

STARPOWER

SEMICONDUCTOR

IGBT

GD200FFY120C6SF

1200V/200A 6 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

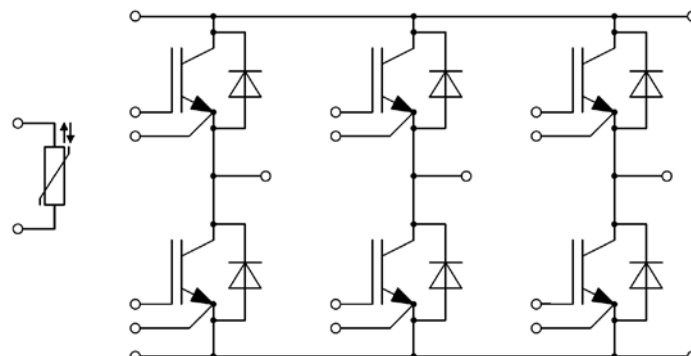
- Low $V_{CE(sat)}$ Trench IGBT technology
- 10 μ s short circuit capability
- $V_{CE(sat)}$ with positive temperature coefficient
- Maximum junction temperature 175°C
- Low inductance case
- Fast & soft reverse recovery anti-parallel FWD
- Isolated copper baseplate using DBC technology
- PressFIT contact technology



Typical Applications

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

Equivalent Circuit Schematic



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

Symbol	Description	Values	Unit
V_{CES}	Collector-Emitter Voltage	1200	V
V_{GES}	Gate-Emitter Voltage	± 20	V
I_C	Collector Current @ $T_C=25^{\circ}\text{C}$	309	A
	@ $T_C=100^{\circ}\text{C}$	200	A
I_{CM}	Pulsed Collector Current $t_p=1\text{ms}$	400	A
P_D	Maximum Power Dissipation @ $T_j=175^{\circ}\text{C}$	1006	W

Diode

Symbol	Description	Values	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1200	V
I_F	Diode Continuous Forward Current	200	A
I_{FM}	Diode Maximum Forward Current $t_p=1\text{ms}$	400	A

Module

Symbol	Description	Values	Unit
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, $f=50\text{Hz}$, $t=1\text{min}$	2500	V

IGBT Characteristics $T_c=25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit	
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C=200\text{A}, V_{GE}=15\text{V}, T_j=25^\circ\text{C}$		1.70	2.15	V	
		$I_C=200\text{A}, V_{GE}=15\text{V}, T_j=125^\circ\text{C}$		1.95			
		$I_C=200\text{A}, V_{GE}=15\text{V}, T_j=150^\circ\text{C}$		2.00			
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=5.0\text{mA}, V_{CE}=V_{GE}, T_j=25^\circ\text{C}$	5.2	6.0	6.8	V	
I_{CES}	Collector Cut-Off Current	$V_{CE}=V_{CES}, V_{GE}=0\text{V}, T_j=25^\circ\text{C}$			1.0	mA	
I_{GES}	Gate-Emitter Leakage Current	$V_{GE}=V_{GES}, V_{CE}=0\text{V}, T_j=25^\circ\text{C}$			400	nA	
R_{Gint}	Internal Gate Resistance			4.0		Ω	
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600\text{V}, I_C=200\text{A}, R_G=1.1\Omega, V_{GE}=\pm 15\text{V}, T_j=25^\circ\text{C}$		150		ns	
t_r	Rise Time			32		ns	
$t_{d(off)}$	Turn-Off Delay Time			330		ns	
t_f	Fall Time			93		ns	
E_{on}	Turn-On Switching Loss				11.2		mJ
E_{off}	Turn-Off Switching Loss				11.3		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600\text{V}, I_C=200\text{A}, R_G=1.1\Omega, V_{GE}=\pm 15\text{V}, T_j=125^\circ\text{C}$		161		ns	
t_r	Rise Time			37		ns	
$t_{d(off)}$	Turn-Off Delay Time			412		ns	
t_f	Fall Time			165		ns	
E_{on}	Turn-On Switching Loss				19.8		mJ
E_{off}	Turn-Off Switching Loss				17.0		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600\text{V}, I_C=200\text{A}, R_G=1.1\Omega, V_{GE}=\pm 15\text{V}, T_j=150^\circ\text{C}$		161		ns	
t_r	Rise Time			43		ns	
$t_{d(off)}$	Turn-Off Delay Time			433		ns	
t_f	Fall Time			185		ns	
E_{on}	Turn-On Switching Loss				21.9		mJ
E_{off}	Turn-Off Switching Loss				19.1		mJ
I_{SC}	SC Data	$t_P \leq 10\mu\text{s}, V_{GE}=15\text{V}, T_j=150^\circ\text{C}, V_{CC}=900\text{V}, V_{CEM} \leq 1200\text{V}$		800		A	

Diode Characteristics $T_C=25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
V_F	Diode Forward Voltage	$I_F=200\text{A}, V_{GE}=0\text{V}, T_j=25^\circ\text{C}$		1.65	2.10	V
		$I_F=200\text{A}, V_{GE}=0\text{V}, T_j=125^\circ\text{C}$		1.65		
		$I_F=200\text{A}, V_{GE}=0\text{V}, T_j=150^\circ\text{C}$		1.65		
Q_r	Recovered Charge			17.6		μC
I_{RM}	Peak Reverse Recovery Current	$V_R=600\text{V}, I_F=200\text{A},$ $-di/dt=5400\text{A}/\mu\text{s}, V_{GE}=-15\text{V}$ $T_j=25^\circ\text{C}$		228		A
E_{rec}	Reverse Recovery Energy			7.7		mJ
Q_r	Recovered Charge			31.8		μC
I_{RM}	Peak Reverse Recovery Current	$V_R=600\text{V}, I_F=200\text{A},$ $-di/dt=5400\text{A}/\mu\text{s}, V_{GE}=-15\text{V}$ $T_j=125^\circ\text{C}$		238		A
E_{rec}	Reverse Recovery Energy			13.8		mJ
Q_r	Recovered Charge			36.6		μC
I_{RM}	Peak Reverse Recovery Current	$V_R=600\text{V}, I_F=200\text{A},$ $-di/dt=5400\text{A}/\mu\text{s}, V_{GE}=-15\text{V}$ $T_j=150^\circ\text{C}$		247		A
E_{rec}	Reverse Recovery Energy			15.2		mJ

NTC Characteristics $T_C=25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
R_{25}	Rated Resistance			5.0		k Ω
$\Delta R/R$	Deviation of R_{100}	$T_C=100^\circ\text{C}, R_{100}=493.3\Omega$	-5		5	%
P_{25}	Power Dissipation				20.0	mW
$B_{25/50}$	B-value	$R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298.15\text{K}))]$		3375		K
$B_{25/80}$	B-value	$R_2=R_{25}\exp[B_{25/80}(1/T_2-1/(298.15\text{K}))]$		3411		K
$B_{25/100}$	B-value	$R_2=R_{25}\exp[B_{25/100}(1/T_2-1/(298.15\text{K}))]$		3433		K

Module Characteristics $T_C=25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Min.	Typ.	Max.	Unit
L_{CE}	Stray Inductance		21		nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal to Chip		1.80		m Ω
R_{thJC}	Junction-to-Case (per IGBT)			0.149	K/W
	Junction-to-Case (per Diode)			0.206	
R_{thCH}	Case-to-Heatsink (per IGBT)		0.031		K/W
	Case-to-Heatsink (per Diode)		0.043		
	Case-to-Heatsink (per Module)		0.009		
M	Mounting Torque, Screw M5	3.0		6.0	N.m
G	Weight of Module		300		g

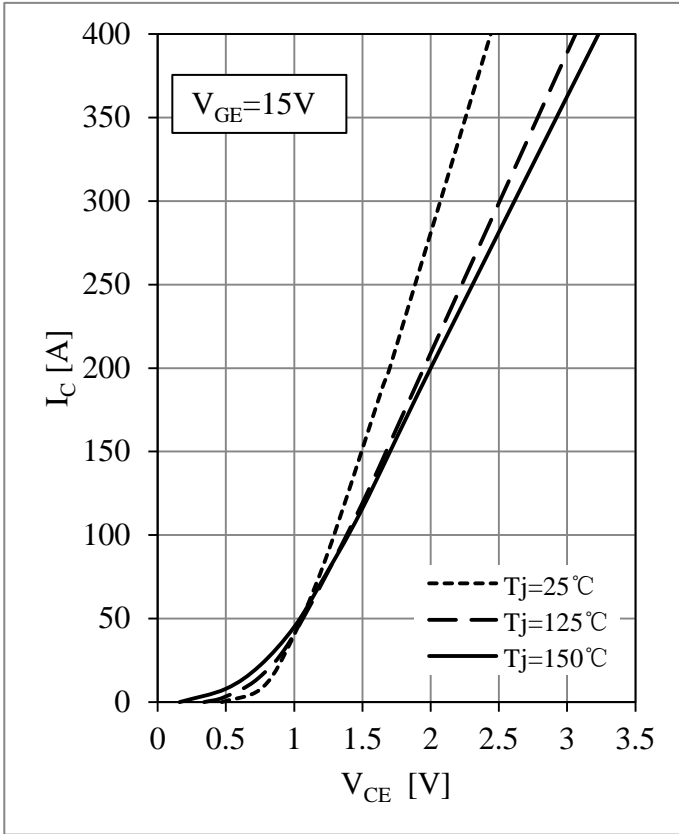


Fig 1. IGBT Output Characteristics

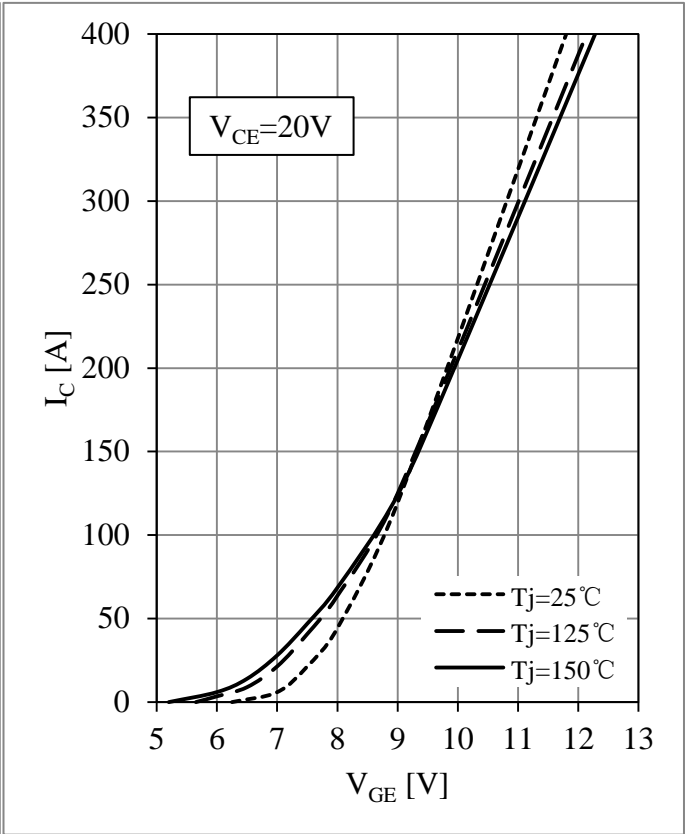


Fig 2. IGBT Transfer Characteristics

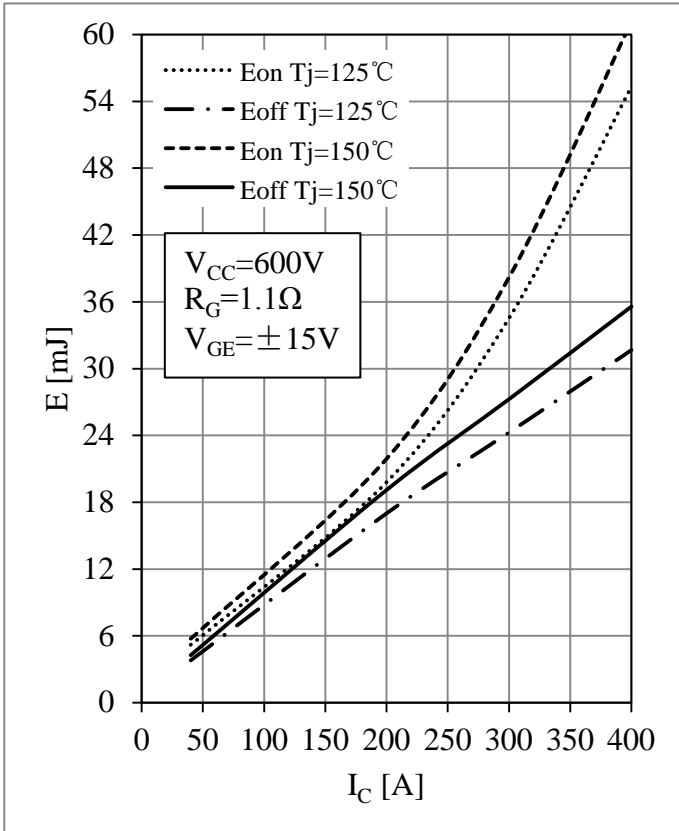


Fig 3. IGBT Switching Loss vs. I_C

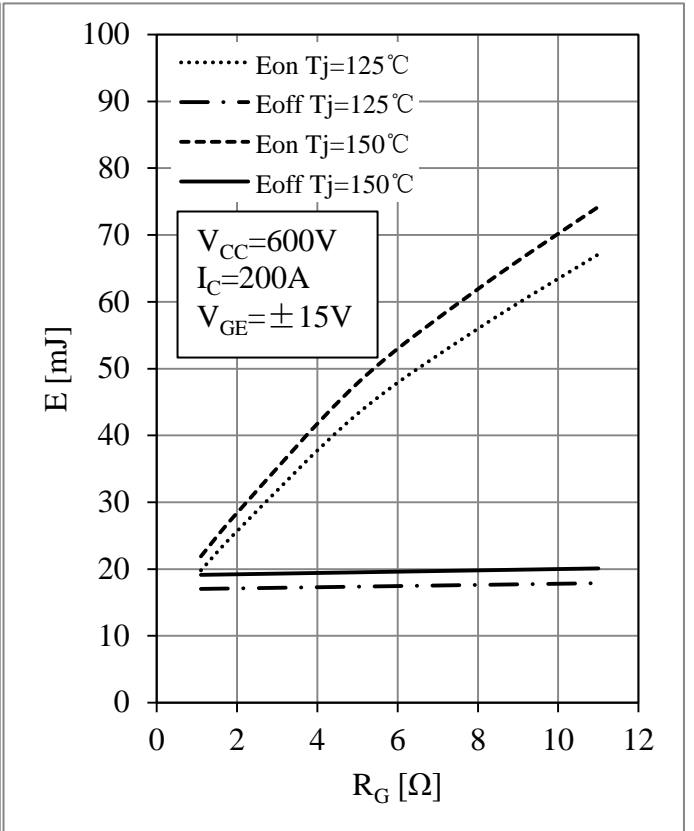


Fig 4. IGBT Switching Loss vs. R_G

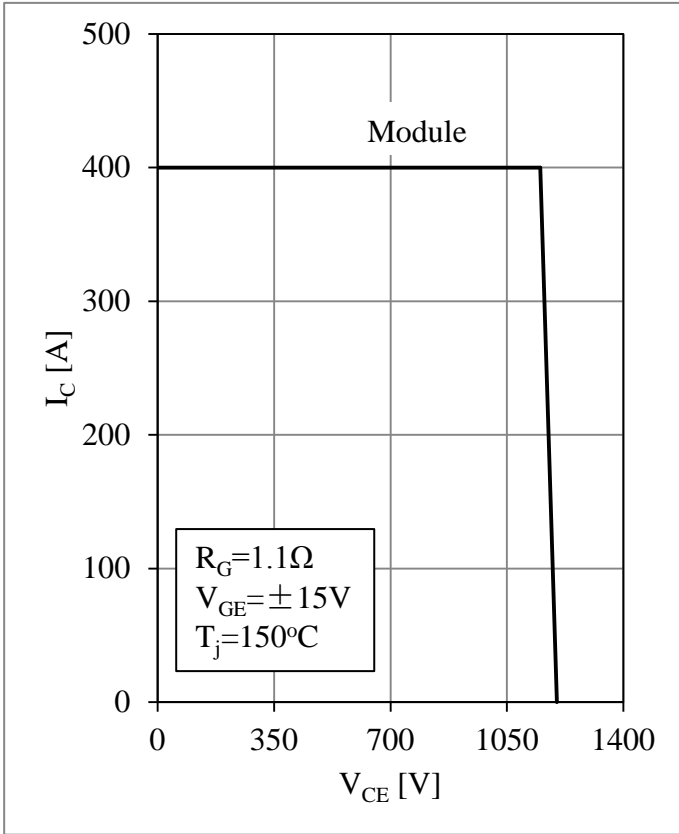


Fig 5. RBSOA

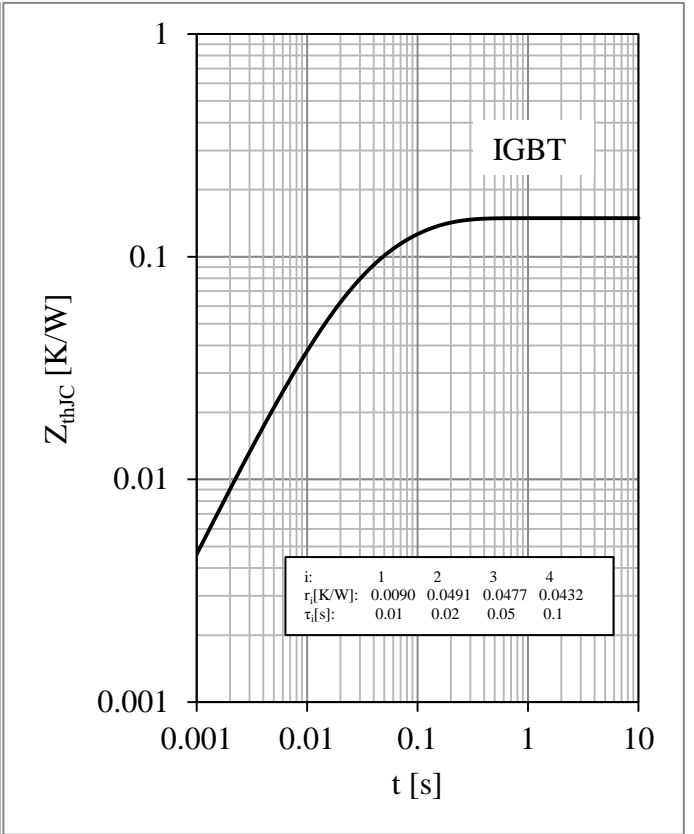


Fig 6. IGBT Transient Thermal Impedance

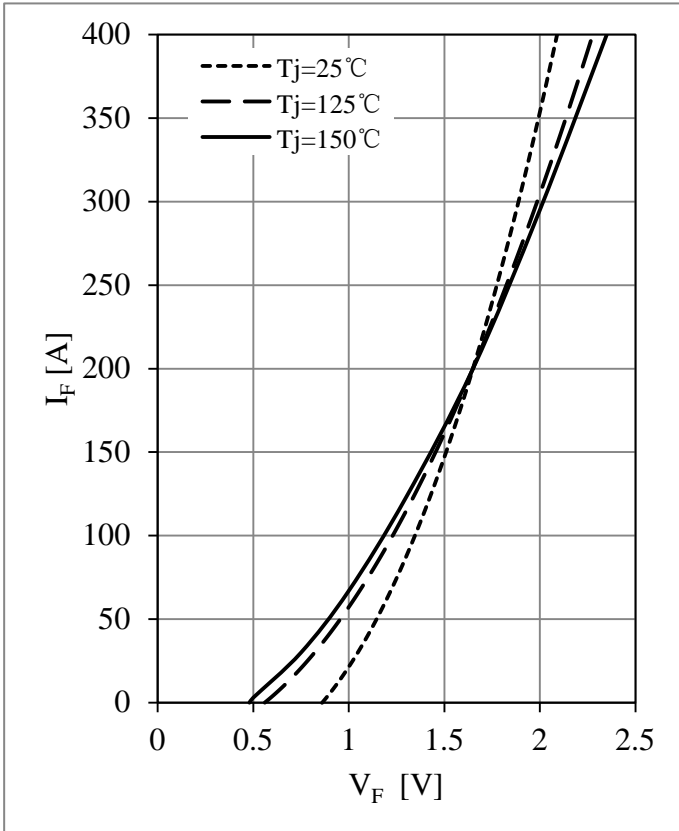


Fig 7. Diode Forward Characteristics

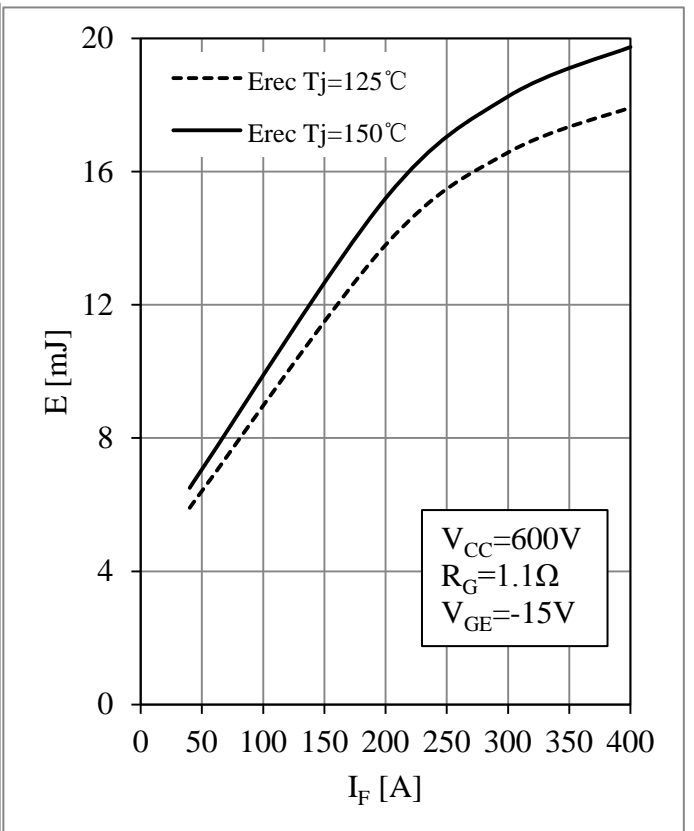


Fig 8. Diode Switching Loss vs. I_F

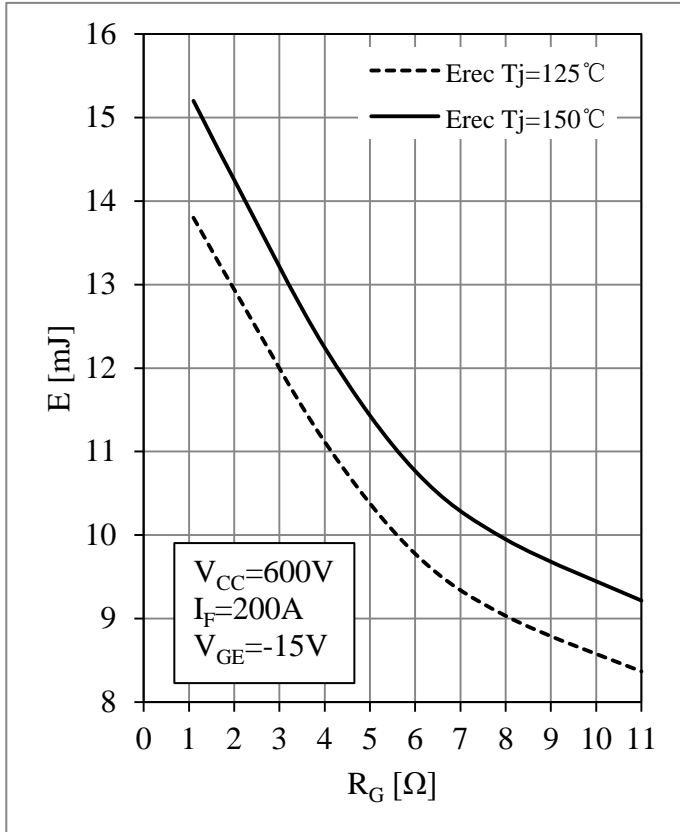


Fig 9. Diode Switching Loss vs. R_G

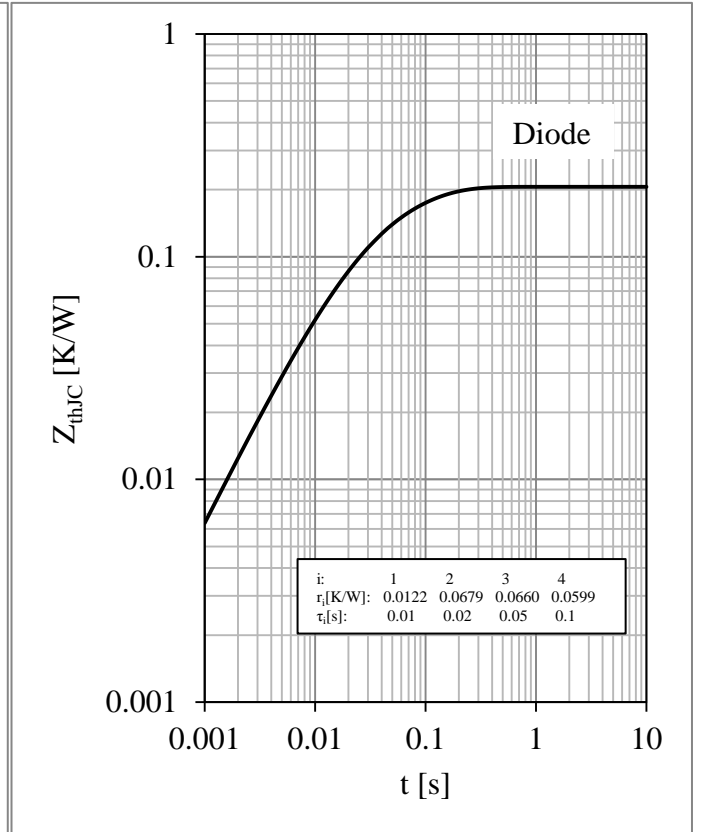


Fig 10. Diode Transient Thermal Impedance

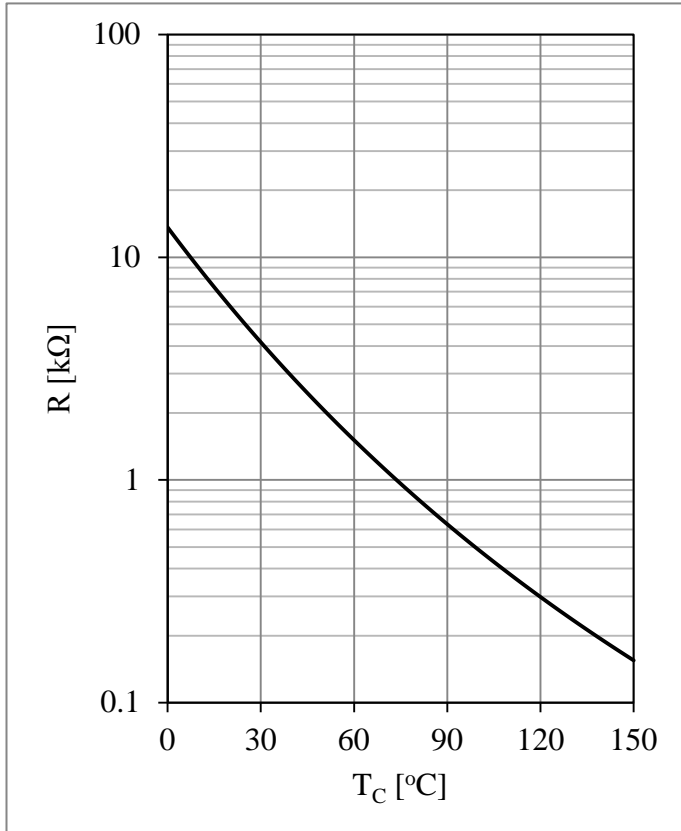
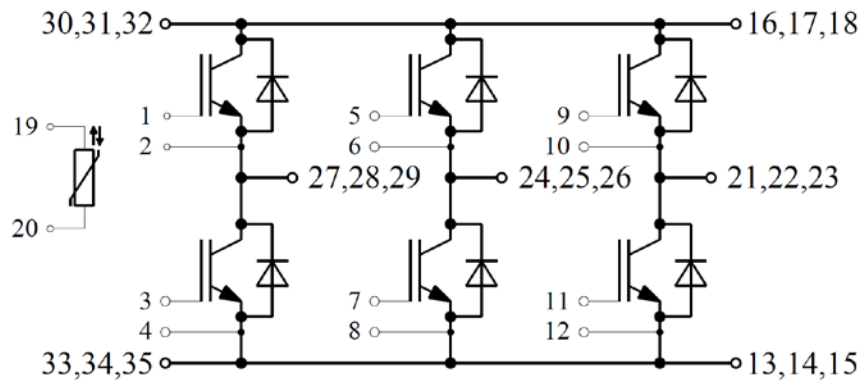


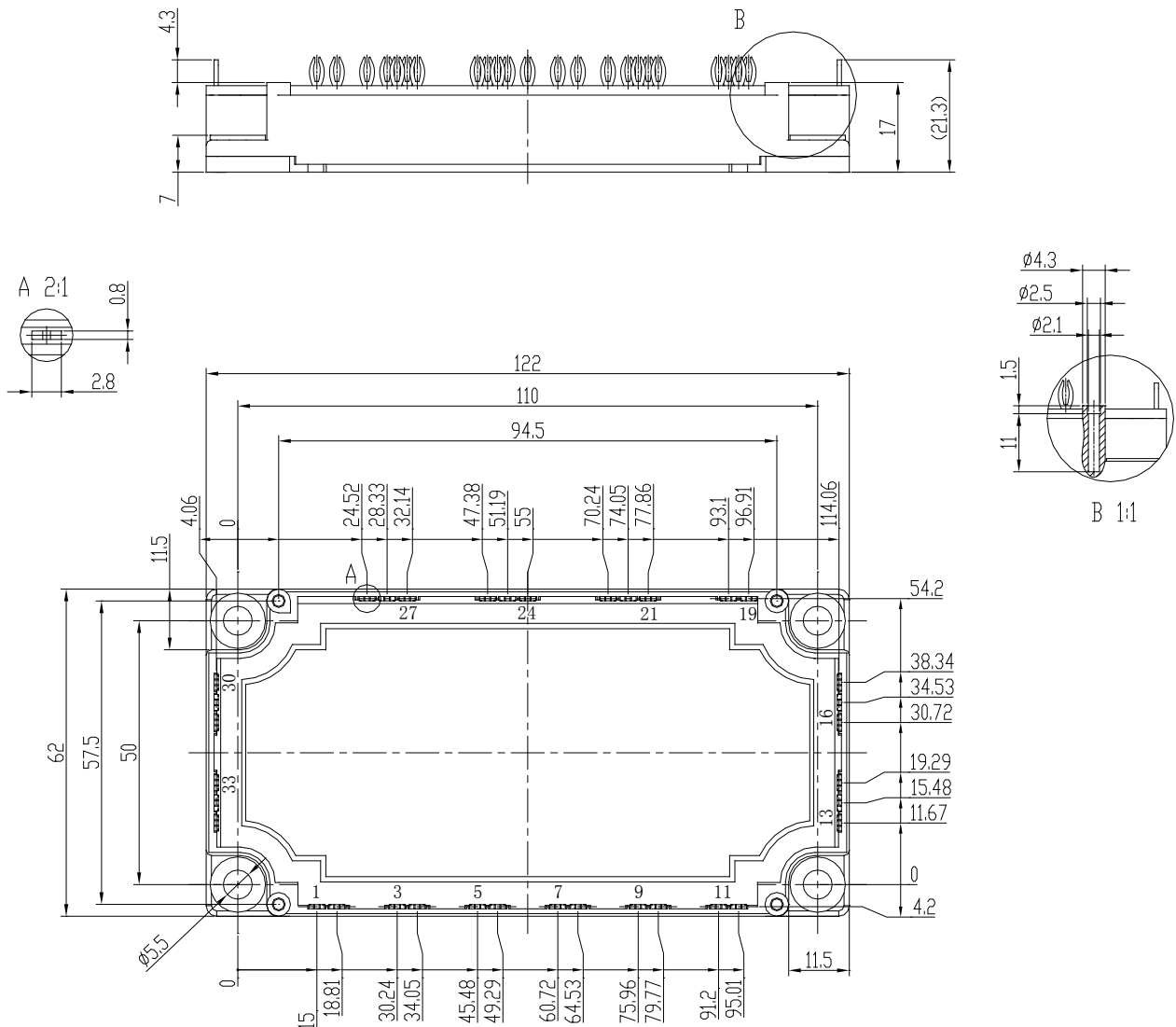
Fig 11. NTC Temperature Characteristic

Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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