STARPOWER

SEMICONDUCTOR **IGBT**

GD800HFA120C6SD

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 general inverter and UPS.

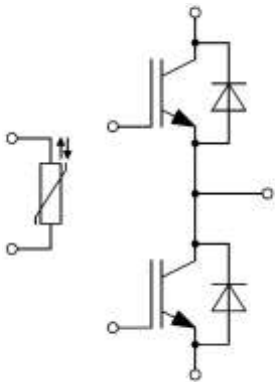
Features

- Low $V_{CE(sat)}$ Trench IGBT technology
- 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	Values	Unit
V_{CES}	Collector-Emitter Voltage	1200	V
V_{GES}	Gate-Emitter Voltage	±20	V
I_C	Collector Current @ T_C=25°C @ T_C=100°C	1468 800	A
I_{CRM}	Repetitive Peak Collector Current t_p=1ms	1600	A
P_D	Maximum Power Dissipation @ T_{vj}=175°C	3947	W

Diode

Symbol	Description	Values	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1200	V
I_F	Diode Continuous Forward Current	800	A
I_{FRM}	Repetitive Peak Forward Current t_p=1ms	1600	A
I_{FSM}	Surge Forward Current t_p=10ms @ T_{vj}=125°C @ T_{vj}=175°C	2392 2448	A
I^2t	I^2t-value,t_p=10ms @ T_{vj}=125°C @ T_{vj}=175°C	28608 29964	A^2s

Module

Symbol	Description	Value	Unit
T_{vjmax}	Maximum Junction Temperature	175	°C
T_{vjop}	Operating Junction Temperature	-40 to +175	°C
T_{STG}	Storage Temperature Range	-40 to +125	°C
V_{ISO}	Isolation Voltage RMS,f=50Hz,t=1min	4000	V

Note: T_{vjop} > 150°C is allowed for operation at overload conditions.

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_{vj}=25°C		1.40	1.85	V
		I_C=800A,V_{GE}=15V, T_{vj}=125°C		1.60		
		I_C=800A,V_{GE}=15V, T_{vj}=175°C		1.60		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=24.0mA,V_{CE}=V_{GE}, T_{vj}=25°C	5.5	6.3	7.0	V
I_{CES}	Collector Cut-Off Current	V_{CE}=V_{CES},V_{GE}=0V, T_{vj}=25°C			1.0	mA
I_{GES}	Gate-Emitter Leakage Current	V_{GE}=V_{GES},V_{CE}=0V, T_{vj}=25°C			400	nA
R_{Gint}	Internal Gate Resistance			0.67		Ω
C_{ies}	Input Capacitance	V_{CE}=25V,f=100kHz, V_{GE}=0V		85.2		nF
C_{res}	Reverse Transfer Capacitance			0.45		nF
Q_G	Gate Charge	V_{GE}=-15…+15V		6.15		μC
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=800A, R_G=1.5Ω,L_S=30nH, V_{GE}=±15V,T_{vj}=25°C		472		ns
t_r	Rise Time			148		ns
$t_{d(off)}$	Turn-Off Delay Time			505		ns
t_f	Fall Time			141		ns
E_{on}	Turn-On Switching Loss			44.4		mJ
E_{off}	Turn-Off Switching Loss			112		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=800A, R_G=1.5Ω,L_S=30nH, V_{GE}=±15V,T_{vj}=125°C		485		ns
t_r	Rise Time			161		ns
$t_{d(off)}$	Turn-Off Delay Time			566		ns
t_f	Fall Time			231		ns
E_{on}	Turn-On Switching Loss			106		mJ
E_{off}	Turn-Off Switching Loss			134		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=800A, R_G=1.5Ω,L_S=30nH, V_{GE}=±15V,T_{vj}=150°C		483		ns
t_r	Rise Time			162		ns
$t_{d(off)}$	Turn-Off Delay Time			590		ns
t_f	Fall Time			256		ns
E_{on}	Turn-On Switching Loss			112		mJ
E_{off}	Turn-Off Switching Loss			139		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=800A, R_G=1.5Ω,L_S=30nH, V_{GE}=±15V,T_{vj}=175°C		484		ns
t_r	Rise Time			166		ns
$t_{d(off)}$	Turn-Off Delay Time			600		ns
t_f	Fall Time			272		ns
E_{on}	Turn-On Switching Loss			120		mJ
E_{off}	Turn-Off Switching Loss			141		mJ
I_{SC}	SC Data	t_P≤8μs,V_{GE}=15V,		2600		A

		T_{vj}=150°C,V_{CC}=800V, V_{CEM}≤1200V				
		t_P≤6μs,V_{GE}=15V, T_{vj}=175°C,V_{CC}=800V, V_{CEM}≤1200V		2500		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=800A,V_{GE}=0V,T_{vj}=25°C		1.55	2.00	V
		I_F=800A,V_{GE}=0V,T_{vj}=125°C		1.50		
		I_F=800A,V_{GE}=0V,T_{vj}=175°C		1.45		
Q_r	Recovered Charge	V_R=600V,I_F=800A, -di/dt=4992A/μs,V_{GE}=-15V, L_S=30nH,T_{vj}=25°C		66.3		μC
I_{RM}	Peak Reverse Recovery Current			385		A
E_{rec}	Reverse Recovery Energy			25.8		mJ
Q_r	Recovered Charge	V_R=600V,I_F=800A, -di/dt=3197A/μs,V_{GE}=-15V, L_S=30nH,T_{vj}=125°C		119		μC
I_{RM}	Peak Reverse Recovery Current			441		A
E_{rec}	Reverse Recovery Energy			44.4		mJ
Q_r	Recovered Charge	V_R=600V,I_F=800A, -di/dt=2901A/μs,V_{GE}=-15V, L_S=30nH,T_{vj}=150°C		137		μC
I_{RM}	Peak Reverse Recovery Current			469		A
E_{rec}	Reverse Recovery Energy			51.0		mJ
Q_r	Recovered Charge	V_R=600V,I_F=800A, -di/dt=2693A/μs,V_{GE}=-15V, L_S=30nH,T_{vj}=175°C		158		μC
I_{RM}	Peak Reverse Recovery Current			480		A
E_{rec}	Reverse Recovery Energy			57.9		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		0.80		mΩ
R_{thJC}	Junction-to-Case (per IGBT) Junction-to-Case (per Diode)			0.038 0.053	K/W
R_{thCH}	Case-to-Heatsink (per IGBT) Case-to-Heatsink (per Diode)		0.028 0.029		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

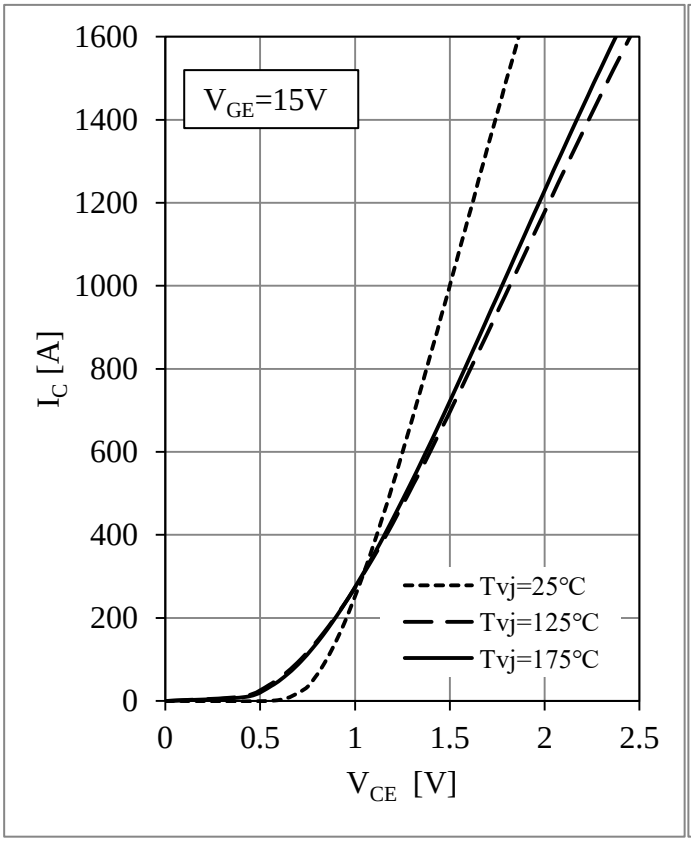


Fig 1. IGBT Output Characteristics

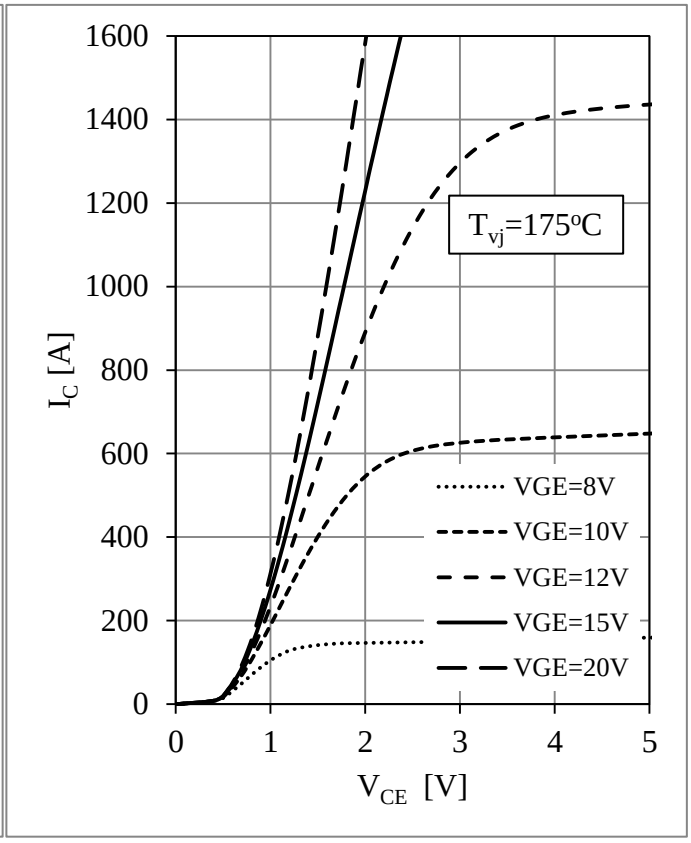


Fig 2. IGBT Output Characteristics

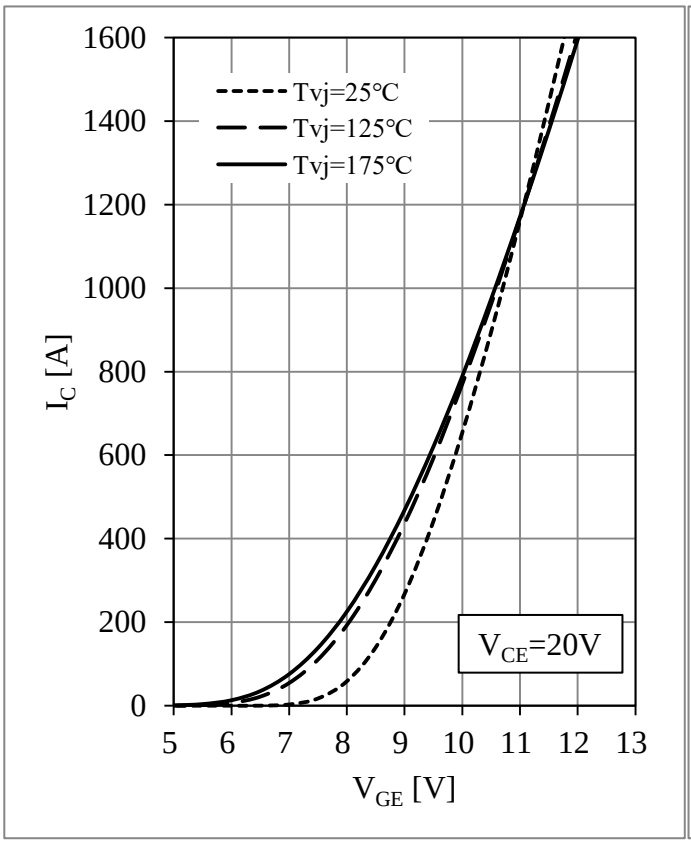


Fig 3. IGBT Transfer Characteristics

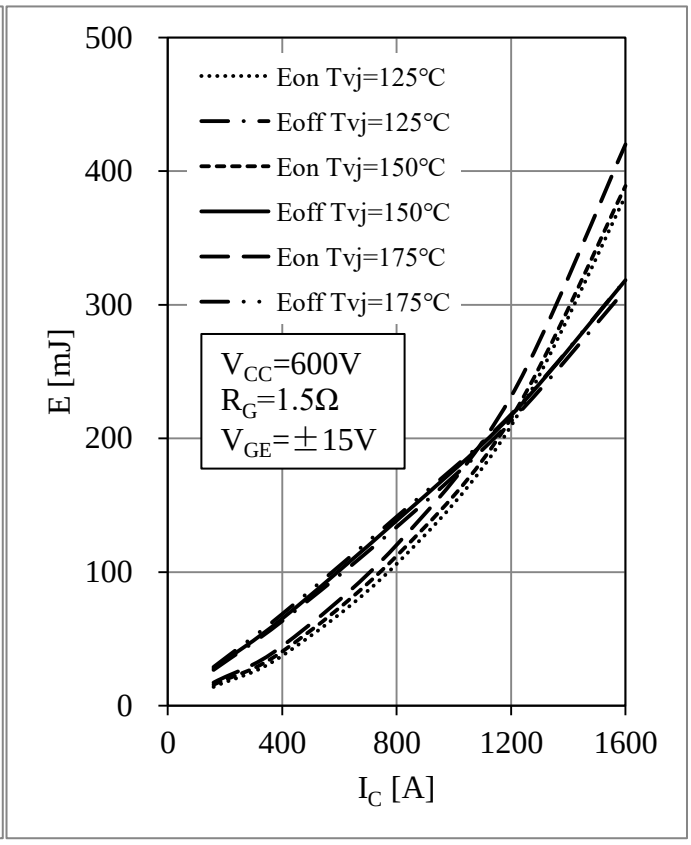


Fig 4. IGBT Switching Loss vs. I_C

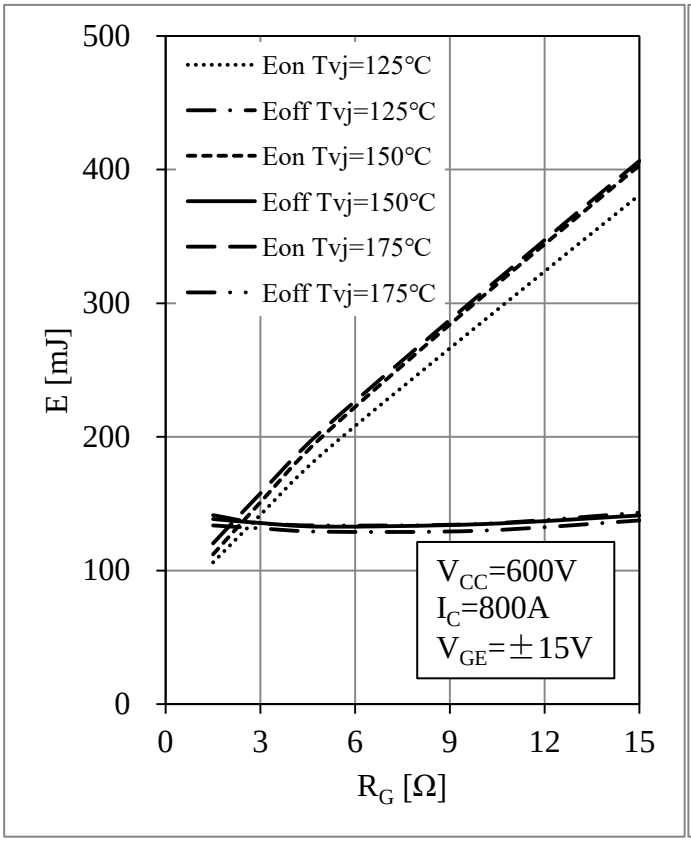


Fig 5. IGBT Switching Loss vs. R_G

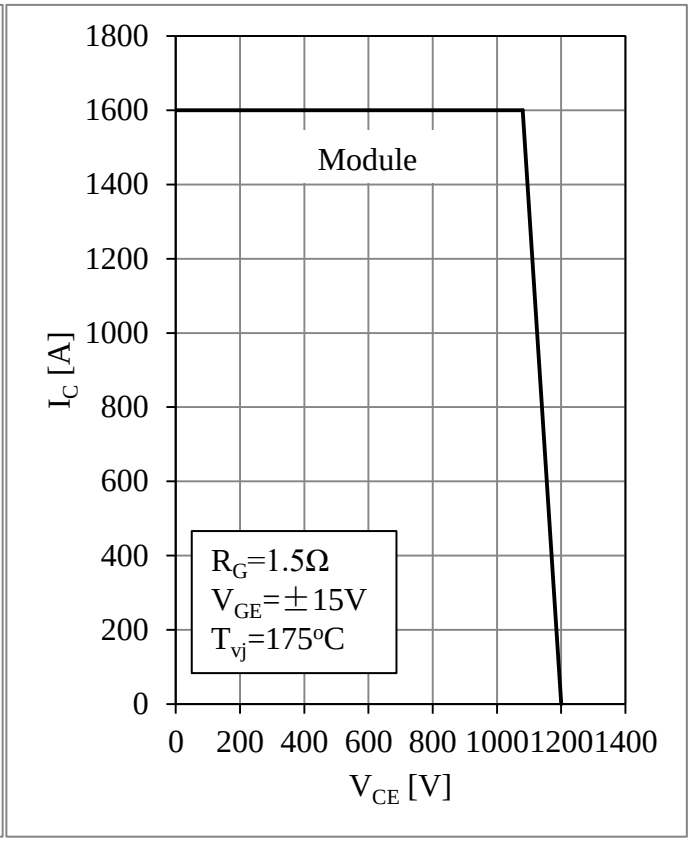


Fig 6. RBSOA

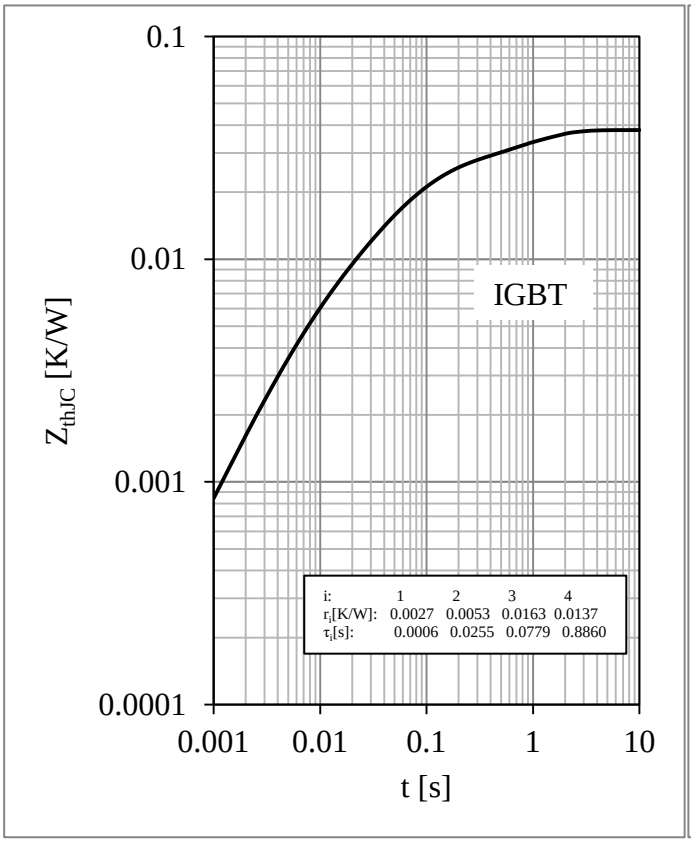


Fig 7. IGBT Transient Thermal Impedance

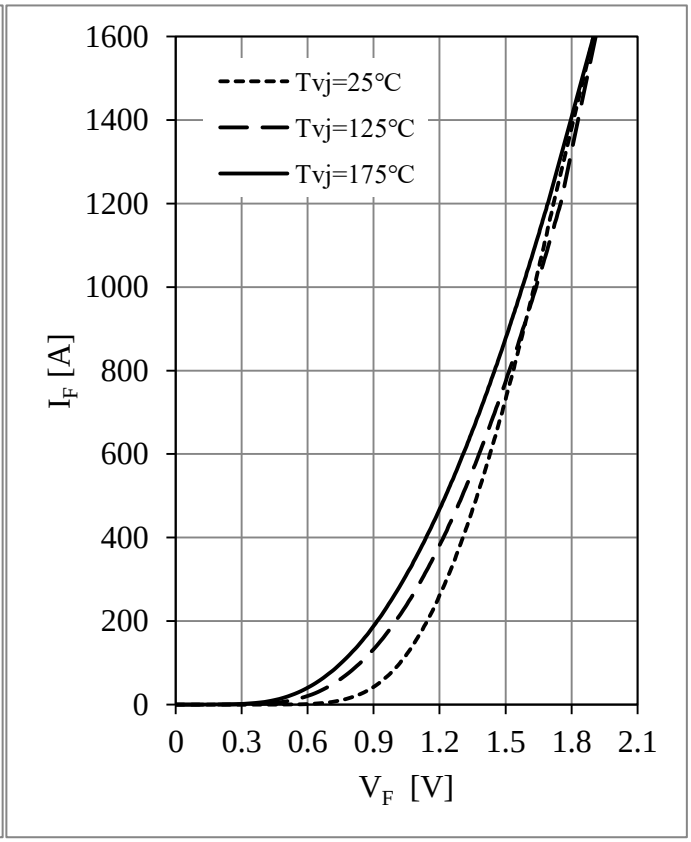


Fig 8. Diode Forward Characteristics

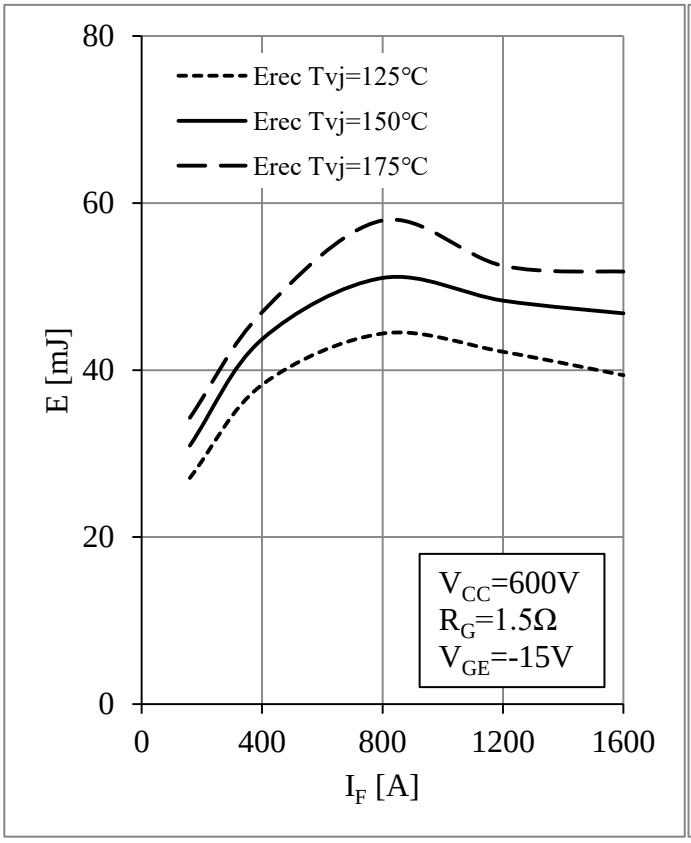


Fig 9. Diode Switching Loss vs. I_F

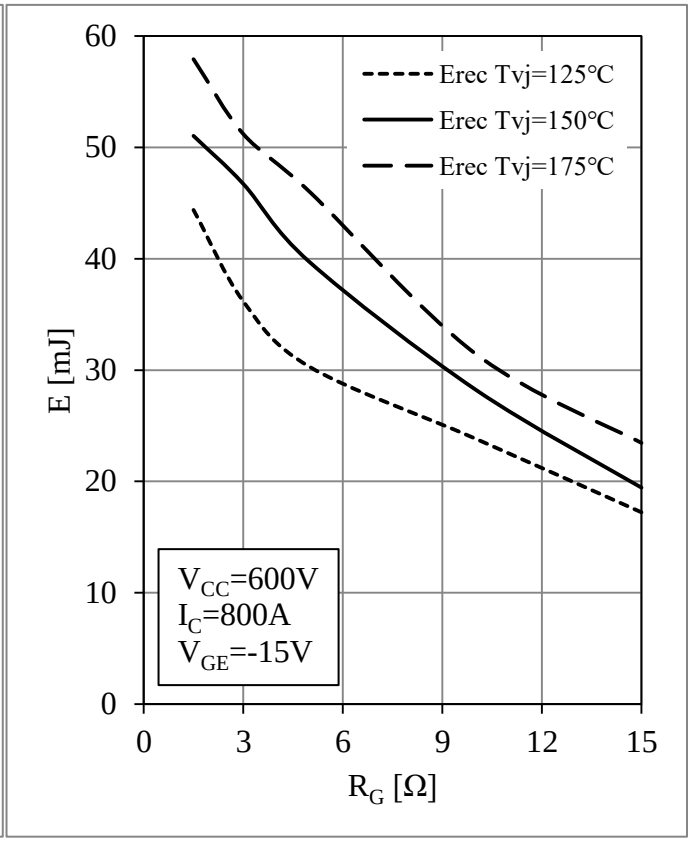


Fig 10. Diode Switching Loss vs. R_G

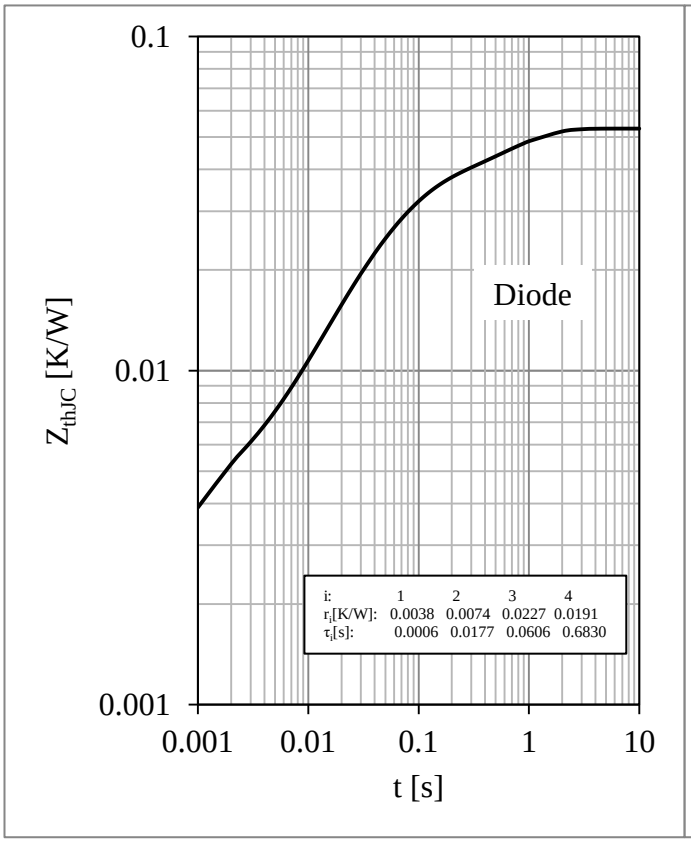


Fig 11. Diode Transient Thermal Impedance

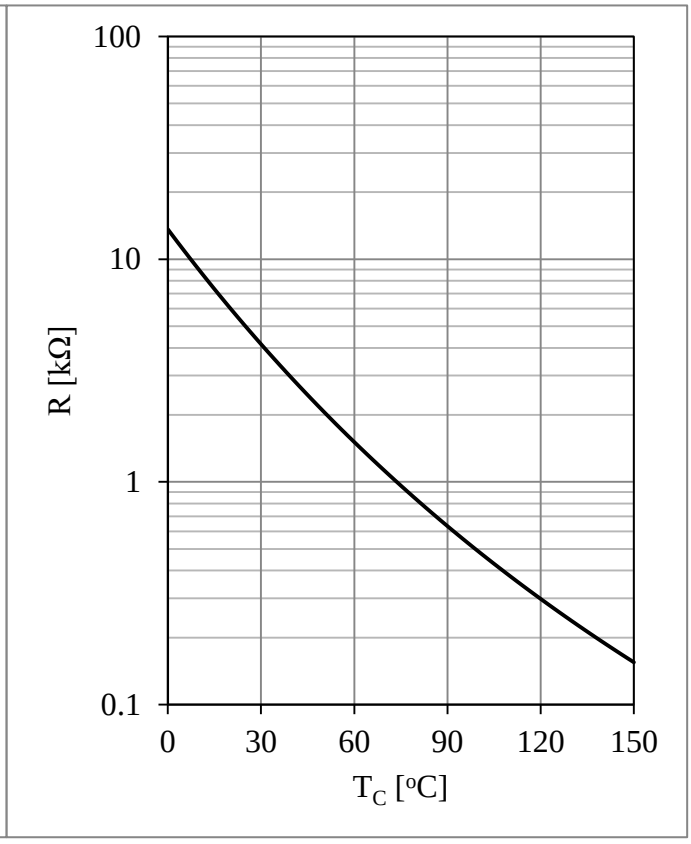
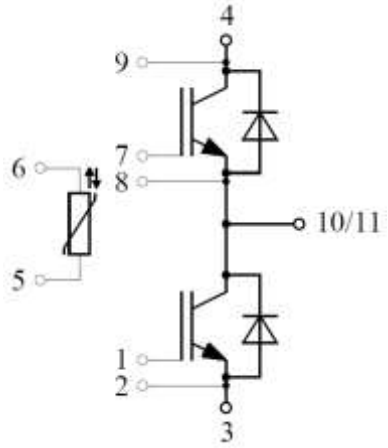


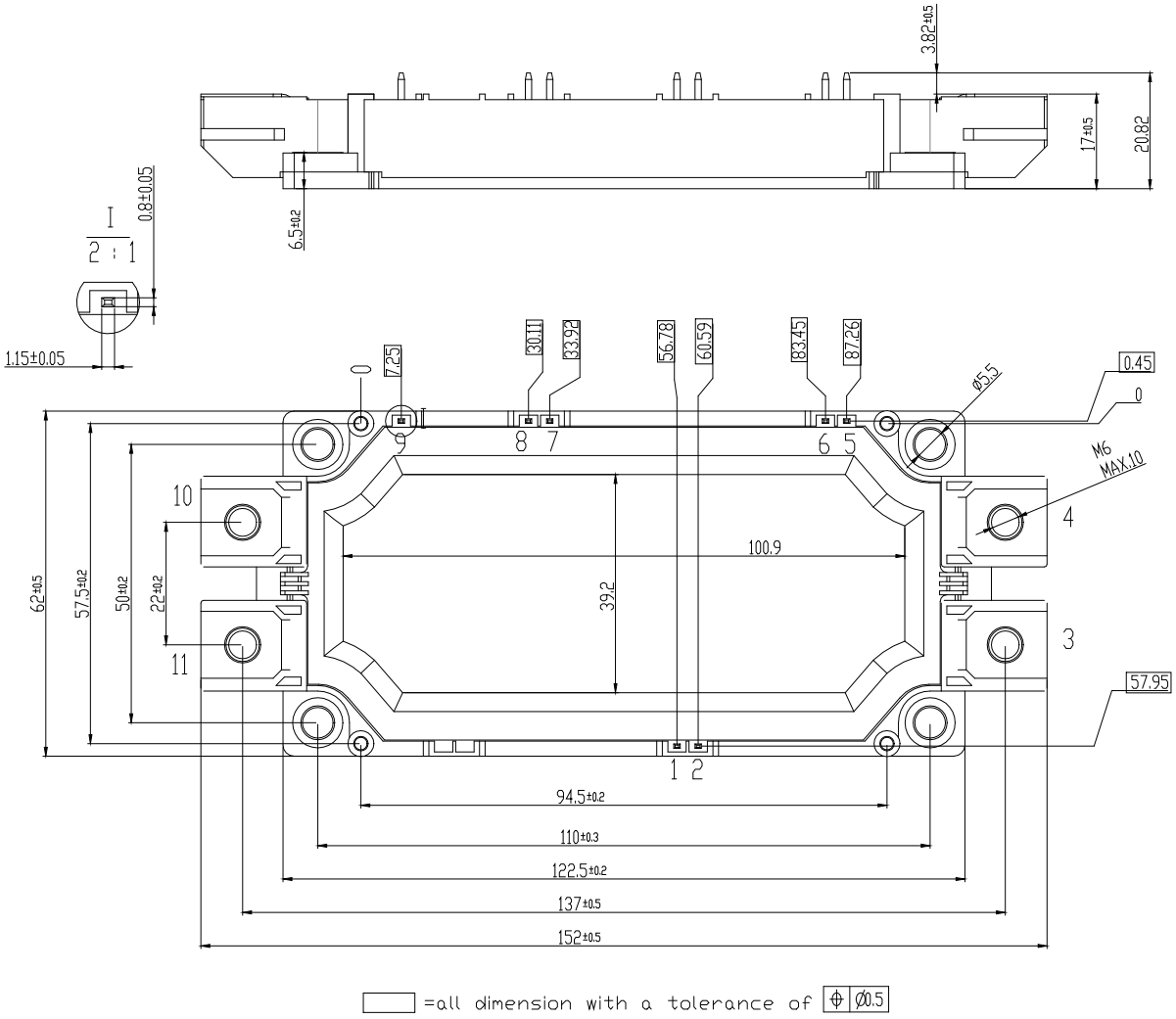
Fig12. NTC Temperature Characteristic

Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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