STARPOWER

SEMICONDUCTOR **IGBT**

GD75PFX170C6SG

1700V/75A 4 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.

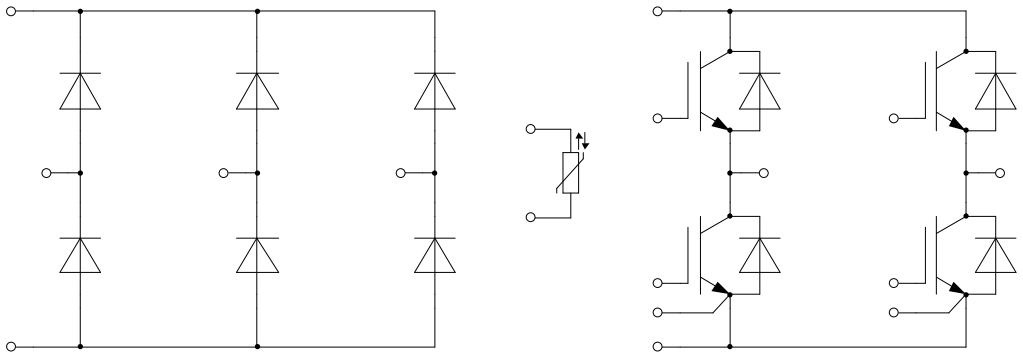
Features

- Low $V_{CE(sat)}$ Trench IGBT technology
- 10μs 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

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-inverter

Symbol	Description	Values	Unit
V_{CES}	Collector-Emitter Voltage	1700	V
V_{GES}	Gate-Emitter Voltage	±20	V
I_C	Collector Current @ T_C=25°C @ T_C=100°C	139 75	A
I_{CM}	Pulsed Collector Current t_p=1ms	150	A
P_D	Maximum Power Dissipation @ T_{vj}=175°C	559	W

Diode-inverter

Symbol	Description	Values	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1700	V
I_F	Diode Continuous Forward Current	75	A
I_{FM}	Diode Maximum Forward Current t_p=1ms	150	A

Diode-rectifier

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	2000	V
I_O	Average Output Current 50Hz/60Hz,sine wave	75	A
I_{FSM}	Surge Forward Current t_p=10ms @ T_{vj}=25°C @ T_{vj}=150°C	1440 1206	A
I^2t	I^2t-value,t_p=10ms @ T_{vj}=25°C @ T_{vj}=150°C	10368 7272	A^2s

Module

Symbol	Description	Value	Unit
T_{vjmax}	Maximum Junction Temperature(inverter) Maximum Junction Temperature (rectifier)	175 150	°C
T_{vjop}	Operating Junction Temperature	-40 to +150	°C
T_{STG}	Storage Temperature Range	-40 to +125	°C
V_{ISO}	Isolation Voltage RMS,f=50Hz,t=1min	4000	V

IGBT-inverter 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=75A,V_{GE}=15V, T_{vj}=25°C		1.85	2.20	V
		I_C=75A,V_{GE}=15V, T_{vj}=125°C		2.25		
		I_C=75A,V_{GE}=15V, T_{vj}=150°C		2.35		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=3.0mA,V_{CE}=V_{GE}, T_{vj}=25°C	5.6	6.2	6.8	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			8.5		Ω
C_{ies}	Input Capacitance	V_{CE}=25V,f=1MHz, V_{GE}=0V		9.03		nF
C_{res}	Reverse Transfer Capacitance			0.22		nF
Q_G	Gate Charge	V_{GE}=-15…+15V		0.71		μC
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=900V,I_C=75A, R_G=6.8Ω,V_{GE}=±15V, L_S=46nH,T_{vj}=25°C		236		ns
t_r	Rise Time			42		ns
$t_{d(off)}$	Turn-Off Delay Time			356		ns
t_f	Fall Time			363		ns
E_{on}	Turn-On Switching Loss			17.3		mJ
E_{off}	Turn-Off Switching Loss			11.7		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=900V,I_C=75A, R_G=6.8Ω,V_{GE}=±15V, L_S=46nH,T_{vj}=125°C		252		ns
t_r	Rise Time			48		ns
$t_{d(off)}$	Turn-Off Delay Time			420		ns
t_f	Fall Time			485		ns
E_{on}	Turn-On Switching Loss			27.1		mJ
E_{off}	Turn-Off Switching Loss			16.6		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=900V,I_C=75A, R_G=6.8Ω,V_{GE}=±15V, L_S=46nH,T_{vj}=150°C		275		ns
t_r	Rise Time			50		ns
$t_{d(off)}$	Turn-Off Delay Time			432		ns
t_f	Fall Time			524		ns
E_{on}	Turn-On Switching Loss			27.9		mJ
E_{off}	Turn-Off Switching Loss			17.7		mJ
I_{SC}	SC Data	t_P≤10μs,V_{GE}=15V, T_{vj}=150°C,V_{CC}=1000V, V_{CEM}≤1700V		300		A

Diode-inverter Characteristics T_C=25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_F	Diode Forward Voltage	I_F=75A,V_{GE}=0V,T_{vj}=25°C		1.80	2.25	V
		I_F=75A,V_{GE}=0V,T_{vj}=125°C		1.90		
		I_F=75A,V_{GE}=0V,T_{vj}=150°C		1.95		
Q_r	Recovered Charge	V_R=900V,I_F=75A, -di/dt=1290A/μs,V_{GE}=-15V L_S=46nH,T_{vj}=25°C		10.3		μC
I_{RM}	Peak Reverse Recovery Current			84		A
E_{rec}	Reverse Recovery Energy			7.44		mJ
Q_r	Recovered Charge	V_R=900V,I_F=75A, -di/dt=1100A/μs,V_{GE}=-15V L_S=46nH,T_{vj}=125°C		20.5		μC
I_{RM}	Peak Reverse Recovery Current			87		A
E_{rec}	Reverse Recovery Energy			16.1		mJ
Q_r	Recovered Charge	V_R=900V,I_F=75A, -di/dt=1060A/μs,V_{GE}=-15V L_S=46nH,T_{vj}=150°C		22.5		μC
I_{RM}	Peak Reverse Recovery Current			97		A
E_{rec}	Reverse Recovery Energy			19.2		mJ

Diode-rectifier Characteristics T_C=25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_F	Diode Forward Voltage	I_C=75A,T_{vj}=150°C		0.95		V
I_R	Reverse Current	T_{vj}=150°C,V_R=2000V			3.0	mA

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
R_{thJC}	Junction-to-Case (per IGBT-inverter) Junction-to-Case (per Diode-inverter) Junction-to-Case (per Diode-rectifier)			0.268 0.481 0.289	K/W
R_{thCH}	Case-to-Heatsink (per IGBT-inverter) Case-to-Heatsink (per Diode-inverter) Case-to-Heatsink (per Diode-rectifier) Case-to-Heatsink (per Module)		0.106 0.190 0.114 0.009		K/W
M	Mounting Torque, Screw:M5	3.0		6.0	N.m
G	Weight of Module		300		g

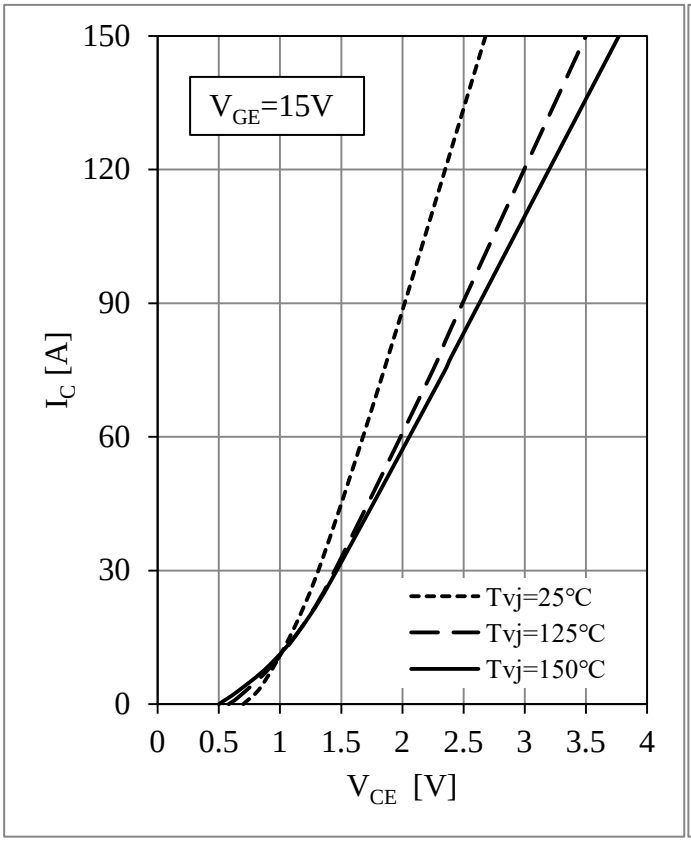


Fig 1. IGBT-inverter Output Characteristics

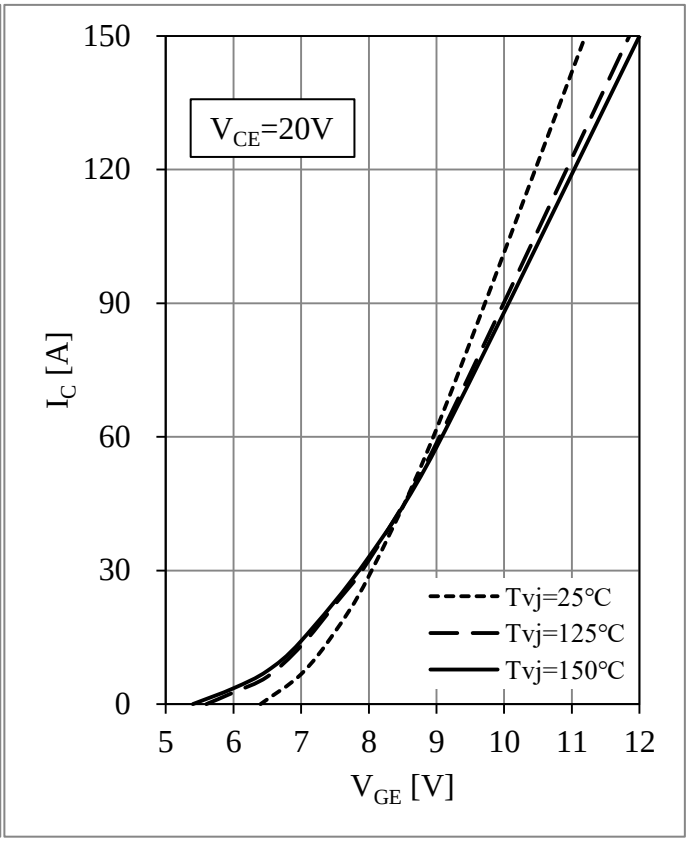


Fig 2. IGBT-inverter Transfer Characteristics

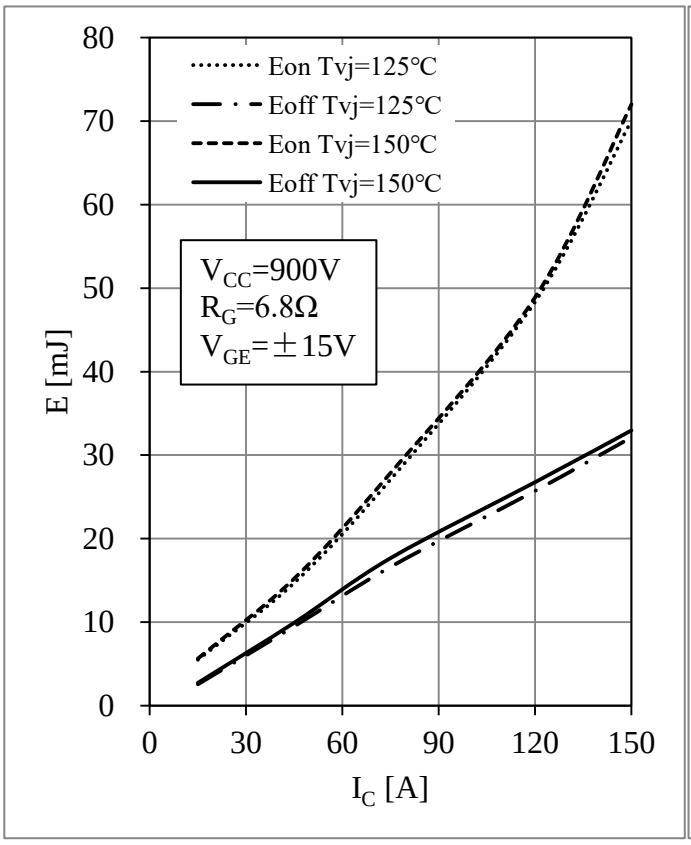


Fig 3. IGBT-inverter Switching Loss vs. I_C

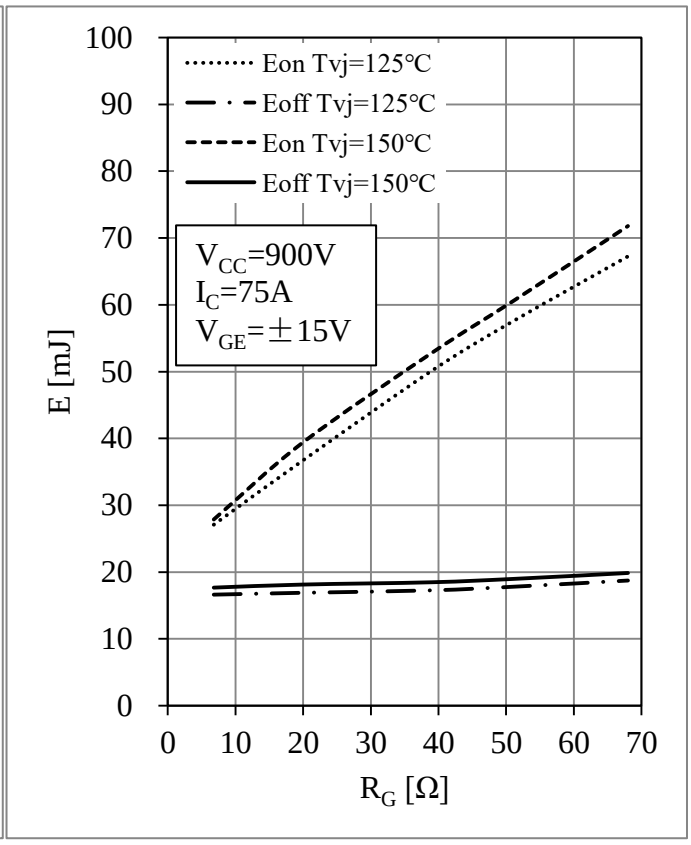


Fig 4. IGBT-inverter Switching Loss vs. R_G

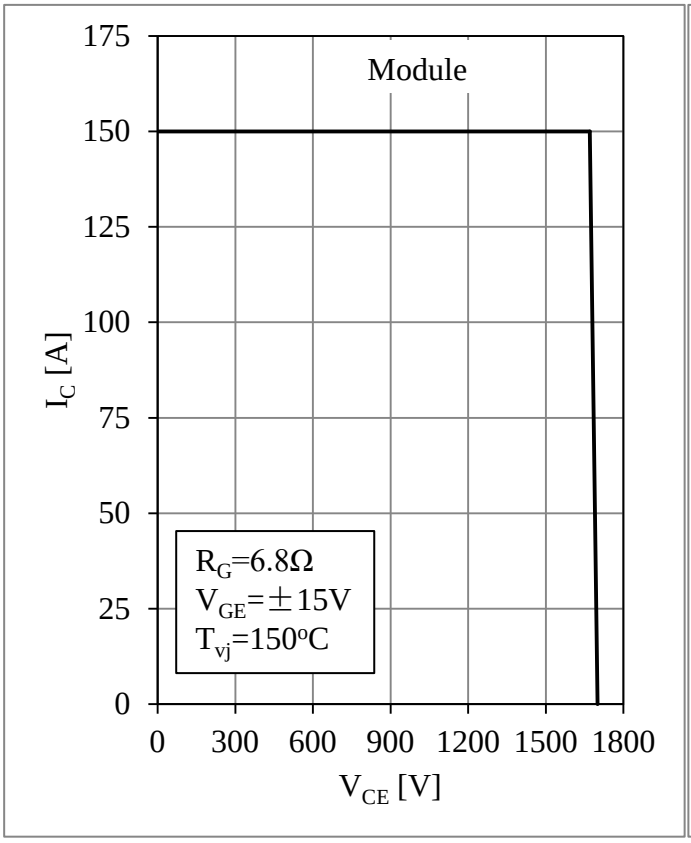


Fig 5. IGBT-inverter RBSOA

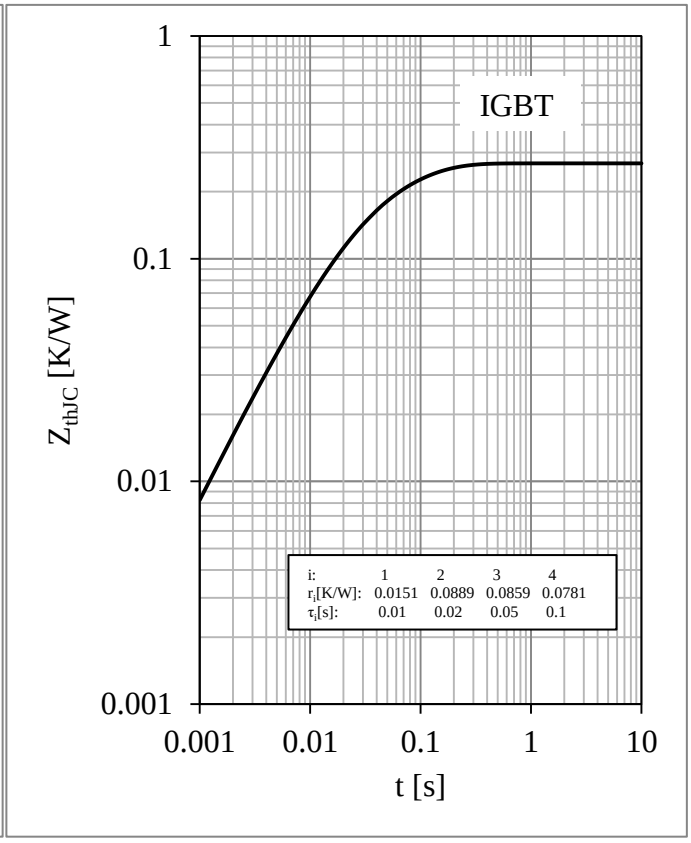


Fig 6. IGBT-inverter Transient Thermal Impedance

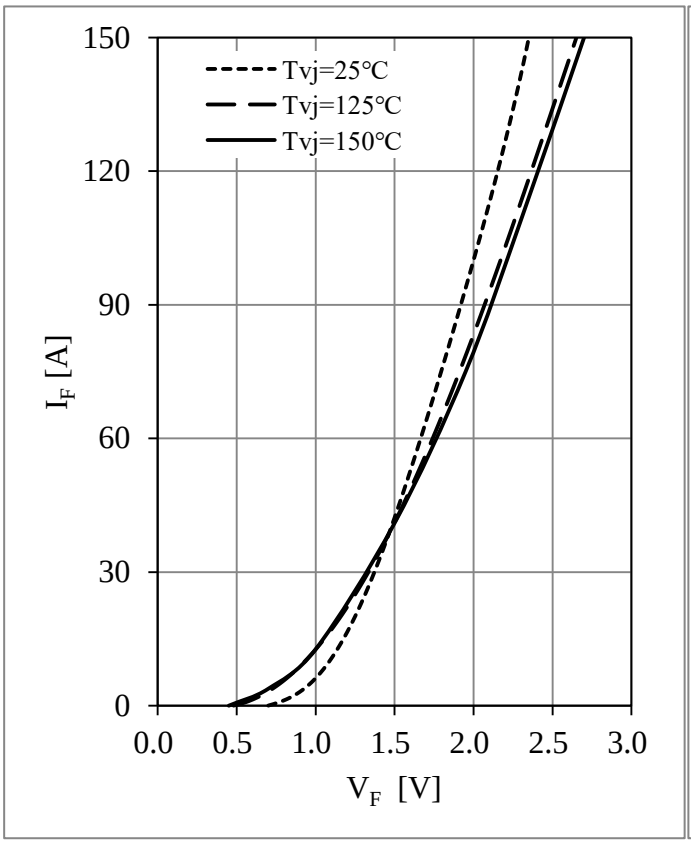


Fig 7. Diode-inverter Forward Characteristics

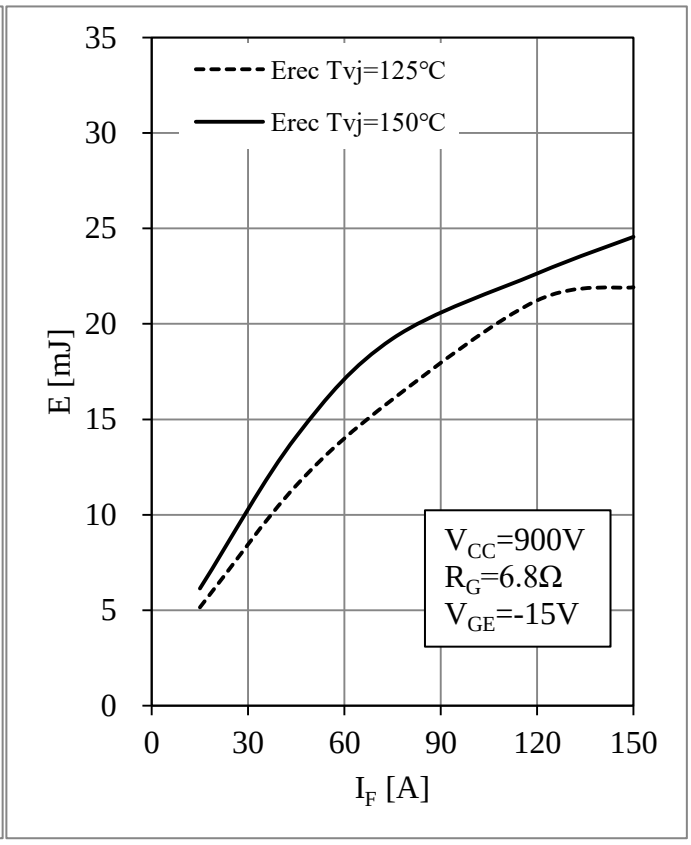


Fig 8. Diode-inverter Switching Loss vs. I_F

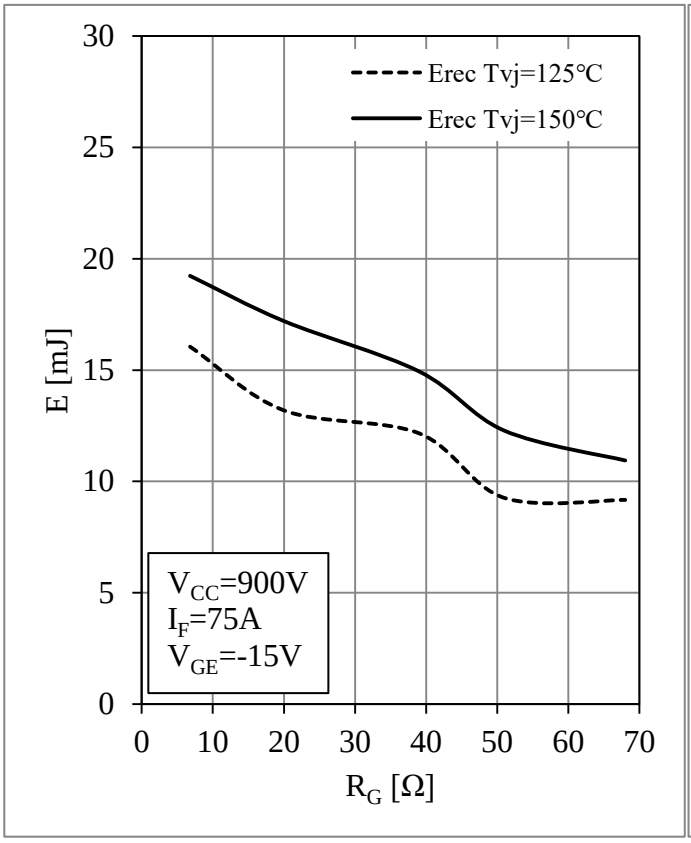


Fig 9. Diode-inverter Switching Loss vs. R_G

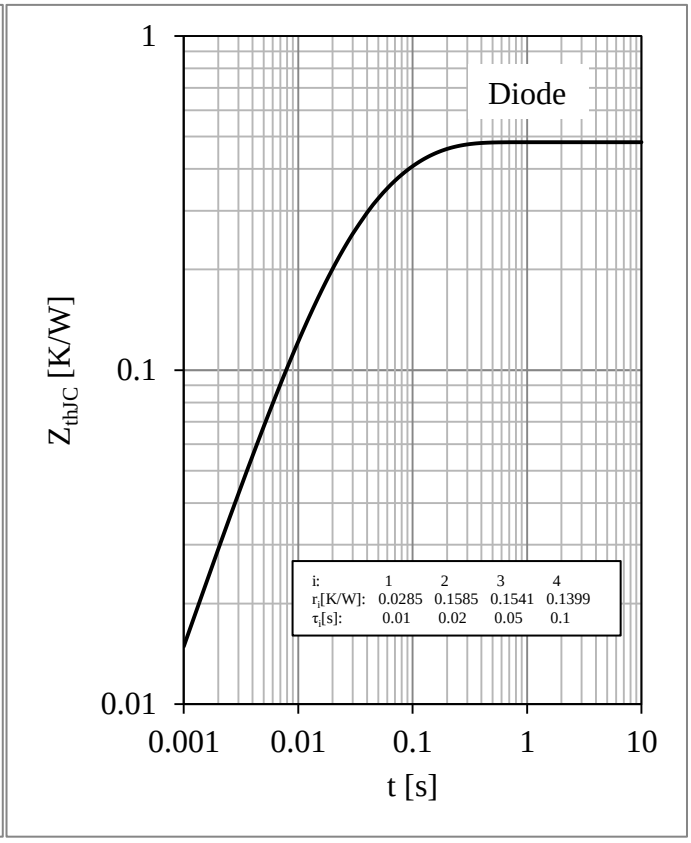


Fig 10. Diode-inverter Transient Thermal Impedance

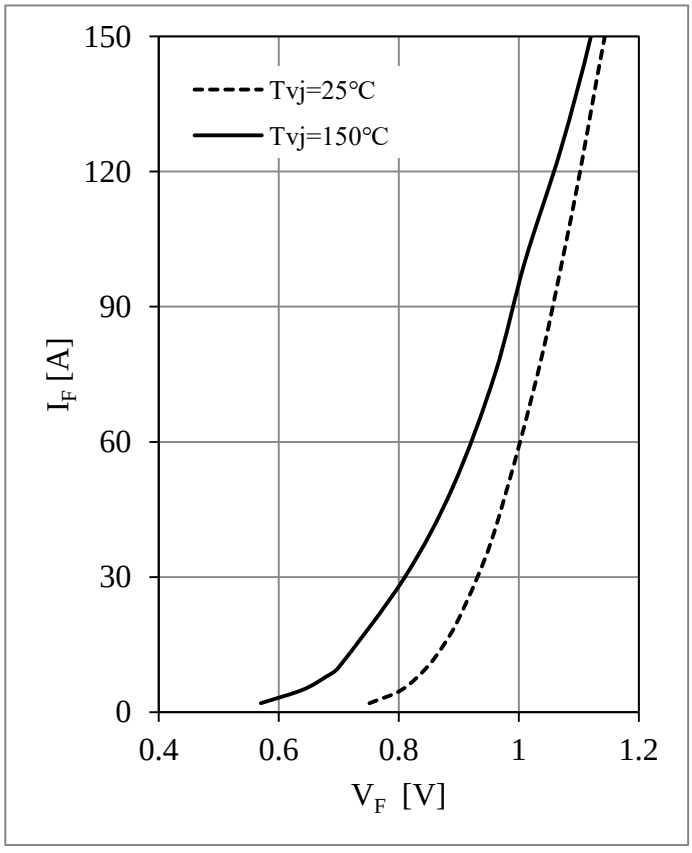


Fig 11. Diode-rectifier Forward Characteristics

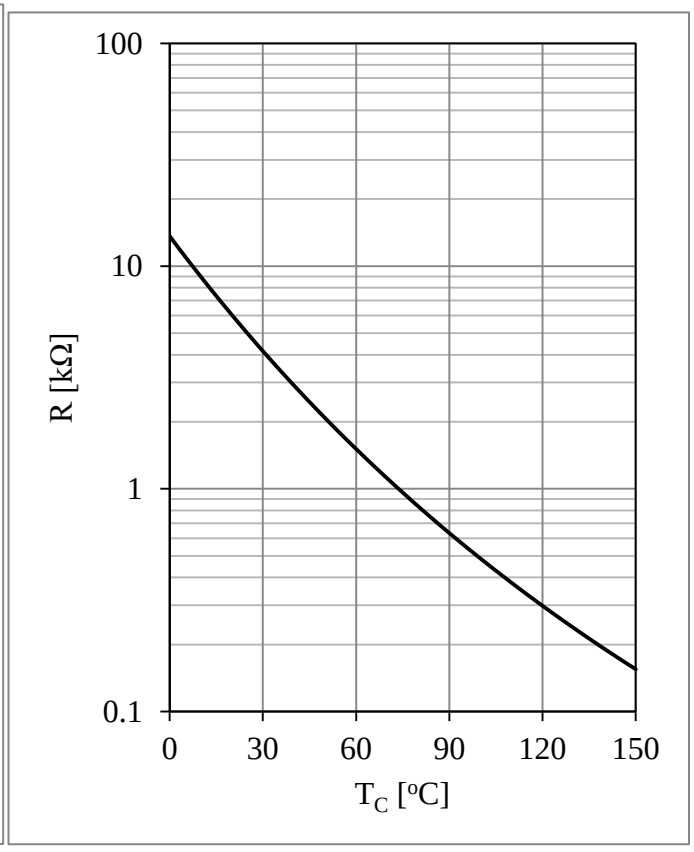
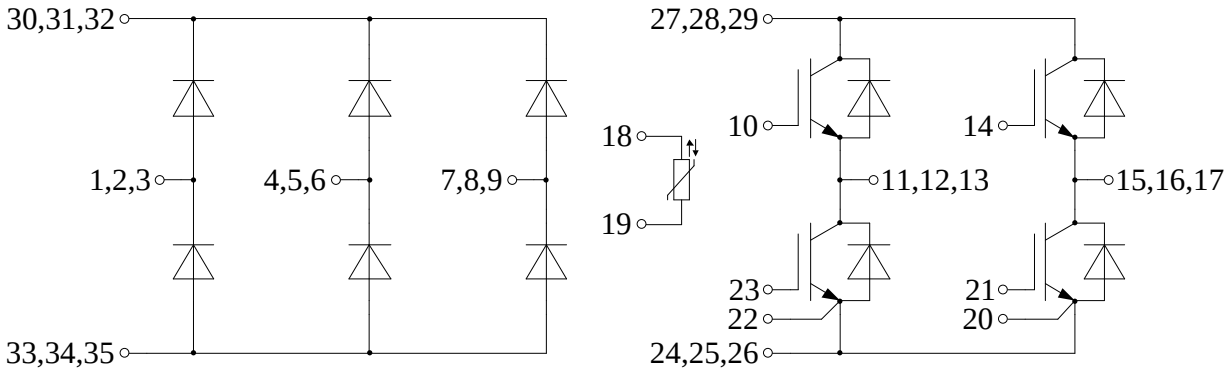


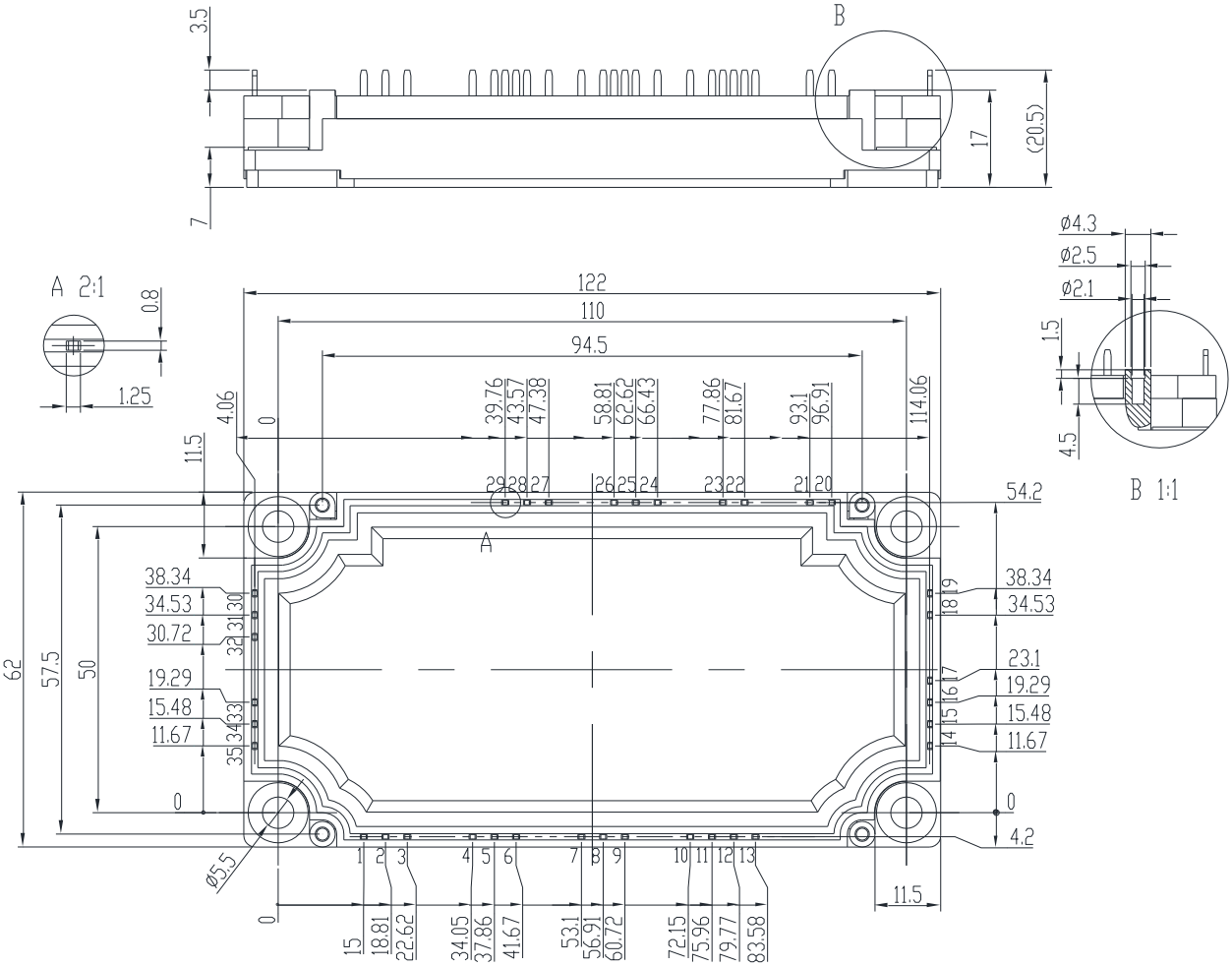
Fig 12. NTC Temperature Characteristic

Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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