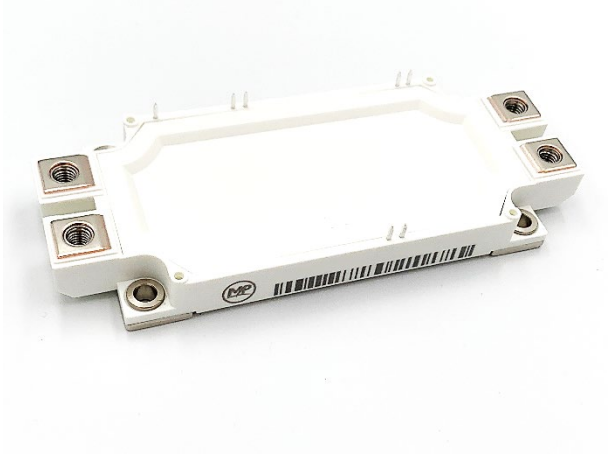
MPFF450R12MBF M4

1200V 450A IGBT Module

Electrical Features

- Trench/Fieldstop IGBT
- Low V_{CE}(sat)
- V_{CE}(sat) with positive temperature coefficient
- 10 μ s short circuit capability
- Fast&soft reverse recovery anti-parallel FWD
- Low inductance case



Typical Applications

- Motor Drives
- UPS System
- Servo Drives
- Wind Turbines

IGBT，Inverter

Maximum Rated Values

Symbol	Item	Conditions	Rating	Unit
IGBT				
V_{CES}	Collector-emitter voltage	T_{vj}=25℃	1200	V
V_{GES}	Gate-emitter voltage	-	±20	V
I_C	Collector current,DC	T_C=100℃,T_{vj}=175℃	450	A
I_{CRM}	Repetitive peak collector current	t_p=1ms	900	A
t_{SC}	Short circuit withstand time	V_{GE}=15V, V_{CC}=600V, T_{vj}≤150℃	10	μs
P_{tot}	Total power dissipation	T_C=25℃,T_{vj}=175℃	2586	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℃		-	-	10	μA
I_{GES}	Gate leakage current	V_{CE}=0V,V_{GE}=20V,T_{vj}=25℃		-	-	50	nA
$V_{GE(th)}$	Gate-emitter threshold voltage	I_C=17.1mA,V_{CE}=V_{GE},T_{vj}=25℃		5.2	5.8	6.4	V
V_{CEsat}	Collector-emitter saturation voltage	I_C=450A V_{GE}=15V	T_{vj}=25℃	-	2.19	-	V
			T_{vj}=125℃	-	2.64	-	
			T_{vj}=150℃	-	2.77	-	
C_{ies}	Input capacitance	V_{CE}=25V,V_{GE}=0V f=1MHz,T_{vj}=25℃		-	73.3	-	nF
C_{oes}	Output capacitance			-	2.79	-	
C_{res}	Reverse transfer capacitance			-	0.18	-	
Q_G	Gate charge	V_{GE}=±15V		-	3250	-	nC
R_g	Internal gate resistance	T_{vj}=25℃		-	0.33	-	Ω

$t_{d(on)}$	Turn-on delay time	V_{CC}=600V, I_C=450A, V_{GE}=±15V, $R_{G(on)}$=5.1 Ω, $R_{G(off)}$=5.1 Ω, L_{load}=100uH	T_{vj}=25℃	-	174	-	ns
			T_{vj}=125℃	-	170	-	
			T_{vj}=150℃	-	148	-	
t_r	Rise time		T_{vj}=25℃	-	156	-	
			T_{vj}=125℃	-	160	-	
			T_{vj}=150℃	-	168	-	
$t_{d(off)}$	Turn-off delay time		T_{vj}=25℃	-	608	-	
			T_{vj}=125℃	-	684	-	
			T_{vj}=150℃	-	698	-	
t_f	Fall time		T_{vj}=25℃	-	98	-	
			T_{vj}=125℃	-	172	-	
			T_{vj}=150℃	-	194	-	
E_{on}	Turn-on energy (per pulse)		T_{vj}=25℃	-	64.8	-	mJ
			T_{vj}=125℃	-	86.6	-	
			T_{vj}=150℃	-	93.1	-	
E_{off}	Turn-off energy (per pulse)		T_{vj}=25℃	-	46.9	-	
			T_{vj}=125℃	-	56.9	-	
			T_{vj}=150℃	-	59.2	-	
SC data	Short-circuit current	V_{CC}=800V,V_{GE}≤15V,T_{vj}=25℃ V_{CES}≤1200V,t_P≤10μs		-	2478	-	A
R_{thJC}	Thermal resistance,junction to case	per IGBT		-	0.058	-	K/W
R_{thCH}	Thermalresistance,case to heatsink	per IGBT/ λgrease=1W/(m·K)		-	0.074	-	K/W
T_{vjop}	Temperature under switching conditions			-40		150	℃

Diode，Inverter

Maximum Rated Values

Symbol	Item	Conditions	Rating	Unit
V_{RRM}	Repetitive peak reverse voltage	T_{vj}=25℃	1200	V
I_F	Forward current,DC	T_C=100℃,T_{vj}=150℃	450	A
I_{FRM}	Repetitive peak forward current	t_p=1ms	900	A
I^2t	I^2t-value	V_R=0V,t_p=10ms,T_{vj}=150℃	-	A^2s

Characteristic Values

V_F	Continuous forward voltage	I_F=450A V_{GE}=0V	T_{vj}=25℃	-	2.44	-	V
			T_{vj}=125℃	-	2.08	-	
			T_{vj}=150℃	-	2.00	-	
I_{RM}	Peak reverse recovery current	V_R=600V I_F=450A	T_{vj}=25℃	-	153	-	A
			T_{vj}=125℃	-	264	-	
			T_{vj}=150℃	-	298	-	
t_{rr}	Reverse recovery time		T_{vj}=25℃	-	167	-	ns
			T_{vj}=125℃	-	616	-	
			T_{vj}=150℃	-	671	-	
Q_r	Recovered charge		T_{vj}=25℃	-	21.5	-	μC
			T_{vj}=125℃	-	68.0	-	
			T_{vj}=150℃	-	84.9	-	

E_{rec}	Reverse recovery energy		T_{vj}=25℃	-	8.33	-	mJ
			T_{vj}=125℃	-	24.8	-	
			T_{vj}=150℃	-	31.7	-	
R_{thJC}	Thermal resistance, junction to case	per diode		-	0.1	-	K/W
R_{thCH}	Thermalresistance,case to heatsink	per diode/ λgrease=1W/(m·K)		-	0.049	-	K/W
T_{vjop}	Temperature under switching conditions			-40		150	℃

NTC Thermistor Characteristics

Symbol	Item	Conditions	Values			Unit
			Min.	Typ.	Max.	
R_{25}	Rated resistance	T_C=25℃	-	5	-	kΩ
ΔR/R	Deviation of resistance	T_C=100℃,R_{100}=493Ω	-5	-	5	%
P_{25}	Power dissipation	T_C=25℃	-	-	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	-	

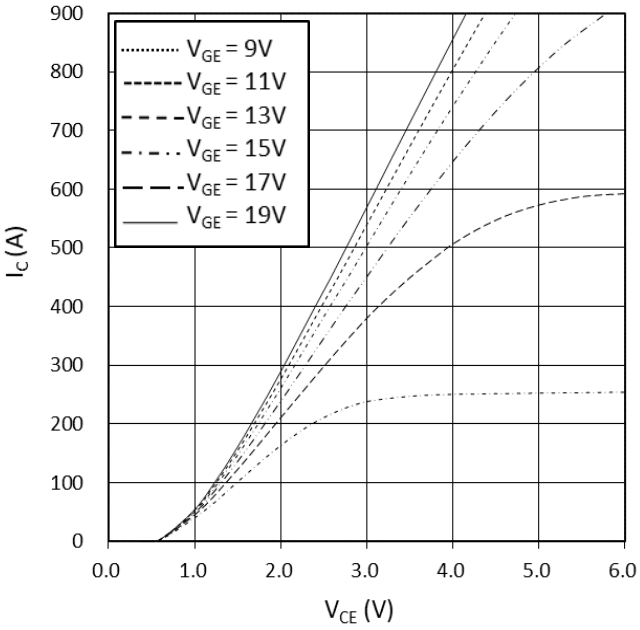
Module

Symbol	Item	Conditions	Rating			Unit
V_{ISOL}	Isolation voltage	Terminals to baseplate，RMS,f=50Hz,t=1min	4000			V
-	Material of module baseplate	-	Cu			-
-	Internal isolation	Basic insulation(class 1, IEC 61140)	Al_2O_3			-
T_{stg}	Storage temperature	-	-40~125			℃
Symbol	Item	Conditions	Values			Unit
			Min.	Typ.	Max.	
M	Mounting torque for module mounting	Screw M6	3.0	-	5.0	Nm
	Terminal connection torque	Screw M6	2.5	-	5.0	Nm
ds	Creepage distance	Terminal to terminal	-	13	-	mm
		Terminal to base plate	-	14.5	-	
da	Clearance	Terminal to terminal	-	10	-	mm
		Terminal to base plate	-	12.5	-	
m	Weight	-	-	346	-	g

output characteristic IGBT, Inverter (typical)

$I_C = f(V_{CE})$

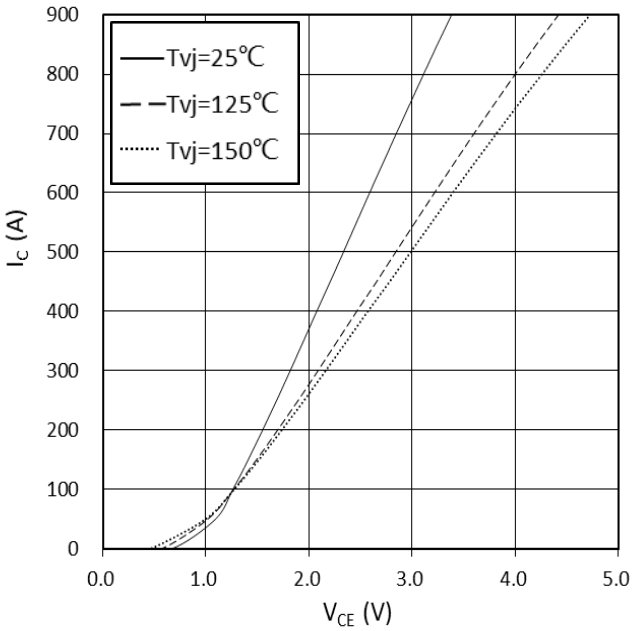
$T_{vj} = 150℃$



output characteristic IGBT, Inverter (typical)

$I_C = f(V_{CE})$

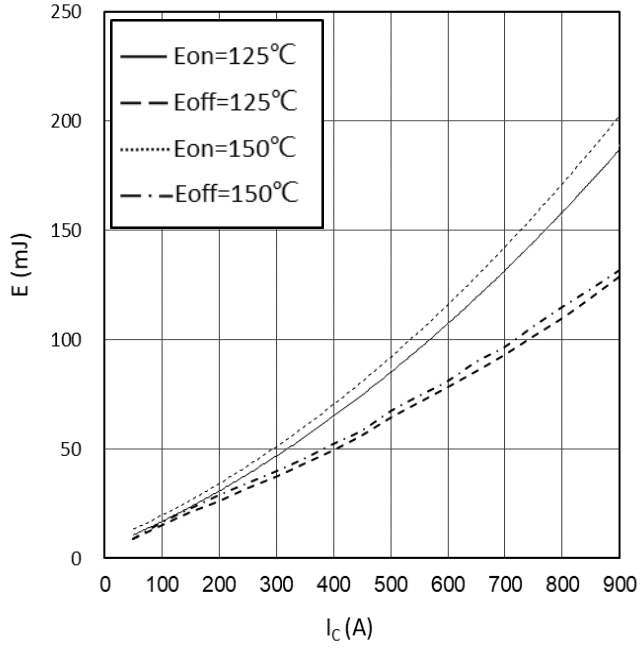
$V_{GE} = 15\ V$



switching losses IGBT,Inverter(typical)

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

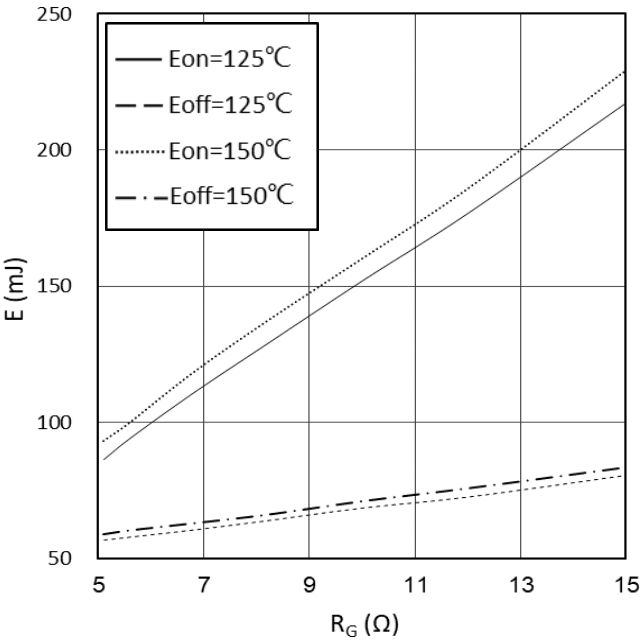
$V_{GE} = \pm 15V$, $R_{Gon} = 5.1\Omega$, $R_{Goff} = 5.1\Omega$, $V_{CE} = 600V$



switching losses IGBT,Inverter(typical)

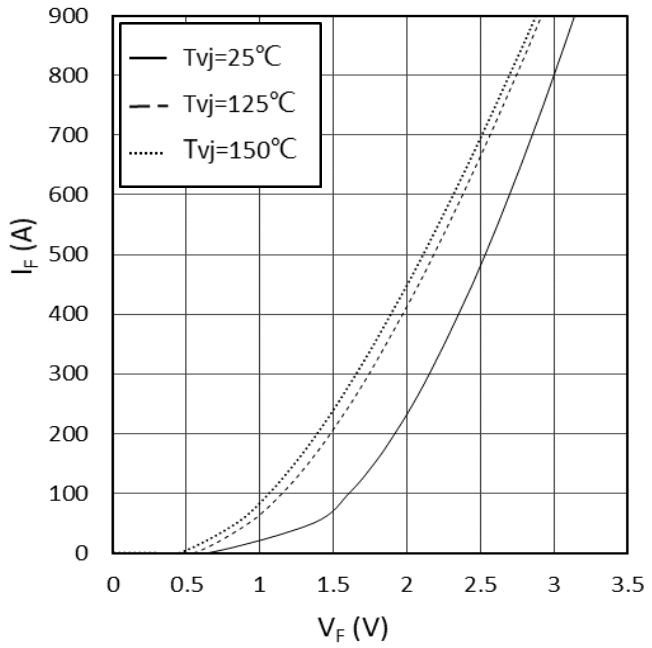
$E_{on} = f(R_G)$, $E_{off} = f(R_G)$

$V_{GE} = \pm 15V$, $I_C = 600A$, $V_{CE} = 600V$



forward characteristic of Diode, Inverter (typical)

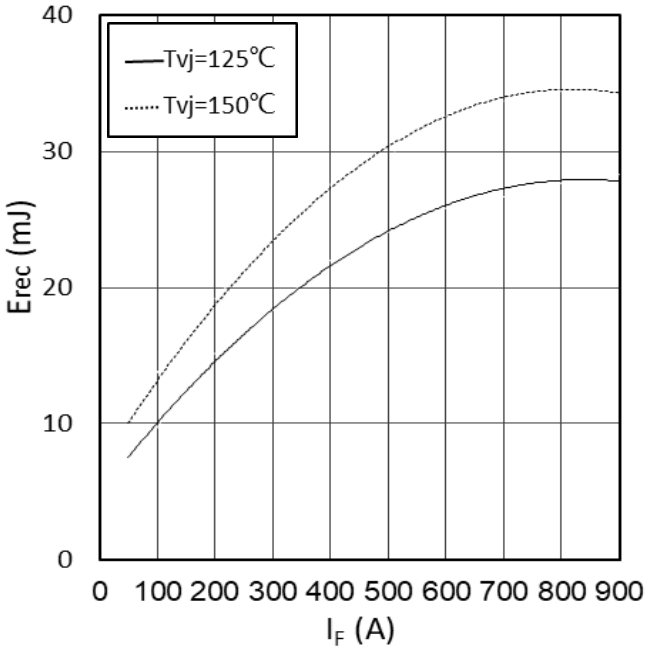
$I_F = f(V_F)$



switching losses Diode, Inverter (typical)

$E_{rec} = f(I_F)$

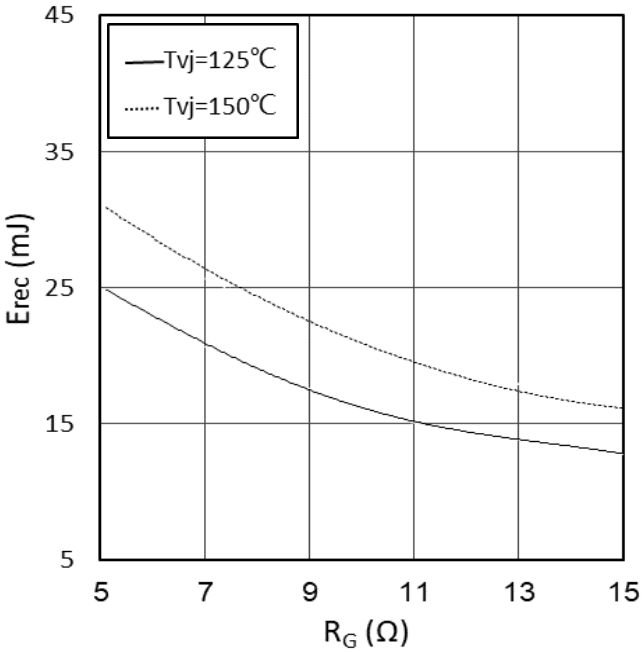
R_{Gon}=5.1Ω, V_{CE}=600V



switching losses Diode, Inverter (typical)

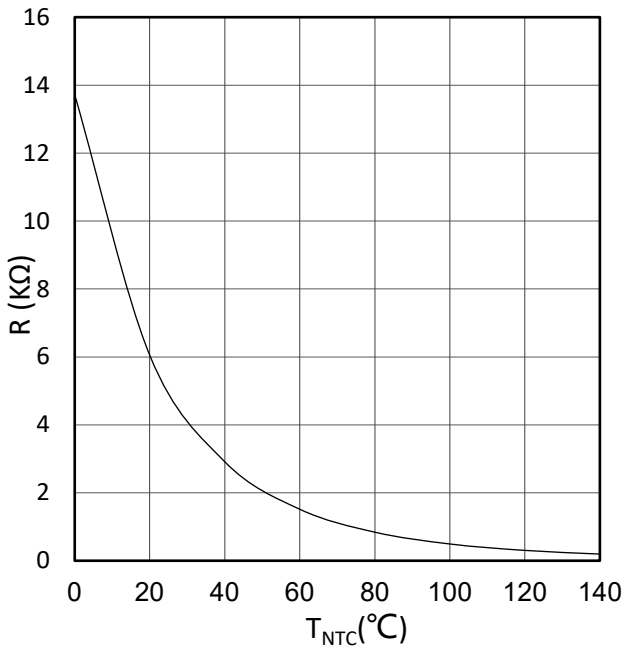
$E_{rec} = f(R_G)$

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



NTC-Thermistor-temperature characteristic(typical)

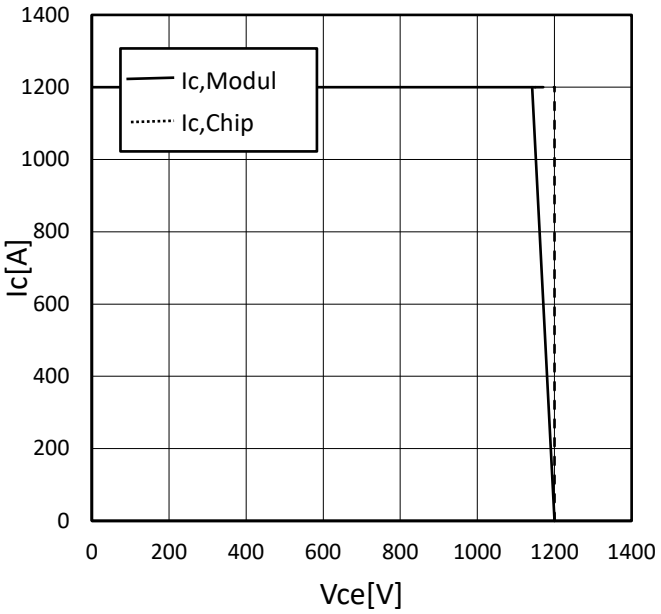
R=f (T)



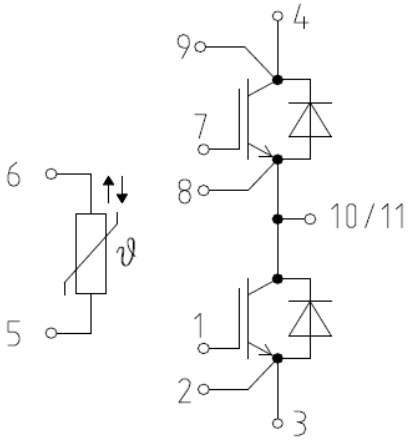
reverse bias safe operating area IGBT,Inverter (RBSOA)

$I_C = f(V_{CE})$

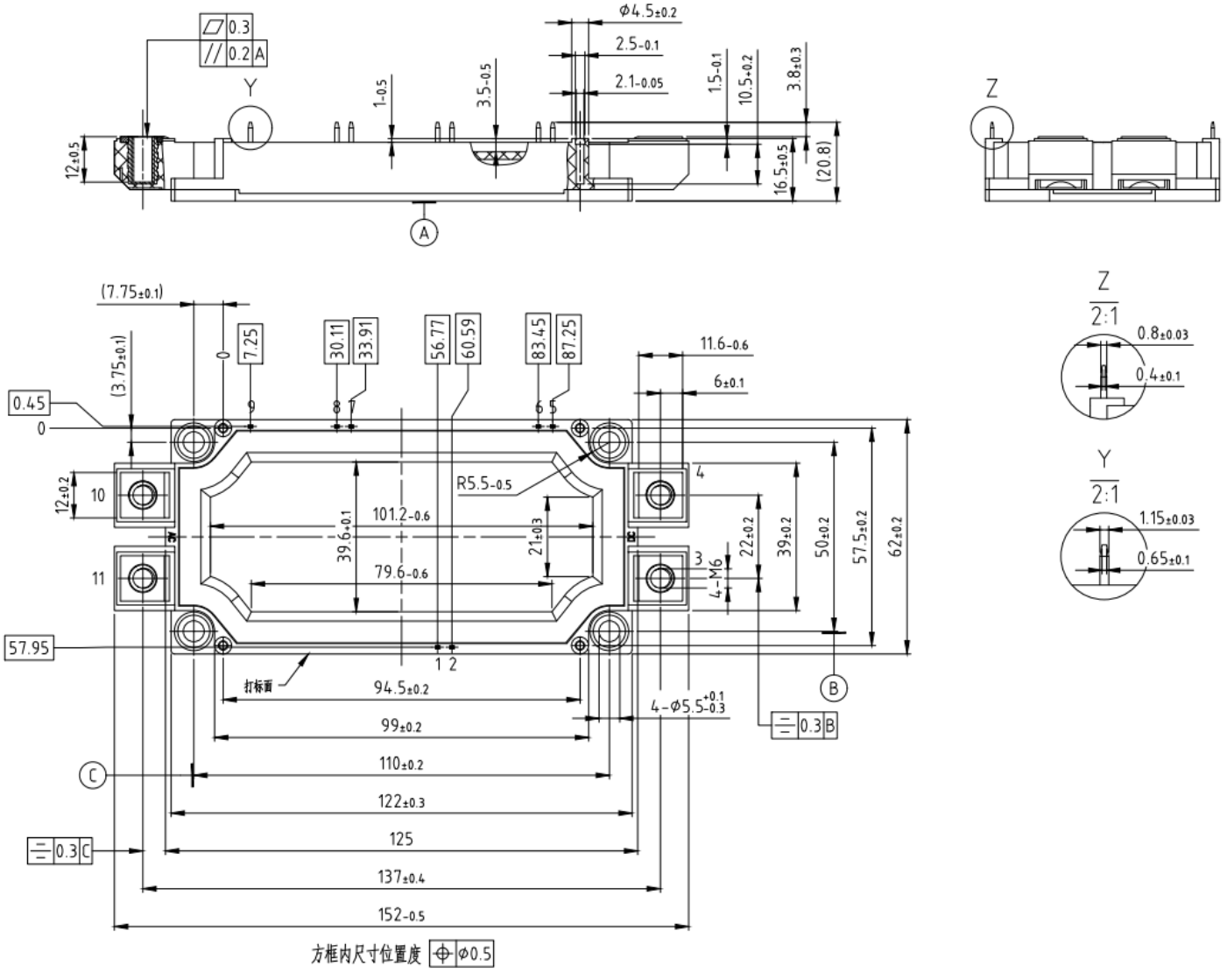
$V_{GE} = \pm 15V$, $R_{Gon} = 5.1\Omega$, $R_{Goff} = 5.1\Omega$, $T_{vj} = 25℃$



Circuit diagram headline



Package outlines（Unit：mm）



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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	2023.3.1	初版规格书发布，版本为V1.0	2023 3 Ver1.0	梁华文
2	2023.3.31	更新曲线，变更为V1.1版本	2023 3 Ver1.1	梁华文
3	2023.10.19	更新外形图，变更为V1.2版本	2023 10 Ver1.2	梁华文