STARPOWER

SEMICONDUCTOR **IGBT**

GD300FFA120C6S

1200V/300A 6 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.

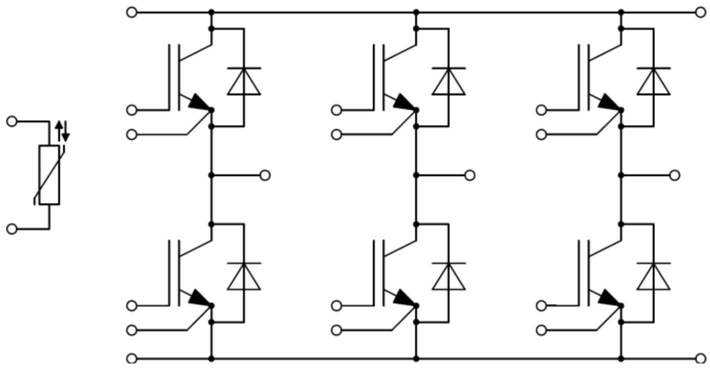
Features

- Low $V_{CE(sat)}$ Trench IGBT technology
- 6μs 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=85°C	427 300	A
I_{CM}	Pulsed Collector Current t_p=1ms	600	A
P_D	Maximum Power Dissipation @ T_j=175°C	1063	W

Diode

Symbol	Description	Values	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1200	V
I_F	Diode Continuous Forward Current	300	A
I_{FM}	Diode Maximum Forward Current t_p=1ms	600	A

Module

Symbol	Description	Values	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=300A,V_{GE}=15V, T_j=25°C		1.40	1.85	V
		I_C=300A,V_{GE}=15V, T_j=125°C		1.60		
		I_C=300A,V_{GE}=15V, T_j=175°C		1.60		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=8mA,V_{CE}=V_{GE}, T_j=25°C	5.5	6.3	7.0	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			1.5		Ω
C_{ies}	Input Capacitance	V_{CE}=25V,f=100kHz, V_{GE}=0V		51.5		nF
C_{res}	Reverse Transfer Capacitance			0.36		nF
Q_G	Gate Charge	V_{GE}=-15…+15V		4.50		μC
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=300A, R_G=1.5Ω,Ls=32nH, V_{GE}=±15V, T_j=25°C		405		ns
t_r	Rise Time			83		ns
$t_{d(off)}$	Turn-Off Delay Time			586		ns
t_f	Fall Time			129		ns
E_{on}	Turn-On Switching Loss			34.3		mJ
E_{off}	Turn-Off Switching Loss			19.3		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=300A, R_G=1.5Ω,Ls=32nH, V_{GE}=±15V, T_j=125°C		461		ns
t_r	Rise Time			107		ns
$t_{d(off)}$	Turn-Off Delay Time			676		ns
t_f	Fall Time			214		ns
E_{on}	Turn-On Switching Loss			48.0		mJ
E_{off}	Turn-Off Switching Loss			26.6		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=300A, R_G=1.5Ω,Ls=32nH, V_{GE}=±15V, T_j=175°C		518		ns
t_r	Rise Time			124		ns
$t_{d(off)}$	Turn-Off Delay Time			738		ns
t_f	Fall Time			264		ns
E_{on}	Turn-On Switching Loss			58.1		mJ
E_{off}	Turn-Off Switching Loss			31.7		mJ
I_{SC}	SC Data	t_P≤7μs,V_{GE}=15V, T_j=150°C,V_{CC}=800V, V_{CEM}≤1200V		1150		A
		t_P≤6μs,V_{GE}=15V, T_j=175°C,V_{CC}=800V, V_{CEM}≤1200V		1110		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_j=25°C		1.60	2.00	V
		I_F=300A,V_{GE}=0V,T_j=125°C		1.60		
		I_F=300A,V_{GE}=0V,T_j=175°C		1.50		
Q_r	Recovered Charge	V_R=600V,I_F=300A, -di/dt=3135A/μs,V_{GE}=-15V, Ls=32nH,T_j=25°C		19.1		μC
I_{RM}	Peak Reverse Recovery Current			140		A
E_{rec}	Reverse Recovery Energy			4.92		mJ
Q_r	Recovered Charge	V_R=600V,I_F=300A, -di/dt=2516A/μs,V_{GE}=-15V Ls=32nH,T_j=125°C		33.7		μC
I_{RM}	Peak Reverse Recovery Current			159		A
E_{rec}	Reverse Recovery Energy			9.35		mJ
Q_r	Recovered Charge	V_R=600V,I_F=300A, -di/dt=2204A/μs,V_{GE}=-15V Ls=32nH,T_j=175°C		46.8		μC
I_{RM}	Peak Reverse Recovery Current			171		A
E_{rec}	Reverse Recovery Energy			13.7		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)			0.141 0.243	K/W
R_{thCH}	Case-to-Heatsink (per IGBT) Case-to-Heatsink (per Diode) Case-to-Heatsink (per Module)		0.085 0.147 0.009		K/W
M	Mounting Screw:M6	3.0		6.0	N.m
G	Weight of Module		300		g

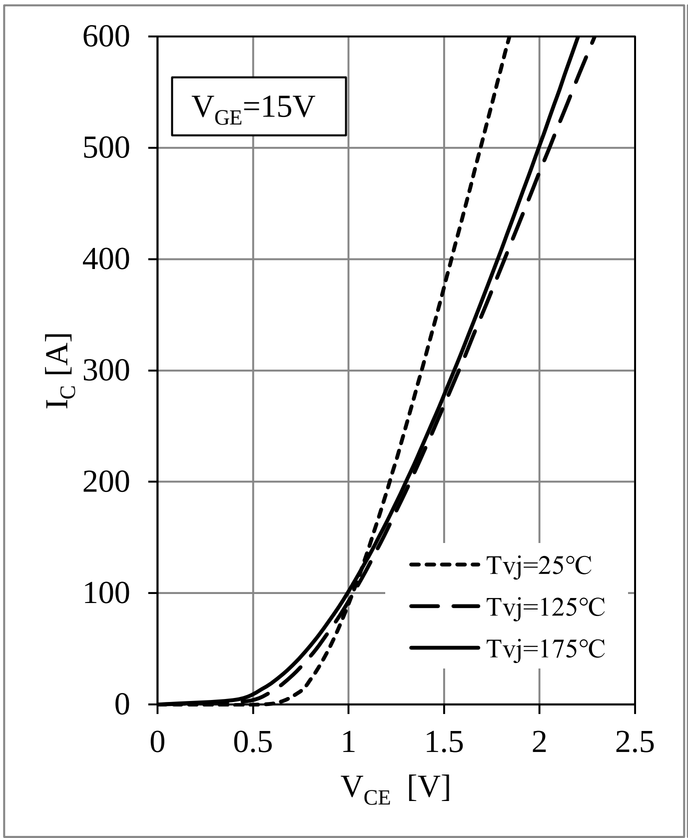


Fig 1. IGBT Output Characteristics

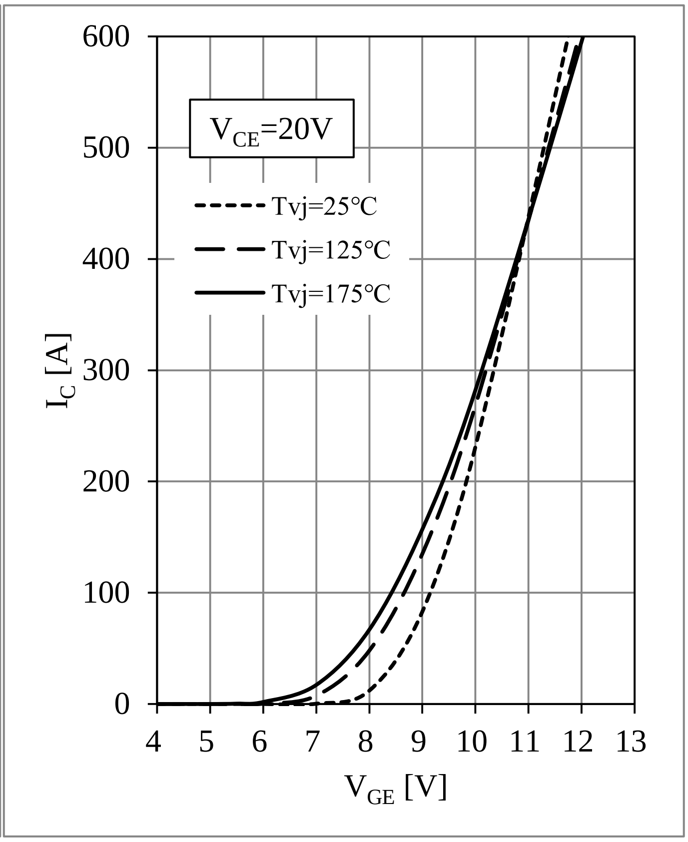


Fig 2. IGBT Transfer Characteristics

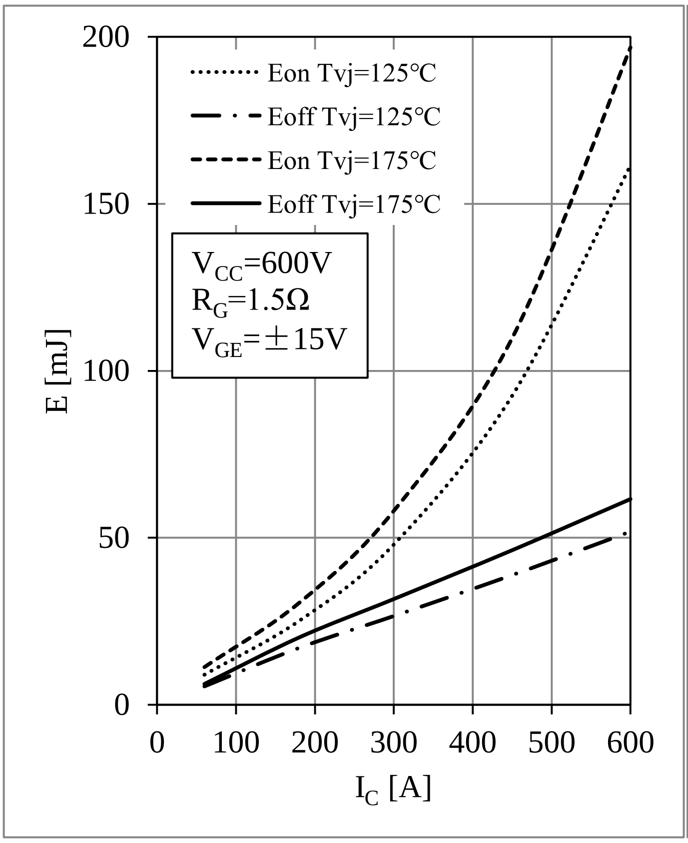


Fig 3. IGBT Switching Loss vs. I_C

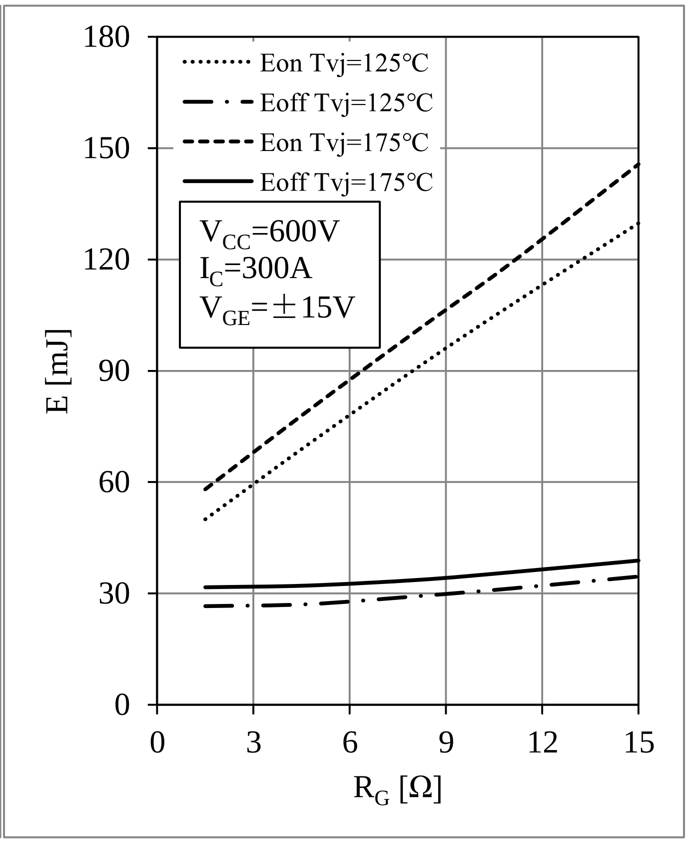


Fig 4. IGBT Switching Loss vs. R_G

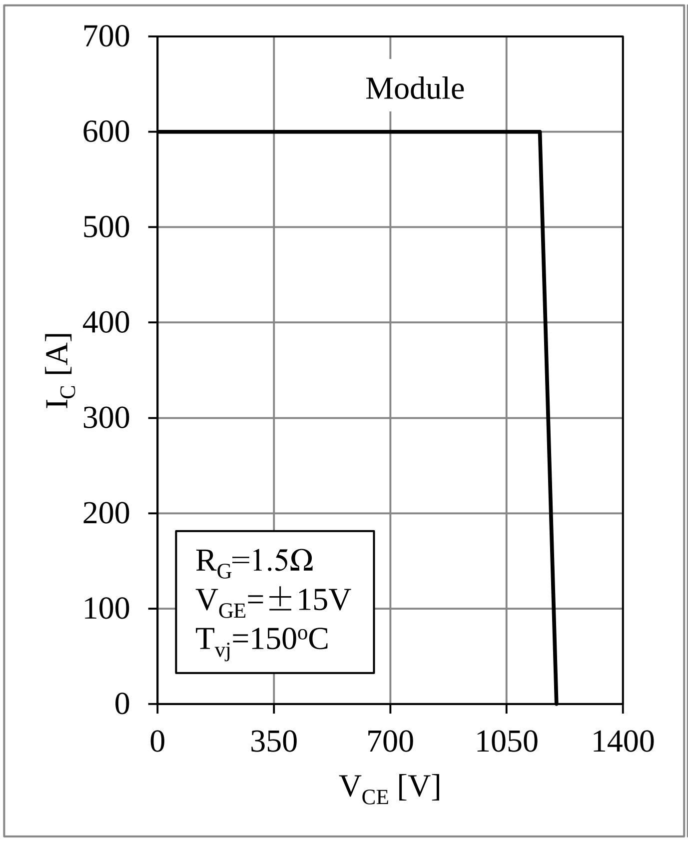


Fig 5. IGBT RBSOA

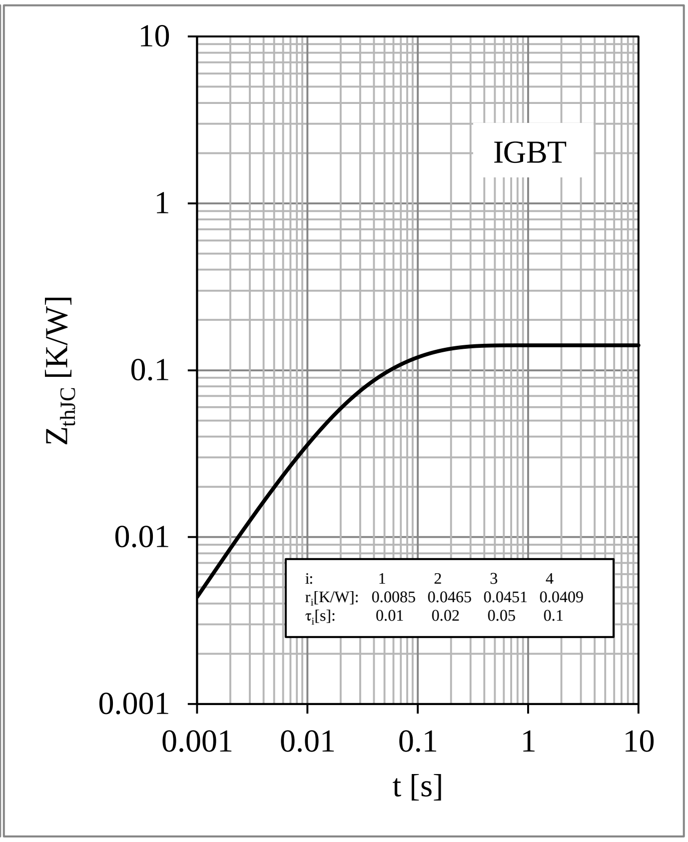


Fig 6. IGBT Transient Thermal Impedance

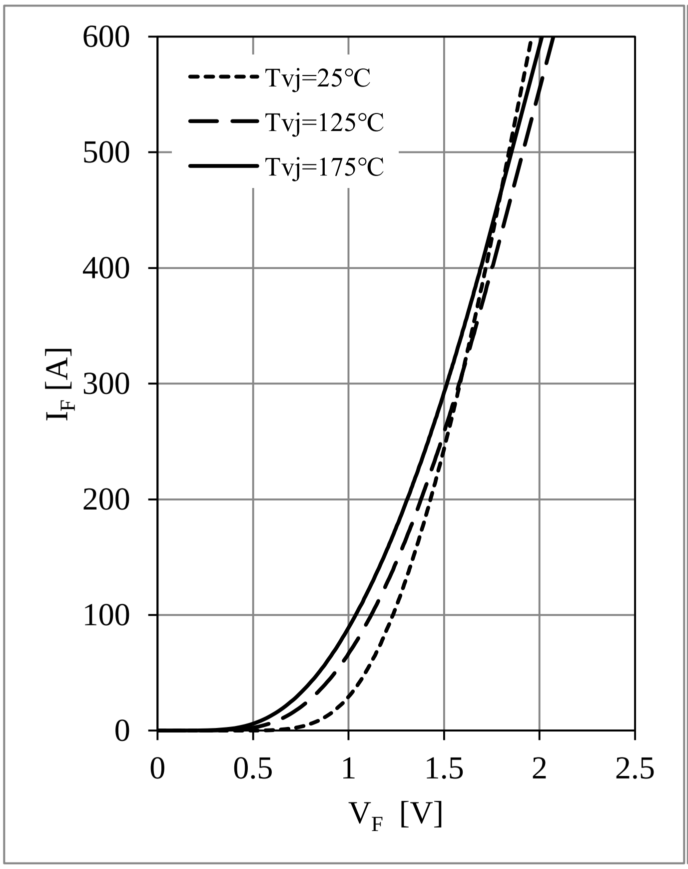


Fig 7. Diode Forward Characteristics

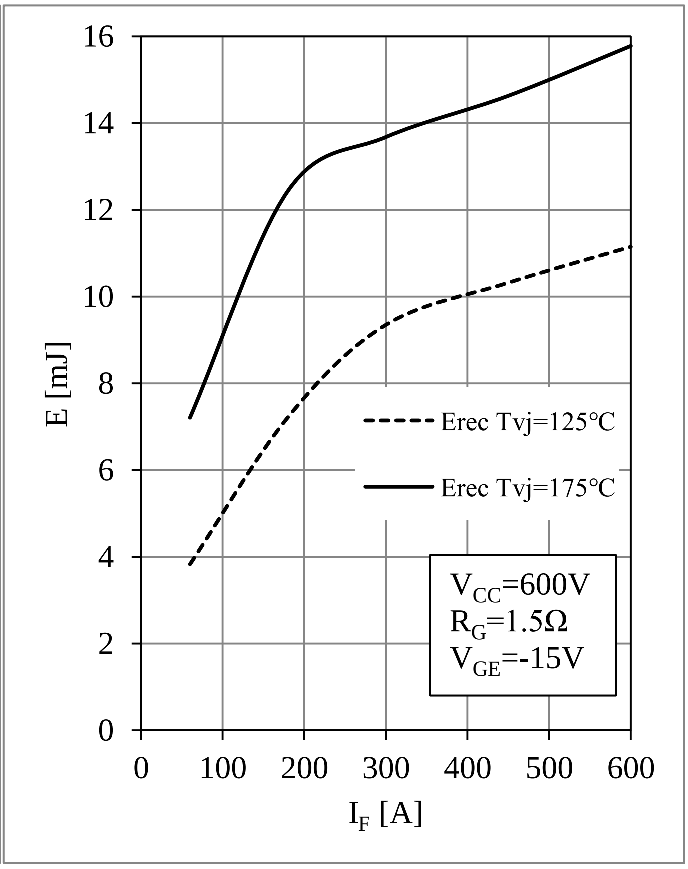


Fig 8. Diode Switching Loss vs. I_F

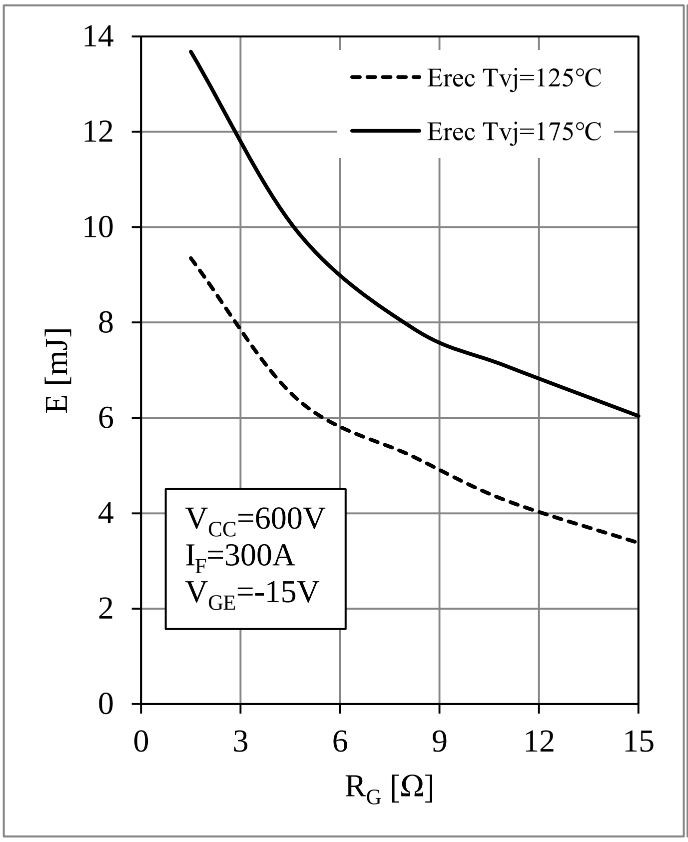


Fig 9. Diode Switching Loss vs. R_G

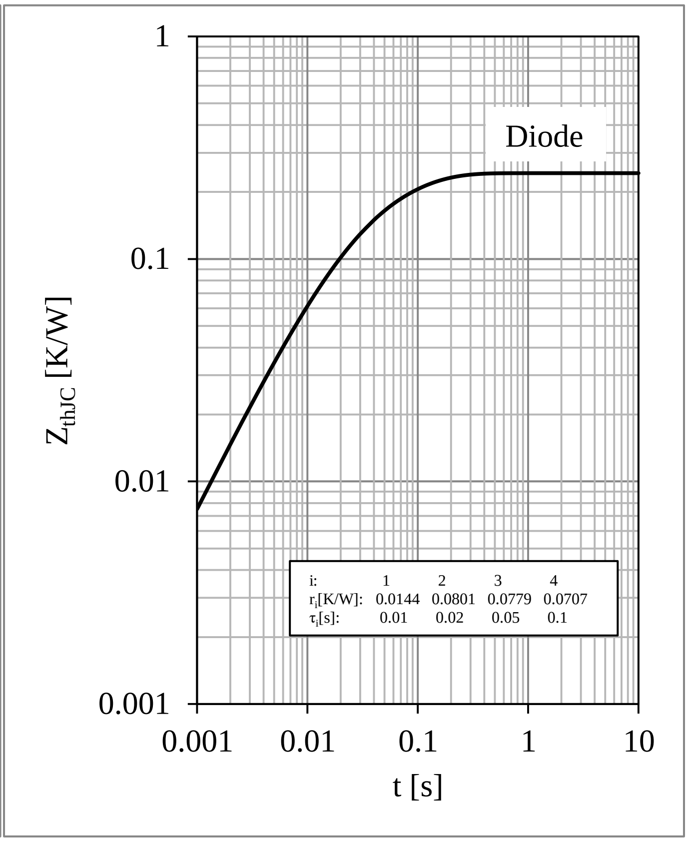


Fig 10. Diode Transient Thermal Impedance

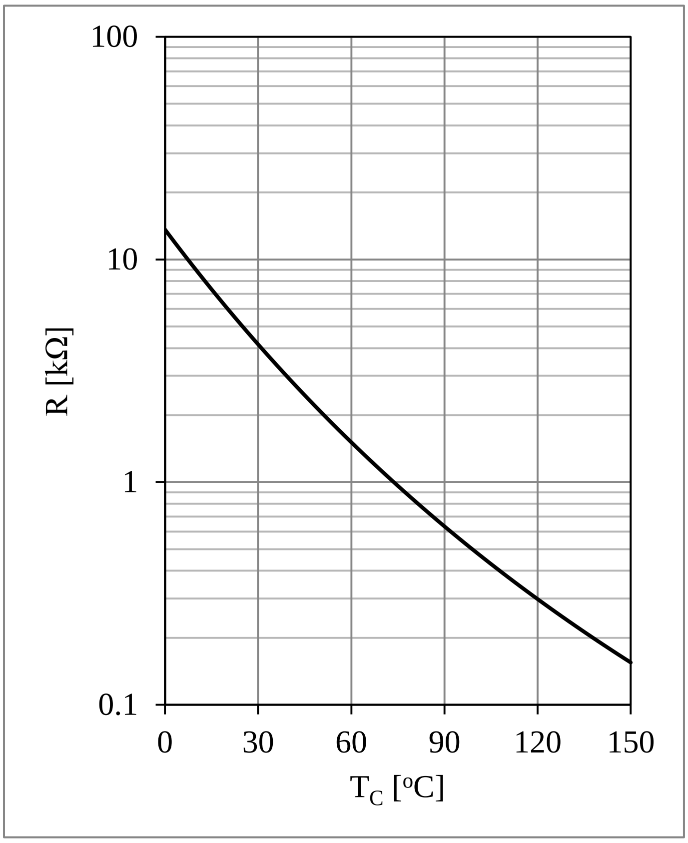
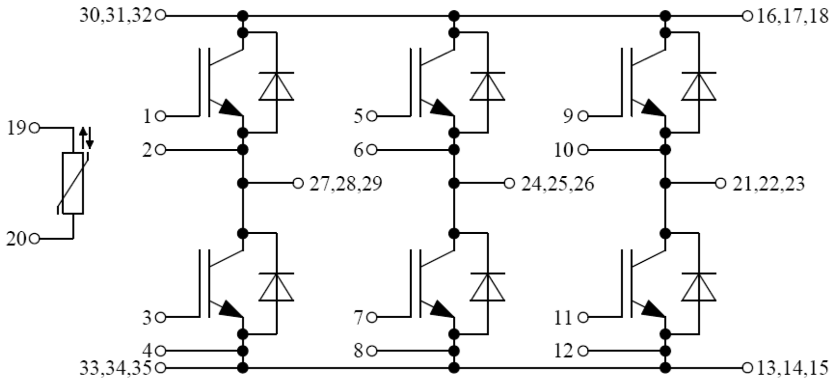


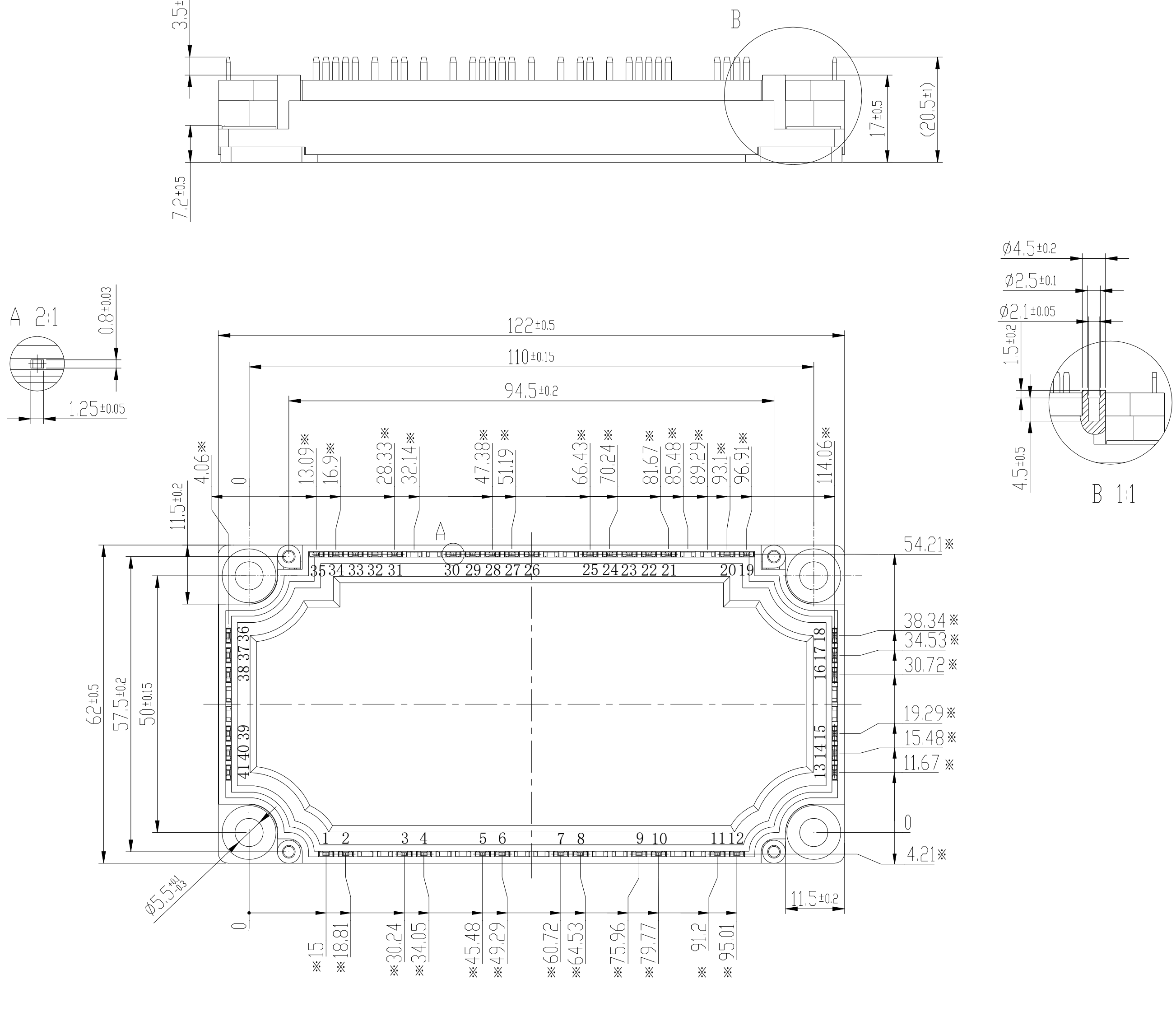
Fig 11. NTC Temperature Characteristic

Circuit Schematic



Package Dimensions

Dimensions in Millimeters



※all dimensions with a tolerance of ⌖φ0.4

Terms and Conditions of Usage

The data contained in this product datasheet is exclusively intended for technically trained staff. you and your technical departments will have to evaluate the suitability of the product for the intended application and the completeness of the product data with respect to such application.

This product data sheet is describing the characteristics of this product for which a warranty is granted. Any such warranty is granted exclusively pursuant the terms and conditions of the supply agreement. There will be no guarantee of any kind for the product and its characteristics.

Should you require product information in excess of the data given in this product data sheet or which concerns the specific application of our product, please contact the sales office, which is responsible for you (see www.powersemi.cc), For those that are specifically interested we may provide application notes.

Due to technical requirements our product may contain dangerous substances. For information on the types in question please contact the sales office, which is responsible for you.

Should you intend to use the Product in aviation applications, in health or live endangering or life support applications, please notify.

If and to the extent necessary, please forward equivalent notices to your customers.
Changes of this product data sheet are reserved.