STARPOWER

SEMICONDUCTOR **IGBT**

GD600HFT65C6S

Molding Type Module

650V/600A 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 general inverters and UPS.

Features

- Low $V_{CE(sat)}$ Trench IGBT technology
- Low switching losses
- 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 pinfin baseplate using DBC technology

Typical Applications

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

IGBT-inverter T_C=25℃ unless otherwise noted

Maximum Rated Values

Symbol	Description	GD600HFT65C6S	Unit
V_{CES}	Collector-Emitter Voltage @ T_j=25℃	650	V
V_{GES}	Gate-Emitter Voltage @ T_j=25℃	±20	V
I_C	Collector Current @ T_C=25℃ @ T_C=55℃	700 600	A
I_{CM}	Pulsed Collector Current t_p=1ms	1200	A
P_{tot}	Total Power Dissipation @ T_j=175℃	1648	W

Off Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)CES}$	Collector-Emitter Breakdown Voltage	T_j=25℃	650			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.	Unit
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=9.6mA,V_{CE}=V_{GE}, T_j=25℃	5.1	5.8	6.4	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C=600A,V_{GE}=15V, T_j=25℃		1.45	1.75	V
		I_C=600A,V_{GE}=15V, T_j=150℃		1.70		

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=300V,I_C=600A, R_G=2.4Ω,V_{GE}=±15V, T_j=25℃		98		ns
t_r	Rise Time			91		ns
$t_{d(off)}$	Turn-Off Delay Time			675		ns
t_f	Fall Time			71		ns
E_{on}	Turn-On Switching Loss			8.92		mJ
E_{off}	Turn-Off Switching Loss			21.6		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=300V,I_C=600A, R_G=2.4Ω,V_{GE}=±15V, T_j=150℃		119		ns
t_r	Rise Time			99		ns
$t_{d(off)}$	Turn-Off Delay Time			728		ns
t_f	Fall Time			75		ns
E_{on}	Turn-On Switching Loss			10.4		mJ
E_{off}	Turn-Off Switching Loss			26.5		mJ
C_{ies}	Input Capacitance	V_{CE}=25V,f=1Mhz, V_{GE}=0V		37.0		nF
C_{res}	Reverse Transfer Capacitance			1.10		nF
Q_G	Gate Charge	V_{CC}=300V,I_C=600A, V_{GE}=-15…+15V		6.50		μC
R_{Gint}	Internal Gate Resister			0.67		Ω
I_{SC}	SC Data	t_P≤6μs,V_{GE}=15V, T_j=150℃, V_{CC}=360V, V_{CEM}≤650V		3000		A

Diode-inverter T_C=25℃ unless otherwise noted

Maximum Rated Values

Symbol	Description	GD600HFT65C6S	Unit
V_{RRM}	Repetitive Peak Reverse Voltage @ T_j=25℃	650	V
I_F	DC Forward Current	600	A
I_{FRM}	Repetitive Peak Forward Current t_p=1ms	1200	A

Characteristics Values

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
V_F	Diode Forward Voltage	I_F=600A, V_{GE}=0V	T_j=25℃		1.55	1.95	V
			T_j=150℃		1.45		
Q_r	Recovered Charge	I_F=600A, V_R=300V, R_G=2.4Ω, V_{GE}=-15V	T_j=25℃		16.8		μC
			T_j=150℃		42.1		
I_{RM}	Peak Reverse Recovery Current		T_j=25℃		204		A
			T_j=150℃		333		
E_{rec}	Reverse Recovery Energy		T_j=25℃		4.02		mJ
			T_j=150℃		10.4		

Electrical Characteristics of NTC T_C=25℃ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
R_{25}	Rated Resistance			5.0		kΩ
ΔR/R	Deviation of R_{100}	R_{100}=493.3Ω	-5		5	%
P_{25}	Power Dissipation				20.0	mW
$B_{25/50}$	B-value	$R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298.15K))]$		3375		K

IGBT Module

Symbol	Parameter	Min.	Typ.	Max.	Unit
V_{ISO}	Isolation Voltage RMS,f=50Hz,t=1min	2500			V
L_{CE}	Stray Inductance		20		nH
$R_{CC'+EE'}$	Module Lead Resistance,Terminal to Chip @ T_C=25℃		1.10		mΩ
$R_{\theta JC}$	Junction-to-Case (per IGBT) Junction-to-Case (per Diode)			0.091 0.152	K/W
$R_{\theta CS}$	Case-to-Sink (Conductive grease applied)		0.009		K/W
T_{jmax}	Maximum Junction Temperature			175	℃
T_{jop}	Operating Junction Temperature	-40		150	℃
T_{stg}	Storage Temperature Range	-40		125	℃
M	Terminal Connection Torque, Screw M5 Mounting Torque, Screw M6	3.0 3.0		6.0 6.0	N.m
G	Weight of Module		350		g

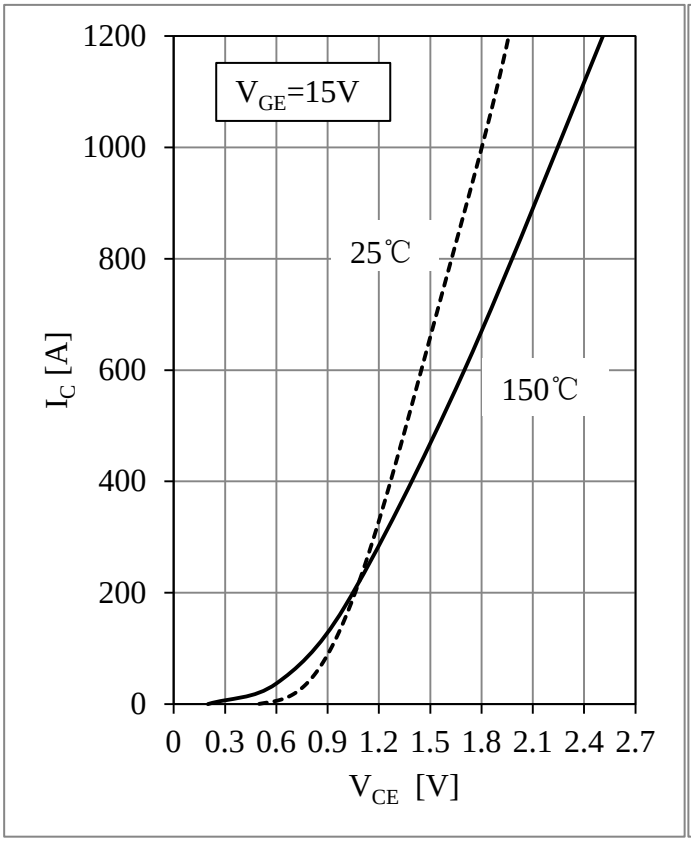


Fig 1. IGBT-inverter Output Characteristics

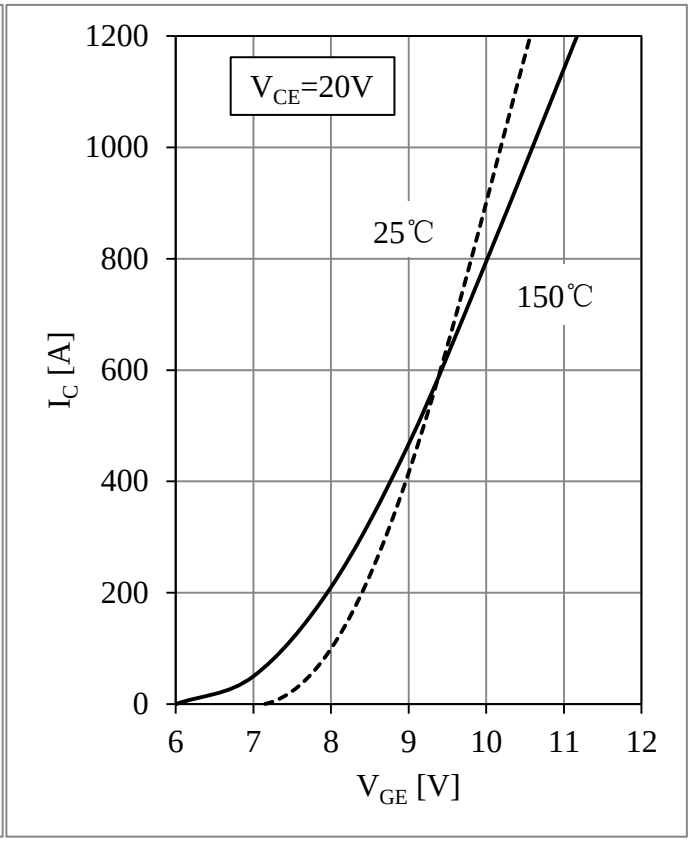


Fig 2. IGBT-inverter Transfer Characteristics

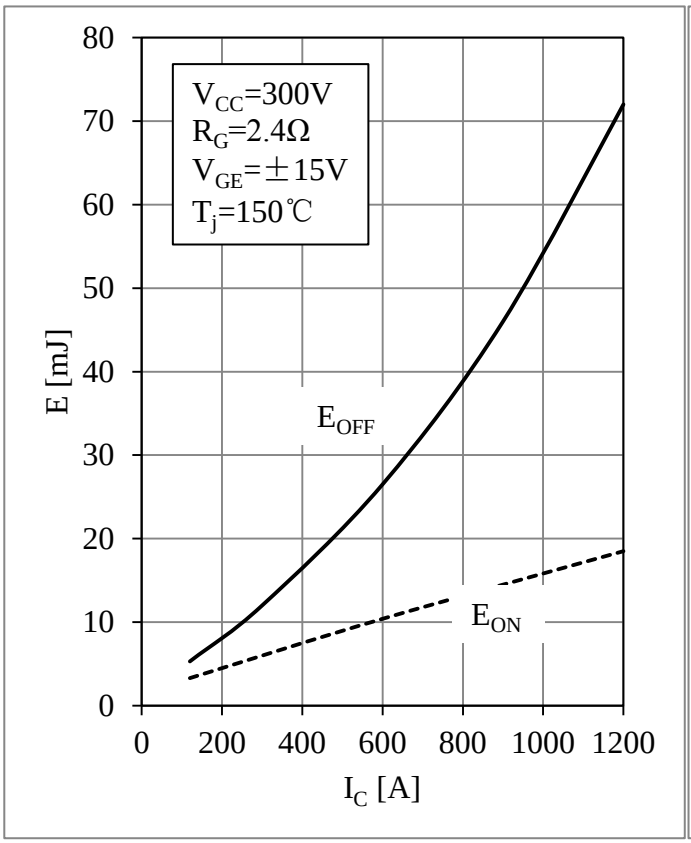


Fig 3. IGBT-inverter Switching Loss vs. I_C

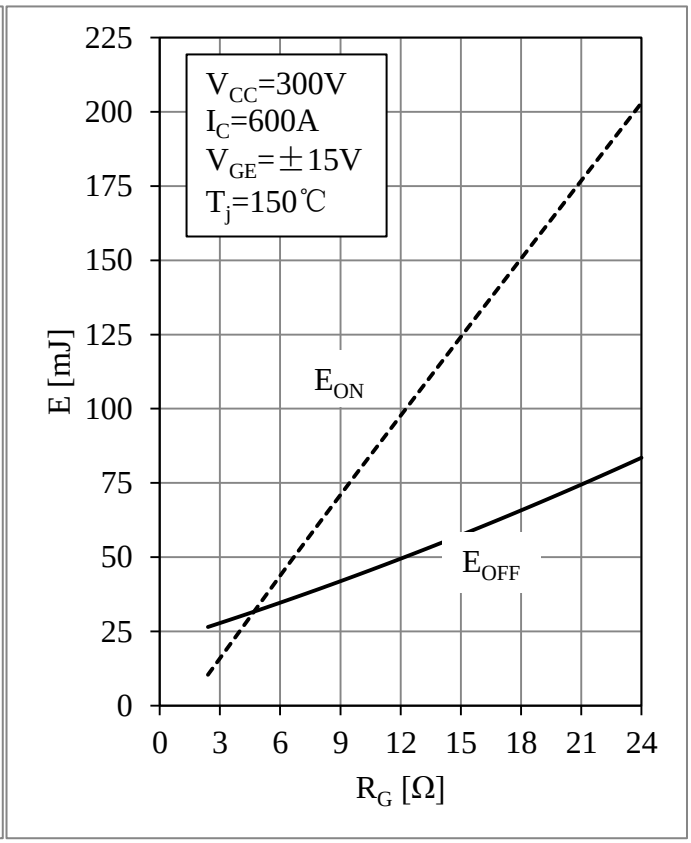


Fig 4. IGBT-inverter Switching Loss vs. R_G

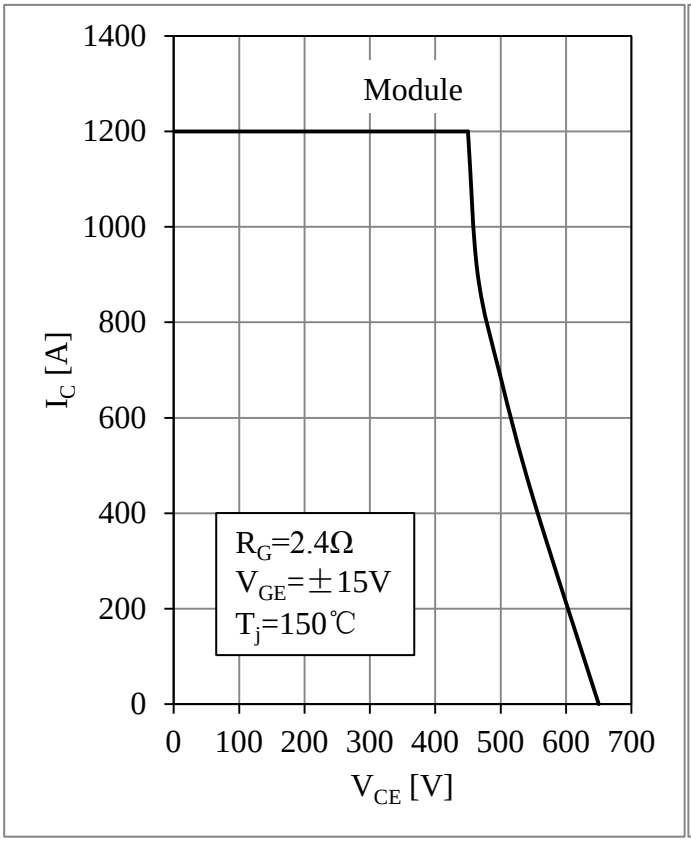


Fig 5. IGBT-inverter RBSOA

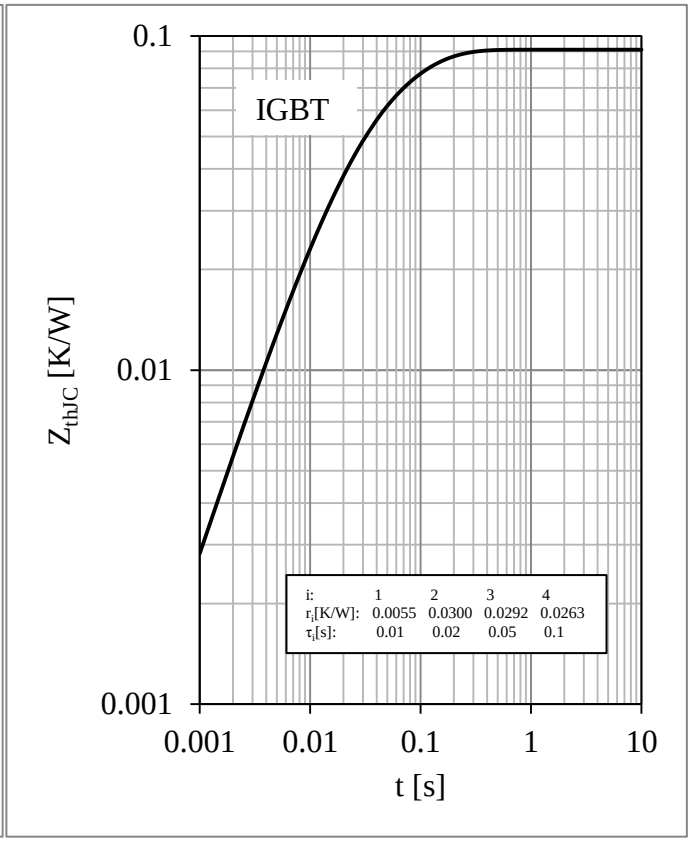


Fig 6. IGBT-inverter Transient Thermal Impedance

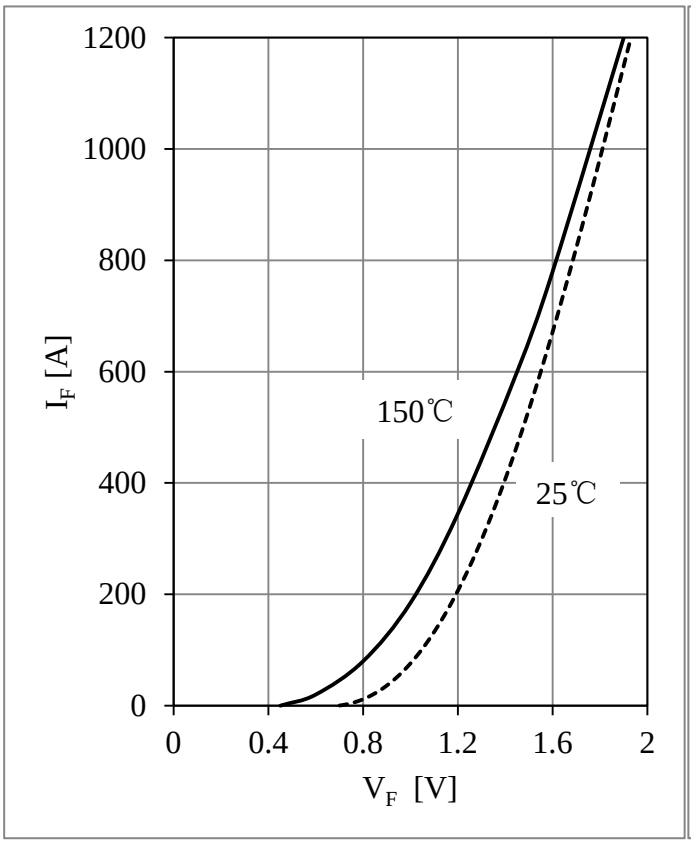


Fig 7. Diode-inverter Forward Characteristics

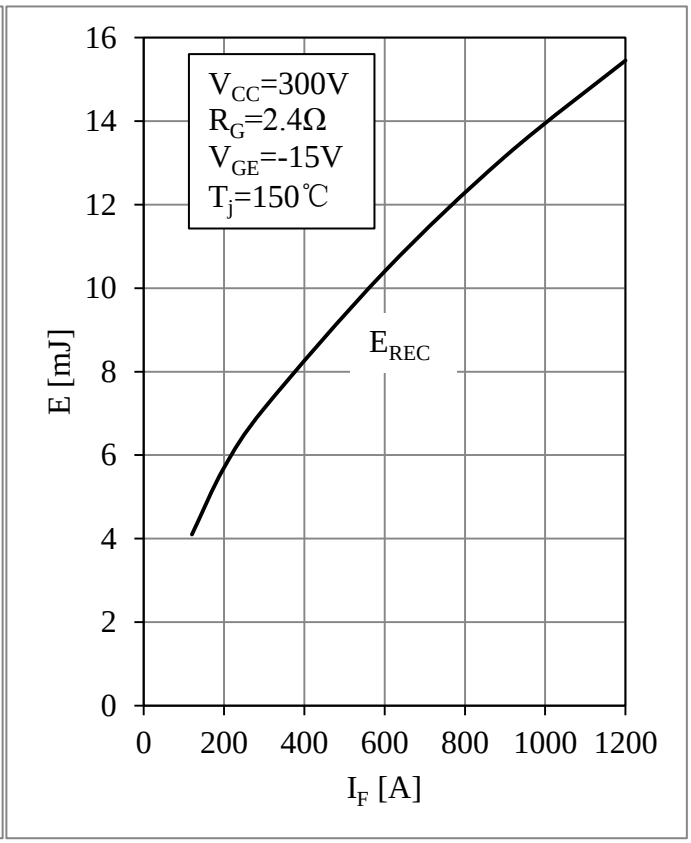


Fig 8. Diode-inverter Switching Loss vs. I_F

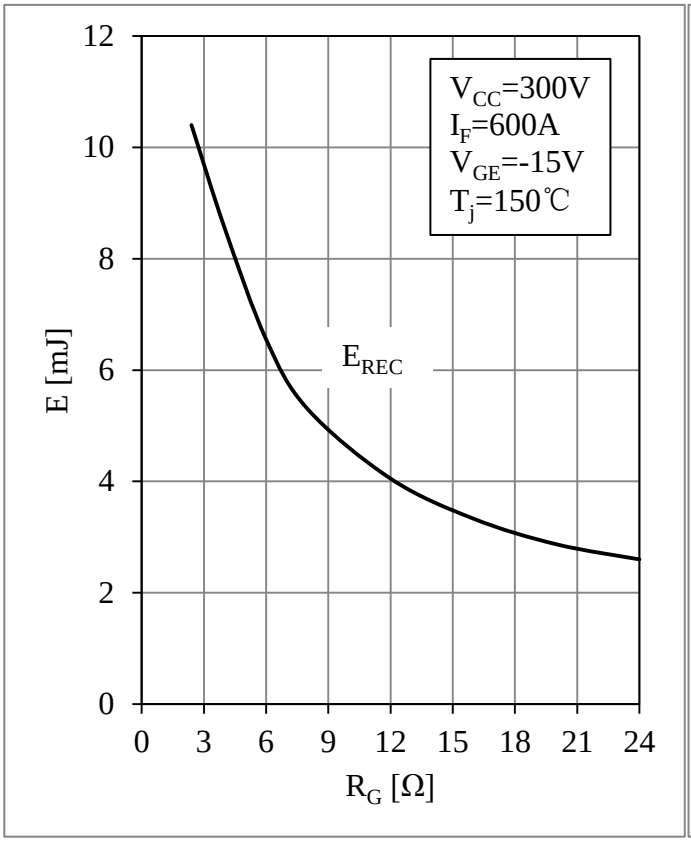


Fig 9. Diode-inverter Switching Loss vs. R_G

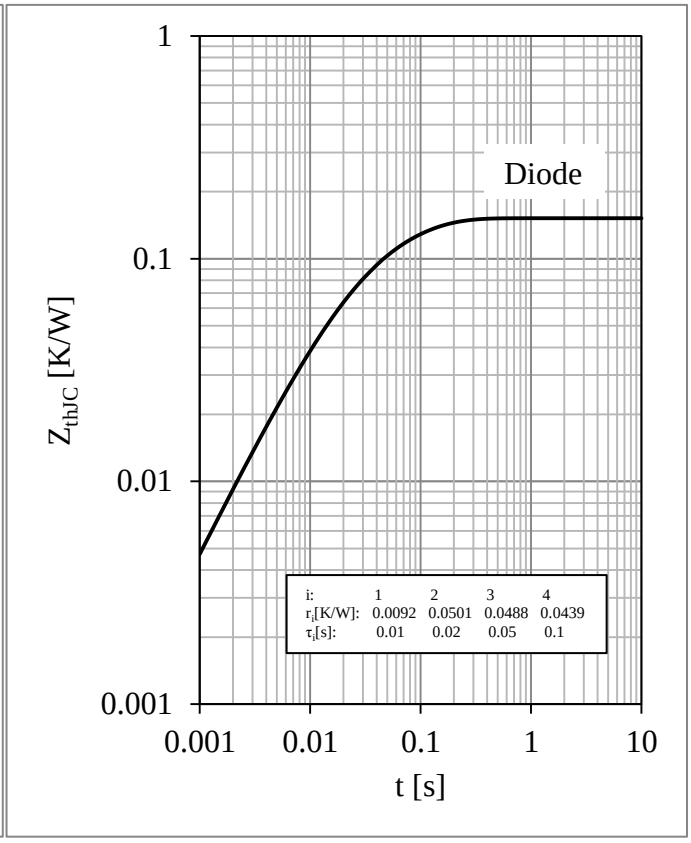


Fig 10. Diode-inverter Transient Thermal Impedance

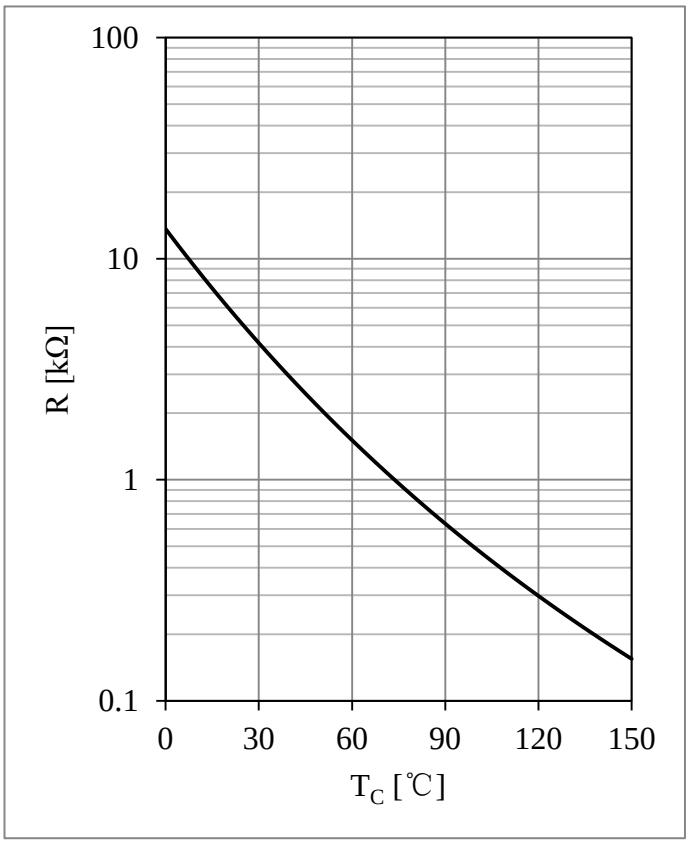
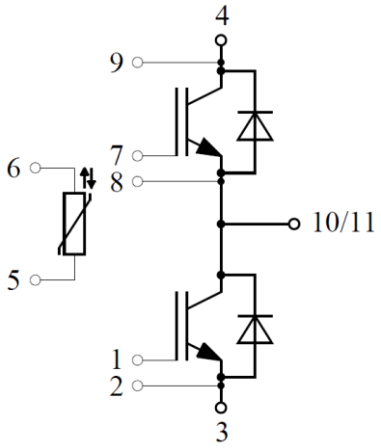


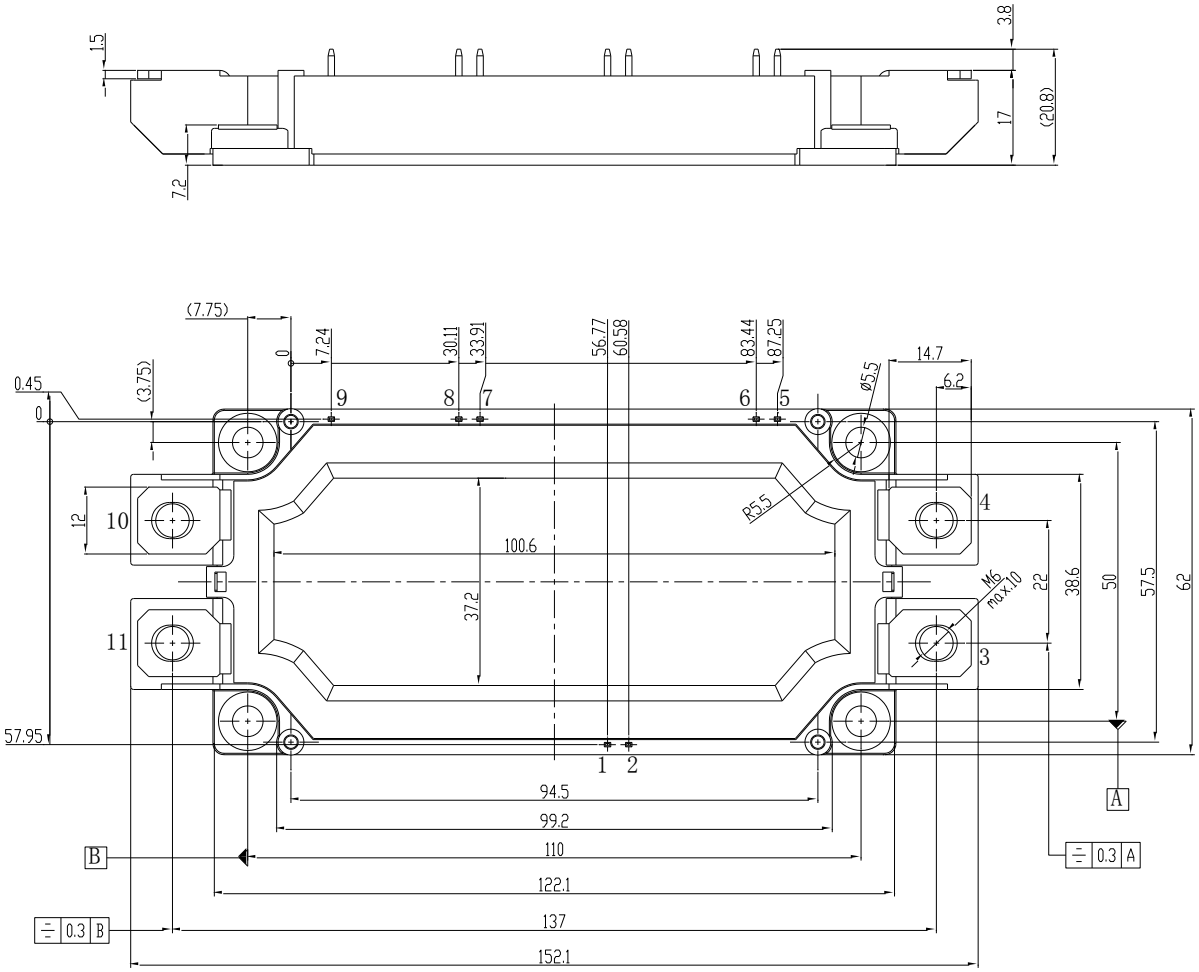
Fig 11. NTC Temperature Characteristic

Equivalent Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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