STARPOWER

SEMICONDUCTOR **IGBT**

GD300HFX170C6SA

1700V/300A 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 general inverters and UPS.

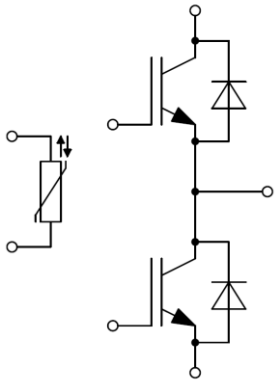
Features

- 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

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	493 300	A
I_{CM}	Pulsed Collector Current t_p=1ms	600	A
P_D	Maximum Power Dissipation @ T_j=175°C	1829	W

Diode

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1700	V
I_F	Diode Continuous Forward Current	300	A
I_{FM}	Diode Maximum Forward Current t_p=1ms	600	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=300A,V_{GE}=15V, T_j=25°C		1.85	2.20	V
		I_C=300A,V_{GE}=15V, T_j=125°C		2.25		
		I_C=300A,V_{GE}=15V, T_j=150°C		2.35		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=12.0mA,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			2.5		Ω
C_{ies}	Input Capacitance	V_{CE}=25V,f=1MHz, V_{GE}=0V		36.1		nF
C_{res}	Reverse Transfer Capacitance			0.88		nF
Q_G	Gate Charge	V_{GE}=-15…+15V		2.83		μC
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=900V,I_C=300A, R_{Gon}=3.3Ω,R_{Goff}=4.7Ω, L_S=66nH,V_{GE}=±15V, T_j=25°C		265		ns
t_r	Rise Time			94		ns
$t_{d(off)}$	Turn-Off Delay Time			565		ns
t_f	Fall Time			326		ns
E_{on}	Turn-On Switching Loss			77.6		mJ
E_{off}	Turn-Off Switching Loss			52.8		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=900V,I_C=300A, R_{Gon}=3.3Ω,R_{Goff}=4.7Ω, L_S=66nH,V_{GE}=±15V, T_j=125°C		302		ns
t_r	Rise Time			104		ns
$t_{d(off)}$	Turn-Off Delay Time			631		ns
t_f	Fall Time			521		ns
E_{on}	Turn-On Switching Loss			108		mJ
E_{off}	Turn-Off Switching Loss			72.8		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=900V,I_C=300A, R_{Gon}=3.3Ω,R_{Goff}=4.7Ω, L_S=66nH,V_{GE}=±15V, T_j=150°C		313		ns
t_r	Rise Time			108		ns
$t_{d(off)}$	Turn-Off Delay Time			645		ns
t_f	Fall Time			545		ns
E_{on}	Turn-On Switching Loss			119		mJ
E_{off}	Turn-Off Switching Loss			78.4		mJ
I_{SC}	SC Data	t_P≤10μs,V_{GE}=15V, T_j=150°C,V_{CC}=1000V, V_{CEM}≤1700V		1200		A

Diode Characteristics T_C=25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
V_F	Diode Forward Voltage	I_F=300A,V_{GE}=0V,T_i=25°C		1.80	2.25	V
		I_F=300A,V_{GE}=0V,T_j=125°C		1.95		
		I_F=300A,V_{GE}=0V,T_j=150°C		1.90		
Q_r	Recovered Charge	V_R=900V,I_F=300A, -di/dt=2650A/μs,V_{GE}=-15V L_S=66nH,T_j=25°C		56.3		μC
I_{RM}	Peak Reverse Recovery Current			228		A
E_{rec}	Reverse Recovery Energy			38.4		mJ
Q_r	Recovered Charge	V_R=900V,I_F=300A, -di/dt=2300A/μs,V_{GE}=-15V L_S=66nH,T_j=125°C		89.6		μC
I_{RM}	Peak Reverse Recovery Current			262		A
E_{rec}	Reverse Recovery Energy			60.2		mJ
Q_r	Recovered Charge	V_R=900V,I_F=300A, -di/dt=2250A/μs,V_{GE}=-15V L_S=66nH,T_j=150°C		102		μC
I_{RM}	Peak Reverse Recovery Current			272		A
E_{rec}	Reverse Recovery Energy			69.6		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		20		nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal to Chip		1.10		mΩ
R_{thJC}	Junction-to-Case (per IGBT) Junction-to-Case (per Diode)			0.082 0.121	K/W
R_{thCH}	Case-to-Heatsink (per IGBT) Case-to-Heatsink (per Diode) Case-to-Heatsink (per Module)		0.030 0.045 0.009		K/W
M	Terminal Connection Torque, Screw M6 Mounting Torque, Screw M5	3.0 3.0		6.0 6.0	N.m
G	Weight of Module		350		g

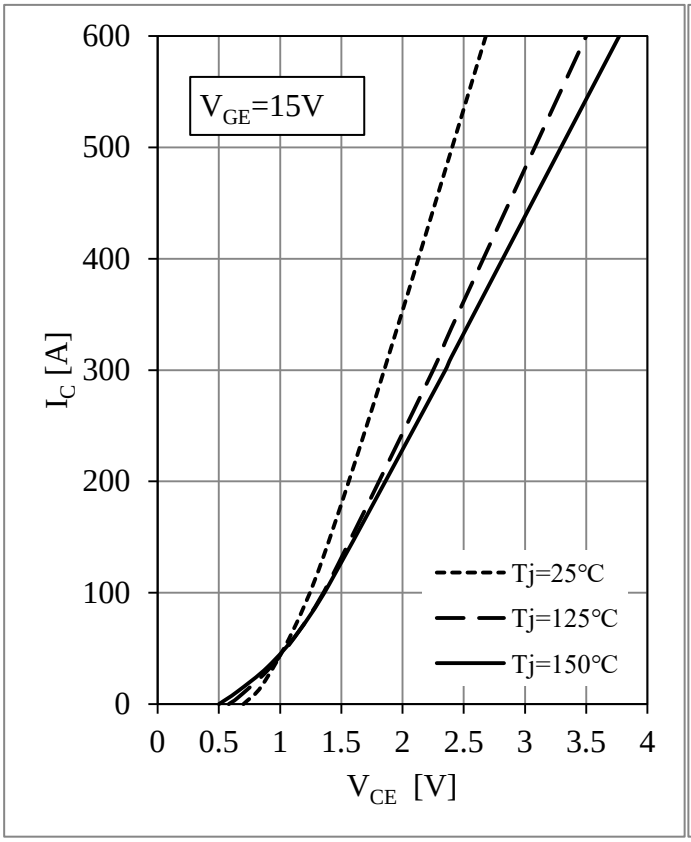


Fig 1. IGBT Output Characteristics

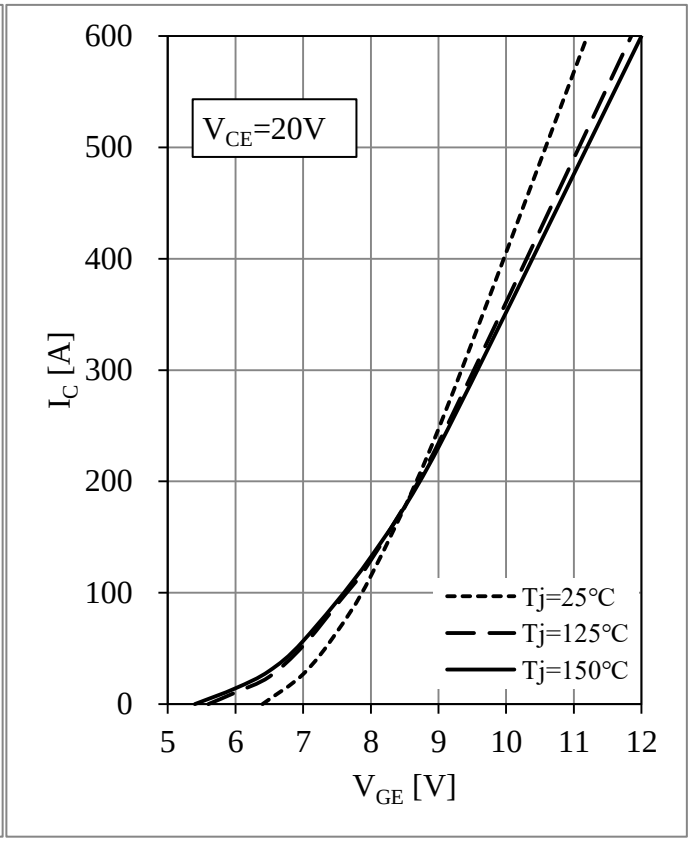


Fig 2. IGBT Transfer Characteristics

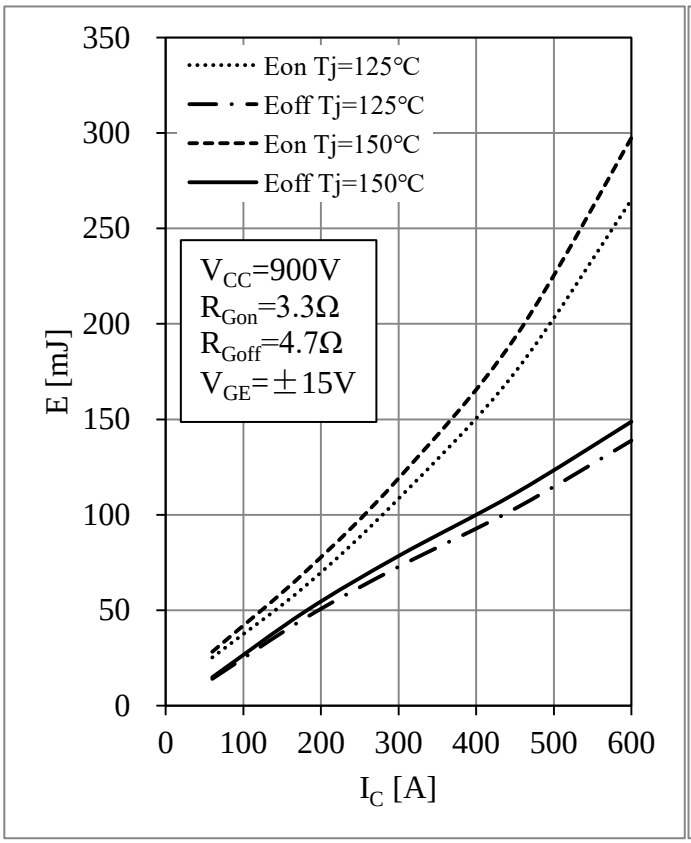


Fig 3. IGBT Switching Loss vs. I_C

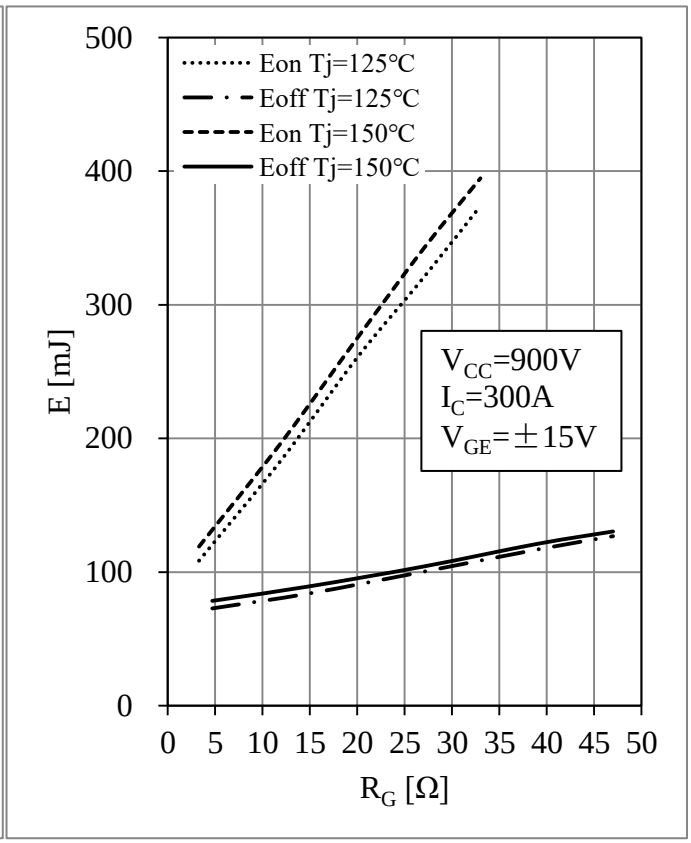


Fig 4. IGBT Switching Loss vs. R_G

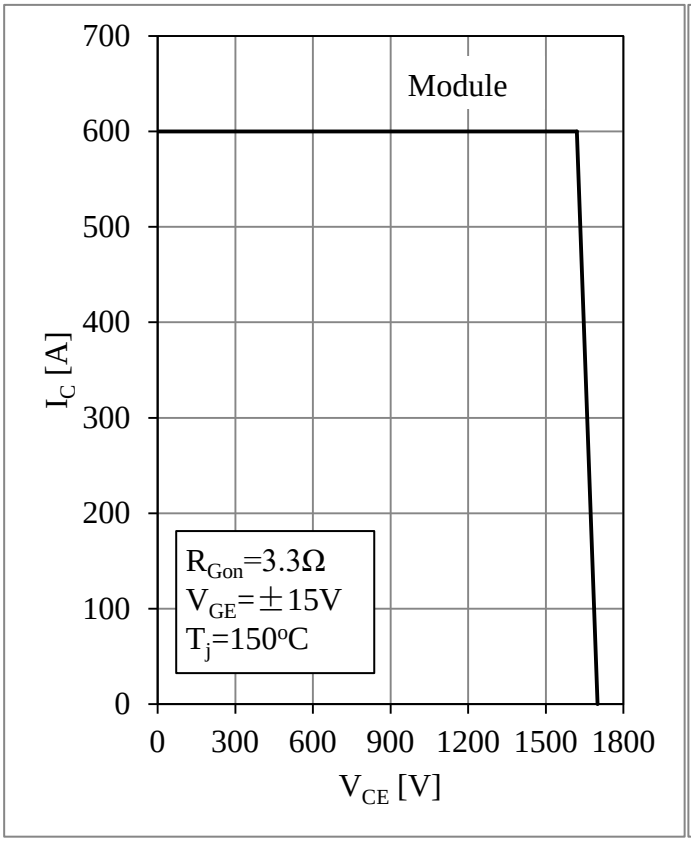


Fig 5. RBSOA

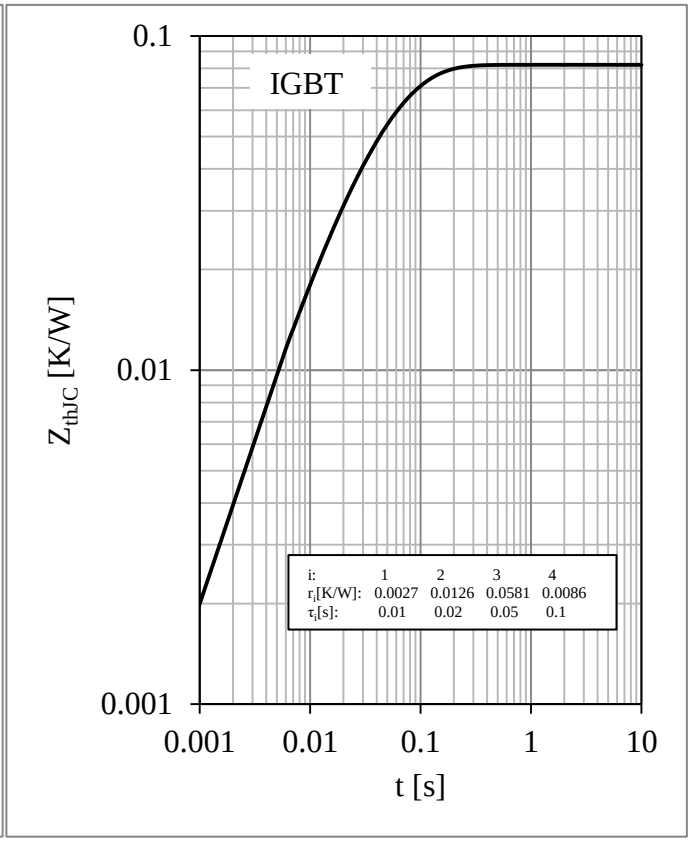


Fig 6. IGBT Transient Thermal Impedance

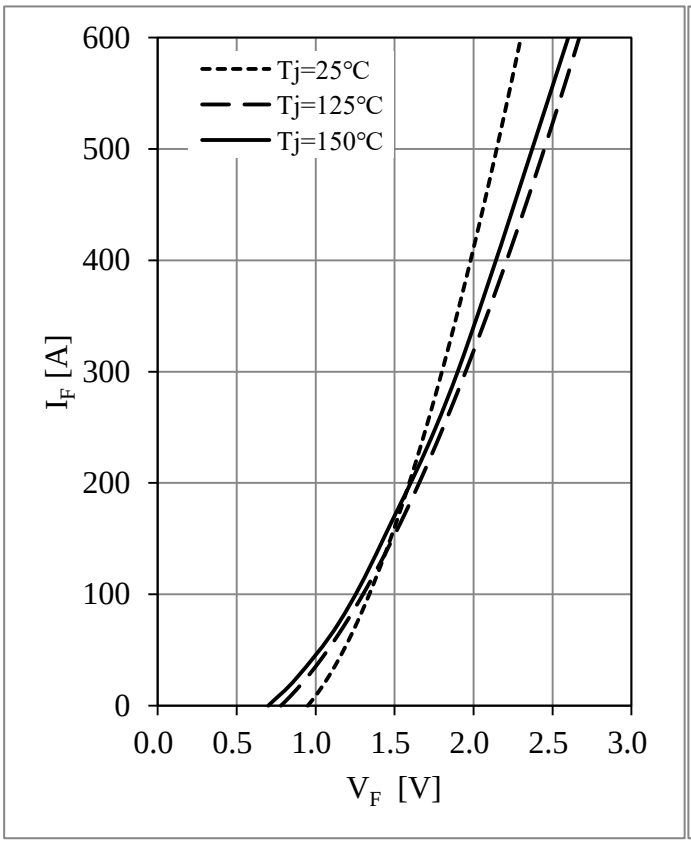


Fig 7. Diode Forward Characteristics

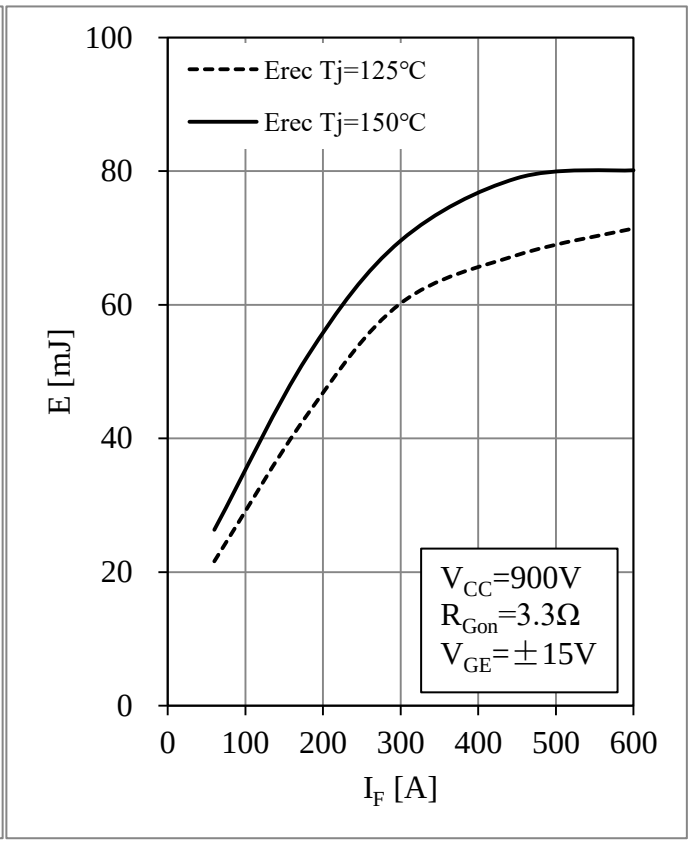


Fig 8. Diode Switching Loss vs. I_F

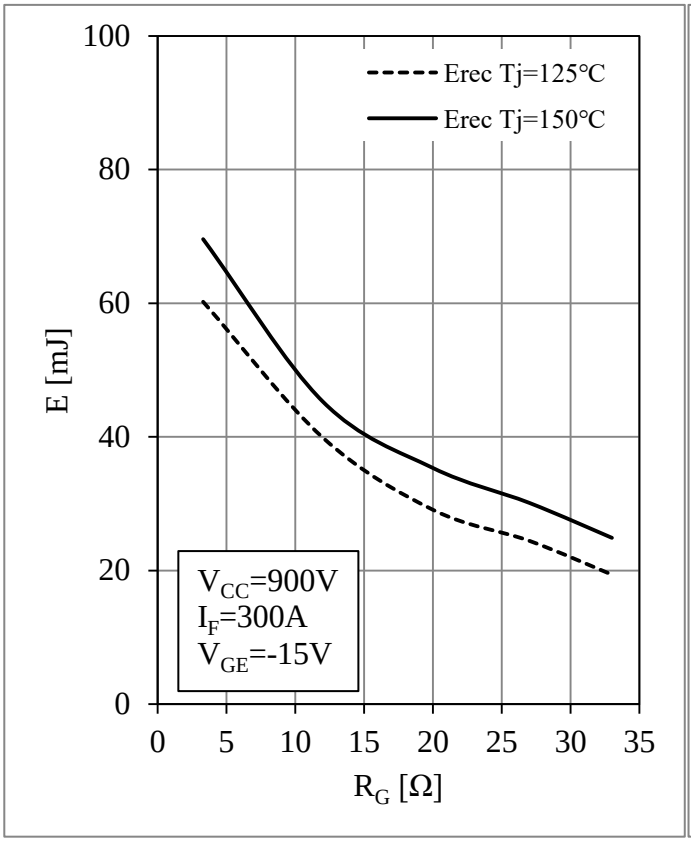


Fig 9. Diode Switching Loss vs. R_G

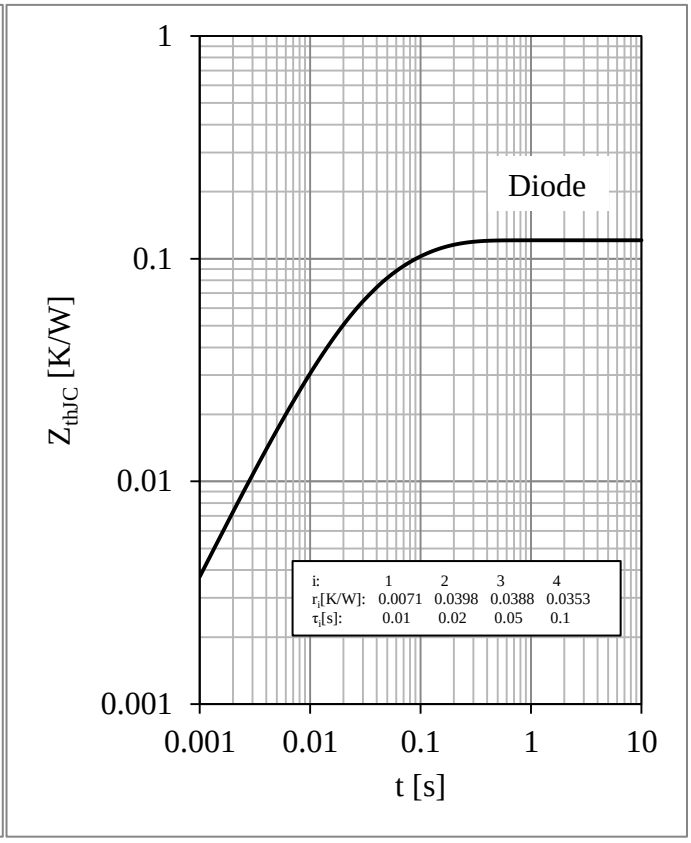


Fig 10. Diode Transient Thermal Impedance

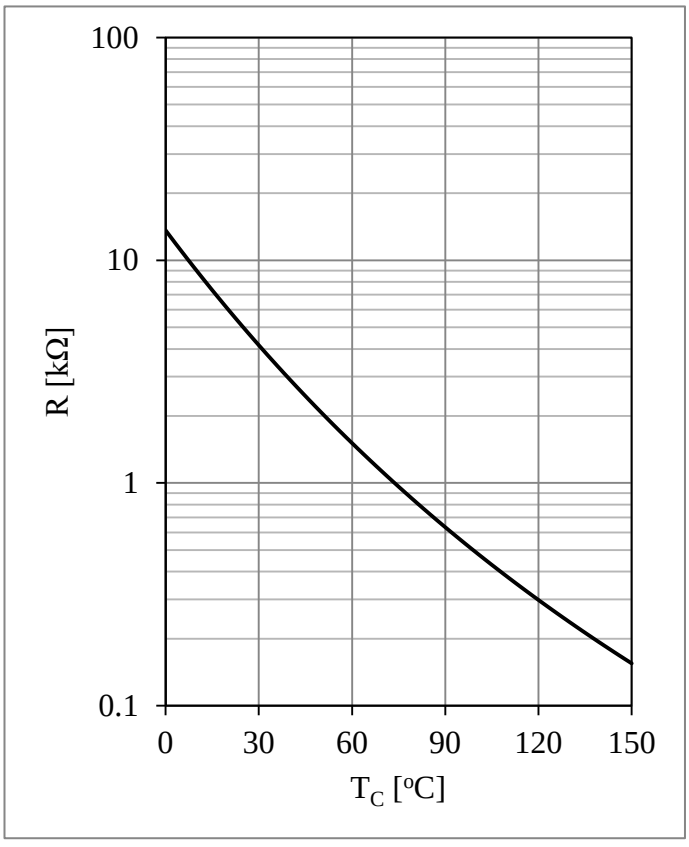
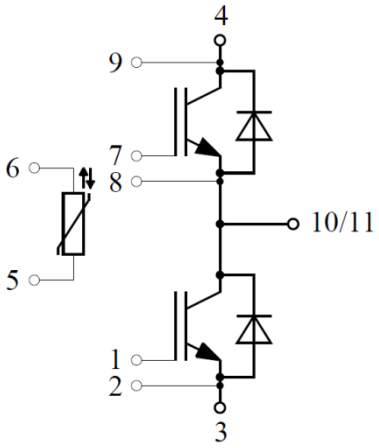


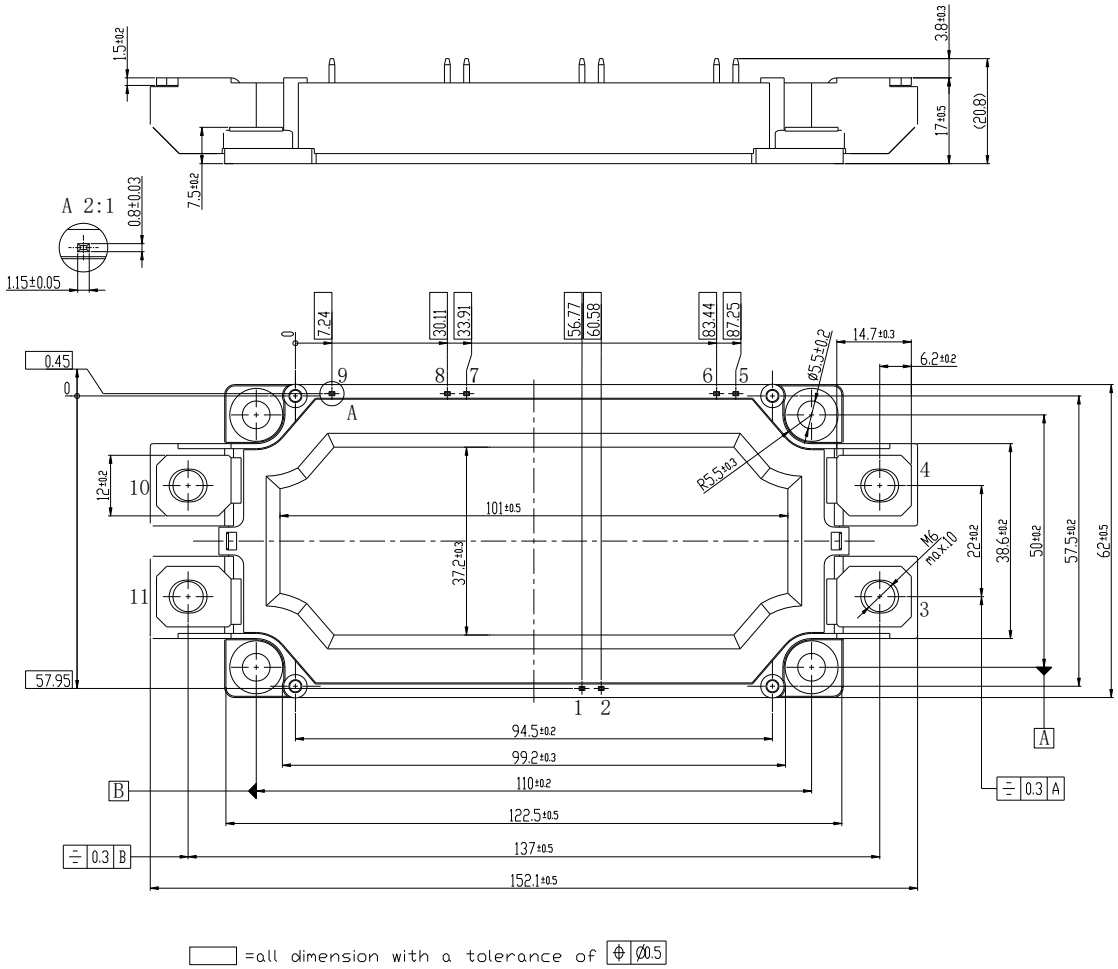
Fig 11. NTC Temperature Characteristic

Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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