TAVAKOL ELECTRONIC
توکل الکترونیک
مرجع تخصصی تأمین قطعات الکترونیکی اورجینال
این دیتاشیت توسط توکل الکترونیک تهیه و ارائه شده است.
جهت مشاهده قیمت، موجودی و ثبت سفارش این قطعه به وب‌سایت توکل الکترونیک مراجعه فرمایید.
مشاهده قیمت و خرید
برای خرید و مشاهده سایر محصولات کلیک کنید

STARPOWER

SEMICONDUCTOR **IGBT**

GD40PIT120C5S

1200V/40A 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.

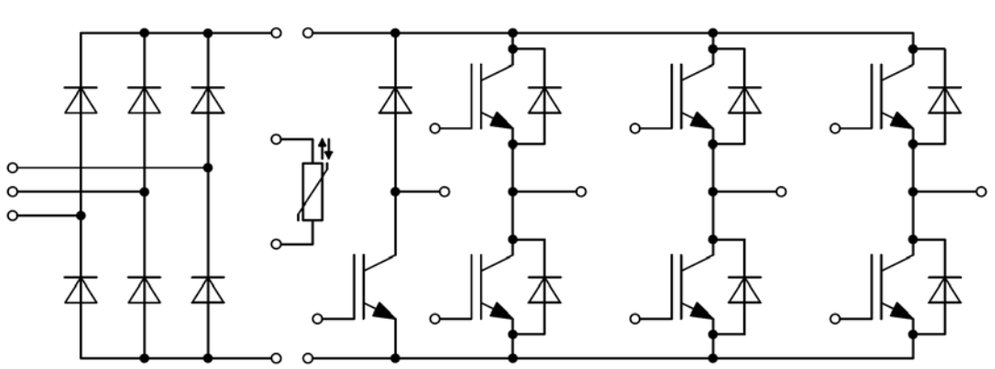
Features

- Low $V_{CE(sat)}$ Trench IGBT technology
- 10μs short circuit capability
- $V_{CE(sat)}$ with positive temperature coefficient
- Maximum junction temperature 175°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-inverter

Symbol	Description	Value	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	72 40	A
I_{CM}	Pulsed Collector Current t_p=1ms	80	A
P_D	Maximum Power Dissipation @ T_j=175°C	280	W

Diode-inverter

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1200	V
I_F	Diode Continuous Forward Current	40	A
I_{FM}	Diode Maximum Forward Current t_p=1ms	80	A

Diode-rectifier

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1600	V
I_O	Average Output Current 50Hz/60Hz,sine wave	40	A
I_{FSM}	Surge Forward Current V_R=0V,t_p=10ms,T_j=45°C	600	A
I^2t	I^2t-value,V_R=0V,t_p=10ms,T_j=45°C	1800	A^2s

IGBT-brake

Symbol	Description	Value	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	30 15	A
I_{CM}	Pulsed Collector Current t_p=1ms	30	A
P_D	Maximum Power Dissipation @ T_j=175°C	145	W

Diode-brake

Symbol	Description	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	1200	V
I_F	Diode Continuous Forward Current	15	A
I_{FM}	Diode Maximum Forward Current t_p=1ms	30	A

Module

Symbol	Description	Values	Unit
T_{jmax}	Maximum Junction Temperature(inverter,brake) Maximum Junction Temperature (rectifier)	175 150	°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-inverter 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=40A,V_{GE}=15V, T_j=25°C		1.70	2.15	V
		I_C=40A,V_{GE}=15V, T_j=125°C		1.95		
		I_C=40A,V_{GE}=15V, T_j=150°C		2.00		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=1.00mA,V_{CE}=V_{GE}, T_j=25°C	5.2	6.0	6.8	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			100	nA
R_{Gint}	Internal Gate Resistance			0		Ω
C_{ies}	Input Capacitance	V_{CE}=25V,f=1MHz, V_{GE}=0V		4.14		nF
C_{res}	Reverse Transfer Capacitance			0.12		nF
Q_G	Gate Charge	V_{GE}=-15…+15V		0.31		μC
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=40A, R_G=12Ω,V_{GE}=±15V, T_j=25°C		145		ns
t_r	Rise Time			28		ns
$t_{d(off)}$	Turn-Off Delay Time			194		ns
t_f	Fall Time			295		ns
E_{on}	Turn-On Switching Loss			1.89		mJ
E_{off}	Turn-Off Switching Loss			2.31		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=40A, R_G=12Ω,V_{GE}=±15V, T_j=125°C		146		ns
t_r	Rise Time			30		ns
$t_{d(off)}$	Turn-Off Delay Time			208		ns
t_f	Fall Time			466		ns
E_{on}	Turn-On Switching Loss			2.31		mJ
E_{off}	Turn-Off Switching Loss			3.51		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=40A, R_G=12Ω,V_{GE}=±15V, T_j=150°C		148		ns
t_r	Rise Time			32		ns
$t_{d(off)}$	Turn-Off Delay Time			212		ns
t_f	Fall Time			480		ns
E_{on}	Turn-On Switching Loss			2.45		mJ
E_{off}	Turn-Off Switching Loss			3.69		mJ
I_{SC}	SC Data	t_P≤10μs,V_{GE}=15V, T_j=150°C,V_{CC}=900V, V_{CEM}≤1200V		160		A

Diode-inverter Characteristics T_C=25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_F	Diode Forward Voltage	I_F=40A,V_{GE}=0V,T_j=25°C		2.00	2.45	V
		I_F=40A,V_{GE}=0V,T_j=125°C		1.90		
		I_F=40A,V_{GE}=0V,T_j=150°C		1.88		
Q_r	Recovered Charge	V_R=600V,I_F=40A, -di/dt=1100A/μs,V_{GE}=-15V T_j=25°C		1.8		μC
I_{RM}	Peak Reverse Recovery Current			40		A
E_{rec}	Reverse Recovery Energy			0.93		mJ
Q_r	Recovered Charge	V_R=600V,I_F=40A, -di/dt=1100A/μs,V_{GE}=-15V T_j=125°C		2.9		μC
I_{RM}	Peak Reverse Recovery Current			47		A
E_{rec}	Reverse Recovery Energy			2.19		mJ
Q_r	Recovered Charge	V_R=600V,I_F=40A, -di/dt=1100A/μs,V_{GE}=-15V T_j=150°C		3.2		μC
I_{RM}	Peak Reverse Recovery Current			49		A
E_{rec}	Reverse Recovery Energy			2.56		mJ

Diode-rectifier Characteristics T_C=25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_F	Diode Forward Voltage	I_F=40A,V_{GE}=0V,T_j=150°C		1.06		V
I_R	Reverse Current	T_j=150°C,V_R=1600V			3.0	mA

IGBT-brake 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=15A,V_{GE}=15V, T_j=25°C		1.70	2.15	V
		I_C=15A,V_{GE}=15V, T_j=125°C		1.95		
		I_C=15A,V_{GE}=15V, T_j=150°C		2.00		
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=0.38mA,V_{CE}=V_{GE}, T_j=25°C	5.2	6.0	6.8	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			0		Ω
C_{ies}	Input Capacitance	V_{CE}=25V,f=1MHz, V_{GE}=0V		1.55		nF
C_{res}	Reverse Transfer Capacitance			0.04		nF
Q_G	Gate Charge	V_{GE}=-15…+15V		0.12		μC
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=15A, R_G=39Ω,V_{GE}=±15V, T_j=25°C		59		ns
t_r	Rise Time			63		ns
$t_{d(off)}$	Turn-Off Delay Time			201		ns
t_f	Fall Time			149		ns
E_{on}	Turn-On Switching Loss			1.39		mJ
E_{off}	Turn-Off Switching Loss			0.85		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=15A, R_G=39Ω,V_{GE}=±15V, T_j=125°C		59		ns
t_r	Rise Time			70		ns
$t_{d(off)}$	Turn-Off Delay Time			283		ns
t_f	Fall Time			196		ns
E_{on}	Turn-On Switching Loss			1.87		mJ
E_{off}	Turn-Off Switching Loss			1.24		mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC}=600V,I_C=15A, R_G=39Ω,V_{GE}=±15V, T_j=150°C		59		ns
t_r	Rise Time			70		ns
$t_{d(off)}$	Turn-Off Delay Time			288		ns
t_f	Fall Time			221		ns
E_{on}	Turn-On Switching Loss			2.09		mJ
E_{off}	Turn-Off Switching Loss			1.39		mJ
I_{SC}	SC Data	t_P≤10μs,V_{GE}=15V, T_j=150°C,V_{CC}=900V, V_{CEM}≤1200V		60		A

Diode-brake Characteristics T_C=25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_F	Diode Forward Voltage	I_F=15A,V_{GE}=0V,T_j=25°C		2.05	2.50	V
		I_F=15A,V_{GE}=0V,T_j=125°C		2.20		
		I_F=15A,V_{GE}=0V,T_j=150°C		2.25		
Q_r	Recovered Charge	V_R=600V,I_F=15A, -di/dt=260A/μs,V_{GE}=-15V T_j=25°C		0.7		μC
I_{RM}	Peak Reverse Recovery Current			11		A
E_{rec}	Reverse Recovery Energy			0.54		mJ
Q_r	Recovered Charge	V_R=600V,I_F=15A, -di/dt=260A/μs,V_{GE}=-15V T_j=125°C		2.4		μC
I_{RM}	Peak Reverse Recovery Current			13		A
E_{rec}	Reverse Recovery Energy			1.00		mJ
Q_r	Recovered Charge	V_R=600V,I_F=15A, -di/dt=260A/μs,V_{GE}=-15V T_j=150°C		2.6		μC
I_{RM}	Peak Reverse Recovery Current			13		A
E_{rec}	Reverse Recovery Energy			1.12		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		60		nH
$R_{CC'+EE'}$ $R_{AA'+CC'}$	Module Lead Resistance,Terminal to Chip		4.00 3.00		mΩ
R_{thJC}	Junction-to-Case (per IGBT-inverter) Junction-to-Case (per Diode-inverter) Junction-to-Case (per Diode-rectifier) Junction-to-Case (per IGBT-brake) Junction-to-Case (per Diode-brake)			0.535 1.068 0.914 1.029 1.760	K/W
R_{thCH}	Case-to-Heatsink (per IGBT-inverter) Case-to-Heatsink (per Diode-inverter) Case-to-Heatsink (per Diode-rectifier) Case-to-Heatsink (per IGBT-brake) Case-to-Heatsink (per Diode-brake) Case-to-Heatsink (per Module)		0.267 0.533 0.456 0.513 0.878 0.020		K/W
M	Mounting Torque, Screw:M5	3.0		6.0	N.m
G	Weight of Module		200		g

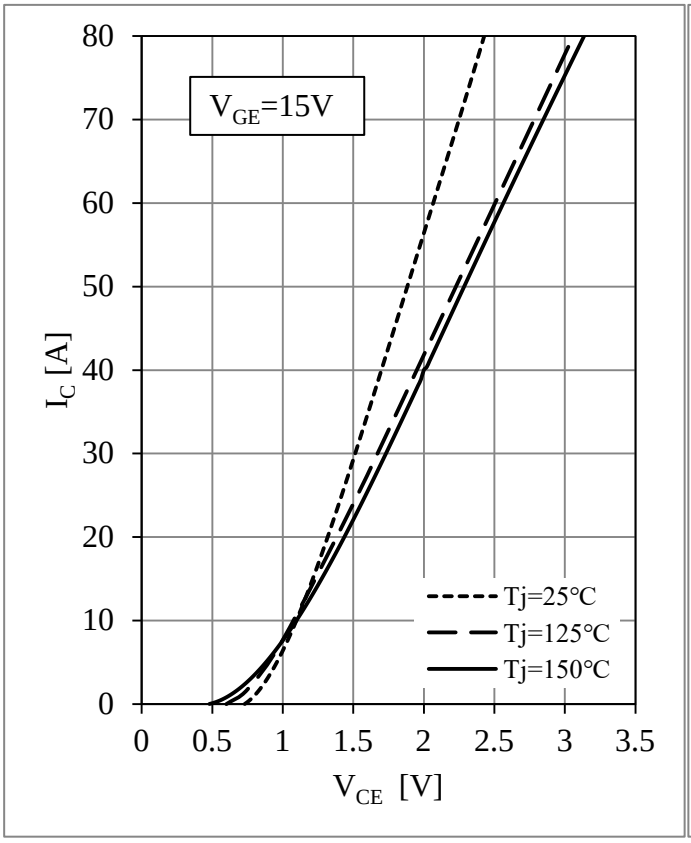


Fig 1. IGBT-inverter Output Characteristics

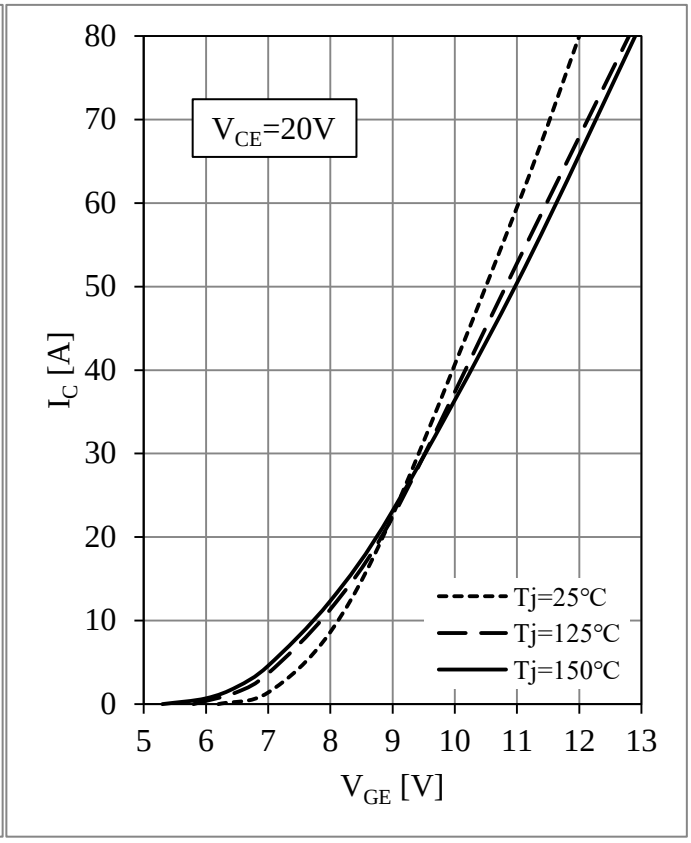


Fig 2. IGBT-inverter Transfer Characteristics

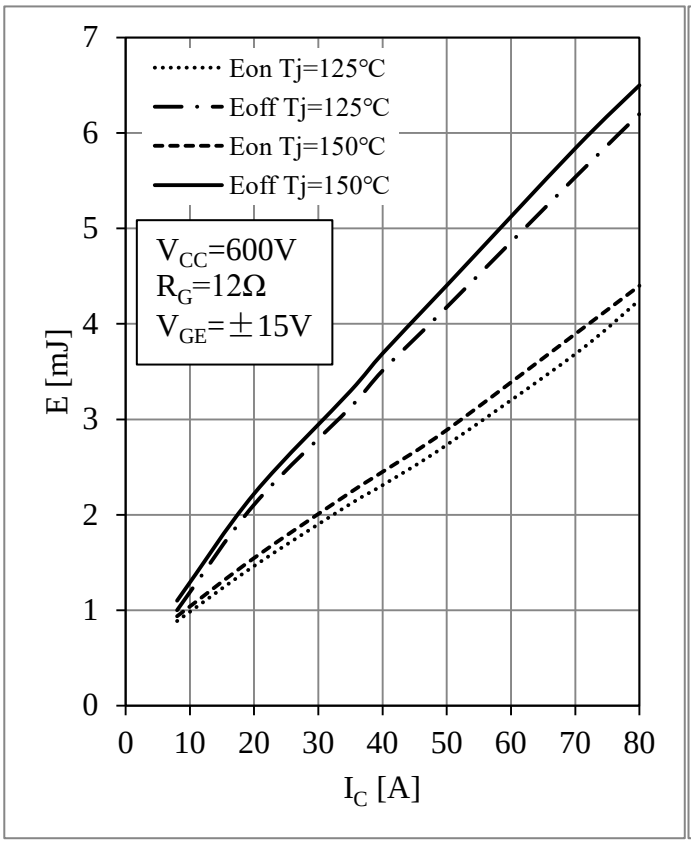


Fig 3. IGBT-inverter Switching Loss vs. I_C

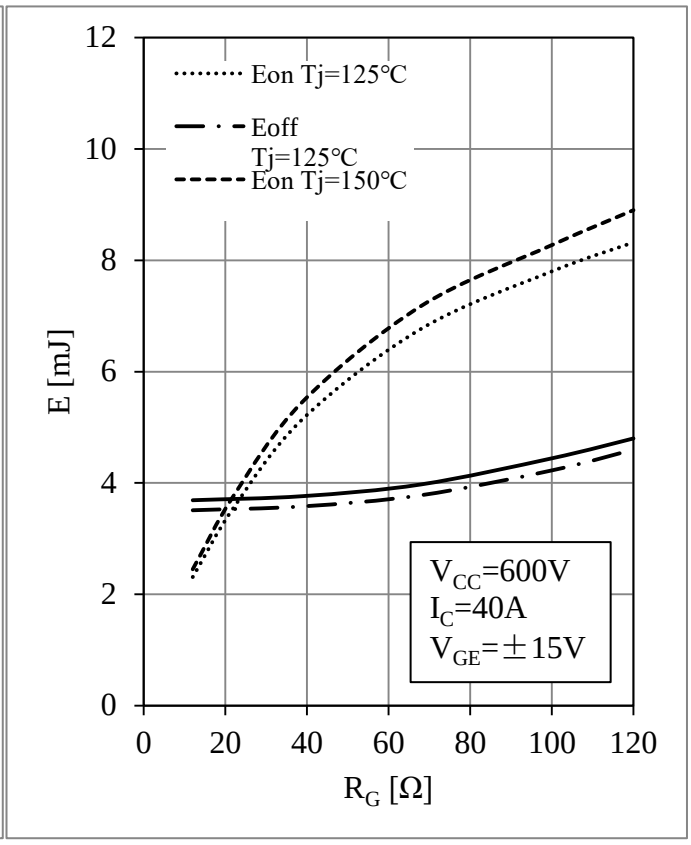


Fig 4. IGBT-inverter Switching Loss vs. R_G

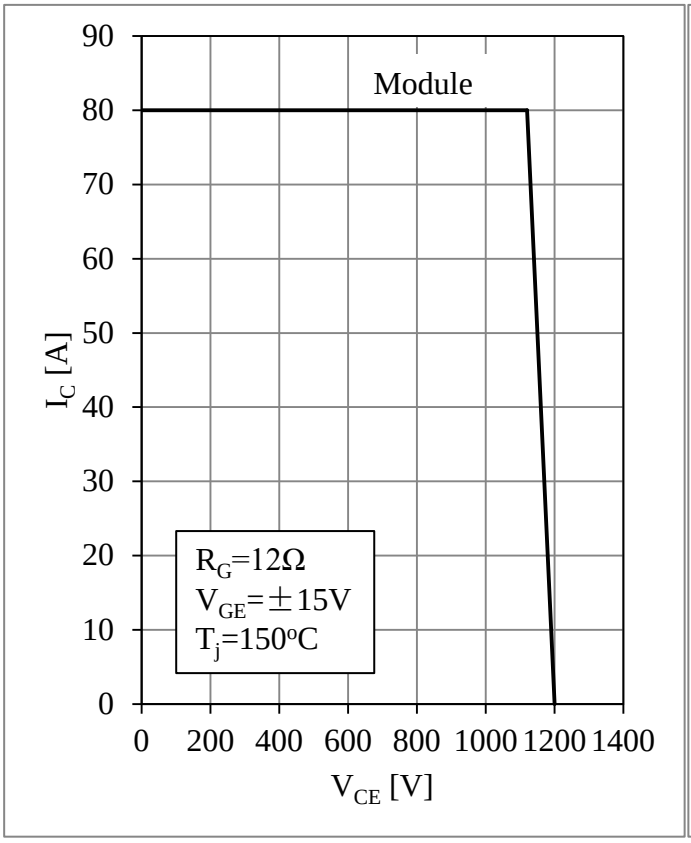


Fig 5. IGBT-inverter RBSOA

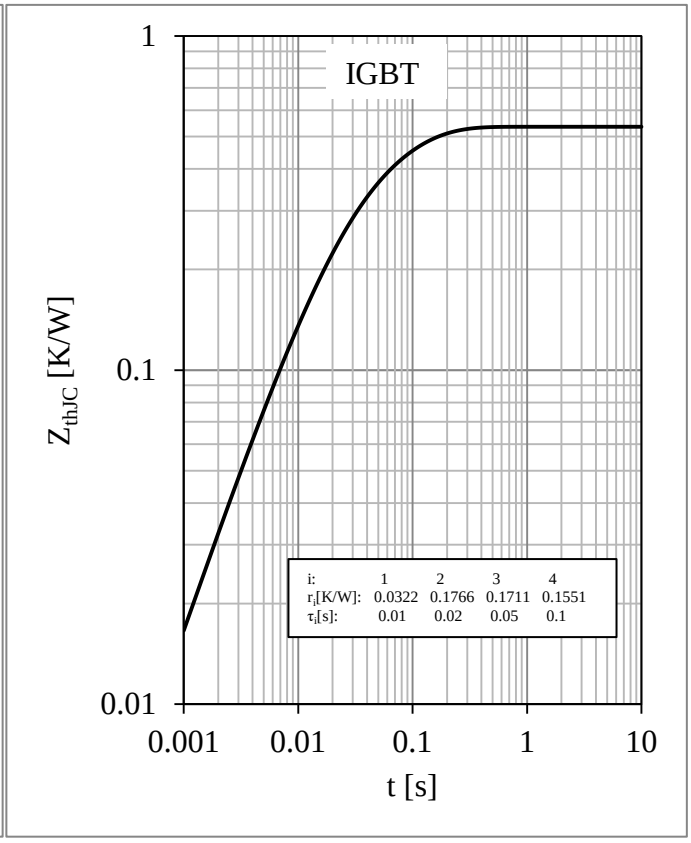


Fig 6. IGBT-inverter Transient Thermal Impedance

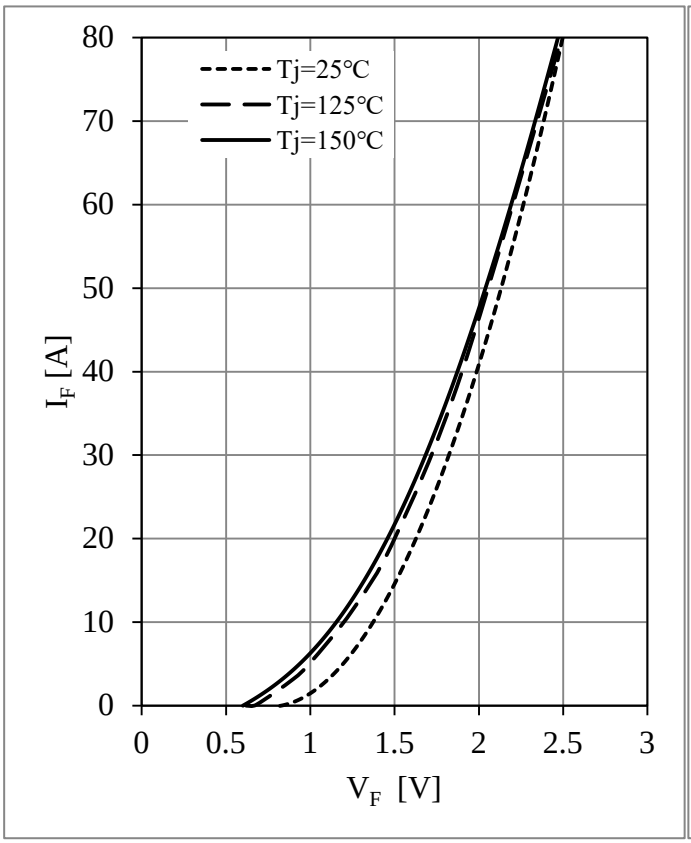


Fig 7. Diode-inverter Forward Characteristics

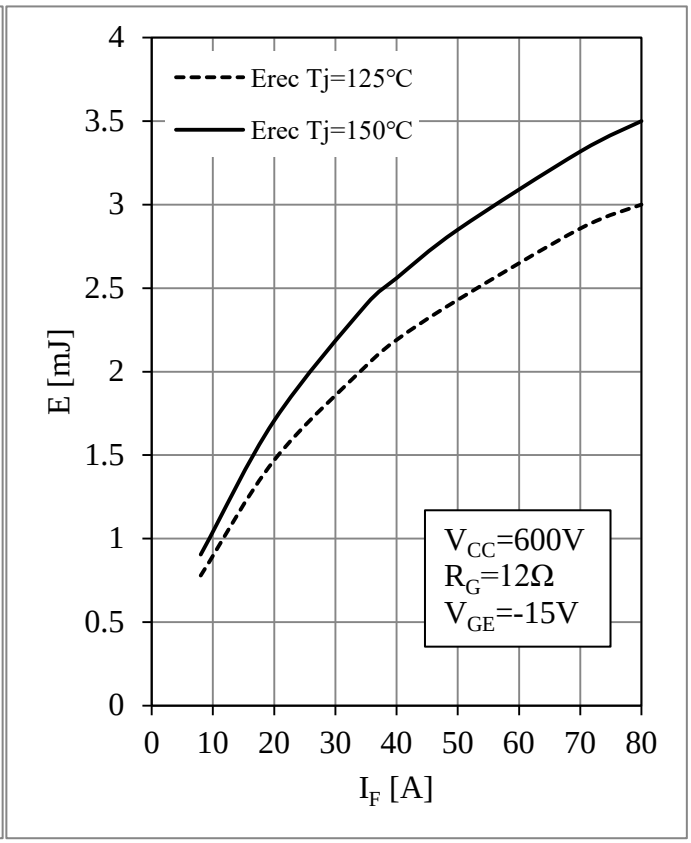


Fig 8. Diode-inverter Switching Loss vs. I_F

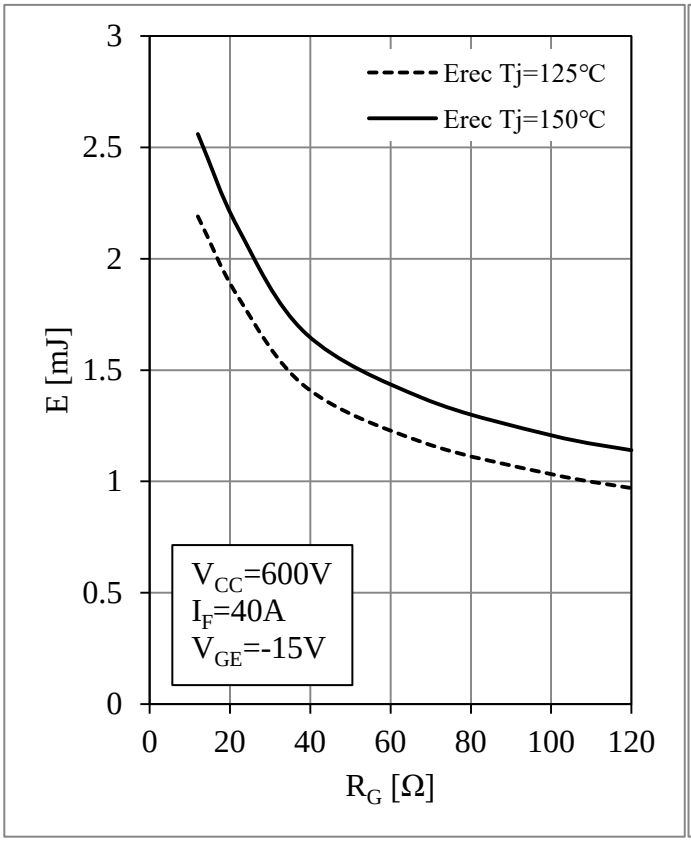


Fig 9. Diode-inverter Switching Loss vs. R_G

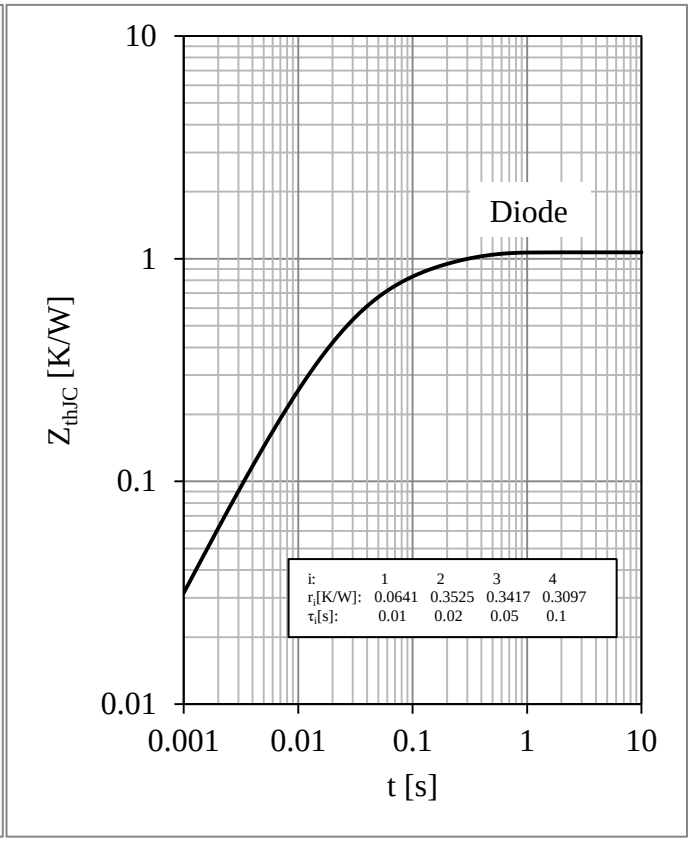


Fig 10. Diode-inverter Transient Thermal Impedance

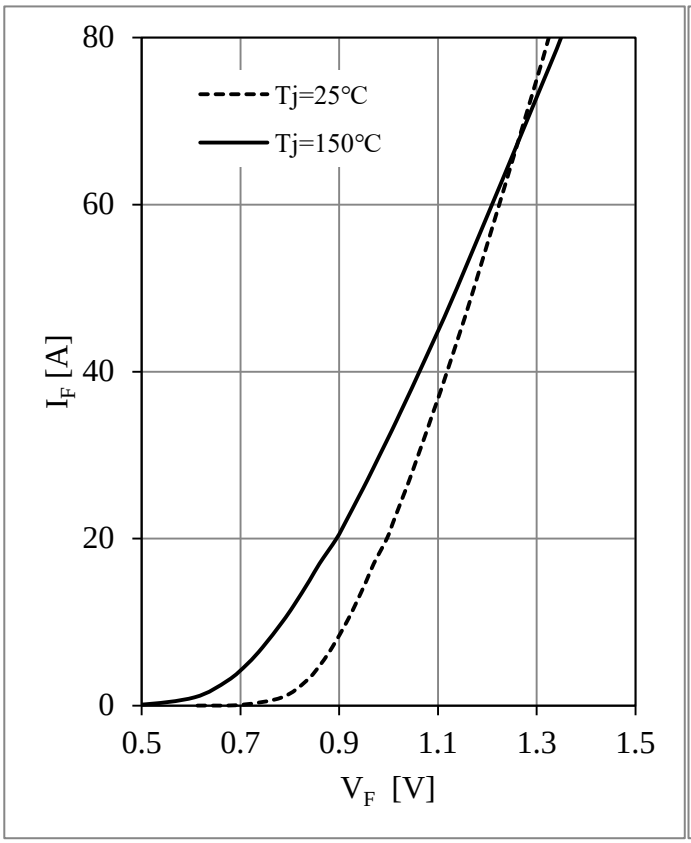


Fig 11. Diode-rectifier Forward Characteristics

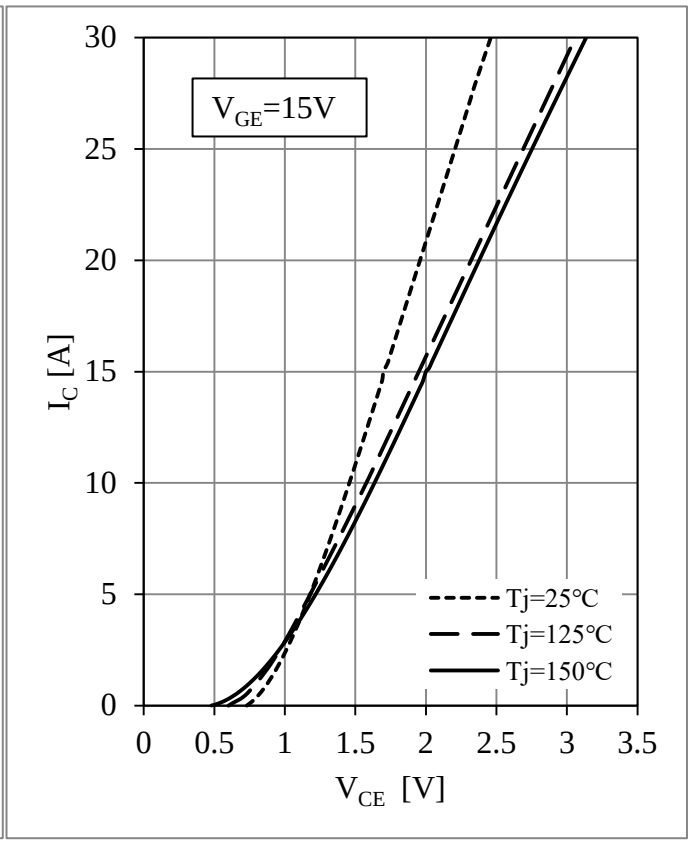


Fig 12. IGBT-brake-chopper Output Characteristics

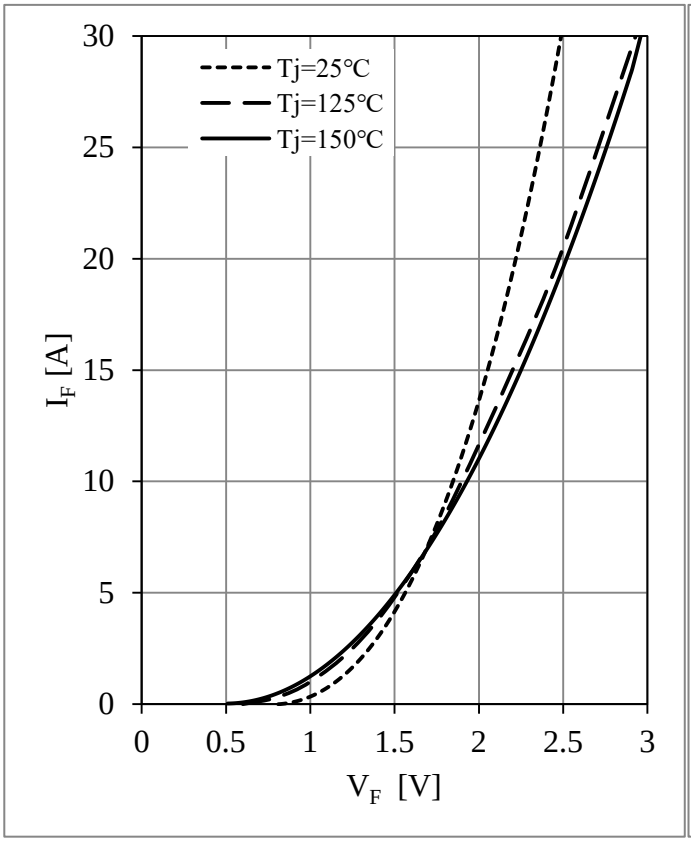


Fig 13. Diode-brake-chopper Forward Characteristics

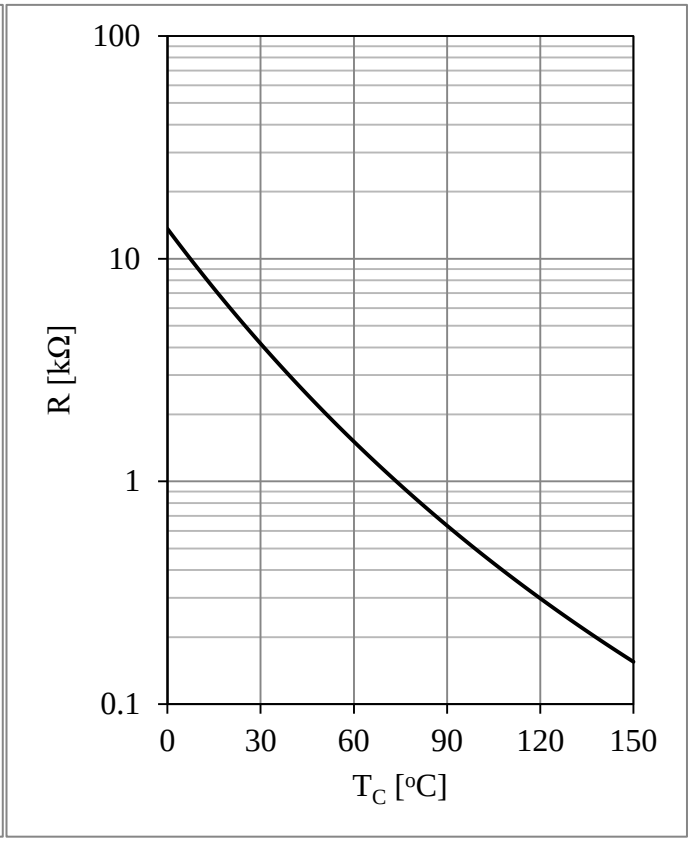
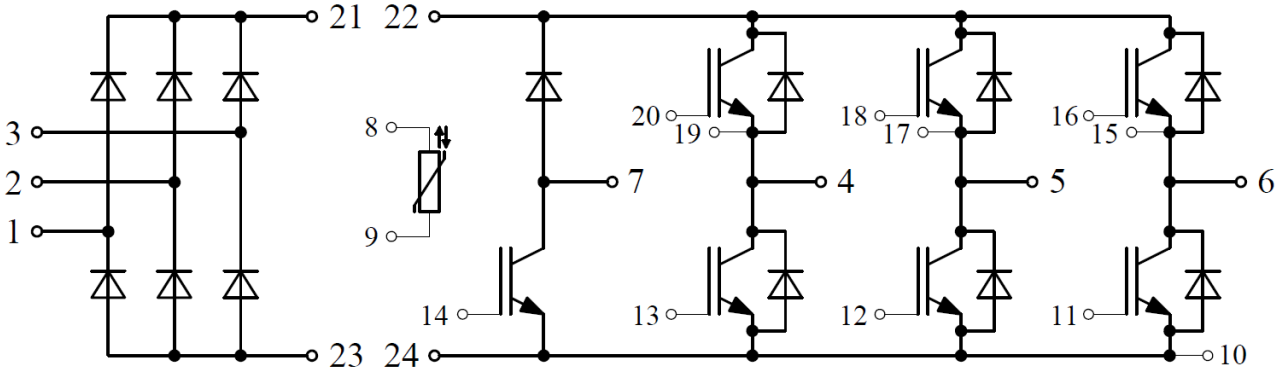


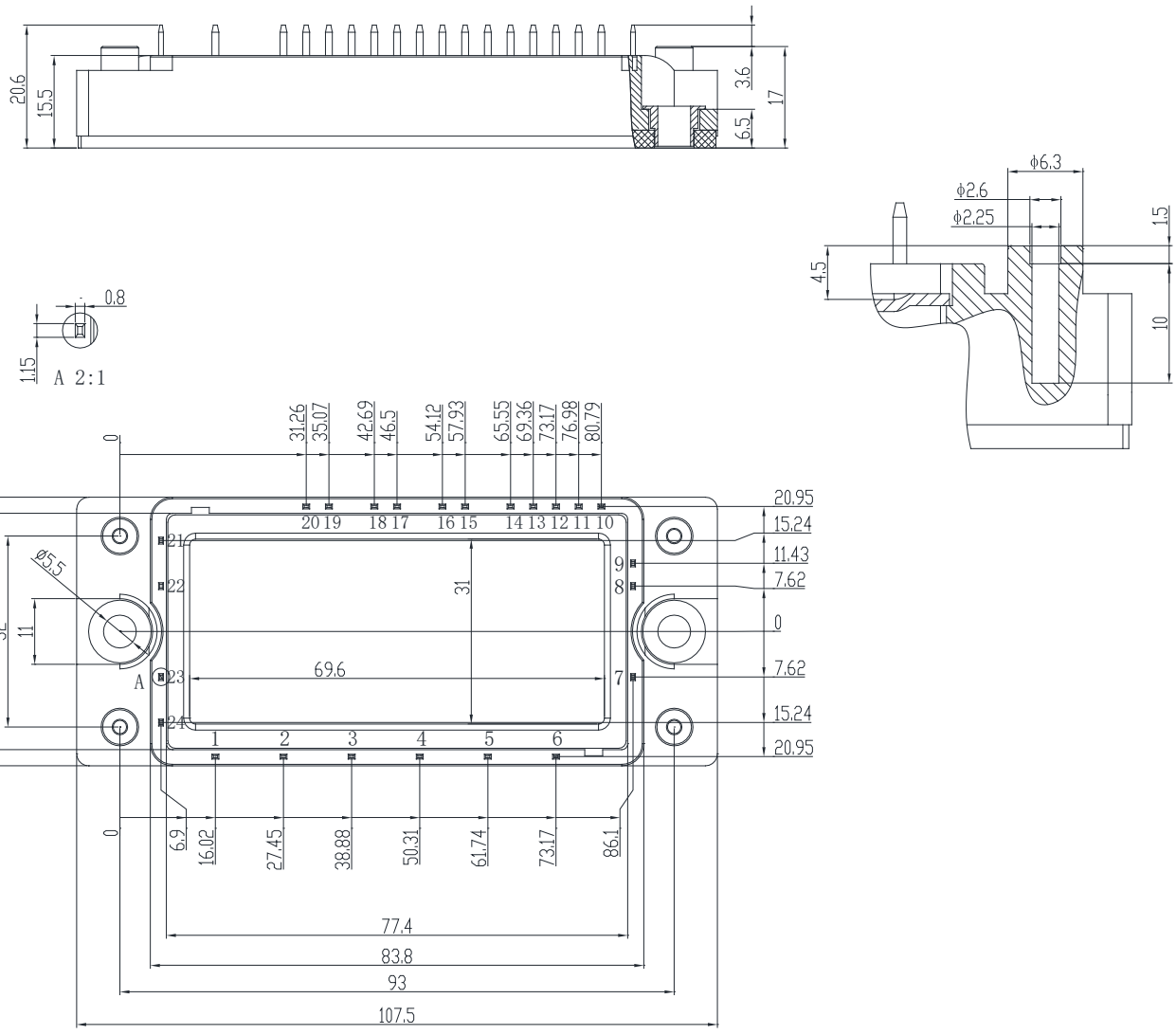
Fig 14. NTC Temperature Characteristic

Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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