JG1G200F120FG

Product Preview

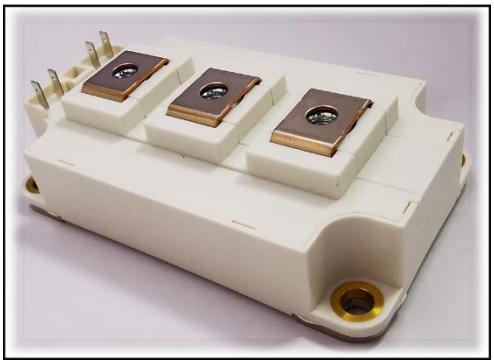
1200V/200A HALF-BRIDGE MODULE WITH

FIELD-STOP TRENCH IGBT AND DIODE

Features

- Low $V_{CE(sat)}$
- Fast Switching
- High Ruggedness
- Short-Circuit Rated

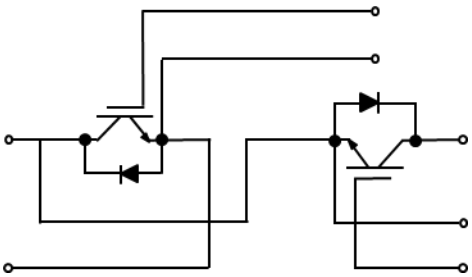
Product Summary	
V_{CES}	1200V
I_C	200A
$V_{CE(sat),typ}$	1.6V (T_J = 25°C)



Applications

- General Purpose Inverters
- Frequency Converters
- Industrial Motor Drives
- Servos

Internal Connection



• IGBT, Inverter

Absolute Maximum Ratings

Parameter	Symbol	Limit	Unit
Collector-to-Emitter Voltage	V_{CES}	1200	V
Gate-to-Emitter Voltage	V_{GES}	±20	
Continuous DC Collector Current (T_c = 100 °C, T_J = 175°C)	I_{CDC}	200	A
Repetitive Peak Collector Current (t_p=1ms)	I_{CRM}	400	
Maximum Power Dissipation (T_c = 25°C, T_J = 175°C)	$P_{D(max)}$	1000	W

Electrical Characteristics (1), (2)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Collector-to-Emitter Breakdown Voltage	BV_{CES}	V_{GE} = 0V, I_C = 250μA	1200	-	-	V
Collector-to-Emitter Leakage Current	I_{CES}	V_{CE} = 1200V, V_{GE} = 0V	-	-	5	mA
Gate-to-Emitter Leakage Current	I_{GES}	V_{CE} = 0V, V_{GE} = ±20V	-	-	400	nA
Gate Threshold Voltage	$V_{GE(th)}$	V_{CE} = V_{GE} , I_C = 1.5mA	5.5	6.5	7.5	V
Collector-to-Emitter Saturation Voltage	$V_{CE(sat)}$	V_{GE} = 15V, I_C = 200A	-	1.6	2.0	V
		V_{GE} = 15V, I_C = 200A, T_J =125°C	-	2.0	-	
		V_{GE} = 15V, I_C = 200A, T_J =150°C	-	2.05	-	
Total Gate Charge	Q_g	V_{CC} = 600V, V_{GE} = 0/15V, I_C = 200A	-	0.96	-	μC
Internal Gate Resistance	R_{Gint}	-	-	2.0	-	Ω
Input Capacitance	C_{iss}	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz	-	19.5	-	nF
Output Capacitance	C_{oss}		-	1.0	-	
Reverse Transfer Capacitance	C_{rss}		-	0.28	-	
Turn-on Delay time	$t_{d(ON)}$	V_{CC} = 600V, V_{GE} = 0/15V, R_G = 2Ω, I_C = 200A, L_{load} = 0.82mH, Energy losses include “tail” and diode reverse recovery.	-	83	-	ns
Rise Time	t_r		-	75	-	
Turn-off Delay time	$t_{d(OFF)}$		-	307	-	
Fall Time	t_f		-	88	-	
Turn-On Switching Loss	E_{on}		-	16.5	-	mJ
Turn-Off Switching Loss	E_{off}		-	8.0	-	
IGBT Total Switching Loss	E_{ts}		-	24.5	-	
Turn-on Delay time	$t_{d(ON)}$	V_{CC} = 600V, V_{GE} = 0/15V, R_G = 2Ω, I_C = 200A, L_{load} = 0.82mH, Energy losses include “tail” and diode reverse recovery. T_J =150°C	-	93	-	ns
Rise Time	t_r		-	95	-	
Turn-off Delay time	$t_{d(OFF)}$		-	396	-	
Fall Time	t_f		-	140	-	
Turn-On Switching Loss	E_{on}		-	28.1	-	mJ
Turn-Off Switching Loss	E_{off}		-	13.9	-	
IGBT Total Switching Loss	E_{ts}		-	42	-	
Short Circuit Collector Current	$I_{C(SC)}$	V_{GE} = 15V, V_{CC} ≤ 600V, t_{SC} ≤ 10μs	-	750	-	A

• Diode, Inverter

Absolute Maximum Ratings

Parameter	Symbol	Limit	Unit
Repetitive Peak Reverse Voltage	V_{RRM}	1200	V
Continuous DC Forward Current (T_c = 100 °C, T_J = 150°C)	I_F	200	A
Repetitive Peak Forward Current (t_P=1ms)	I_{FRM}	400	

Electrical Characteristics (1)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Diode Forward Voltage	V_F	I_F = 200A	-	1.8	2.15	V
		I_F = 200A T_J = 125°C	-	1.55	-	
		I_F = 200A T_J = 150°C	-	1.5	-	
Diode Reverse-Recovery Charge	Q_{rr}	V_R = 600V, I_F = 200A, dI_F/dt = -2116 A/µs	-	16.4	-	µC
Diode Peak Reverse-Recovery Current	I_{rrm}		-	113	-	A
Diode Reverse-Recovery Loss	E_{rr}		-	5.4	-	mJ

• Module

Absolute Maximum Ratings

Parameter	Symbol	Limit	Unit
Maximum Junction Temperature	T_j	-40 to +175	°C
Operating Junction Temperature	$T_{vj\ op}$	-40 to +150	
Storage Temperature	T_{stg}	-40 to +125	
Isolation Voltage (f = 50 Hz, t = 1 min)	V_{ISO}	2.5	kV

Characteristics

Parameter	Symbol	Min	Typ	Max	Unit
Material of Module Baseplate	-	-	Cu	-	-
Internal Isolation	-	-	Al_2O_3	-	-
Creepage Distance, Terminal to Heatsink	-	-	29	-	mm
Creepage Distance, Terminal to Terminal	-	-	23	-	mm

Clearance, Terminal to Heatsink	-	-	23	-	mm
Clearance, Terminal to Terminal	-	-	11	-	mm
Stray Inductance, Module	L_{SCE}	-	20	-	nH
Module Lead Resistance, Terminal to Chip	$R_{CC'+EE'}$	-	0.7	-	mΩ
Junction-to-Case Thermal Resistance, per IGBT, Inverter	$R_{\theta JC}$	-	0.12	-	°C/W
Junction-to-Case Thermal Resistance, per Diode, Inverter		-	0.18	-	
Case-to-Heatsink Thermal Resistance, per IGBT, Inverter	$R_{\theta CH}$	-	0.034	-	°C/W
Case-to-Heatsink Thermal Resistance, per Diode, Inverter		-	0.05	-	
Case-to-Heatsink Thermal Resistance, per Module		-	0.01	-	
Mounting Torque for Module Mounting, Screw M6	M	3.0	-	6.0	Nm
Terminal Connection Torque, Screw M6	M	2.5	-	5.0	Nm
Weight per Module	G	-	320	-	g

(1) T_J = 25°C unless otherwise specified

(2) t_r: from 10% of Ic to 90% of Ic; t_f: from 90% of Ic to 10% of Ic;

E_{on}: from 10% of V_{GE} to 10% of V_{CE}; E_{off}: from 90% of V_{GE} to 10% of Ic.

• Typical Electrical Characteristics

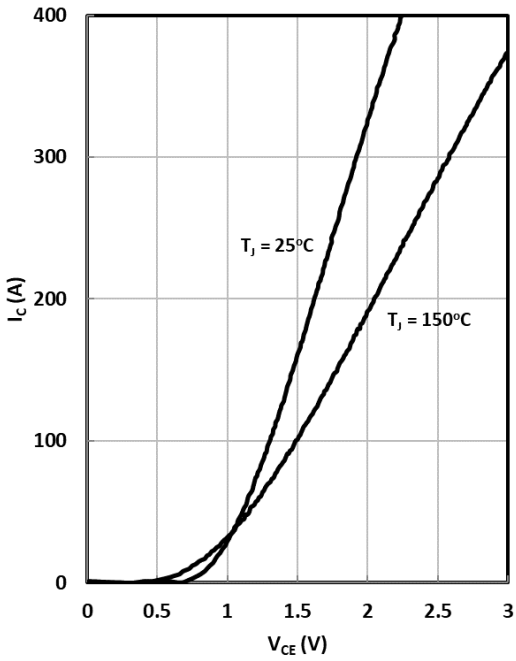


Fig. 1 IGBT (Inverter) Output Characteristics

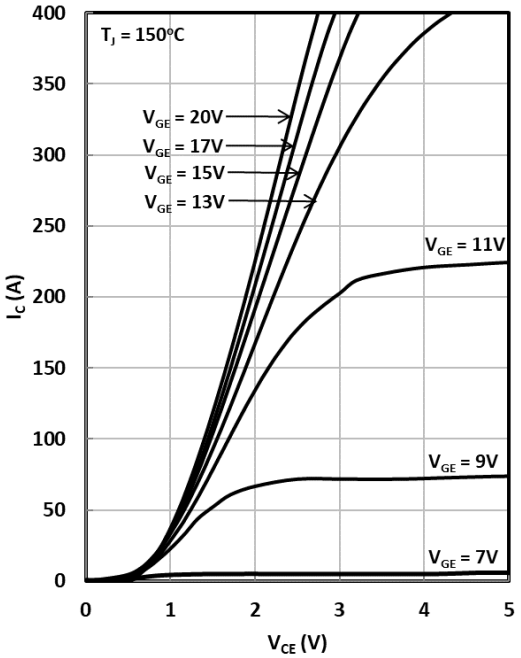


Fig. 2 IGBT (Inverter) Output Characteristics

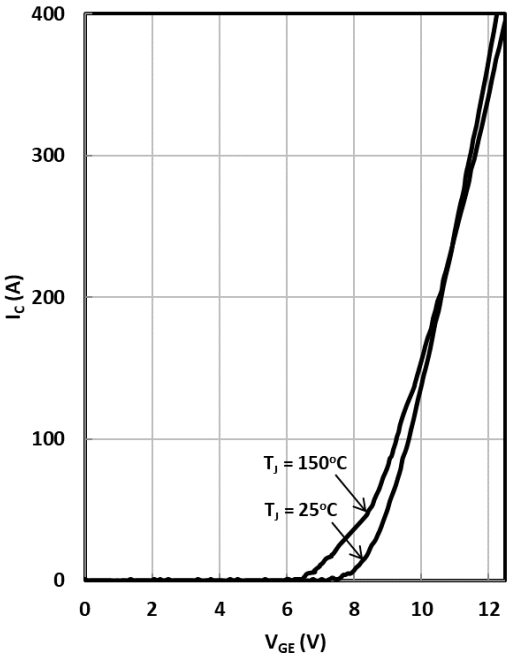


Fig. 3 IGBT (Inverter) Transfer Characteristics

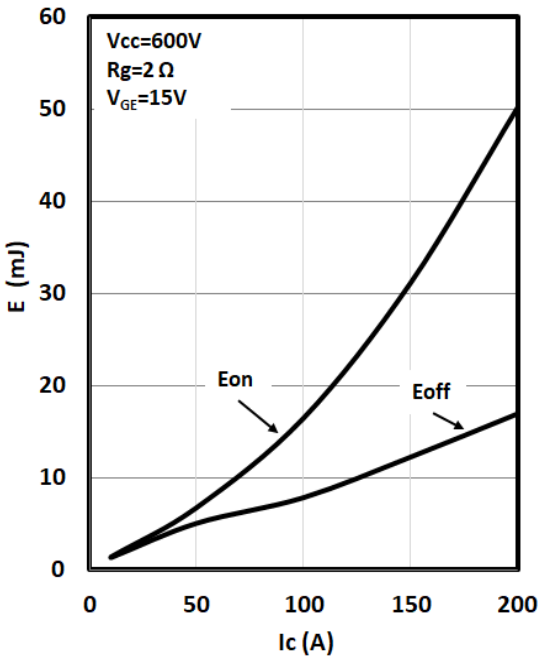


Fig. 4 IGBT (Inverter) Switching Loss vs. Ic

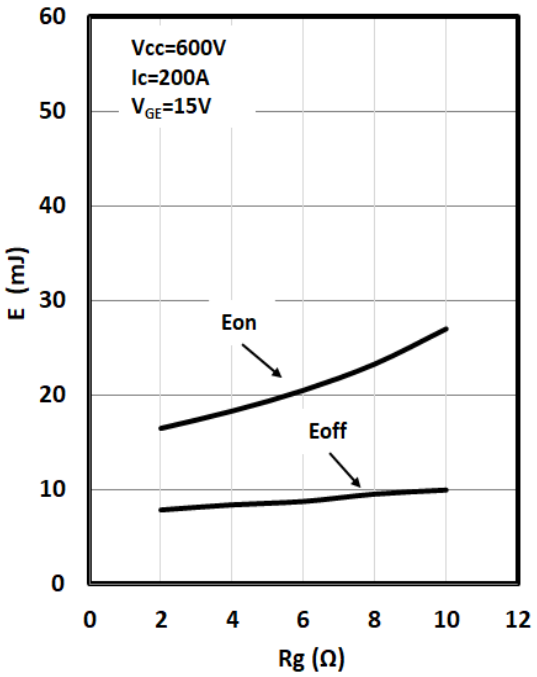


Fig. 5 IGBT (Inverter) Switching Loss vs. Rg

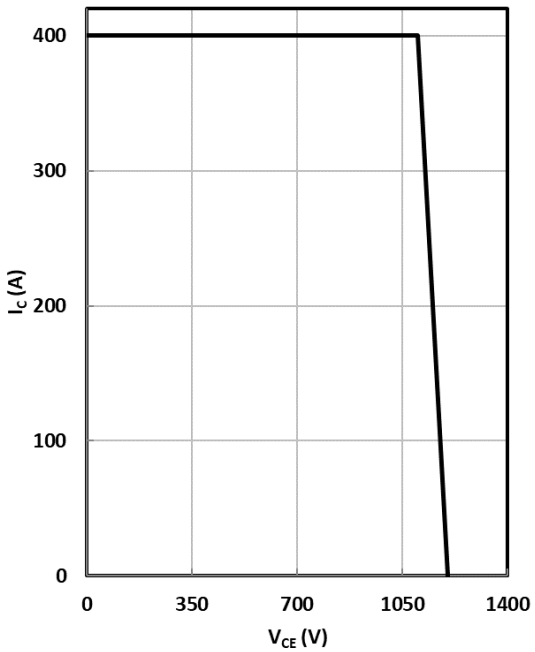


Fig. 6 RBSOA

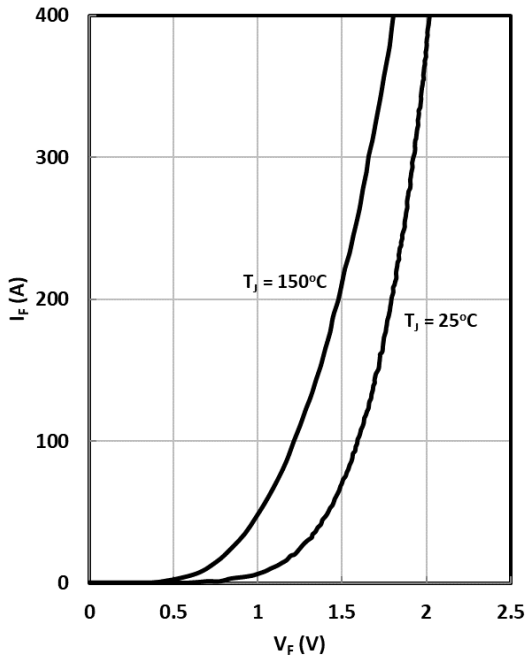
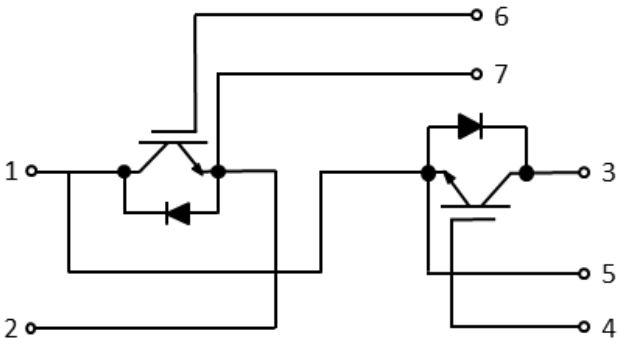
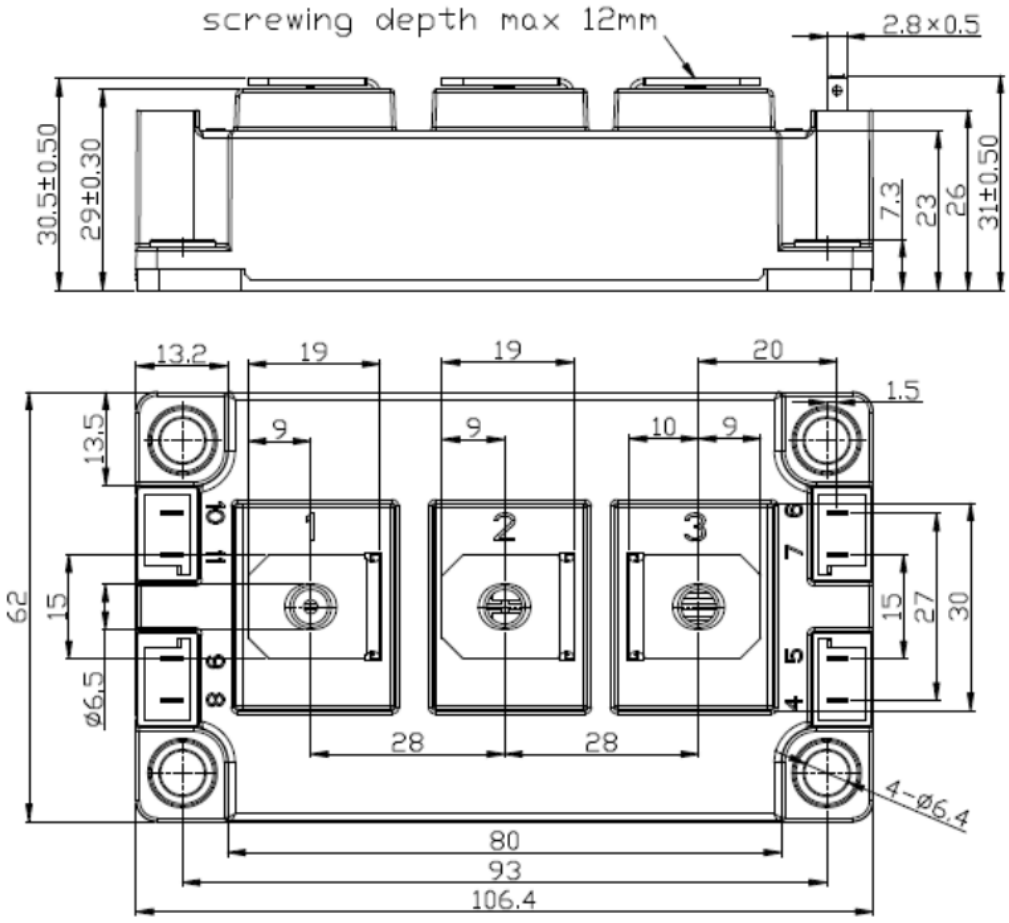


Fig. 7 Diode (Inverter) Forward Characteristics

- **Circuit diagram**



- **Package Dimensions**



Revision history of JG1G200F120FG Specification

Version	Change Items	Effective Date
1.00	Initial Release	Apr-2021

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