STARPOWER

SEMICONDUCTOR **IGBT**

GD150FFX170C6S

1200V/150A 6 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 UPS.

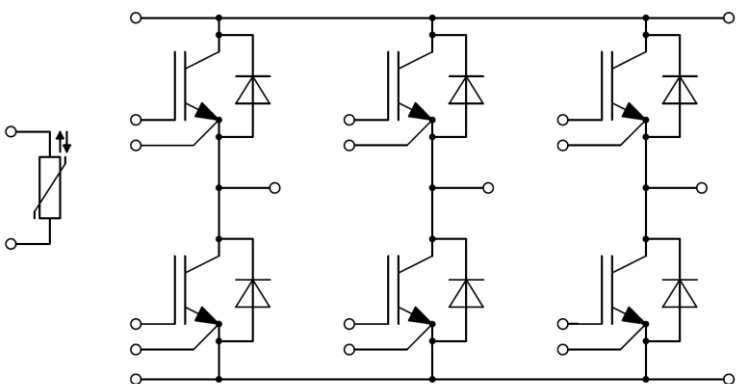
Features

- 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

- Uninterruptible 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	1700	V
V_{GES}	Gate-Emitter Voltage	±20	V
I_C	Collector Current @ T_C=25°C @ T_C=100°C	232 150	A
I_{CM}	Pulsed Collector Current t_p=1ms	300	A
P_D	Maximum Power Dissipation @ T_j=175°C	829	W

Diode

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

Module

Symbol	Description	Value	Unit
T_{jmax}	Maximum Junction Temperature	175	°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 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		1.85	2.20	V
		I_C=150A,V_{GE}=15V, T_j=125°C		2.25		
		I_C=150A,V_{GE}=15V, T_j=150°C		2.35		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=6.00mA,V_{CE}=V_{GE}, T_j=25°C	5.6	6.2	6.8	V
I_{CES}	Collector Cut-Off Current	V_{CE}=V_{CES},V_{GE}=0V, T_j=25°C			5.0	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			4.3		Ω
C_{ies}	Input Capacitance	V_{CE}=25V,f=1MHz, V_{GE}=0V		18.1		nF
C_{res}	Reverse Transfer Capacitance			0.44		nF
Q_G	Gate Charge	V_{GE}=-15…+15V		1.41		μC
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=900V,I_C=150A, R_G=4.8Ω,V_{GE}=±15V, T_j=25°C		204		ns
t_r	Rise Time			48		ns
$t_{d(off)}$	Turn-Off Delay Time			595		ns
t_f	Fall Time			100		ns
E_{on}	Turn-On Switching Loss			51.7		mJ
E_{off}	Turn-Off Switching Loss			32.2		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=900V,I_C=150A, R_G=4.8Ω,V_{GE}=±15V, T_j=125°C		224		ns
t_r	Rise Time			55		ns
$t_{d(off)}$	Turn-Off Delay Time			611		ns
t_f	Fall Time			159		ns
E_{on}	Turn-On Switching Loss			65.3		mJ
E_{off}	Turn-Off Switching Loss			48.4		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=900V,I_C=150A, R_G=4.8Ω,V_{GE}=±15V, T_j=150°C		240		ns
t_r	Rise Time			55		ns
$t_{d(off)}$	Turn-Off Delay Time			624		ns
t_f	Fall Time			180		ns
E_{on}	Turn-On Switching Loss			72.5		mJ
E_{off}	Turn-Off Switching Loss			51.5		mJ
I_{SC}	SC Data	t_P≤10μs,V_{GE}=15V, T_j=150°C,V_{CC}=1000V, V_{CEM}≤1700V		600		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_i=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

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		21		nH
$R_{CC'+EE'}$	Module Lead Resistance,Terminal to Chip		1.80		mΩ
R_{thJC}	Junction-to-Case (per IGBT) Junction-to-Case (per Diode)			0.181 0.300	K/W
R_{thCH}	Case-to-Heatsink (per IGBT) Case-to-Heatsink (per Diode) Case-to-Heatsink (per Module)		0.087 0.144 0.009		K/W
M	Mounting Screw:M5	3.0		6.0	N.m
G	Weight of Module		300		g

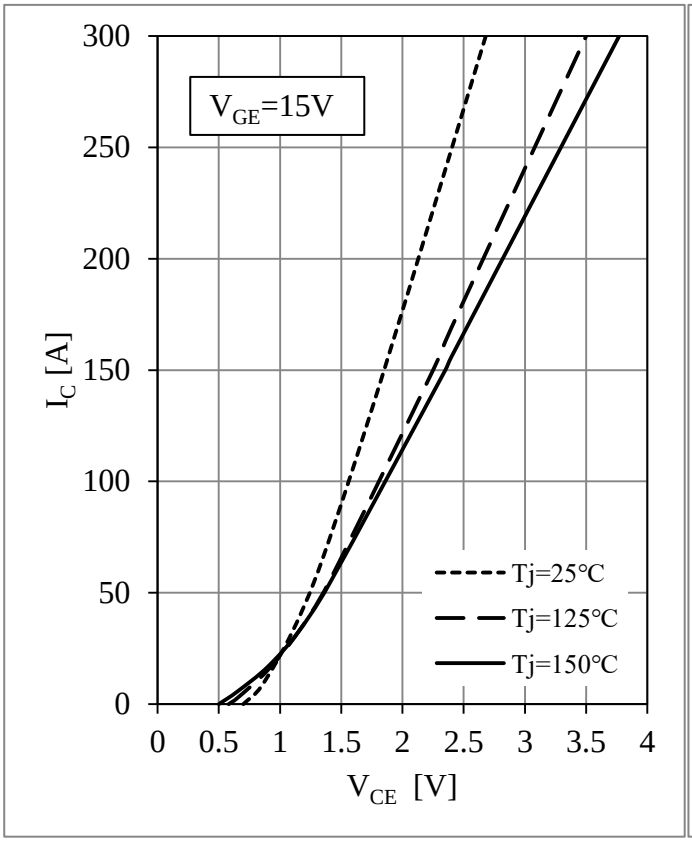


Fig 1. IGBT Output Characteristics

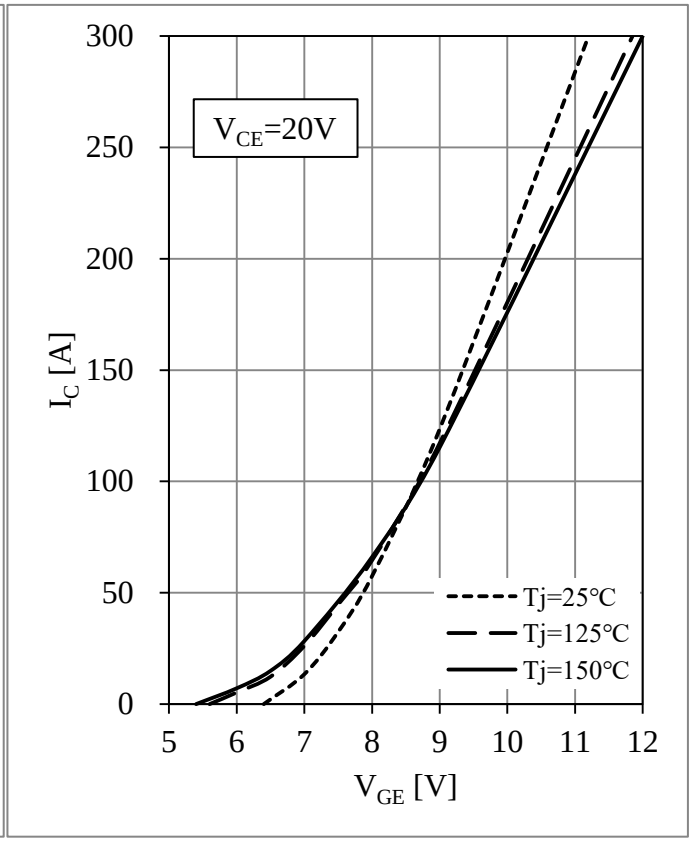


Fig 2. IGBT Transfer Characteristics

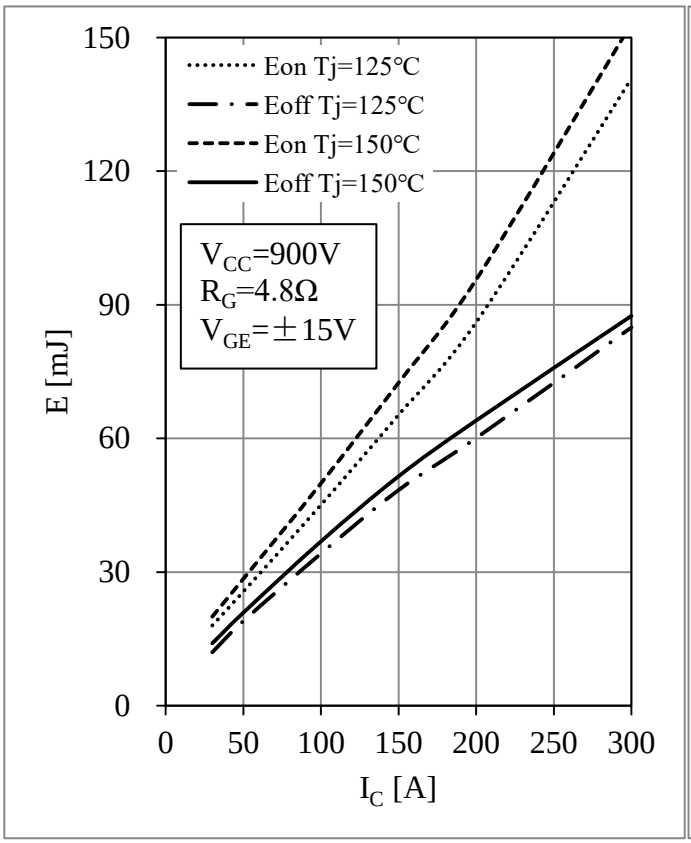


Fig 3. IGBT Switching Loss vs. I_C

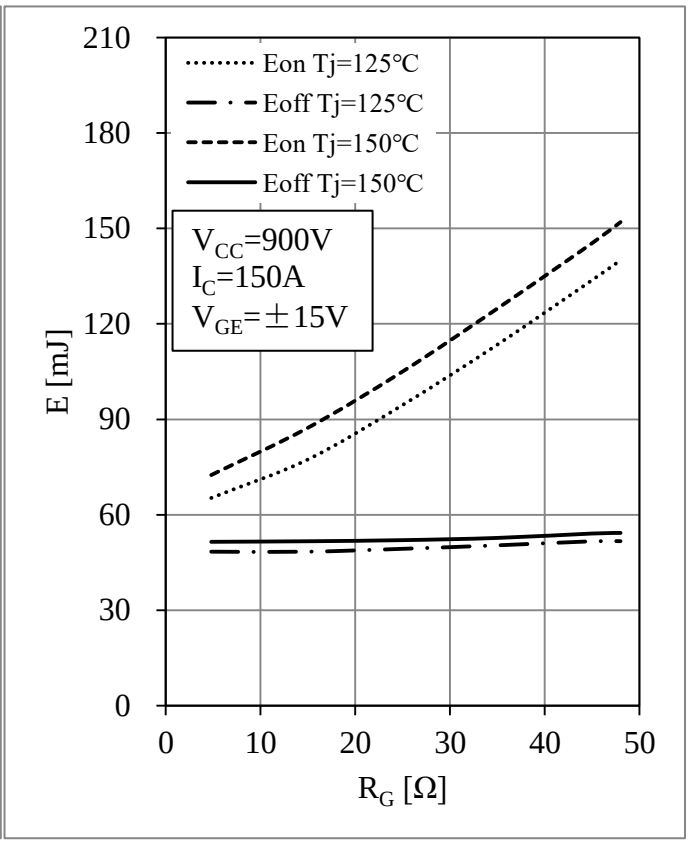


Fig 4. IGBT Switching Loss vs. R_G

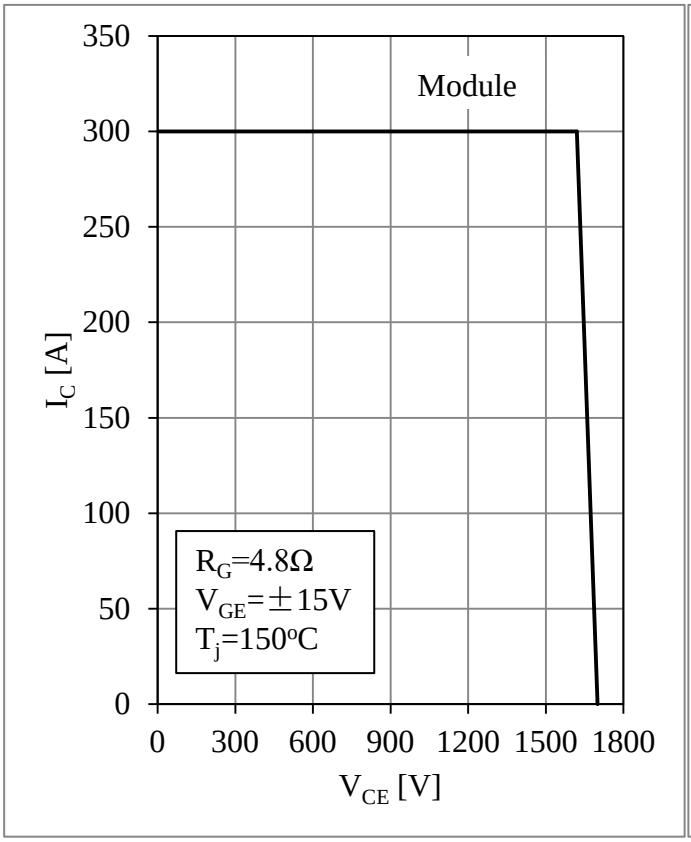


Fig 5. IGBT RBSOA

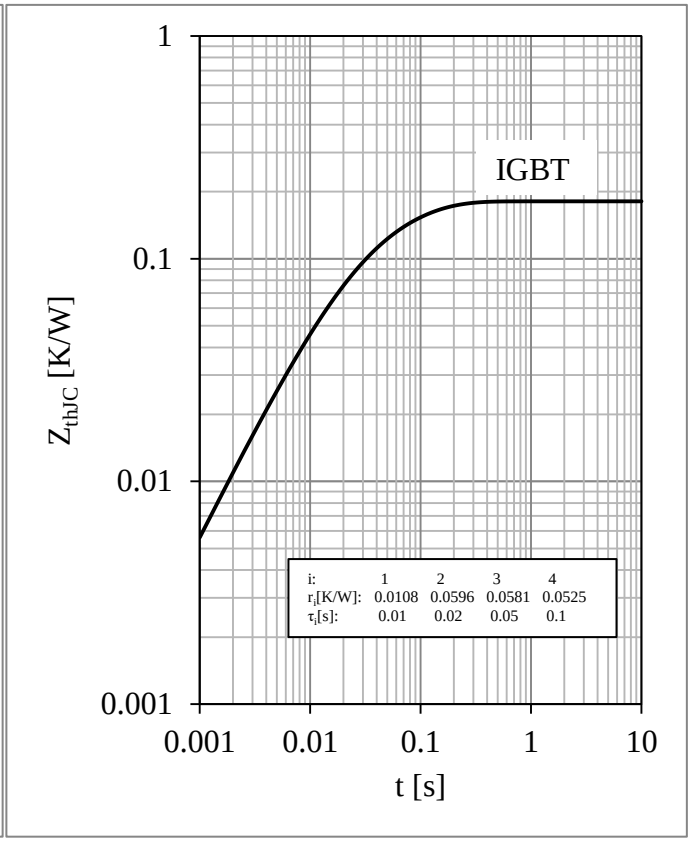


Fig 6. IGBT Transient Thermal Impedance

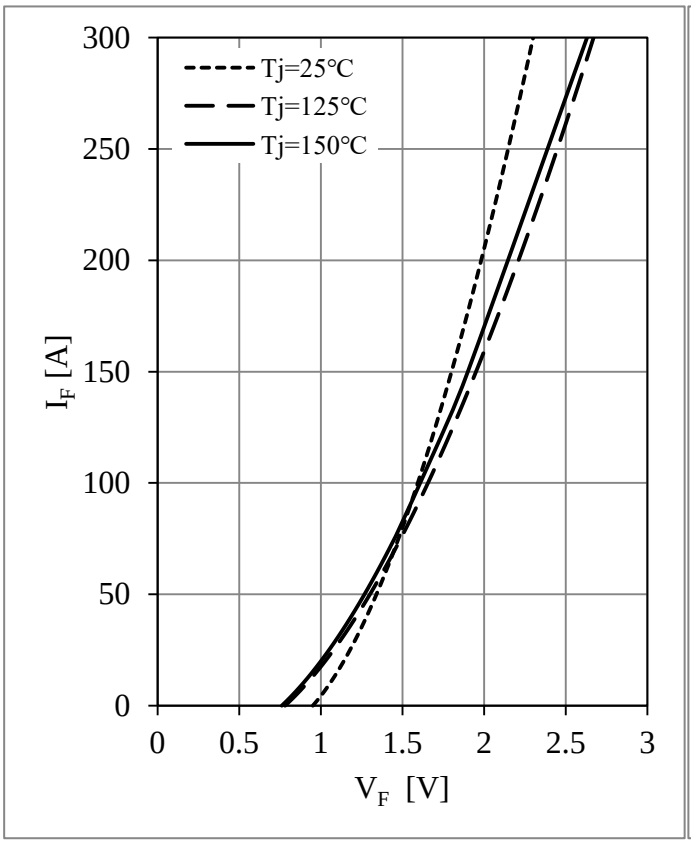


Fig 7. Diode Forward Characteristics

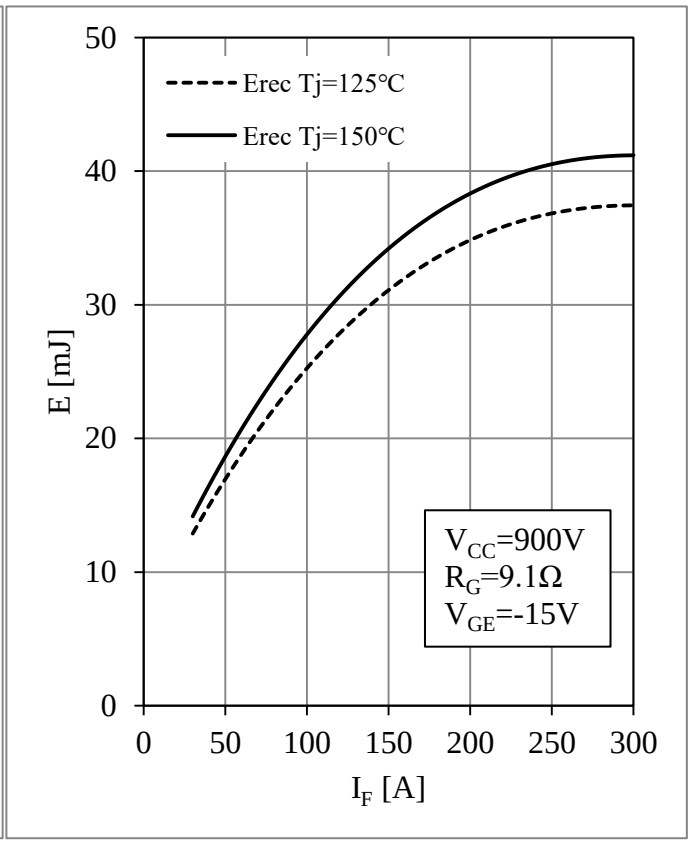


Fig 8. Diode Switching Loss vs. I_F

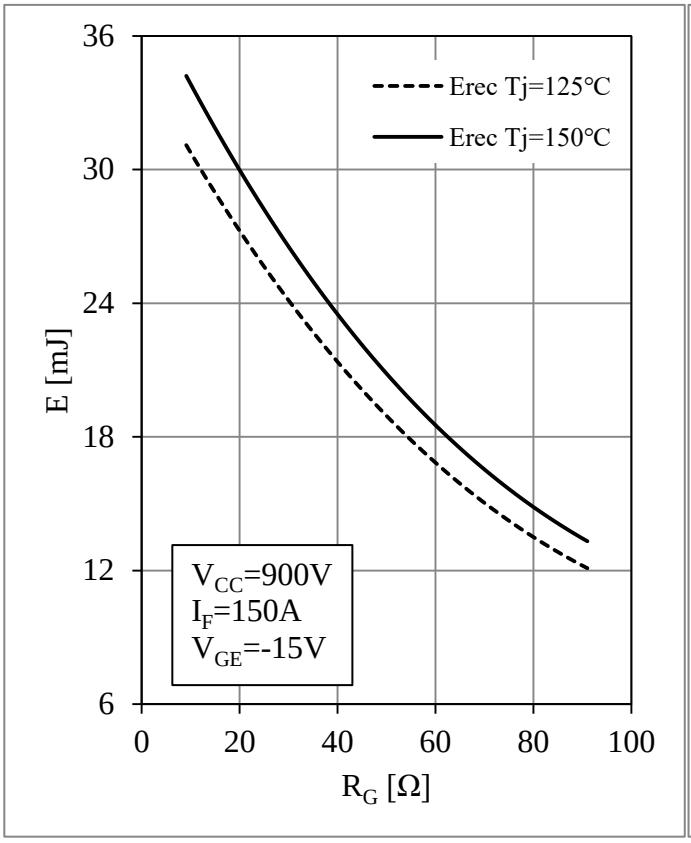


Fig 9. Diode Switching Loss vs. R_G

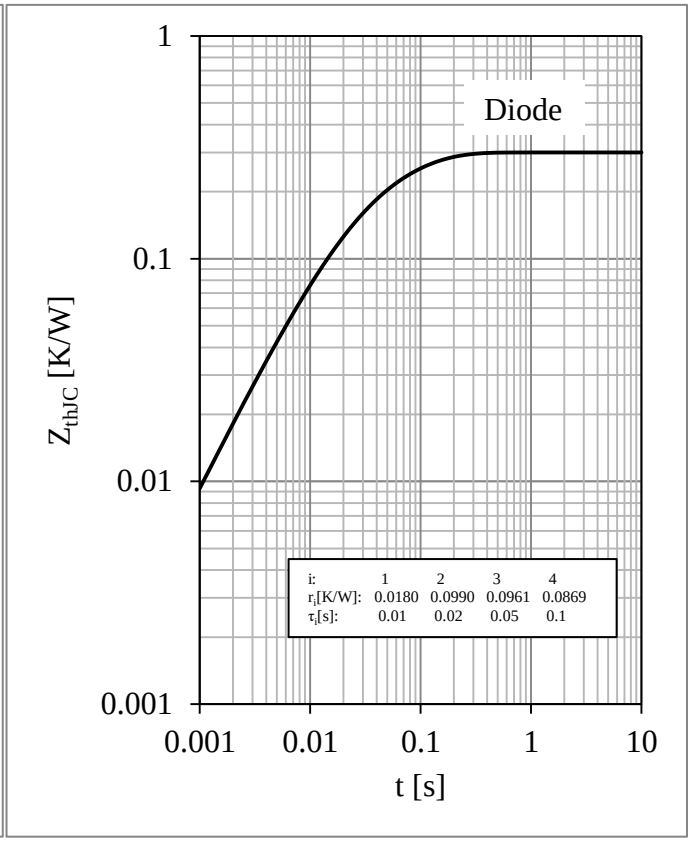


Fig 10. Diode Transient Thermal Impedance

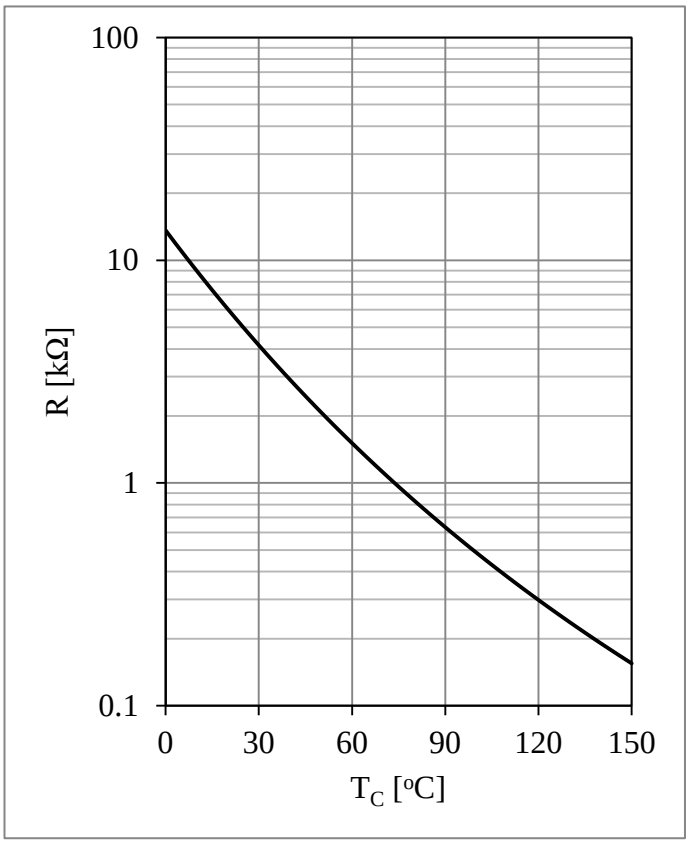
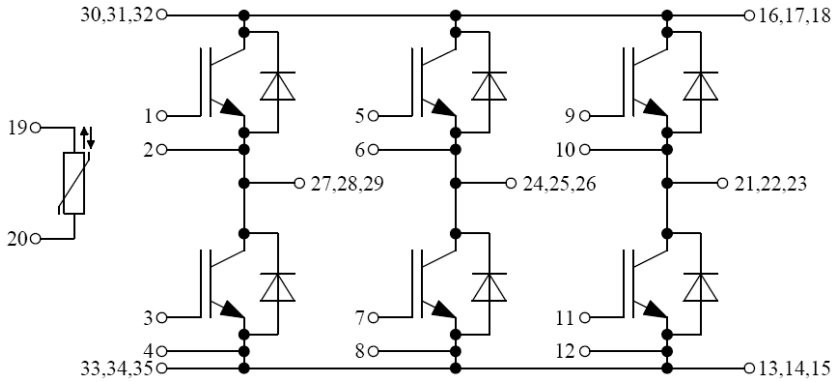


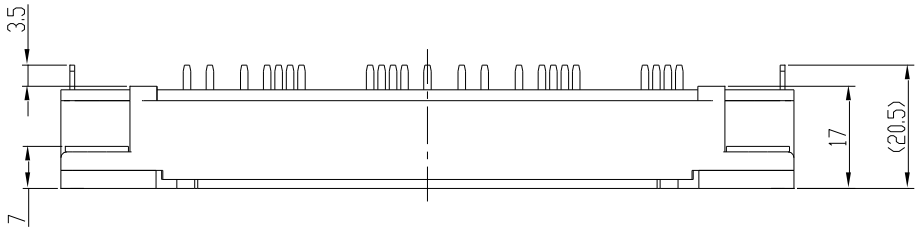
Fig 11. NTC Temperature Characteristic

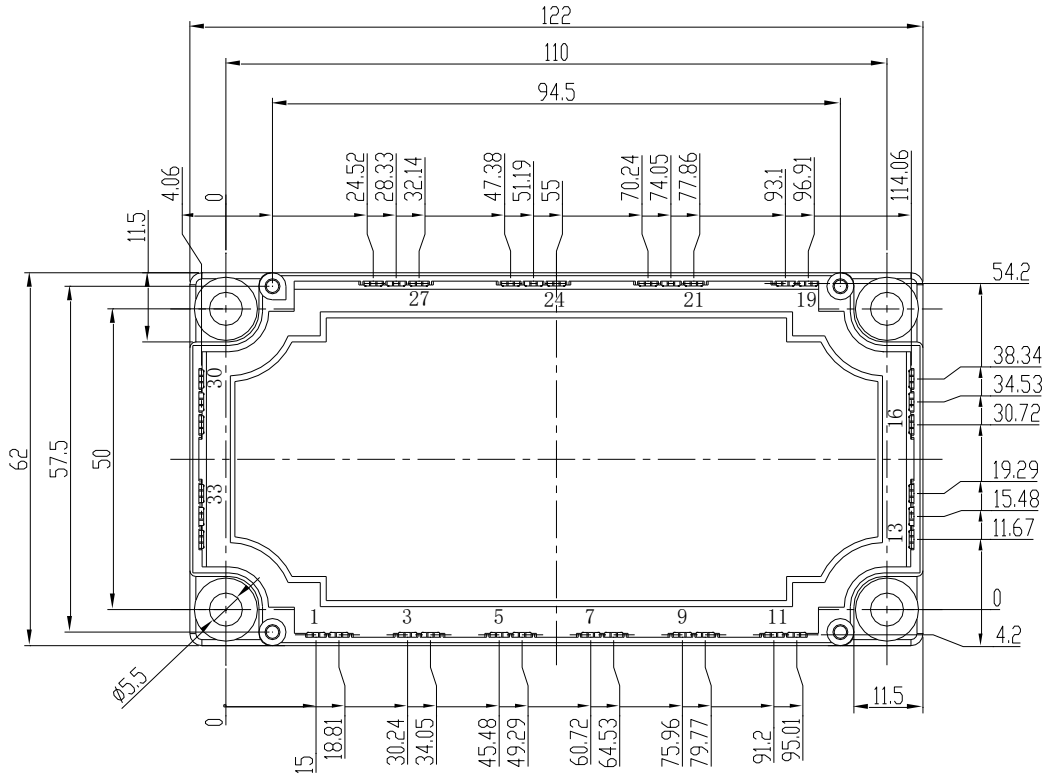
Circuit Schematic



Package Dimensions

Dimensions in Millimeters





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