STARPOWER

SEMICONDUCTOR **IGBT**

GD75PIT120C6SN

Molding Type Module

1200V/75A 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
- 10μs short circuit capability
- $V_{CE(sat)}$ with positive temperature coefficient
- Maximum junction temperature 175℃
- 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℃ unless otherwise noted

Maximum Rated Values

Symbol	Description	GD75PIT120C6SN	Units
V_{CES}	Collector-Emitter Voltage @ T_j=25℃	1200	V
V_{GES}	Gate-Emitter Voltage @ T_j=25℃	±20	V
I_C	Collector Current @ T_C=25℃ @ T_C=100℃	130 75	A
I_{CM}	Pulsed Collector Current t_p=1ms	150	A
P_{tot}	Total Power Dissipation @ T_j=175℃	453	W

Off Characteristics

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

On Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=3.0mA,V_{CE}=V_{GE}, T_j=25℃	5.0	5.8	6.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C=75A,V_{GE}=15V, T_j=25℃		1.70	2.15	V
		I_C=75A,V_{GE}=15V, T_j=125℃		1.90		

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=75A, R_G=4.7Ω,V_{GE}=±15V, T_j=25℃		258		ns
t_r	Rise Time			31		ns
$t_{d(off)}$	Turn-Off Delay Time			410		ns
t_f	Fall Time			68		ns
E_{on}	Turn-On Switching Loss			6.52		mJ
E_{off}	Turn-Off Switching Loss			6.78		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=75A, R_G=4.7Ω,V_{GE}=±15V, T_j=125℃		292		ns
t_r	Rise Time			48		ns
$t_{d(off)}$	Turn-Off Delay Time			525		ns
t_f	Fall Time			91		ns
E_{on}	Turn-On Switching Loss			9.42		mJ
E_{off}	Turn-Off Switching Loss			7.98		mJ
C_{ies}	Input Capacitance	V_{CE}=25V,f=1Mhz, V_{GE}=0V		5.35		nF
C_{oes}	Output Capacitance			0.28		nF
C_{res}	Reverse Transfer Capacitance			0.24		nF
Q_G	Gate Charge	V_{CC}=600V,I_C=75A, V_{GE}=-15…+15V		0.70		μC
R_{Gint}	Internal Gate Resistor			10		Ω
I_{SC}	SC Data	t_P≤10μs,V_{GE}=15V, T_j=125℃,V_{CC}=900V, V_{CEM}≤1200V		300		A

Diode-inverter T_C=25℃ unless otherwise noted

Maximum Rated Values

Symbol	Description	GD75PIT120C6SN	Units
V_{RRM}	Repetitive Peak Reverse Voltage @ T_j=25℃	1200	V
I_F	DC Forward Current	75	A
I_{FRM}	Repetitive Peak Forward Current t_p=1ms	150	A

Characteristics Values

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Units
V_F	Diode Forward Voltage	I_F=75A, V_{GE}=0V	T_j=25℃		1.65	2.10	V
			T_j=125℃		1.65		
Q_r	Recovered Charge	I_F=75A, V_R=600V, R_G=4.7Ω, V_{GE}=-15V	T_j=25℃		9.25		μC
			T_j=125℃		16.6		
I_{RM}	Peak Reverse Recovery Current		T_j=25℃		78		A
			T_j=125℃		85		
E_{rec}	Reverse Recovery Energy		T_j=25℃		3.22		mJ
			T_j=125℃		6.48		

Diode-rectifier T_C=25℃ unless otherwise noted

Maximum Rated Values

Symbol	Description	GD75PIT120C6SN	Units
V_{RRM}	Repetitive Peak Reverse Voltage @ T_j=25℃	1600	V
I_F	DC Forward Current @ T_C=100℃	78	A
I_{RMSM}	Maximum RMS Current At Rectifier Output @ T_C=80℃	120	A
I_{FSM}	Surge Forward Current V_R=0V,t_p=10ms,T_j=45℃	1100	A
I^2t	I^2t-value,V_R=0V,t_p=10ms,T_j=45℃	6050	A^2s

Characteristics Values

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Units
V_F	Diode Forward Voltage	I_F=75A	T_j=150℃		1.10		V
I_R	Reverse Current	T_j=150℃,V_R=1600V				3.0	mA

IGBT-brake-chopper T_C=25℃ unless otherwise noted

Maximum Rated Values

Symbol	Description	GD75PIT120C6SN	Units
V_{CES}	Collector-Emitter Voltage @ T_j=25℃	1200	V
V_{GES}	Gate-Emitter Voltage @ T_j=25℃	±20	V
I_C	Collector Current @ T_C=25℃ @ T_C=100℃	60 35	A
I_{CM}	Pulsed Collector Current t_p=1ms	70	A
P_{tot}	Total Power Dissipation @ T_j=150℃	274	W

Off Characteristics

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

On Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=250μA,V_{CE}=V_{GE}, T_j=25℃	4.4	4.9	6.0	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C=35A,V_{GE}=15V, T_j=25℃		2.40	2.85	V
		I_C=35A,V_{GE}=15V, T_j=125℃		2.80		

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=35A, R_G=24Ω,V_{GE}=±15V, T_j=25℃		270		ns
t_r	Rise Time			53		ns
$t_{d(off)}$	Turn-Off Delay Time			272		ns
t_f	Fall Time			168		ns
E_{on}	Turn-On Switching Loss			3.43		mJ
E_{off}	Turn-Off Switching Loss			2.02		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=35A, R_G=24Ω,V_{GE}=±15V, T_j=125℃		272		ns
t_r	Rise Time			54		ns
$t_{d(off)}$	Turn-Off Delay Time			300		ns
t_f	Fall Time			308		ns
E_{on}	Turn-On Switching Loss			4.61		mJ
E_{off}	Turn-Off Switching Loss			3.95		mJ
C_{ies}	Input Capacitance	V_{CE}=30V,f=1Mhz, V_{GE}=0V		3.48		nF
C_{oes}	Output Capacitance			0.28		nF
C_{res}	Reverse Transfer Capacitance			0.11		nF
Q_G	Gate Charge	V_{CC}=600V,I_C=35A, V_{GE}=0-15V		255		nC
I_{SC}	SC Data	t_P≤10μs,V_{GE}=15V, T_j=125℃,V_{CC}=900V, V_{CEM}≤1200V		320		A

Diode-brake-chopper T_C=25℃ unless otherwise noted

Maximum Rated Values

Symbol	Description	GD75PIT120C6SN	Units
V_{RRM}	Repetitive Peak Reverse Voltage @ T_j=25℃	1200	V
I_F	DC Forward Current	35	A
I_{FRM}	Repetitive Peak Forward Current t_p=1ms	70	A

Characteristics Values

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Units
V_F	Diode Forward Voltage	I_F=35A, V_{GE}=0V	T_j=25℃		1.90	2.30	V
			T_j=125℃		1.80		
Q_r	Recovered Charge	I_F=35A, V_R=600V, R_G=24Ω, V_{GE}=-15V	T_j=25℃		1.7		μC
			T_j=125℃		4.3		
I_{RM}	Peak Reverse Recovery Current		T_j=25℃		27		A
			T_j=125℃		29		
E_{rec}	Reverse Recovery Energy		T_j=25℃		1.17		mJ
			T_j=125℃		2.19		

Electrical Characteristics of NTC T_C=25℃ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
R_{25}	Rated Resistance			5.0		kΩ
ΔR/R	Deviation of R_{100}	T_C=100℃,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

IGBT Module

Symbol	Parameter	Min.	Typ.	Max.	Units
V_{ISO}	Isolation Voltage RMS,f=50Hz,t=1min	2500			V
L_{CE}	Stray Inductance		40		nH
$R_{CC'+EE'}$ $R_{AA'+CC'}$	Module Lead Resistance,Terminal to Chip @ T_C=25℃		4.00 3.00		mΩ
$R_{\theta JC}$	Junction-to-Case (per IGBT-inverter) Junction-to-Case (per Diode-inverter) Junction-to-Case (per Diode-rectifier) Junction-to-Case (per IGBT-brake-chopper) Junction-to-Case (per Diode-brake-chopper)			0.331 0.577 0.547 0.457 1.073	K/W
$R_{\theta CS}$	Case-to-Sink (Conductive grease applied)		0.009		K/W
T_{jmax}	Maximum Junction Temperature(inverter) Maximum Junction Temperature (rectifier,brake)			175 150	℃
T_{jop}	Operating Junction Temperature	-40		150	℃
T_{STG}	Storage Temperature Range	-40		125	℃
Mounting Torque	Mounting Screw:M5	3.0		6.0	N.m
G	Weight of Module		300		g

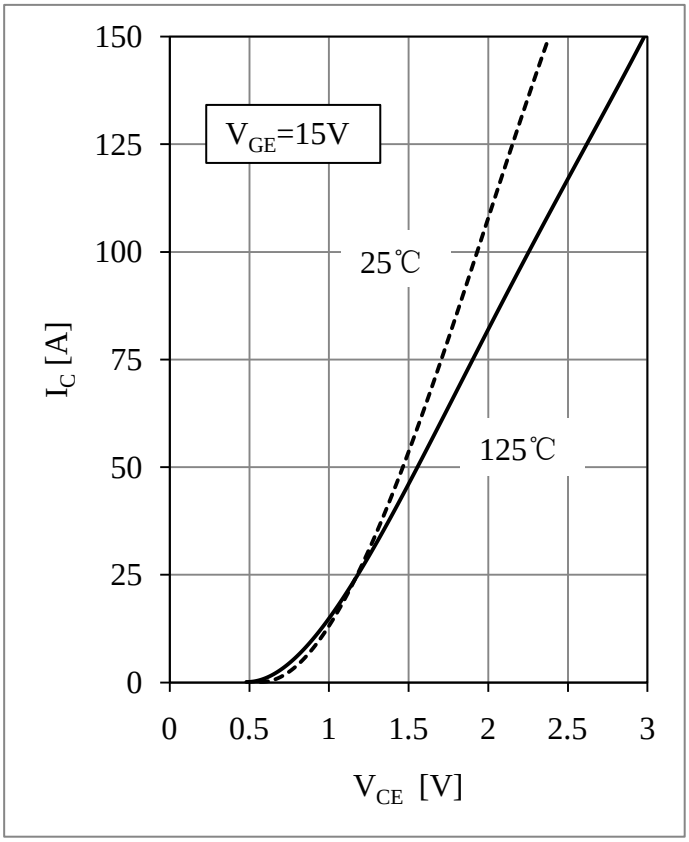


Fig 1. IGBT-inverter Output Characteristics

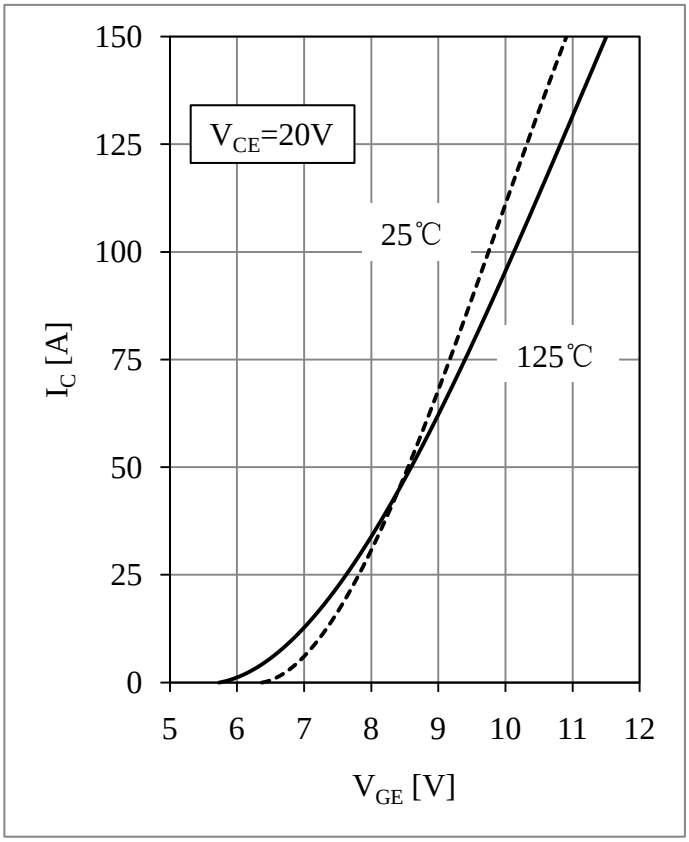


Fig 2. IGBT-inverter Transfer Characteristics

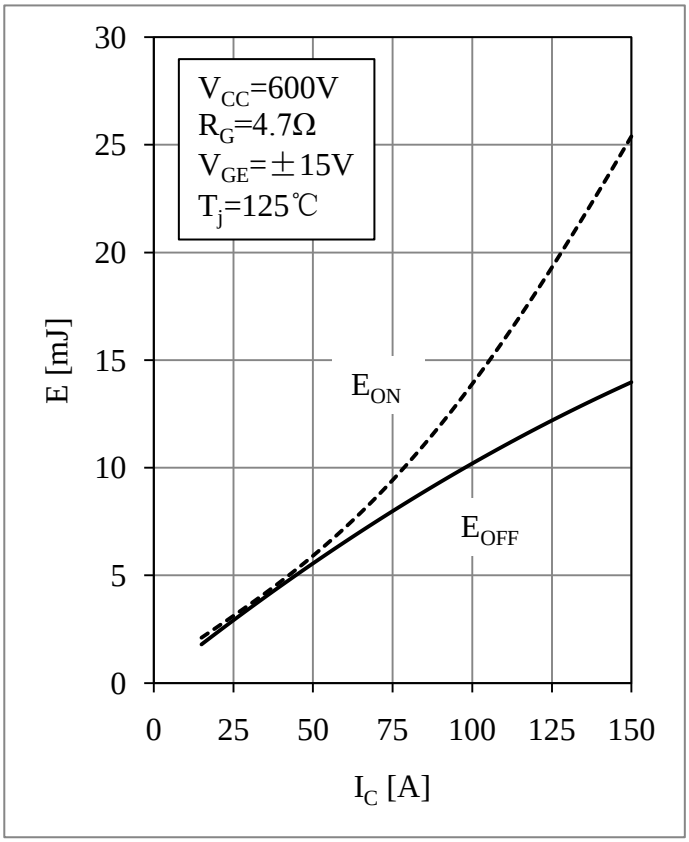


Fig 3. IGBT-inverter Switching Loss vs. I_C

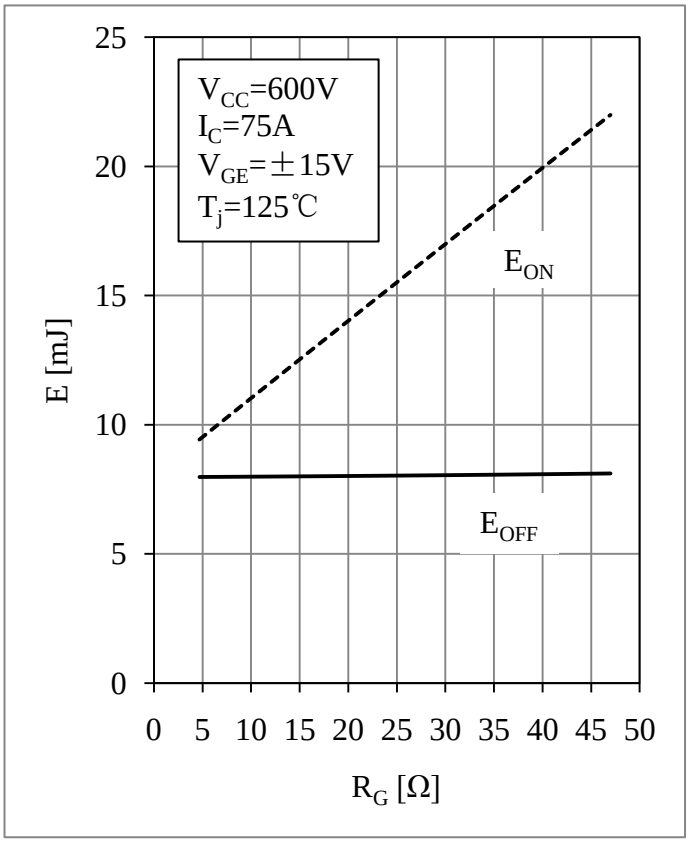


Fig 4. IGBT-inverter Switching Loss vs. R_G

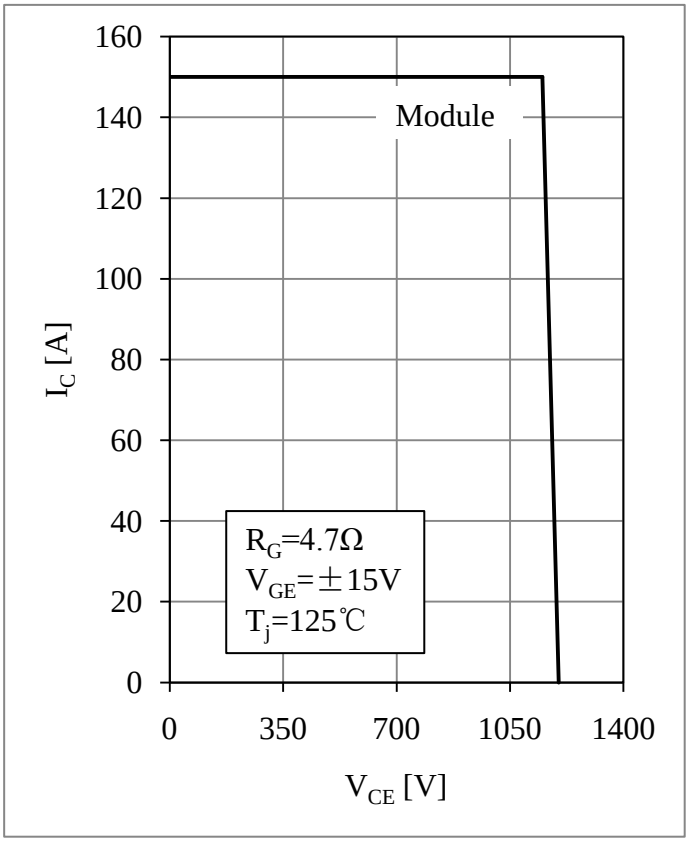


Fig 5. IGBT-inverter RBSOA

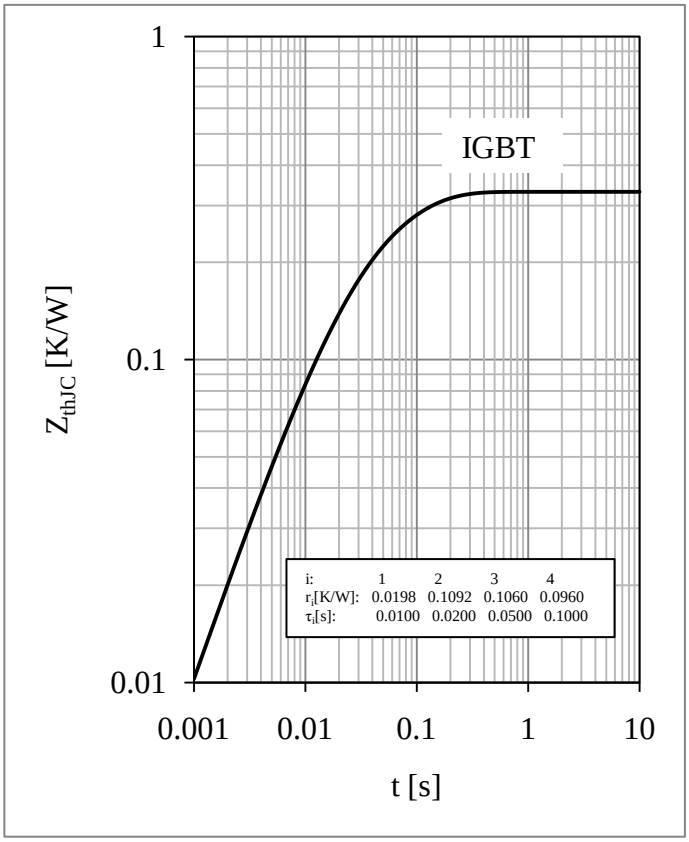


Fig 6. IGBT-inverter Transient Thermal Impedance

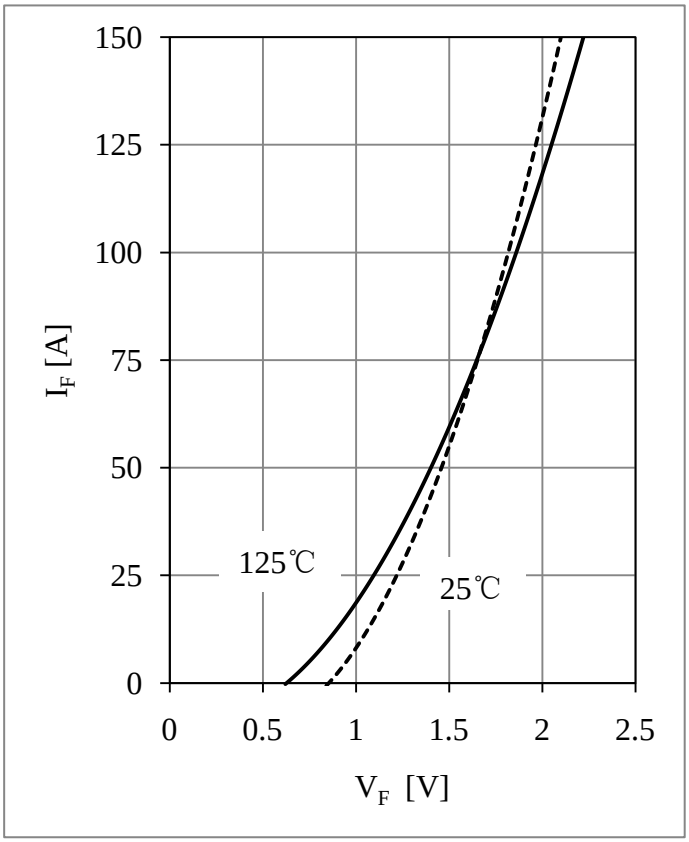


Fig 7. Diode-inverter Forward Characteristics

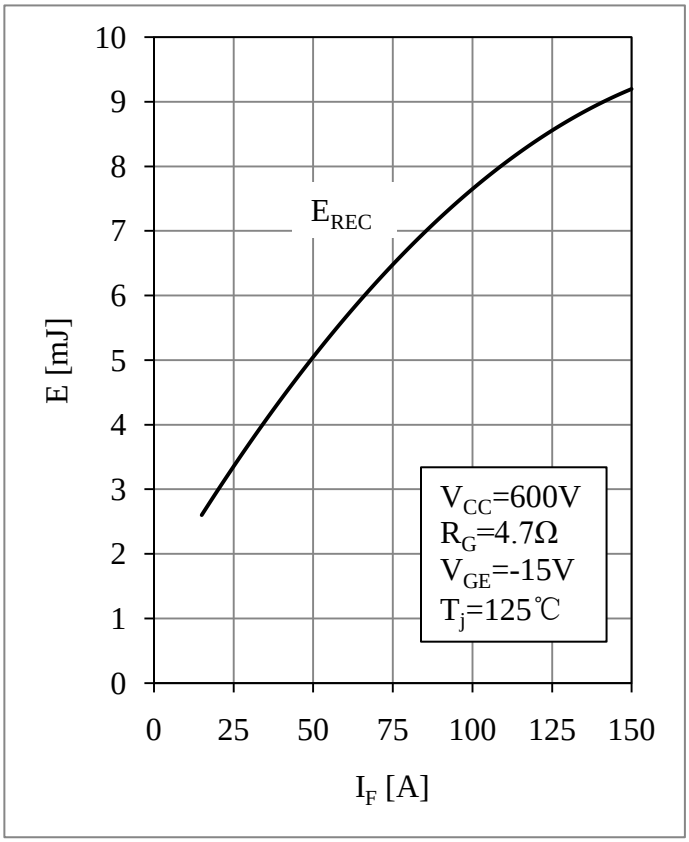


Fig 8. Diode-inverter Switching Loss vs. I_F

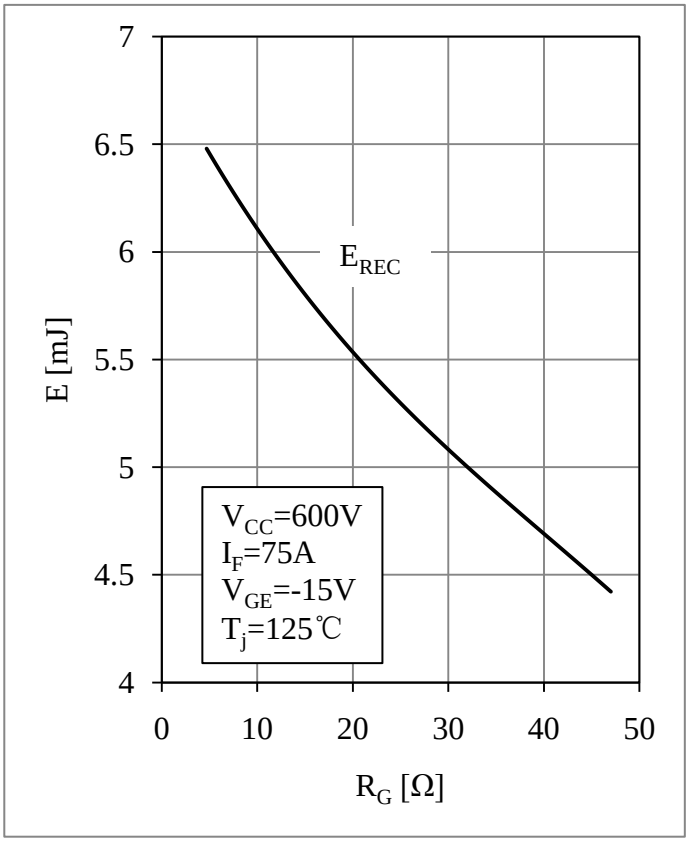


Fig 9. Diode-inverter Switching Loss vs. R_G

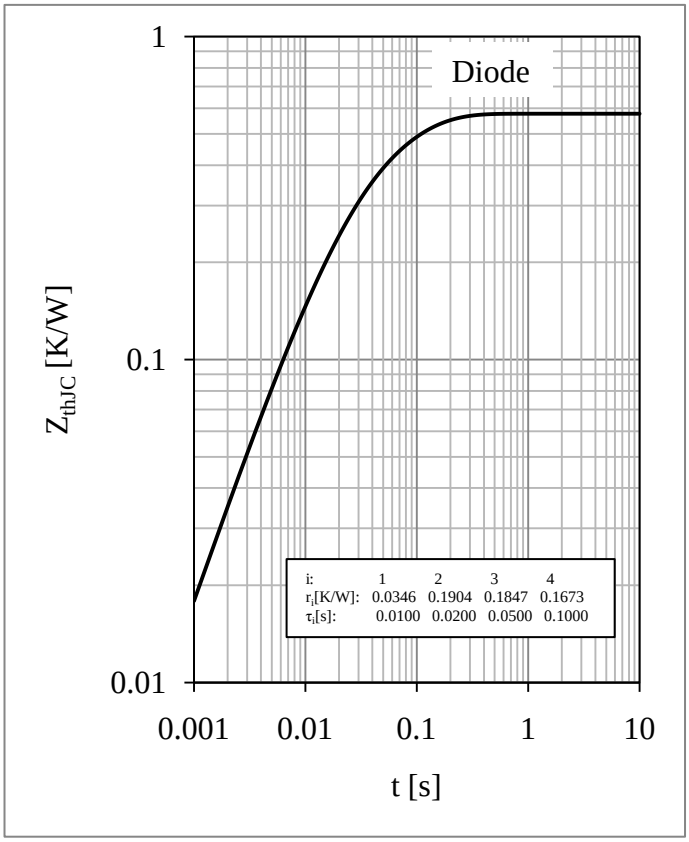


Fig 10. Diode-inverter Transient Thermal Impedance

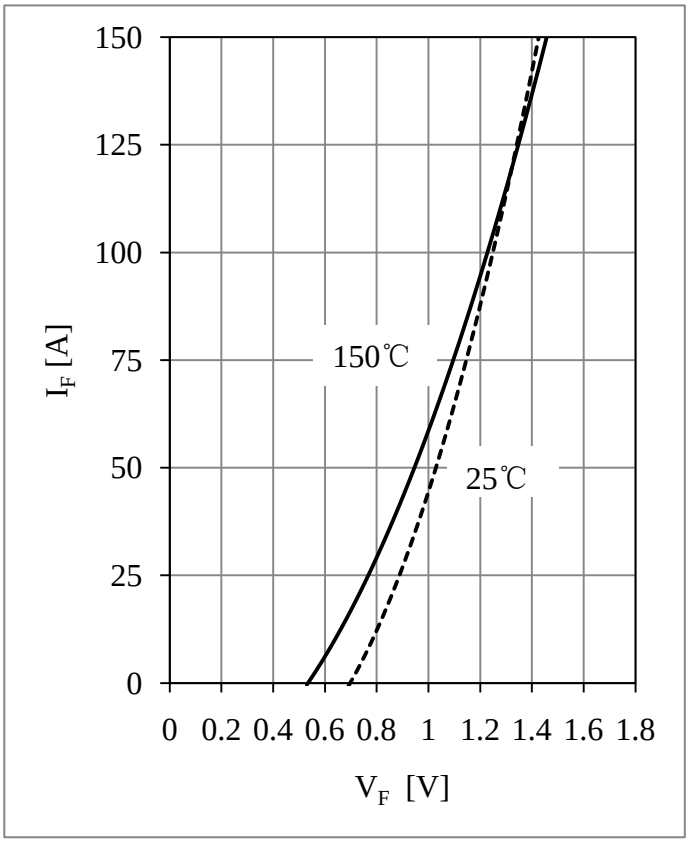


Fig 11. Diode-rectifier Forward Characteristics

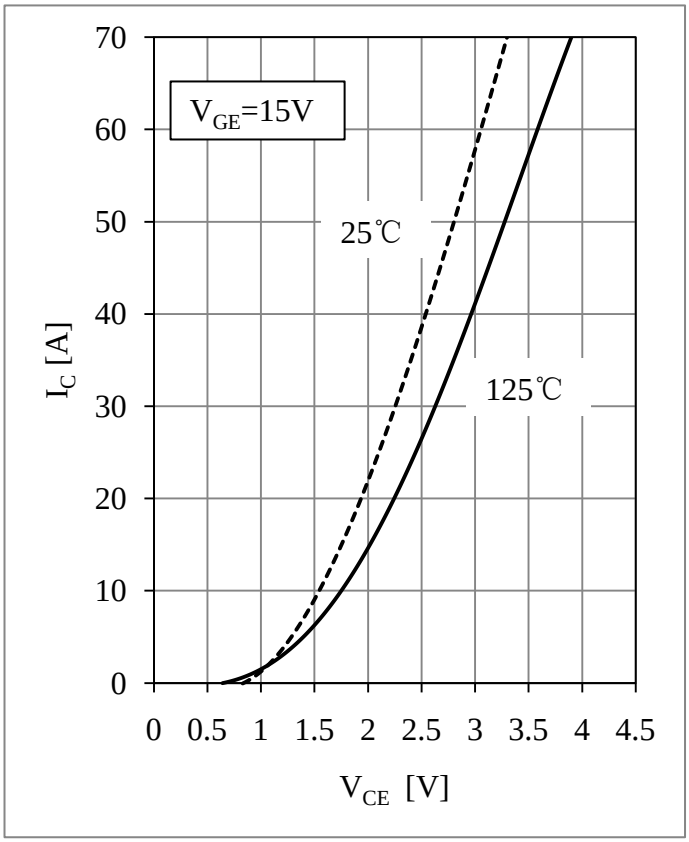


Fig 12. IGBT-brake-chopper Output Characteristics

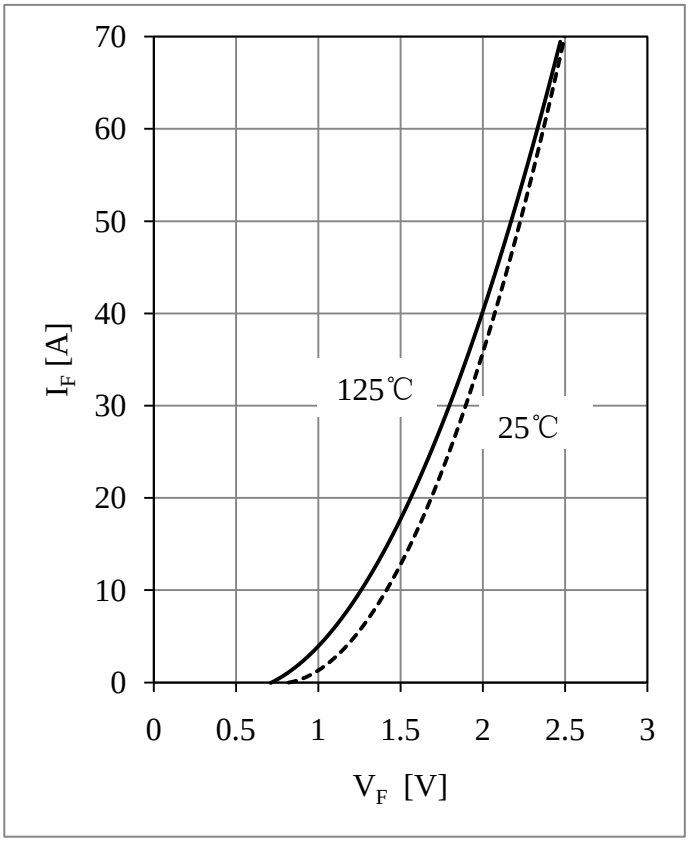


Fig 13. Diode-brake-chopper Forward Characteristics

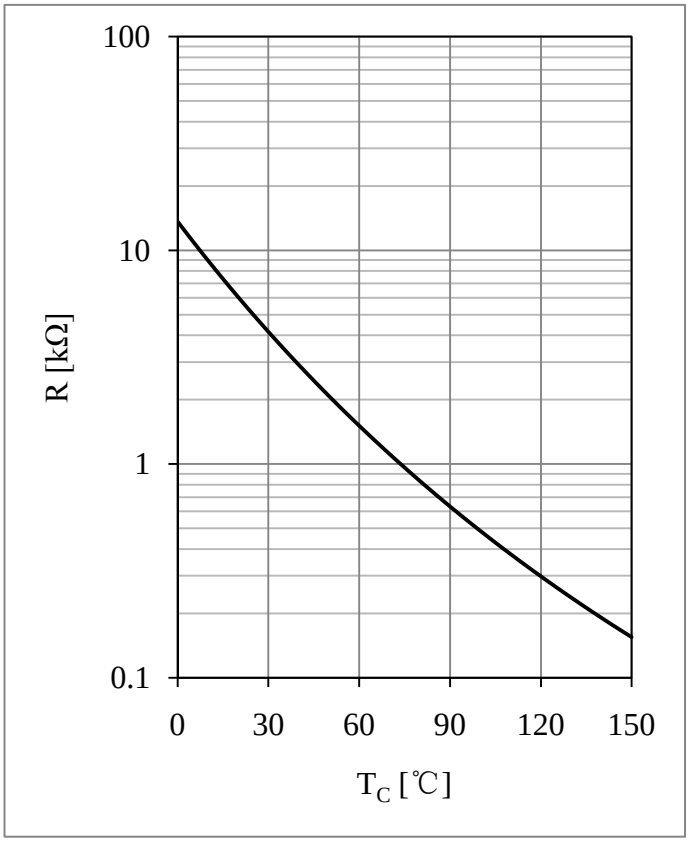
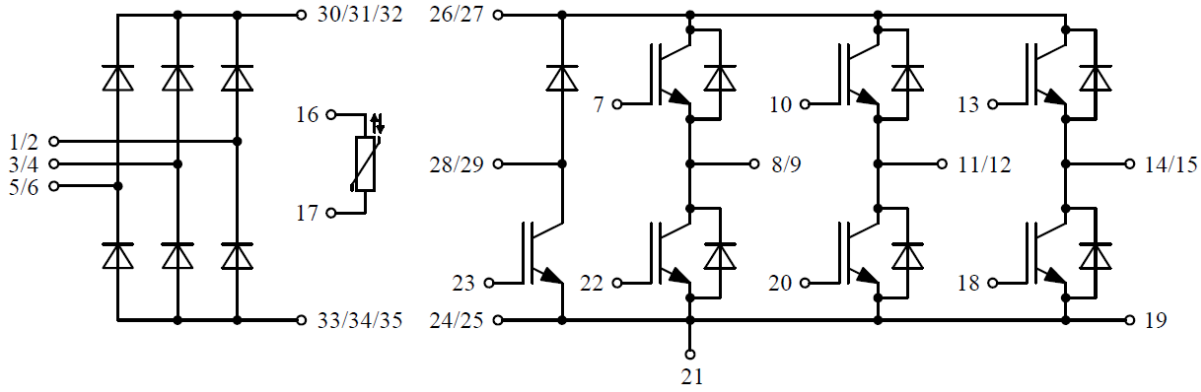


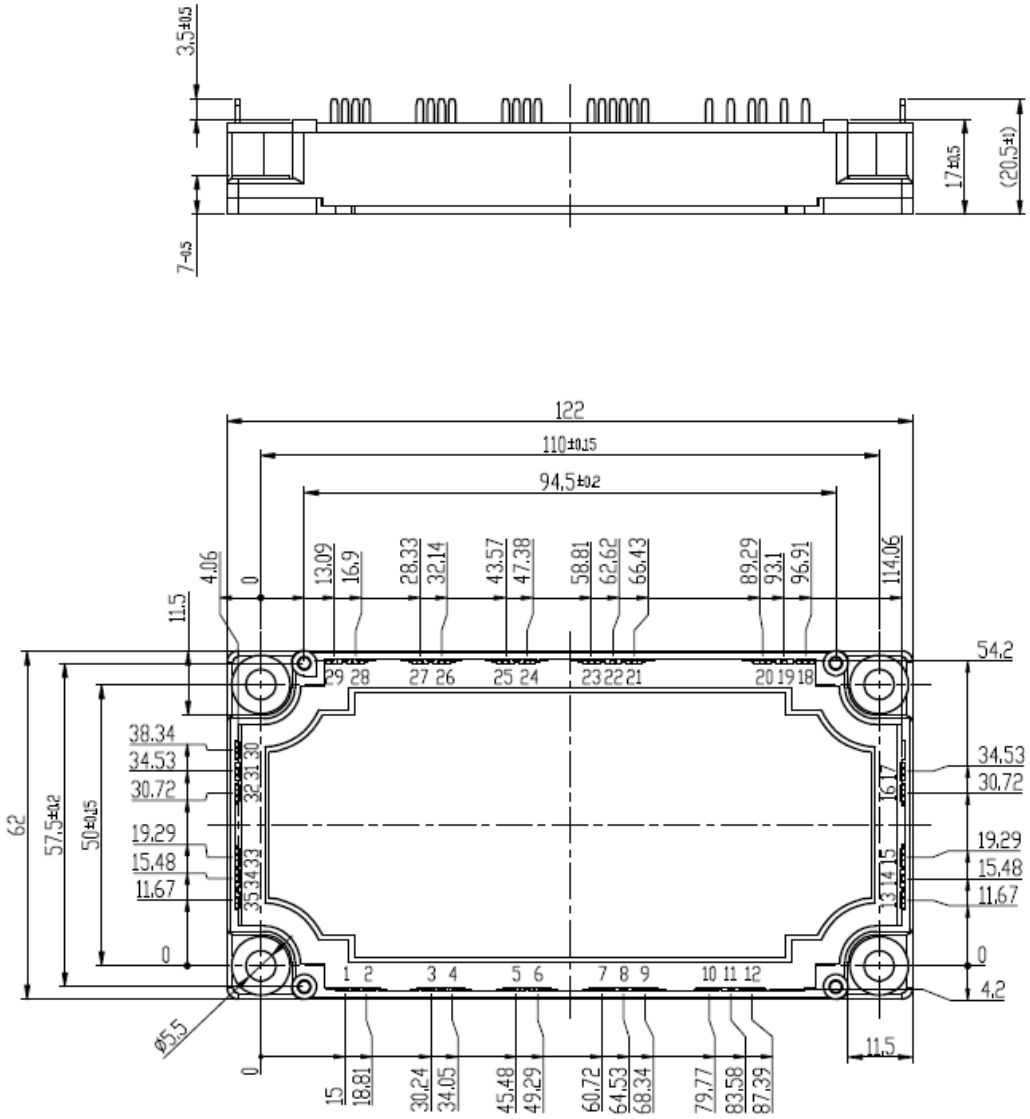
Fig 14. NTC Temperature Characteristic

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.