STARPOWER

SEMICONDUCTOR **IGBT**

GD1000HFX170P2S

1700V/1000A 2 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 wind power.

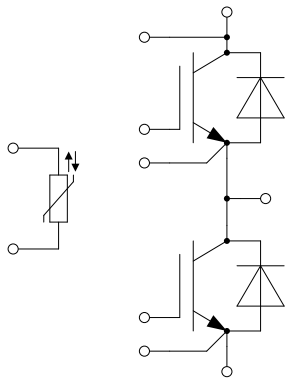
Features

- Low $V_{CE(sat)}$ Trench IGBT technology
- 10μs short circuit capability
- $V_{CE(sat)}$ with positive temperature coefficient
- Maximum junction temperature 175°C
- Enlarged Diode for regenerative operation
- Isolated copper baseplate using DBC technology
- High power and thermal cycling capability

Typical Applications

- High Power Converter
- Wind Power
- Auxiliary Inverter

Equivalent Circuit Schematic



Absolute Maximum Ratings T_C=25°C unless otherwise noted

IGBT

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=100°C	1604 1000	A
I_{CM}	Pulsed Collector Current t_p=1ms	2000	A
P_D	Maximum Power Dissipation @ T_j=175°C	6.25	kW

Diode

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1700	V
I_F	Diode Continuous Forward Current	1000	A
I_{FM}	Diode Maximum Forward Current t_p=1ms	2000	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 +150	°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=1000A,V_{GE}=15V, T_j=25°C		1.95	2.40	V
		I_C=1000A,V_{GE}=15V, T_j=125°C		2.40		
		I_C=1000A,V_{GE}=15V, T_j=150°C		2.50		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=40.0mA,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			2.3		Ω
C_{ies}	Input Capacitance	V_{CE}=25V,f=1MHz, V_{GE}=0V		108		nF
C_{res}	Reverse Transfer Capacitance			2.63		nF
Q_G	Gate Charge	V_{GE}=-15…+15V		9.43		μC
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=900V,I_C=1000A, R_{Gon}=1.2Ω,R_{Goff}=1.8Ω V_{GE}=±15V,T_j=25°C		468		ns
t_r	Rise Time			95		ns
$t_{d(off)}$	Turn-Off Delay Time			850		ns
t_f	Fall Time			363		ns
E_{on}	Turn-On Switching Loss			292		mJ
E_{off}	Turn-Off Switching Loss			230		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=900V,I_C=1000A, R_{Gon}=1.2Ω,R_{Goff}=1.8Ω V_{GE}=±15V,T_j=125°C		480		ns
t_r	Rise Time			120		ns
$t_{d(off)}$	Turn-Off Delay Time			1031		ns
t_f	Fall Time			613		ns
E_{on}	Turn-On Switching Loss			439		mJ
E_{off}	Turn-Off Switching Loss			325		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=900V,I_C=1000A, R_{Gon}=1.2Ω,R_{Goff}=1.8Ω V_{GE}=±15V,T_j=150°C		480		ns
t_r	Rise Time			120		ns
$t_{d(off)}$	Turn-Off Delay Time			1040		ns
t_f	Fall Time			708		ns
E_{on}	Turn-On Switching Loss			447		mJ
E_{off}	Turn-Off Switching Loss			347		mJ
I_{SC}	SC Data	t_P≤10μs,V_{GE}=15V, T_j=150°C,V_{CC}=1300V, V_{CEM}≤1700V		4000		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=1000A,V_{GE}=0V,T_j=25°C		1.85	2.30	V
		I_F=1000A,V_{GE}=0V,T_j=125°C		2.00		
		I_F=1000A,V_{GE}=0V,T_j=150°C		2.05		
Q_r	Recovered Charge	V_R=900V,I_F=1000A, -di/dt=9200A/μs,V_{GE}=-15V T_j=25°C		270		μC
I_{RM}	Peak Reverse Recovery Current			1155		A
E_{rec}	Reverse Recovery Energy			132		mJ
Q_r	Recovered Charge	V_R=900V,I_F=1000A, -di/dt=9200A/μs,V_{GE}=-15V T_j=125°C		451		μC
I_{RM}	Peak Reverse Recovery Current			1260		A
E_{rec}	Reverse Recovery Energy			241		mJ
Q_r	Recovered Charge	V_R=900V,I_F=1000A, -di/dt=9200A/μs,V_{GE}=-15V T_j=150°C		528		μC
I_{RM}	Peak Reverse Recovery Current			1250		A
E_{rec}	Reverse Recovery Energy			294		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		10		nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal to Chip		0.20		mΩ
R_{thJC}	Junction-to-Case (per IGBT) Junction-to-Case (per Diode)			24.0 48.0	K/kW
R_{thCH}	Case-to-Heatsink (per IGBT) Case-to-Heatsink (per Diode) Case-to-Heatsink (per Module)		9.0 18.0 3.0		K/kW
M	Terminal Connection Torque, Screw M4 Terminal Connection Torque, Screw M8 Mounting Torque, Screw M5	1.8 8.0 3.0		2.1 10 6.0	N.m
G	Weight of Module		1210		g

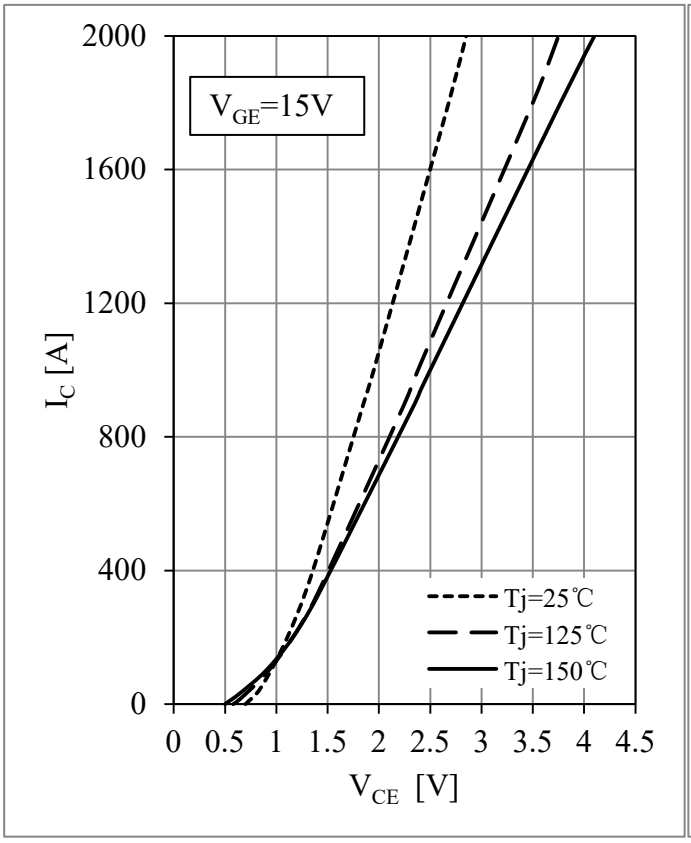


Fig 1. IGBT Output Characteristics

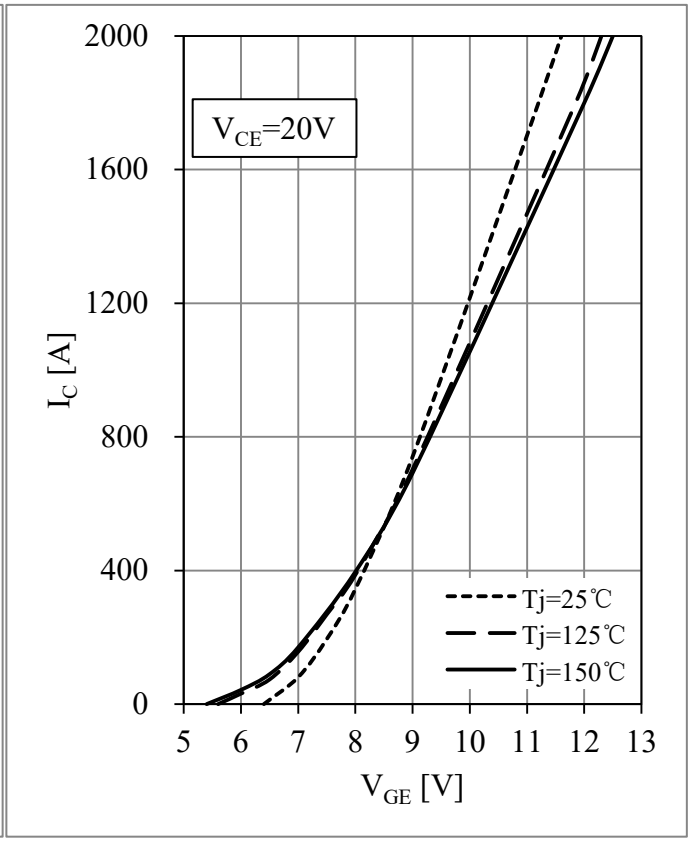


Fig 2. IGBT Transfer Characteristics

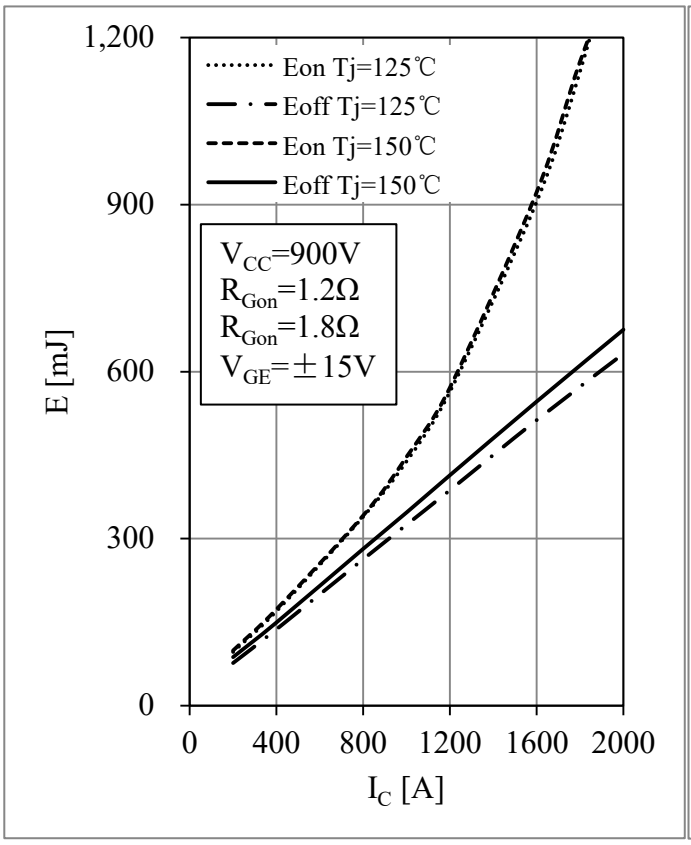


Fig 3. IGBT Switching Loss vs. I_C

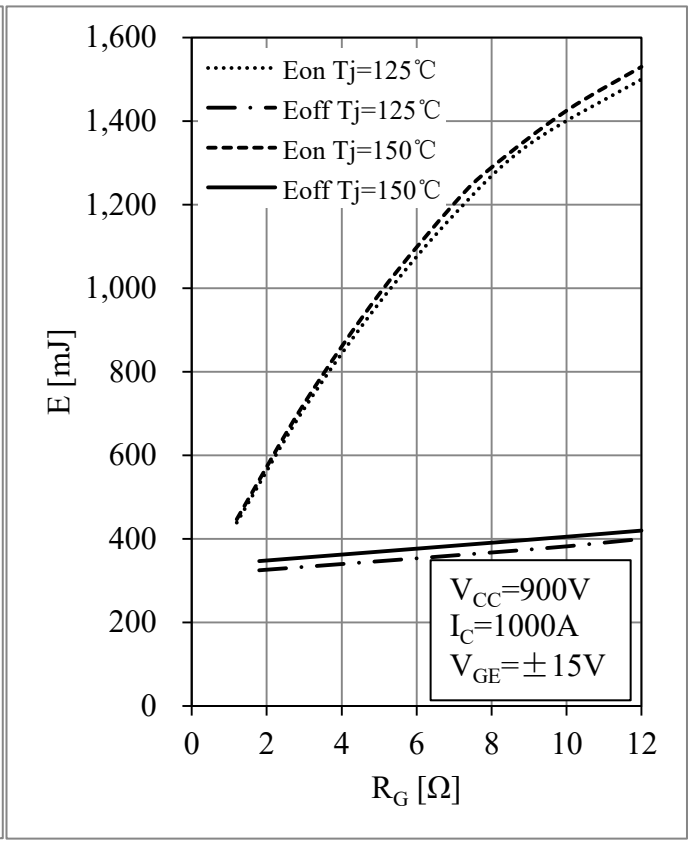


Fig 4. IGBT Switching Loss vs. R_G

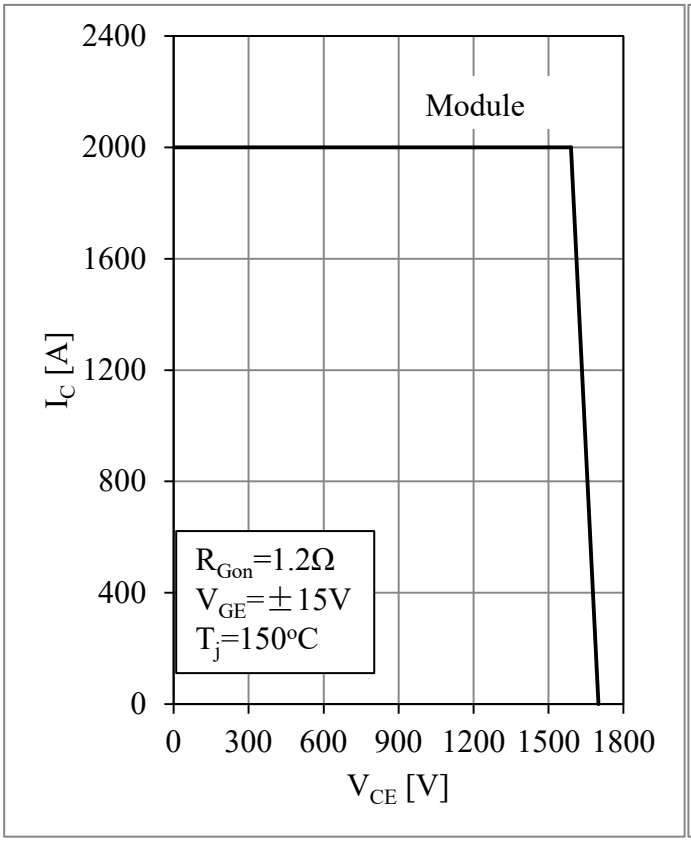


Fig 5. RBSOA

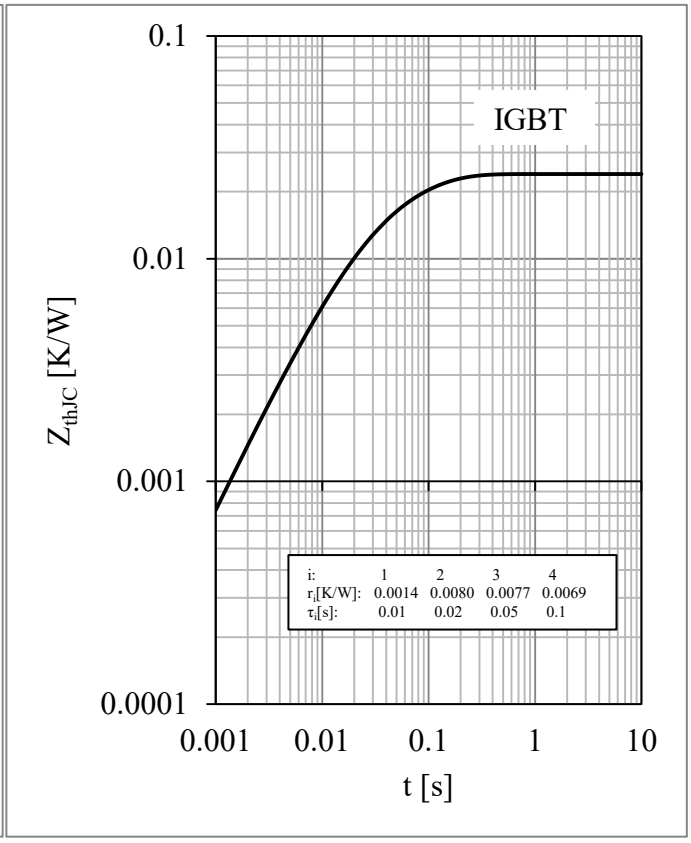


Fig 6. IGBT Transient Thermal Impedance

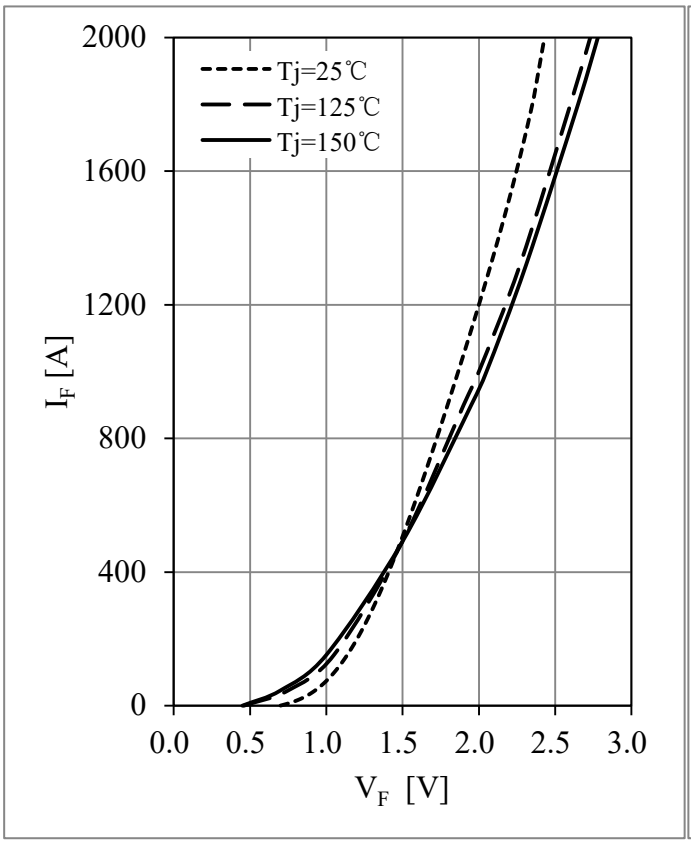


Fig 7. Diode Forward Characteristics

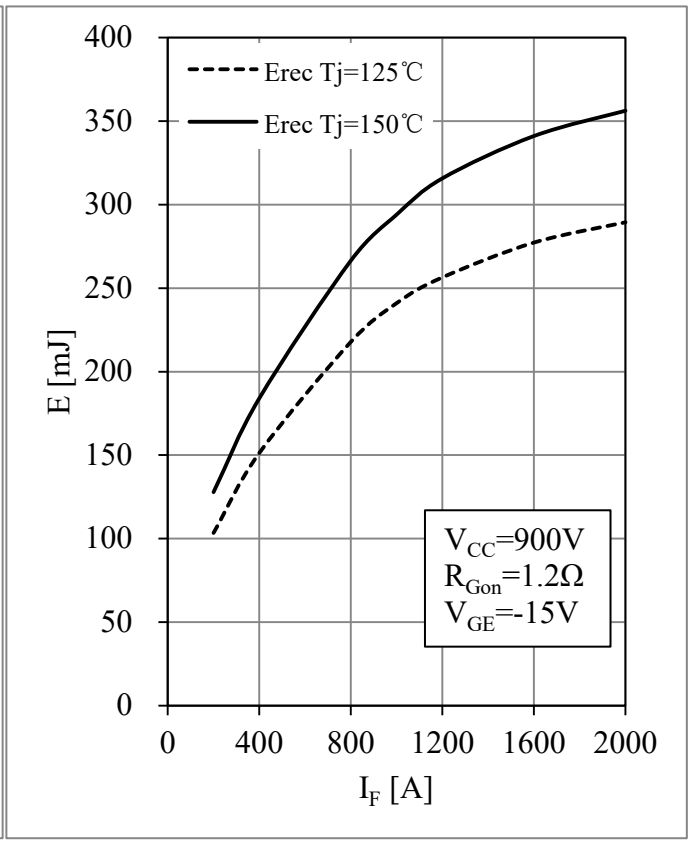


Fig 8. Diode Switching Loss vs. I_F

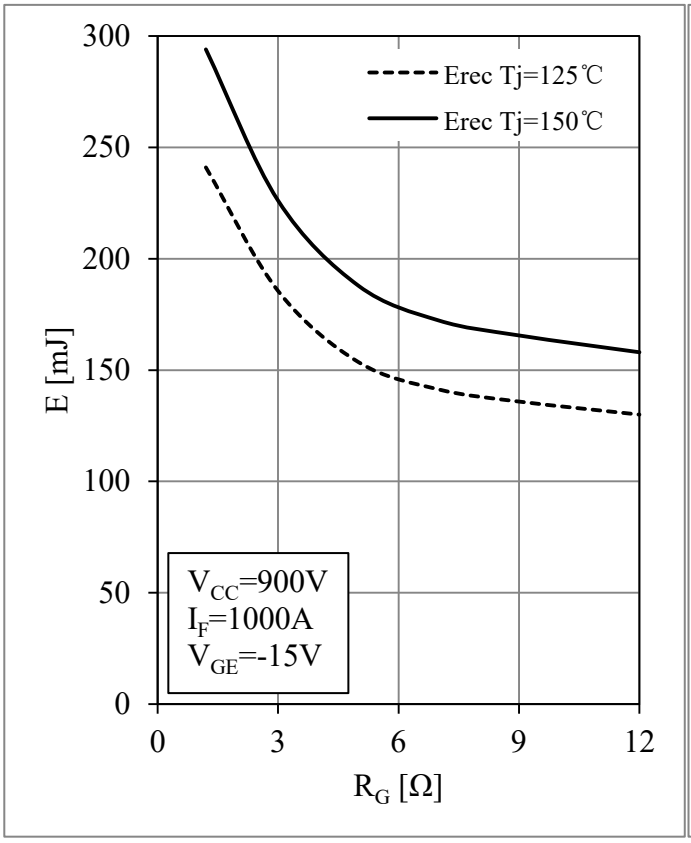


Fig 9. Diode Switching Loss vs. R_G

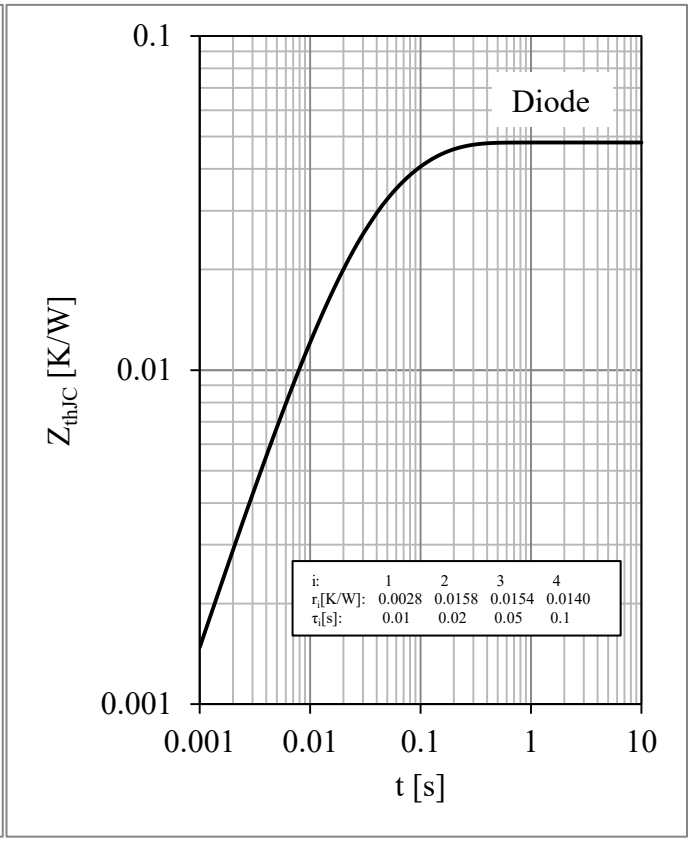


Fig 10. Diode Transient Thermal Impedance

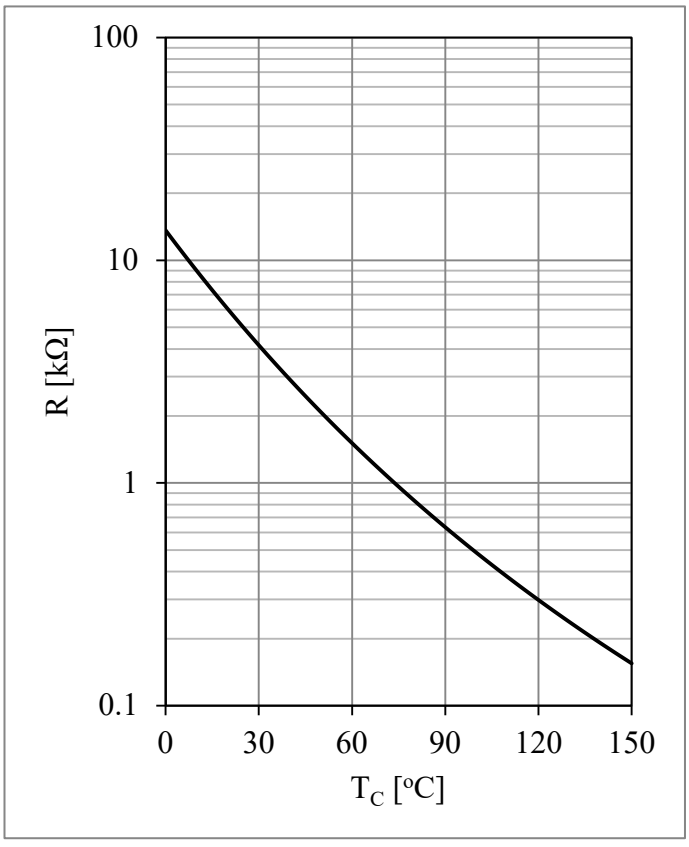
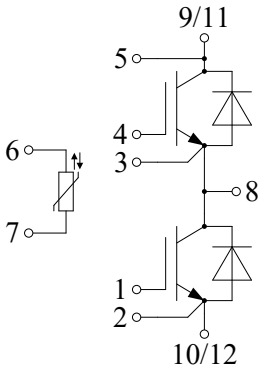


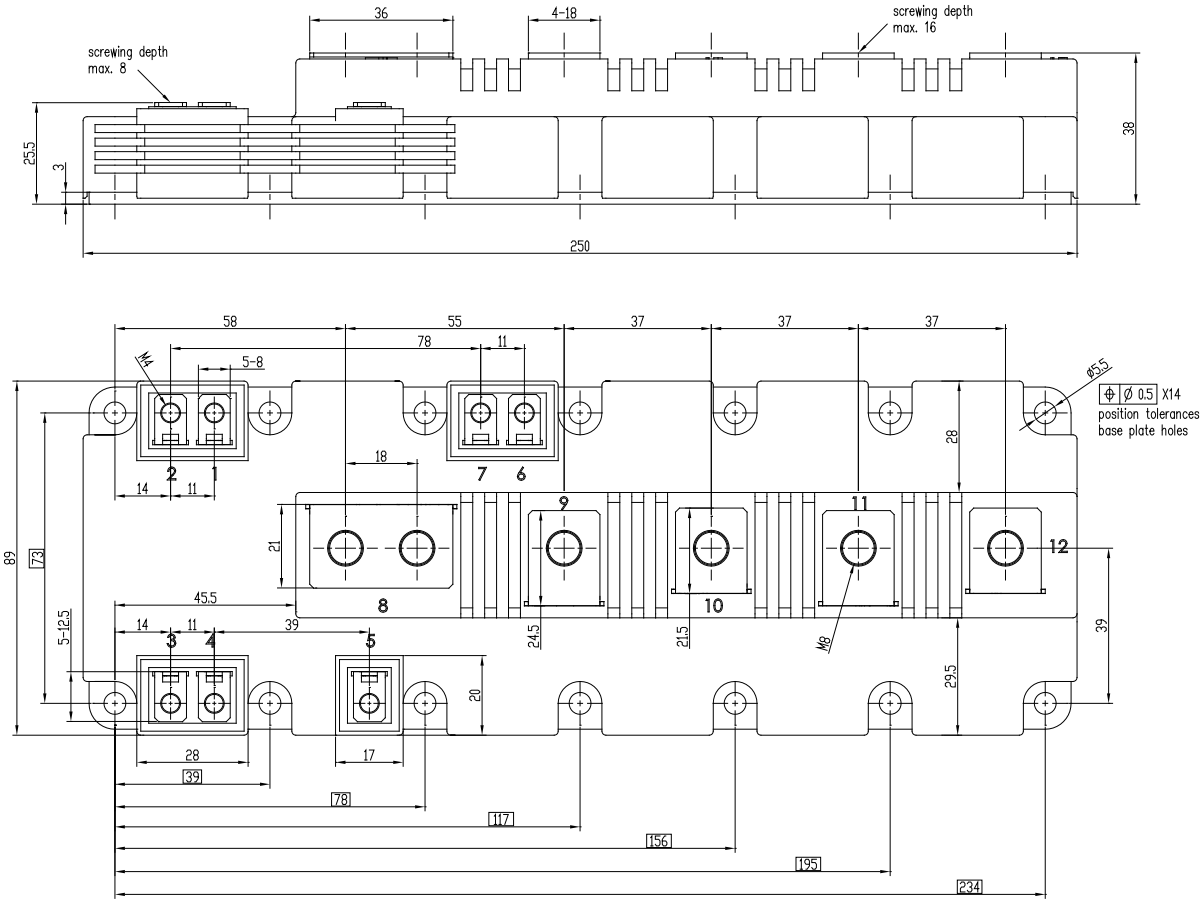
Fig 11. NTC Temperature Characteristic

Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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