E_{on}	Turn-On Switching Loss			164		mJ
E_{off}	Turn-Off Switching Loss			116		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=900V,I_C=600A, R_G=2.0Ω,V_{GE}= ±15V, T_j=125℃		250		ns
t_r	Rise Time			120		ns
$t_{d(off)}$	Turn-Off Delay Time			475		ns
t_f	Fall Time			155		ns
E_{on}	Turn-On Switching Loss			212		mJ
E_{off}	Turn-Off Switching Loss			176		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=900V,I_C=600A, R_G=2.0Ω,V_{GE}= ±15V, T_j=150℃		255		ns
t_r	Rise Time			125		ns
$t_{d(off)}$	Turn-Off Delay Time			500		ns
t_f	Fall Time			160		ns
E_{on}	Turn-On Switching Loss			236		mJ
E_{off}	Turn-Off Switching Loss			192		mJ
I_{SC}	SC Data	t_P≤10μs,V_{GE}=15V, T_j=150℃,V_{CC}=1300V, V_{CEM}≤1700V		1920		A

Diode Characteristics T_C=25℃ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_F	Diode Forward Voltage	I_F=600A,V_{GE}=0V, T_j=25℃		1.80	2.25	V
		I_F=600A,V_{GE}=0V, T_j=125℃		1.95		
		I_F=600A,V_{GE}=0V, T_j=150℃		1.90		
Q_r	Recovered Charge	V_{CC}=900V,I_F=600A, -di/dt=5280A/μs,V_{GE}= ±15V, T_j=25℃		148		μC
I_{RM}	Peak Reverse Recovery Current			460		A
E_{rec}	Reverse Recovery Energy			101		mJ
Q_r	Recovered Charge	V_{CC}=900V,I_F=600A, -di/dt=5280A/μs,V_{GE}= ±15V, T_j=125℃		240		μC
I_{RM}	Peak Reverse Recovery Current			520		A
E_{rec}	Reverse Recovery Energy			166		mJ
Q_r	Recovered Charge	V_{CC}=900V,I_F=600A, -di/dt=5280A/μs,V_{GE}= ±15V, T_j=150℃		288		μC
I_{RM}	Peak Reverse Recovery Current			560		A
E_{rec}	Reverse Recovery Energy			194		mJ

Module Characteristics T_C=25℃ unless otherwise noted

Symbol	Parameter	Min.	Typ.	Max.	Unit
L_{CE}	Stray Inductance			20	nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal to Chip		0.18		mΩ
$R_{\theta JC}$	Junction-to-Case (per IGBT) Junction-to-Case (per Diode)			0.026 0.046	K/W
$R_{\theta CS}$	Case-to-Sink (per IGBT) Case-to-Sink (per Diode)		0.055 0.097		K/W
$R_{\theta CS}$	Case-to-Sink		0.035		K/W
M	Terminal Connection Torque, Screw M4 Terminal Connection Torque, Screw M6 Mounting Torque, Screw M6	1.1 2.5 3.0		2.0 5.0 5.0	N.m
G	Weight of Module		300		g

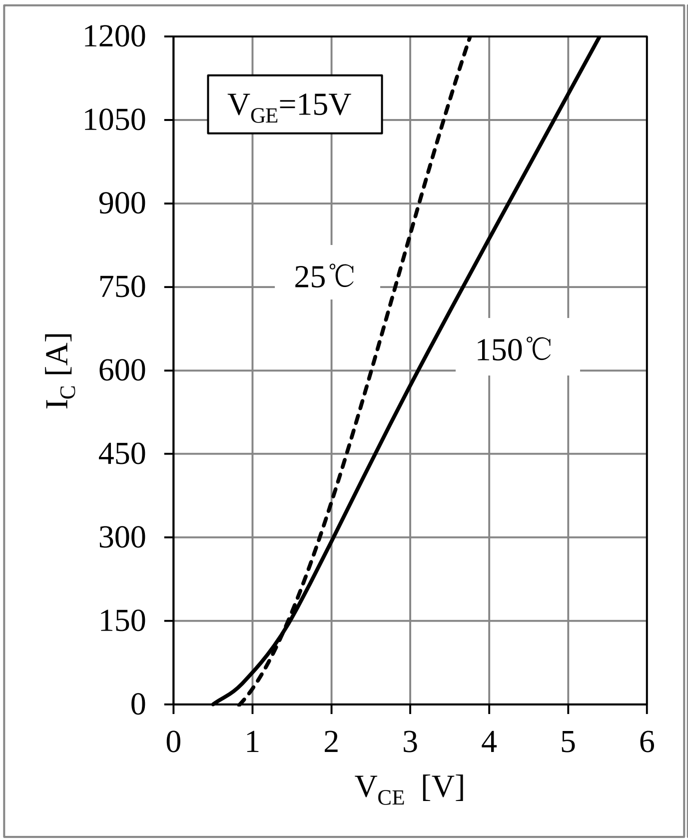


Fig 1. IGBT Output Characteristics

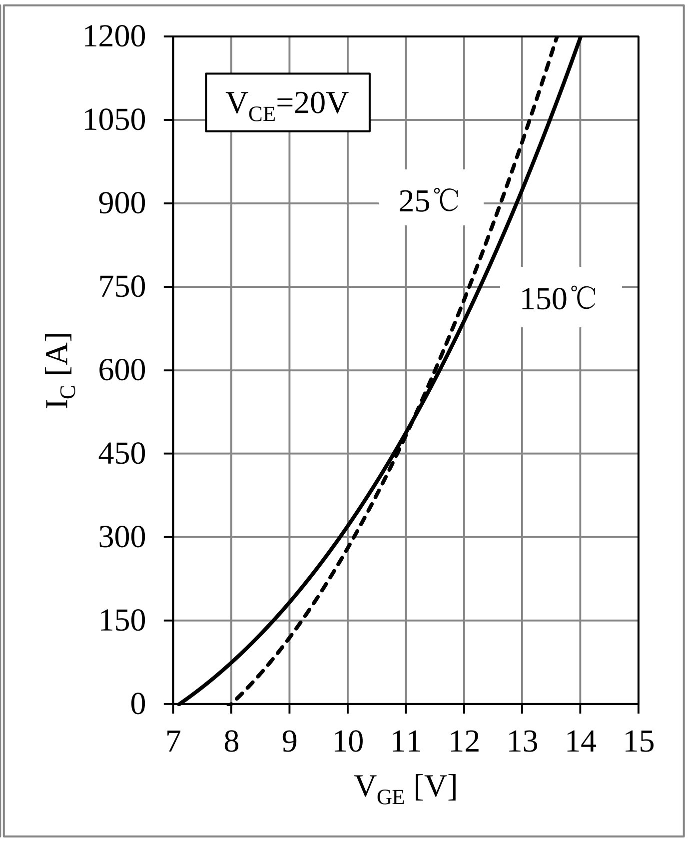


Fig 2. IGBT Transfer Characteristics

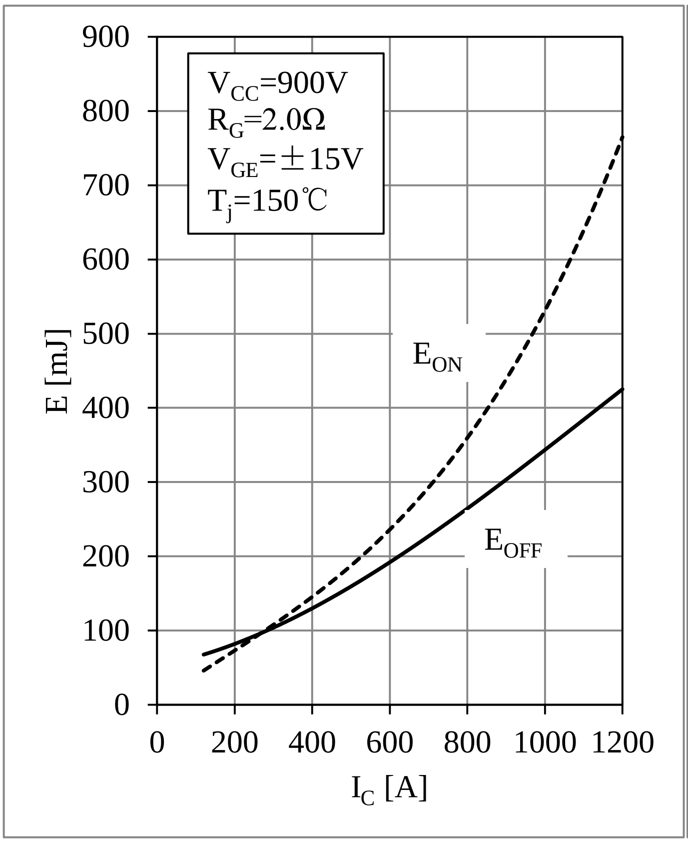


Fig 3. IGBT Switching Loss vs. I_C

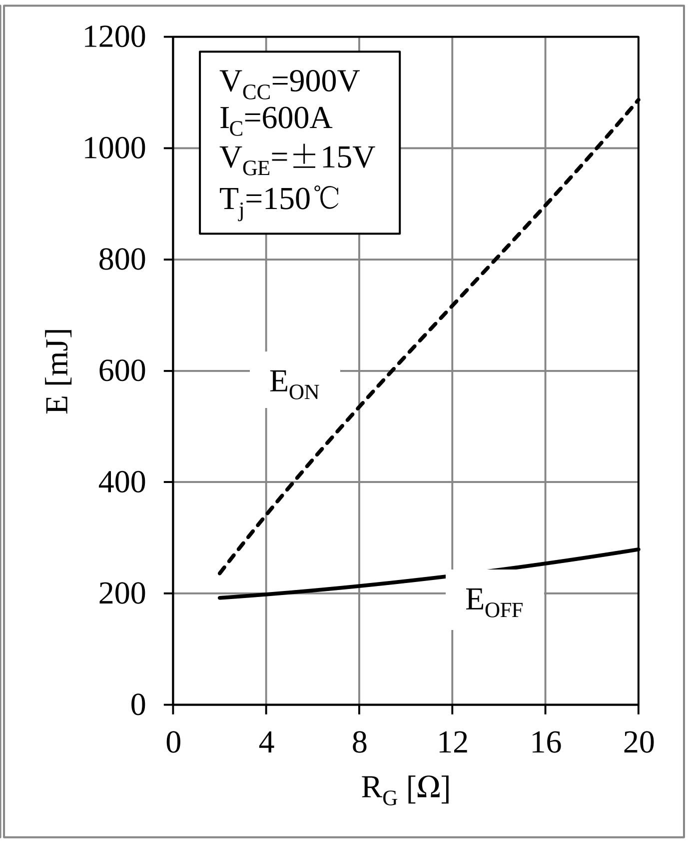


Fig 4. IGBT Switching Loss vs. R_G

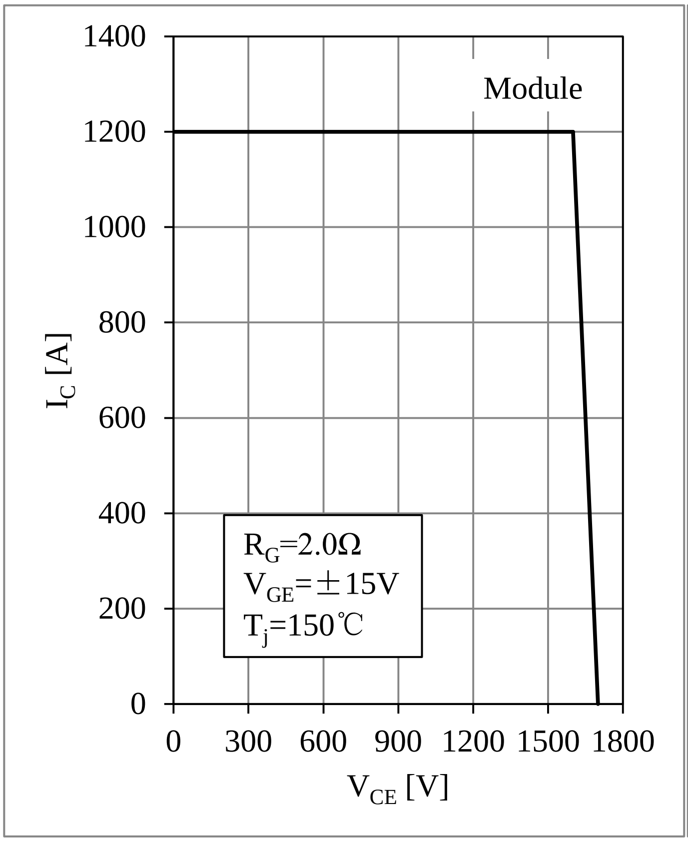


Fig 5. RBSOA

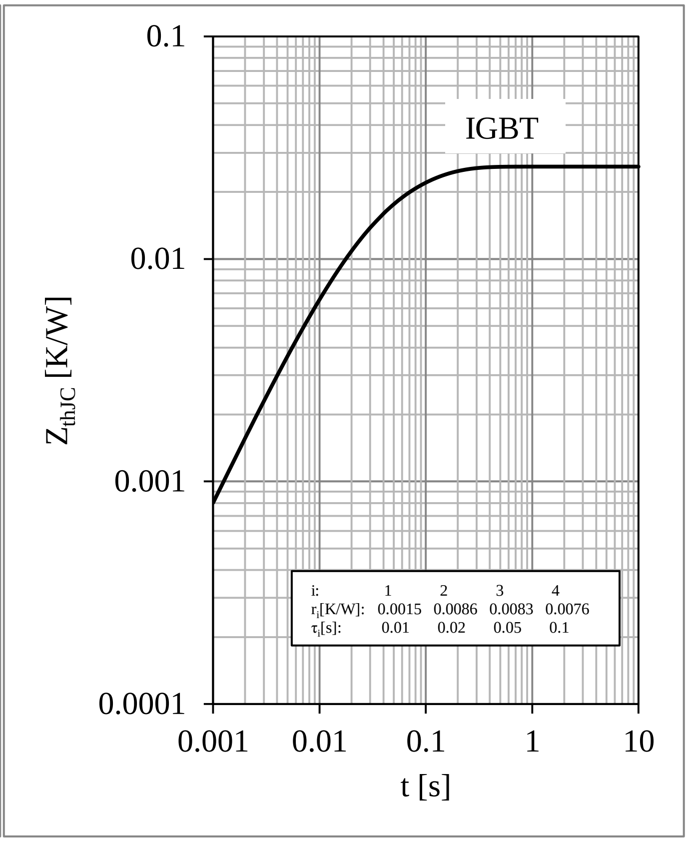


Fig 6. IGBT Transient Thermal Impedance

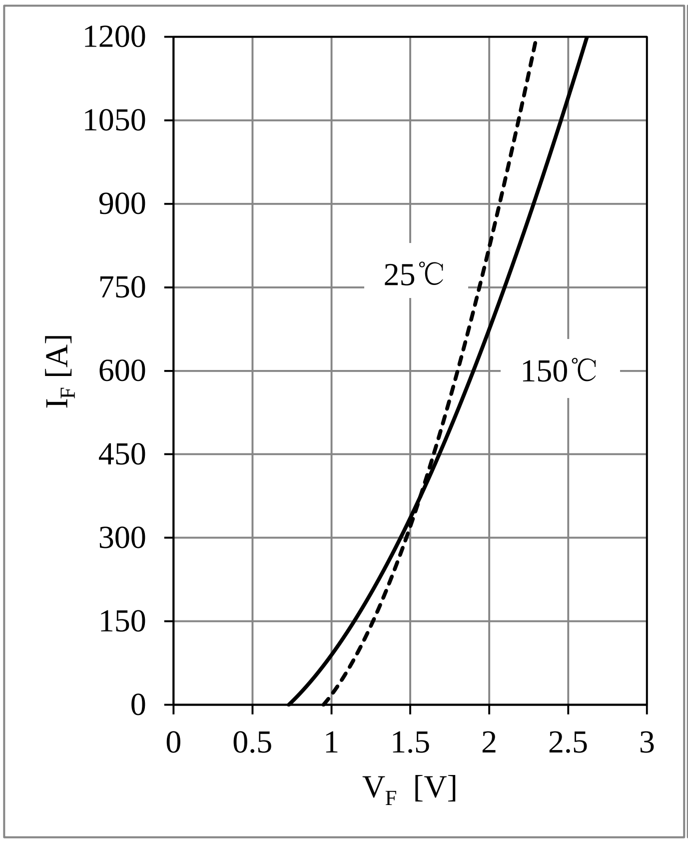


Fig 7. Diode Forward Characteristics

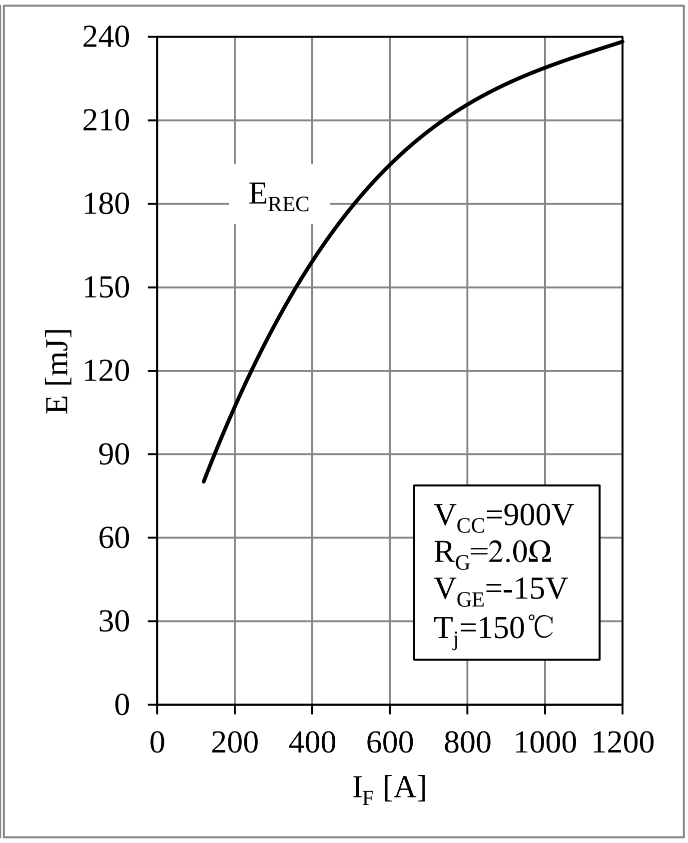


Fig 8. Diode Switching Loss vs. I_F

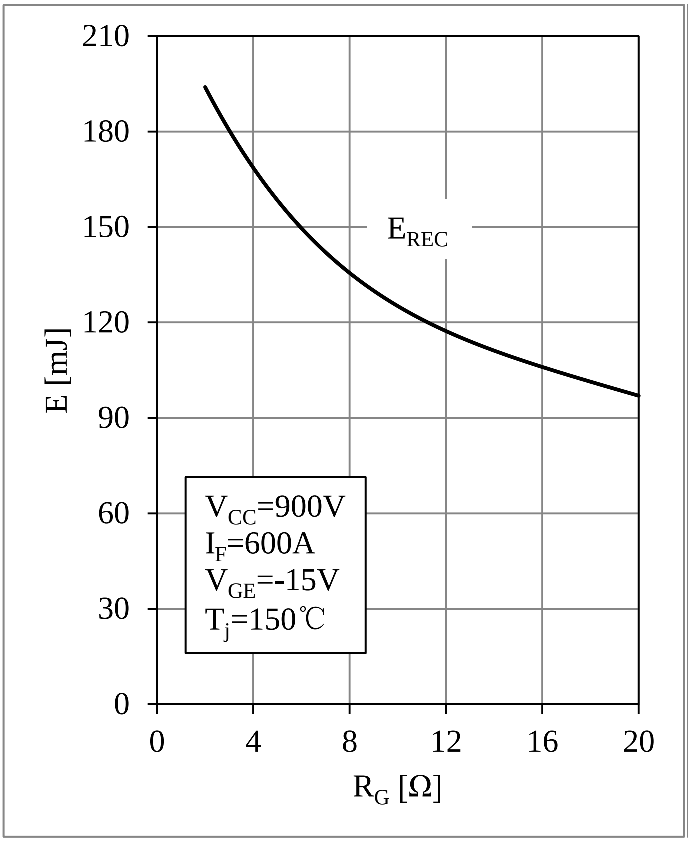


Fig 9. Diode Switching Loss vs. R_G

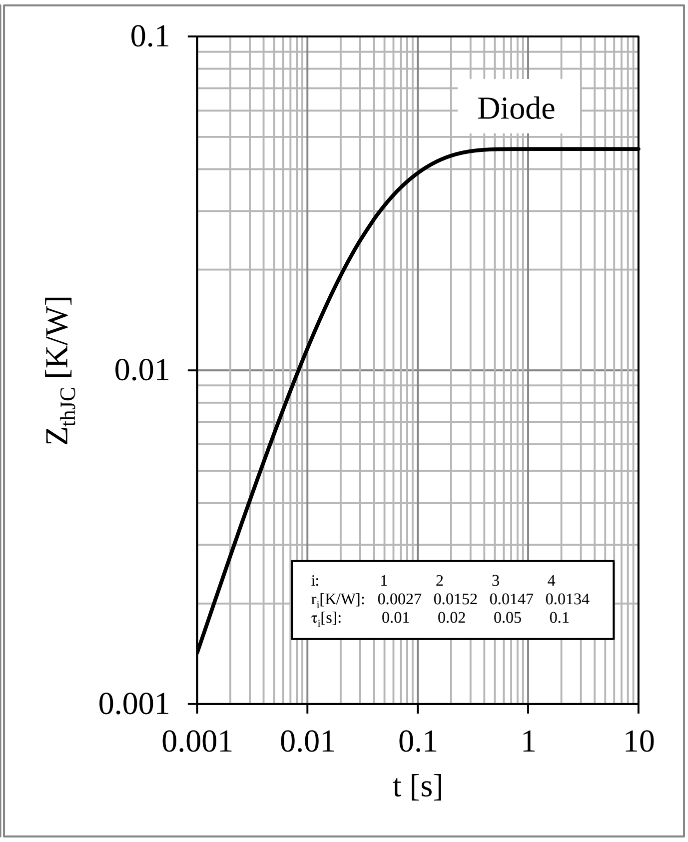
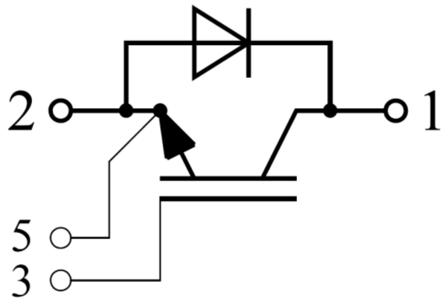


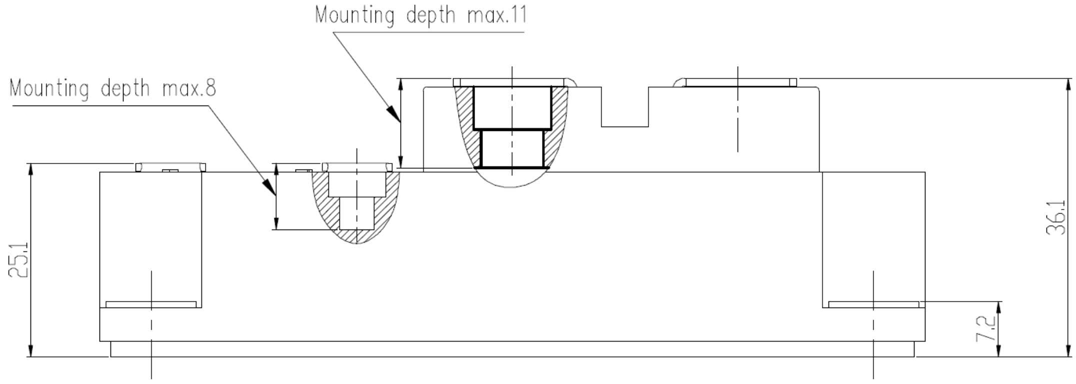
Fig 10. Diode Transient Thermal Impedance

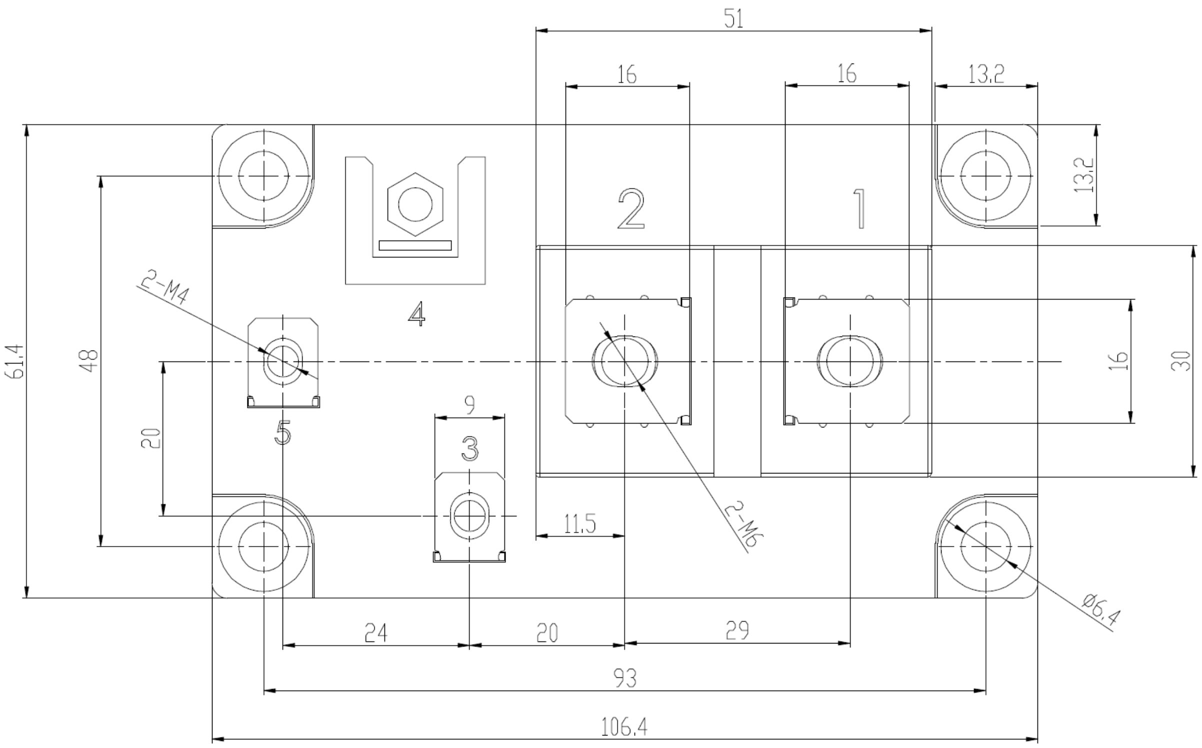
Circuit Schematic



Package Dimensions

Dimensions in Millimeters





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