Industrial IGBT Power Module
HB2G030N120FF

Confidential, Shared Under NDA

Rev 1.0

Features

- V_{CEsat} with positive temperature coefficient
- High power density
- High creepage and clearance distances

Applications

- Inverter for motor drives AC and DC servo drives
- High power converters
- UPS systems
- Solar power

Table 1 Key Performance and Package Parameters

Type	V_{CES}	I_C (T_C = 80°C)	$V_{CE\ sat}$ (T_j = 25℃, Ic = 300A, V_{GE} = 15V)	T_{vjmax}	Package
IGBT+FRD	1200V	300A	1.68V	175°C	HB2

Table 2 Absolute Maximum ratings (Ta = 25 °C)

Parameter	Symbol	Ratings	Unit
Collector-emitter voltage	V_{CES}	1200	V
Gate-emitter peak voltage	V_{GE}	±20	V
Implemented collector current	I_{CN}	300	A
Continuous DC collector current (T_C = 80°C)	I_C	300	A
Repetitive peak collector current	I_{CRM}	600	A
Continuous DC forward current	I_F	300	A
Maximum junction temperature	T_{vjmax}	-40 to +175	°C
Temperature under switching conditions	T_{vjop}	-40 to +150	°C
Storage temperature	T_{stg}	-40 to +125	°C

Table 3 Thermal Resistance

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
IGBT thermal resistance junction - case	R_{thJC}	Per IGBT	-	0.098	-	°C / W
Diode thermal resistance junction - case	R_{thJC}	Per diode	-	0.126	-	°C / W

Table 4 Characteristics values

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
Collector emitter voltage	$V_{(BR)CES}$	V_{GE} = 0V	T_{vj} = 25°C	1200	-	-	V
Collector-emitter saturation voltage	$V_{CE(sat)}$	V_{GE} = 15V, I_C = 300A	T_{vj} = 25°C	-	1.68	-	V
		V_{GE} = 15V, I_C = 300A	T_{vj} = 175°C	-	2.21	-	
Diode forward voltage	V_F	V_{GE} = 0V, I_C = 300A	T_{vj} = 25°C	-	1.54	-	V
		V_{GE} = 0V, I_C = 300A	T_{vj} = 175°C	-	1.53	-	
Gate-emitter threshold voltage	$V_{GE(th)}$	V_{CE} = V_{GE}, I_C = 10.4mA	T_{vj} = 25°C	-	5.8	-	V
Zero gate voltage collector current	I_{CES}	V_{CE} = 1200V, V_{GE} = 0V	T_{vj} = 25°C	-	-	100	uA
Gate-emitter leakage current	I_{GES}	V_{GE} = 20V, V_{CE} = 0V	T_{vj} = 25°C	-	-	100	nA
Input capacitance	C_{ies}	V_{CE} = 25V, V_{GE} = 0V, f = 100 kHz	T_{vj} = 25°C	-	36.0	-	nF
Output capacitance	C_{oss}		T_{vj} = 25°C	-	1.41	-	
Reverse transfer capacitance	C_{rss}		T_{vj} = 25°C	-	0.27	-	
Gate input resistance	R_G	f = 1MHz	T_{vj} = 25°C	-	1.90	-	Ω
Gate charge	Q_g	V_{GE} = ±15 V V_{CE} = 600 V	T_{vj} = 25°C	-	2.29	-	µC
Turn-on delay time (inductive load)	$t_{d\ on}$	V_{CE} = 600V, I_C = 300A , V_{GE} = ±15 V , R_{Gon} = 1.8Ω, R_{Goff} = 1.8Ω	T_{vj} = 25°C	-	262	-	ns
			T_{vj} = 175°C	-	278	-	
Rise time (inductive load)	t_r		T_{vj} = 25°C	-	38	-	
			T_{vj} = 175°C	-	52	-	
Turn-off delay time (inductive load)	$t_{d\ off}$		T_{vj} = 25°C	-	308	-	
			T_{vj} = 175°C	-	345	-	
Fall time (inductive load)	t_f		T_{vj} = 25°C	-	194	-	
			T_{vj} = 175°C	-	330	-	
Turn - on switching loss	E_{on}		T_{vj} = 25°C	-	17.7	-	mJ
			T_{vj} = 175°C	-	39.2	-	
Turn - off switching loss	E_{off}		T_{vj} = 25°C	-	25.5	-	
			T_{vj} = 175°C	-	34.0	-	
Total switching energy loss	E_{ts}		T_{vj} = 25°C	-	43.2	-	
			T_{vj} = 175°C	-	73.3	-	
Short circuit current	I_{SC}	V_{CE} = 800V, V_{GE} ≤ 15V , V_{CEmax} = V_{CES} - L_{sCE}*di/dt	T_P ≤ 6 us, T_{vj} =150°C	-	1100	-	A

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
Reverse recovery time	T_{rr}	V_{CE} = 600V, I_{CE} = 300A , V_{GE} = ±15 V , R_{Gon} = 1.8Ω, R_{Goff} = 1.8Ω	T_{vj} = 25°C	-	100	-	ns
			T_{vj} = 175°C	-	462	-	
Peak reverse recovery current	I_{RM}		T_{vj} = 25°C	-	200	-	A
			T_{vj} = 175°C	-	202	-	
Reverse recovery charge	Q_{rr}		T_{vj} = 25°C	-	12	-	µC
			T_{vj} = 175°C	-	46	-	
Reverse recovery energy	E_{rec}		T_{vj} = 25°C	-	3.5	-	mJ
			T_{vj} = 175°C	-	16.7	-	

Table 5 Module

Parameter	Symbol	Value	Unit	Unit Conditions
Isolation test voltage	V_{ISOL}	4.0	kV	RMS, f = 50 Hz, t = 1min
Material of module baseplate		Cu+Ni		
Internal isolation		Improved Al_2O_3 ceramic		Basic insulation
Mounting torque of screws to heat sink	Ms	3.0-6.0	N·m	M5
Mounting torque of screws to terminals	Mt	2.5-5.0	N·m	M6
Comparative tracking index	CTI	>175		

Characteristics Diagrams

Fig.1 Typical Output Characteristic, IGBT, Inverter
$I_C = f(V_{CE})$
V_{GE} = 15V

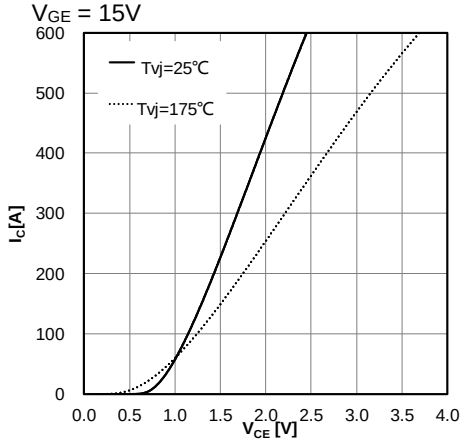


Fig.2 Typical Output Characteristic, IGBT, Inverter
$I_C = f(V_{CE})$
T_{Vj} = 175°C

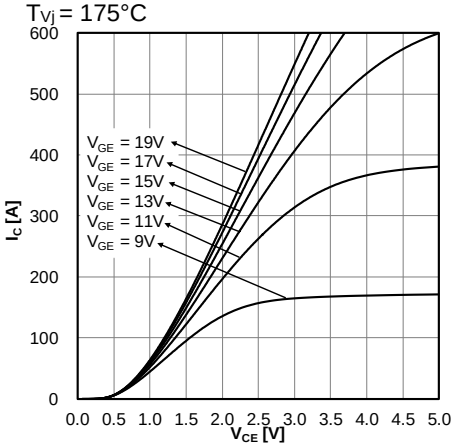


Fig.3 Typical Output Characteristic, IGBT, Inverter
$I_C = f(V_{GE})$
V_{CE} = 20V

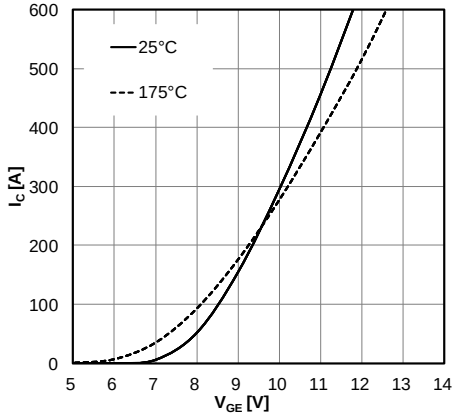


Fig.4 Switching losses, IGBT, Inverter
$E = f(I_C)$
R_{Goff} = 1.8 Ω, R_{Gon} = 1.8 Ω, V_{CE} = 600V, V_{GE} = ±15V

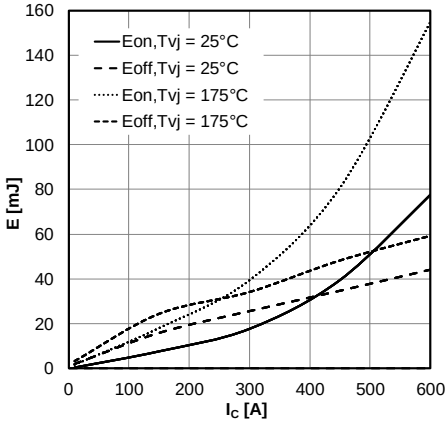


Fig.5 Switching losses, IGBT, Inverter
$E = f(R_G)$
I_C = 300A, V_{CE} = 600V, V_{GE} = ±15V

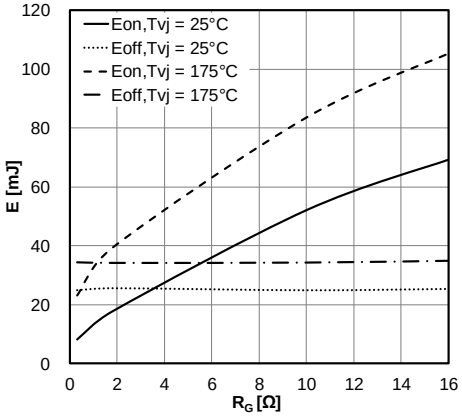
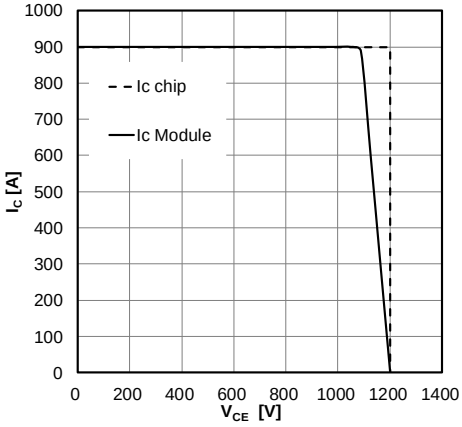


Fig.6 Reverse bias safe operating area(RBOSA), IGBT, Inverter
$I_C = f(V_{CE})$
R_{Goff} = 1.8 Ω, V_{GE} = ±15V, T_{vj} = 175°C



Characteristics Diagrams

Fig.7 Capacity characteristic, IGBT, Inverter
$C = f(V_{CE})$
$f = 100KHz$, $V_{GE} = 0V$, $T_{vj} = 25°C$

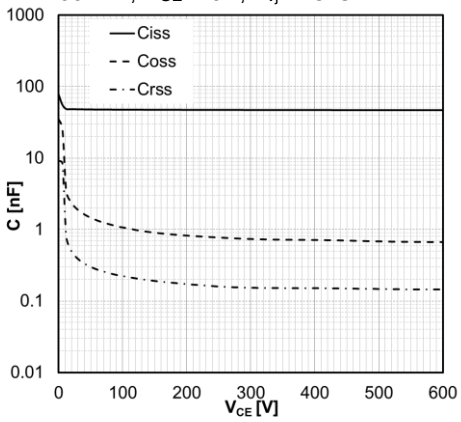


Fig.8 Transient thermal impedance IGBT, Inverter
$Z_{thJC} = f(t)$

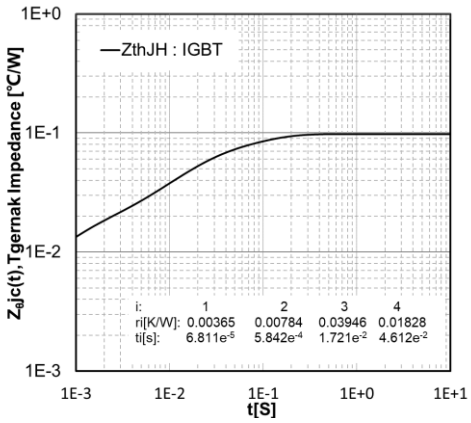


Fig.9 Forward characteristic, Diode, Inverter
$I_F = f(V_F)$

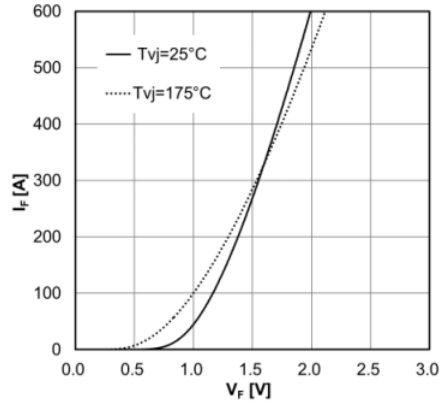


Fig.10 Switching losses, Diode, Inverter
$E_{rec} = f(I_F)$
$V_{CE} = 600V$, $R_{Goff} = 1.8\ \Omega$, $R_{Gon} = 1.8\ \Omega$, $V_{GE} = \pm 15V$

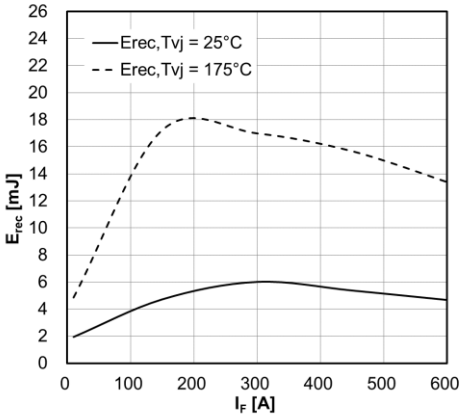


Fig.11 Switching losses, Diode, Inverter
$E_{rec} = f(R_G)$
$V_{CE} = 600V$, $I_F = 300A$

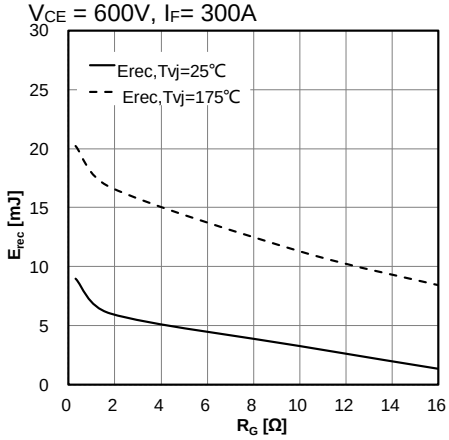
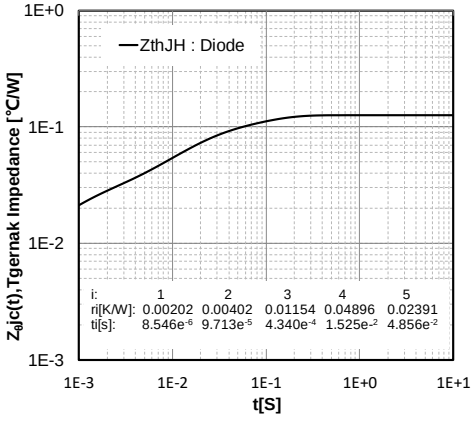
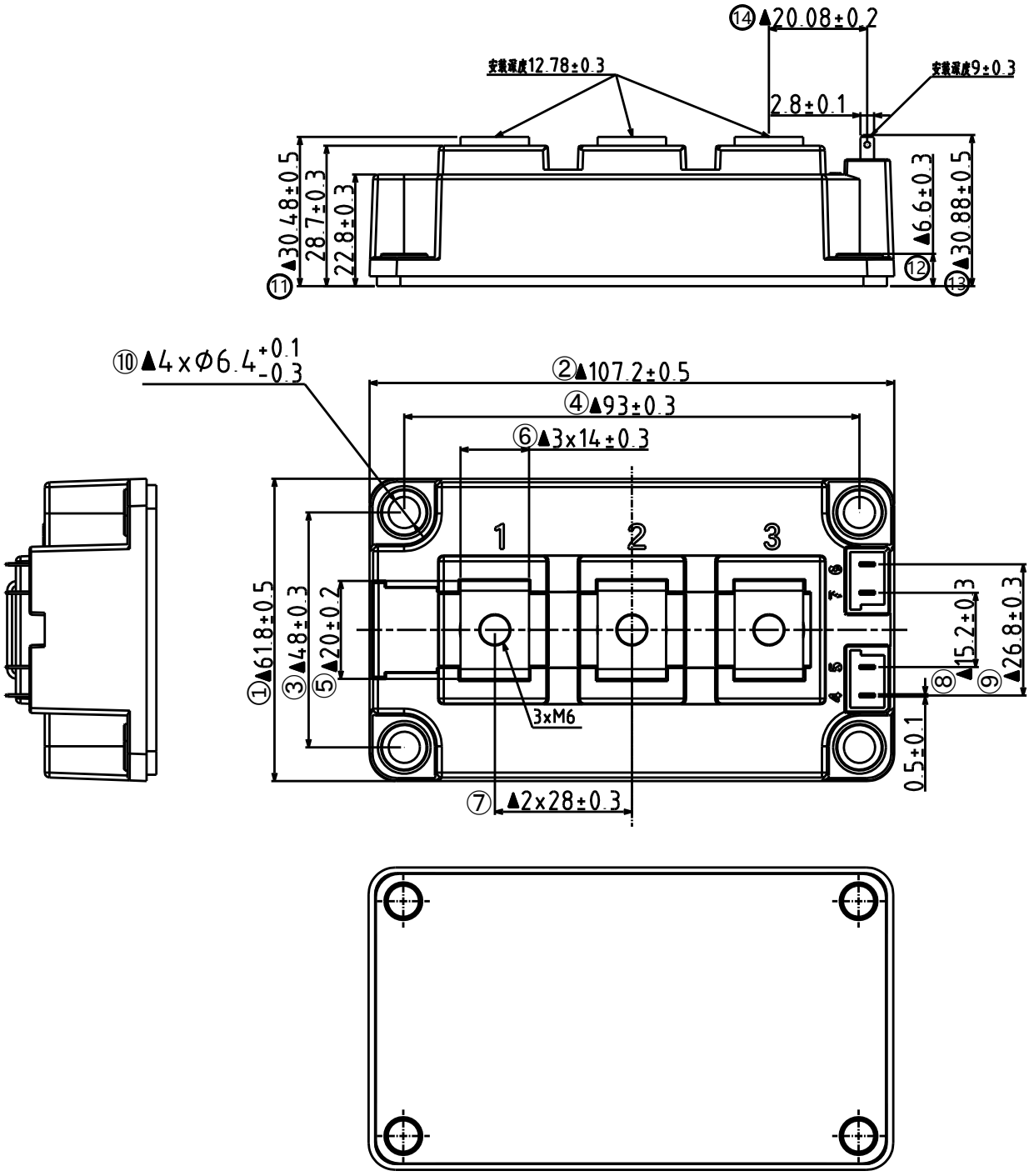


Fig.12 Transient thermal impedance Diode, Inverter
$Z_{thJC} = f(t)$



Package Outlines



Circuit Diagram