

JG1B35P120FG2

Product Preview

**1200V/35A PIM WITH
FIELD-STOP TRENCH IGBT, DIODE AND NTC**

Features

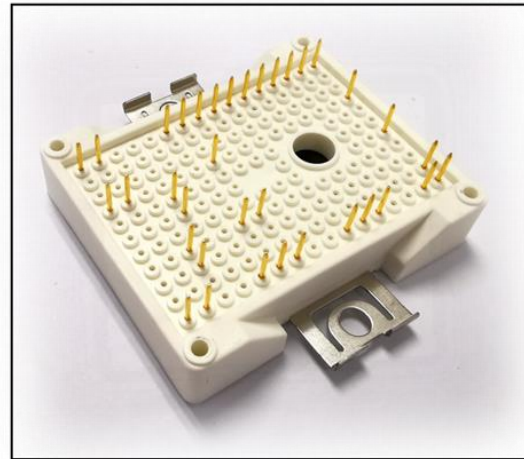
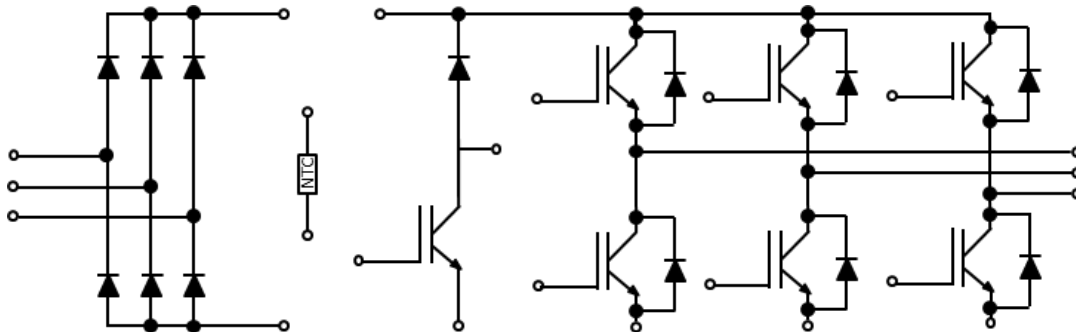
- Low $V_{CE(sat)}$
- Fast Switching
- High Ruggedness
- Short-Circuit Rated



Product Summary	
V_{CES}	1200V
I_C	35A
$V_{CE(sat),typ}$	1.65V ($T_J = 25^\circ\text{C}$)

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}	35	A
Repetitive Peak Collector Current ($t_p=1\text{ms}$)	I_{CRM}	70	

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}	$V_{CE} = 1200V, V_{GE} = 0V$	-	-	1	mA
Gate-to-Emitter Leakage Current	I_{GES}	$V_{CE} = 0V, V_{GE} = \pm 20V$	-	-	100	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	$V_{CE(sat)}$	$V_{GE} = 15V, I_C = 35A$	-	1.65	2.0	
		$V_{GE} = 15V, I_C = 35A, T_J = 125^\circ C$	-	2.0	-	
		$V_{GE} = 15V, I_C = 35A, T_J = 150^\circ C$	-	2.1	-	
Total Gate Charge	Q_g	$V_{CC} = 600V, V_{GE} = 15V, I_C = 35A$	-	148	-	nC
Input Capacitance	C_{iss}	$V_{CE} = 25V, V_{GE} = 0V, f = 1MHz$	-	3460	-	pF
Output Capacitance	C_{oss}		-	154	-	
Reverse Transfer Capacitance	C_{rss}		-	41	-	
Turn-on Delay time	$t_{d(ON)}$	$V_{CC} = 600V, V_{GE} = 0/15V, R_G = 10\Omega, I_C = 35A, L_{load} = 0.82mH, \text{Energy losses include "tail" and diode reverse recovery.}$	-	55	-	ns
Rise Time	t_r		-	58	-	
Turn-off Delay time	$t_{d(OFF)}$		-	300	-	
Fall Time	t_f		-	110	-	
Turn-On Switching Loss	E_{on}		-	2.8	-	mJ
Turn-Off Switching Loss	E_{off}		-	1.6	-	
IGBT Total Switching Loss	E_{ts}		-	4.4	-	
Turn-on Delay time	$t_{d(ON)}$	$V_{CC} = 600V, V_{GE} = 0/15V, R_G = 10\Omega, I_C = 35A, L_{load} = 0.82mH, \text{Energy losses include "tail" and diode reverse recovery. } T_J = 150^\circ C$	-	57	-	ns
Rise Time	t_r		-	60	-	
Turn-off Delay time	$t_{d(OFF)}$		-	320	-	
Fall Time	t_f		-	136	-	
Turn-On Switching Loss	E_{on}		-	4.95	-	mJ
Turn-Off Switching Loss	E_{off}		-	2.15	-	
IGBT Total Switching Loss	E_{ts}		-	7.1	-	
Short Circuit Collector Current	$I_{C(SC)}$	$V_{GE} = 15V, V_{CC} \leq 600V, t_{SC} \leq 10\mu s$	-	160	-	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	35	A
Repetitive Peak Forward Current ($t_p=1\text{ms}$)	I_{FRM}	75	

Electrical Characteristics ⁽¹⁾

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Diode Forward Voltage	V_F	$I_F = 35\text{A}$	-	2.05	2.45	V
		$I_F = 35\text{A}$ $T_j = 125\text{ }^\circ\text{C}$	-	1.75	-	
		$I_F = 35\text{A}$ $T_j = 150\text{ }^\circ\text{C}$	-	1.68	-	
Diode Reverse-Recovery Charge	Q_{rr}	$V_R = 600\text{V}$, $I_F = 35\text{A}$, $di_F/dt = -500\text{ A}/\mu\text{s}$	-	2.15	-	μC
Diode Peak Reverse-Recovery Current	I_{rrm}		-	18	-	A
Diode Reverse-Recovery Loss	E_{rr}		-	0.75	-	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}	25	A
Repetitive Peak Collector Current ($t_p=1\text{ms}$)	I_{CRM}	50	

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}	$V_{CE} = 1200\text{V}$, $V_{GE} = 0\text{V}$	-	-	1	mA
Gate-to-Emitter Leakage Current	I_{GES}	$V_{CE} = 0\text{V}$, $V_{GE} = \pm 20\text{V}$	-	-	100	nA
Gate Threshold Voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$, $I_C = 600\mu\text{A}$	5.5	6.5	7.5	V

Collector-to-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_{GE} = 15V, I_C = 25A$	-	1.85	2.2	
		$V_{GE} = 15V, I_C = 25A, T_J = 125^\circ C$	-	2.3	-	
		$V_{GE} = 15V, I_C = 25A, T_J = 150^\circ C$	-	2.4	-	
Total Gate Charge	Q_g	$V_{CC} = 600V, V_{GE} = 15V, I_C = 25A$	-	105	-	nC
Input Capacitance	C_{iss}	$V_{CE} = 25V, V_{GE} = 0V, f = 1MHz$	-	1980	-	pF
Output Capacitance	C_{oss}		-	110	-	
Reverse Transfer Capacitance	C_{riss}		-	20	-	
Turn-on Delay time	$t_{d(ON)}$	$V_{CC} = 600V, V_{GE} = 0/15V, R_G = 15\Omega, I_C = 25A, L_{load} = 0.82mH,$ Energy losses include "tail" and diode reverse recovery.	-	40	-	ns
Rise Time	t_r		-	45	-	
Turn-off Delay time	$t_{d(OFF)}$		-	190	-	
Fall Time	t_f		-	120	-	
Turn-On Switching Loss	E_{on}		-	1.75	-	mJ
Turn-Off Switching Loss	E_{off}		-	1.15	-	
IGBT Total Switching Loss	E_{ts}		-	2.9	-	
Turn-on Delay time	$t_{d(ON)}$	$V_{CC} = 600V, V_{GE} = 0/15V, R_G = 15\Omega, I_C = 25A, L_{load} = 0.82mH,$ Energy losses include "tail" and diode reverse recovery. $T_J = 150^\circ C$	-	45	-	ns
Rise Time	t_r		-	48	-	
Turn-off Delay time	$t_{d(OFF)}$		-	240	-	
Fall Time	t_f		-	170	-	
Turn-On Switching Loss	E_{on}		-	2.9	-	mJ
Turn-Off Switching Loss	E_{off}		-	1.45	-	
IGBT Total Switching Loss	E_{ts}		-	4.35	-	

- **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	15	A
Repetitive Peak Forward Current ($t_p=1ms$)	I_{FRM}	30	

Electrical Characteristics ⁽¹⁾

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Diode Forward Voltage	V_F	$I_F = 15A$	-	2.0	2.40	V
		$I_F = 15A$ $T_J = 125^\circ C$	-	1.75	-	
		$I_F = 15A$ $T_J = 150^\circ C$	-	1.65	-	
Diode Reverse-Recovery Charge	Q_{rr}	$V_R = 600V, I_F = 15A,$ $dI_F/dt = -600 A/\mu s$	-	1.2	-	μC
Diode Peak Reverse-Recovery Current	I_{rrm}		-	14.5	-	A
Diode Reverse-Recovery Loss	E_{rr}		-	0.4	-	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 ($T_c = 100^\circ C$)	$I_{F(AV)}$	35	A
Maximum RMS Current at Rectifier Output ($T_c = 100^\circ C$)	I_{RMSM}	60	
Surge Forward Current ($V_R=0, t_p=10ms$)	I_{FSM}	320	
I^2t – value ($V_R=0, t_p = 10 ms$)	I^2t	510	A^2s

Electrical Characteristics

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Diode Forward Voltage	V_F	$I_F = 35A$ $T_J = 150^\circ C$	-	1.12	-	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 Ω
Deviation of R100	$\Delta R/R$	$T_c = 100^\circ C$ $R_{100} = 493.3\Omega$	-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	°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}	-	30	-	nH
Module Lead Resistance, Terminal to Chip	$R_{CC'+EE'}$	-	5.0	-	mΩ
Module Lead Resistance, Terminal to Chip	$R_{AA'+CC'}$	-	6.0	-	
Junction-to-Case Thermal Resistance, per IGBT, Inverter	$R_{\theta JC}$	-	0.60	-	°C/W
Junction-to-Case Thermal Resistance, per Diode, Inverter		-	0.80	-	
Junction-to-Case Thermal Resistance, per IGBT, Brake-Chopper		-	0.95	-	
Junction-to-Case Thermal Resistance, per Diode, Brake-Chopper		-	1.30	-	
Junction-to-Case Thermal Resistance, per Diode, Rectifier		-	0.90	-	
Case-to-Heatsink Thermal Resistance, per IGBT, Inverter	$R_{\theta CH}$	-	0.60	-	°C/W
Case-to-Heatsink Thermal Resistance, per Diode, Inverter		-	0.75	-	
Case-to-Heatsink Thermal Resistance, per IGBT, Brake-Chopper		-	0.80	-	
Case-to-Heatsink Thermal Resistance, per Diode, Brake-Chopper		-	1.05	-	
Case-to-Heatsink Thermal Resistance, per Diode, Rectifier		-	0.95	-	
Case-to-Heatsink Thermal Resistance, per Module				0.037	
Mounting Force per Clamp	F	30	-	80	N
Weight per Module	G	-	45	-	g

(1) $T_j = 25^\circ\text{C}$ 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

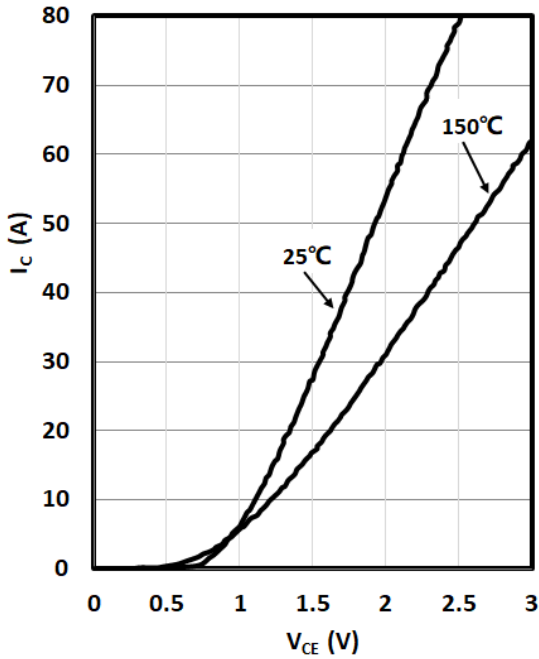


Fig. 1 IGBT (Inverter) Output Characteristics

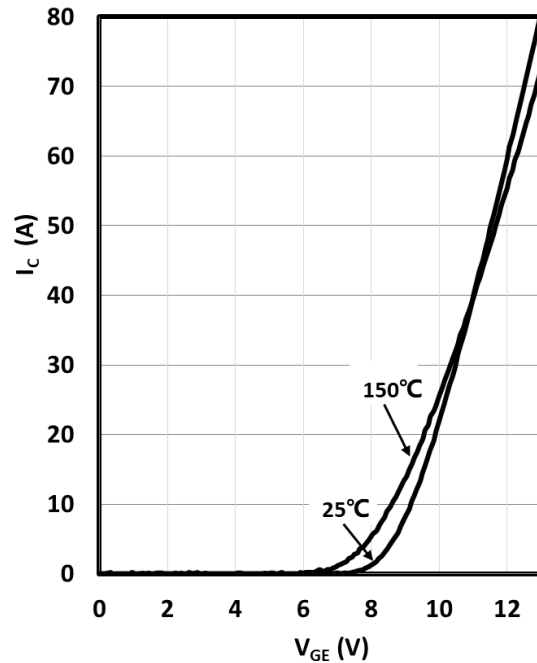


Fig. 2 IGBT (Inverter) Transfer Characteristics

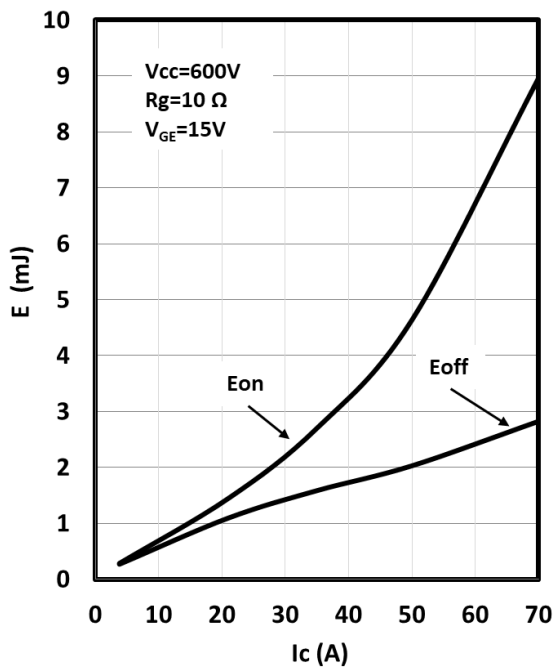


Fig. 3 IGBT (Inverter) Switching Loss vs. Ic

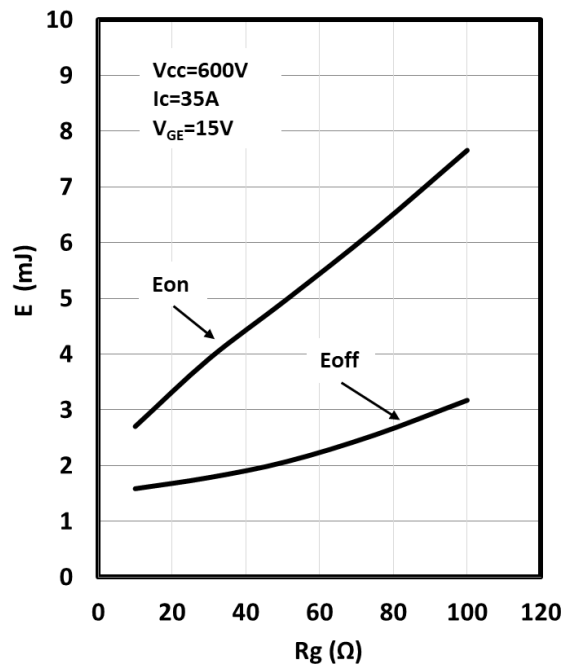


Fig. 4 IGBT (Inverter) Switching Loss vs. Rg

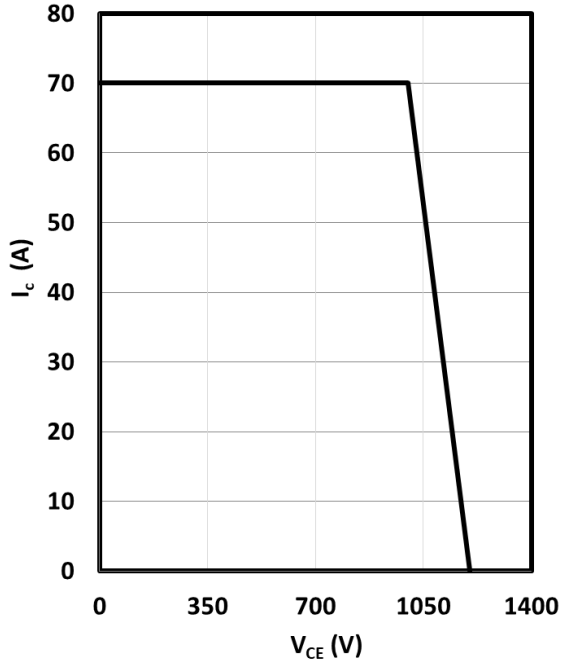


Fig. 5 RBSOA

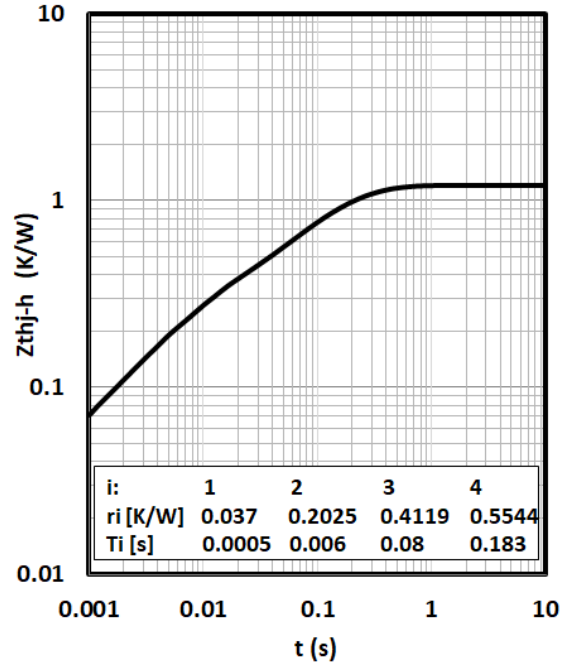


Fig. 6 IGBT (Inverter) Transient Thermal Impedance

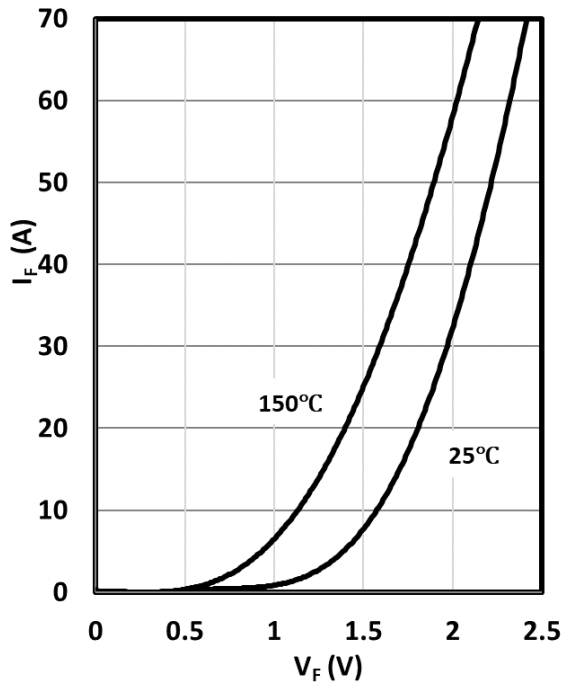


Fig. 7 Diode (Inverter) Forward Characteristics

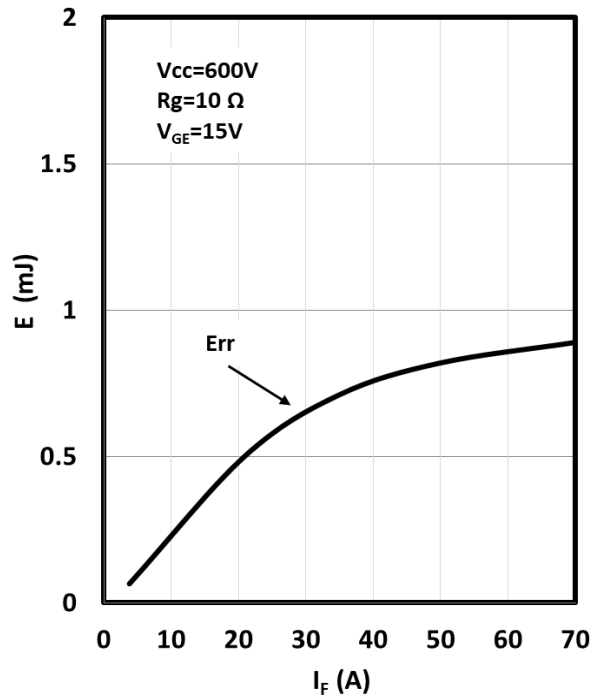


Fig. 8 Diode (Inverter) Reverse-Recovery Loss vs. I_F

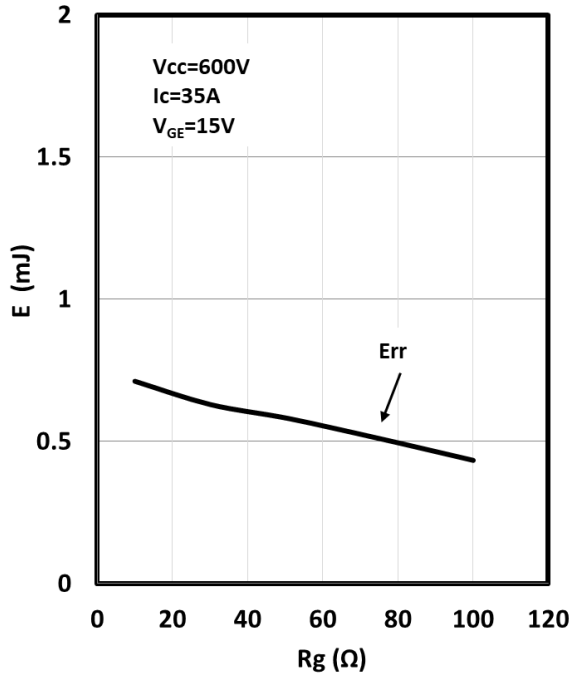


Fig. 9 Diode (Inverter) Reverse-Recovery Loss vs. R_g

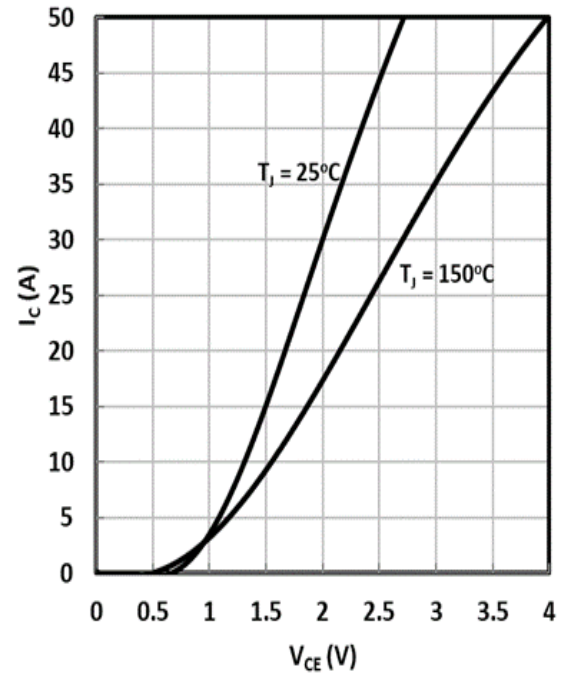


Fig. 10 IGBT (Break-Chopper) Output Characteristics

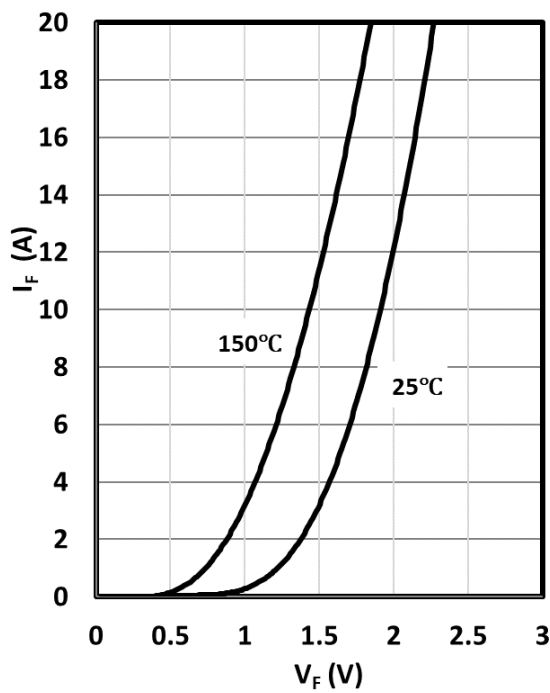


Fig. 11 Diode (Brake-Chopper) Output Characteristics

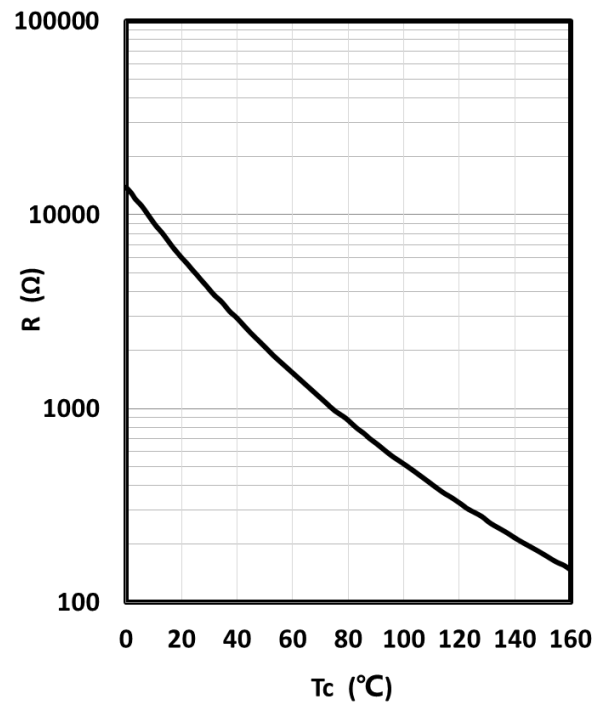
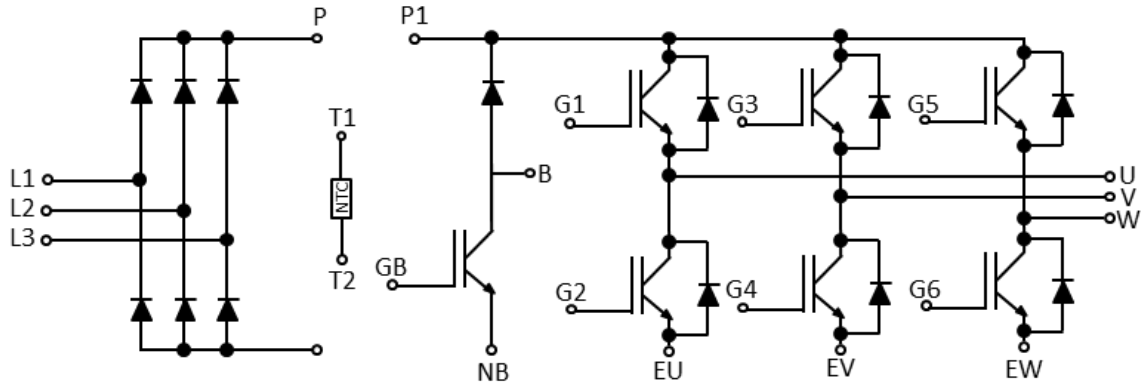
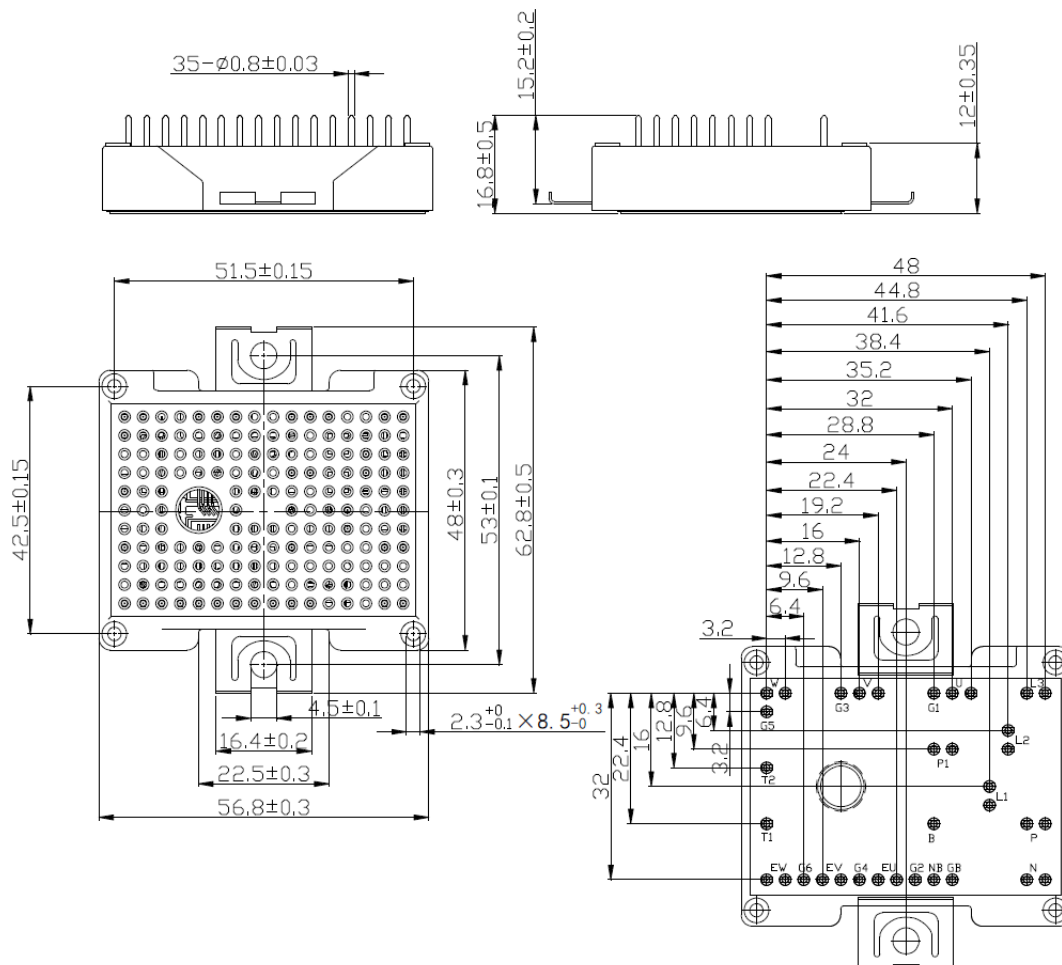


Fig. 12 NTC Temperature Characteristics

• **Circuit diagram**



• **Package Dimensions**



Revision history of JG1B35P120FG2 Specification

Version	Change Items	Effective Date
1.00	Initial Release	Jan 2021

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