

JG1E100P120FG

Product Preview

**1200V/100A PIM WITH
FIELD-STOP TRENCH IGBT, DIODE AND NTC**

Features

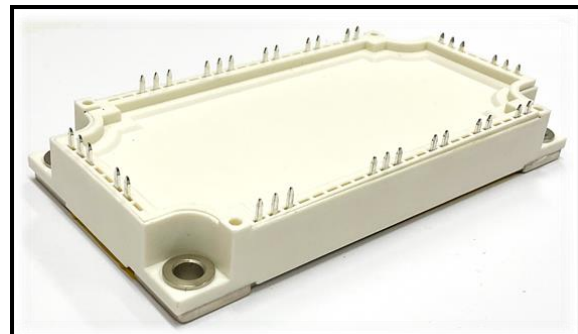
- Low $V_{CE(sat)}$
- Fast Switching
- High Ruggedness
- Short-Circuit Rated



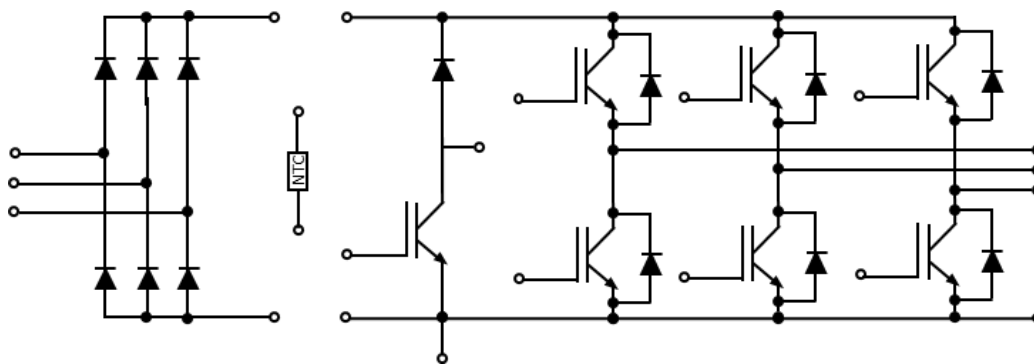
Product Summary	
V_{CES}	1200V
I_C	100A
$V_{CE(sat),typ}$	1.68V ($T_J = 25^\circ\text{C}$)

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 ($T_c = 100^\circ\text{C}$, $T_J = 175^\circ\text{C}$)	I_{CDC}	100	A
Repetitive Peak Collector Current ($t_p=1\text{ms}$)	I_{CRM}	200	

Electrical Characteristics ^{(1), (2)}

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit	
Collector-to-Emitter Breakdown Voltage	BV_{CES}	$V_{GE} = 0V, I_C = 250\mu A$	1200	-	-	V	
Collector-to-Emitter Leakage Current	I_{CES}	$V_{CE} = 1200V, V_{GE} = 0V$	-	-	5	mA	
Gate-to-Emitter Leakage Current	I_{GES}	$V_{CE} = 0V, V_{GE} = \pm 20V$	-	-	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	$V_{CE(sat)}$	$V_{GE} = 15V, I_C = 100A$	-	1.68	2.05		
		$V_{GE} = 15V, I_C = 100A, T_J = 125^\circ C$	-	2.05	-		
		$V_{GE} = 15V, I_C = 100A, T_J = 150^\circ C$	-	2.2	-		
Total Gate Charge	Q_g	$V_{CC} = 600V, V_{GE} = 0/15V, I_C = 100A$	-	0.48	-	μC	
Internal Gate Resistance	R_{Gint}	-	-	4.0	-	Ω	
Input Capacitance	C_{iss}	$V_{CE} = 25V, V_{GE} = 0V, f = 1MHz$	-	9.65	-	nF	
Output Capacitance	C_{oss}		-	0.41	-		
Reverse Transfer Capacitance	C_{riss}		-	0.10	-		
Turn-on Delay time	$t_{d(ON)}$	$V_{CC} = 600V, V_{GE} = 0/15V, R_G = 2\Omega, I_C = 100A, L_{load} = 0.82mH, \text{Energy losses include "tail" and diode reverse recovery.}$	-	154	-	ns	
Rise Time	t_r		-	38	-		
Turn-off Delay time	$t_{d(OFF)}$		-	308	-		
Fall Time	t_f		-	110	-		
Turn-On Switching Loss	E_{on}		-	-	5.65	-	mJ
Turn-Off Switching Loss	E_{off}			-	4.72	-	
IGBT Total Switching Loss	E_{ts}			-	10.37	-	
Turn-on Delay time	$t_{d(ON)}$	$V_{CC} = 600V, V_{GE} = 0/15V, R_G = 2\Omega, I_C = 100A, L_{load} = 0.82mH, \text{Energy losses include "tail" and diode reverse recovery. } T_J = 150^\circ C$	-	160	-	ns	
Rise Time	t_r		-	45	-		
Turn-off Delay time	$t_{d(OFF)}$		-	395	-		
Fall Time	t_f		-	180	-		
Turn-On Switching Loss	E_{on}		-	-	10.5	-	mJ
Turn-Off Switching Loss	E_{off}			-	6.95	-	
IGBT Total Switching Loss	E_{ts}			-	17.45	-	
Short Circuit Collector Current	$I_{C(SC)}$	$V_{GE} = 15V, V_{CC} \leq 600V, t_{SC} \leq 10\mu s$	-	350	-	A	

- **Diode, Inverter**

Absolute Maximum Ratings

Parameter	Symbol	Limit	Unit
Repetitive Peak Reverse Voltage	V_{RRM}	1200	V
Continuous DC Forward Current ($T_c = 100\text{ }^\circ\text{C}$, $T_j = 150\text{ }^\circ\text{C}$)	I_F	100	A
Repetitive Peak Forward Current ($t_p=1\text{ms}$)	I_{FRM}	200	

Electrical Characteristics ⁽¹⁾

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Diode Forward Voltage	V_F	$I_F = 100\text{A}$	-	1.88	2.25	V
		$I_F = 100\text{A}$ $T_j = 125\text{ }^\circ\text{C}$	-	1.69	-	
		$I_F = 100\text{A}$ $T_j = 150\text{ }^\circ\text{C}$	-	1.62	-	
Diode Reverse-Recovery Charge	Q_{rr}	$V_R = 600\text{V}$, $I_F = 100\text{A}$, $di_F/dt = -2100\text{ A}/\mu\text{s}$	-	7.3	-	μC
Diode Peak Reverse-Recovery Current	I_{rrm}		-	90	-	A
Diode Reverse-Recovery Loss	E_{rr}		-	2.78	-	mJ

- **IGBT, Brake-Chopper**

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 ($T_c = 100\text{ }^\circ\text{C}$, $T_j = 175\text{ }^\circ\text{C}$)	I_{CDC}	75	A
Repetitive Peak Collector Current ($t_p=1\text{ms}$)	I_{CRM}	150	

Electrical Characteristics ^{(1), (2)}

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Collector-to-Emitter Breakdown Voltage	BV_{CES}	$V_{GE} = 0\text{V}$, $I_C = 250\mu\text{A}$	1200	-	-	V
Collector-to-Emitter Leakage Current	I_{CES}	$V_{CE} = 1200\text{V}$, $V_{GE} = 0\text{V}$	-	-	5	mA
Gate-to-Emitter Leakage Current	I_{GES}	$V_{CE} = 0\text{V}$, $V_{GE} = \pm 20\text{V}$	-	-	100	nA
Gate Threshold Voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$, $I_C = 1.5\text{mA}$	5.5	6.5	7.5	V

Collector-to-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_{GE} = 15V, I_C = 75A$	-	1.65	2.0	
		$V_{GE} = 15V, I_C = 75A, T_J = 125^\circ C$	-	2.05	-	
		$V_{GE} = 15V, I_C = 75A, T_J = 150^\circ C$	-	2.2	-	
Total Gate Charge	Q_g	$V_{CC} = 600V, V_{GE} = 15V, I_C = 75A$	-	328	-	nC
Internal Gate Resistance	R_{Gint}	-	-	4.0	-	Ω
Input Capacitance	C_{iss}	$V_{CE} = 25V, V_{GE} = 0V, f = 1MHz$	-	7.33	-	nF
Output Capacitance	C_{oss}		-	0.29	-	
Reverse Transfer Capacitance	C_{rss}		-	0.097	-	
Turn-on Delay time	$t_{d(ON)}$	$V_{CC} = 600V, V_{GE} = 0/15V, R_G = 2\Omega, I_C = 75A, L_{load} = 0.82mH, \text{Energy losses include "tail" and diode reverse recovery.}$	-	120	-	ns
Rise Time	t_r		-	40	-	
Turn-off Delay time	$t_{d(OFF)}$		-	286	-	
Fall Time	t_f		-	109	-	
Turn-On Switching Loss	E_{on}		-	3.5	-	mJ
Turn-Off Switching Loss	E_{off}	-	2.8	-		
IGBT Total Switching Loss	E_{ts}	-	6.3	-		

• Diode, Brake-Chopper

Absolute Maximum Ratings

Parameter	Symbol	Limit	Unit
Repetitive Peak Reverse Voltage	V_{RRM}	1200	V
Continuous DC Forward Current ($T_c = 100^\circ C, T_J = 150^\circ C$)	I_F	35	A
Repetitive Peak Forward Current ($t_p=1ms$)	I_{FRM}	70	

Electrical Characteristics ⁽¹⁾

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Diode Forward Voltage	V_F	$I_F = 35A$	-	2.05	2.45	V
		$I_F = 35A, T_J = 125^\circ C$	-	1.75	-	
		$I_F = 35A, T_J = 150^\circ C$	-	1.68	-	

Diode Reverse-Recovery Charge	Q_{rr}	$V_R = 600V, I_F = 35A,$ $di_F/dt = -1100 A/\mu s$	-	2.92	-	μC
Diode Peak Reverse-Recovery Current	I_{rrm}		-	36	-	A
Diode Reverse-Recovery Loss	E_{rr}		-	1.05	-	mJ

• Diode, Rectifier

Absolute Maximum Ratings ⁽¹⁾

Parameter	Symbol	Limit	Unit
Repetitive Peak Reverse Voltage	V_{RRM}	1600	V
Average Output Current 50/60Hz,sine wave ($T_c = 100^\circ C$)	$I_{F(AV)}$	100	A
Surge Forward Current ($V_R=0, t_p=10ms$)	I_{FSM}	1100	
I^2t Value ($V_R=0, t_p=10ms$)	I^2t	6050	A^2s

Electrical Characteristics

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Diode Forward Voltage	V_F	$I_F = 100A$ $T_J = 150^\circ C$	-	1.15	-	V
Diode Reverse Current	I_R	$V_R = 1600V$ $T_J = 150^\circ C$	-	-	2.0	mA

• NTC thermistors

Characteristics

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Rated Resistance	R_{25}	-	-	5.0	-	$k\Omega$
Deviation of R_{100}	$\Delta R/R$	$T_C = 100^\circ C$ $R_{100} = 493\Omega$	-5	-	5	%
Power Dissipation	P_{25}	-	-	-	20.0	mW
B-value	$B_{25/50}$	$R_2 = R_{25} \exp [B_{25/50}(1/T_2 - 1/(298.15 K))]$	-	3375	-	K

• Module

Absolute Maximum Ratings

Parameter	Symbol	Limit	Unit
Maximum Junction Temperature	T_J	-40 to +175	$^\circ C$
Operating Junction Temperature	$T_{vj op}$	-40 to +150	

Storage Temperature	T _{stg}	-40 to +150	
Isolation Voltage (f = 50 Hz, t = 1 min.)	V _{ISO}	2.5	kV

Characteristics

Parameter	Symbol	Min	Typ	Max	Unit
Stray Inductance-module	L _{SCE}	-	40	-	nH
Module Lead Resistance, Terminal to Chip	R _{CC'+EE'}	-	4.0	-	mΩ
Module Lead Resistance, Terminal to Chip	R _{AA'+CC'}	-	3.0	-	
Junction-to-Case Thermal Resistance, per IGBT, Inverter	R _{θJC}	-	0.25	-	°C/W
Junction-to-Case Thermal Resistance, per Diode, Inverter		-	0.45	-	
Junction-to-Case Thermal Resistance, per IGBT, Brake-Chopper		-	0.30	-	
Junction-to-Case Thermal Resistance, per Diode, Brake-Chopper		-	0.91	-	
Junction-to-Case Thermal Resistance, per Diode, Rectifier		-	0.5	-	
Case-to-Heatsink Thermal Resistance, per IGBT, Inverter	R _{θCH}	-	0.13	-	°C/W
Case-to-Heatsink Thermal Resistance, per Diode, Inverter		-	0.23	-	
Case-to-Heatsink Thermal Resistance, per IGBT, Brake-Chopper		-	0.15	-	
Case-to-Heatsink Thermal Resistance, per Diode, Brake-Chopper		-	0.46	-	
Case-to-Heatsink Thermal Resistance, per Diode, Rectifier		-	0.25	-	
Case-to-Heatsink Thermal Resistance, per Module				0.01	
Module-to-Sink Torque	M _S	3.0	-	6.0	Nm
Weight per Module	G	-	300	-	g

- (1) T_J = 25°C unless otherwise specified
- (2) t_r: from 10% of I_C to 90% of I_C; t_f: from 90% of I_C to 10% of I_C;
 E_{on}: from 10% of V_{GE} to 10% of V_{CE}; E_{off}: from 90% of V_{GE} to 10% of I_C.

• Typical Electrical Characteristics

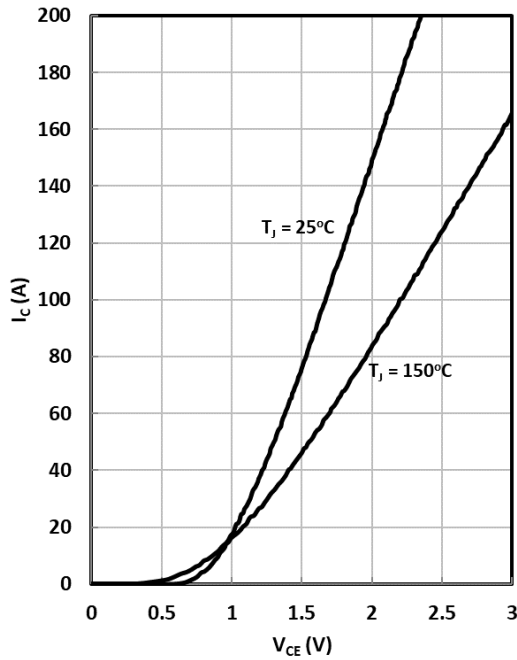


Fig. 1 IGBT (Inverter) Output Characteristics

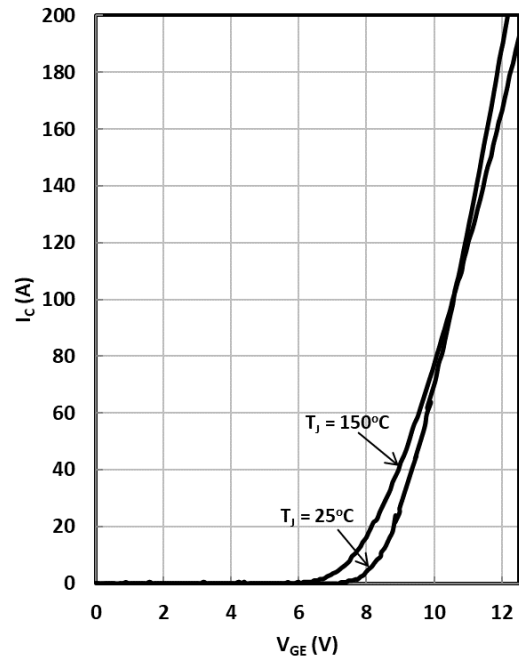


Fig. 2 IGBT (Inverter) Transfer Characteristics

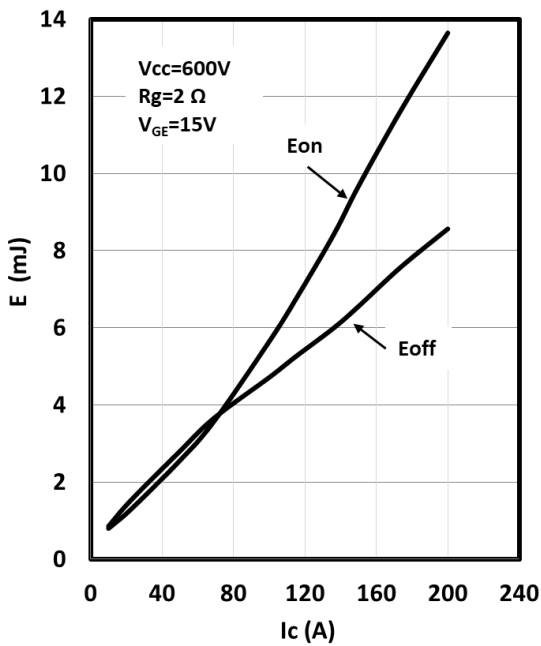


Fig. 3 IGBT (Inverter) Switching Loss vs. Ic

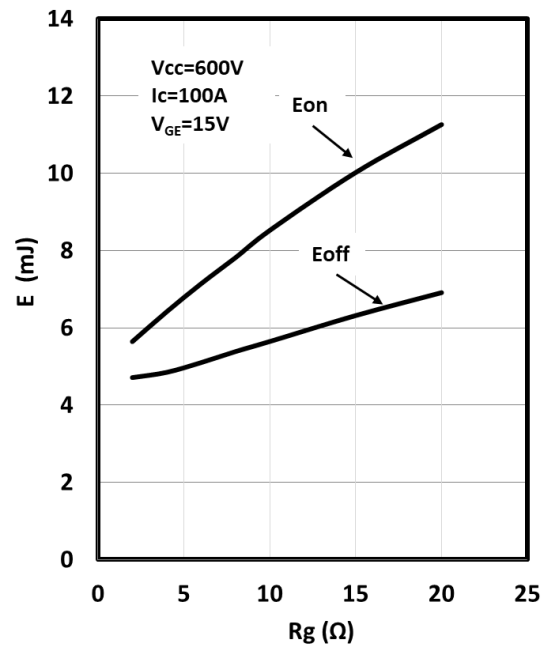


Fig. 4 IGBT (Inverter) Switching Loss vs. Rg

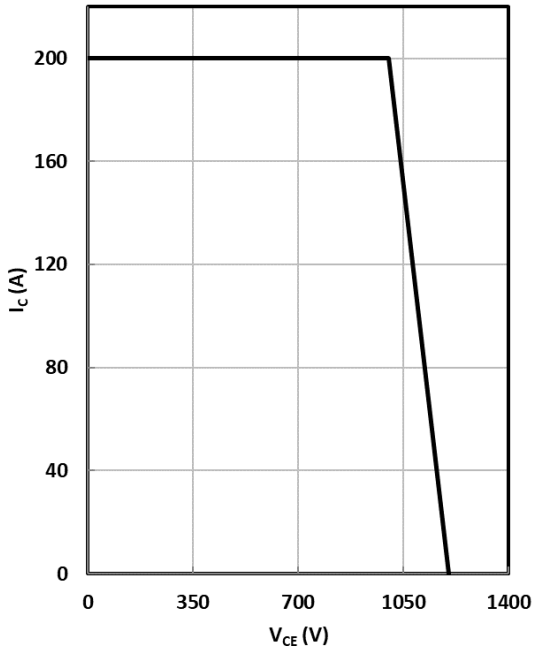


Fig. 5 RBSOA

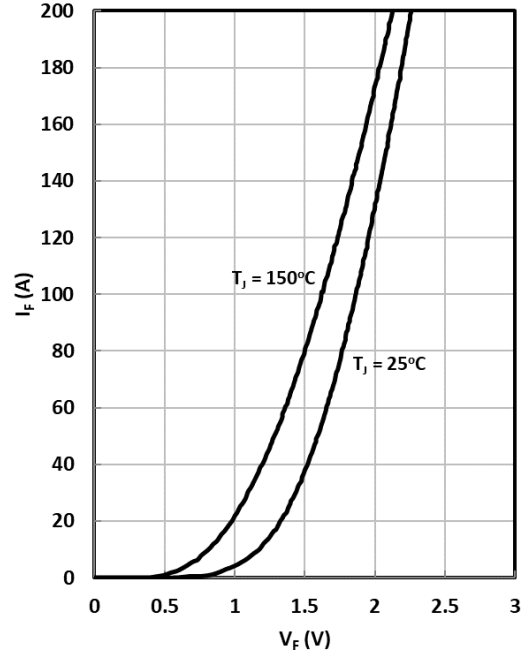


Fig. 6 Diode (Inverter) Forward Characteristics

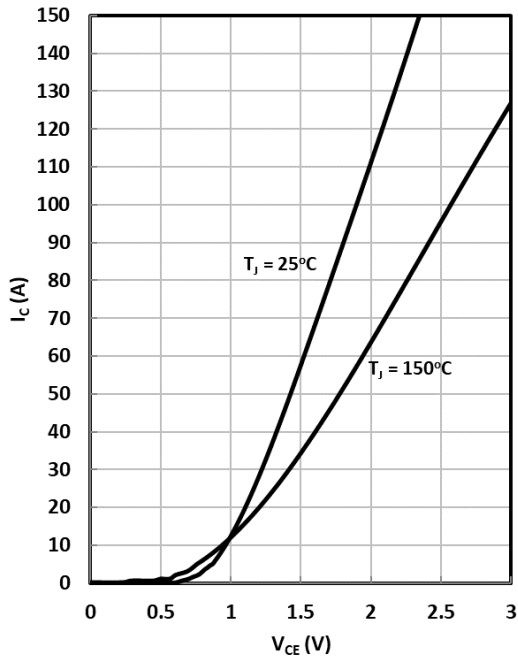


Fig. 7 IGBT (Brake-Chopper) Output Characteristics

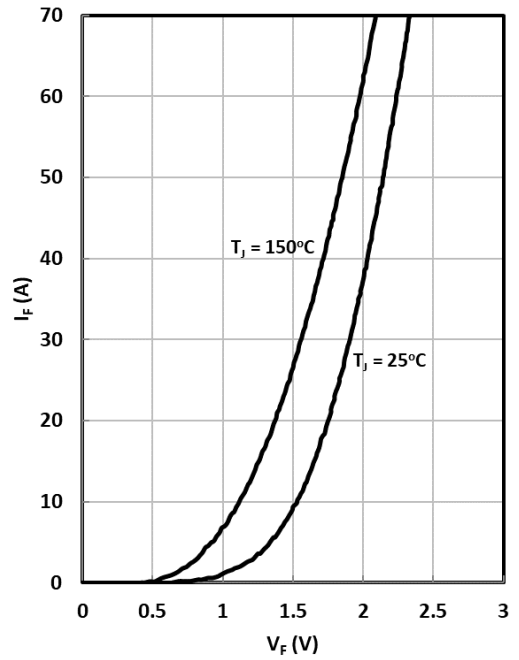


Fig. 8 Diode (Brake-Chopper) Output Characteristics

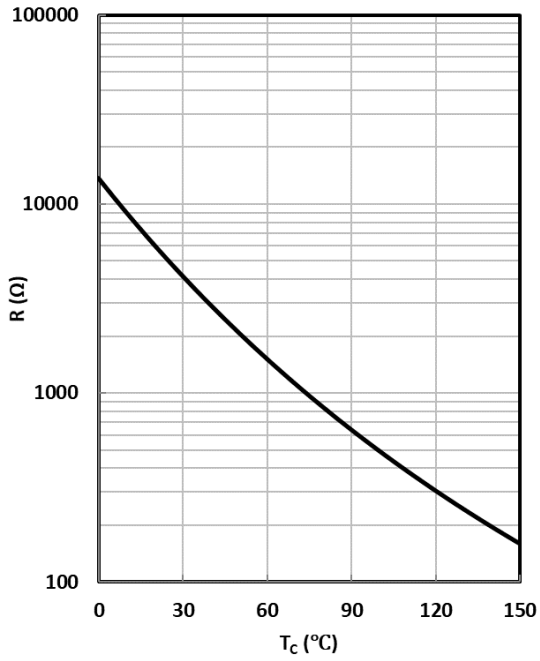
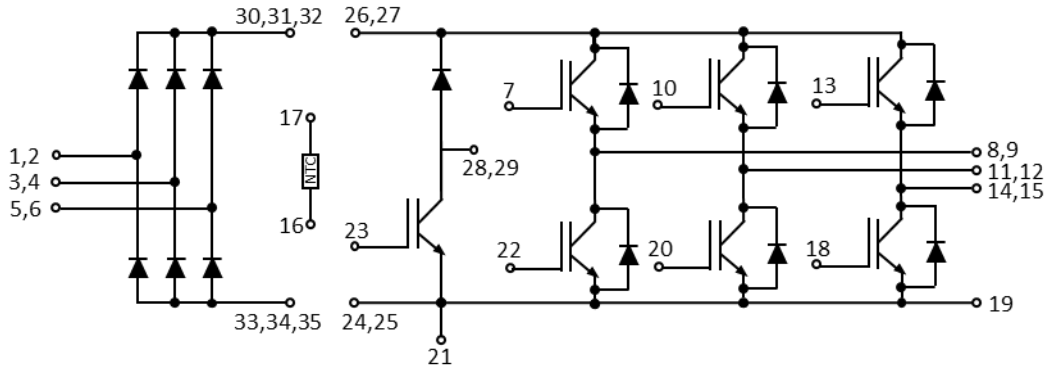
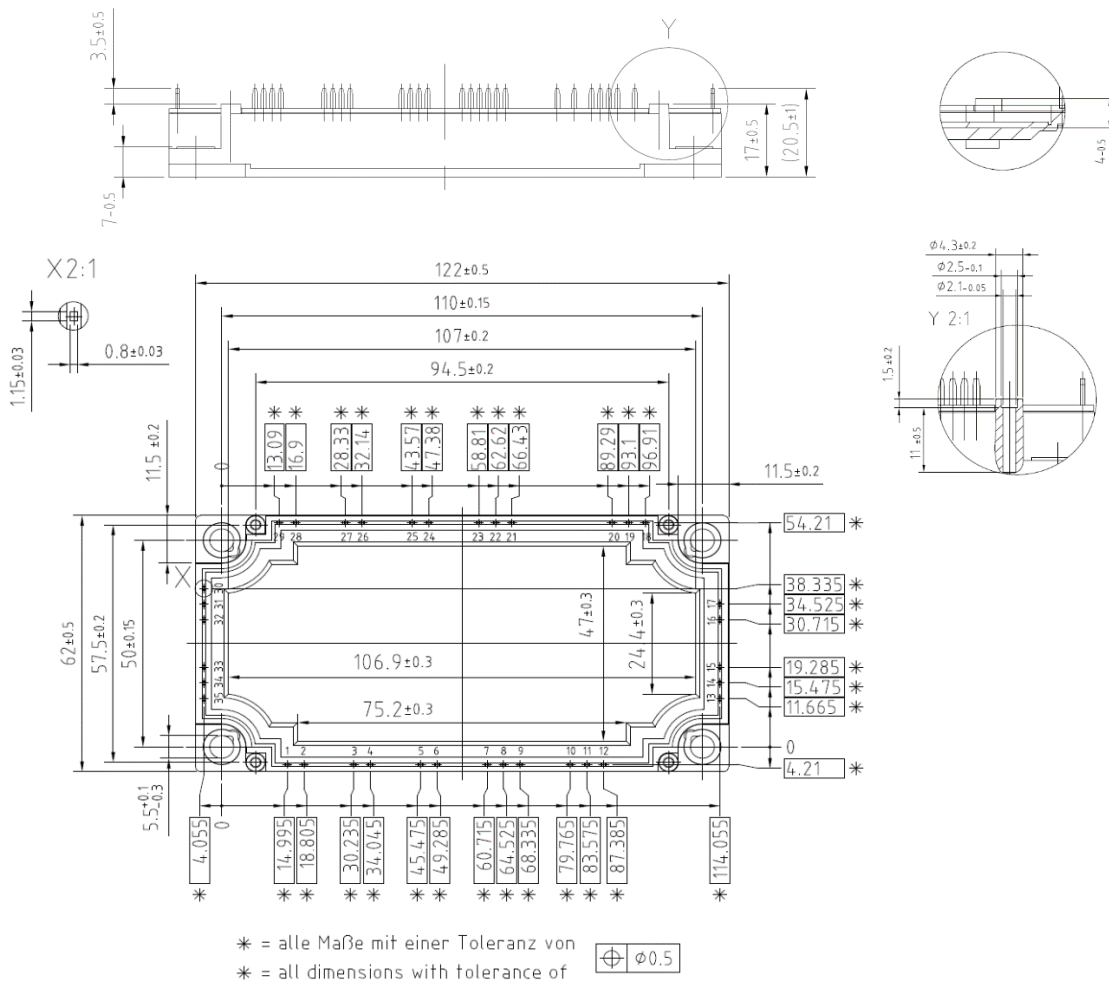


Fig. 9 NTC Temperature Characteristics

● **Circuit diagram**



● **Package Dimensions**



Revision history of JG1E100P120FG Specification

Version	Change Items	Effective Date
1.00	Initial Release	May-21

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