MPFP150R12DBF
1200V 150A IGBT Module

Electrical Features
- Trench/Fieldstop IGBT
- V_{CEsat} with positive Temperature Coefficient
- Low V_{CEsat}

Typical Applications
- Auxiliary inverters
- Motor drives
- Servo drives

Mechanical Features
- High power density
- Integrated NTC temperature sensor
- Copper base plate
- Solder contact technology
- Standard housing

IGBT，Inverter

Maximum Rated Values				
Symbol	Item	Conditions	Rating	Unit
IGBT				
V_{CES}	Collector-emitter voltage	T_{vj}=25°C	1200	V
V_{GES}	Gate-emitter voltage	-	±20	V
I_C	Collector current,DC	T_C=100°C,T_{vj}=175°C	150	A
I_{CRM}	Repetitive peak collector current	t_p=1ms	300	A
P_{tot}	Total power dissipation	T_C=25°C,T_{vj}=175°C	872	W

Characteristics Values						
Symbol	Item	Conditions		Values		Unit
IGBT			Min.	Typ.	Max.	
I_{CES}	Collector-emitter cut-off current	V_{CE}=1200V,V_{GE}=0V,T_{vj}=25°C	-	-	1	mA
I_{GES}	Gate leakage current	V_{CE}=0V,V_{GE}=20V,T_{vj}=25°C	-	-	500	nA
$V_{GE(th)}$	Gate-emitter threshold voltage	I_C=5.7mA,V_{CE}=V_{GE},T_{vj}=25°C	5.2	5.71	6.2	V
V_{CEsat}	Collector-emitter saturation voltage	I_C=150A V_{GE}=15V, T_{vj}=25°C	-	1.9	-	V
		T_{vj}=125°C	-	2.1	-	
		T_{vj}=150°C	-	2.2	-	
C_{ies}	Input capacitance	V_{CE}=25V,V_{GE}=0V f=1MHz,T_{vj}=25°C	-	10.6	-	nF
C_{oes}	Output capacitance		-	0.69	-	
C_{res}	Reverse transfer capacitance		-	0.36	-	
Q_G	Gate charge	V_{CC}=600V, I_C=150A V_{GE}=-15...+15V,T_{vj}=25°C	-	0.939	-	μC
R_g	Internal gate resistance	T_{vj}=25°C	-	1.2	-	Ω

2023.8 Ver1.9

Symbol	Item	Conditions					Unit
$t_{d(on)}$	Turn-on delay time	V_{CC}=600V I_C=150A V_{GE}=±15V $R_{G(on)}$=10Ω $R_{G(off)}$=10Ω	T_{vj}=25°C	-	133.0	-	ns
			T_{vj}=125°C	-	101.2	-	
			T_{vj}=150°C	-	98.5	-	
t_r	Rise time		T_{vj}=25°C	-	99.4	-	
			T_{vj}=125°C	-	112.3	-	
			T_{vj}=150°C	-	125.8	-	
$t_{d(off)}$	Turn-off delay time		T_{vj}=25°C	-	480.2	-	
			T_{vj}=125°C	-	539.2	-	
			T_{vj}=150°C	-	550.4	-	
t_f	Fall time		T_{vj}=25°C	-	116.5	-	
			T_{vj}=125°C	-	126.4	-	
			T_{vj}=150°C	-	126.3	-	
E_{on}	Turn-on energy (per pulse)		T_{vj}=25°C	-	21.24	-	mJ
			T_{vj}=125°C	-	26.83	-	
			T_{vj}=150°C	-	31.79	-	
E_{off}	Turn-off energy (per pulse)		T_{vj}=25°C	-	11.0	-	
			T_{vj}=125°C	-	16.99	-	
			T_{vj}=150°C	-	20.76	-	
SC data	Short-circuit current	V_{CC}=600V,V_{GE}≤15V,T_{vj}=125°C V_{CES}≤1200V,t_P≤10μs		-	473	-	A
R_{thJC}	Thermal resistance,junction to case	Per IGBT		-	-	0.172	K/W
R_{thCH}	Thermalresistance,case to heatsink	Per IGBT λgrease=1W/(m·K)		-	0.0785	-	K/W
Tvjop	Temperature under switching conditions			-40		150	°C

Diode，Inverter
Maximum Rated Values

Symbol	Item	Conditions	Rating	Unit
V_{RRM}	Repetitive peak reverse voltage	T_{vj}=25°C	1200	V
I_F	Forward current,DC		150	A
I_{FRM}	Repetitive peak forward current	t_p=1ms	300	A
I^2t	I^2t-value	V_R=0V,t_p=10ms,T_{vj}=150°C	2950	A^2s

Characteristic Values

Symbol	Item	Conditions					Unit
V_F	Continuous forward voltage	I_F=150A V_{GE}=0V	T_{vj}=25°C	-	1.36	-	V
			T_{vj}=125°C	-	1.62	-	
			T_{vj}=150°C	-	1.67	-	
I_{RM}	Peak reverse recovery current	V_R=600V I_F=150A V_{GE}=-15V	T_{vj}=25°C	-	51.0	-	A
			T_{vj}=125°C	-	72.8	-	
			T_{vj}=150°C	-	77.0	-	
t_{rr}	Reverse recovery time		T_{vj}=25°C	-	112	-	ns
			T_{vj}=125°C	-	902	-	
			T_{vj}=150°C	-	976	-	

Q$_r$	Recovered charge		T$_{vj}$=25°C	-	6.29	-	µC
			T$_{vj}$=125°C	-	17.81	-	
			T$_{vj}$=150°C	-	18.13	-	
E$_{rec}$	Reverse recovery energy		T$_{vj}$=25°C	-	1.54	-	mJ
			T$_{vj}$=125°C	-	4.81	-	
			T$_{vj}$=150°C	-	5.66	-	
R$_{thJC}$	Thermal resistance, junction to case	per diode		-	-	0.299	K/W
R$_{thCH}$	Thermal resistance, case to heatsink	per diode，λ$_{grease}$=1 W/(m・K)		-	0.105	-	K/W
Tvjop	Temperature under switching conditions			-40		150	°C

Diode, Rectifier

Maximum Rated Values

Symbol	Item	Conditions	Rating	Unit
V$_{RRM}$	Repetitive peak reverse voltage	T$_{vj}$=25°C	1600	V
I$_{FRMSM}$	Maximum RMS forward current per chip	T$_C$=100°C,T$_{vj}$=175°C	150	A
I$_{RMSM}$	Maximum RMS current at rectifier output	T$_C$= 100°C	150	A
I$_{FSM}$	Surge forward current	tp = 10 ms, Tvj = 25°C	1320	A
I^{2}t	I^{2}t-value	V$_R$=0V,t$_p$=10ms,T$_{vj}$=150°C	9800	A^{2}s

Characteristic Values

Symbol	Item	Conditions		Min.	Typ.	Max.	Unit
V$_F$	Continuous forward voltage	I$_F$=150A V$_{GE}$=0V	T$_{vj}$=25°C	-	1.1	-	V
			T$_{vj}$=125°C	-	-	-	
			T$_{vj}$=150°C	-	-	-	
I$_R$	Reverse current	V$_R$=1600V	T$_{vj}$=25°C	-	-	10	uA
			T$_{vj}$=125°C	-	-	-	
			T$_{vj}$=150°C	-	-	-	
R$_{thJC}$	Thermal resistance, junction to case	per diode		-	-	0.284	K/W
R$_{thCH}$	Thermal resistance, case to heatsink	per diode，λ$_{grease}$=1 W/(m・K)		-	0.0887	-	K/W
Tvjop	Temperature under switching conditions			-40		150	°C

IGBT，Brake-Chopper

Maximum Rated Values				
Symbol	Item	Conditions	Values	Unit
V_{CES}	Collector-emitter voltage	T_{vj}=25°C	1200	V
V_{GES}	Gate-emitter voltage	-	±20	V
I_C	Collector current,DC	T_C=100°C,T_{vj}=175°C	100	A
I_{CRM}	Repetitive peak collector current	t_p=1ms	200	A
P_{tot}	Total power dissipation	T_C=25°C,T_{vj}=175°C	652	W

Characteristic Values						
Symbol	Item	Conditions		Values		Unit
IGBT				Min.	Typ.	Max.	
I_{CES}	Collector-emitter cut-off current	V_{CE}=1200V,V_{GE}=0V,T_{vj}=25°C		-	-	1	mA
I_{GES}	Gate leakage current	V_{CE}=0V,V_{GE}=20V,T_{vj}=25°C		-	-	500	nA
$V_{GE(th)}$	Gate-emitter threshold voltage	I_C=3.8mA,V_{CE}=V_{GE},T_{vj}=25°C		5.2	5.56	6.2	
V_{CEsat}	Collector-emitter saturation voltage	I_C=100A V_{GE}=15V	T_{vj}=25°C	-	1.83	-	V
			T_{vj}=125°C	-	2.11	-	
			T_{vj}=150°C	-	2.22	-	
C_{ies}	Input capacitance	V_{CE}=25V,V_{GE}=0V f=1MHz,T_{vj}=25°C		-	7.07	-	nF
C_{oes}	Output capacitance			-	0.46	-	
C_{res}	Reverse transfer capacitance			-	0.24	-	
Q_G	Gate charge	V_{CC}=600V,I_C=100A V_{GE}=-15...+15V,T_{vj}=25°C		-	0.64	-	μC
R_g	Internal gate resistance	T_{vj}=25°C		-	1.8	-	Ω
$t_{d(on)}$	Turn-on delay time	V_{CC}=600V I_C=100A V_{GE}=±15V $R_{G(on)}$=10Ω $R_{G(off)}$=10Ω	T_{vj}=25°C	-	105	-	ns
			T_{vj}=125°C	-	115	-	
			T_{vj}=150°C	-	114	-	
t_r	Rise time		T_{vj}=25°C	-	59.2	-	
			T_{vj}=125°C	-	67.8	-	
			T_{vj}=150°C	-	72.0	-	
$t_{d(off)}$	Turn-off delay time		T_{vj}=25°C	-	471.2	-	
			T_{vj}=125°C	-	676.2	-	
			T_{vj}=150°C	-	708.8	-	
t_f	Fall time		T_{vj}=25°C	-	161	-	
			T_{vj}=125°C	-	210	-	
			T_{vj}=150°C	-	268	-	
E_{on}	Turn-on energy (per pulse)		T_{vj}=25°C	-	10.01	-	mJ
			T_{vj}=125°C	-	18.93	-	
			T_{vj}=150°C	-	21.59	-	
E_{off}	Turn-off energy (per pulse)		T_{vj}=25°C	-	8.03	-	
			T_{vj}=125°C	-	10.21	-	
			T_{vj}=150°C	-	10.94	-	
SC data	Short-circuit current	V_{CC}=600V,V_{GE}≤15V,T_{vj}=125°C V_{CES}≤1200V,t_P≤10μs		-	244	-	A
R_{thJC}	Thermal resistance,junction to case	Per IGBT		-	-	0.23	K/W

R$_{thCH}$	Thermalresistance,case to heatsink	Per IGBT λgrease=1W/(m·K)	-	0.0941	-	K/W
Tvjop	Temperature under switching conditions		-40		150	°C

Diode，Brake-Chopper

Maximum Rated Values

Symbol	Item	Conditions		Rating		Unit
V$_{RRM}$	Repetitive peak reverse voltage	T$_{vj}$=25°C		1200		V
I$_F$	Forward current,DC			50		A
I$_{FRM}$	Repetitive peak forward current	t$_p$=1ms		100		A
I^{2}t	I^{2}t-value	V$_R$=0V,t$_p$=10ms,T$_{vj}$=125°C		560		A^{2}s

Characteristic Values

Symbol	Item	Conditions			Values			Unit
V$_F$	Continuous forward voltage	I$_F$=50A V$_{GE}$=0V		T$_{vj}$=25°C	-	1.52	-	V
				T$_{vj}$=125°C	-	1.43	-	
				T$_{vj}$=150°C	-	1.35	-	
I$_{RM}$	Peak reverse recovery current			T$_{vj}$=25°C	-	83.12	-	A
				T$_{vj}$=125°C	-	108.37	-	
				T$_{vj}$=150°C	-	121.12	-	
t$_{rr}$	Reverse recovery time	V$_R$=600V I$_F$=50A V$_{GE}$=-15V		T$_{vj}$=25°C	-	59.2	-	ns
				T$_{vj}$=125°C	-	63.8	-	
Q$_r$	Recovered charge			T$_{vj}$=25°C	-	7.03	-	μC
				T$_{vj}$=125°C	-	9.5	-	
E$_{rec}$	Reverse recovery energy			T$_{vj}$=25°C	-	1.87	-	mJ
				T$_{vj}$=125°C	-	4.9291	-	
R$_{thJC}$	Thermal resistance, junction to case	per diode			-	-	0.682	K/W
R$_{thCH}$	Thermal resistance, case to heatsink	per diode，λ$_{grease}$=1 W/(m · K)			-	0.123	-	K/W
Tvjop	Temperature under switching conditions				-40		150	°C

Note:

IGBT electrical characteristics according to IEC 60747 – 9

Diode electrical characteristics according to IEC 60747 – 2

NTC Thermistor Characteristics

Symbol	Item	Conditions	Values			Unit
			Min.	Typ.	Max.	
R$_{25}$	Rated resistance	T$_C$=25°C	-	5	-	kΩ
ΔR/R	Deviation of resistance	T$_C$=100°C,R$_{100}$=493Ω	-5	-	5	%
P$_{25}$	Power dissipation	T$_C$=25°C	-	-	20	mW
B$_{25/50}$	B-constant	R$_2$=R$_{25}$exp[B$_{25/50}$(1/T$_2$-1/(298.15K))	-	3375	-	K
B$_{25/80}$	B-constant	R$_2$=R$_{25}$exp[B$_{25/80}$(1/T$_2$-1/(298.15K))	-	3411	-	
B$_{25/100}$	B-constant	R$_2$=R$_{25}$exp[B$_{25/100}$(1/T$_2$-1/(298.15K))	-	3433	-	

 2023.8 Ver1.9

Module

Symbol	Item	Conditions	Rating		Unit
V_{ISOL}	Isolation voltage	Terminals to baseplate，RMS,f=50Hz,t=1min	2500		V
$T_{vj\ max}$	Maximum junction temperature	-	175		°C
$T_{vj\ op}$	Operating junction temperature	Continuous operationg(underswitching)	-40~150		°C
T_{stg}	Storage temperature	-	-40~125		°C

Symbol	Item	Conditions	Values			Unit
			Min.	Typ.	Max.	
M	Mountingtorqueformodulmounting	-	3	-	6	Nm
d_{Creep}	Creepage distance	Terminal to terminal	-	-	-	mm
		Terminal to base plate	-	10	-	
d_{Clear}	Clearance	Terminal to terminal	-	-	-	mm
		Terminal to base plate	-	7.5	-	
m	Weight	-	-	290	-	g

output characteristic IGBT,Inverter (typical)
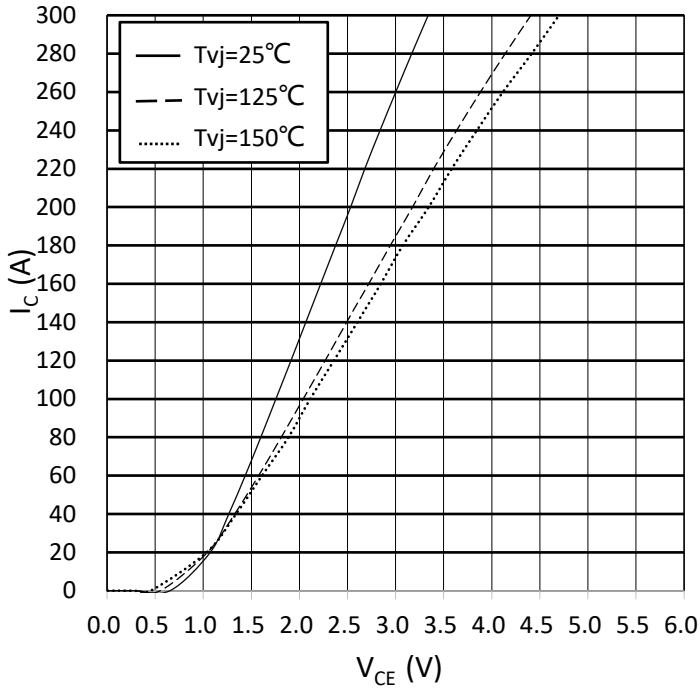
$I_C = f(V_{CE})$

$V_{GE} = 15V$

output characteristic IGBT,Inverter (typical)

$I_C = f(V_{CE})$

$T_{vj} = 150°C$
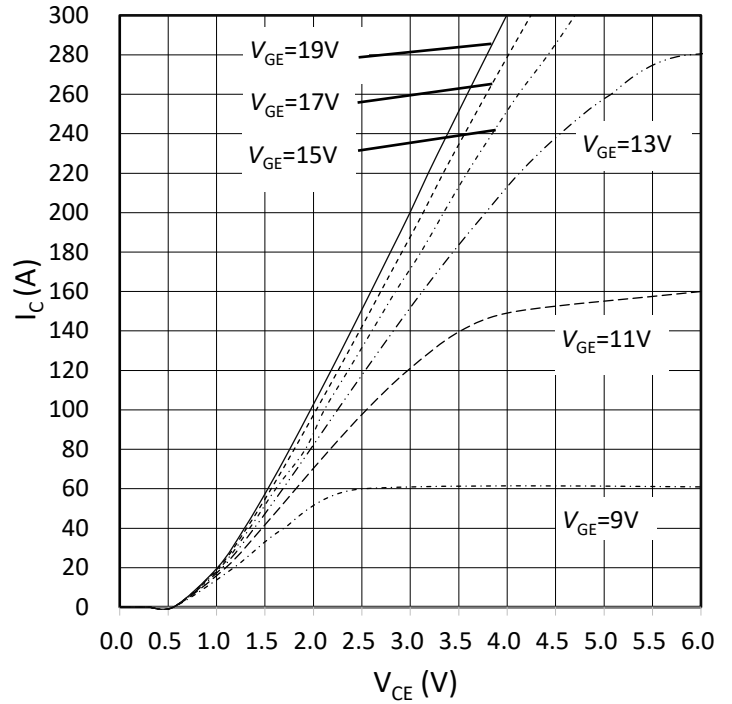
switching losses IGBT,Inverter (typical)

$E_{on} = f(I_C)$, $E_{off} = f(I_C)$

$V_{GE} = \pm15V$, $R_{Gon} = 30\Omega$, $R_{Goff} = 30\Omega$, $V_{CE} = 600V$
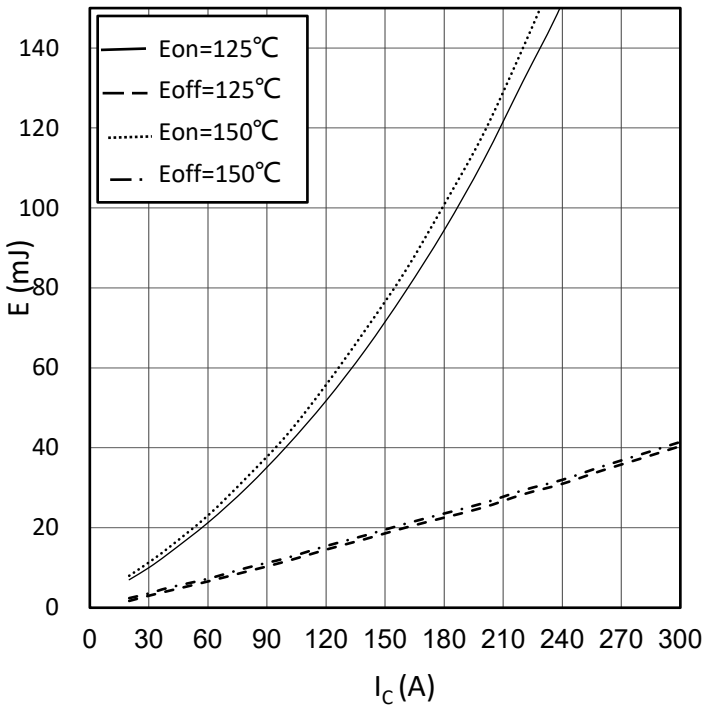
switching losses IGBT,Inverter (typical)

$E_{on} = f(R_G)$, $E_{off} = f(R_G)$

$V_{GE} = \pm15V$, $I_C = 150A$, $V_{CE} = 600V$

     2023.8 Ver1.9
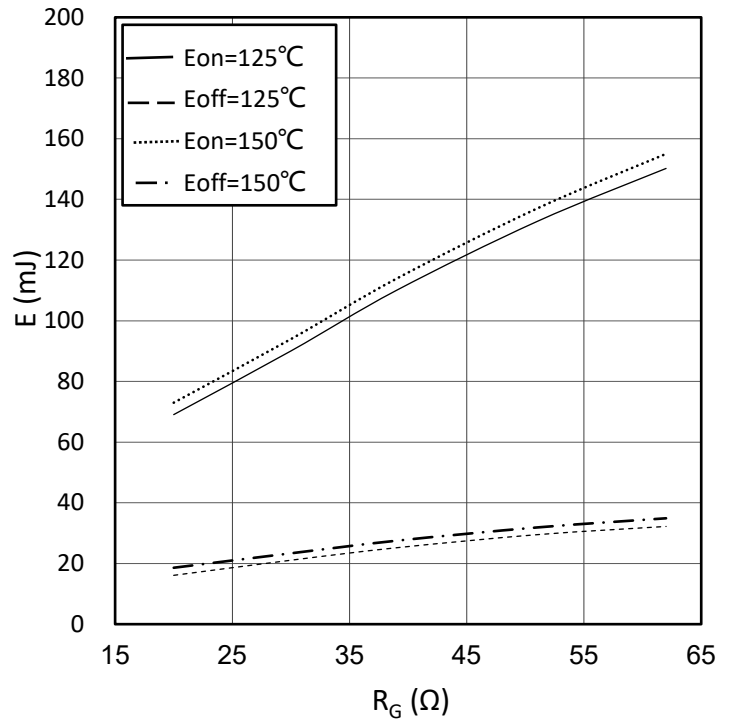
forward characteristic of Diode, Inverter (typical)

$I_F = f(V_F)$
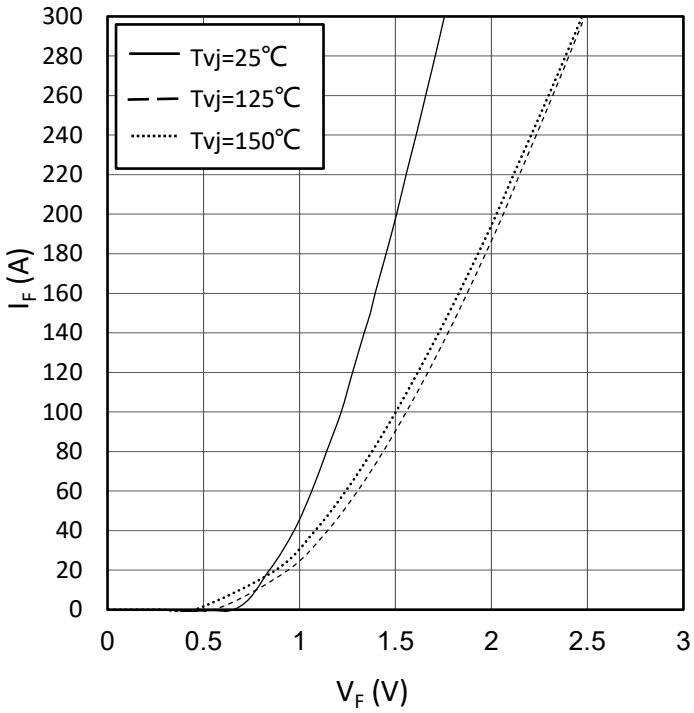
switching losses Diode, Inverter (typical)

$E_{rec} = f(I_F)$

$R_{Gon} = 30\Omega, V_{CE} = 600 \text{ V}$
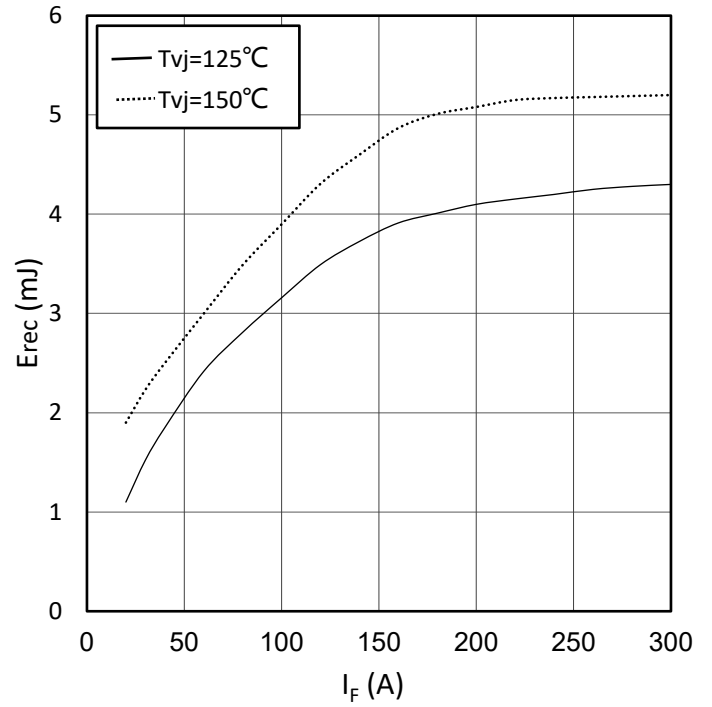
switching losses Diode, Inverter (typical)

$E_{rec} = f(R_G)$

$I_F = 150A, V_{CE} = 600V$
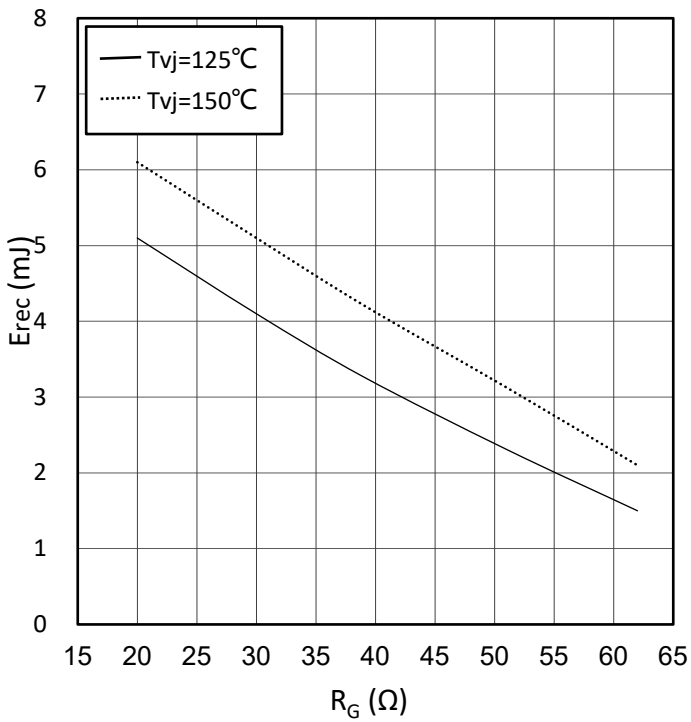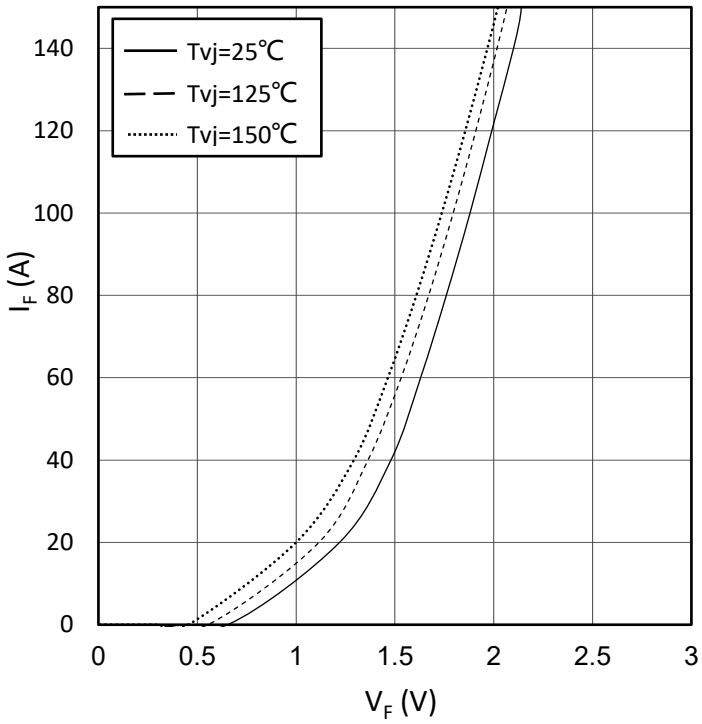

output characteristic IGBT, Brake-Chopper (typical)

$I_C = f(V_{CE})$

$V_{GE} = 15V$

2023.8 Ver1.9
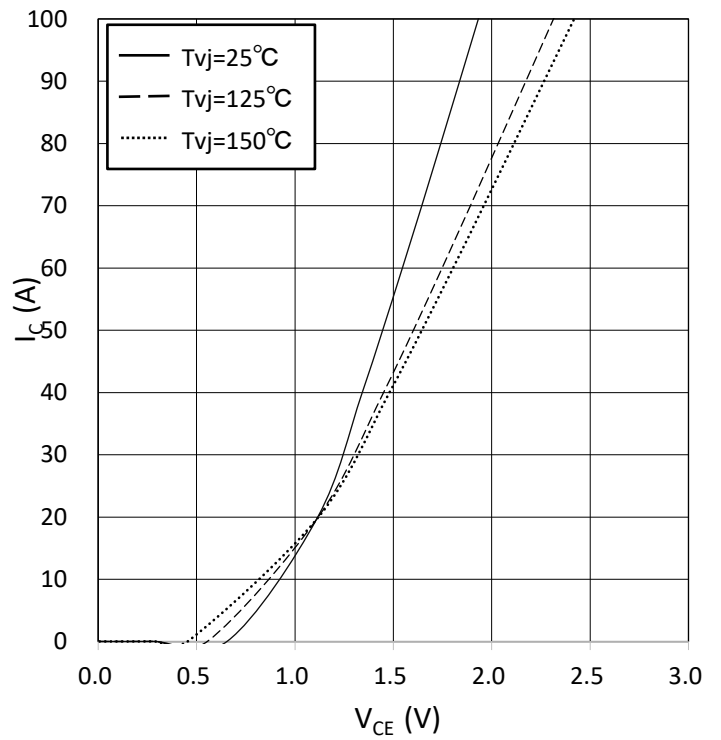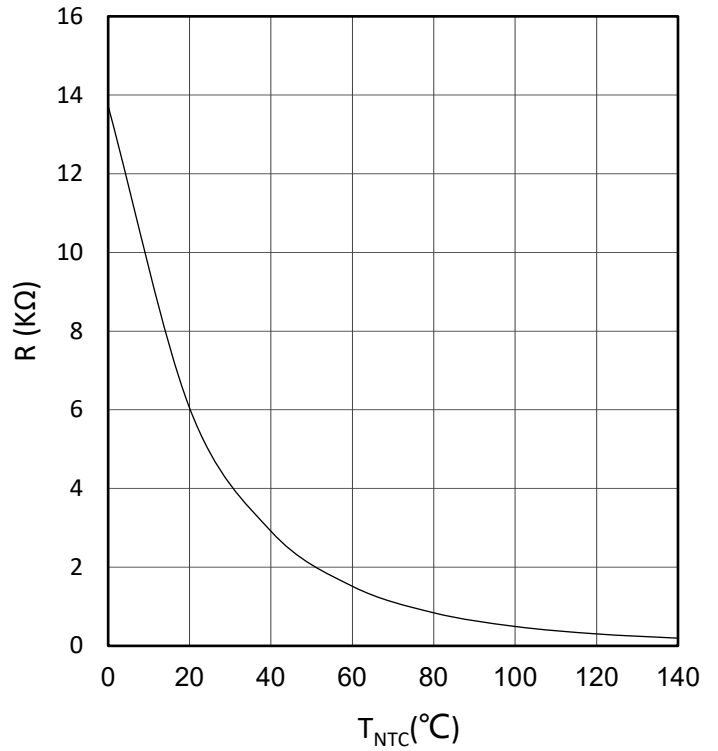
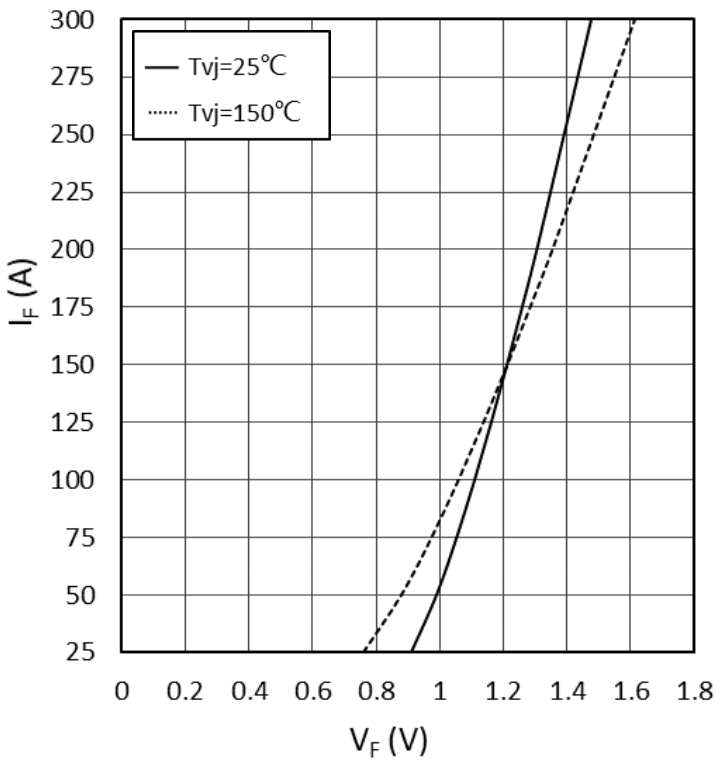**forward characteristic of Diode, Brake-Chopper (typical)**
$I_F = f(V_F)$

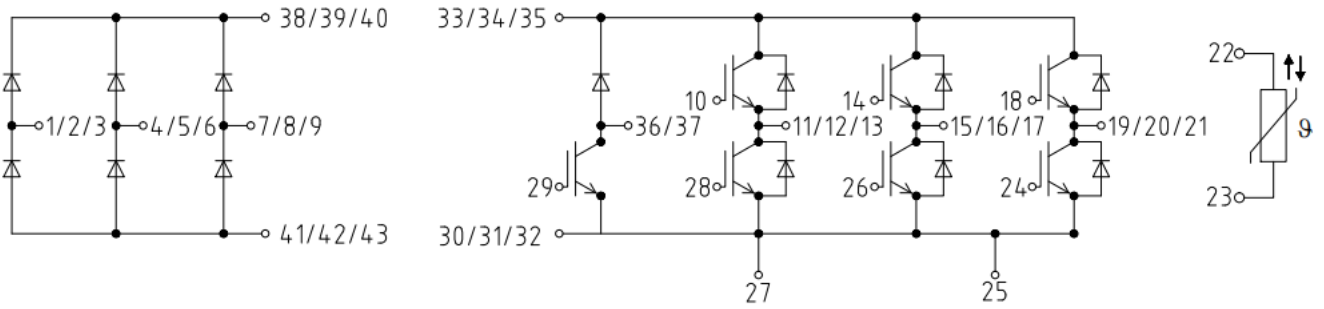**NTC-Thermistor-temperature characteristic(typical)**
$R=f(T)$
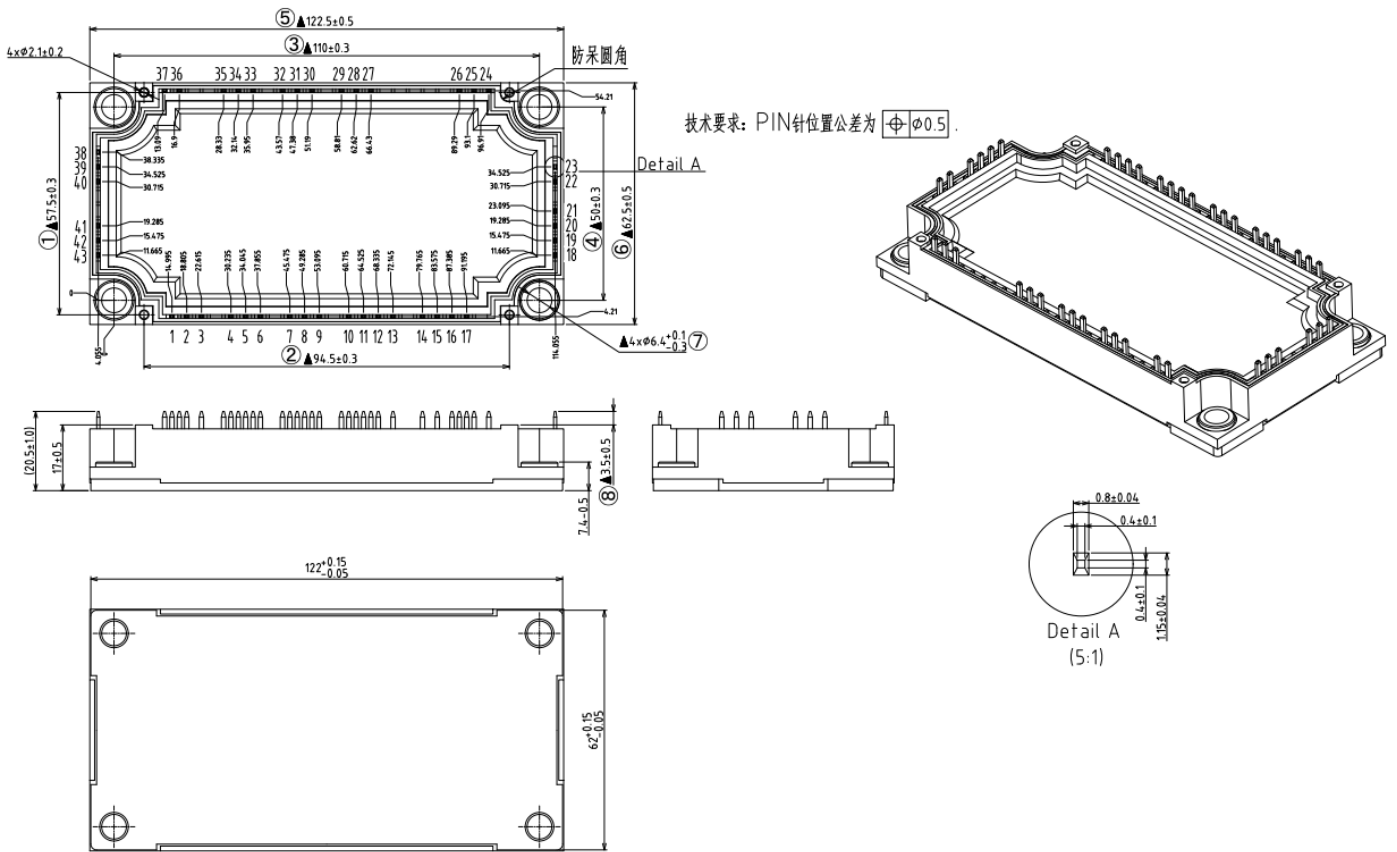

forward characteristic of Diode, Rectifier (typical)
$I_F = f(V_F)$

9 / 12 2023.8 Ver1.9

Cricuit Diagram

Package Outlines

Terms & Conditions of usage

1.The product specifications, characteristics, data, materials and structures given in this datasheet are subject to change without notice.

2.The information given in this datasheet shall in no event be regarded as a guarantee of conditions or characteristics. Marching-Power Technology Co., Ltd. does not warrant or assume any legal liability or responsibility for the accuracy and completeness of any examples, hints or any typical values stated herein and/or any information regarding the application of the product.

3.This datasheet is only used as a reference for customers to apply our products，Marching-Power Technology Co., Ltd. does not undertake to permit the use of intellectual property rights or any third-party property rights related to the product information described in this datasheet.

4.Although Marching-Power Technology Co., Ltd. is committed to enhancing product quality and reliability, all semiconductor products still have a probability of failure. When using Marching-Power semiconductor products in your equipment, you are requested to take adequate safety measures to prevent the equipment from causing accidents or events including but not limited to physical injury, fire or damage to other property if any of the products become faulty.

5.The products introduced in this datasheet are electrostatic sensitive devices and must be protected against static electricity during device installation, testing, packaging, storage and transportation.

6. 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.

7.Do not use the products introduced in this datasheet in equipment or systems that requiring strict reliability or/and may directly endanger human life such as medical, life-saving, life-sustaining, space equipment, aeronautic equipment, nuclear equipment submarine repeater equipment and equivalents to strategic equipment (without limitation).

8.No part of this datasheet may be disseminated and reproduced in any form or by any means without prior written permission from Marching-Power Technology Co., Ltd.

9.The data contained in this datasheet is exclusively intended for use by professional technicians only. It is the responsibility of the customer's own technical departments to evaluate the suitability of the product for the intended application and the completeness of the product information given in this document with respect to corresponding application. If you have any question about any portion in this datasheet, contact Marching-Power Technology Co., Ltd. before using the product. Marching-Power Technology Co., Ltd. shall not be liable for any injury caused by any use of the products not in accordance with instructions set forth herein.

序号 Item	日期 Date	变更记录及描述 Change History Description	版本序号 Rev. item	经办人 Responsibility
1	2023.7.28	更新外形图，版本为V1.8	2023 7 Ver1.8	梁华文
2	2023.8.28	更新整流二极管正向偏压特性曲线。版本为V1.9	2023 8 Ver1.9	梁华文