

STARPOWER

SEMICONDUCTOR

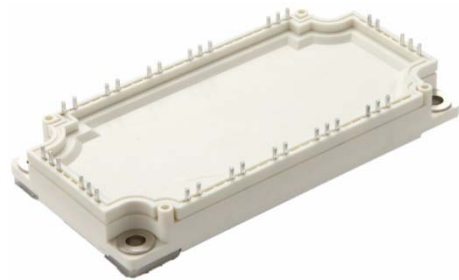
IGBT

GD100PIT120C6SN_G8

Molding Type Module**1200V/100A PIM 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
- 10 μ s short circuit capability
- $V_{CE(sat)}$ with positive temperature coefficient
- Maximum junction temperature 175 $^{\circ}$ 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

IGBT-inverter $T_C=25^{\circ}\text{C}$ unless otherwise noted**Maximum Rated Values**

Symbol	Description	GD100PIT120C6SN_G8	Units
V_{CES}	Collector-Emitter Voltage @ $T_j=25^{\circ}\text{C}$	1200	V
V_{GES}	Gate-Emitter Voltage @ $T_j=25^{\circ}\text{C}$	± 30	V
I_C	Collector Current @ $T_C=25^{\circ}\text{C}$ @ $T_C=100^{\circ}\text{C}$	155 100	A
I_{CM}	Pulsed Collector Current $t_p=1\text{ms}$	200	A
P_{tot}	Total Power Dissipation @ $T_j=175^{\circ}\text{C}$	508	W

Off Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{(BR)CES}$	Collector-Emitter Breakdown Voltage	$T_j=25^{\circ}\text{C}$	1200			V
I_{CES}	Collector Cut-Off Current	$V_{CE}=V_{CES}, V_{GE}=0\text{V},$ $T_j=25^{\circ}\text{C}$			5.0	mA
I_{GES}	Gate-Emitter Leakage Current	$V_{GE}=V_{GES}, V_{CE}=0\text{V},$ $T_j=25^{\circ}\text{C}$			400	nA

On Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=4.0\text{mA}, V_{CE}=V_{GE},$ $T_j=25^{\circ}\text{C}$	5.0	5.7	6.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C=100\text{A}, V_{GE}=15\text{V},$ $T_j=25^{\circ}\text{C}$		1.70	2.15	V
		$I_C=100\text{A}, V_{GE}=15\text{V},$ $T_j=125^{\circ}\text{C}$		1.95		

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600V, I_C=100A,$ $R_G=4.7\Omega, V_{GE}=\pm 15V,$ $T_j=25^\circ C$		280		ns
t_r	Rise Time			54		ns
$t_{d(off)}$	Turn-Off Delay Time			31		ns
t_f	Fall Time			232		ns
E_{on}	Turn-On Switching Loss			3.50		mJ
E_{off}	Turn-Off Switching Loss			7.35		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600V, I_C=100A,$ $R_G=4.7\Omega, V_{GE}=\pm 15V,$ $T_j=125^\circ C$		281		ns
t_r	Rise Time			56		ns
$t_{d(off)}$	Turn-Off Delay Time			33		ns
t_f	Fall Time			379		ns
E_{on}	Turn-On Switching Loss			5.15		mJ
E_{off}	Turn-Off Switching Loss			11.3		mJ
C_{ies}	Input Capacitance	$V_{CE}=30V, f=1Mhz,$ $V_{GE}=0V$		9.10		nF
C_{res}	Reverse Transfer Capacitance			0.28		nF
Q_G	Gate Charge	$V_{CC}=600V, I_C=100A,$ $V_{GE}=15V$		0.60		μC
R_{Gint}	Internal Gate Resistor			2.0		Ω
I_{SC}	SC Data	$t_p \leq 10\mu s, V_{GE}=15V,$ $T_j=125^\circ C, V_{CC}=900V,$ $V_{CEM} \leq 1200V$		400		A

Diode-inverter $T_C=25^{\circ}\text{C}$ unless otherwise noted**Maximum Rated Values**

Symbol	Description	GD100PIT120C6SN_G8	Units
V_{RRM}	Repetitive Peak Reverse Voltage @ $T_j=25^{\circ}\text{C}$	1200	V
I_F	DC Forward Current	100	A
I_{FRM}	Repetitive Peak Forward Current $t_p=1\text{ms}$	200	A

Characteristics Values

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Units
V _F	Diode Forward Voltage	I _F =100A, V _{GE} =0V	T _j =25°C		1.70	2.10	V
			T _j =125°C		1.65		
Q _r	Recovered Charge	I _F =100A, V _R =600V, R _G =4.7Ω, V _{GE} =-15V	T _j =25°C		7.7		μC
			T _j =125°C		14.6		
I _{RM}	Peak Reverse Recovery Current		T _j =25°C		98		A
			T _j =125°C		117		
E _{rec}	Reverse Recovery Energy		T _j =25°C		4.36		mJ
			T _j =125°C		7.74		

Diode-rectifier $T_C=25^{\circ}\text{C}$ unless otherwise noted**Maximum Rated Values**

Symbol	Description	GD100PIT120C6SN_G8	Units
V_{RRM}	Repetitive Peak Reverse Voltage @ $T_j=25^{\circ}\text{C}$	1600	V
I_F	DC Forward Current @ $T_C=80^{\circ}\text{C}$	100	A
I_{RMSM}	Maximum RMS Current At Rectifier Output @ $T_C=80^{\circ}\text{C}$	150	A
I_{FSM}	Surge Forward Current $V_R=0\text{V}$, $t_p=10\text{ms}$, $T_j=45^{\circ}\text{C}$	1100	A
I^2t	I^2t -value, $V_R=0\text{V}$, $t_p=10\text{ms}$, $T_j=45^{\circ}\text{C}$	6050	A^2s

Characteristics Values

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
V_F	Diode Forward Voltage	$I_F=100\text{A}$, $T_j=150^{\circ}\text{C}$		1.17		V
I_R	Reverse Current	$T_j=150^{\circ}\text{C}$, $V_R=1600\text{V}$			2.0	mA

IGBT-brake-chopper $T_C=25^{\circ}\text{C}$ unless otherwise noted**Maximum Rated Values**

Symbol	Description	GD100PIT120C6SN_G8	Units
V_{CES}	Collector-Emitter Voltage @ $T_j=25^{\circ}\text{C}$	1200	V
V_{GES}	Gate-Emitter Voltage @ $T_j=25^{\circ}\text{C}$	± 20	V
I_C	Collector Current @ $T_C=25^{\circ}\text{C}$	100	A
	@ $T_C=100^{\circ}\text{C}$	50	
I_{CM}	Pulsed Collector Current $t_p=1\text{ms}$	100	A
P_{tot}	Total Power Dissipation @ $T_j=175^{\circ}\text{C}$	449	W

Off Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{(BR)CES}$	Collector-Emitter Breakdown Voltage	$T_j=25^{\circ}\text{C}$	1200			V
I_{CES}	Collector Cut-Off Current	$V_{CE}=V_{CES}, V_{GE}=0\text{V},$ $T_j=25^{\circ}\text{C}$			5.0	mA
I_{GES}	Gate-Emitter Leakage Current	$V_{GE}=V_{GES}, V_{CE}=0\text{V},$ $T_j=25^{\circ}\text{C}$			400	nA

On Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=2.0\text{mA}, V_{CE}=V_{GE},$ $T_j=25^{\circ}\text{C}$	5.0	6.2	7.0	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C=50\text{A}, V_{GE}=15\text{V},$ $T_j=25^{\circ}\text{C}$		1.85	2.30	V
		$I_C=50\text{A}, V_{GE}=15\text{V},$ $T_j=125^{\circ}\text{C}$		1.95		

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600V, I_C=50A,$ $R_G=15\Omega, V_{GE}=\pm 15V,$ $T_j=25^\circ C$		392		ns
t_r	Rise Time			74		ns
$t_{d(off)}$	Turn-Off Delay Time			374		ns
t_f	Fall Time			380		ns
E_{on}	Turn-On Switching Loss			6.28		mJ
E_{off}	Turn-Off Switching Loss			3.22		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600V, I_C=50A,$ $R_G=15\Omega, V_{GE}=\pm 15V,$ $T_j=125^\circ C$		403		ns
t_r	Rise Time			69		ns
$t_{d(off)}$	Turn-Off Delay Time			408		ns
t_f	Fall Time			381		ns
E_{on}	Turn-On Switching Loss			7.30		mJ
E_{off}	Turn-Off Switching Loss			5.22		mJ
C_{ies}	Input Capacitance	$V_{CE}=25V, f=1Mhz,$ $V_{GE}=0V$		4.29		nF
C_{res}	Reverse Transfer Capacitance			0.20		nF
Q_G	Gate Charge	$V_{CC}=600V, I_C=50A,$ $V_{GE}=-15 \dots +15V$		536		nC
R_{Gint}	Internal Gate Resistor			10		Ω
I_{SC}	SC Data	$t_p \leq 10\mu s, V_{GE}=15V,$ $T_j=125^\circ C, V_{CC}=900V,$ $V_{CEM} \leq 1200V$		270		A

Diode-brake-chopper $T_C=25^\circ C$ unless otherwise noted**Maximum Rated Values**

Symbol	Description	GD100PIT120C6SN_G8	Units
V_{RRM}	Repetitive Peak Reverse Voltage @ $T_j=25^\circ C$	1200	V
I_F	DC Forward Current	25	A
I_{FRM}	Repetitive Peak Forward Current $t_p=1ms$	50	A

Characteristics Values

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Units
V _F	Diode Forward Voltage	I _F =25A, V _{GE} =0V	T _j =25°C		1.78	2.18	V
			T _j =125°C		1.88		
Q _r	Recovered Charge	I _F =25A, V _R =600V, R _G =33Ω, V _{GE} =-15V	T _j =25°C		1.1		μC
			T _j =125°C		3.2		
I _{RM}	Peak Reverse Recovery Current		T _j =25°C		17		A
			T _j =125°C		21		
E _{rec}	Reverse Recovery Energy		T _j =25°C		0.80		mJ
			T _i =125°C		1.38		

Electrical Characteristics of NTC $T_C=25^{\circ}\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
R_{25}	Rated Resistance			5.0		$\text{k}\Omega$
$\Delta R/R$	Deviation of R_{100}	$T_C=100^{\circ}\text{C}, R_{100}=493.3\Omega$	-5		5	%
P_{25}	Power Dissipation				20.0	mW
$B_{25/50}$	B-value	$R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298.15\text{K}))]$		3375		K

IGBT Module

Symbol	Parameter	Min.	Typ.	Max.	Units
V_{ISO}	Isolation Voltage RMS, $f=50\text{Hz}, t=1\text{min}$	4000			V
L_{CE}	Stray Inductance		40		nH
$R_{\theta\text{JC}}$	Junction-to-Case (per IGBT-inverter)			0.295	K/W
	Junction-to-Case (per Diode-inverter)			0.505	
	Junction-to-Case (per Diode-rectifier)			0.560	
	Junction-to-Case (per IGBT-brake-chopper)			0.334	
	Junction-to-Case (per Diode-brake-chopper)			0.946	
$R_{\theta\text{CS}}$	Case-to-Sink (per IGBT-inverter)		0.125		K/W
	Case-to-Sink (per Diode-inverter)		0.214		
	Case-to-Sink (per Diode-rectifier)		0.237		
	Case-to-Sink (per IGBT-brake-chopper)		0.141		
	Case-to-Sink (per Diode-brake-chopper)		0.400		
$R_{\theta\text{CS}}$	Case-to-Sink (Conductive grease applied)		0.009		K/W
T_{jmax}	Maximum Junction Temperature (inverter, brake)			175	$^{\circ}\text{C}$
	Maximum Junction Temperature (rectifier)			150	
T_{jop}	Operating Junction Temperature	-40		150	$^{\circ}\text{C}$
T_{STG}	Storage Temperature Range	-40		125	$^{\circ}\text{C}$
M	Mounting Torque, Screw: M5	3.0		6.0	N.m
G	Weight of Module		300		g

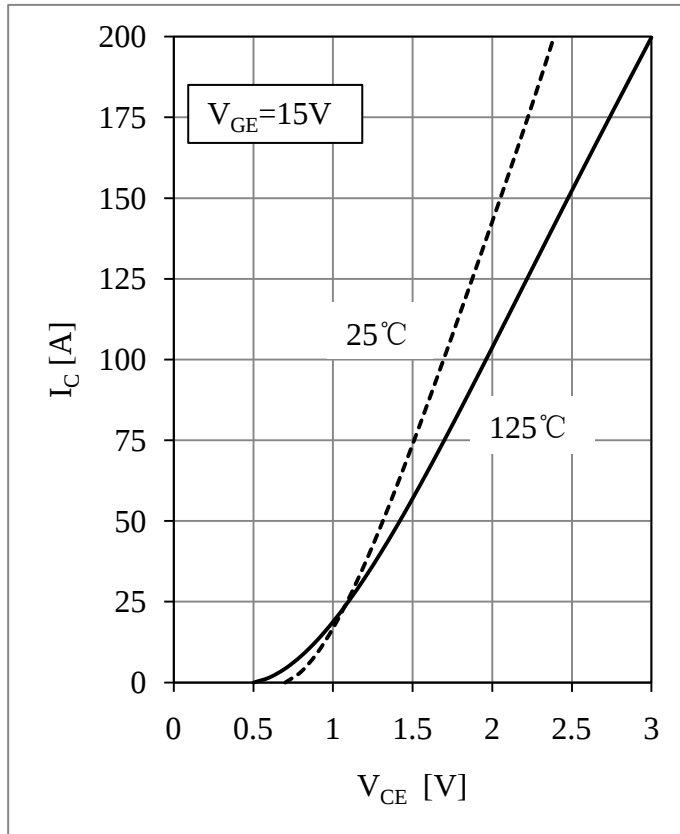


Fig 1. IGBT-inverter Output Characteristics

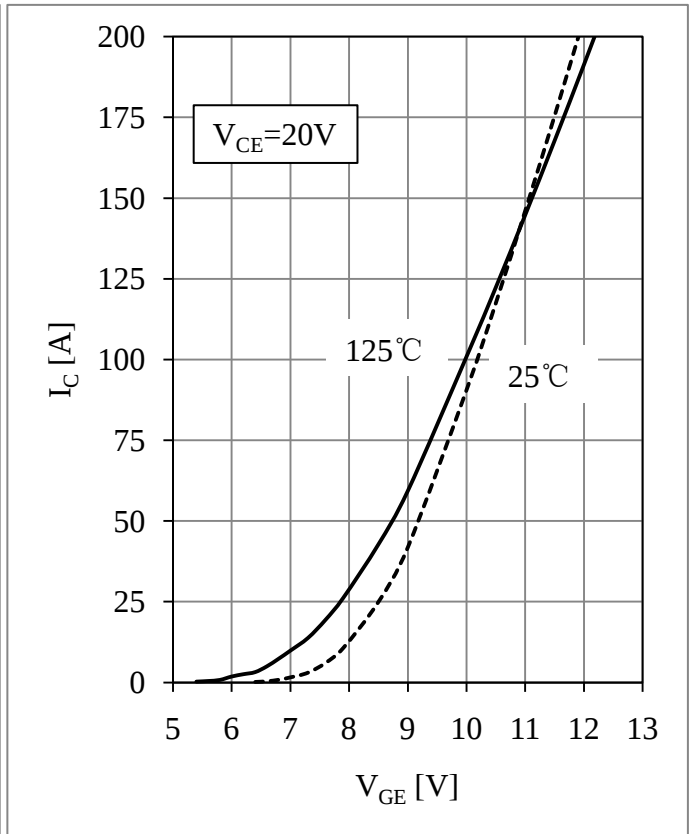
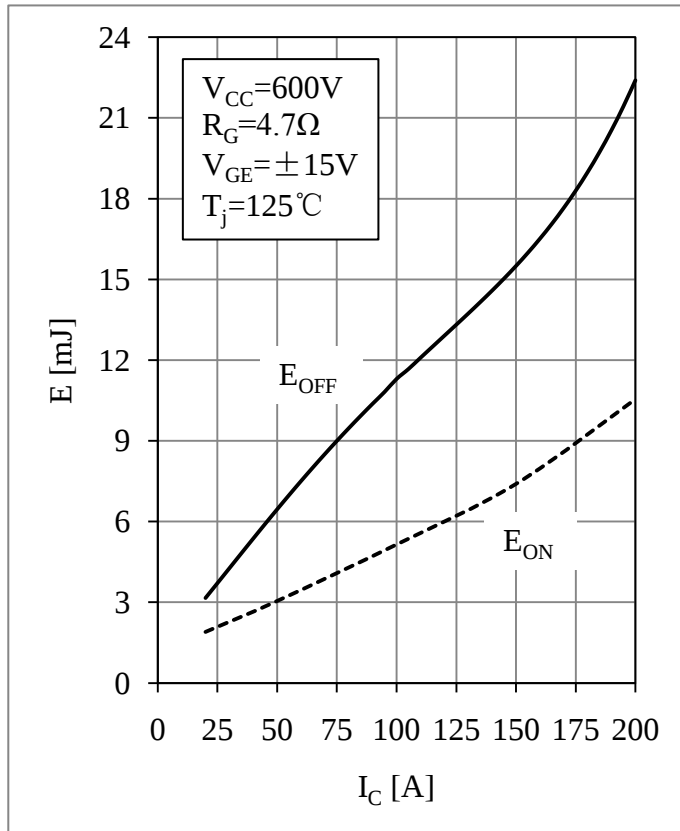
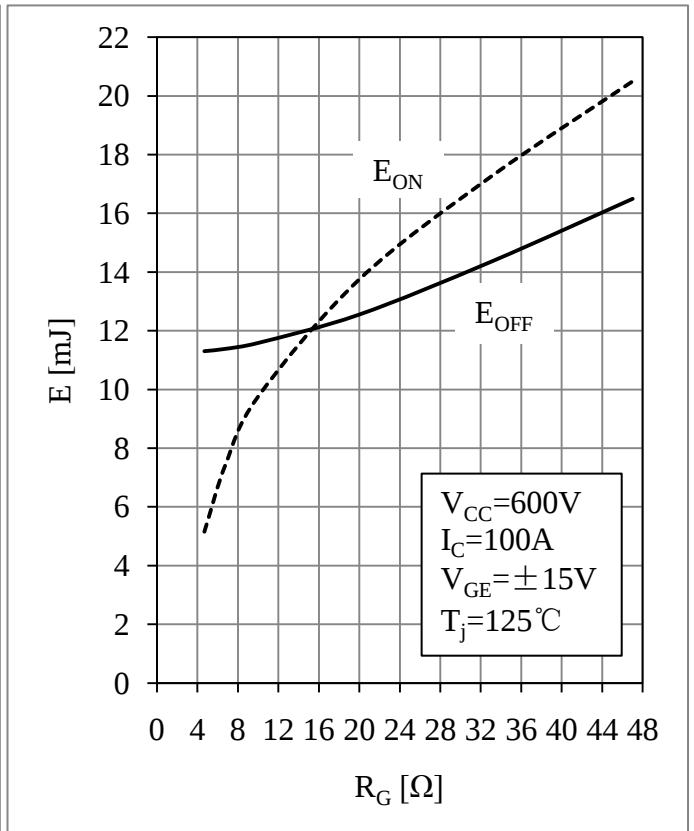


Fig 2. IGBT-inverter Transfer Characteristics

Fig 3. IGBT-inverter Switching Loss vs. I_C Fig 4. IGBT-inverter Switching Loss vs. R_G

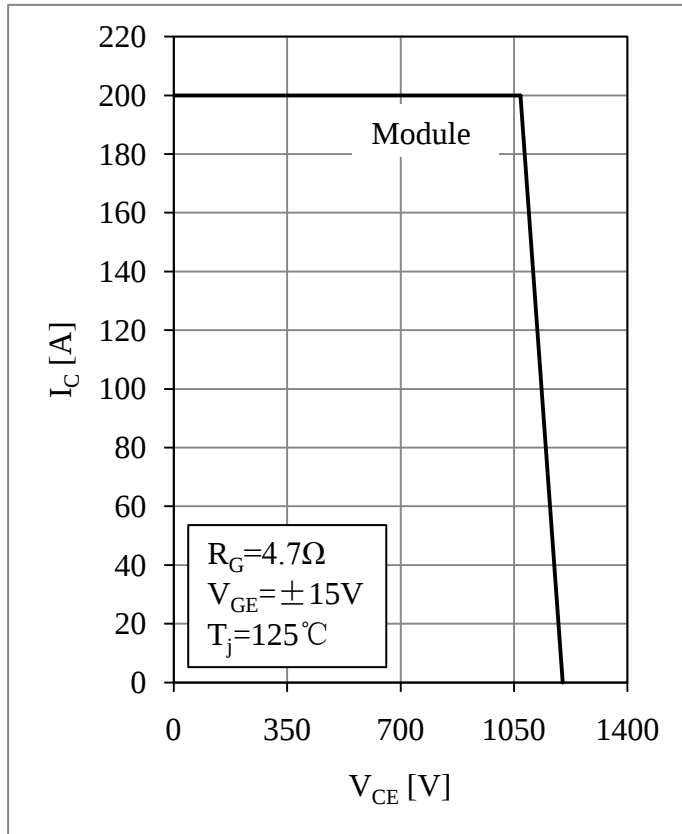


Fig 5. IGBT-inverter RBSOA

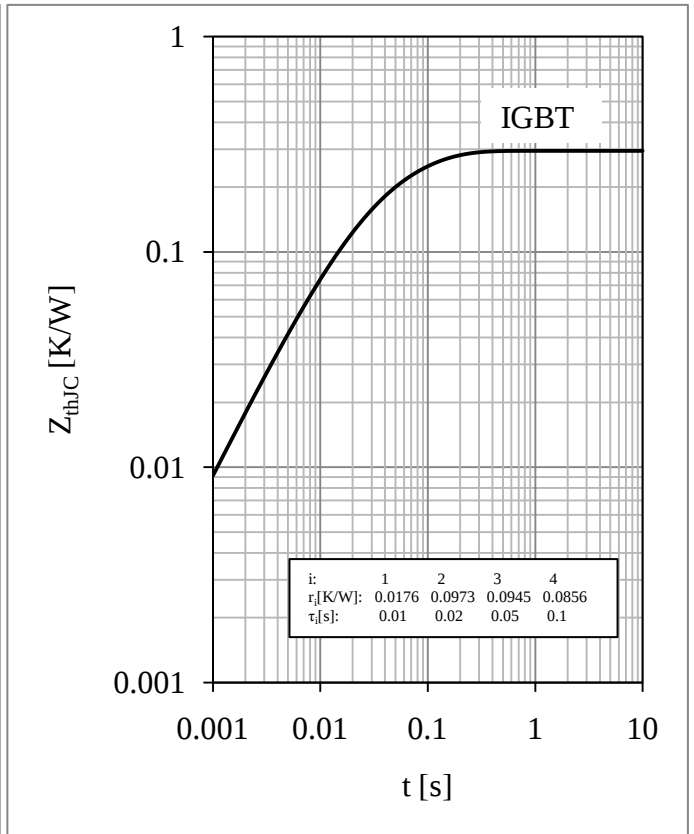


Fig 6. IGBT-inverter Transient Thermal Impedance

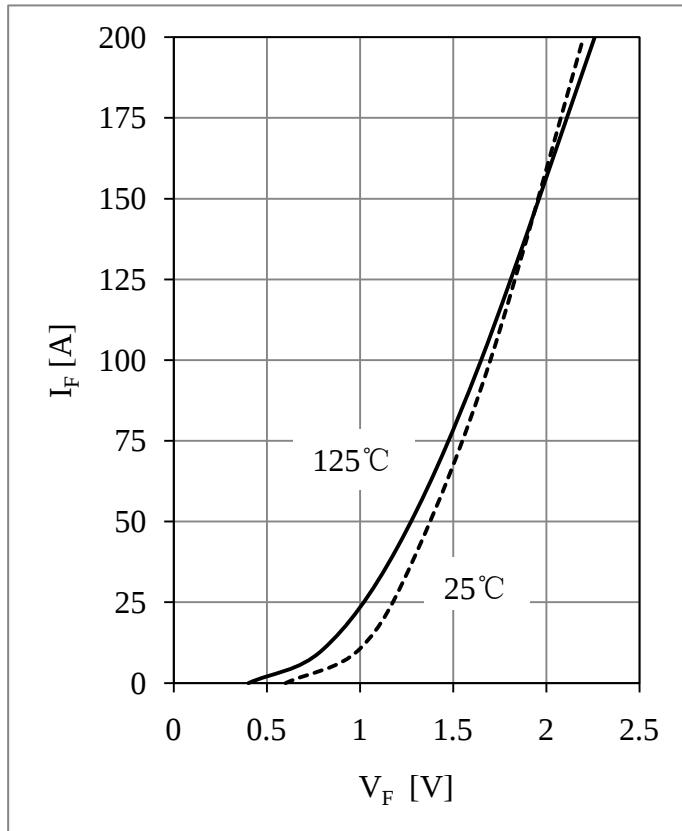
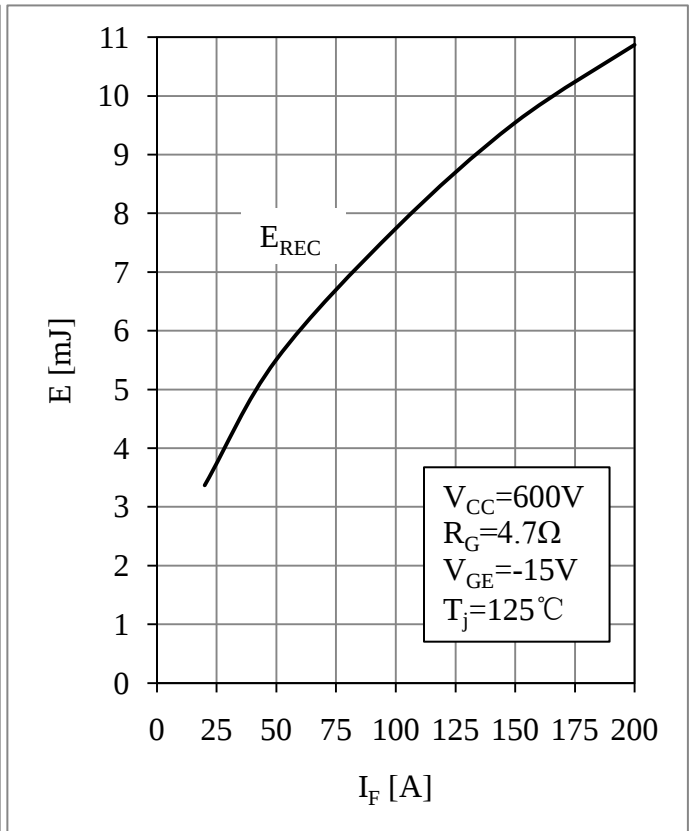
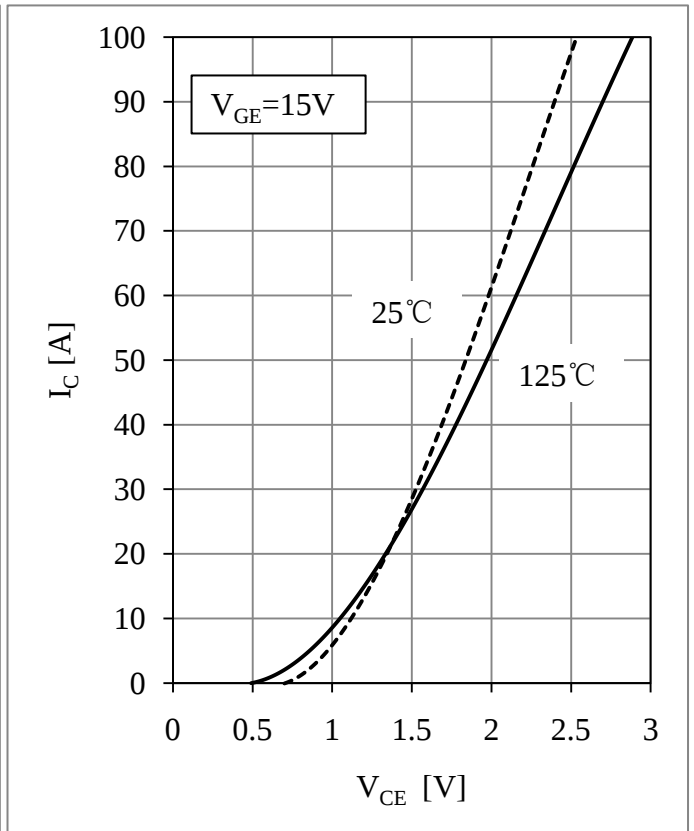
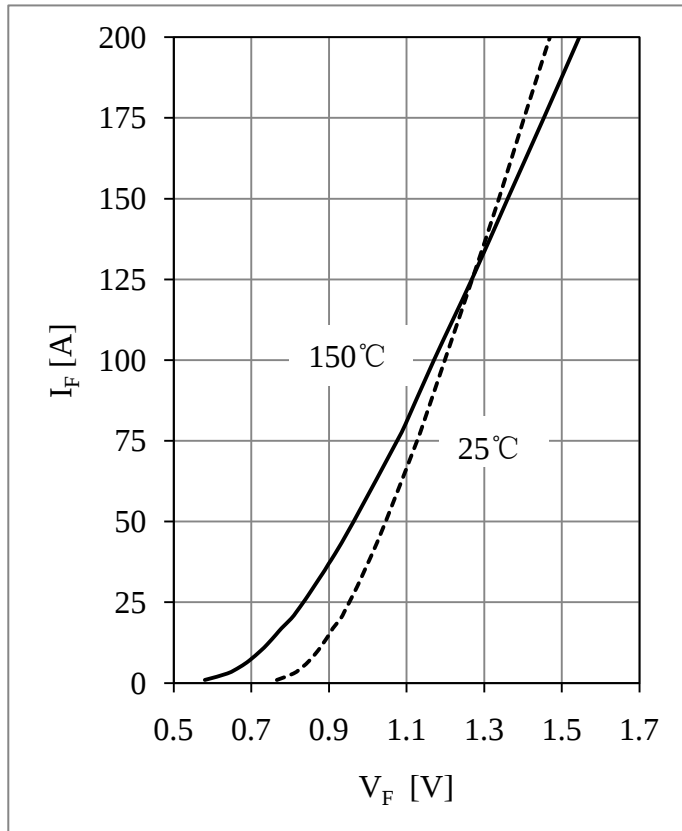
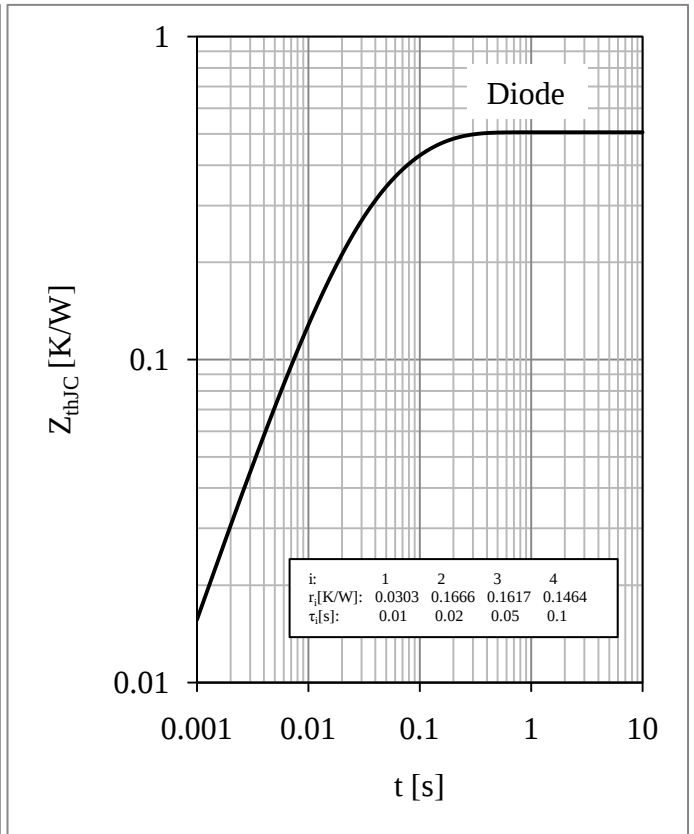
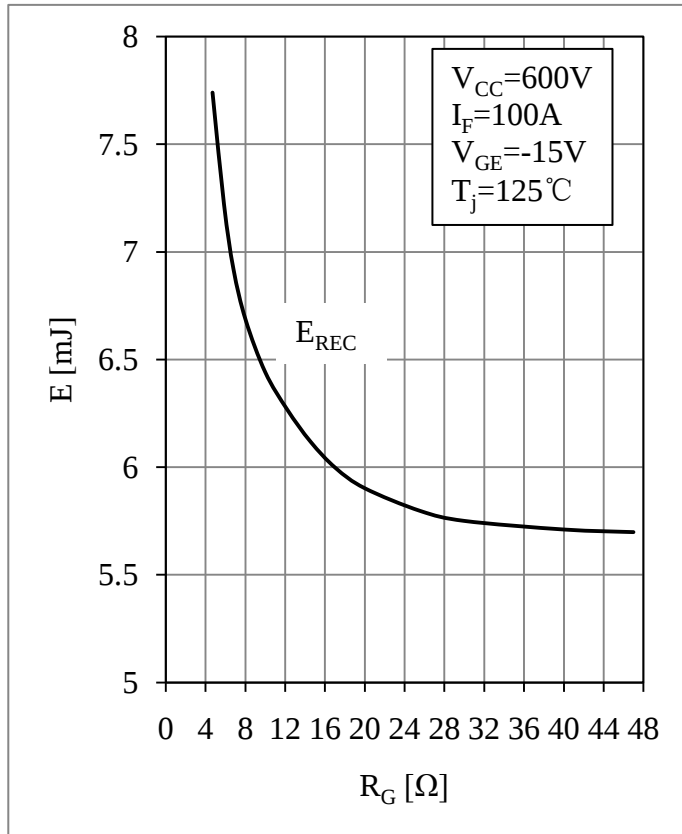


Fig 7. Diode-inverter Forward Characteristics

Fig 8. Diode-inverter Switching Loss vs. I_F



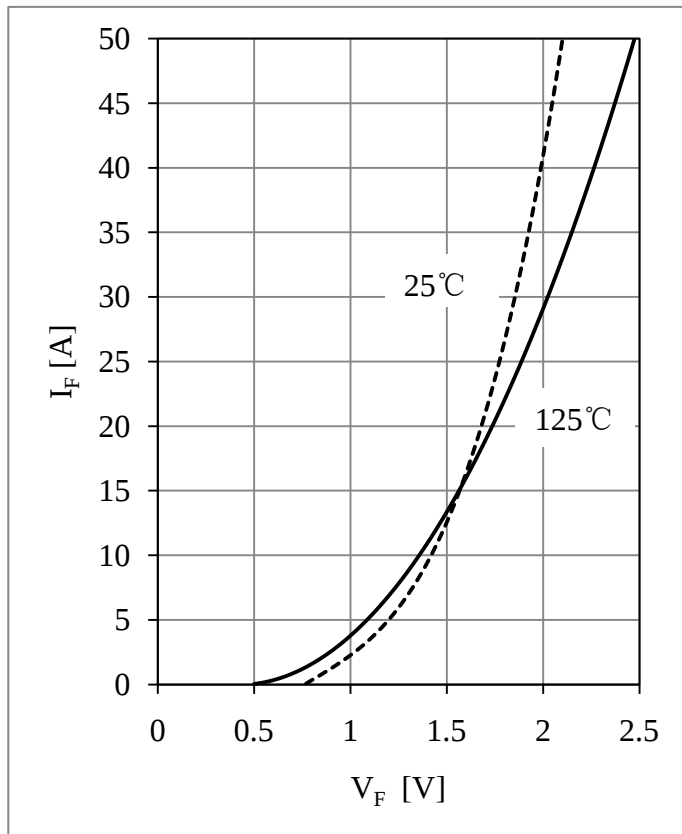


Fig 13. Diode-brake-chopper Forward Characteristics

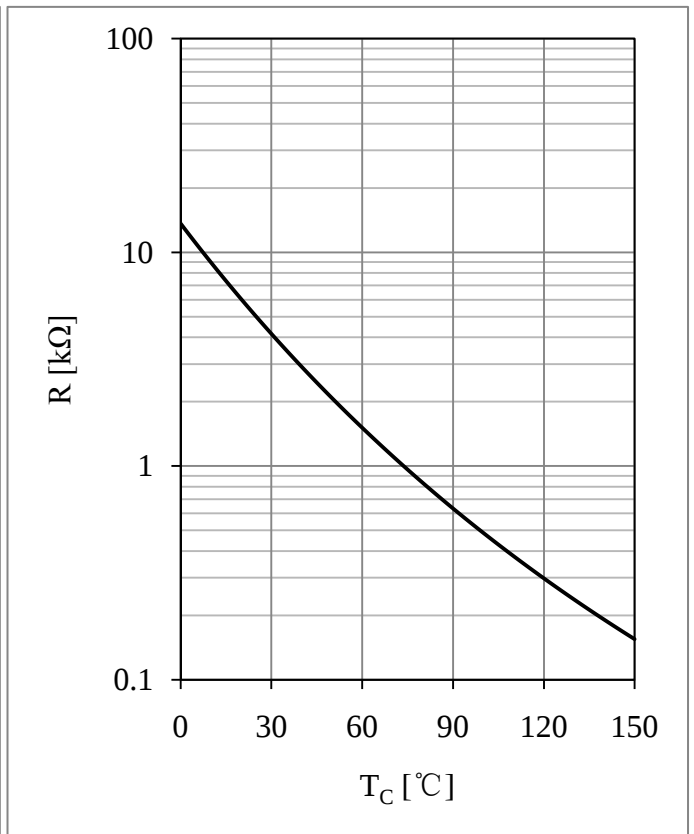
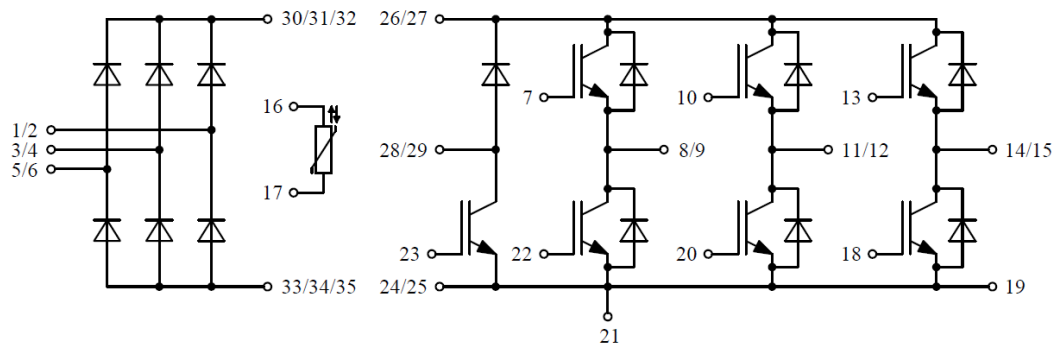


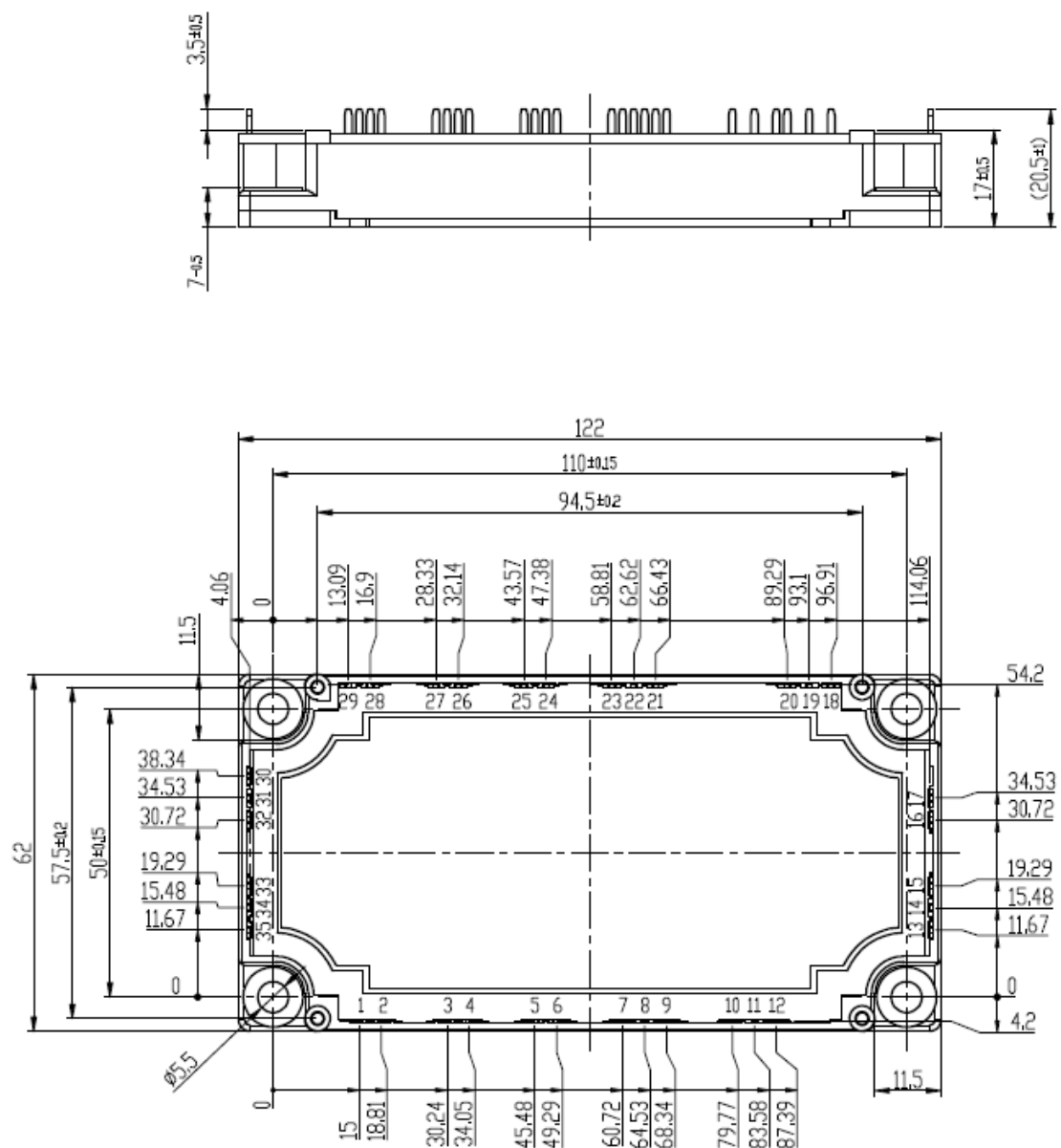
Fig 14. NTC Temperature Characteristic

Equivalent Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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.