QMFF600R12XFF

1200V600A IGBT Module

Electrical Features

- Trench/Fieldstop IGBT
- Low VCE(sat)
- VCE(sat) with positive temperature coefficient
- 10 μs short circuit capability
- Fast&soft reverse recovery anti-parallel FWD
- Low inductance case

Typical Applications

- Motor Drives
- High Power Converters
- 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℃		600		A
I_{CRM}	Repetitive peak collector current	t_p= 1ms		1200		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℃		3750		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℃		-	-	3	mA
I_{GES}	Gate leakage current	V_{CE}=0V,V_{GE}=20V,T_{vj}=25℃		-	-	400	nA
$V_{GE(th)}$	Gate-emitter threshold voltage	I_C=23mA,V_{CE}=V_{GE},T_{vj}=25℃		5.0	5.7	7.0	V
V_{CEsat}	Collector-emitter saturation voltage	I_C=600A V_{GE}= 15V	T_{vj}=25℃	-	2.2	2.4	V
			T_{vj}= 125℃	-	2.7	-	
			T_{vj}= 150℃	-	2.9	-	
C_{ies}	Input capacitance	V_{CE}=25V,V_{GE}=0V f=1MHz,T_{vj}=25℃		-	49.77	-	nF
C_{oes}	Output capacitance			-	2.28	-	
C_{res}	Reverse transfer capacitance			-	2.22	-	
Q_G	Gate charge	V_{GE}= ± 15V		-	7.5	-	nC
R_g	Internal gate resistance	T_{vj}=25℃		-	0.28	-	Ω

$t_{d(on)}$	Turn-on delay time	V_{CC}=600V, I_C=600A, V_{GE}=±15V, $R_{G(on)}$=5.1Ω, $R_{G(off)}$=5.1Ω, L_{load}=50uH di/dt=4140A/μs (T_{vj}=125°C) du/dt=4328V/μs (T_{vj}=125°C)	T_{vj}=25°C	-	259	-	ns
			T_{vj}= 125°C	-	238	-	
			T_{vj}= 150°C	-	227	-	
t_r	Rise time		T_{vj}=25°C	-	264	-	
			T_{vj}= 125°C	-	262	-	
			T_{vj}= 150°C	-	259	-	
$t_{d(off)}$	Turn-off delay time		T_{vj}=25°C	-	988	-	
			T_{vj}= 125°C	-	1073	-	
			T_{vj}= 150°C	-	1102	-	
t_f	Fall time		T_{vj}=25°C	-	145	-	
			T_{vj}= 125°C	-	233	-	
			T_{vj}= 150°C	-	281	-	
E_{on}	Turn-on energy (per pulse)		T_{vj}=25°C	-	149.5	-	mJ
			T_{vj}= 125°C	-	166.0	-	
			T_{vj}= 150°C	-	171.5	-	
E_{off}	Turn-off energy (per pulse)		T_{vj}=25°C	-	86.2	-	
			T_{vj}= 125°C	-	106.1	-	
			T_{vj}= 150°C	-	110.6	-	
R_{thJC}	Thermal resistance,junction to case	per IGBT		-	0.04	-	K/W
R_{thCH}	Thermalresistance,case to heatsink	per IGBT/ λgrease= 1W/(m·K)		-	0.082	-	K/W
T_{vjop}	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	T_C= 100°C,T_{vj}= 150°C	600	A
I_{FRM}	Repetitive peak forward current	t_p= 1ms	1200	A

Characteristic Values

V_F	Continuous forward voltage	I_F=600A V_{GE}=0V	T_{vj}=25°C	-	2.28	-	V
			T_{vj}= 125°C	-	2.51	-	
			T_{vj}= 150°C	-	2.53	-	
I_{RM}	Peak reverse recovery current	V_R=600V I_F=600A V_{GE}=- 15V -di$_F$/dt=2890A/μs (T_{vj}=125°C)	T_{vj}=25°C	-	208.8	-	A
			T_{vj}= 125°C	-	249.1	-	
			T_{vj}= 150°C	-	267.8	-	
t_{rr}	Reverse recovery time		T_{vj}=25°C	-	216.1	-	ns
			T_{vj}= 125°C	-	401.4	-	
			T_{vj}= 150°C	-	502.2	-	
Q_r	Recovered charge		T_{vj}=25°C	-	24.2	-	μC
			T_{vj}= 125°C	-	61.3	-	
			T_{vj}= 150°C	-	76.7	-	
E_{rec}	Reverse recovery energy		T_{vj}=25°C	-	8.8	-	mJ
			T_{vj}= 125°C	-	19.9	-	
			T_{vj}= 150°C	-	26.1	-	

R_{thJC}	Thermal resistance, junction to case	per diode	-	0.07	-	K/W
R_{thCH}	Thermalresistance,case to heatsink	per diode/ λgrease= 1W/(m·K)	-	0.089	-	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	-	

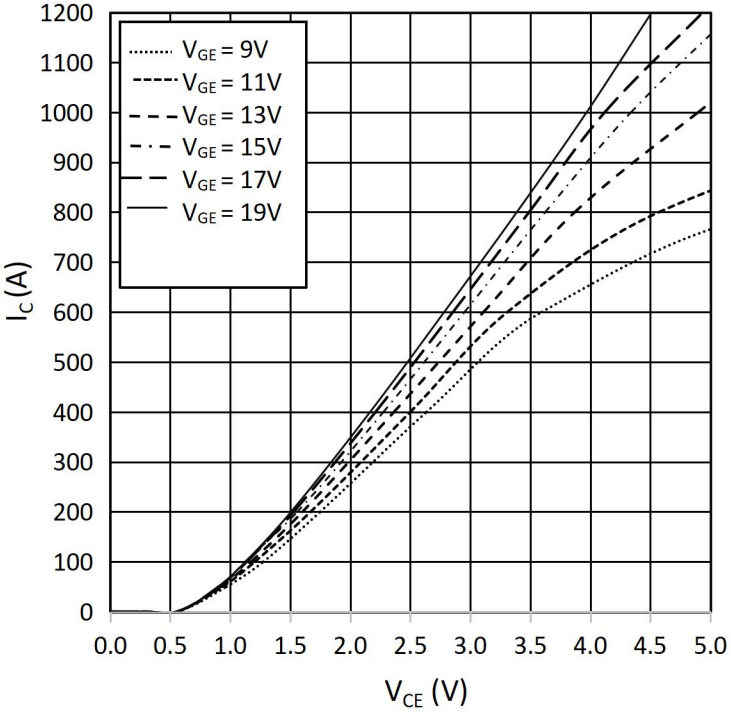
Module

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	-	-	340	-	g
L_{sCE}	Stray inductance module			45		nH

output characteristic IGBT, Inverter (typical)

$I_C = f(V_{CE})$

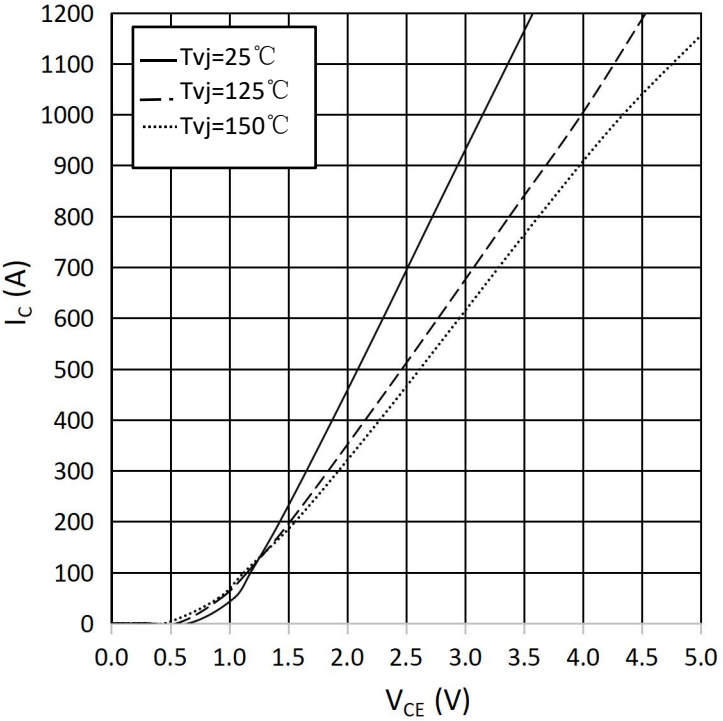
$T_{vj} = 150℃$



output characteristic IGBT, Inverter (typical)

$I_C = f(V_{CE})$

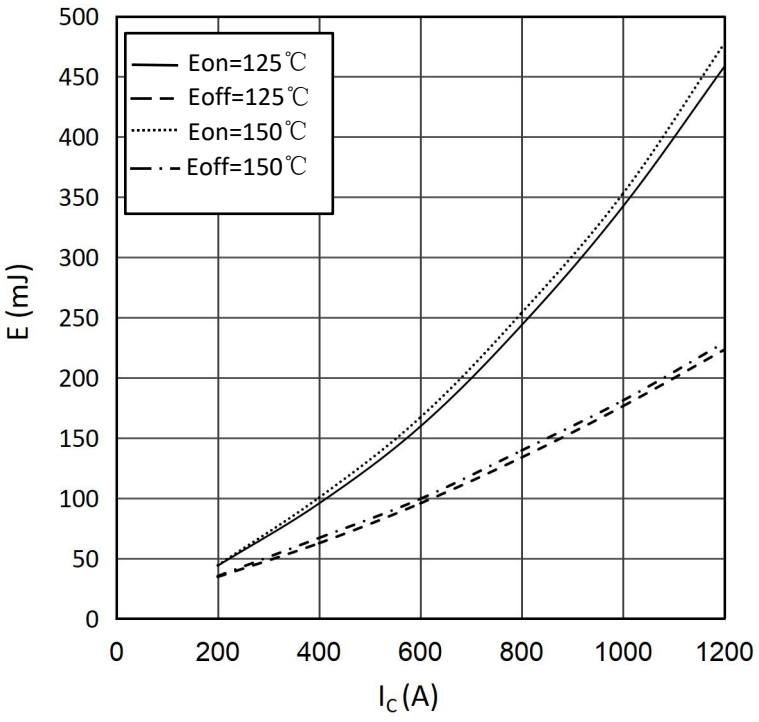
$V_{GE} = 15\ V$



switching losses IGBT,Inverter(typical)

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

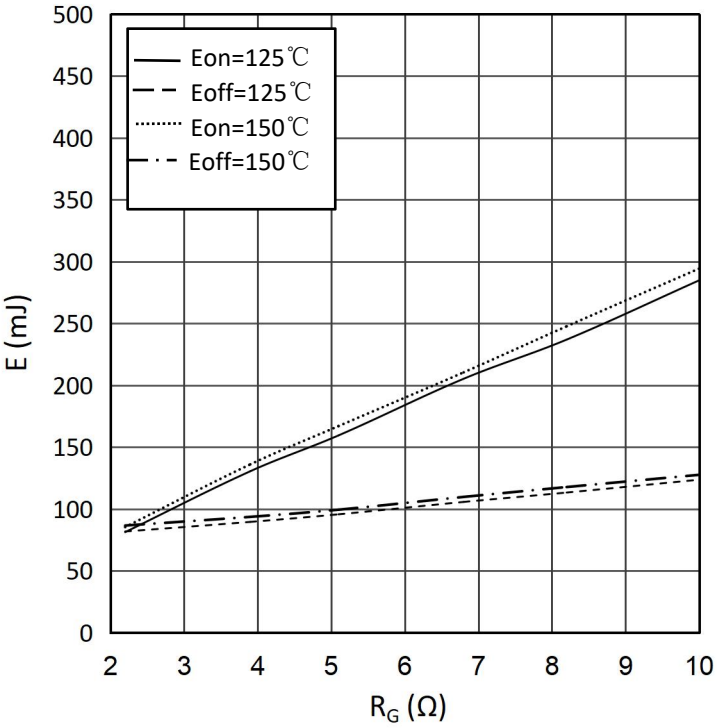
$V_{GE} = \pm 15V$, $R_{Gon} = 5.1\Omega$, $R_{Goff} = 5.1\Omega$, $V_{CE} = 600V$



switching losses IGBT,Inverter(typical)

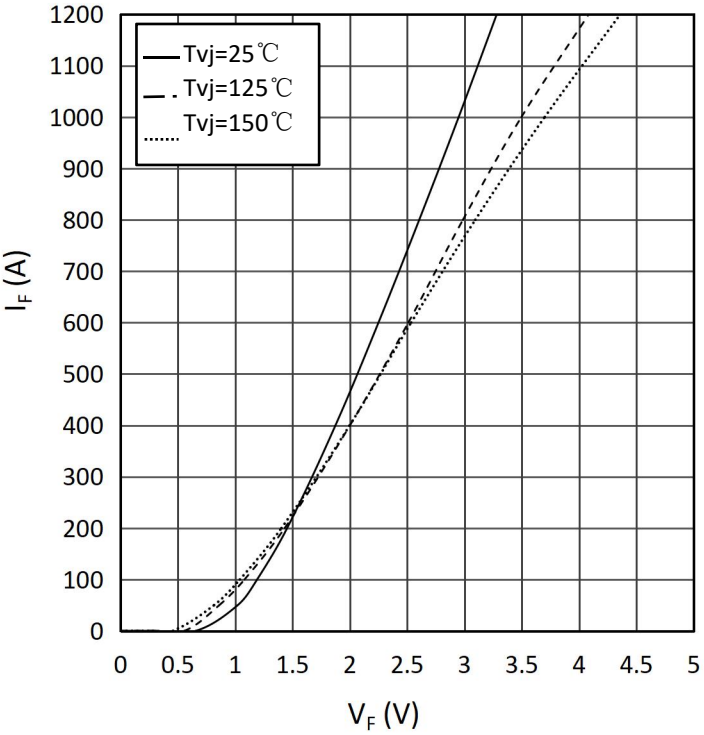
$E_{on} = f(R_G)$, $E_{off} = f(R_G)$

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



forward characteristic of Diode, Inverter (typical)

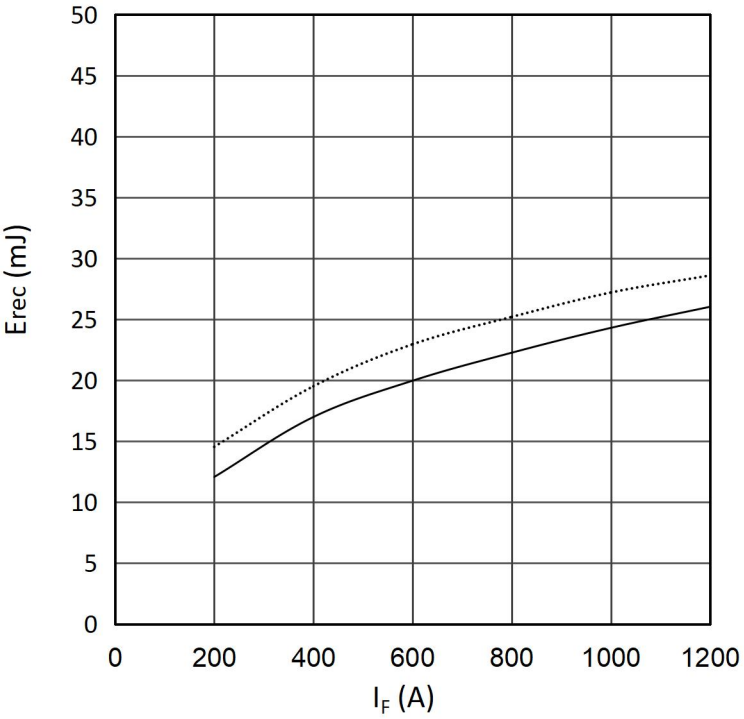
$I_F = f(V_F)$



switching losses Diode, Inverter (typical)

$E_{rec} = f(I_F)$ R_{Gon}=5. 1Ω,

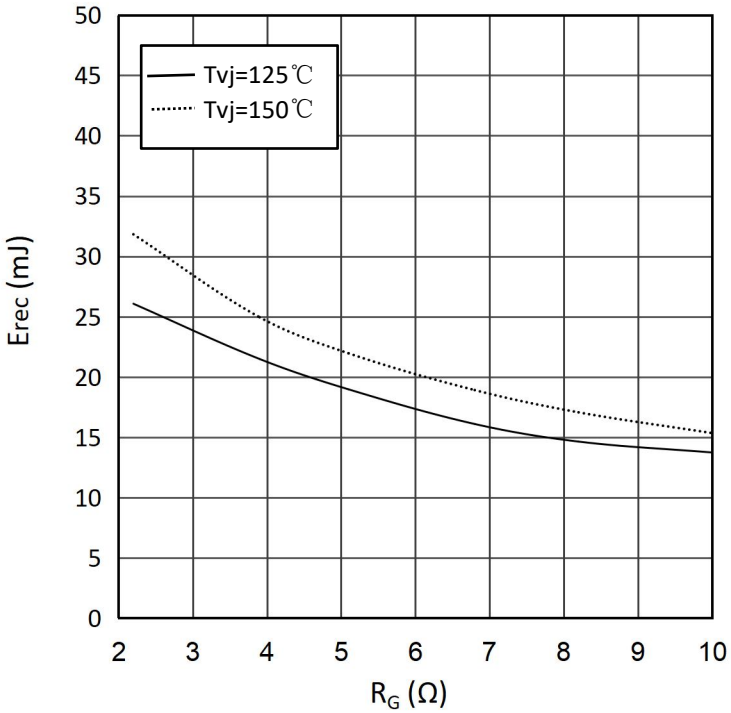
V_{CE}=600V



switching losses Diode, Inverter (typical)

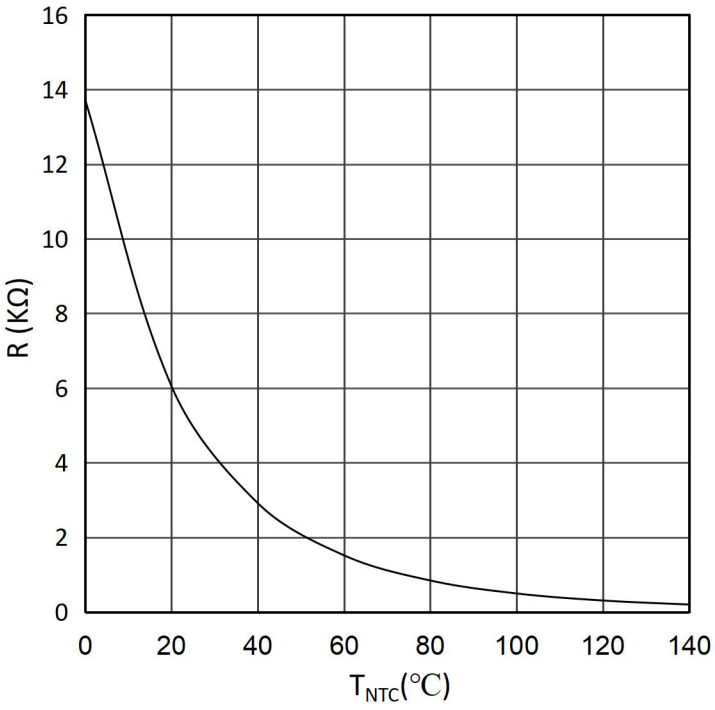
$E_{rec} = f(R_G)$

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



NTC- Thermistor- temperature characteristic(typical)

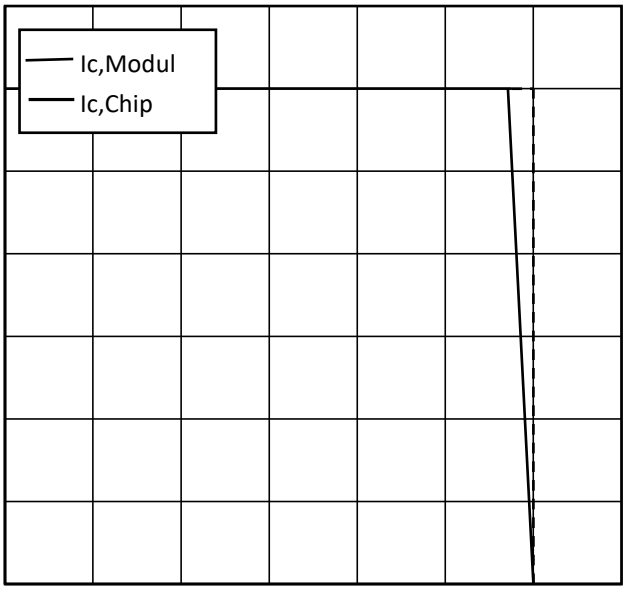
R=f (T)



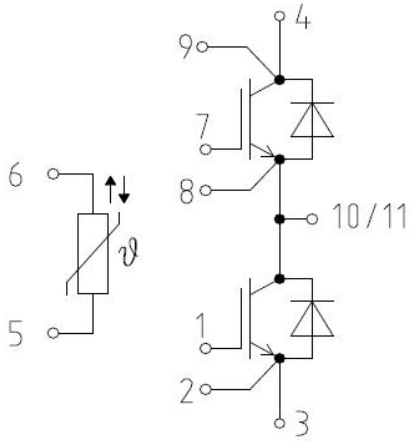
reverse bias safe operating area IGBT,Inverter (RBSOA)

$I_C = f(V_{CE})$

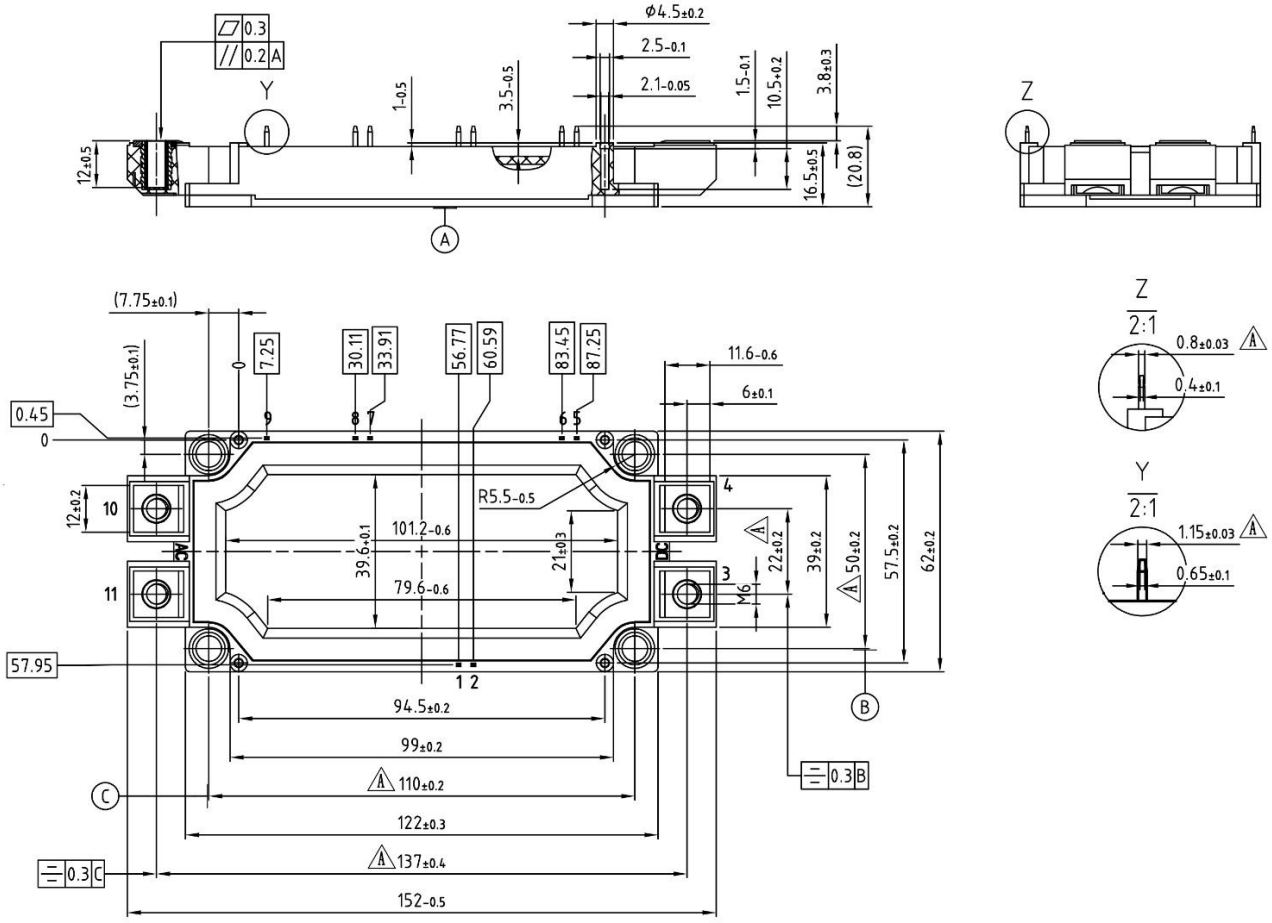
$V_{GE} = \pm 15V$, $R_{Gon} = 5.1\Omega$, $R_{Goff} = 5.1\Omega$, $T_{vj} = 25℃$



Circuit diagram headline



Package outlines （Unit：mm）



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