STARPOWER

SEMICONDUCTOR **IGBT**

GD150HHU120C6SD

1200V/150A 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 electronic welder and inductive heating.

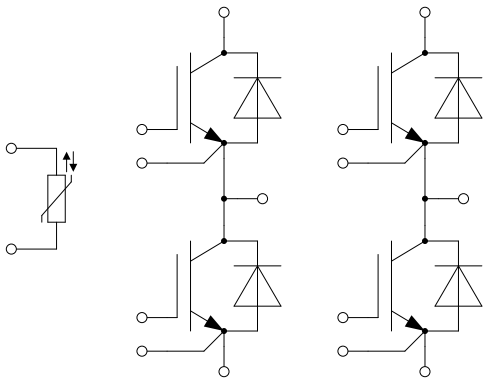
Features

- 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

- Switching mode power supply
- Inductive heating
- Electronic welder

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=80°C	230 150	A
I_{CM}	Pulsed Collector Current t_p=1ms	300	A
P_D	Maximum Power Dissipation @ T_j=150°C	1179	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_{jmax}	Maximum Junction Temperature	150	°C
T_{jop}	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=150A,V_{GE}=15V, T_{vj}=25°C		2.90	3.35	V
		I_C=150A,V_{GE}=15V, T_{vj}=125°C		3.60		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=3.0mA,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			1.5		Ω
C_{ies}	Input Capacitance	V_{CE}=30V,f=1MHz, V_{GE}=0V		19.2		nF
C_{res}	Reverse Transfer Capacitance			0.60		nF
Q_G	Gate Charge	V_{GE}=-15…+15V		1.83		μC
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=150A, R_G=4.3Ω,Ls=48nH, V_{GE}=±15V,T_{vj}=25 °C		45		ns
t_r	Rise Time			40		ns
$t_{d(off)}$	Turn-Off Delay Time			324		ns
t_f	Fall Time			27		ns
E_{on}	Turn-On Switching Loss			8.37		mJ
E_{off}	Turn-Off Switching Loss			3.52		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=150A, R_G=4.3Ω,Ls=48nH, V_{GE}=±15V,T_{vj}=125 °C		47		ns
t_r	Rise Time			42		ns
$t_{d(off)}$	Turn-Off Delay Time			355		ns
t_f	Fall Time			41		ns
E_{on}	Turn-On Switching Loss			10.7		mJ
E_{off}	Turn-Off Switching Loss			5.48		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		1.60	2.05	V
		I_F=150A,V_{GE}=0V,T_{vj}=125°C		1.70		
Q_r	Recovered Charge	V_R=600V,I_F=150A, -di/dt=4200A/μs,V_{GE}=-15V, Ls=48nH,T_{vj}=25 °C		13.1		μC
I_{RM}	Peak Reverse Recovery Current			181		A
E_{rec}	Reverse Recovery Energy			4.24		mJ
Q_r	Recovered Charge	V_R=600V,I_F=150A, -di/dt=4100A/μs,V_{GE}=-15V, Ls=48nH,T_{vj}=125 °C		23.6		μC
I_{RM}	Peak Reverse Recovery Current			208		A
E_{rec}	Reverse Recovery Energy			9.04		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

Module Characteristics T_C=25°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		2.60		mΩ
R_{thJC}	Junction-to-Case (per IGBT) Junction-to-Case (per Diode)			0.106 0.568	K/W
R_{thCH}	Case-to-Sink (per IGBT) Case-to-Sink (per Diode) Case-to-Heatsink (per Module)		0.043 0.229 0.009		K/W
M	Mounting Torque, Screw M6	3.0		6.0	N.m
G	Weight of Module		300		g

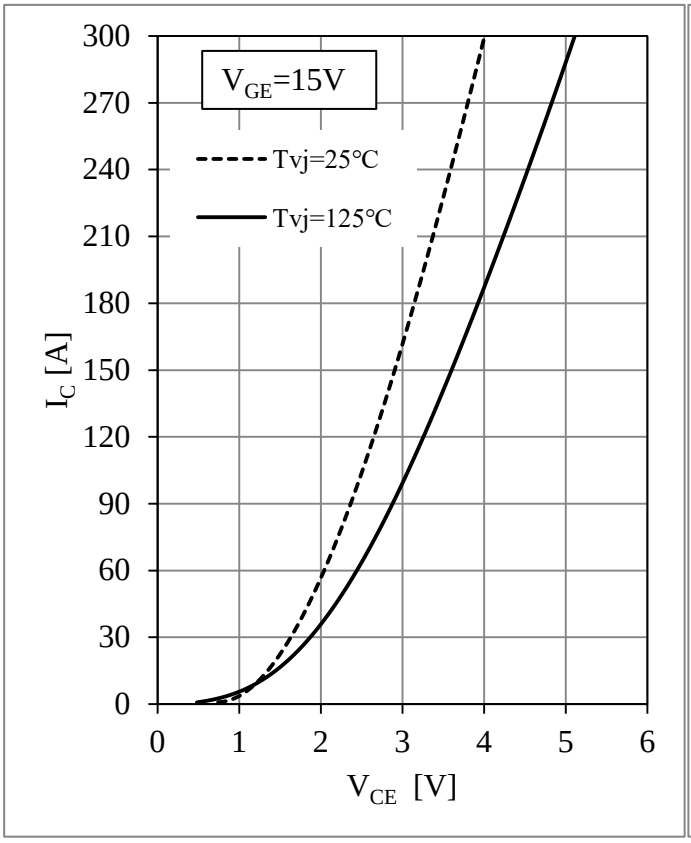


Fig 1. IGBT Output Characteristics

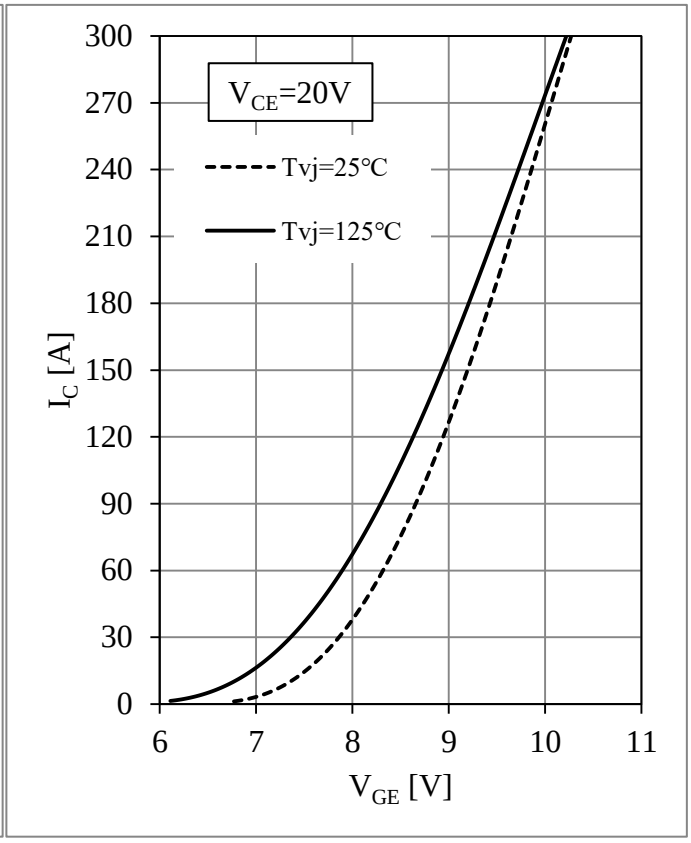


Fig 2. IGBT Transfer Characteristics

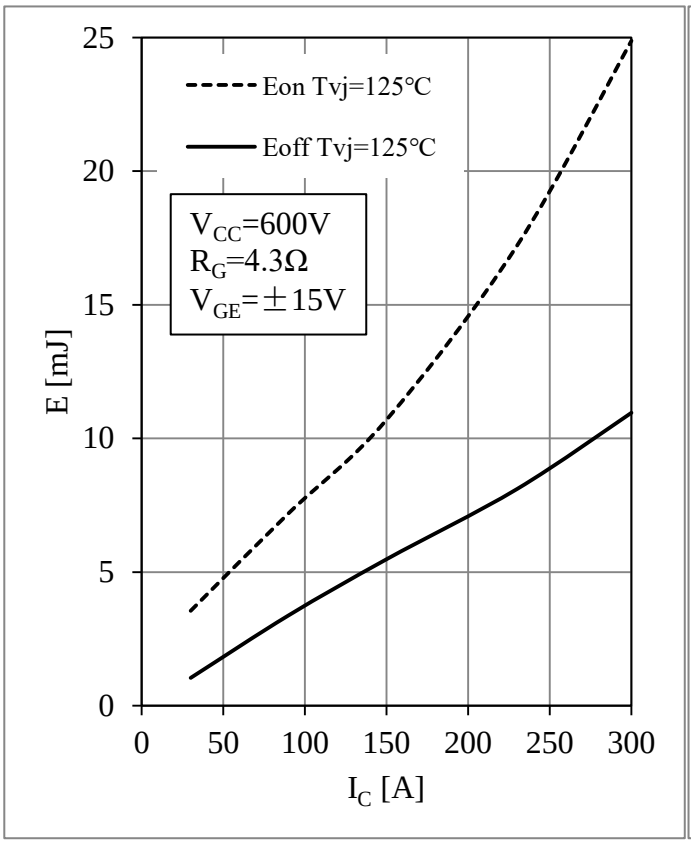


Fig 3. IGBT Switching Loss vs. I_C

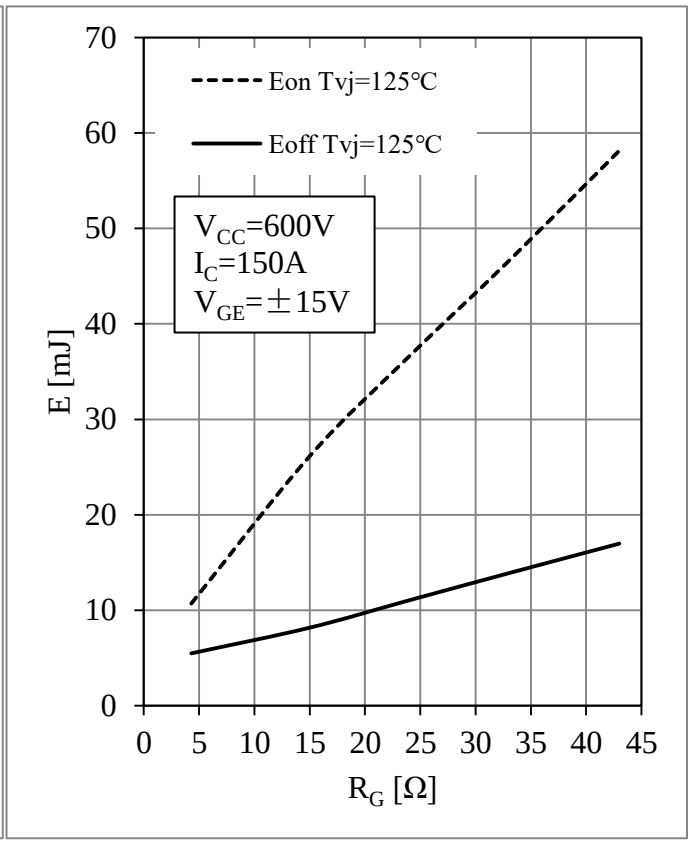


Fig 4. IGBT Switching Loss vs. R_G

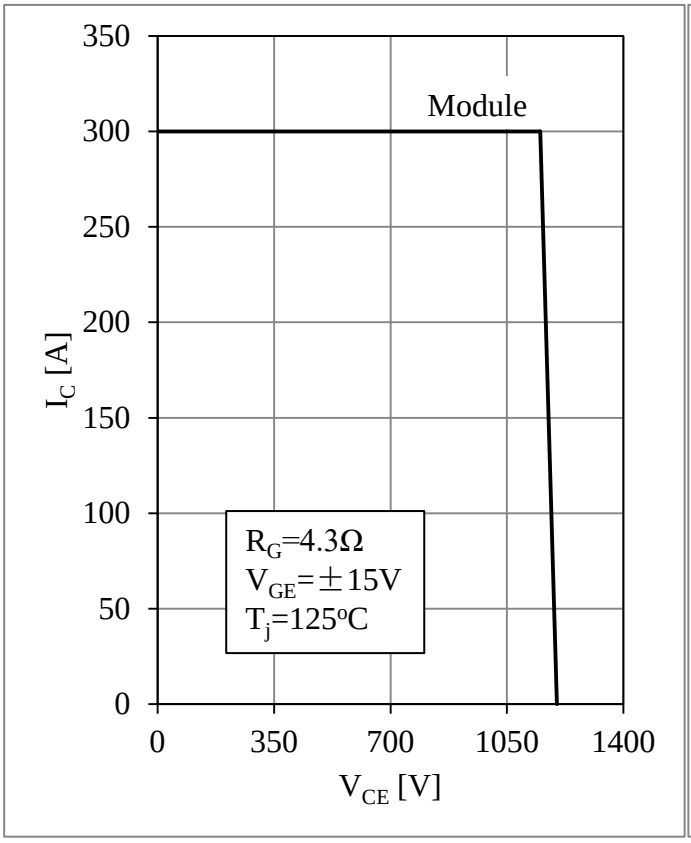


Fig 5. RBSOA

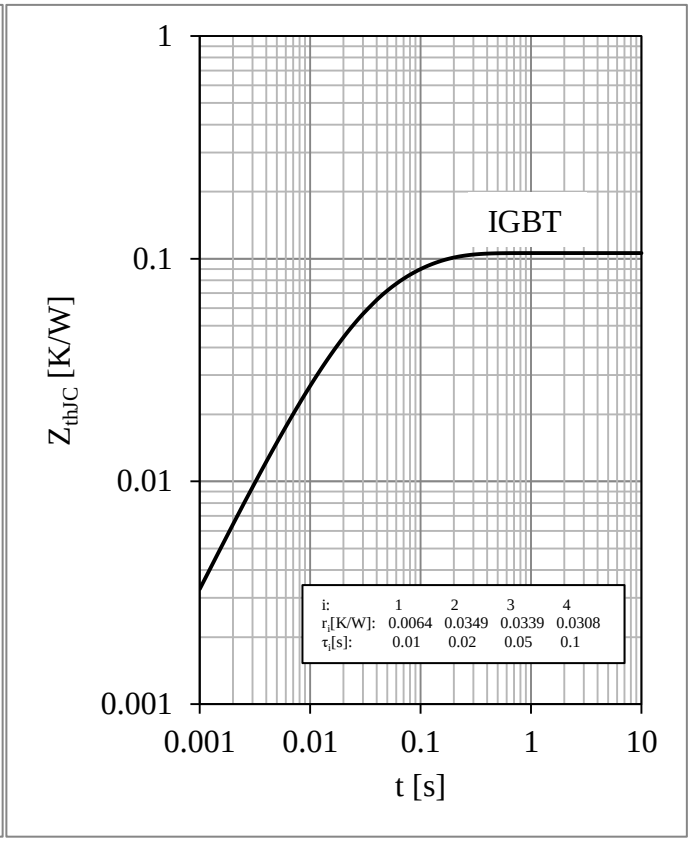


Fig 6. IGBT Transient Thermal Impedance

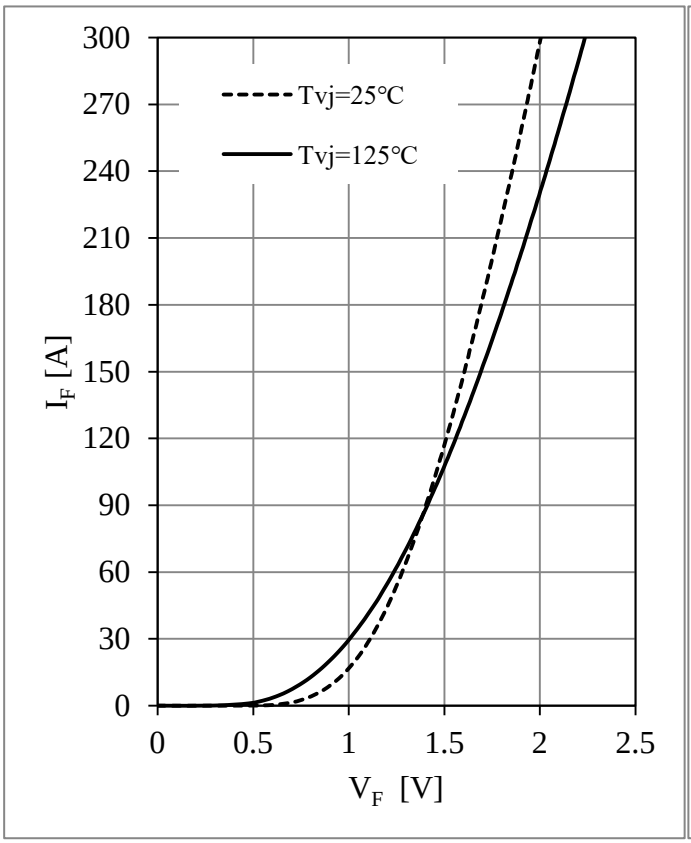


Fig 7. Diode Forward Characteristics

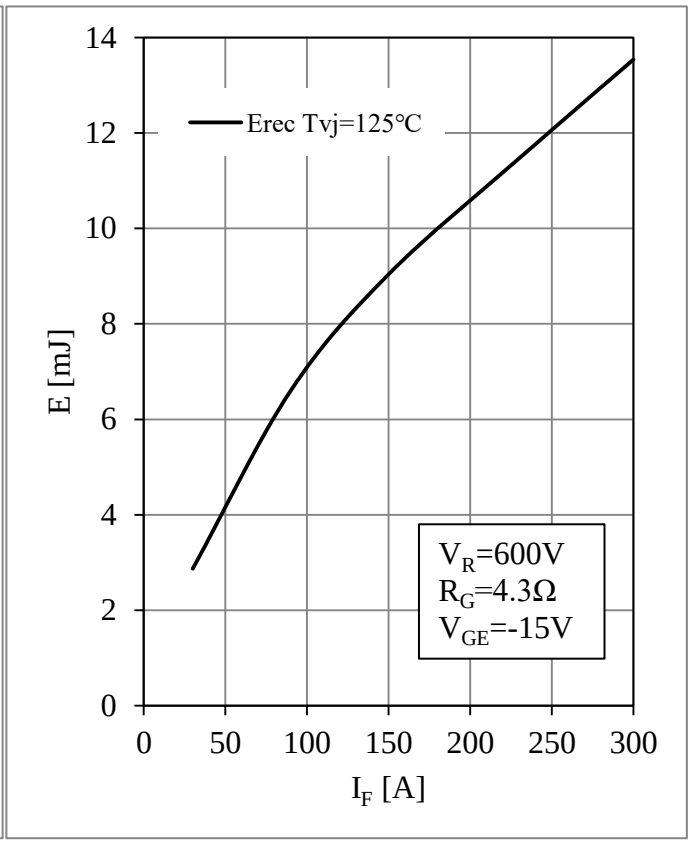


Fig 8. Diode Switching Loss vs. I_F

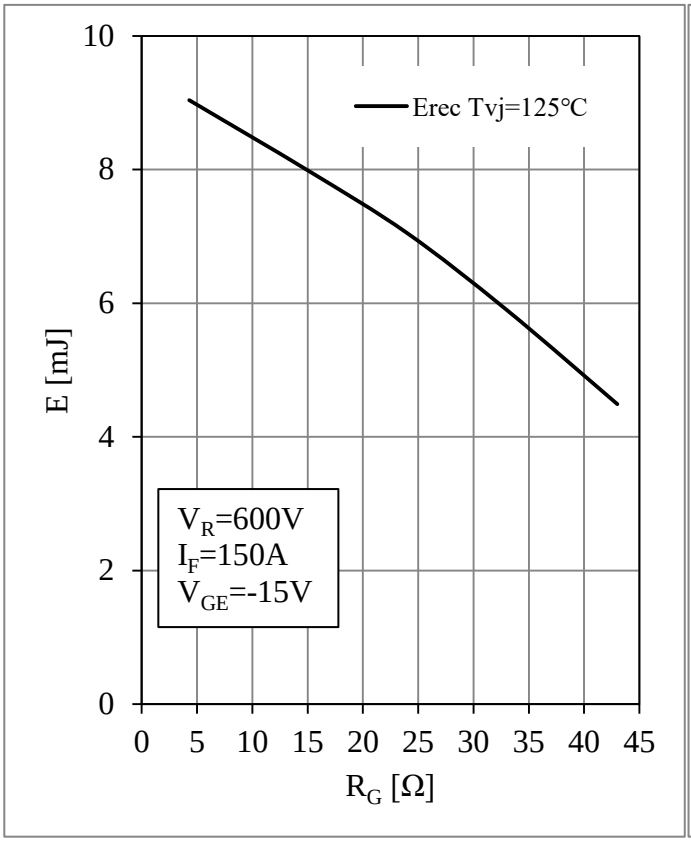


Fig 9. Diode Switching Loss vs. R_G

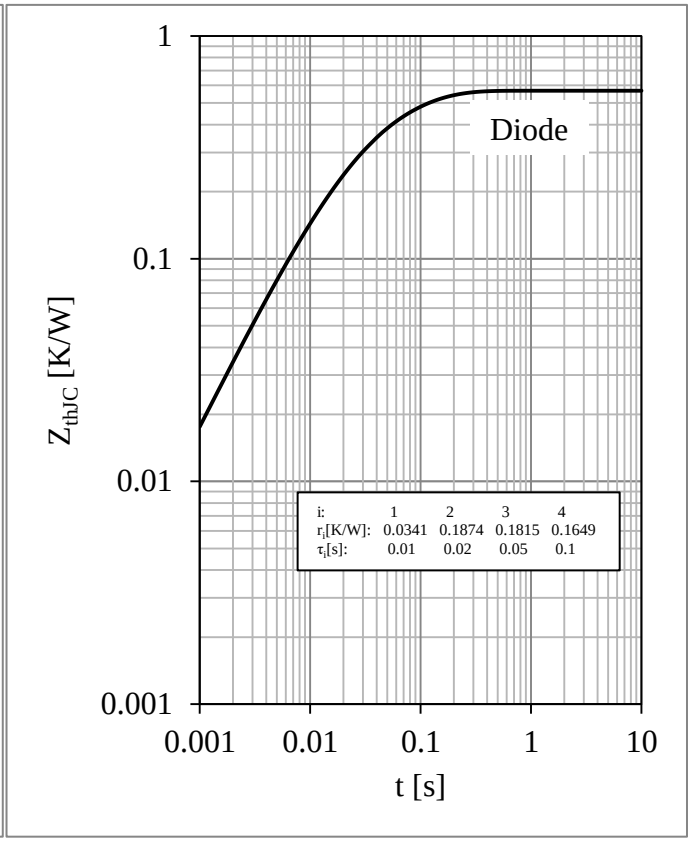


Fig 10. Diode Transient Thermal Impedance

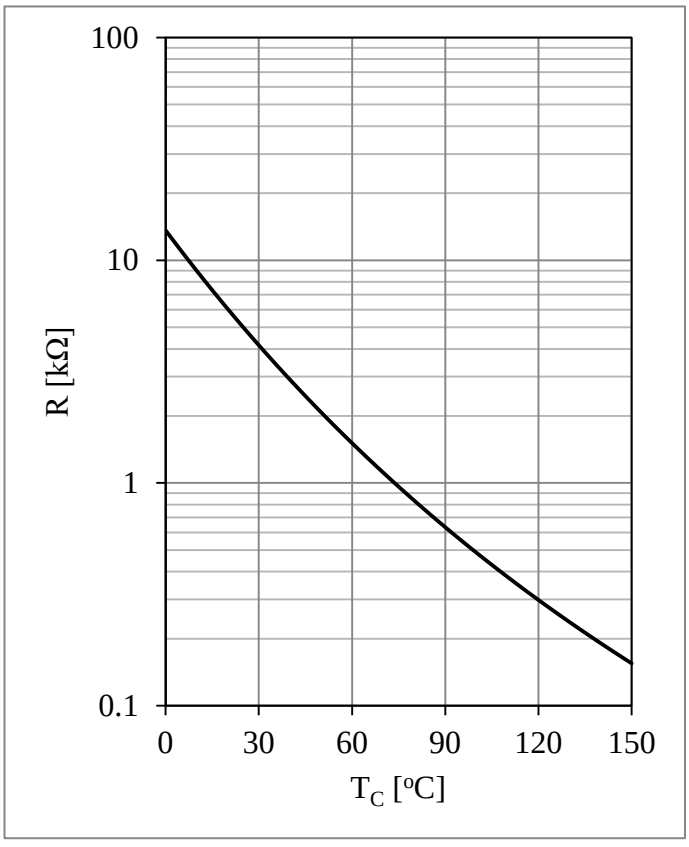
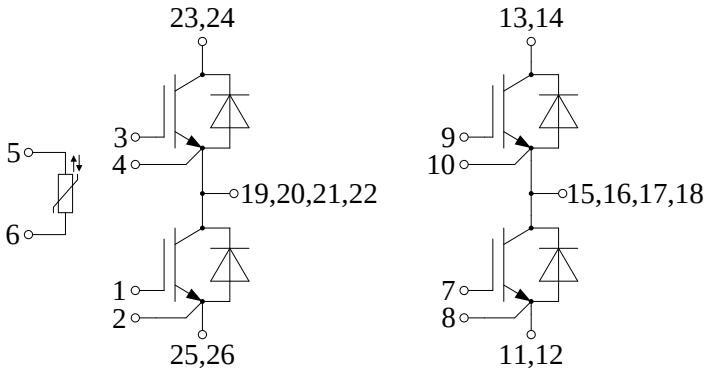


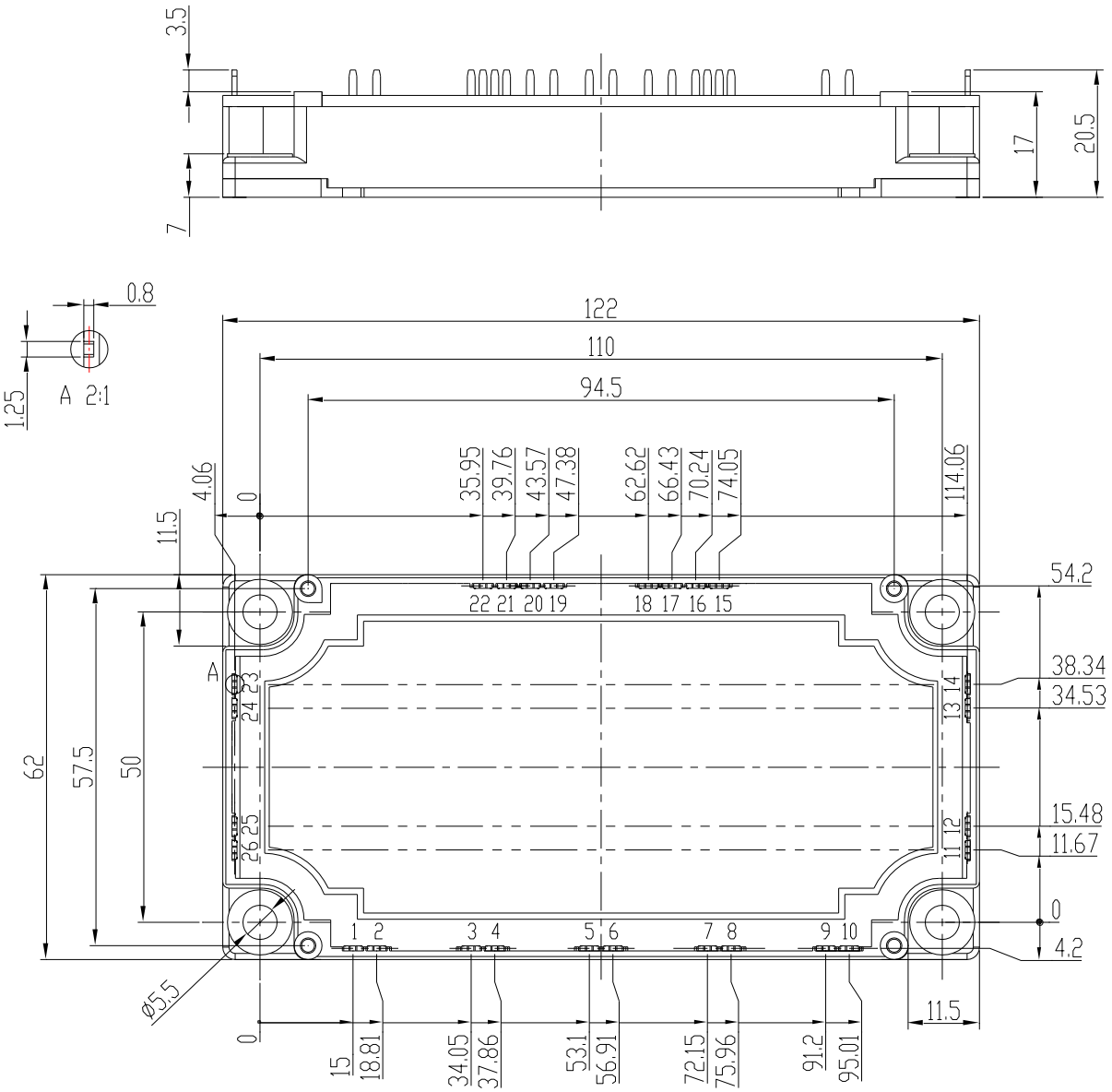
Fig 11. NTC Temperature Characteristic

Circuit Schematic



Package Dimensions

Dimensions in Millimeters



Terms and Conditions of Usage

The data contained in this product datasheet is exclusively intended for technically trained staff. you and your technical departments will have to evaluate the suitability of the product for the intended application and the completeness of the product data with respect to such application.

This product data sheet is describing the characteristics of this product for which a warranty is granted. Any such warranty is granted exclusively pursuant the terms and conditions of the supply agreement. There will be no guarantee of any kind for the product and its characteristics.

Should you require product information in excess of the data given in this product data sheet or which concerns the specific application of our product, please contact the sales office, which is responsible for you (see www.powersemi.cc), For those that are specifically interested we may provide application notes.

Should you intend to use the Product in aviation applications, in health or live endangering or life support applications, please notify.

If and to the extent necessary, please forward equivalent notices to your customers.
Changes of this product data sheet are reserved.