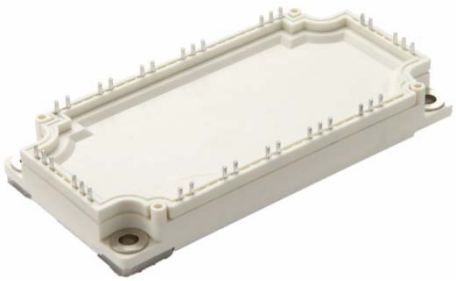
STARPOWER

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
- 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	GD100PIT120C6SN_G8	Units
V_{CES}	Collector-Emitter Voltage @ T_j=25℃	1200	V
V_{GES}	Gate-Emitter Voltage @ T_j=25℃	±30	V
I_C	Collector Current @ T_C=25℃ @ T_C=100℃	155 100	A
I_{CM}	Pulsed Collector Current t_p=1ms	200	A
P_{tot}	Total Power Dissipation @ T_j=175℃	508	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=4.0mA,V_{CE}=V_{GE}, T_j=25℃	5.0	5.7	6.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C=100A,V_{GE}=15V, T_j=25℃		1.70	2.15	V
		I_C=100A,V_{GE}=15V, T_j=125℃		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=4.7Ω,V_{GE}=±15V, T_j=25℃		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=4.7Ω,V_{GE}=±15V, T_j=125℃		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≤10μs,V_{GE}=15V, T_j=125℃,V_{CC}=900V, V_{CEM}≤1200V		400		A

Diode-inverter T_C=25℃ unless otherwise noted

Maximum Rated Values

Symbol	Description	GD100PIT120C6SN_G8	Units
V_{RRM}	Repetitive Peak Reverse Voltage @ T_j=25℃	1200	V
I_F	DC Forward Current	100	A
I_{FRM}	Repetitive Peak Forward Current t_p=1ms	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℃		1.70	2.10	V
			T_j=125℃		1.65		
Q_r	Recovered Charge	I_F=100A, V_R=600V, R_G=4.7Ω, V_{GE}=-15V	T_j=25℃		7.7		μC
			T_j=125℃		14.6		
I_{RM}	Peak Reverse Recovery Current		T_j=25℃		98		A
			T_j=125℃		117		
E_{rec}	Reverse Recovery Energy		T_j=25℃		4.36		mJ
			T_j=125℃		7.74		

Diode-rectifier T_C=25℃ unless otherwise noted

Maximum Rated Values

Symbol	Description	GD100PIT120C6SN_G8	Units
V_{RRM}	Repetitive Peak Reverse Voltage @ T_j=25℃	1600	V
I_F	DC Forward Current @ T_C=80℃	100	A
I_{RMSM}	Maximum RMS Current At Rectifier Output @ T_C=80℃	150	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=100A,T_j=150℃		1.17		V
I_R	Reverse Current	T_j=150℃,V_R=1600V			2.0	mA

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

Maximum Rated Values

Symbol	Description	GD100PIT120C6SN_G8	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℃	100 50	A
I_{CM}	Pulsed Collector Current t_p=1ms	100	A
P_{tot}	Total Power Dissipation @ T_j=175℃	449	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=2.0mA,V_{CE}=V_{GE}, T_j=25℃	5.0	6.2	7.0	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C=50A,V_{GE}=15V, T_j=25℃		1.85	2.30	V
		I_C=50A,V_{GE}=15V, T_j=125℃		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=15Ω,V_{GE}=±15V, T_j=25℃		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=15Ω,V_{GE}=±15V, T_j=125℃		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…+15V		536		nC
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		270		A

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

Maximum Rated Values

Symbol	Description	GD100PIT120C6SN_G8	Units
V_{RRM}	Repetitive Peak Reverse Voltage @ T_j=25℃	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℃		1.78	2.18	V
			T_j=125℃		1.88		
Q_r	Recovered Charge	I_F=25A, V_R=600V, R_G=33Ω, V_{GE}=-15V	T_j=25℃		1.1		μC
			T_j=125℃		3.2		
I_{RM}	Peak Reverse Recovery Current		T_j=25℃		17		A
			T_j=125℃		21		
E_{rec}	Reverse Recovery Energy		T_j=25℃		0.80		mJ
			T_j=125℃		1.38		

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	4000			V
L_{CE}	Stray Inductance		40		nH
$R_{\theta JC}$	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)			0.295 0.505 0.560 0.334 0.946	K/W
$R_{\theta CS}$	Case-to-Sink (per IGBT-inverter) Case-to-Sink (per Diode-inverter) Case-to-Sink (per Diode-rectifier) Case-to-Sink (per IGBT-brake-chopper) Case-to-Sink (per Diode-brake-chopper)		0.125 0.214 0.237 0.141 0.400		K/W
$R_{\theta CS}$	Case-to-Sink (Conductive grease applied)		0.009		K/W
T_{jmax}	Maximum Junction Temperature (inverter,brake) Maximum Junction Temperature(rectifier)			175 150	℃
T_{jop}	Operating Junction Temperature	-40		150	℃
T_{STG}	Storage Temperature Range	-40		125	℃
M	Mounting Torque, Screw:M5	3.0		6.0	N.m
G	Weight of Module		300		g

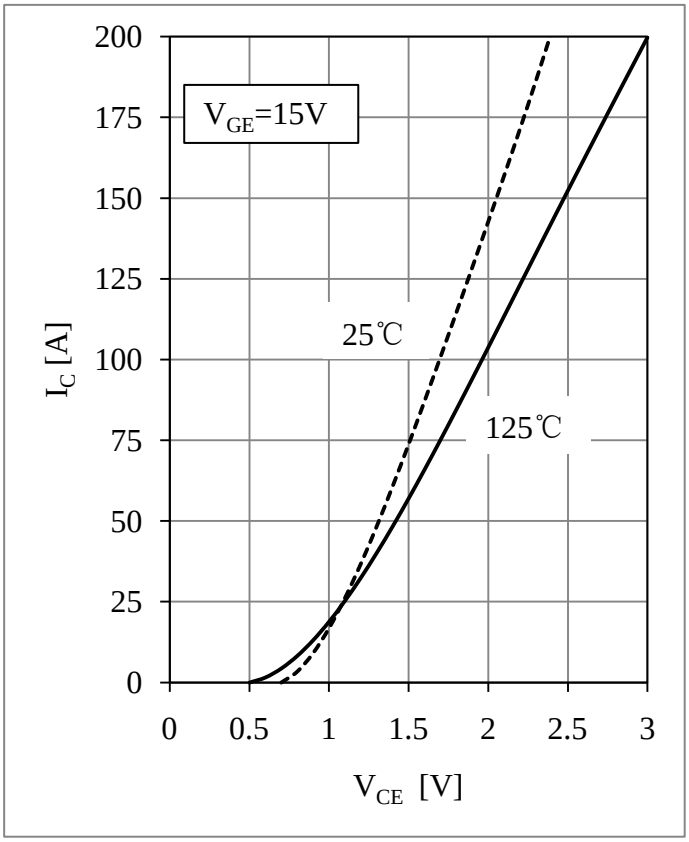


Fig 1. IGBT-inverter Output Characteristics

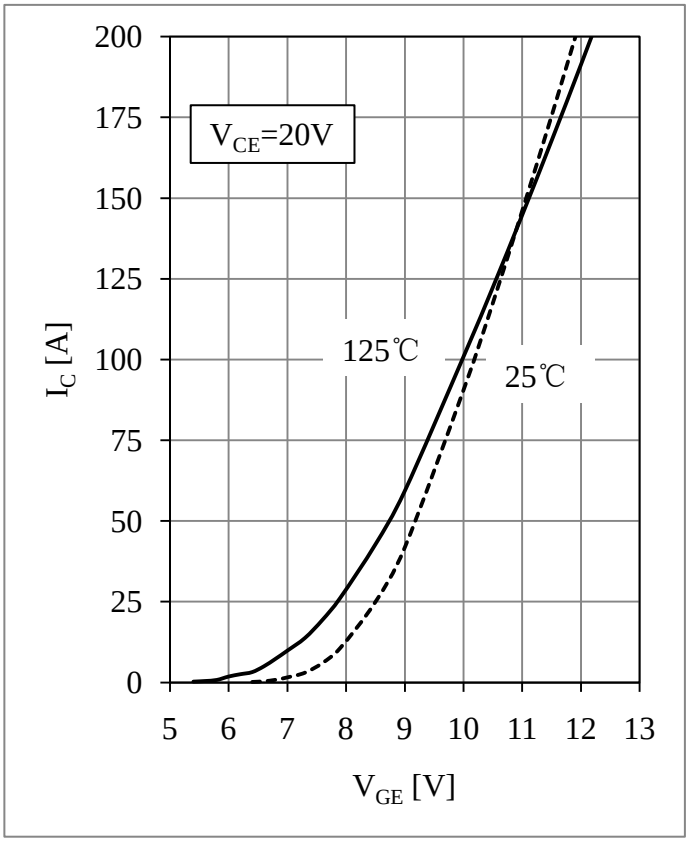


Fig 2. IGBT-inverter Transfer Characteristics

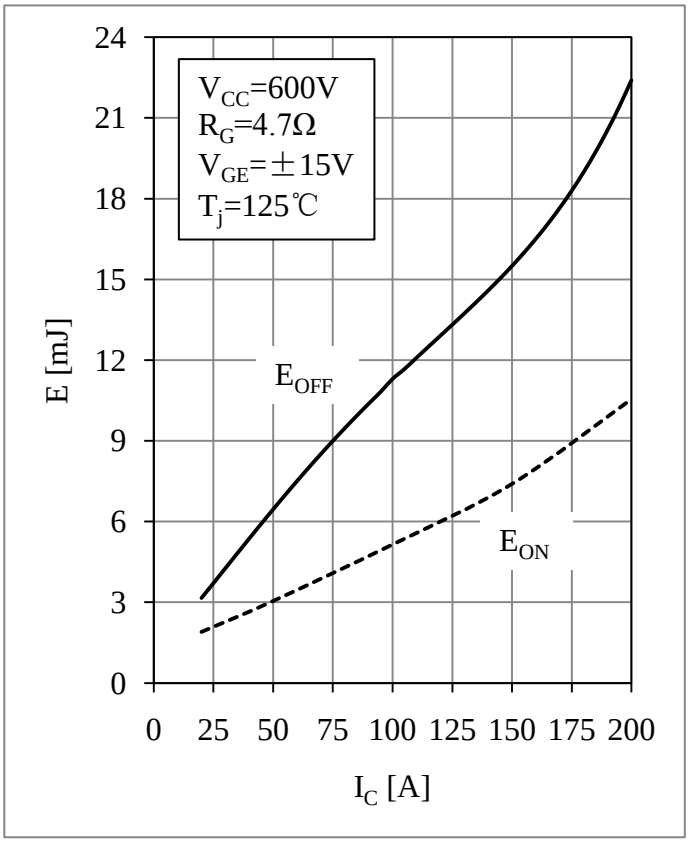


Fig 3. IGBT-inverter Switching Loss vs. I_C

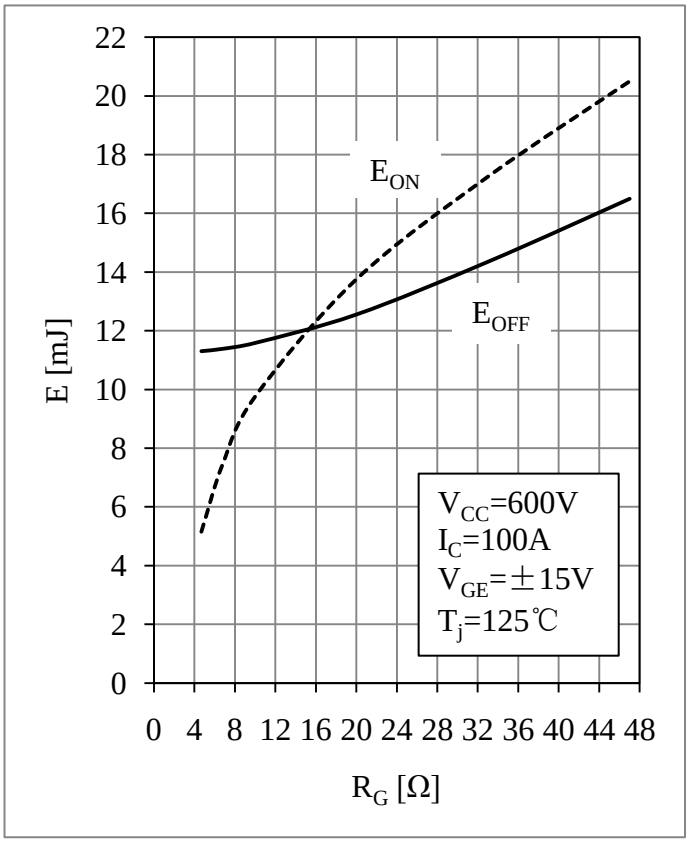


Fig 4. IGBT-inverter Switching Loss vs. R_G

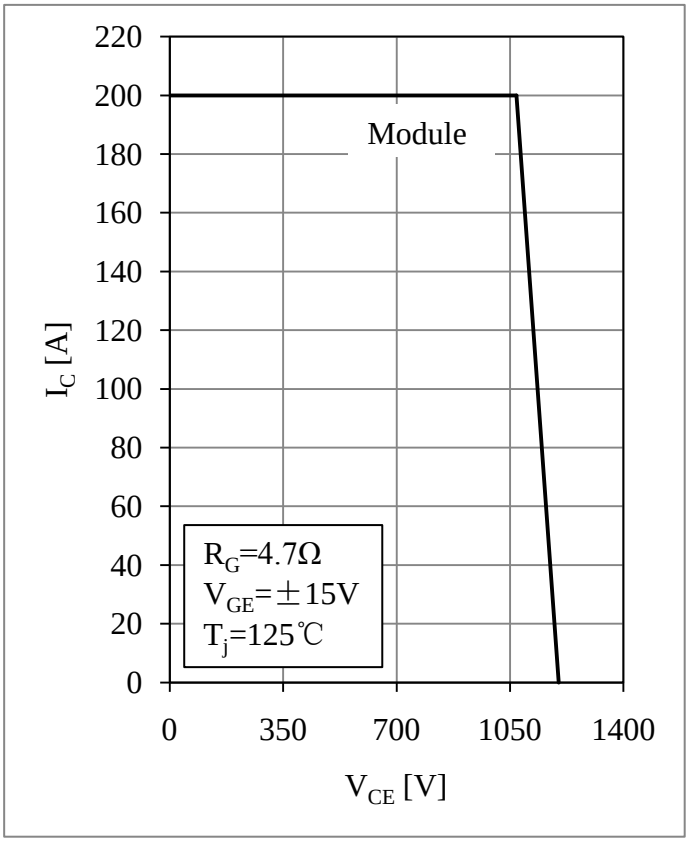


Fig 5. IGBT-inverter RBSOA

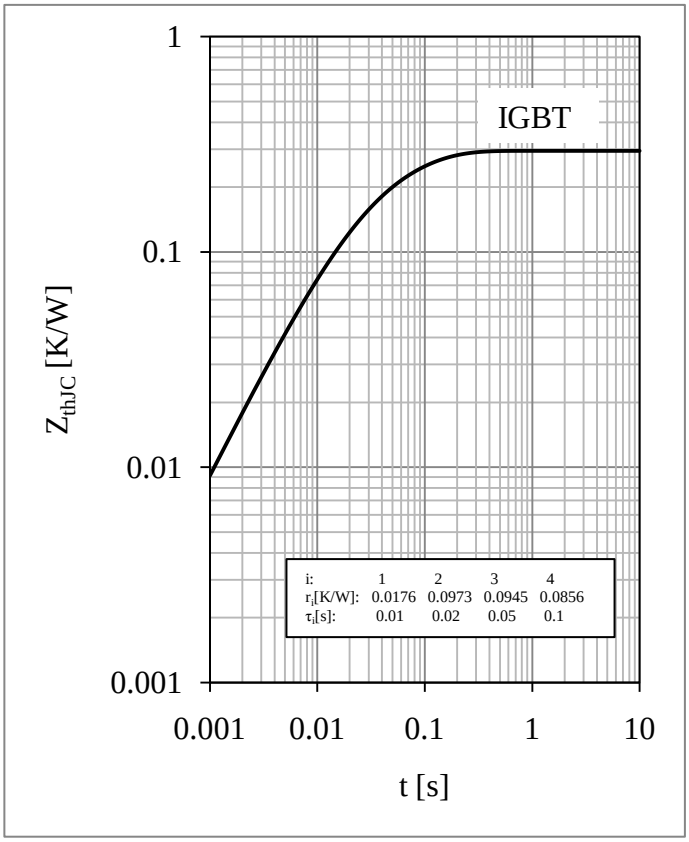


Fig 6. IGBT-inverter Transient Thermal Impedance

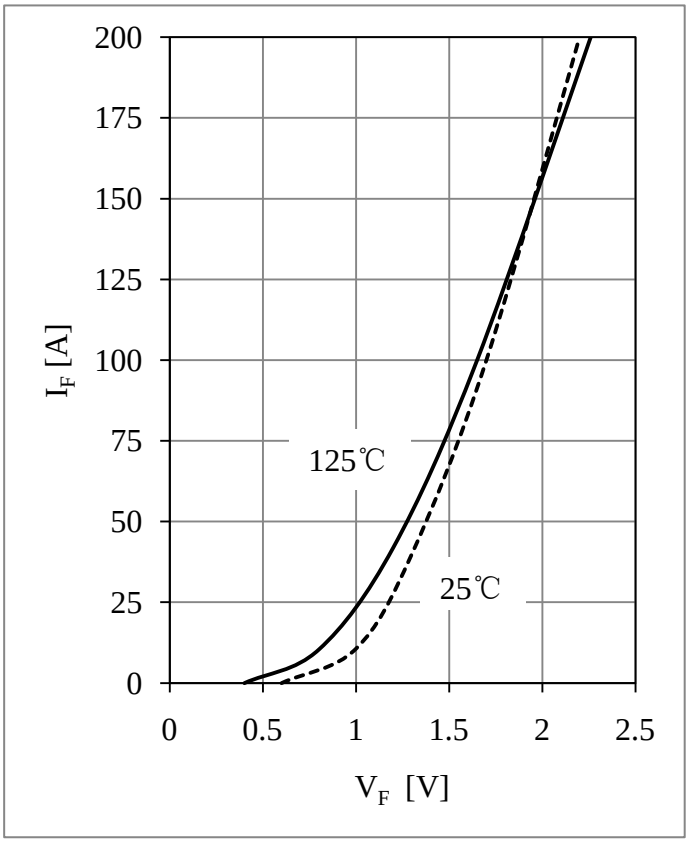


Fig 7. Diode-inverter Forward Characteristics

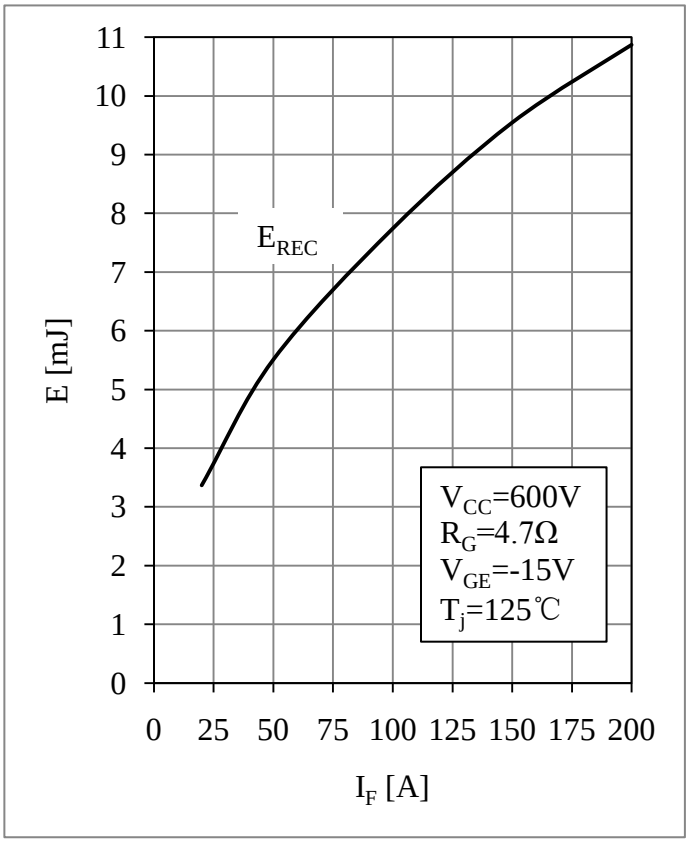


Fig 8. Diode-inverter Switching Loss vs. I_F

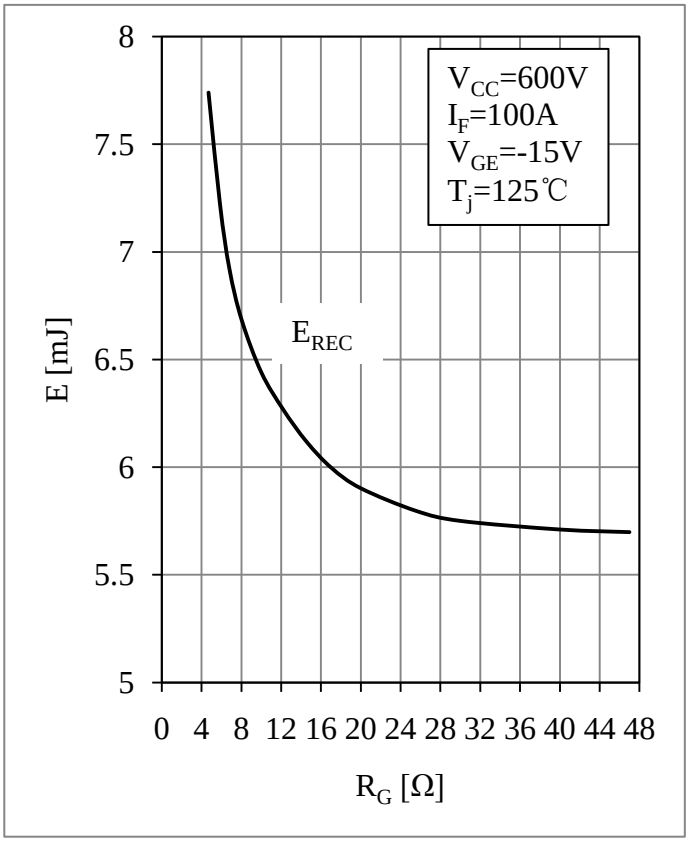


Fig 9. Diode-inverter Switching Loss vs. R_G

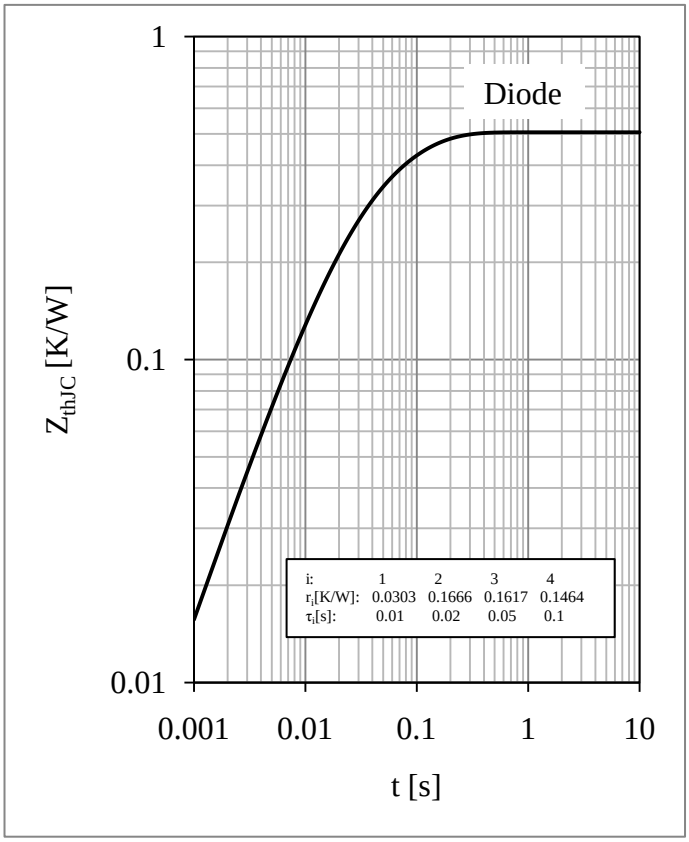


Fig 10. Diode-inverter Transient Thermal Impedance

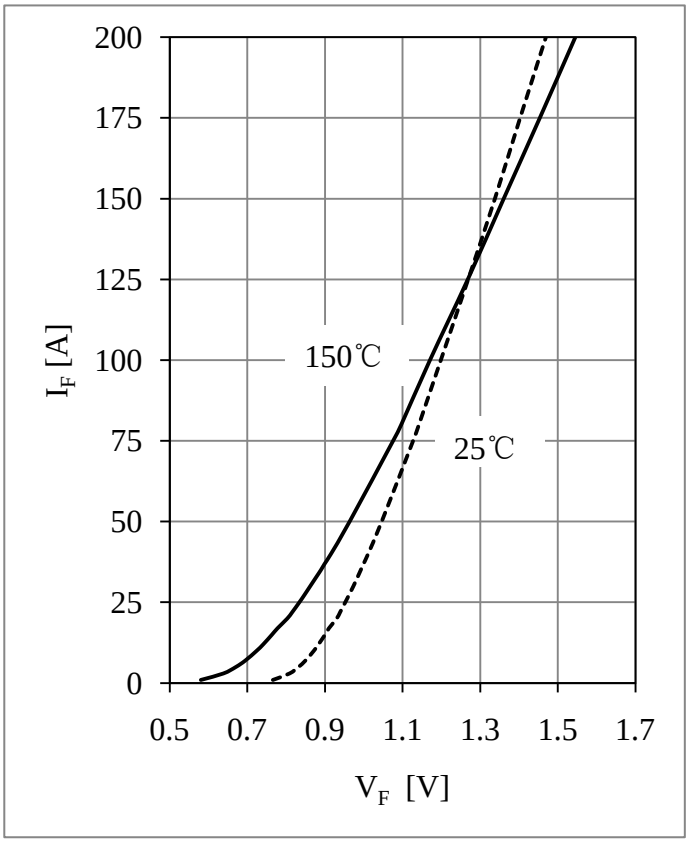


Fig 11. Diode-rectifier Forward Characteristics

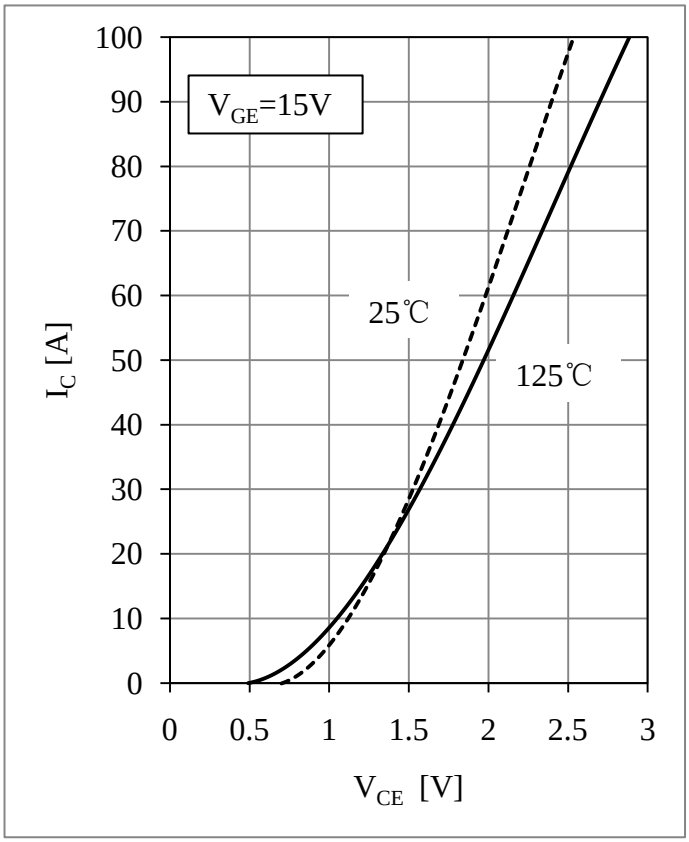


Fig 12. IGBT-brake-chopper Output Characteristics

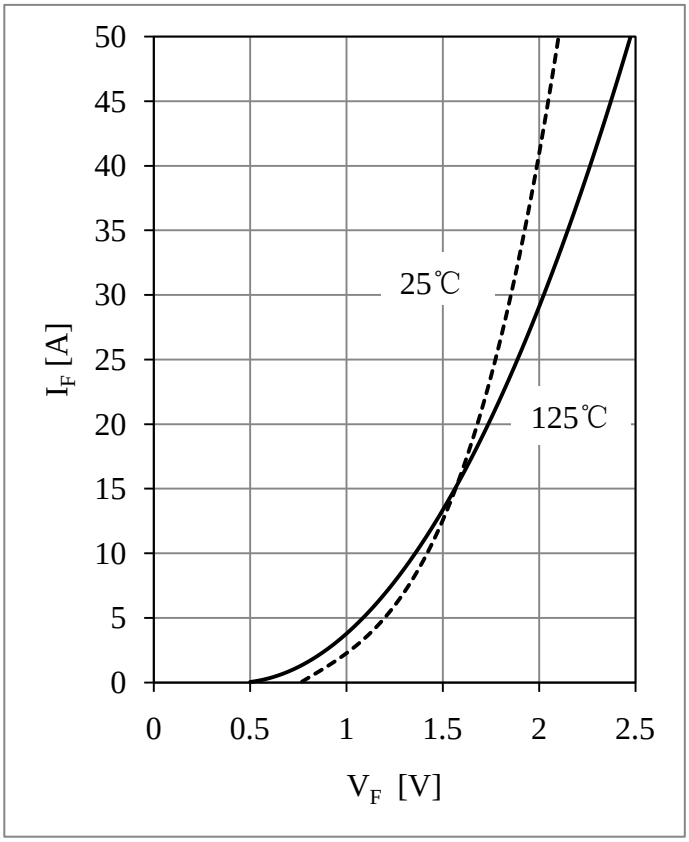


Fig 13. Diode-brake-chopper Forward Characteristics

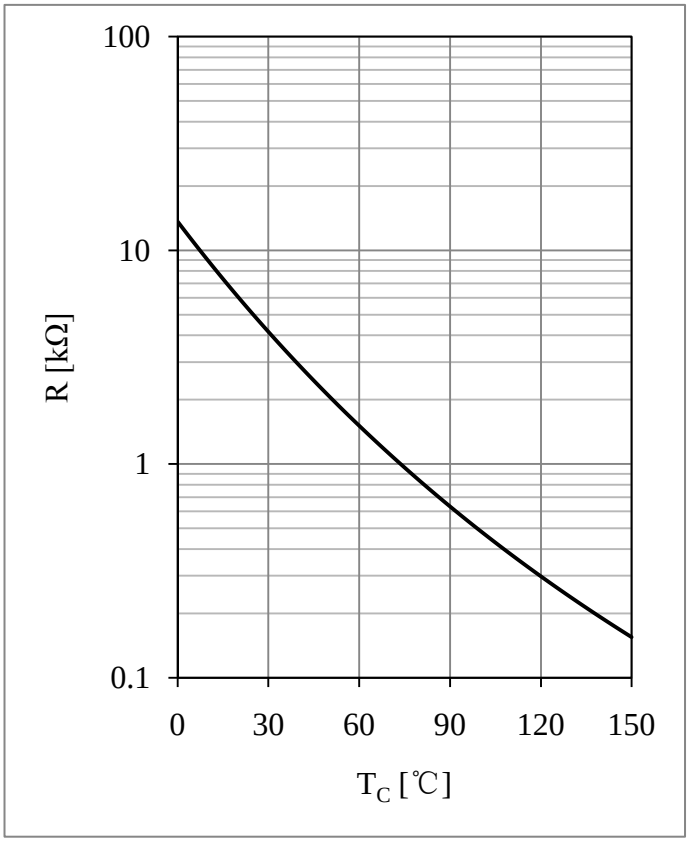
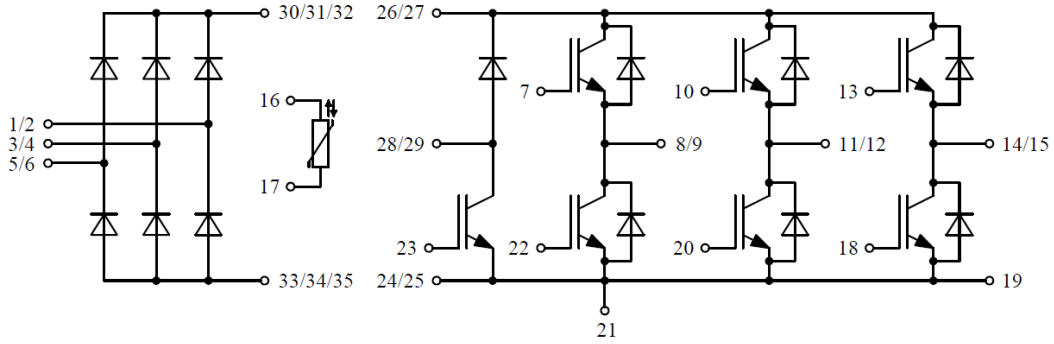


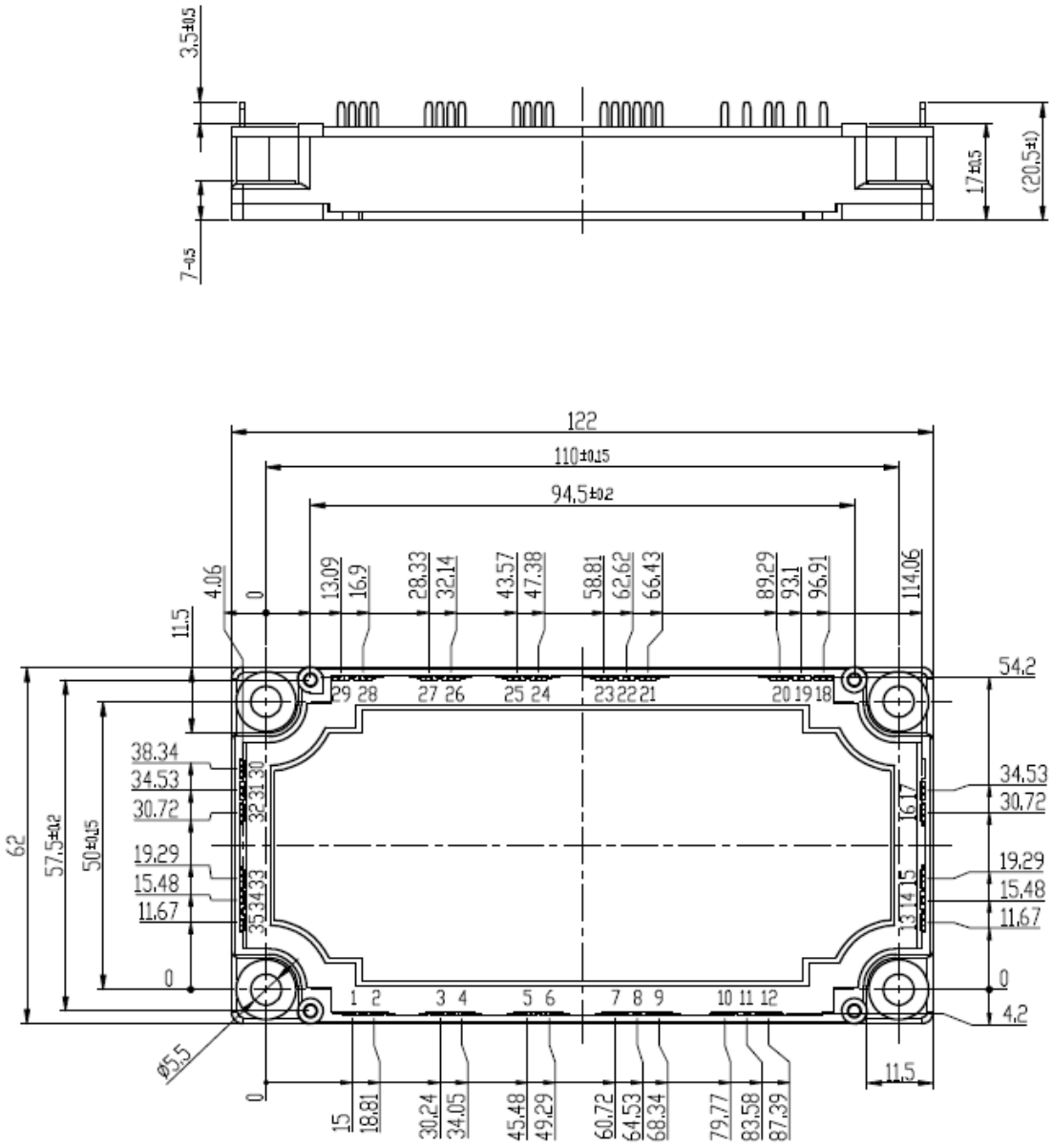
Fig 14. NTC Temperature Characteristic

Equivalent Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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