STARPOWER

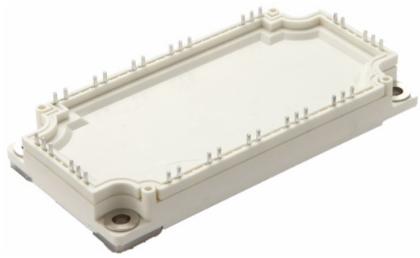
SEMICONDUCTOR **IGBT**

GD150PFL170C6S

1700V/150A 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 SVG.



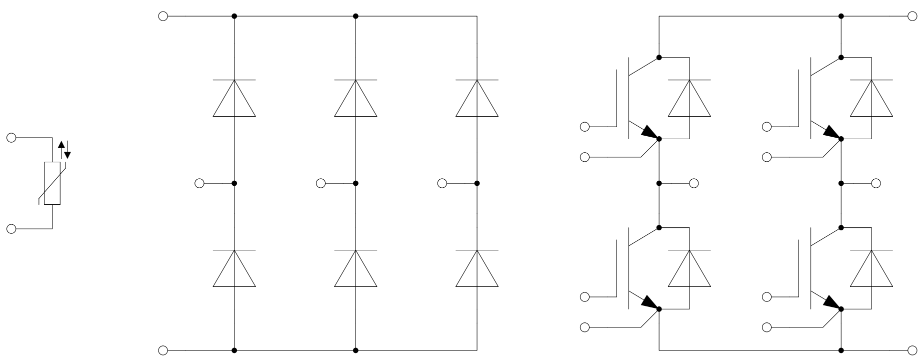
Features

- Low $V_{CE(sat)}$ SPT+ 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
- Static var generator
- High power converter

Equivalent Circuit Schematic



Absolute Maximum Ratings T_C=25°C unless otherwise noted

IGBT-inverter

Symbol	Description	Value	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=85°C	210 150	A
I_{CM}	Pulsed Collector Current t_p=1ms	300	A
P_D	Maximum Power Dissipation @ T_j=175°C	887	W

Diode-inverter

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1700	V
I_F	Diode Continuous Forward Current	150	A
I_{FM}	Diode Maximum Forward Current t_p=1ms	300	A

Diode-rectifier

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1800	V
I_O	Average Output Current 50Hz/60Hz,sine wave	150	A
I_{FSM}	Surge Forward Current V_R=0V,t_p=10ms,T_j=150°C	1560	A
I^2t	I^2t-value,V_R=0V,t_p=10ms,T_j=150°C	12170	A^2s

Module

Symbol	Description	Value	Unit
T_{jmax}	Maximum Junction Temperature(inverter) Maximum Junction Temperature(rectifier)	175 150	°C
T_{jop}	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=150A,V_{GE}=15V, T_j=25°C		2.40	2.85	V
		I_C=150A,V_{GE}=15V, T_j=125°C		2.80		
		I_C=150A,V_{GE}=15V, T_j=150°C		2.90		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=6.0mA,V_{CE}=V_{GE}, T_j=25°C	5.4	6.2	7.4	V
I_{CES}	Collector Cut-Off Current	V_{CE}=V_{CES},V_{GE}=0V, T_j=25°C			1.0	mA
I_{GES}	Gate-Emitter Leakage Current	V_{GE}=V_{GES},V_{CE}=0V, T_j=25°C			400	nA
R_{Gint}	Internal Gate Resistance			4.6		Ω
C_{ies}	Input Capacitance	V_{CE}=25V,f=1MHz, V_{GE}=0V		10.0		nF
C_{res}	Reverse Transfer Capacitance			0.36		nF
Q_G	Gate Charge	V_{GE}=-15…+15V		0.90		μC
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=900V,I_C=150A, R_G=9.1Ω,V_{GE}=±15V, T_j=25°C		373		ns
t_r	Rise Time			123		ns
$t_{d(off)}$	Turn-Off Delay Time			336		ns
t_f	Fall Time			339		ns
E_{on}	Turn-On Switching Loss			56.4		mJ
E_{off}	Turn-Off Switching Loss			25.4		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=900V,I_C=150A, R_G=9.1Ω,V_{GE}=±15V, T_j=125°C		382		ns
t_r	Rise Time			123		ns
$t_{d(off)}$	Turn-Off Delay Time			371		ns
t_f	Fall Time			726		ns
E_{on}	Turn-On Switching Loss			61.0		mJ
E_{off}	Turn-Off Switching Loss			40.0		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=900V,I_C=150A, R_G=9.1Ω,V_{GE}=±15V, T_j=150°C		391		ns
t_r	Rise Time			123		ns
$t_{d(off)}$	Turn-Off Delay Time			384		ns
t_f	Fall Time			813		ns
E_{on}	Turn-On Switching Loss			67.1		mJ
E_{off}	Turn-Off Switching Loss			44.0		mJ
I_{SC}	SC Data	t_P≤10μs,V_{GE}=15V, T_j=150°C,V_{CC}=1000V, V_{CEM}≤1700V		480		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=150A,V_{GE}=0V,T_j=25°C		1.80	2.25	V
		I_F=150A,V_{GE}=0V,T_j=125°C		1.95		
		I_F=150A,V_{GE}=0V,T_j=150°C		1.90		
Q_r	Recovered Charge	V_R=900V,I_F=150A, -di/dt=1150A/μs,V_{GE}=-15V T_j=25°C		33.4		μC
I_{RM}	Peak Reverse Recovery Current			98		A
E_{rec}	Reverse Recovery Energy			19.9		mJ
Q_r	Recovered Charge	V_R=900V,I_F=150A, -di/dt=1150A/μs,V_{GE}=-15V T_j=125°C		53.0		μC
I_{RM}	Peak Reverse Recovery Current			119		A
E_{rec}	Reverse Recovery Energy			31.1		mJ
Q_r	Recovered Charge	V_R=900V,I_F=150A, -di/dt=1150A/μs,V_{GE}=-15V T_j=150°C		65.3		μC
I_{RM}	Peak Reverse Recovery Current			132		A
E_{rec}	Reverse Recovery Energy			34.2		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_F=150A,T_j=150°C		0.97		V
I_R	Reverse Current	T_j=150°C,V_R=1800V			2.0	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

Module Characteristics T_C=25°C unless otherwise noted

Symbol	Parameter	Min.	Typ.	Max.	Unit
R_{thJC}	Junction-to-Case (per IGBT) Junction-to-Case (per Diode) Junction-to-Case (per Diode-rectifier)			0.169 0.284 0.380	K/W
R_{thCH}	Case-to-Heatsink (per IGBT) Case-to-Heatsink (per Diode) Case-to-Heatsink (per Diode-rectifier) Case-to-Heatsink (per Module)		0.081 0.137 0.183 0.009		K/W
M	Mounting Torque, Screw M5	3.0		6.0	N.m
G	Weight of Module		300		g

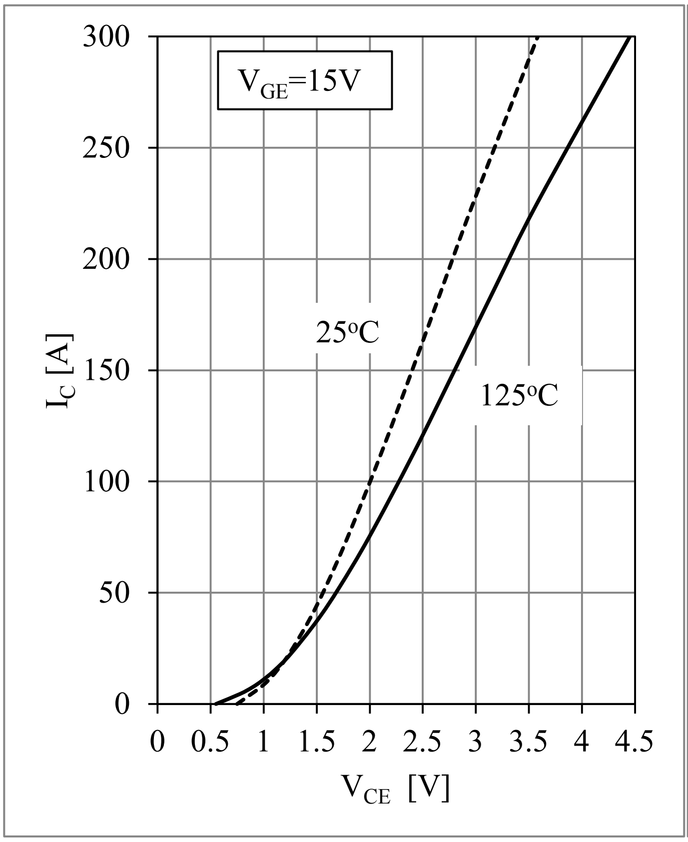


Fig 1. IGBT-inverter Output Characteristics

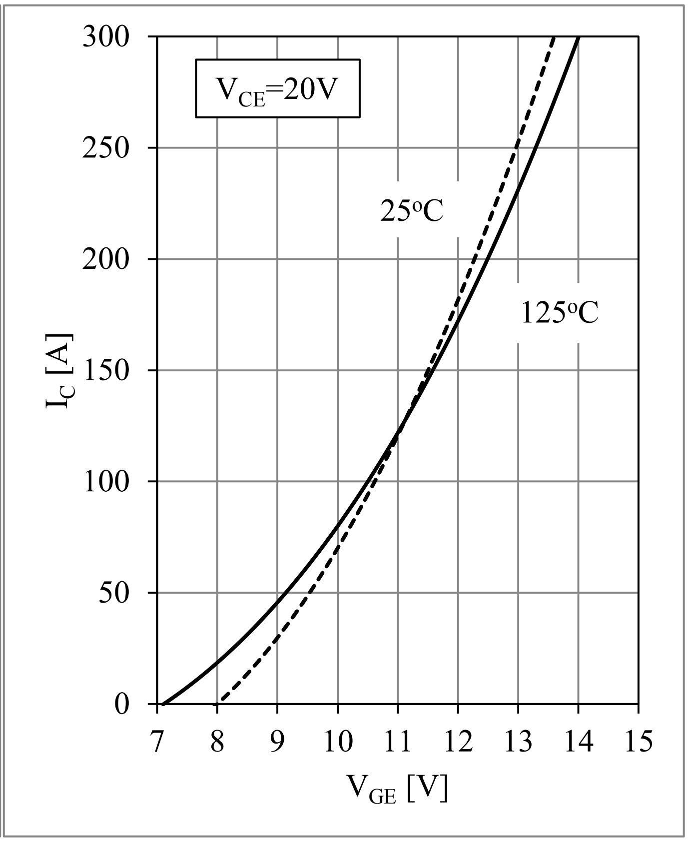


Fig 2. IGBT-inverter Transfer Characteristics

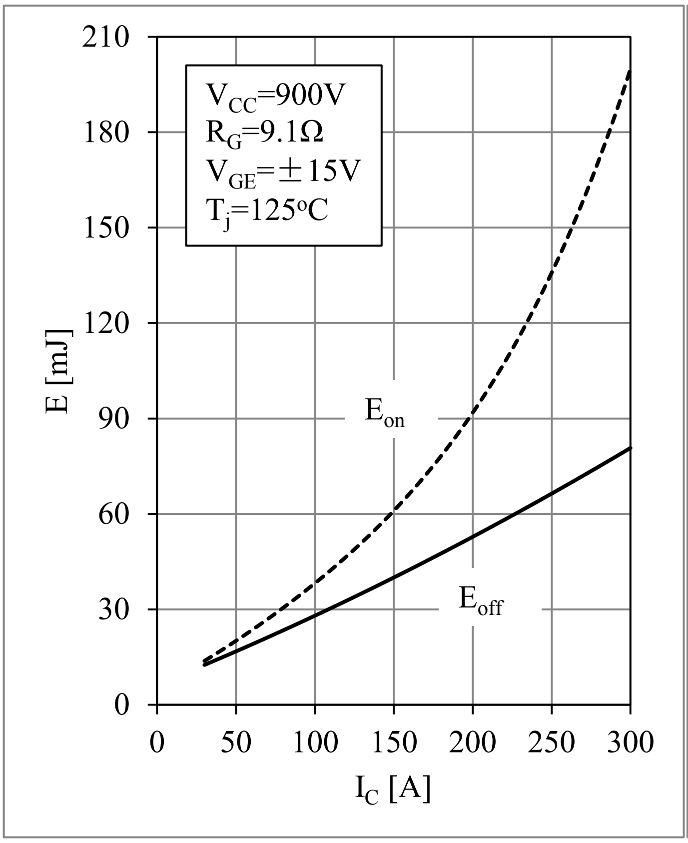


Fig 3. IGBT-inverter Switching Loss vs. I_C

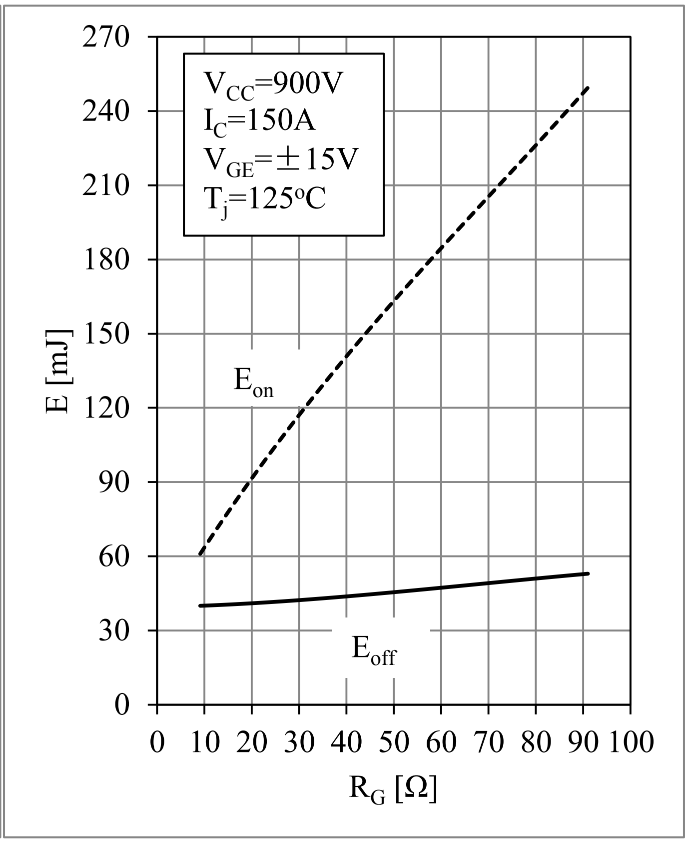


Fig 4. IGBT-inverter Switching Loss vs. R_G

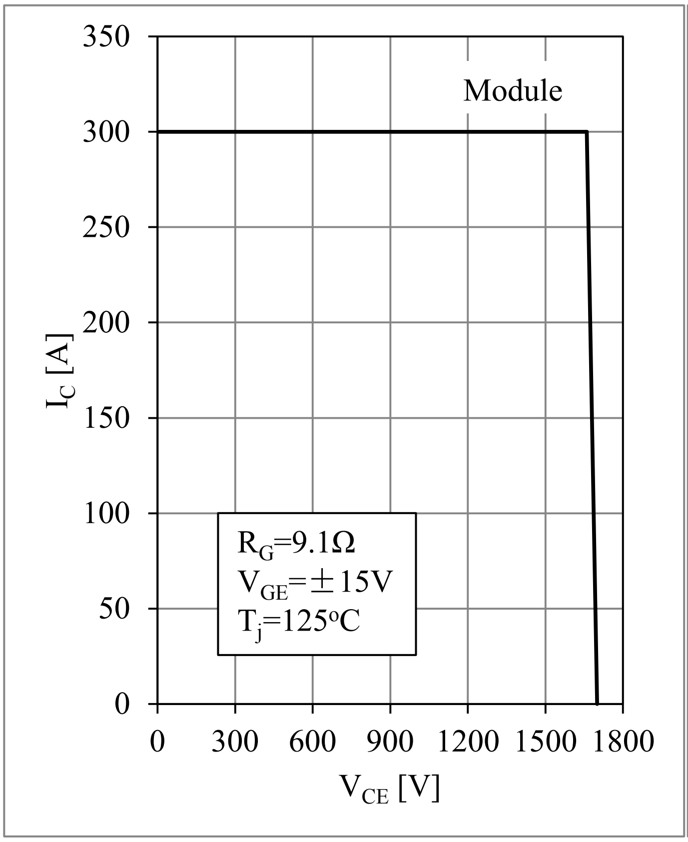


Fig 5. IGBT-inverter RBSOA

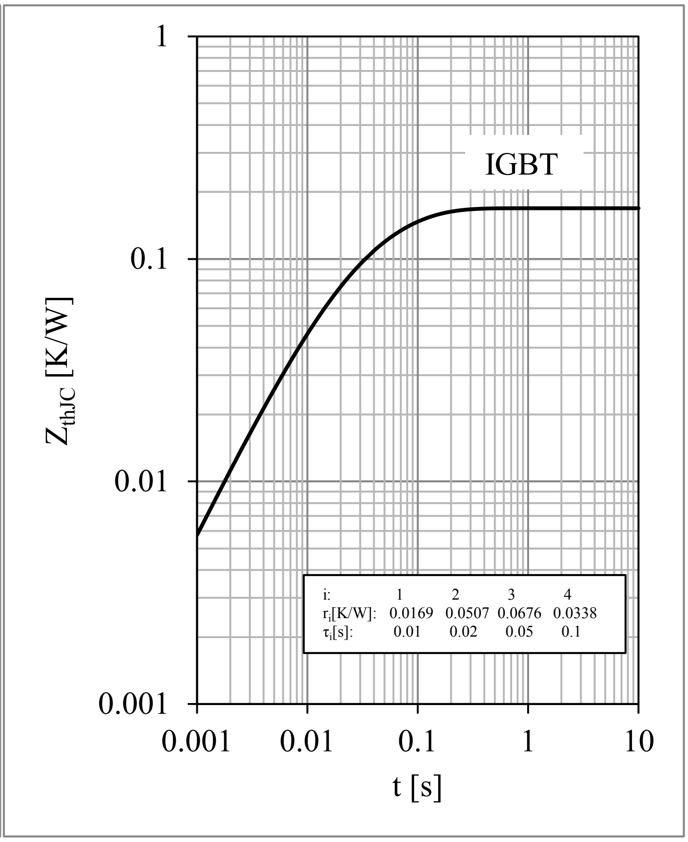


Fig 6. IGBT-inverter Transient Thermal Impedance

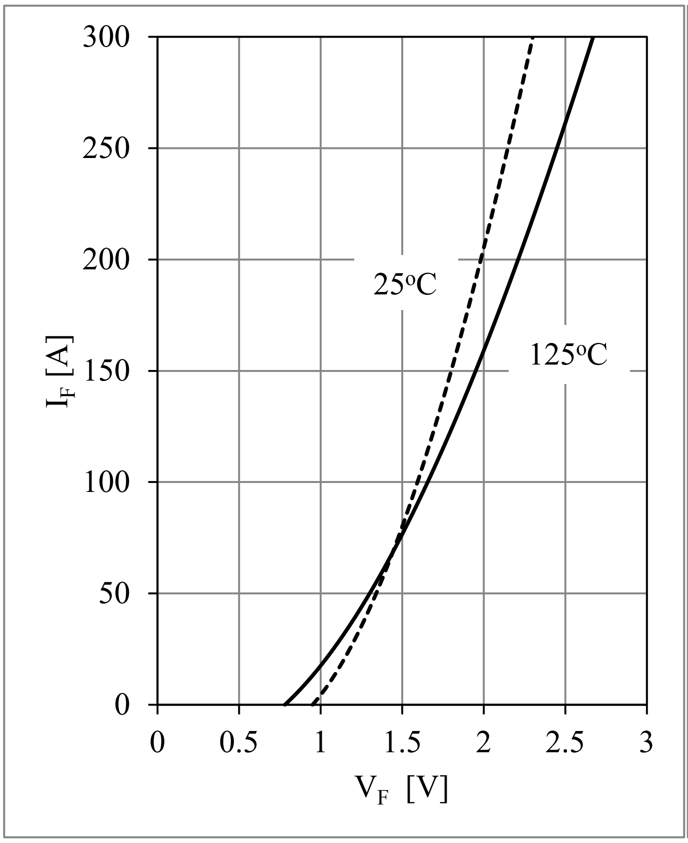


Fig 7. Diode-inverter Forward Characteristics

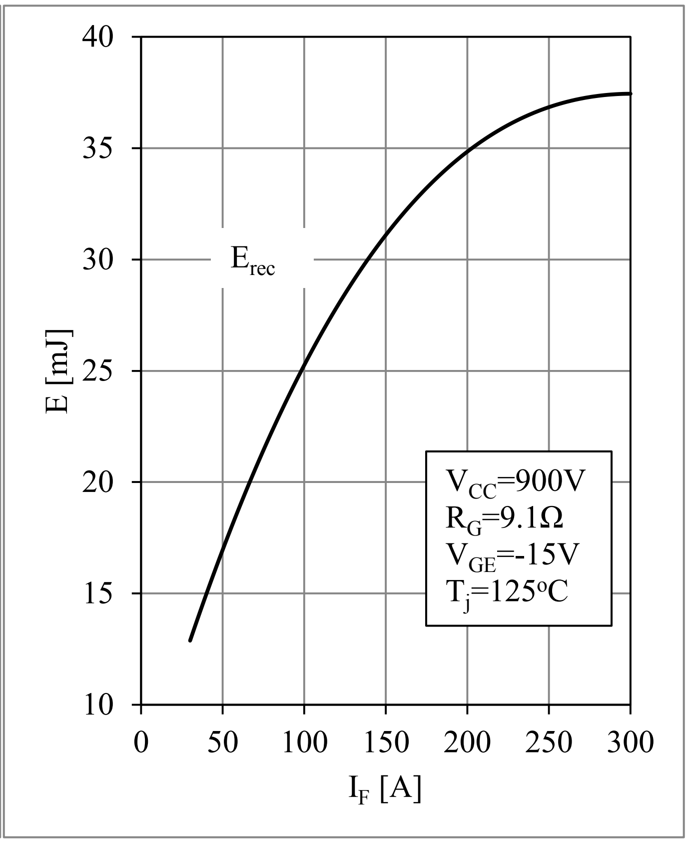


Fig 8. Diode-inverter Switching Loss vs. I_F

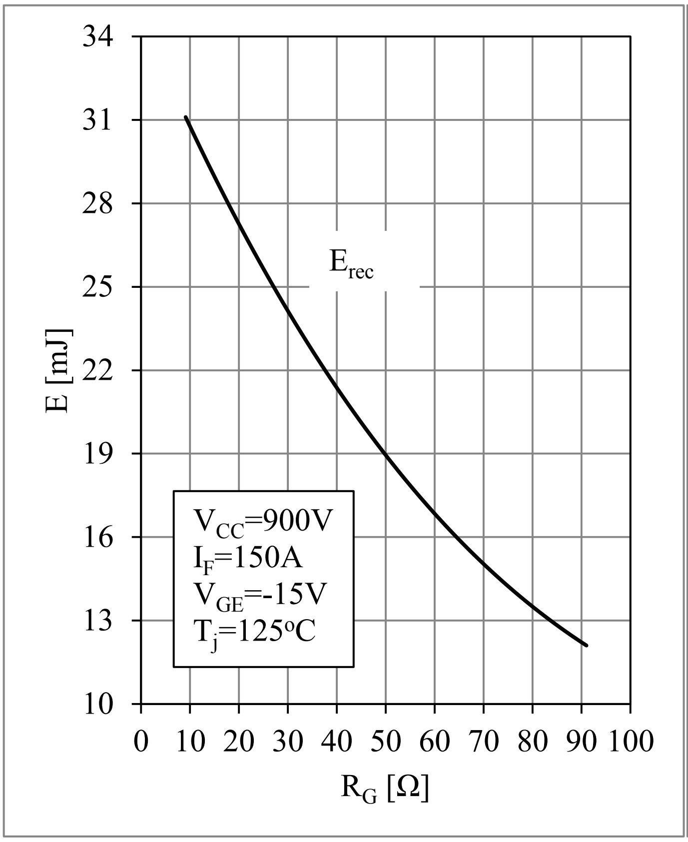


Fig 9. Diode-inverter Switching Loss vs. R_G

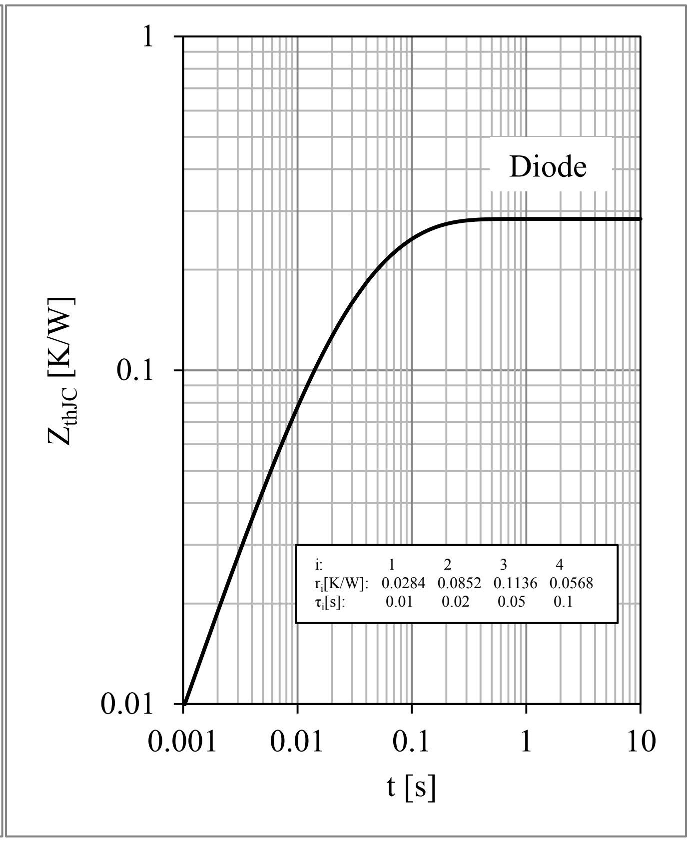


Fig 10. Diode-inverter Transient Thermal Impedance

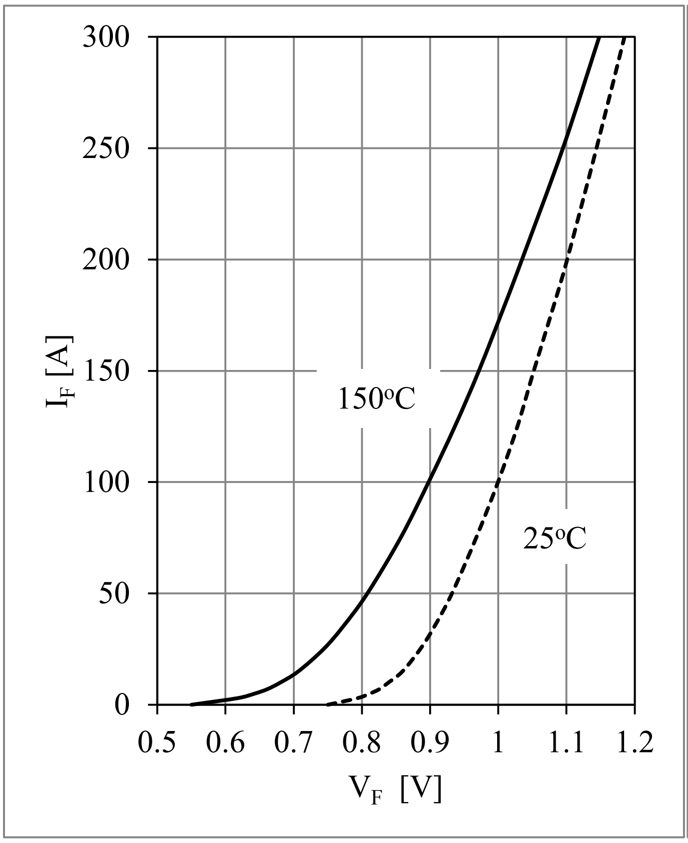


Fig 11. Diode-rectifier Forward Characteristics

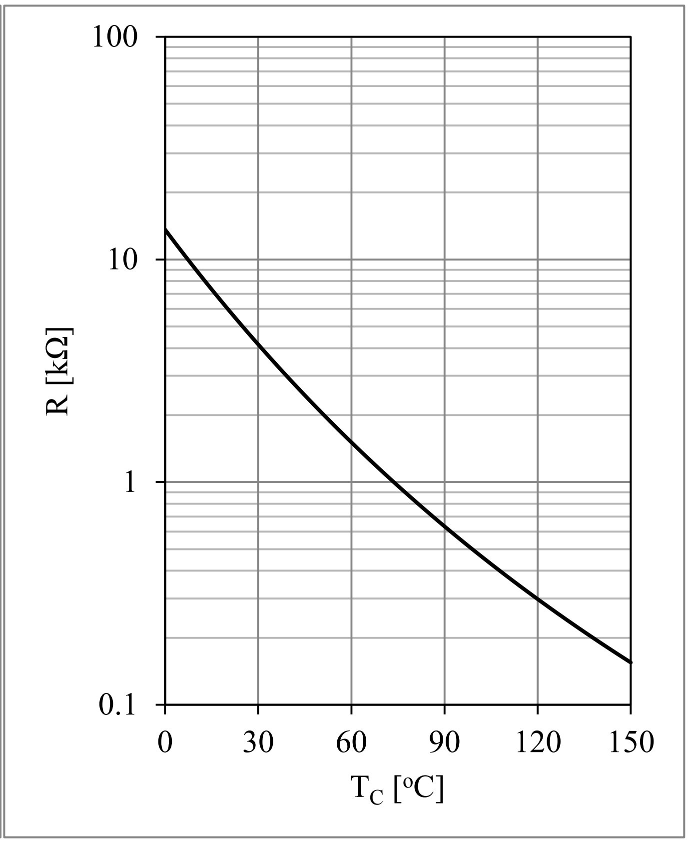
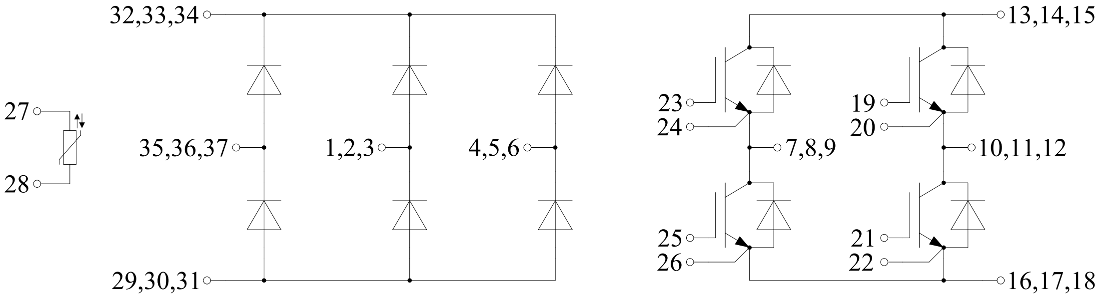


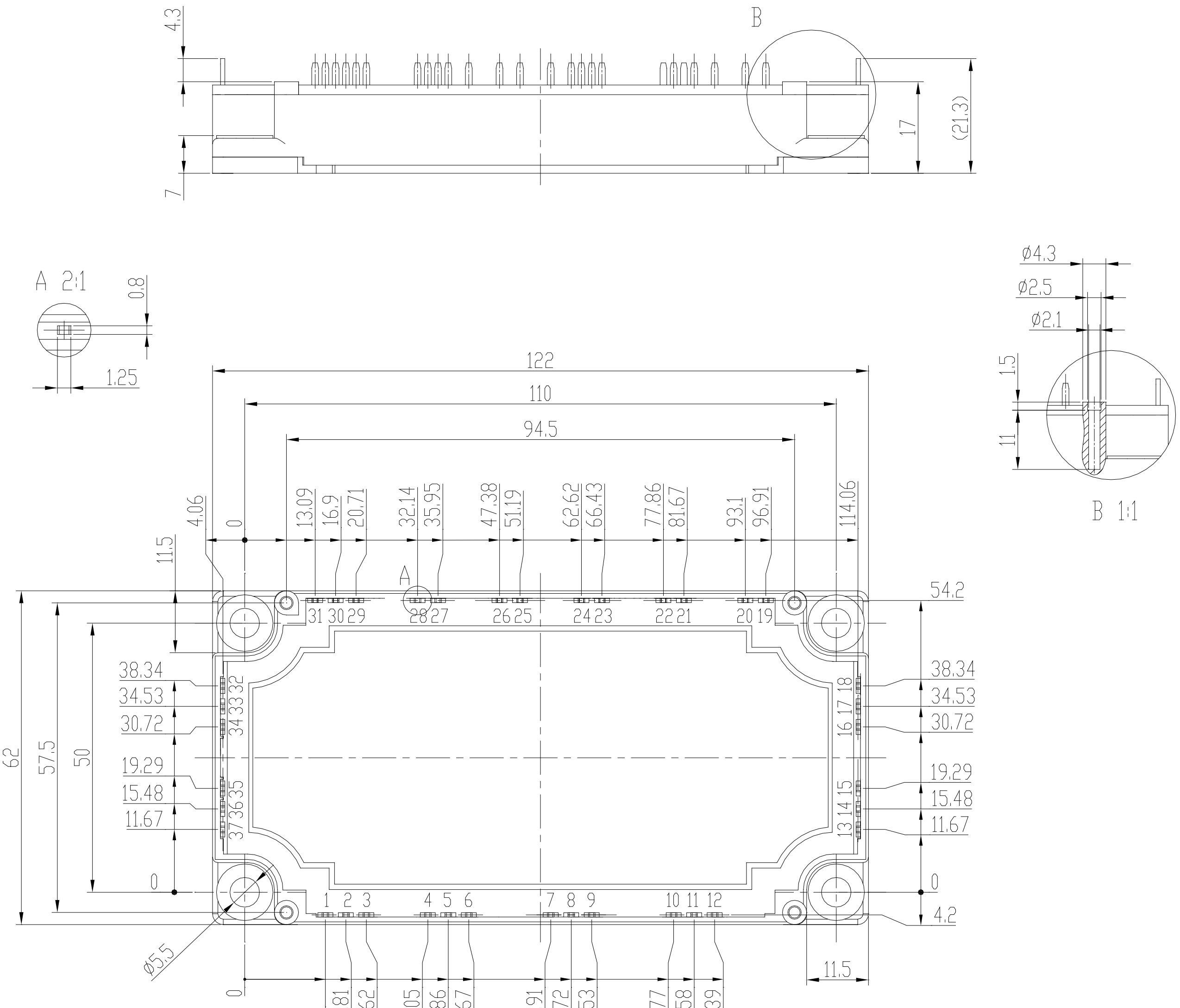
Fig 12. NTC Temperature Characteristic

Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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