STARPOWER

SEMICONDUCTOR **IGBT**

GD50HHU120C5SD

1200V/50A 4 in one-package

General Description

STARPOWER IGBT Power Module provides ultrafast switching speed as well as short circuit ruggedness. It's designed for the applications such as welding machine and inductive heating.

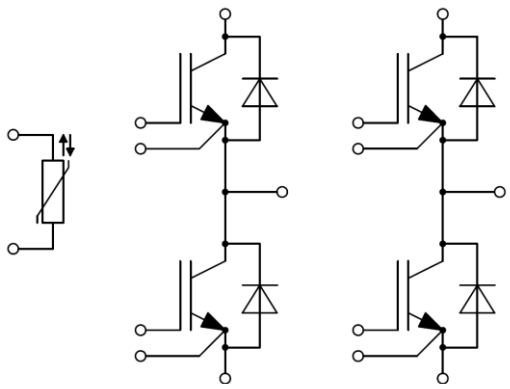
Features

- NPT IGBT technology
- 10μs short circuit capability
- Low switching losses
- $V_{CE(sat)}$ with positive temperature coefficient
- Low inductance case
- Fast & soft reverse recovery anti-parallel FWD
- Isolated copper baseplate using DBC technology

Typical Applications

- Switching mode power supply
- Inductive heating
- Welding machine

Equivalent Circuit Schematic



Absolute Maximum Ratings T_C=25°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°C @ T_C=80°C	77 50	A
I_{CM}	Pulsed Collector Current t_p=1ms	100	A
P_D	Maximum Power Dissipation @ T_{vj}=150°C	395	W

Diode

Symbol	Description	Values	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1200	V
I_F	Diode Continuous Forward Current	50	A
I_{FM}	Diode Maximum Forward Current t_p=1ms	100	A

Module

Symbol	Description	Values	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	2500	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=50A,V_{GE}=15V, T_{vj}=25°C		2.90	3.35	V
		I_C=50A,V_{GE}=15V, T_{vj}=125°C		3.60		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=1.0mA,V_{CE}=V_{GE}, T_{vj}=25°C	5.0	6.1	7.0	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			2.00		Ω
C_{ies}	Input Capacitance	V_{CE}=30V,f=1MHz, V_{GE}=0V		3.41		nF
C_{res}	Reverse Transfer Capacitance			0.20		nF
Q_G	Gate Charge	V_{GE}=-15…+15V		0.61		μC
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=50A, R_G=12Ω,V_{GE}=±15V, L_S=50nH,T_{vj}=25°C		37		ns
t_r	Rise Time			34		ns
$t_{d(off)}$	Turn-Off Delay Time			231		ns
t_f	Fall Time			20		ns
E_{on}	Turn-On Switching Loss			3.86		mJ
E_{off}	Turn-Off Switching Loss			0.89		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=50A, R_G=12Ω,V_{GE}=±15V, L_S=50nH,T_{vj}=125°C		40		ns
t_r	Rise Time			36		ns
$t_{d(off)}$	Turn-Off Delay Time			257		ns
t_f	Fall Time			66		ns
E_{on}	Turn-On Switching Loss			5.12		mJ
E_{off}	Turn-Off Switching Loss			1.68		mJ
I_{SC}	SC Data	t_P≤10μs,V_{GE}=15V, T_{vj}=125°C,V_{CC}=800V, V_{CEM}≤1200V		350		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=50A,V_{GE}=0V,T_{vj}=25°C		1.85	2.30	V
		I_F=50A,V_{GE}=0V,T_{vj}=125°C		1.90		
Q_r	Recovered Charge	V_R=600V,I_F=50A, -di/dt=1850A/μs,V_{GE}=-15V, L_S=50nH,T_{vj}=25°C		5.5		μC
I_{RM}	Peak Reverse Recovery Current			73		A
E_{rec}	Reverse Recovery Energy			1.77		mJ
Q_r	Recovered Charge	V_R=600V,I_F=50A, -di/dt=1790A/μs,V_{GE}=-15V, L_S=50nH,T_{vj}=125°C		10.2		μC
I_{RM}	Peak Reverse Recovery Current			84		A
E_{rec}	Reverse Recovery Energy			3.85		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		30		nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal to Chip		2.20		mΩ
R_{thJC}	Junction-to-Case (per IGBT) Junction-to-Case (per Diode)			0.316 0.545	K/W
R_{thCH}	Case-to-Heatsink (per IGBT) Case-to-Heatsink (per Diode) Case-to-Heatsink (per Module)		0.126 0.218 0.020		K/W
M	Mounting Torque, Screw M5	3.0		6.0	N.m
G	Weight of Module		200		g

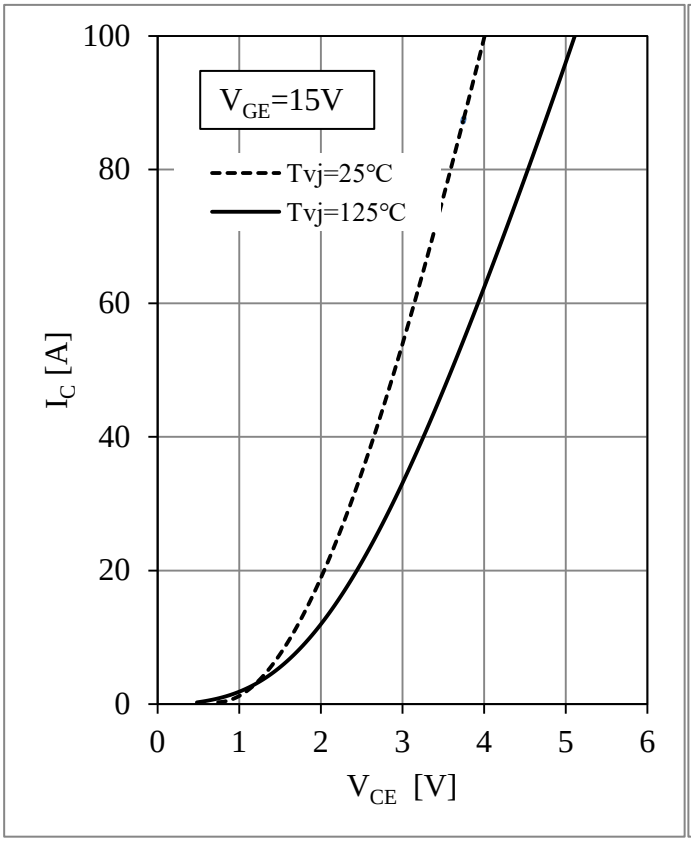


Fig 1. IGBT Output Characteristics

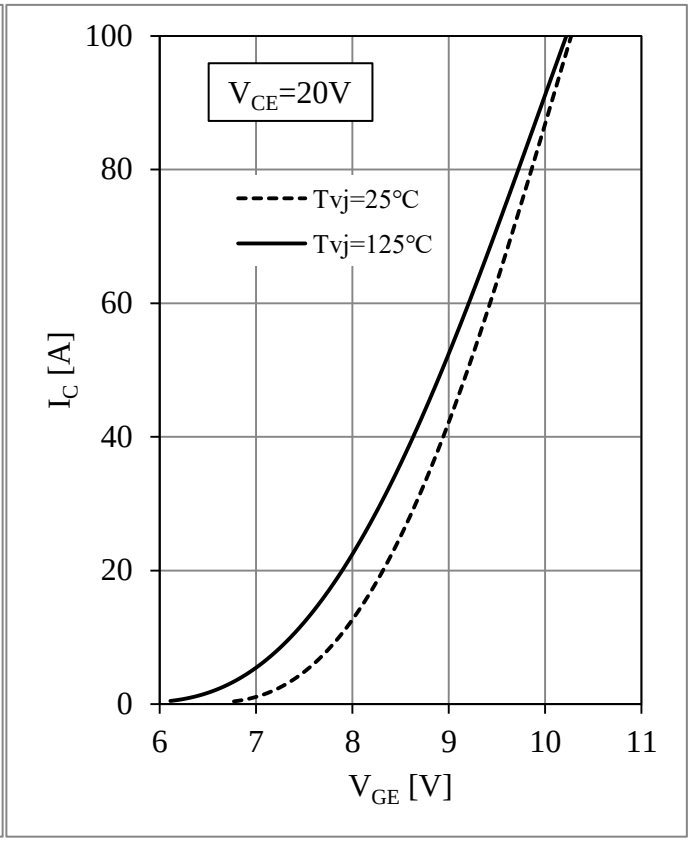


Fig 2. IGBT Transfer Characteristics

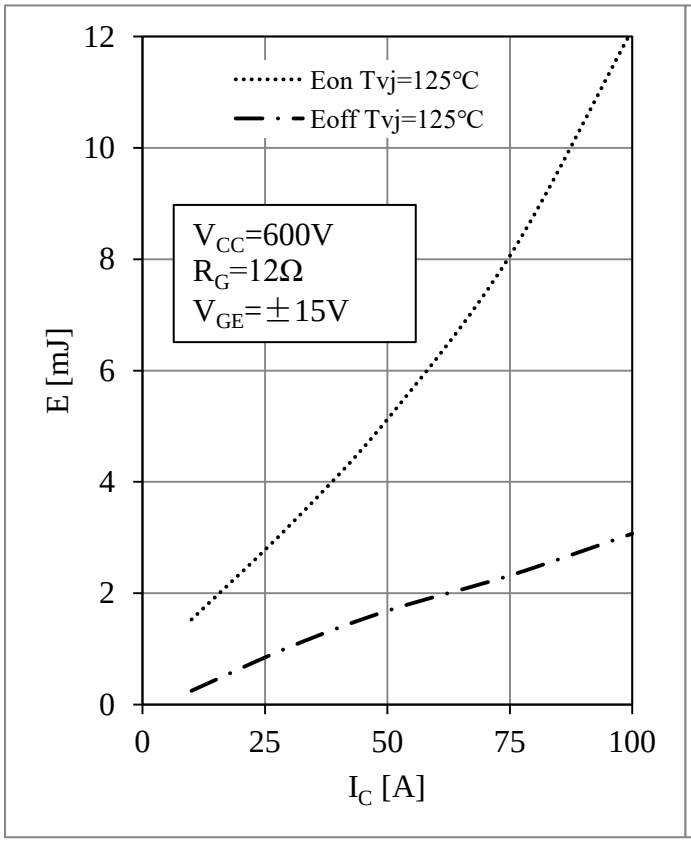


Fig 3. IGBT Switching Loss vs. I_C

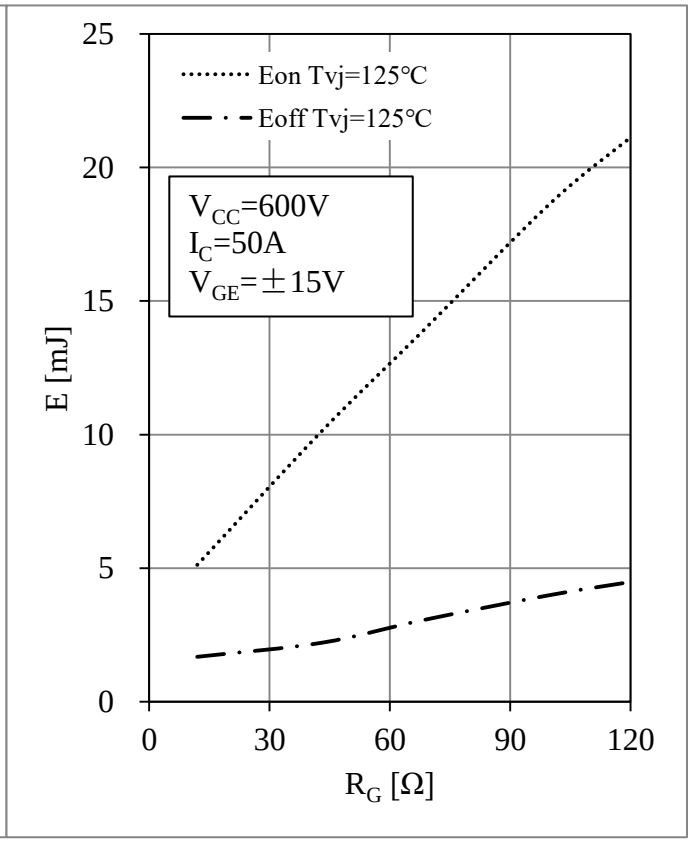


Fig 4. IGBT Switching Loss vs. R_G

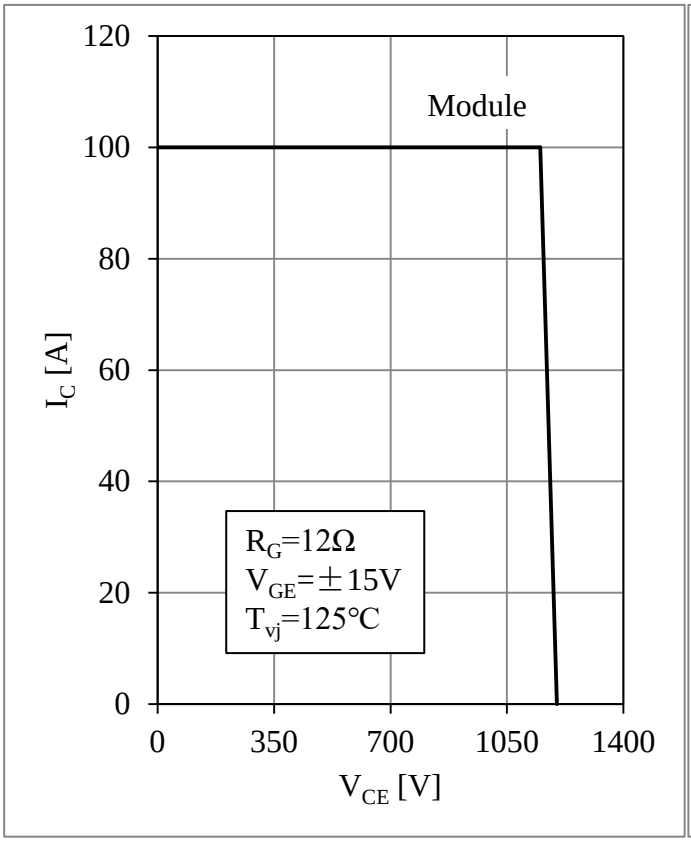


Fig 5. RBSOA

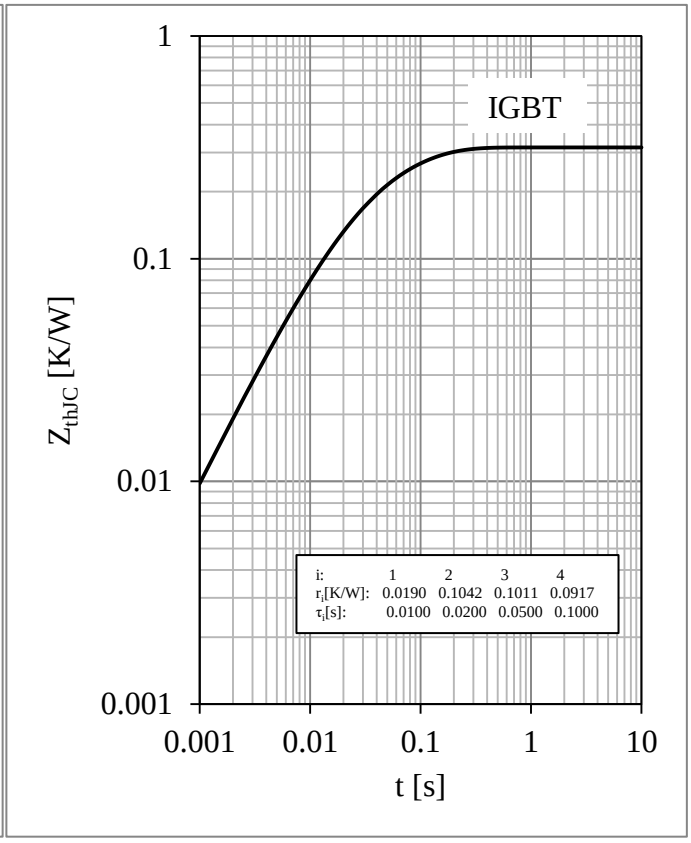


Fig 6. IGBT Transient Thermal Impedance

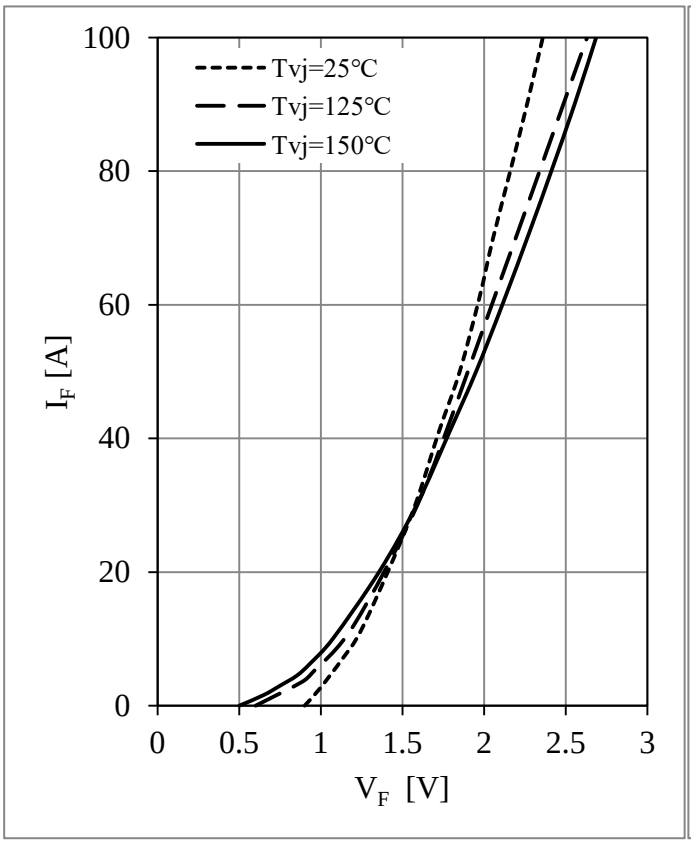


Fig 7. Diode Forward Characteristics

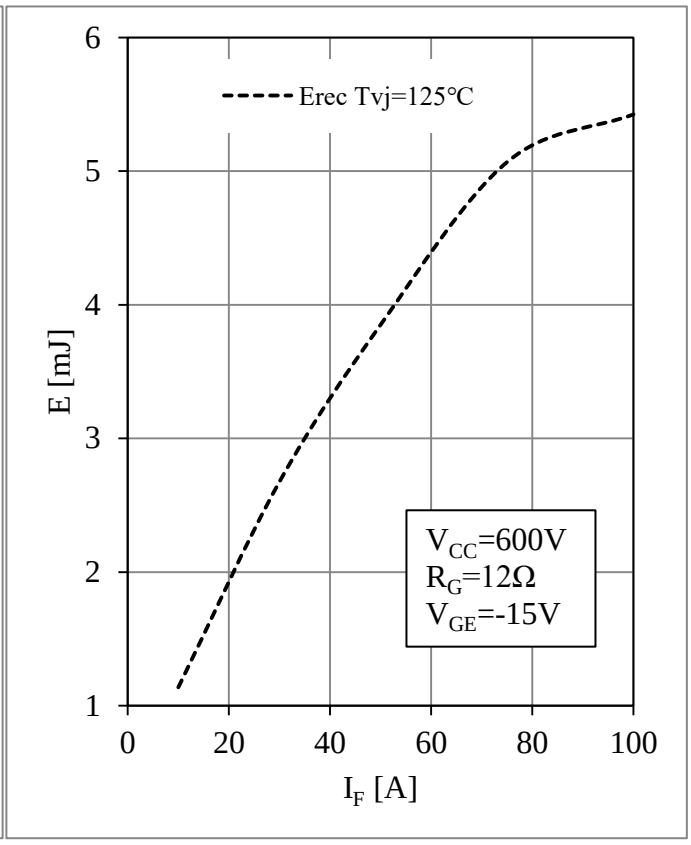


Fig 8. Diode Switching Loss vs. I_F

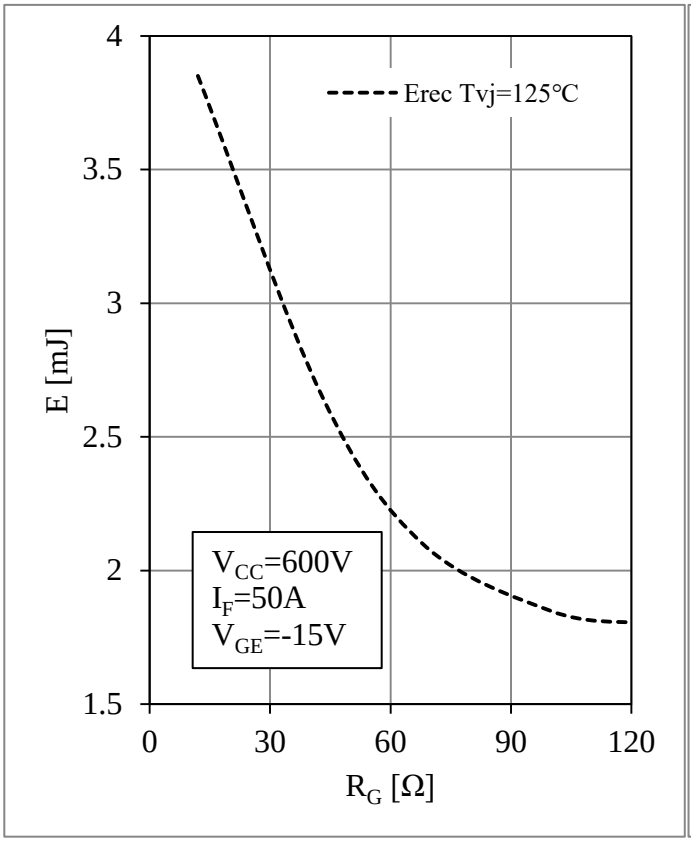


Fig 9. Diode Switching Loss vs. R_G

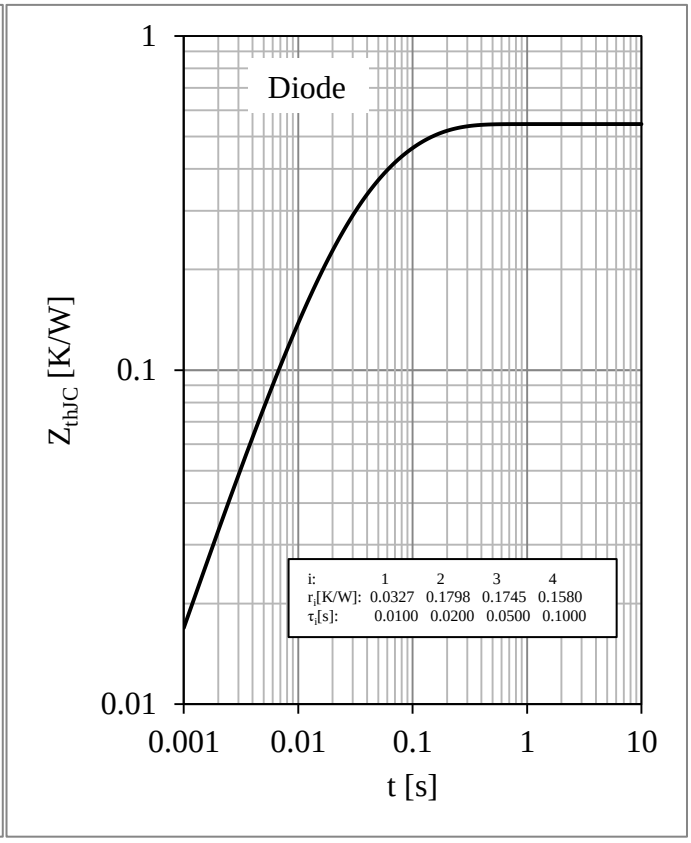


Fig 10. Diode Transient Thermal Impedance

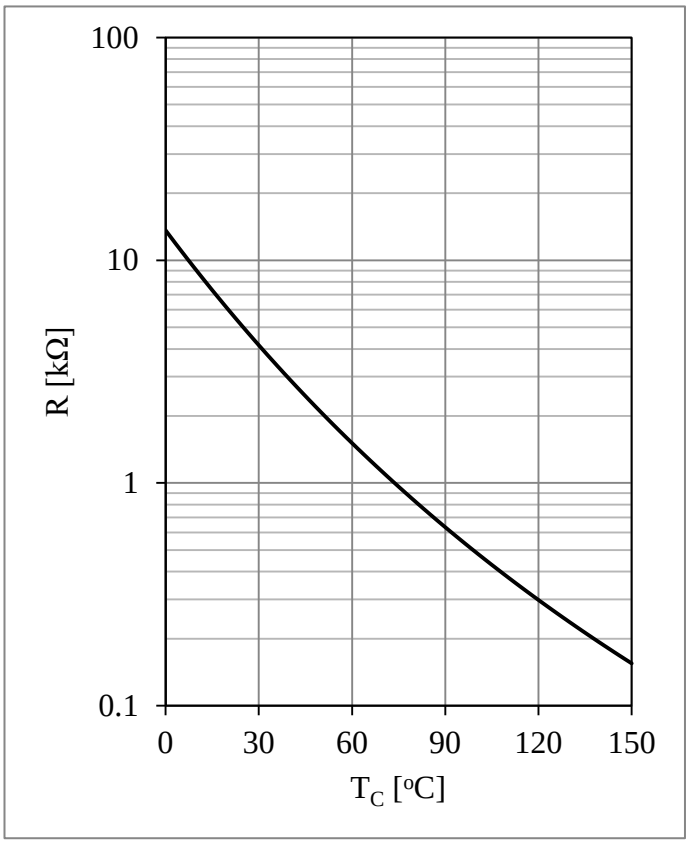
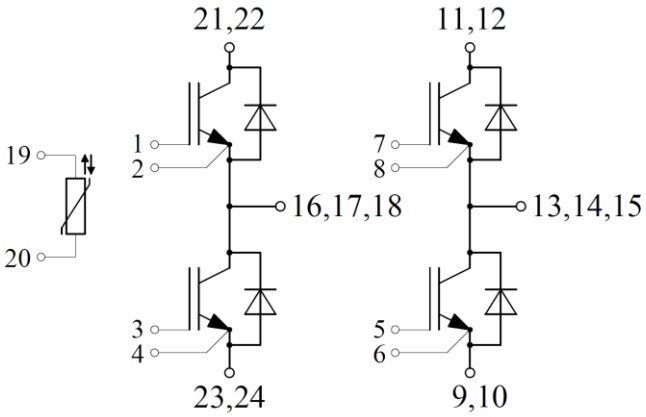


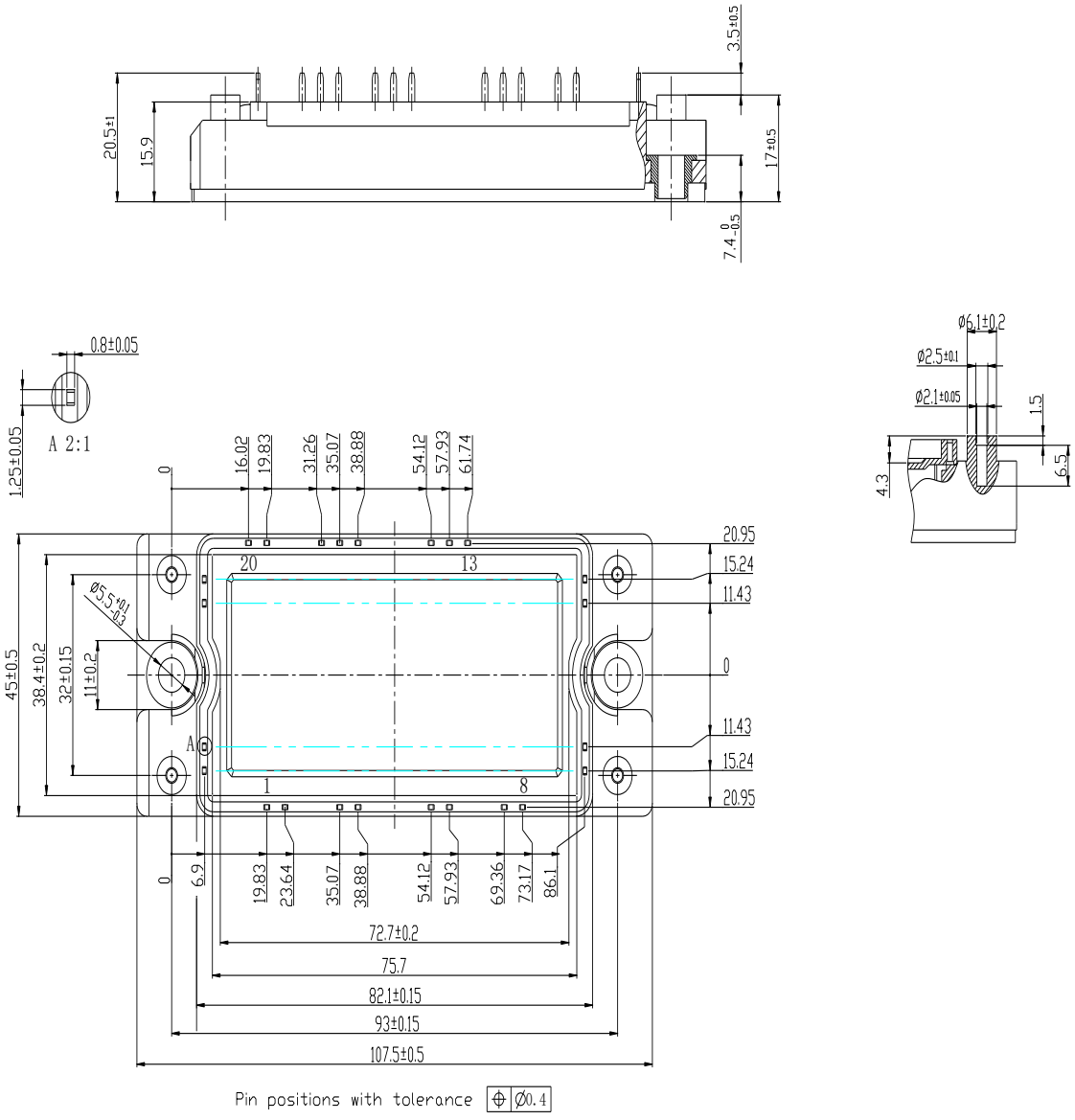
Fig 11. NTC Temperature Characteristic

Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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