STARPOWER

SEMICONDUCTOR

IGBT

GD400HFT120C2SN

Molding Type Module

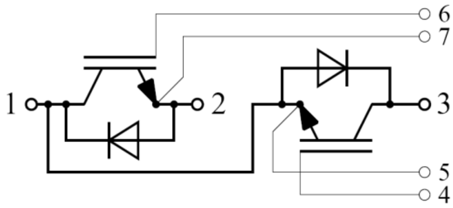
1200V/400A 2 in one-package

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
- 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
- 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℃ unless otherwise noted

Symbol	Description	GD400HFT120C2SN	Units
V_{CES}	Collector-Emitter Voltage	1200	V
V_{GES}	Gate-Emitter Voltage	±20	V
I_C	Collector Current @ T_C=25℃ @ T_C=100℃	650 400	A
I_{CM}	Pulsed Collector Current t_p=1ms	800	A
I_F	Diode Continuous Forward Current	400	A
I_{FM}	Diode Maximum Forward Current t_p=1ms	800	A
P_D	Maximum Power Dissipation @ T_j=175℃	2542	W
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	4000	V
Mounting Torque	Power Terminal Screw:M6 Mounting Screw:M6	2.5 to 5.0 3.0 to 5.0	N.m
Weight	Weight of Module	300	g

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	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=16.0mA,$V_{CE}=V_{GE}$, T_j=25℃	5.0	5.8	6.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C=400A,V_{GE}=15V, T_j=25℃		1.70	2.15	V
		I_C=400A,V_{GE}=15V, T_j=125℃		2.00		
		I_C=400A,V_{GE}=15V, T_j=150℃		2.10		

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=400A, R_G=1.8Ω,V_{GE}=±15V, T_j=25℃		250		ns
t_r	Rise Time			39		ns
$t_{d(off)}$	Turn-Off Delay Time			500		ns
t_f	Fall Time			100		ns
E_{on}	Turn-On Switching Loss			17.0		mJ
E_{off}	Turn-Off Switching Loss			42.0		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=400A, R_G=1.8Ω,V_{GE}=±15V, T_j=125℃		299		ns
t_r	Rise Time			46		ns
$t_{d(off)}$	Turn-Off Delay Time			605		ns
t_f	Fall Time			155		ns
E_{on}	Turn-On Switching Loss			25.1		mJ
E_{off}	Turn-Off Switching Loss			61.9		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=400A, R_G=1.8Ω,V_{GE}=±15V, T_j=150℃		320		ns
t_r	Rise Time			52		ns
$t_{d(off)}$	Turn-Off Delay Time			625		ns
t_f	Fall Time			180		ns
E_{on}	Turn-On Switching Loss			30.5		mJ
E_{off}	Turn-Off Switching Loss			66.8		mJ
C_{ies}	Input Capacitance	V_{CE}=25V,f=1MHz, V_{GE}=0V		28.8		nF
C_{oes}	Output Capacitance			1.51		nF
C_{res}	Reverse Transfer Capacitance			1.31		nF
I_{SC}	SC Data	t_P≤10μs,V_{GE}=15V, T_j=125℃,V_{CC}=900V, V_{CEM}≤1200V		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			0.35		mΩ

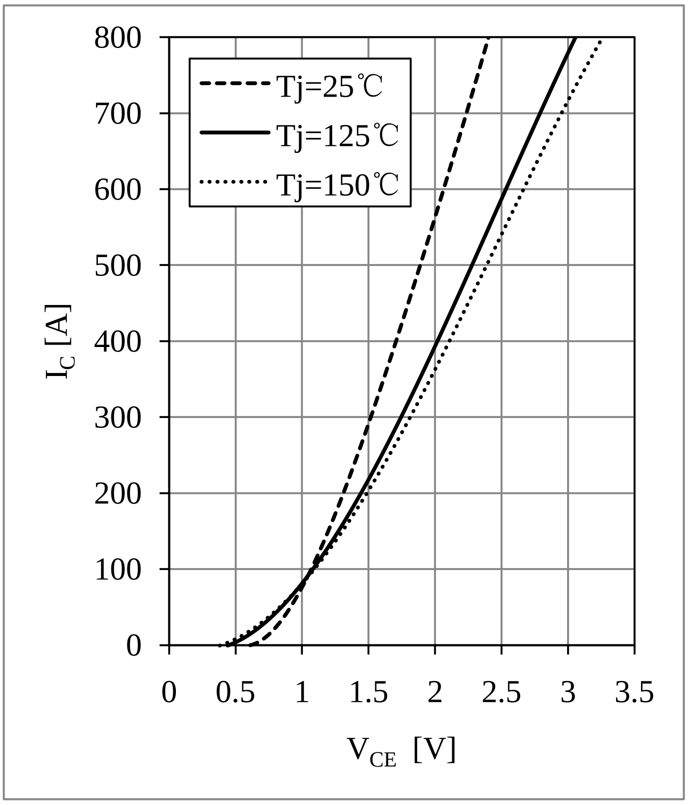
Electrical Characteristics of Diode T_C=25℃ unless otherwise noted

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Units
V_F	Diode Forward Voltage	I_F=400A, V_{GE}=0V	T_j=25℃		1.65	2.15	V
			T_j=125℃		1.65		
			T_j=150℃		1.65		
Q_r	Recovered Charge	I_F=400A, V_R=600V, R_G=1.8Ω, V_{GE}=-15V	T_j=25℃		44		μC
			T_j=125℃		78		
			T_j=150℃		90		
I_{RM}	Peak Reverse Recovery Current		T_j=25℃		490		A
			T_j=125℃		555		
			T_j=150℃		565		
E_{rec}	Reverse Recovery Energy		T_j=25℃		19.0		mJ
			T_j=125℃		35.1		
			T_j=150℃		38.8		

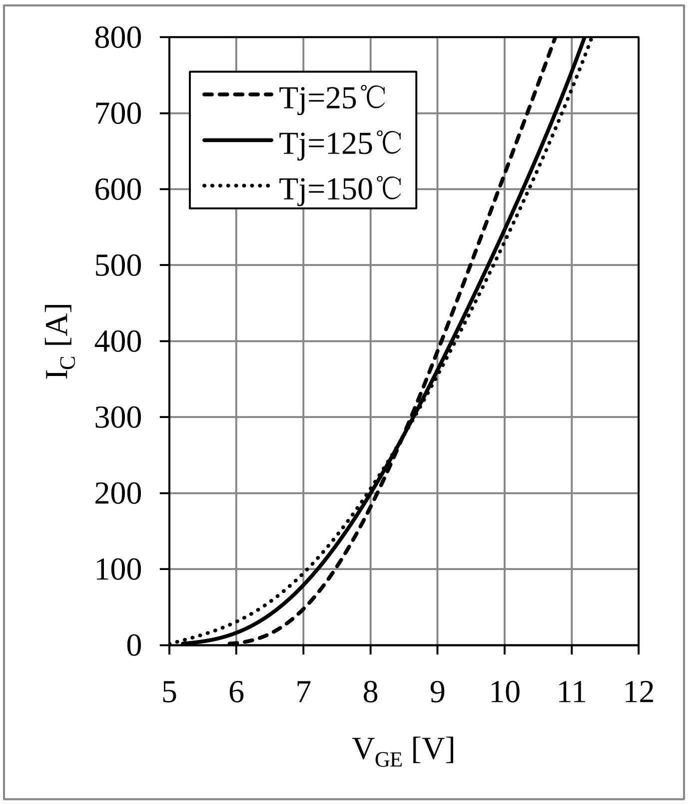
Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case (per IGBT)		0.059	K/W
$R_{\theta JC}$	Junction-to-Case (per Diode)		0.106	K/W
$R_{\theta CS}$	Case-to-Sink (Conductive grease applied)	0.035		K/W

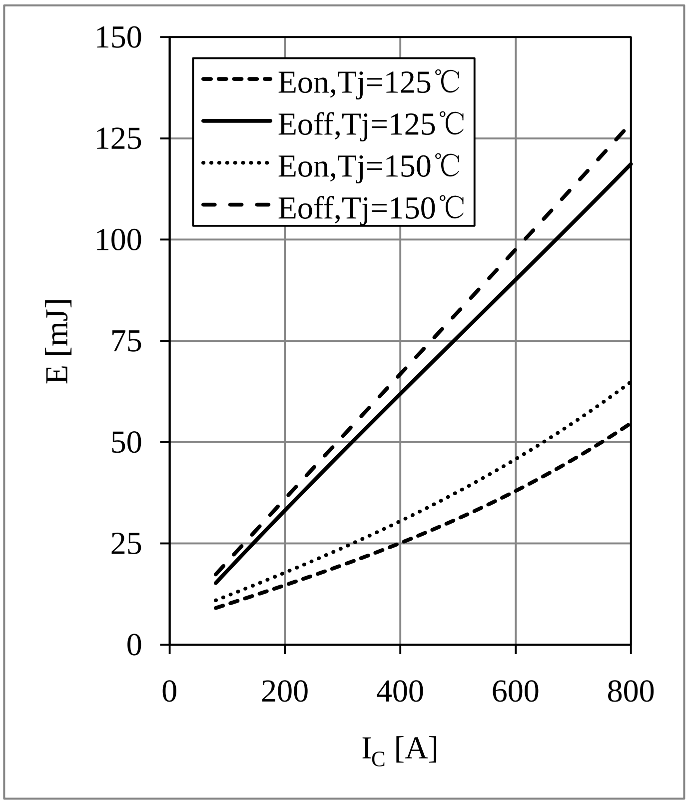
IGBT-inverter Output Characteristics
V_{GE}=15V



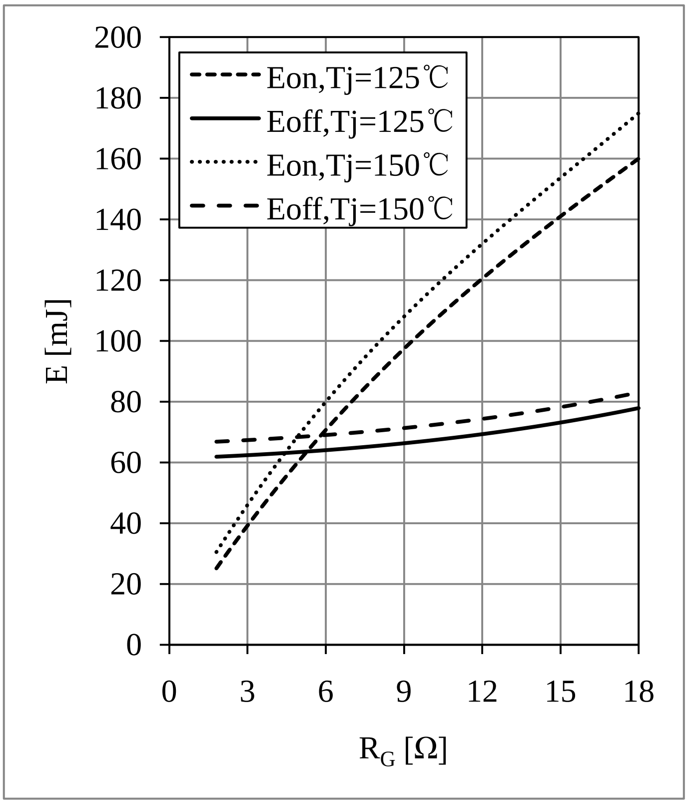
IGBT-inverter Transfer Characteristics
V_{CE}=20V



IGBT-inverter Switching Loss vs. I_C
V_{CC}=600V,R_G=1.8Ω,V_{GE}=±15V

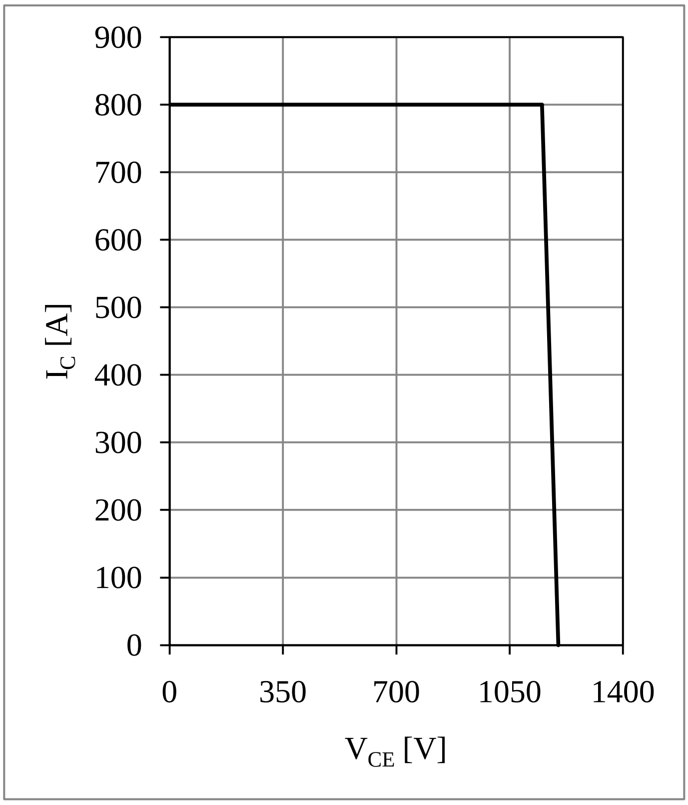


IGBT-inverter Switching Loss vs. R_G
V_{CC}=600V,I_C=400A,V_{GE}=±15V

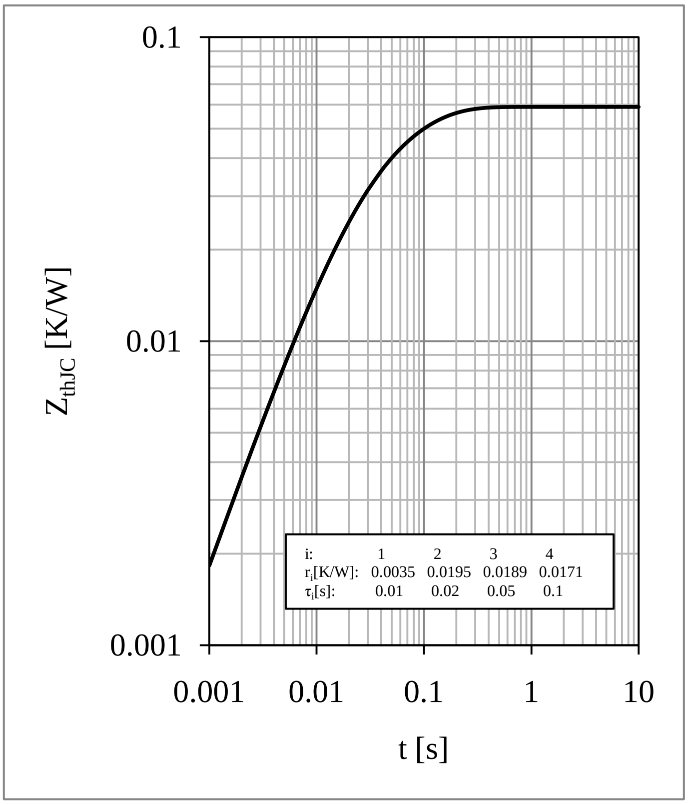


IGBT-inverter RBSOA

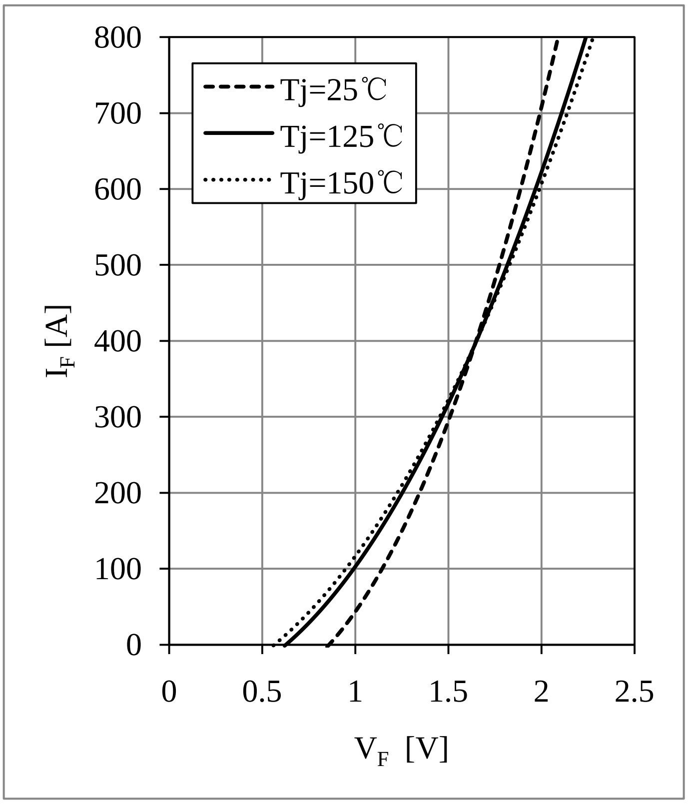
Module, R_G=1.8Ω,V_{GE}=±15V,T_j=150℃



IGBT-inverter Transient Thermal Impedance

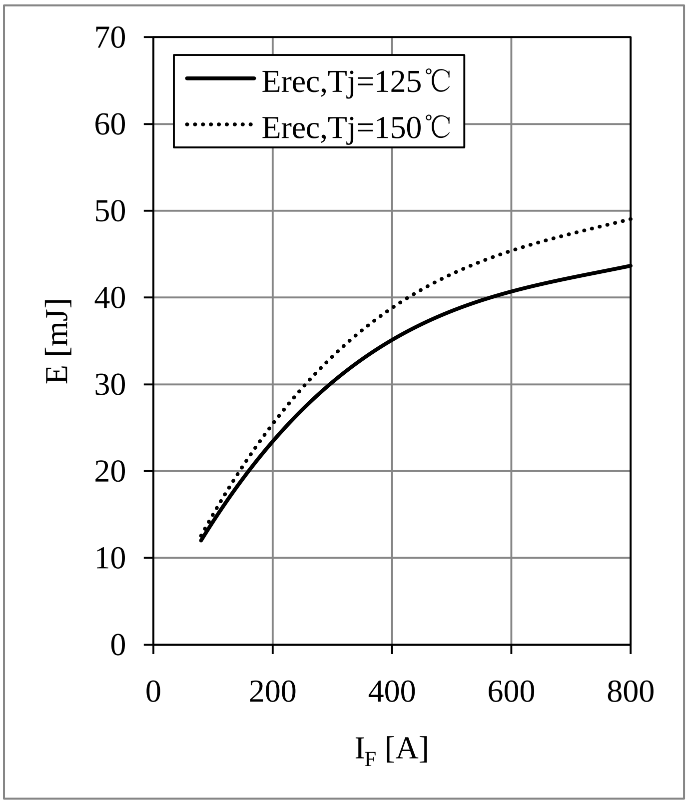


Diode-inverter Forward Characteristics

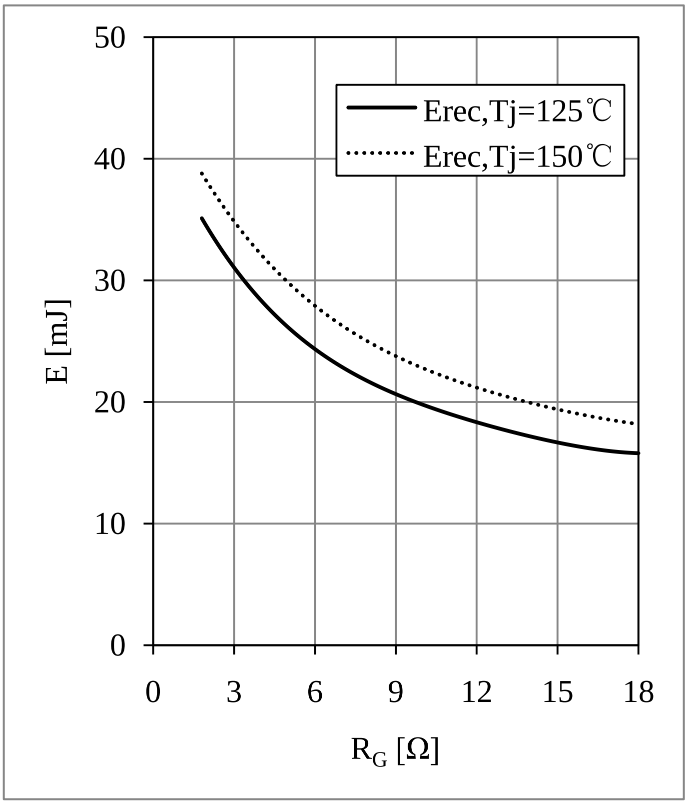


Diode-inverter Switching Loss vs. I_F

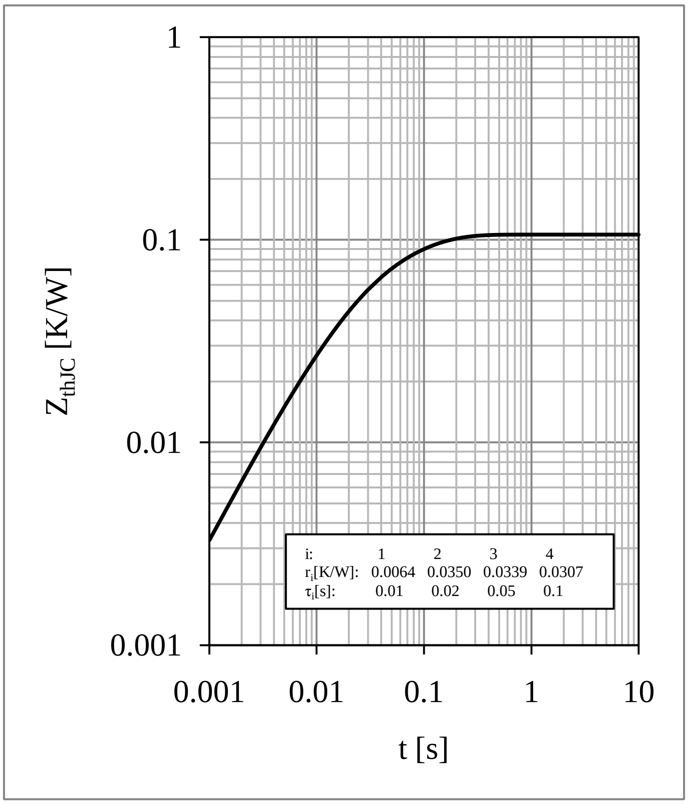
V_{CC}=600V,R_G=1.8Ω



Diode-inverter Switching Loss vs. R_G
V_{CC}=600V,I_F=400A

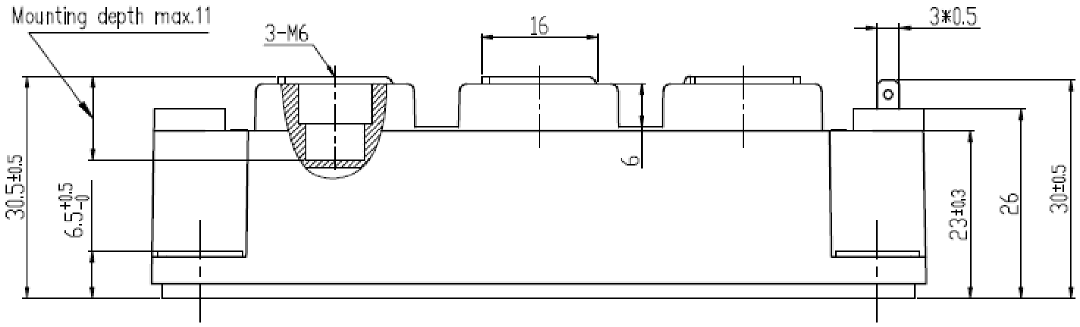


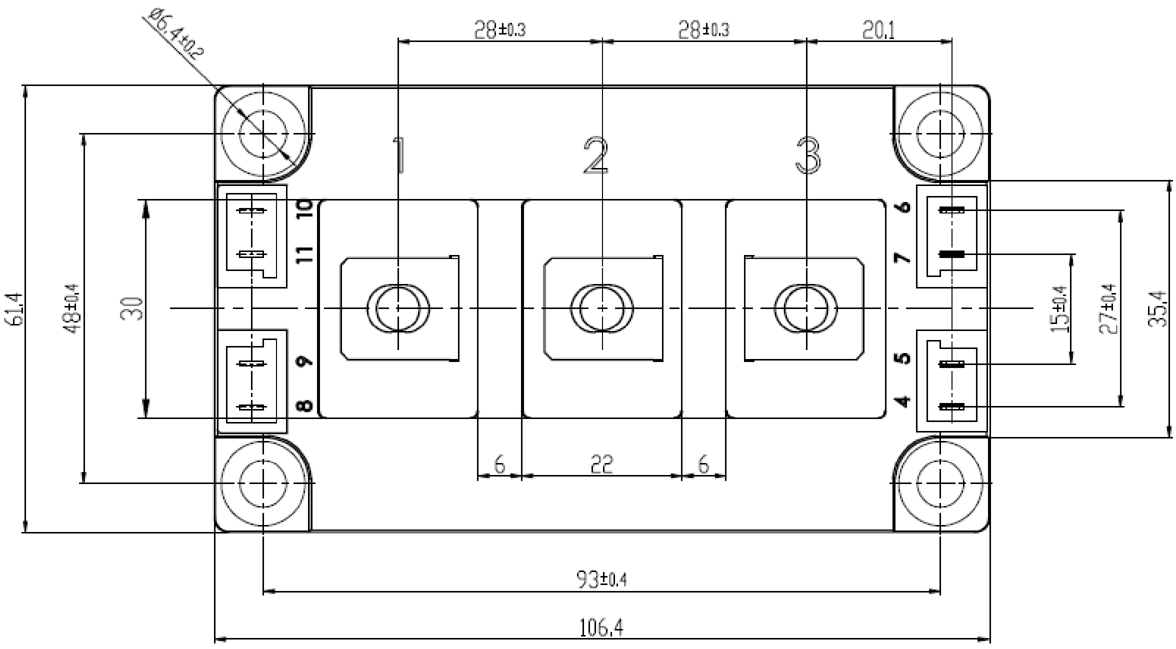
Diode-inverter Transient Thermal Impedance



Package Dimensions

Dimensions in Millimeters





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