QMFF400R12EFF

1200V 400A IGBT Module

Electrical Features

- Trench/Fieldstop IGBT
- Half-bridge
- Standard package
- High short circuit capability
- Including anti-parallel FWD

Typical Applications

- Frequency converter
- UPS
- High Power Converters
- Motor Drives
- Wind Turbines

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	400	A
I_{CRM}	Repetitive peak collector current	t_p=1ms	800	A
t_{SC}	Short circuit withstand time	V_{GE}=15V, V_{CC}=600V, T_{vj}≤150°C	10	μs
P_{tot}	Total power dissipation	T_C=25°C,T_{vj}=175°C	2419	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		-	-	250	nA
$V_{GE(th)}$	Gate-emitter threshold voltage	I_C=16mA,V_{CE}=V_{GE},T_{vj}=25°C		5.0	6.0	7.0	V
V_{CEsat}	Collector-emitter saturation voltage	I_C=400A V_{GE}=15V	T_{vj}=25°C	-	1.90	2.4	V
			T_{vj}=125°C	-	1.90	-	
			T_{vj}=150°C	-	1.93	-	
C_{ies}	Input capacitance	V_{CE}=25V,V_{GE}=0V f=1MHz,T_{vj}=25°C		-	31.3	-	nF
C_{res}	Reverse transfer capacitance			-	0.95	-	
Q_G	Gate charge	V_{CC}=600V, I_C=400A, V_{GE}=15V		-	2.4	-	uC
R_g	Internal gate resistance	T_{vj}=25°C		-	0.43	-	Ω

$t_{d(on)}$	Turn-on delay time	V_{CC}=600V, I_C=400A, V_{GE}=±15V, $R_{G(on)}$=2.5 Ω, $R_{G(off)}$=2.5 Ω, L_{load}=100uH di/dt=5390A/μs (T_{vj}=150°C) du/dt=2546V/μs (T_{vj}=150°C)	T_{vj}=25°C	-	88	-	ns
			T_{vj}=125°C	-	156	-	
			T_{vj}=150°C	-	156	-	
t_r	Rise time		T_{vj}=25°C	-	117	-	
			T_{vj}=125°C	-	163	-	
			T_{vj}=150°C	-	169	-	
$t_{d(off)}$	Turn-off delay time		T_{vj}=25°C	-	498	-	
			T_{vj}=125°C	-	924	-	
			T_{vj}=150°C	-	931	-	
t_f	Fall time		T_{vj}=25°C	-	170	-	
			T_{vj}=125°C	-	270	-	
			T_{vj}=150°C	-	296	-	
E_{on}	Turn-on energy (per pulse)		T_{vj}=25°C	-	27.8	-	mJ
			T_{vj}=125°C	-	86.3	-	
			T_{vj}=150°C	-	93.3	-	
E_{off}	Turn-off energy (per pulse)		T_{vj}=25°C	-	38.9	-	
			T_{vj}=125°C	-	64.8	-	
			T_{vj}=150°C	-	67.4	-	
R_{thJC}	Thermal resistance,junction to case	per IGBT		-	0.062	-	K/W
R_{thCH}	Thermalresistance,case to heatsink	per IGBT/ λgrease=1W/(m·K)		-		-	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		400	A
I_{FRM}	Repetitive peak forward current	t_p=1ms	800	A

Characteristic Values

V_F	Continuous forward voltage	I_F=400A V_{GE}=0V	T_{vj}=25°C	-	1.90	2.4	V
			T_{vj}=125°C	-	1.35	-	
			T_{vj}=150°C	-	1.30	-	
I_{RM}	Peak reverse recovery current	V_R=600V I_F=400A di_F/dt=-4264A/μs (T_{vj}=150°C)	T_{vj}=25°C	-	248	-	A
			T_{vj}=125°C	-	328	-	
			T_{vj}=150°C	-	364	-	
t_{rr}	Reverse recovery time		T_{vj}=25°C	-	171	-	ns
			T_{vj}=125°C	-	388	-	
			T_{vj}=150°C	-	547	-	
Q_r	Recovered charge		T_{vj}=25°C	-	31.6	-	μC
			T_{vj}=125°C	-	82.1	-	
			T_{vj}=150°C	-	101.9	-	
E_{rec}	Reverse recovery energy		T_{vj}=25°C	-	12.1	-	mJ
			T_{vj}=125°C	-	31.6	-	
			T_{vj}=150°C	-	39.6	-	

R_{thJC}	Thermal resistance, junction to case	per diode	-	0.11	-	K/W
R_{thCH}	Thermalresistance,case to heatsink	per diode/ λgrease=1W/(m·K)	-		-	K/W
T_{vjop}	Temperature under switching conditions		-40		150	℃

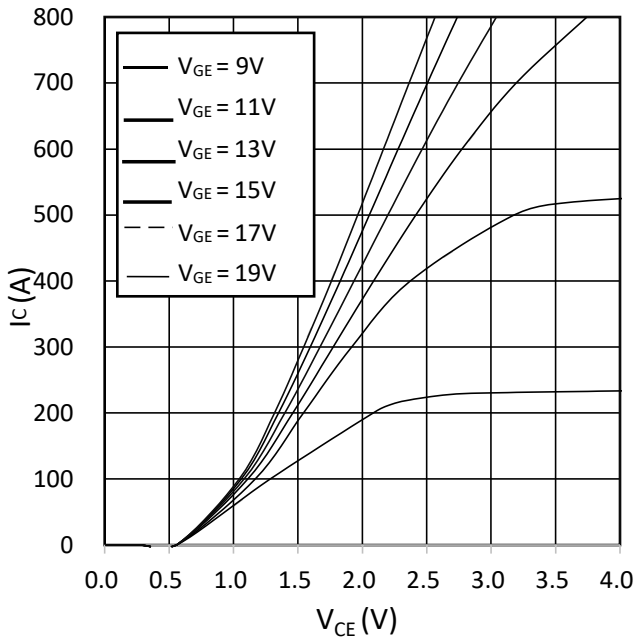
Module

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	-	6.0	Nm
	Terminal connection torque	Screw M6	2.5	-	5.0	Nm
ds	Creepage distance	Terminal to terminal	-	23	-	mm
		Terminal to base plate	-	29	-	
da	Clearance	Terminal to terminal	-	11	-	mm
		Terminal to base plate	-	23	-	
m	Weight	-	-	315	-	g

utput characteristic IGBT, Inverter (typical)

$I_C = f(V_{CE})$

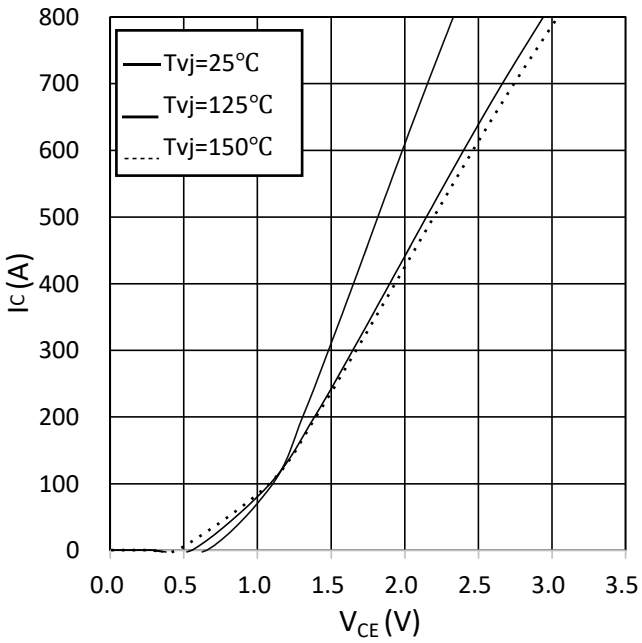
$T_{vj} = 150℃$



output characteristic IGBT, Inverter (typical)

$I_C = f(V_{CE})$

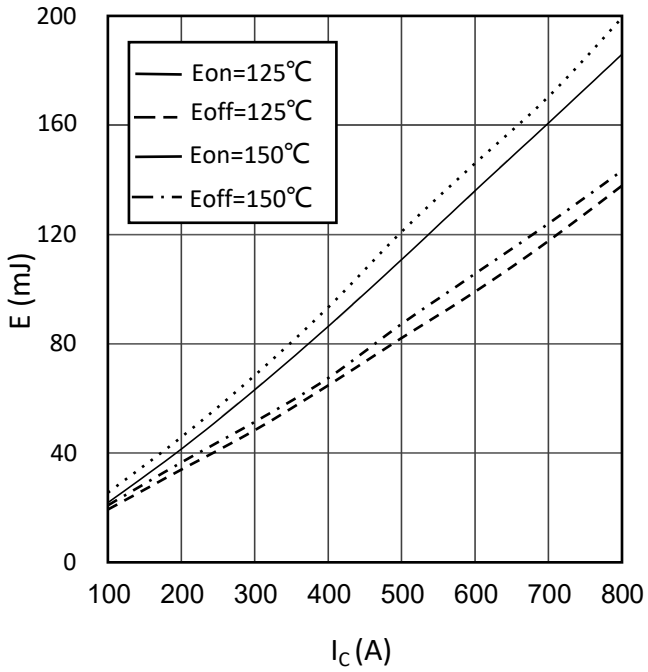
$V_{GE} = 15\ V$



switching losses IGBT,Inverter(typical)

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

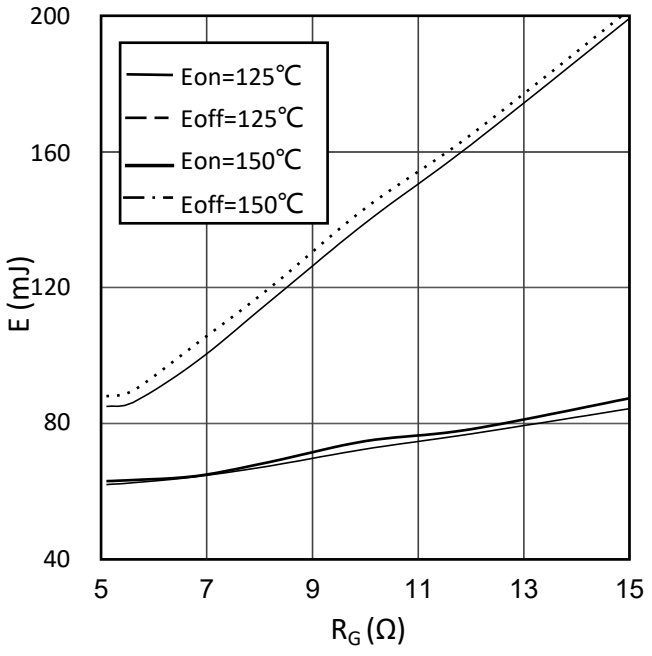
$V_{GE} = \pm 15V$, $R_{Gon} = 5.1\Omega$, $R_{Goff} = 5.1\Omega$, $V_{CE} = 600V$



switching losses IGBT,Inverter(typical)

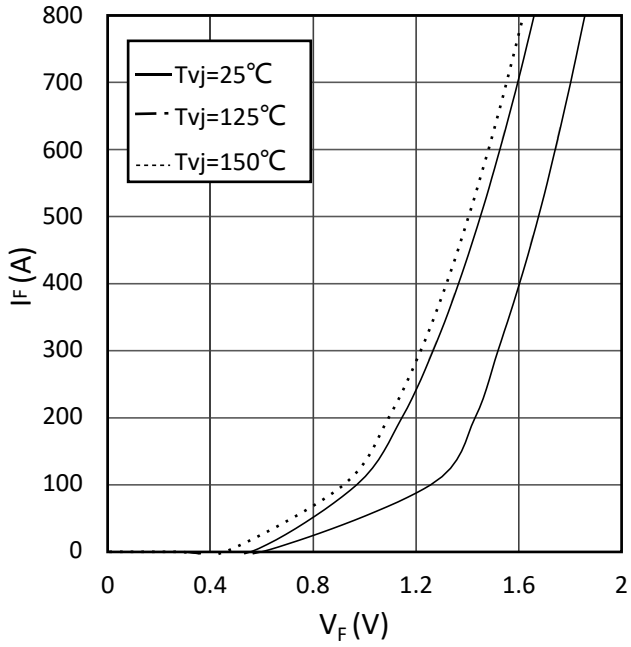
$E_{on} = f(R_G)$, $E_{off} = f(R_G)$

$V_{GE} = \pm 15V$, $I_C = 400A$, $V_{CE} = 600V$



forward characteristic of Diode, Inverter (typical)

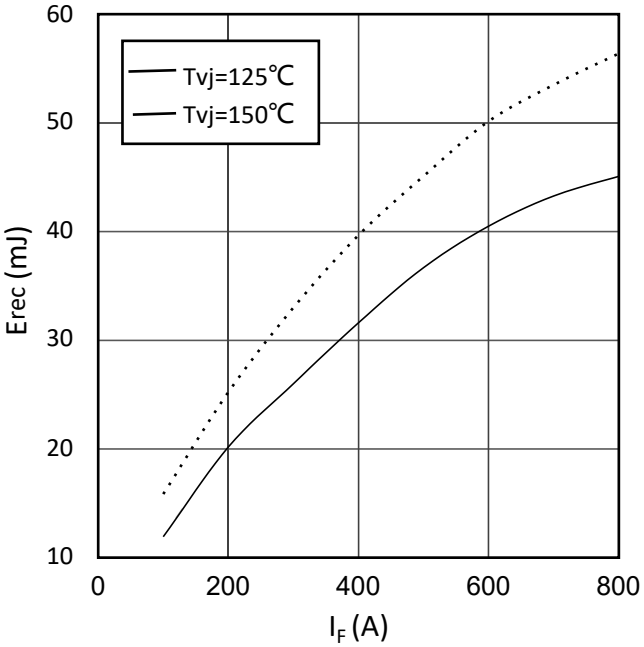
$I_F = f(V_F)$



switching losses Diode, Inverter (typical)

$E_{rec} = f(I_F)$

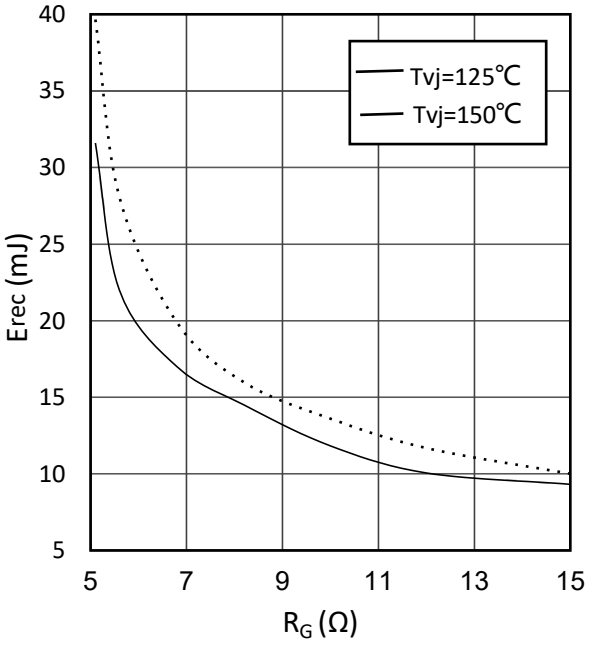
R_{Gon}=5.1Ω, V_{CE}=600V



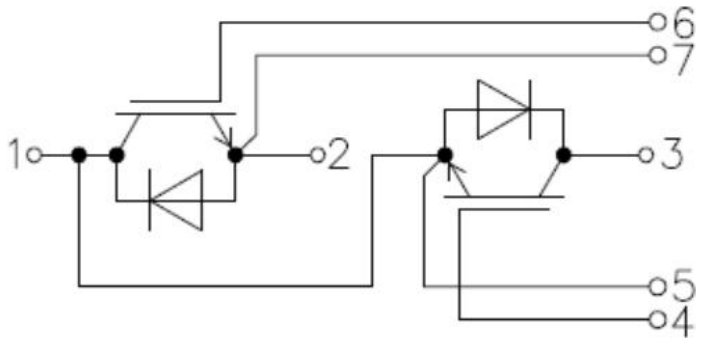
switching losses Diode, Inverter (typical)

$E_{rec} = f(R_G)$

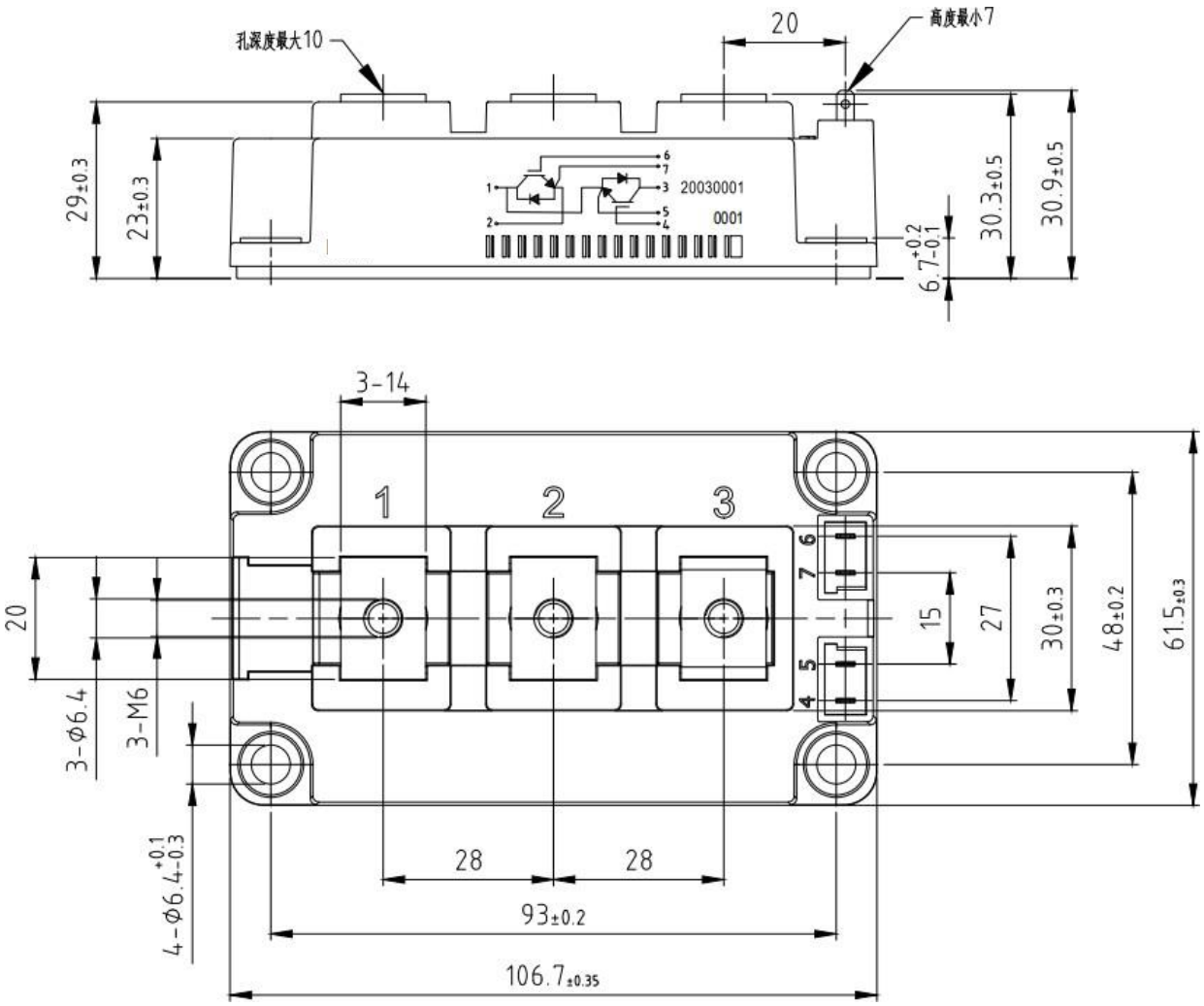
I_F=400A, V_{CE}=600V



Circuit diagram headline



Package outlines（Unit：mm）



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