STARPOWER

SEMICONDUCTOR **IGBT**

GD800HFX120C6HA

1200V/800A 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 hybrid and electric vehicle.

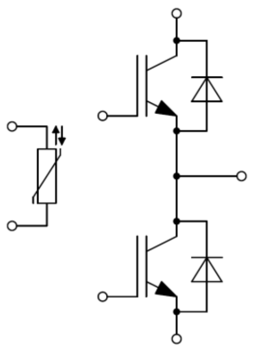
Features

- 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
- Si_3N_4 substrate for low thermal resistance
- Isolated copper baseplate using Si_3N_4 AMB technology

Typical Applications

- Hybrid and electric vehicle
- Inverter for motor drive
- 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	1200	V
V_{GES}	Gate-Emitter Voltage	±20	V
I_C	Collector Current @ T_C=100°C	800	A
I_{CM}	Pulsed Collector Current t_p=1ms	1600	A
P_D	Maximum Power Dissipation @ T_j=175°C	5172	W

Diode

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1200	V
I_F	Diode Continuous Forward Current	800	A
I_{FM}	Diode Maximum Forward Current t_p=1ms	1600	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	2500	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=800A,V_{GE}=15V, T_j=25°C		1.95	2.40	V
		I_C=800A,V_{GE}=15V, T_j=125°C		2.30		
		I_C=800A,V_{GE}=15V, T_j=150°C		2.40		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=24.0mA,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			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			0.7		Ω
C_{ies}	Input Capacitance	V_{CE}=25V,f=1MHz, V_{GE}=0V		62.1		nF
C_{res}	Reverse Transfer Capacitance			1.74		nF
Q_G	Gate Charge	V_{GE}=-15…+15V		4.66		μC
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=800A, R_G=1.0Ω, V_{GE}=±15V, L_S=40nH,T_j=25°C		266		ns
t_r	Rise Time			98		ns
$t_{d(off)}$	Turn-Off Delay Time			394		ns
t_f	Fall Time			201		ns
E_{on}	Turn-On Switching Loss			108		mJ
E_{off}	Turn-Off Switching Loss			73.8		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=800A, R_G=1.0Ω, V_{GE}=±15V, L_S=40nH,T_j=125°C		280		ns
t_r	Rise Time			115		ns
$t_{d(off)}$	Turn-Off Delay Time			435		ns
t_f	Fall Time			275		ns
E_{on}	Turn-On Switching Loss			153		mJ
E_{off}	Turn-Off Switching Loss			91.3		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=800A, R_G=1.0Ω, V_{GE}=±15V, L_S=40nH ,T_j=150°C		282		ns
t_r	Rise Time			117		ns
$t_{d(off)}$	Turn-Off Delay Time			446		ns
t_f	Fall Time			290		ns
E_{on}	Turn-On Switching Loss			165		mJ
E_{off}	Turn-Off Switching Loss			94.4		mJ
I_{SC}	SC Data	t_P≤10μs,V_{GE}=15V, T_j=150°C,V_{CC}=800V, V_{CEM}≤1200V		2400		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=800A,V_{GE}=0V,T_j=25°C		2.00	2.45	V
		I_F=800A,V_{GE}=0V,T_j=125°C		2.15		
		I_F=800A,V_{GE}=0V,T_j=150°C		2.20		
Q_r	Recovered Charge	V_{CC}=600V,I_F=800A, -di/dt=5800A/μs,V_{GE}=-15V, L_S=40nH,T_j=25°C		48.1		μC
I_{RM}	Peak Reverse Recovery Current			264		A
E_{rec}	Reverse Recovery Energy			18.0		mJ
Q_r	Recovered Charge	V_{CC}=600V,I_F=800A, -di/dt=4800A/μs,V_{GE}=-15V, L_S=40nH,T_j=125°C		95.3		μC
I_{RM}	Peak Reverse Recovery Current			291		A
E_{rec}	Reverse Recovery Energy			35.3		mJ
Q_r	Recovered Charge	V_{CC}=600V,I_F=800A, -di/dt=4550A/μs,V_{GE}=-15V, L_S=40nH,T_j=150°C		107		μC
I_{RM}	Peak Reverse Recovery Current			293		A
E_{rec}	Reverse Recovery Energy			38.5		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
R_{thJC}	Junction-to-Case (per IGBT) Junction-to-Case (per Diode)			0.029 0.050	K/W
R_{thCH}	Case-to-Heatsink (per IGBT) Case-to-Heatsink (per Diode) Case-to-Heatsink (per Module)		0.028 0.049 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

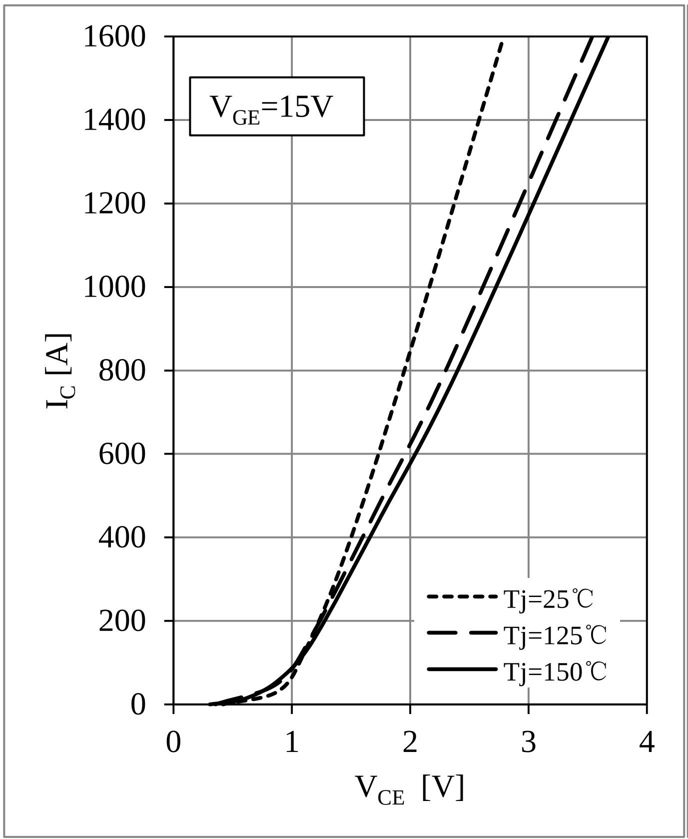


Fig 1. IGBT Output Characteristics

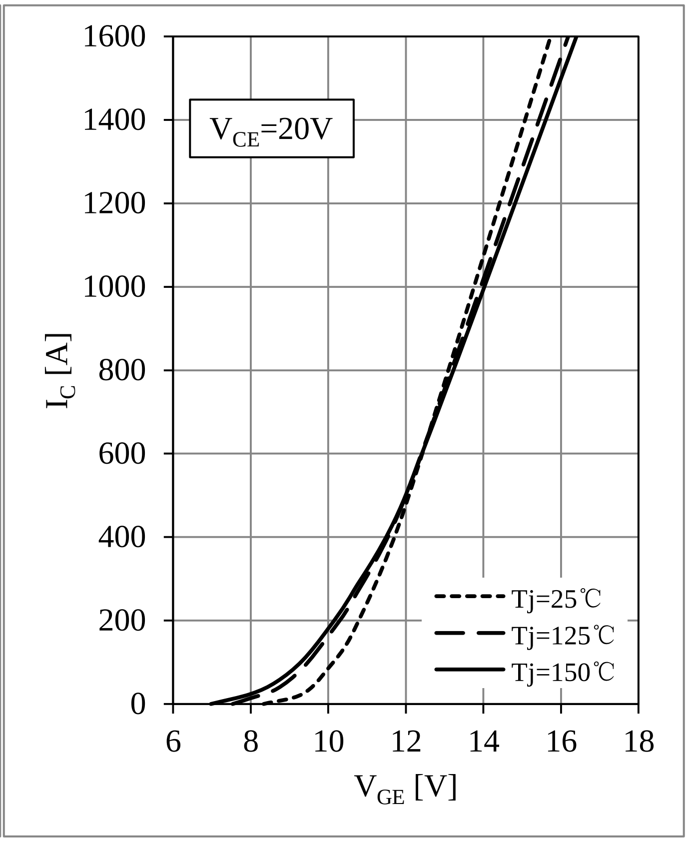


Fig 2. IGBT Transfer Characteristics

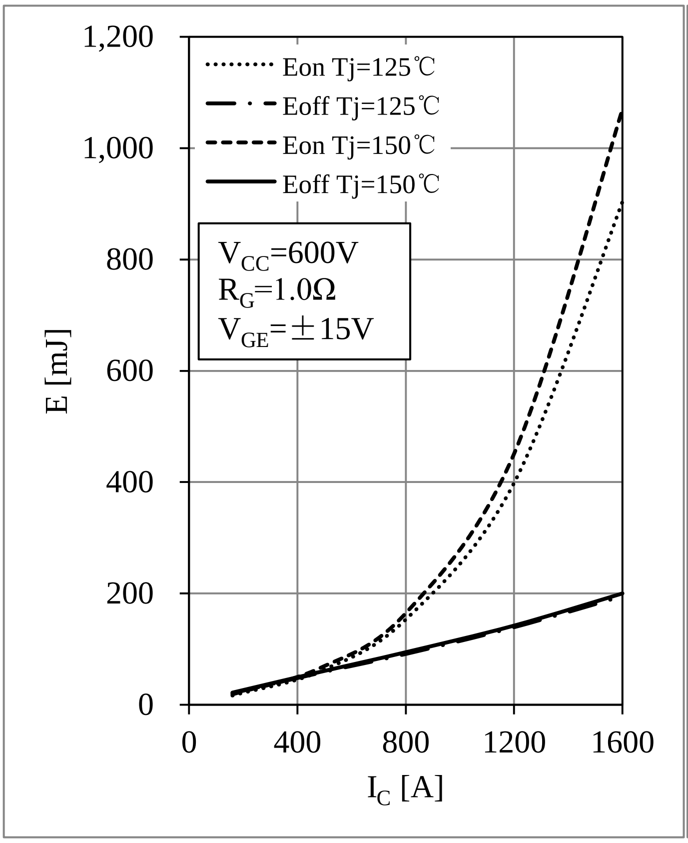


Fig 3. IGBT Switching Loss vs. I_C

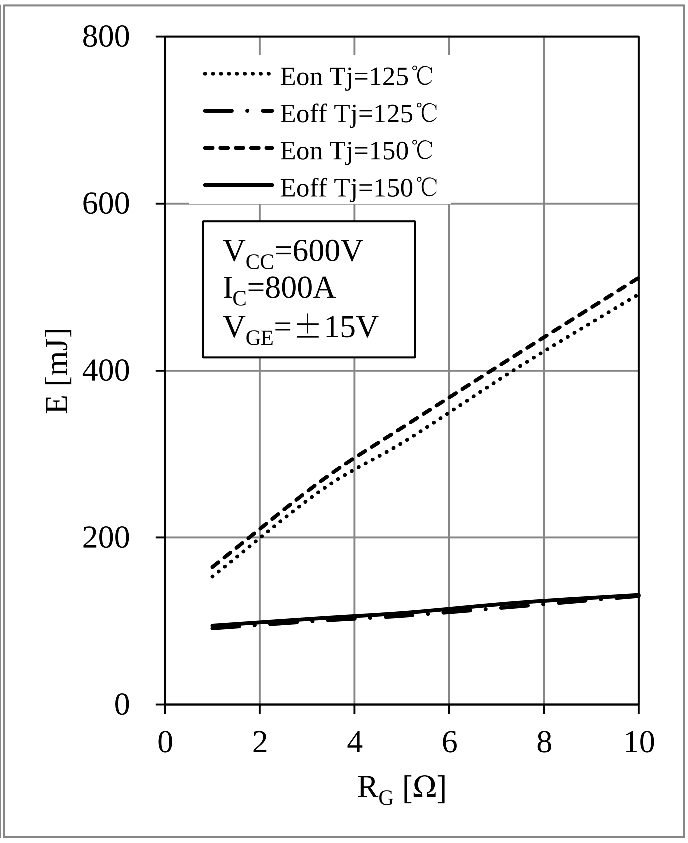


Fig 4. IGBT Switching Loss vs. R_G

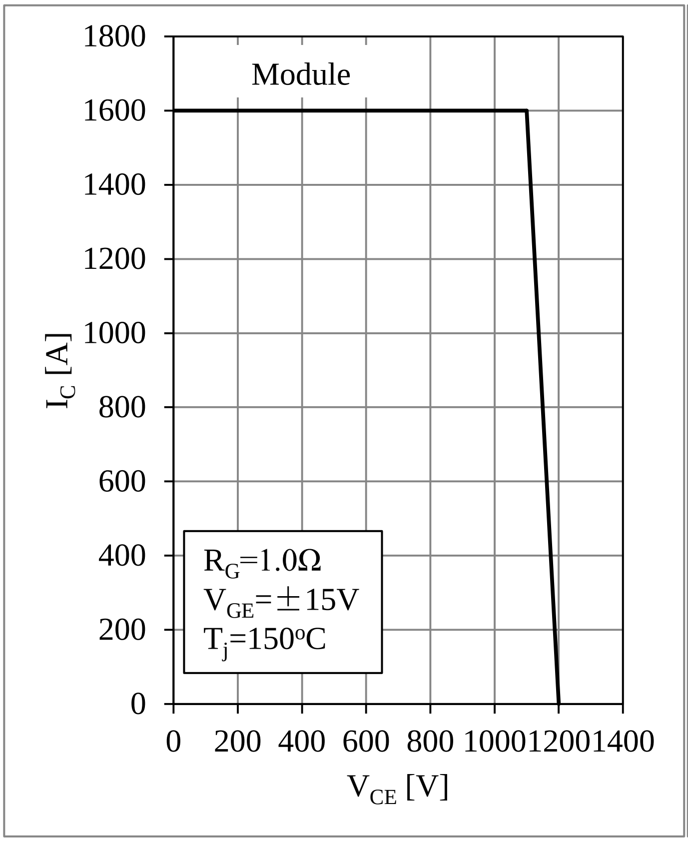


Fig 5. RBSOA

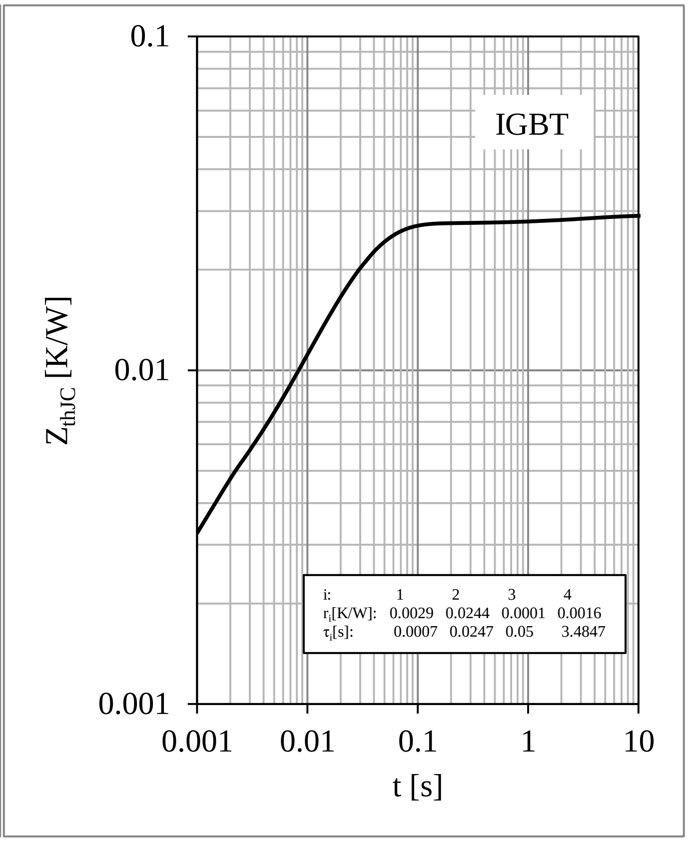


Fig 6. IGBT Transient Thermal Impedance

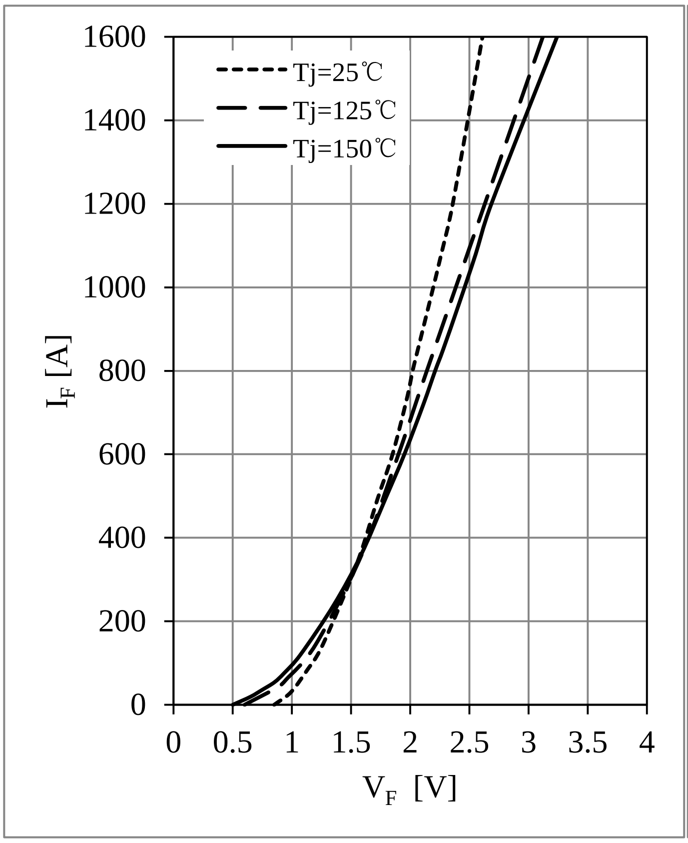


Fig 7. Diode Forward Characteristics

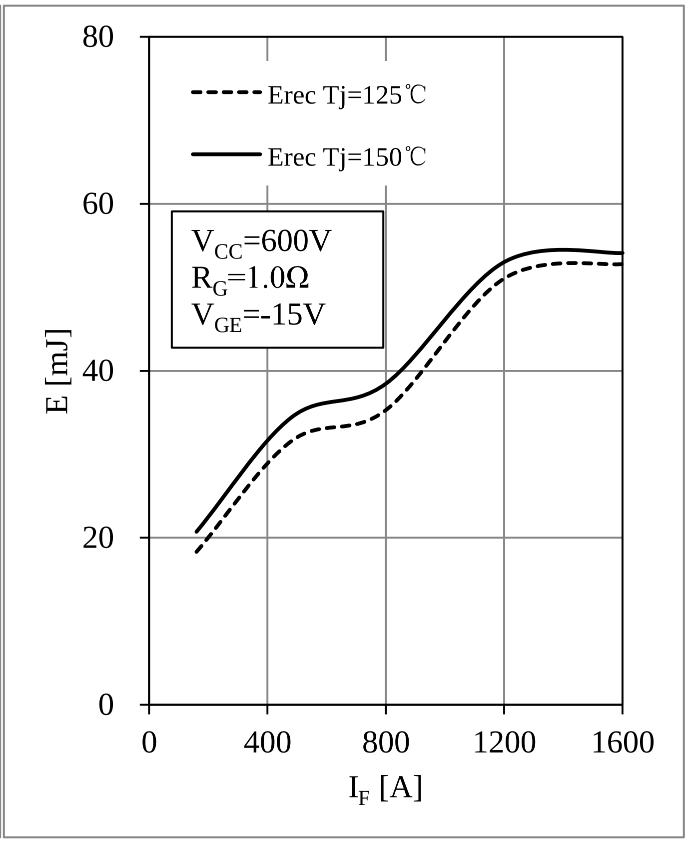
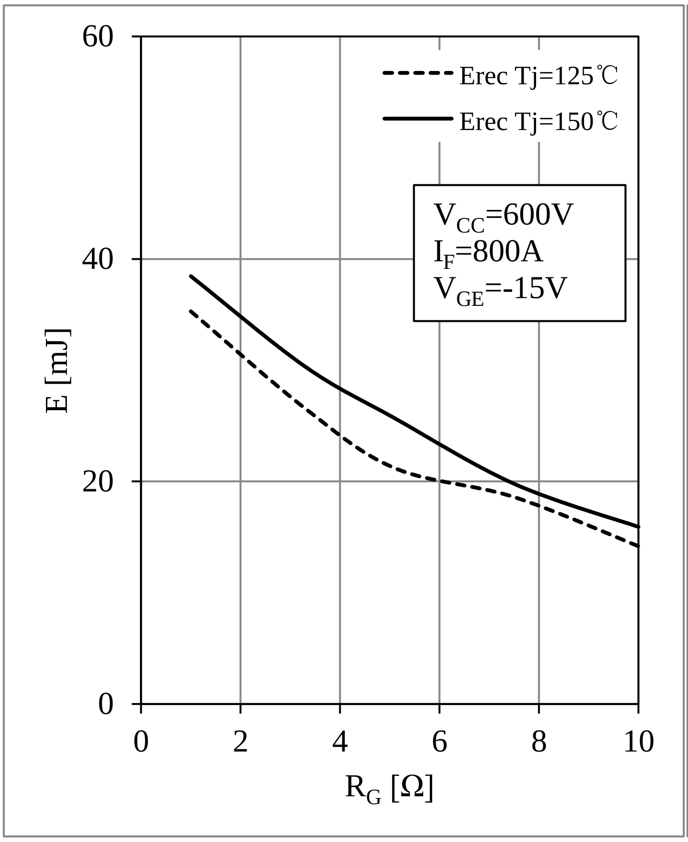


Fig 8. Diode Switching Loss vs. I_F



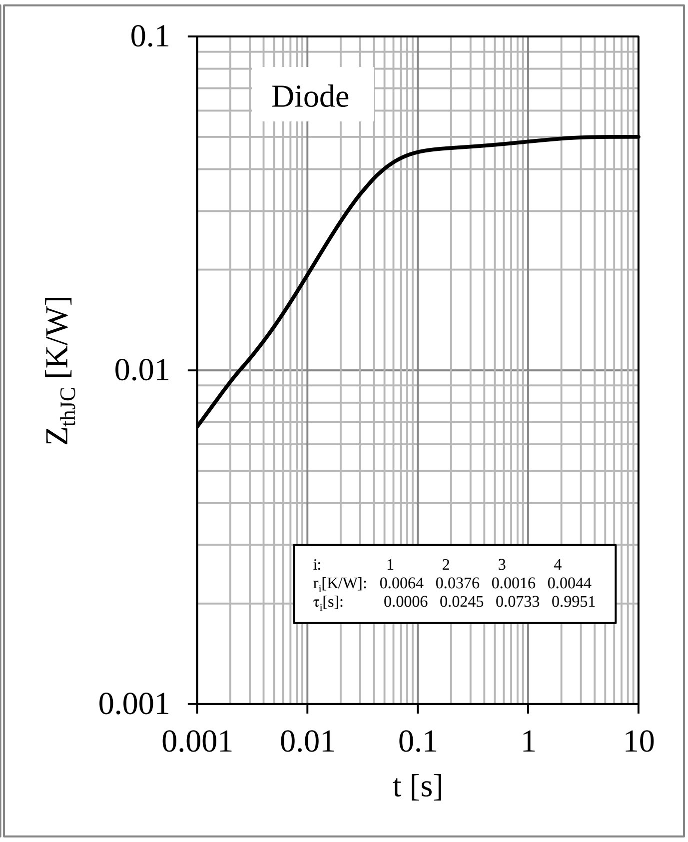


Fig 9. Diode Switching Loss vs. R_G

Fig 10. Diode Transient Thermal Impedance

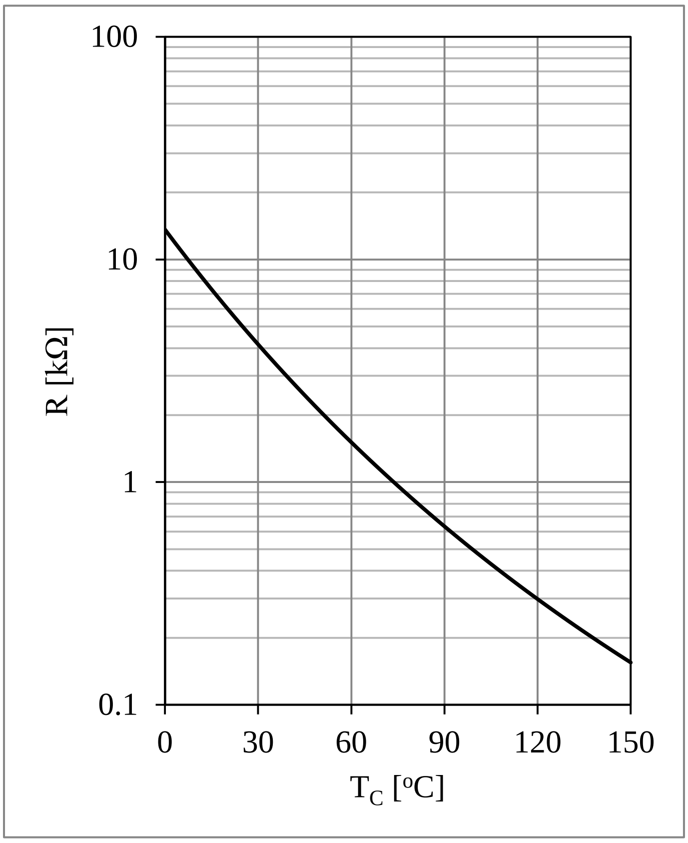
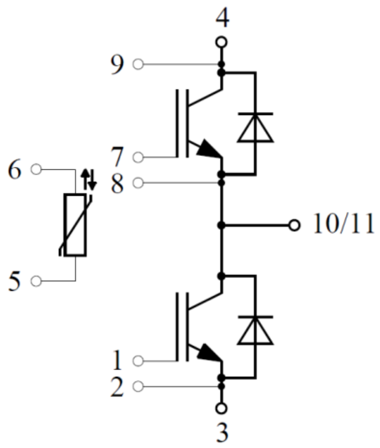


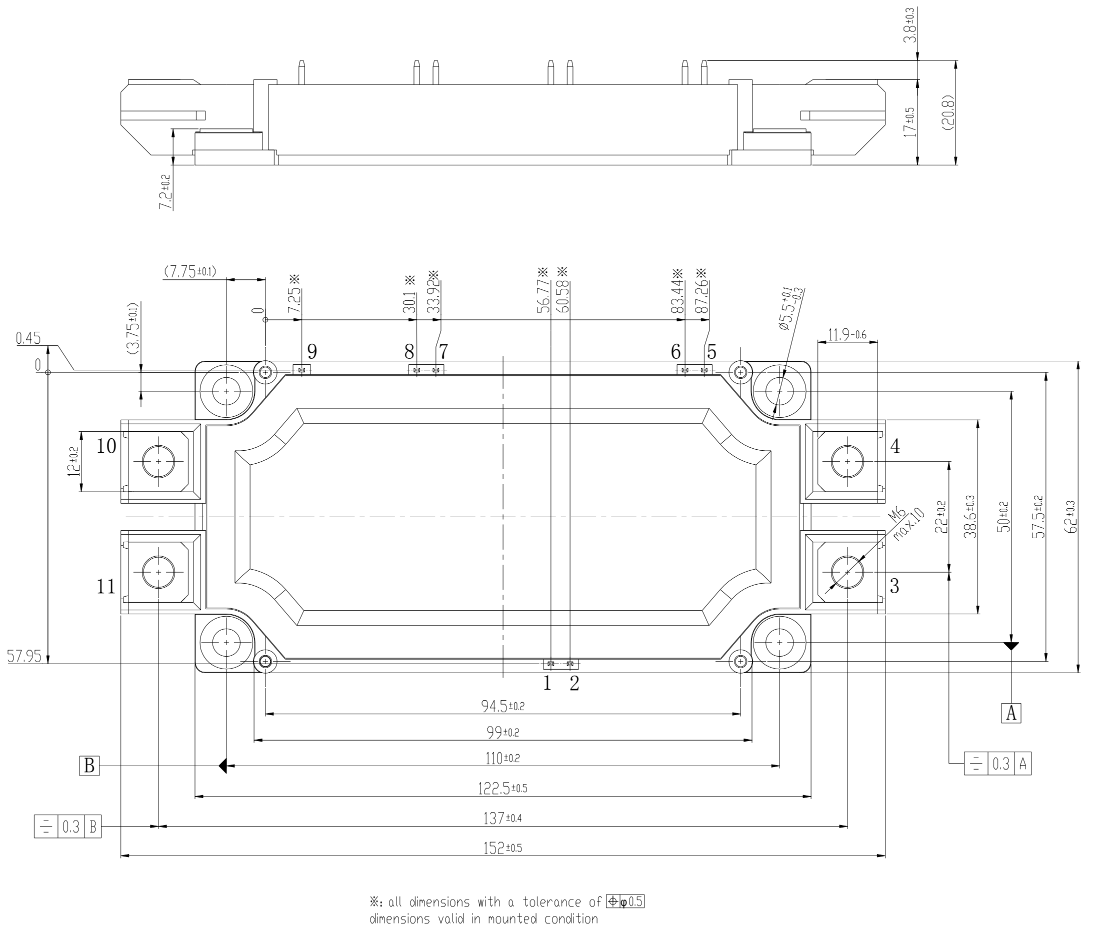
Fig 11. NTC Temperature Characteristic

Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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