STARPOWER

SEMICONDUCTOR **IGBT**

GD150HFU120C6SD

1200V/150A 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.

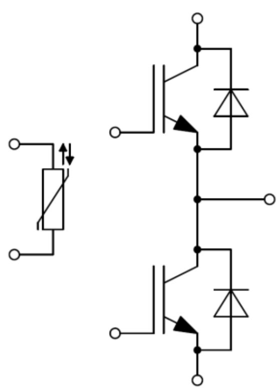
Features

- NPT IGBT technology
- 10μs short circuit capability
- Low switching losses
- Rugged with ultrafast performance
- $V_{CE(sat)}$ with positive temperature coefficient
- Fast & soft reverse recovery anti-parallel FWD
- Isolated copper baseplate using DBC 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°C unless otherwise noted

IGBT

Symbol	Description	Value	Unit
V_{CES}	Collector-Emitter Voltage	1200	V
V_{GES}	Gate-Emitter Voltage	±20	V
I_C	Collector Current @ T_C=25°C @ T_C=100°C	300 150	A
I_{CM}	Pulsed Collector Current t_p=1ms	300	A
P_D	Maximum Power Dissipation @ T_{vj}=150°C	1865	W

Diode

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1200	V
I_F	Diode Continuous Forward Current	150	A
I_{FM}	Diode Maximum Forward Current t_p=1ms	300	A

Module

Symbol	Description	Value	Unit
T_{vjmax}	Maximum Junction Temperature	150	°C
T_{vjop}	Operating Junction Temperature	-40 to +125	°C
T_{STG}	Storage Temperature Range	-40 to +125	°C
V_{ISO}	Isolation Voltage RMS,f=50Hz,t=1min	4000	V

IGBT Characteristics T_C=25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C=150A,V_{GE}=15V, T_{vj}=25°C		2.40	2.85	V
		I_C=150A,V_{GE}=15V, T_{vj}=125°C		3.00		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=9.0mA,V_{CE}=V_{GE}, T_j=25°C	4.7	5.7	6.7	V
I_{CES}	Collector Cut-Off Current	V_{CE}=V_{CES},V_{GE}=0V, T_{vj}=25°C			5.0	mA
I_{GES}	Gate-Emitter Leakage Current	V_{GE}=V_{GES},V_{CE}=0V, T_{vj}=25°C			400	nA
R_{Gint}	Internal Gate Resistance			0.83		Ω
C_{ies}	Input Capacitance	V_{CE}=25V,f=1MHz, V_{GE}=0V		15.2		nF
C_{res}	Reverse Transfer Capacitance			0.93		nF
Q_G	Gate Charge	V_{GE}=-15…+15V		2.43		μC
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=150A, R_G=4.3Ω,V_{GE}=±15V, Ls=40nH,T_{vj}=25°C		267		ns
t_r	Rise Time			61		ns
$t_{d(off)}$	Turn-Off Delay Time			400		ns
t_f	Fall Time			56		ns
E_{on}	Turn-On Switching Loss			9.92		mJ
E_{off}	Turn-Off Switching Loss			5.44		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=150A, R_G=4.3Ω,V_{GE}=±15V, Ls=40nH,T_{vj}=125°C		44		ns
t_r	Rise Time			29		ns
$t_{d(off)}$	Turn-Off Delay Time			273		ns
t_f	Fall Time			317		ns
E_{on}	Turn-On Switching Loss			12.3		mJ
E_{off}	Turn-Off Switching Loss			6.44		mJ
I_{SC}	SC Data	t_P≤10μs,V_{GE}=15V, T_{vj}=125°C,V_{CC}=800V, V_{CEM}≤1200V		900		A

Diode Characteristics T_C=25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_F	Diode Forward Voltage	I_F=150A,V_{GE}=0V,T_{vj}=25°C		1.65	2.10	V
		I_F=150A,V_{GE}=0V,T_{vj}=125°C		1.65		
Q_r	Recovered Charge	V_R=600V,I_F=150A, -di/dt=3295A/μs,V_{GE}=-15V Ls=40nH,T_{vj}=25°C		13.8		μC
I_{RM}	Peak Reverse Recovery Current			147		A
E_{rec}	Reverse Recovery Energy			5.05		mJ
Q_r	Recovered Charge	V_R=600V,I_F=150A, -di/dt=2879A/μs,V_{GE}=-15V Ls=40nH,T_{vj}=125°C		25.5		μC
I_{RM}	Peak Reverse Recovery Current			183		A
E_{rec}	Reverse Recovery Energy			11.1		mJ

NTC Characteristics T_C=25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
R_{25}	Rated Resistance			5.0		kΩ
ΔR/R	Deviation of R_{100}	T_C=100 °C,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
$B_{25/80}$	B-value	$R_2=R_{25}exp[B_{25/80}(1/T_2-1/(298.15K))]$		3411		K
$B_{25/100}$	B-value	$R_2=R_{25}exp[B_{25/100}(1/T_2-1/(298.15K))]$		3433		K

Module Characteristics T_C=25°C unless otherwise noted

Symbol	Parameter	Min.	Typ.	Max.	Unit
L_{CE}	Stray Inductance		20		nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal to Chip		1.10		mΩ
R_{thJC}	Junction-to-Case (per IGBT) Junction-to-Case (per Diode)			0.067 0.177	K/W
R_{thCH}	Case-to-Heatsink (per IGBT) Case-to-Heatsink (per Diode) Case-to-Heatsink (per Module)		0.025 0.066 0.009		K/W
M	Terminal Connection Torque, Screw M6 Mounting Torque, Screw M5	3.0 3.0		6.0 6.0	N.m
G	Weight of Module		350		g

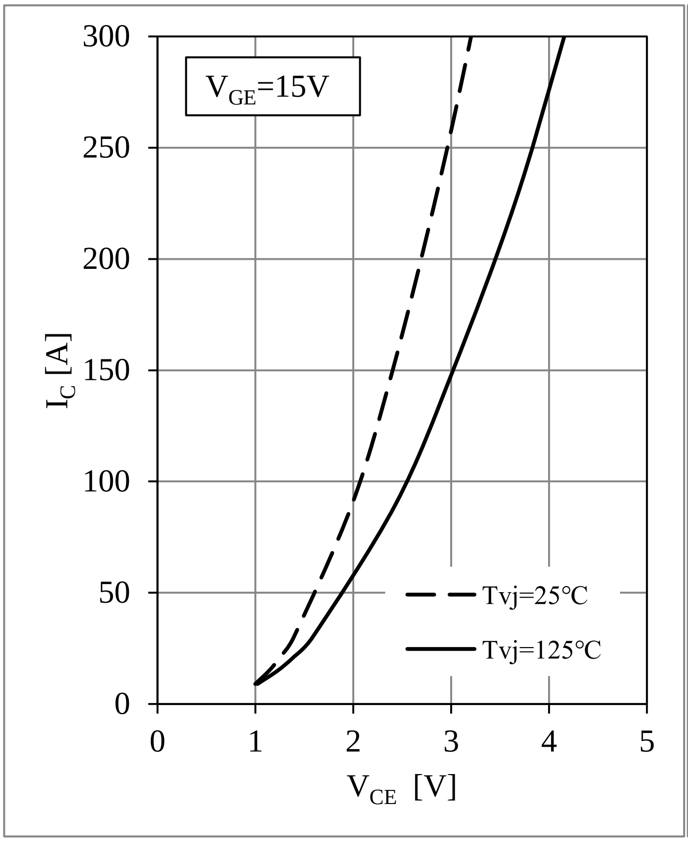


Fig 1. IGBT Output Characteristics

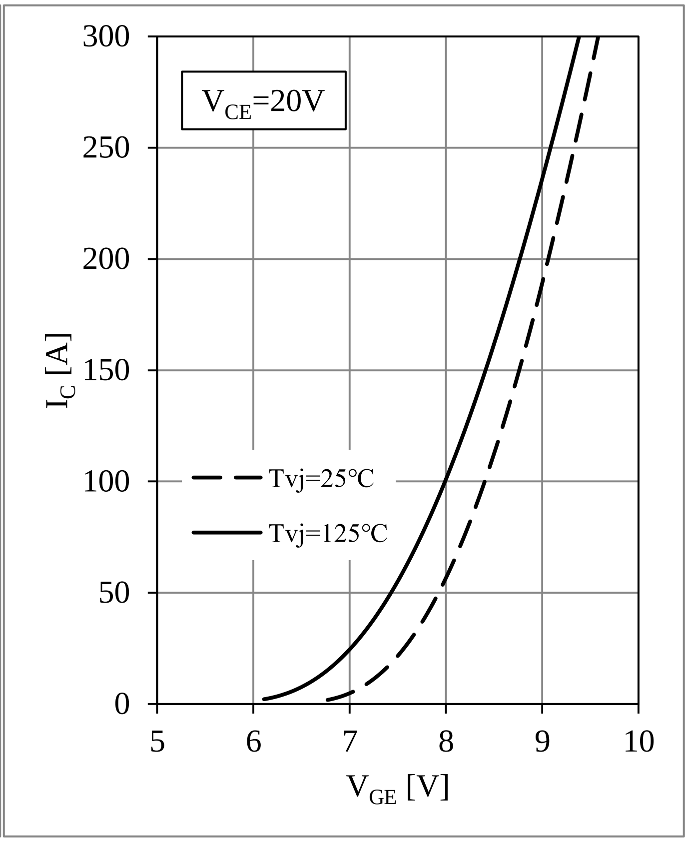


Fig 2. IGBT Transfer Characteristics

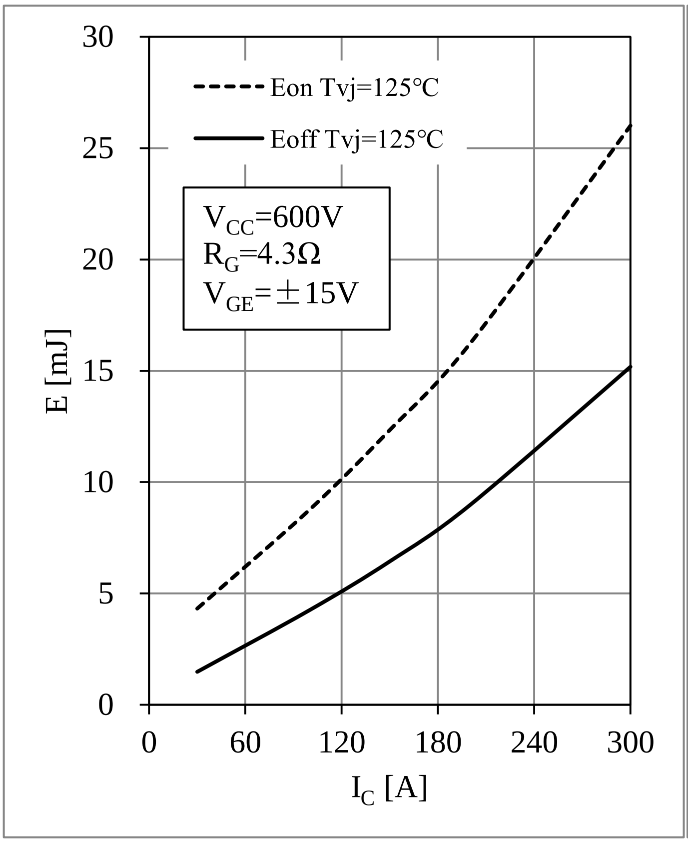


Fig 3. IGBT Switching Loss vs. I_C

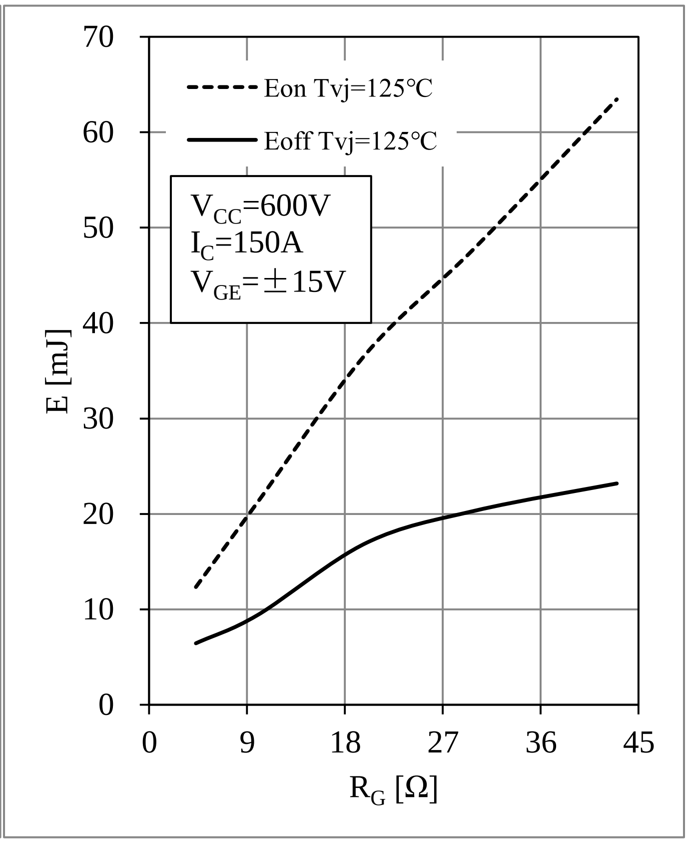


Fig 4. IGBT Switching Loss vs. R_G

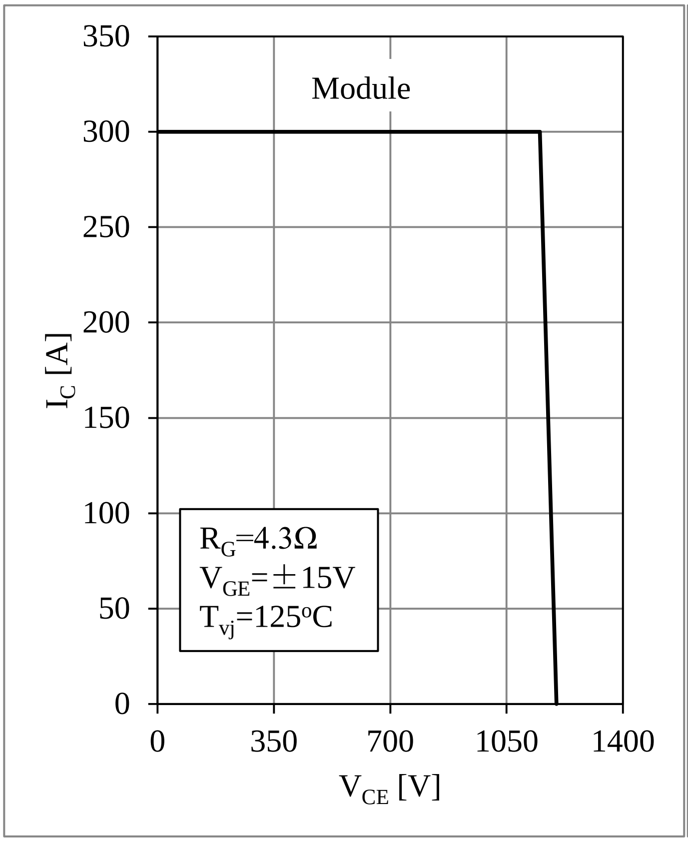


Fig 5. RBSOA

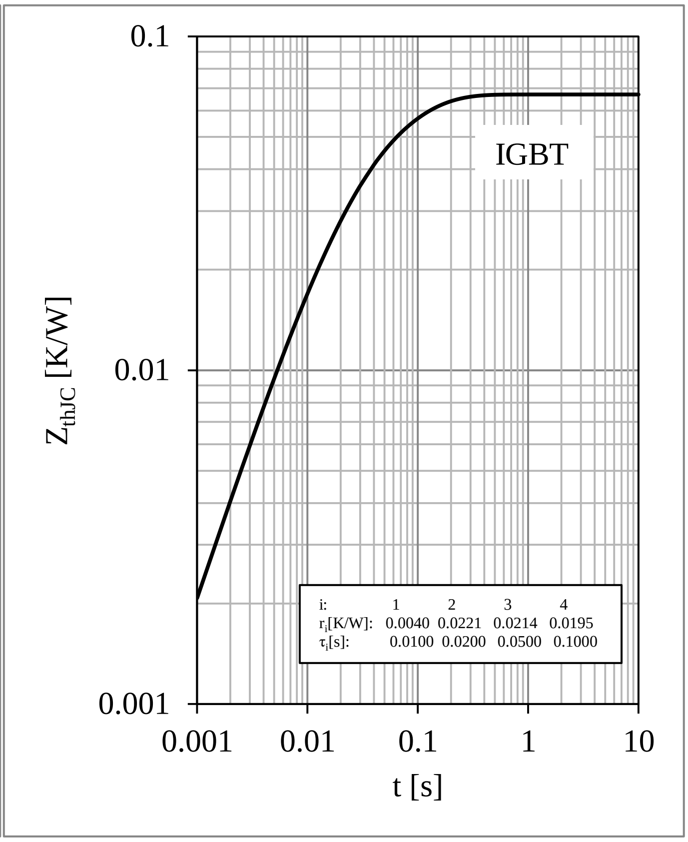


Fig 6. IGBT Transient Thermal Impedance

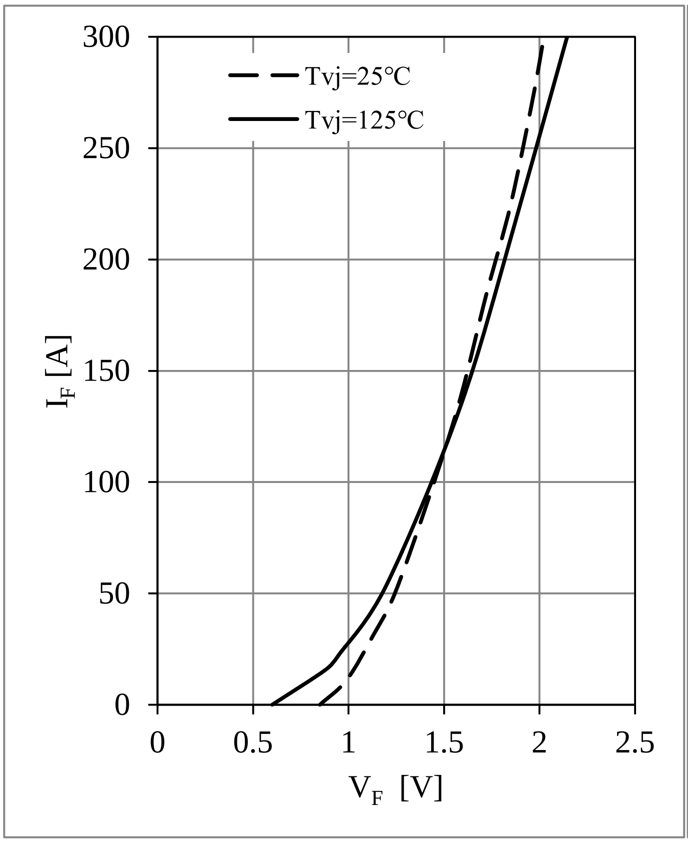


Fig 7. Diode Forward Characteristics

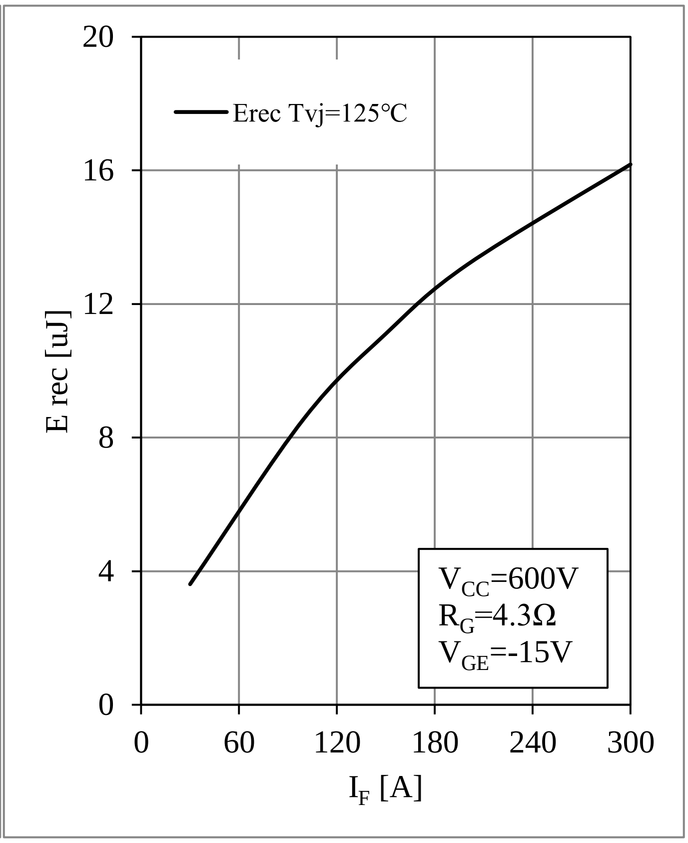


Fig 8. Diode Switching Loss vs. I_F

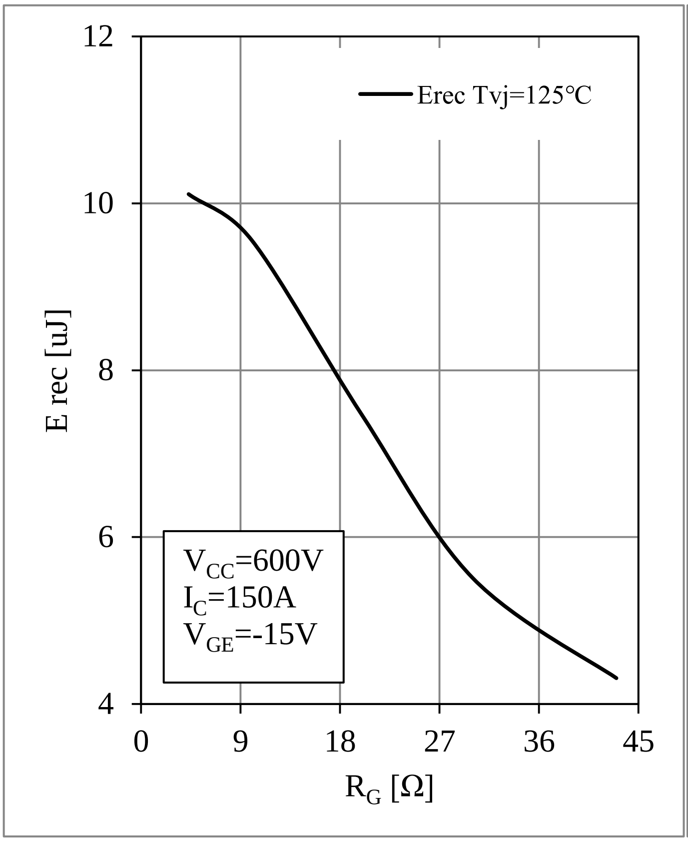


Fig 9. Diode Switching Loss vs. R_G

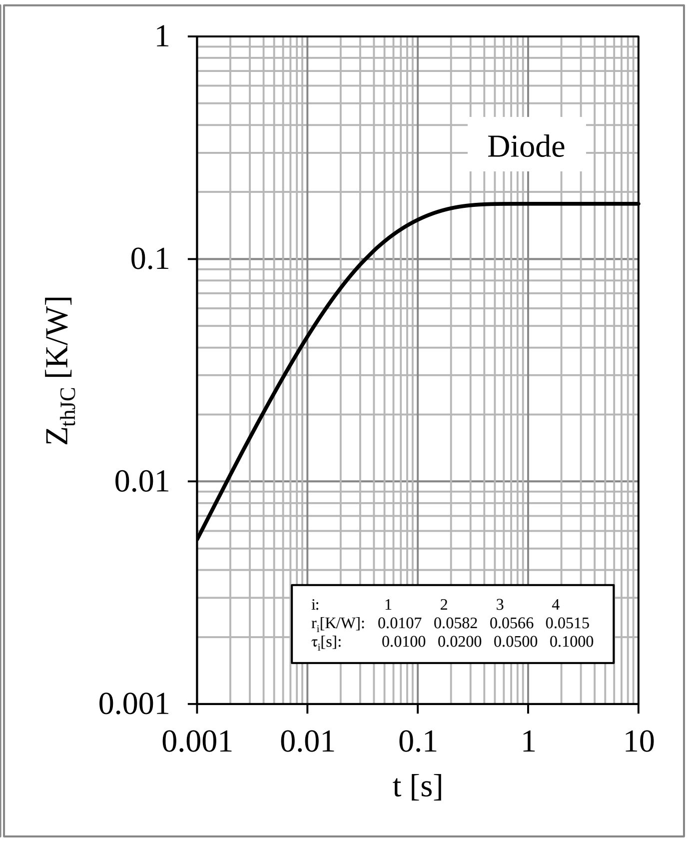


Fig 10. Diode Transient Thermal Impedance

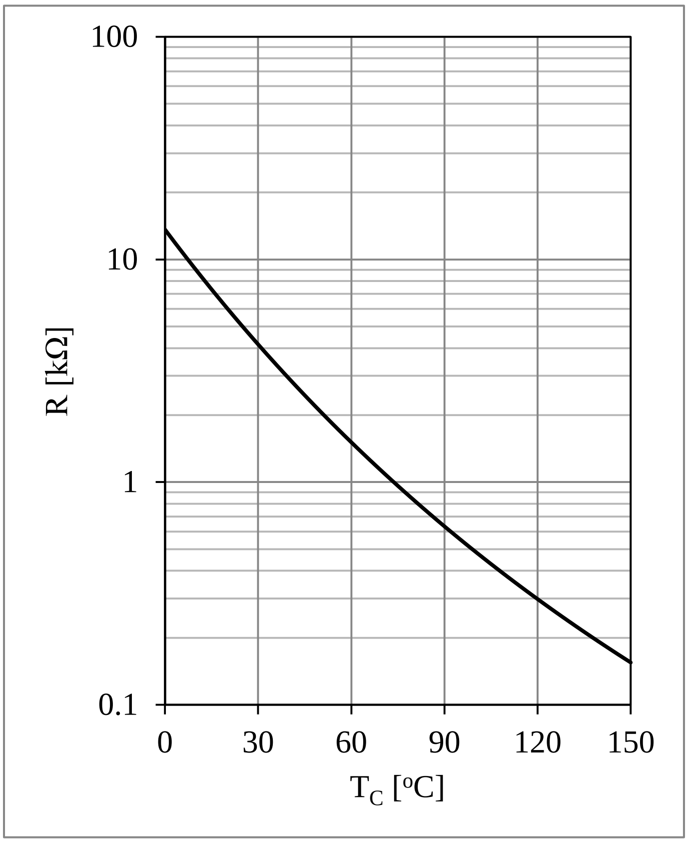
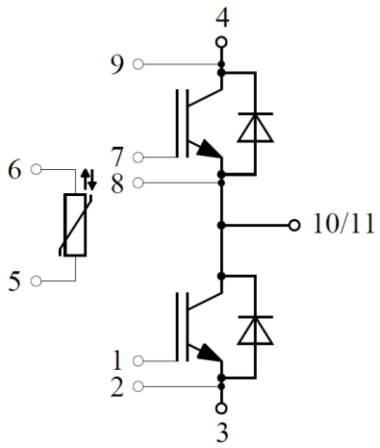


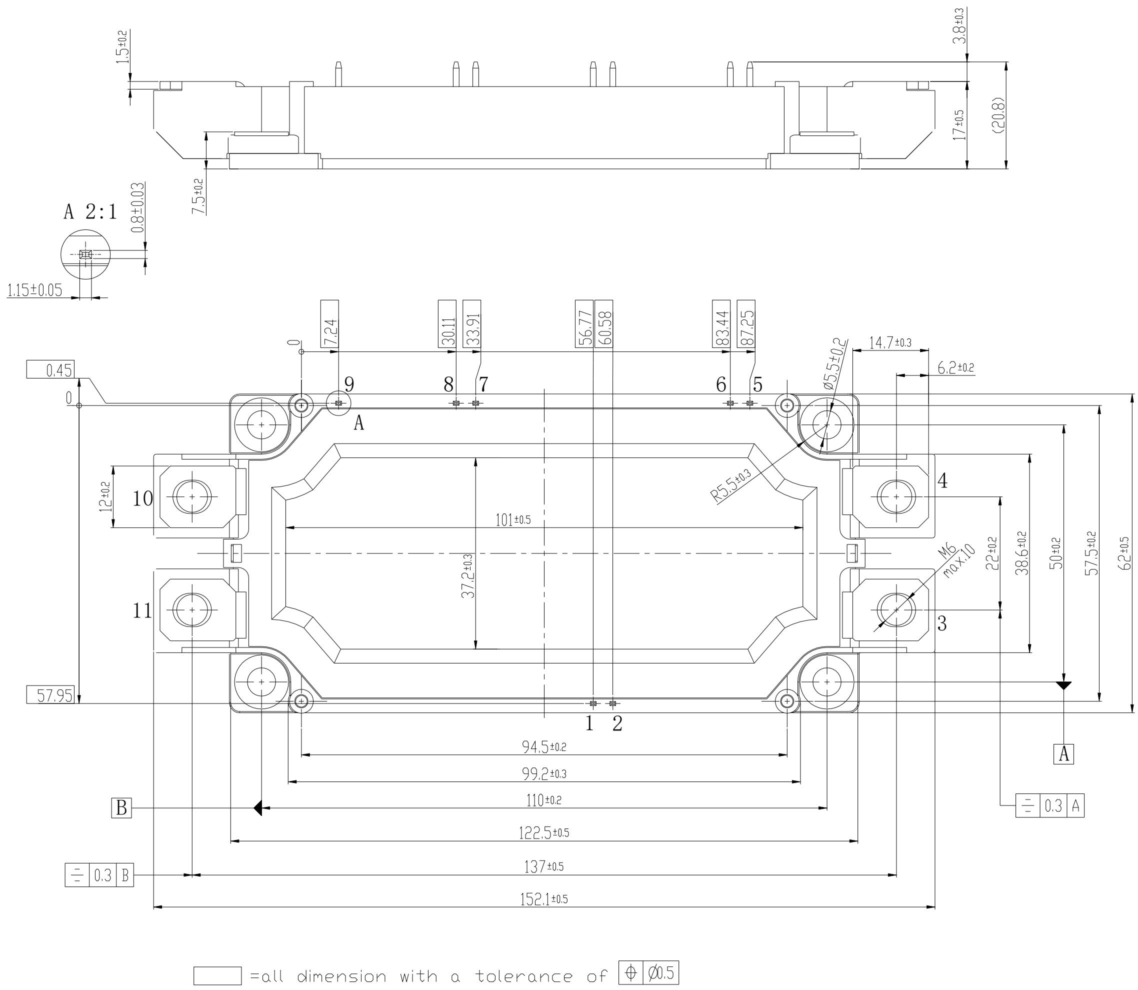
Fig 11. NTC Temperature Characteristic

Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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