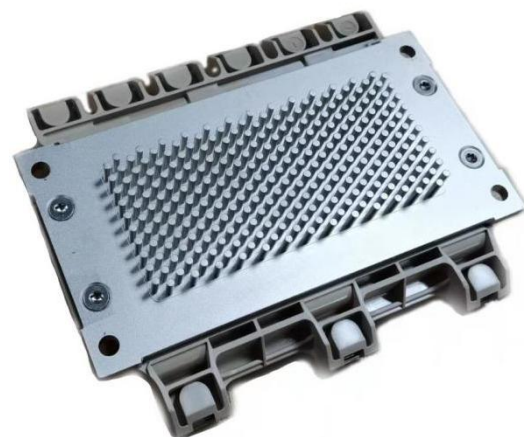# QMFS400R08YNF
750V400A IGBT Module

Electrical Features

- Trench/Fieldstop IGBT
- Low $V_{CE}(sat)$
- $V_{CE}(sat)$ with positive temperature coefficient
- Fast&soft reverse recovery anti-parallel FWD
- Low inductance case

Typical Applications

- Motor Drives
- Hybrid Electrical Vehicles (H)EV
- Commercial Agriculture Vehicles
- Automotive Applications

IGBT，Inverter

Maximum Rated Values

Symbol	Item	Conditions	Rating	Unit
IGBT				
V_{CES}	Collector-emitter voltage	$T_{vj}=25°C$	750	V
V_{GES}	Gate-emitter voltage	-	±20	V
I_C	Collector current,DC	$T_C=75°C$,$T_{vj}=175°C$	400	A
I_{CRM}	Repetitive peak collector current	$t_p=1ms$	800	A
P_{tot}	Total power dissipation	$T_C=25°C$,$T_{vj}=175°C$	810	W

Characteristics Values

Symbol	Item	Conditions		Min.	Typ.	Max.	Unit
IGBT							
I_{CES}	Collector-emitter cut-off current	$V_{CE}=750V$,$V_{GE}=0V$,$T_{vj}=25°C$		-	-	1	mA
I_{GES}	Gate leakage current	$V_{CE}=0V$,$V_{GE}=20V$,$T_{vj}=25°C$		-	-	400	nA
$V_{GE(th)}$	Gate-emitter threshold voltage	$I_C=5.2mA$,$V_{CE}=V_{GE}$,$T_{vj}=25°C$		5.0	5.9	7.0	V
V_{CEsat}	Collector-emitter saturation voltage	$I_C=400A$ $V_{GE}=15V$	$T_{vj}=25°C$	-	1.45	-	V
			$T_{vj}=125°C$	-	1.56	-	
			$T_{vj}=150°C$	-	1.58	-	
C_{ies}	Input capacitance	$V_{CE}=25V$,$V_{GE}=0V$		-	33.6	-	nF
C_{res}	Reverse transfer capacitance	$f=1MHz$,$T_{vj}=25°C$		-	2.81	-	
Q_G	Gate charge	$V_{GE}=±15V$		-	2.08	-	uC
R_g	Internal gate resistance	$T_{vj}=25°C$		-	1	-	Ω

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Symbol	Item	Conditions		Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time		T_{vj}=25°C	-	96	-	
			T_{vj}=125°C	-	86.4	-	
			T_{vj}=150°C	-	89.6	-	
t_r	Rise time	V_{CC}=400V, I_C=400A, V_{GE}=±15V, $R_{G(on)}$=2.4Ω, $R_{G(off)}$=12Ω, L_{load}=20uH	T_{vj}=25°C	-	99	-	ns
			T_{vj}=125°C	-	112	-	
			T_{vj}=150°C	-	111	-	
$t_{d(off)}$	Turn-off delay time		T_{vj}=25°C	-	595	-	
			T_{vj}=125°C	-	660	-	
			T_{vj}=150°C	-	683	-	
t_f	Fall time		T_{vj}=25°C	-	82	-	
			T_{vj}=125°C	-	82.4	-	
			T_{vj}=150°C	-	84.8	-	
E_{on}	Turn-on energy (per pulse)	V_{CC}=400V, I_C=400A, V_{GE}=±15V, $R_{G(on)}$=2.4Ω, di/dt=3900A/μs(T_{vj}=25°C)	T_{vj}=25°C	-	14.5	-	mJ
			T_{vj}=125°C	-	21.0	-	
			T_{vj}=150°C	-	21.8	-	
E_{off}	Turn-off energy (per pulse)	V_{CC}=400V, I_C=400A, V_{GE}=±15V, $R_{G(off)}$=12Ω, du/dt=3333V/μs(T_{vj}=25°C)	T_{vj}=25°C	-	31.7	-	
			T_{vj}=125°C	-	33.9	-	
			T_{vj}=150°C	-	35.4	-	
SC data	Short-circuit current	V_{CC}=450V,V_{GE}≤15V,T_{vj}=125°C, t_P≤8μs		-	1600	-	A
R_{thJF}	Thermal resistance,junction to cooling fluid	per IGBT;ΔV/Δt=10dm³/min		-	0.17	0.18	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	750	V
I_F	Forward current,DC		400	A
I_{FRM}	Repetitive peak forward current	t_p=1ms	800	A

Characteristic Values

Symbol	Item	Conditions		Min.	Typ.	Max.	Unit
V_F	Continuous forward voltage	I_F=400A V_{GE}=0V	T_{vj}=25°C	-	1.51	-	V
			T_{vj}=125°C	-	1.58	-	
			T_{vj}=150°C	-	1.58	-	
I_{RM}	Peak reverse recovery current	V_R=400V I_F=400A V_{GE}=-15V -di$_F$/dt=2140A/μs (T_{vj}=25°C)	T_{vj}=25°C	-	127	-	A
			T_{vj}=125°C	-	152	-	
			T_{vj}=150°C	-	163	-	
t_{rr}	Reverse recovery time		T_{vj}=25°C	-	286	-	ns
			T_{vj}=125°C	-	262	-	
			T_{vj}=150°C	-	279	-	
Q_r	Recovered charge		T_{vj}=25°C	-	19.4	-	μC
			T_{vj}=125°C	-	28.1	-	
			T_{vj}=150°C	-	31.4	-	

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E_{rec}	Reverse recovery energy		T_{vj}=25°C	-	7.04	-	mJ
			T_{vj}=125°C	-	9.2	-	
			T_{vj}=150°C	-	10.2	-	
R_{thJF}	Thermal resistance,junction to cooling fluid	per IGBT;$\Delta V/\Delta t$=10dm³/min		-	0.27	0.29	K/W
T_{vjop}	Temperature under switching conditions			-40		150	°C

NTC Thermistor Characteristics

Symbol	Item	Conditions	Values			Unit
			Min.	Typ.	Max.	
R_{25}	Rated resistance	T_C=25°C	-	5	-	kΩ
$\Delta R/R$	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	-	

Module

Symbol	Item	Conditions	Rating	Unit
V_{ISOL}	Isolation voltage	Terminals to baseplate，RMS,f=50Hz,t=1min	2500	V
-	Material of module baseplate	-	Cu	-
-	Internal isolation	Basic insulation(class 1, IEC 61140)	Al_2O_3	-
T_{stg}	Storage temperature	-	-40~125	°C

| Symbol	Item	Conditions	Values			Unit
			Min.	Typ.	Max.	
Δp	Pressure drop in cooling circuit	$\Delta V/\Delta t$ = 10.0 dm³/min; T_F = 25°C	-	100	-	mbar
p	Maximum pressure in cooling circuit		-	-	2.0	bar
M	Mounting torque for module mounting	Screw M5 baseplatetoheatsink	3.0	-	6.0	Nm
	Terminal connection torque	Screw M6	3.0	-	6.0	Nm
d_{Creep}	Creepage distance	Terminal to terminal	-	6.1	-	mm
		Terminal to heatsink	-	12	-	
d_{Clear}	Clearance	Terminal to terminal	-	6.1	-	mm
		Terminal to heatsink	-	12	-	
m	Weight	-	-	692	-	g

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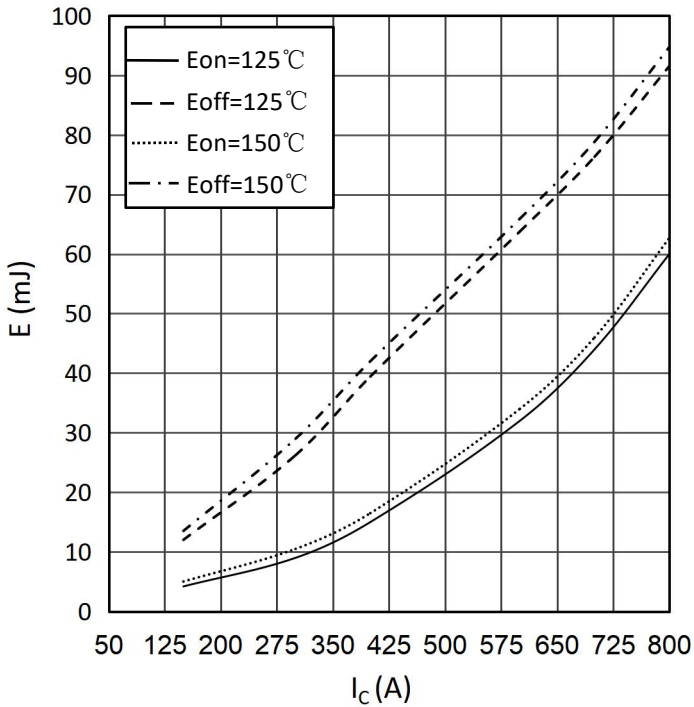
$I_C = f(V_{CE})$

$V_{GE} = 15\ V$
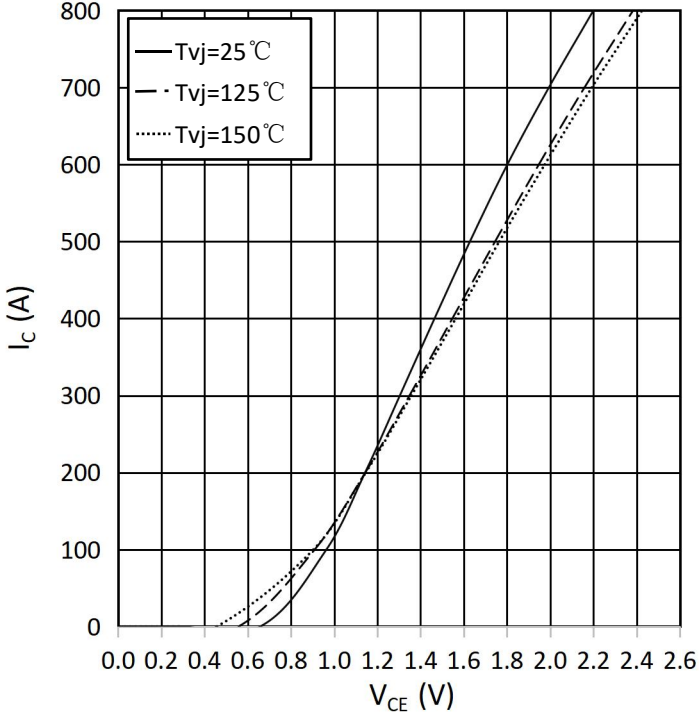
output characteristic IGBT, Inverter (typical)
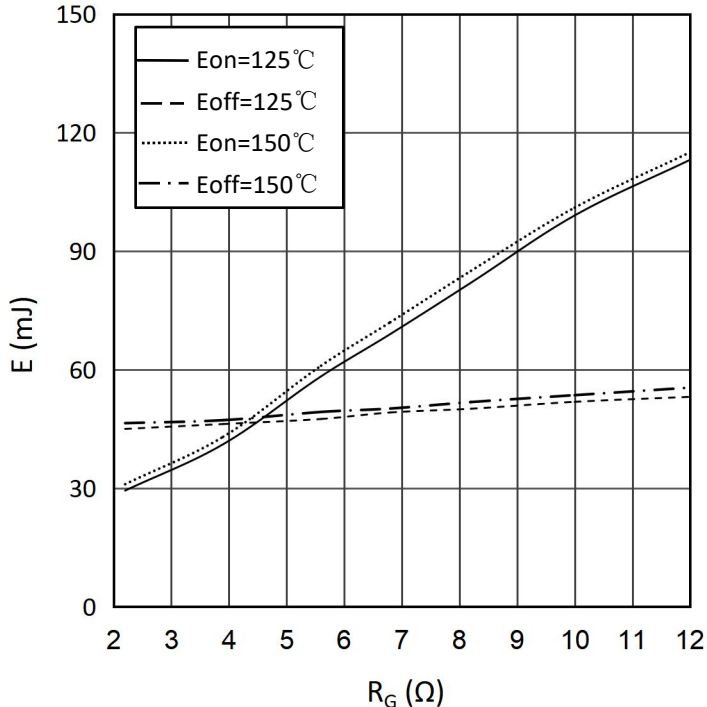
$I_C = f(V_{CE})$

$T_{vj} = 150\,℃$
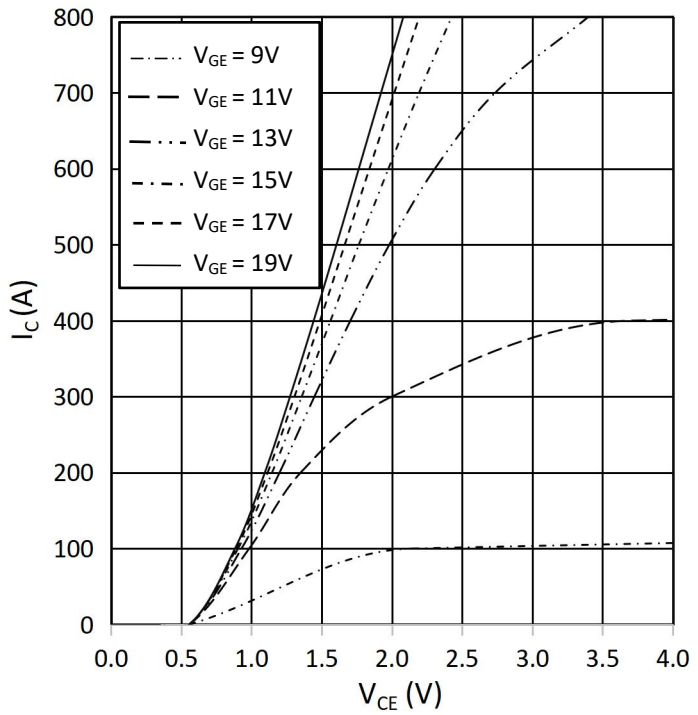
switching losses IGBT,Inverter(typical)

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

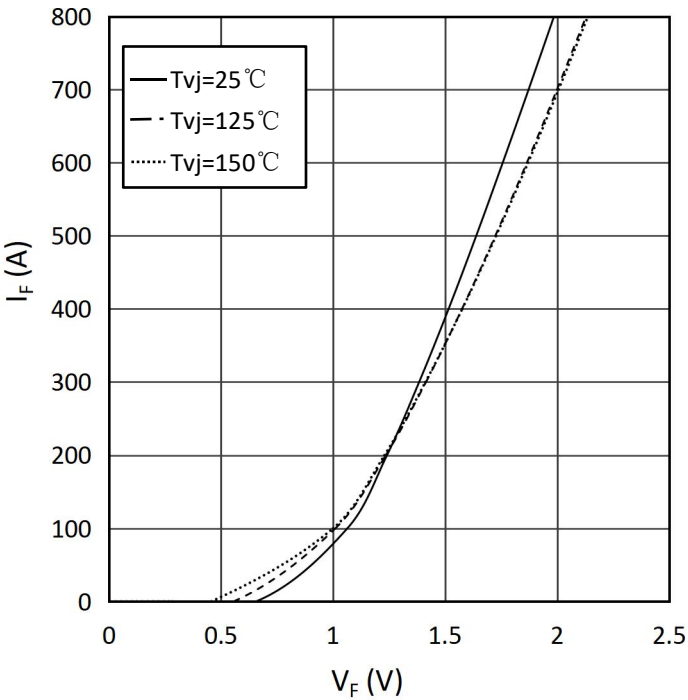$V_{GE} = \pm15V$, $R_{Gon} = 2.4\Omega$, $R_{Goff} = 2.4\Omega$, $V_{CE} = 900V$

switching losses IGBT,Inverter(typical)

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

$V_{GE} = \pm15V$, $I_C = 450A$, $V_{CE} = 900V$

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

switching losses Diode, Inverter (typical)
$E_{rec} = f(I_F)$
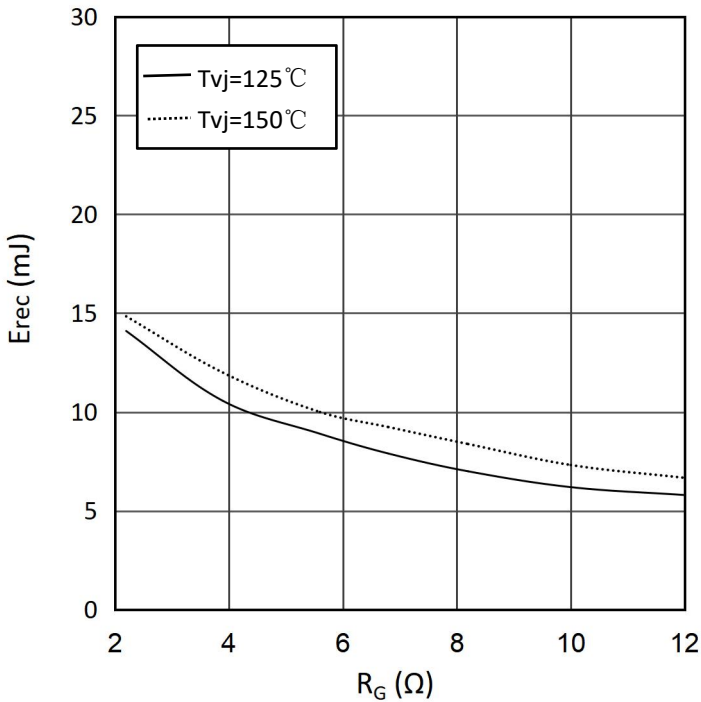$R_{Gon} = 2.4\Omega$, $V_{CE} = 900V$
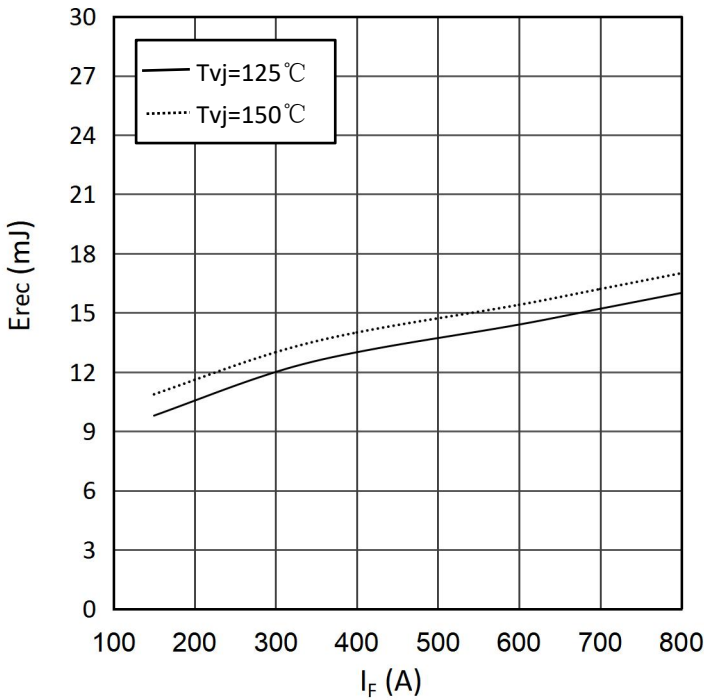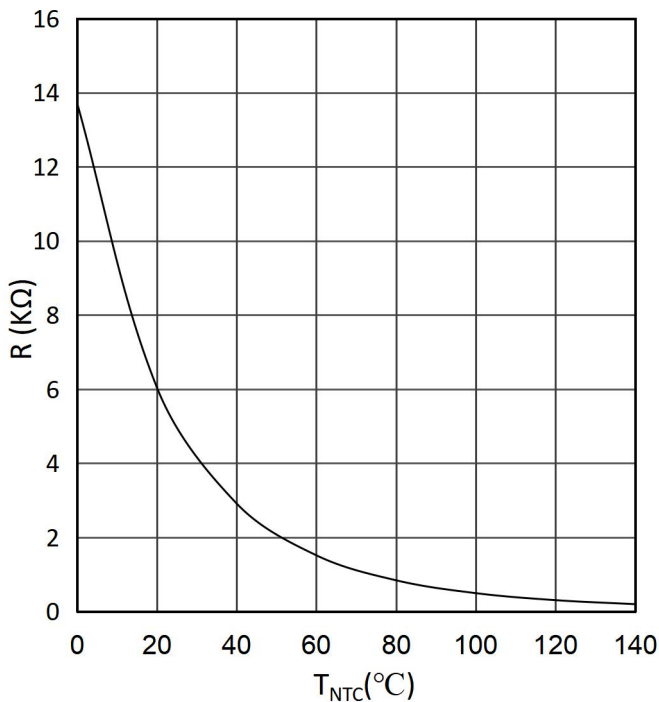

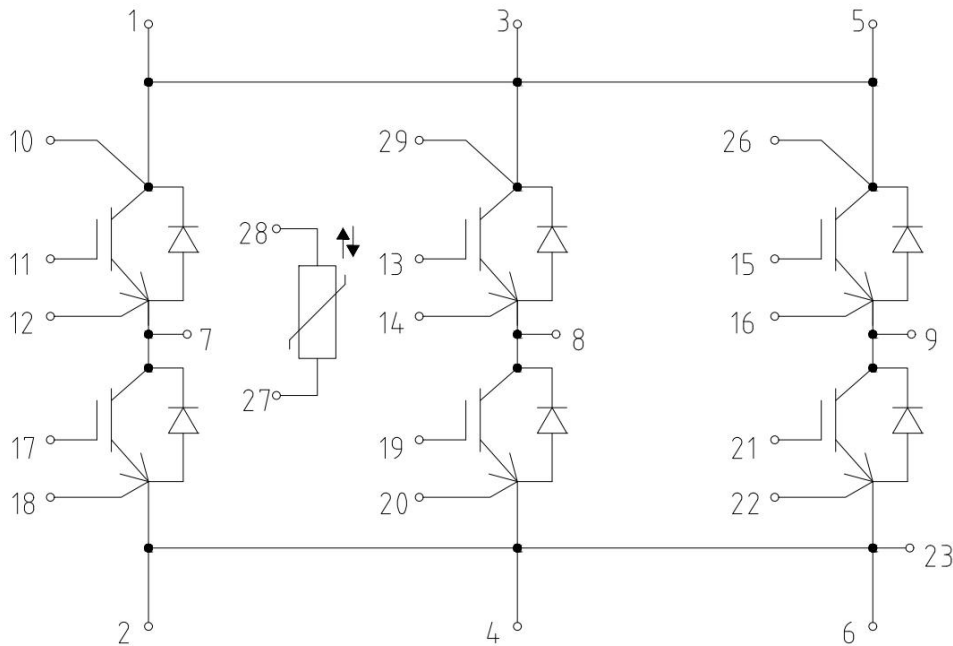**switching losses Diode, Inverter (typical)**
$E_{rec} = f(R_G)$
$I_F = 450A$, $V_{CE} = 900V$
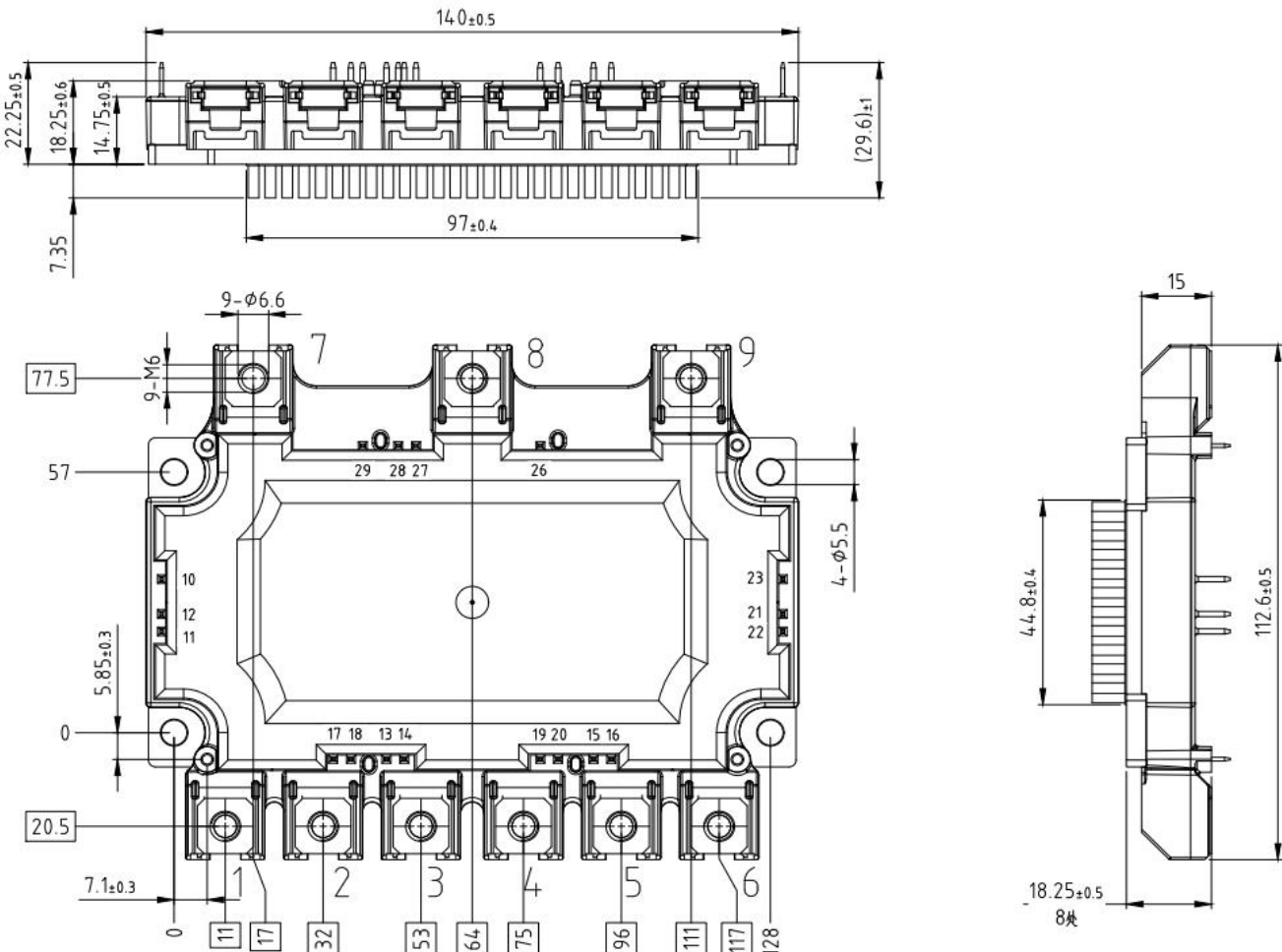
NTC-Thermistor-temperature characteristic(typical)
$R = f(T)$

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Circuit diagram headline

Package outlines（Unit：mm）

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A (2:1)

4-1.78±0.1
18-1.15±0.1
4-2.88±0.1
18-0.8±0.1

33.405
41.025
44.835
71.505

0

34.29

5.08
0
2.54
6.349

34.29

43.68±0.3

66.675
29.845
26.035
18.415
14.605
R2.5
0
14.605
18.415
26.035
29.845
66.675

方框内尺寸位置度 ⌖ ⌀0.5

69.74
68.7

A

4⌀2.1±0.1▽10

0
1.04

0
34.67
37.21
75.32
79.13
113.8

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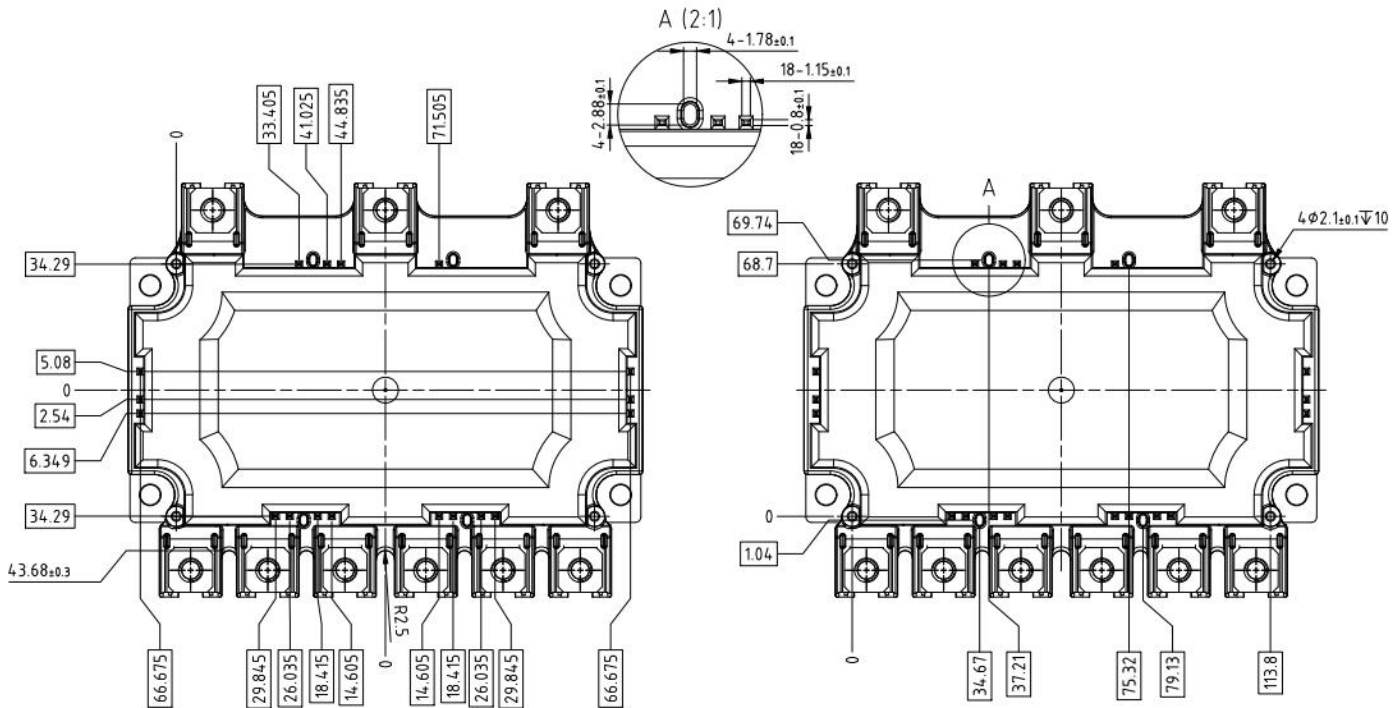
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