

JG1A25P120FG2

Product Preview

**1200V/25A PIM WITH
FIELD-STOP TRENCH IGBT, DIODE AND NTC**

Features

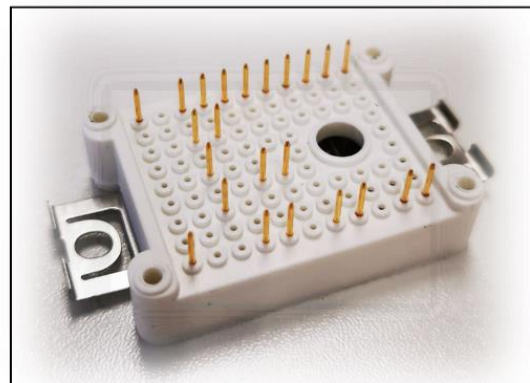
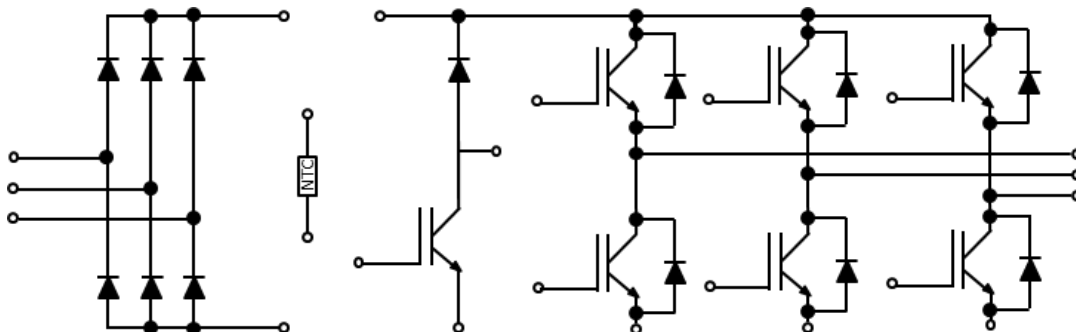
- Low $V_{CE(sat)}$
- Fast Switching
- High Ruggedness
- Short-Circuit Rated



Product Summary	
V_{CES}	1200V
I_c	25A
$V_{CE(sat),typ}$	1.85V ($T_J = 25^\circ\text{C}$)

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}	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}	$V_{GE} = 0V, I_C = 250\mu A$	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	$V_{GE(th)}$	$V_{CE} = V_{GE}, I_C = 600\mu A$	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_{rss}		-	20	-	
Turn-on Delay time	$t_{d(ON)}$	$V_{CC} = 600V, V_{GE} = 0/15V, R_G = 15\Omega, I_C = 25A, L_{load} = 0.82mH, \text{Energy losses include "tail" and diode reverse recovery.}$	-	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	$t_{d(ON)}$	$V_{CC} = 600V, V_{GE} = 0/15V, R_G = 15\Omega, I_C = 25A, L_{load} = 0.82mH, \text{Energy losses include "tail" and diode reverse recovery. } T_J = 150^\circ C$	-	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	-	
Short Circuit Collector Current	$I_{C(SC)}$	$V_{GE} = 15V, V_{CC} \leq 600V, t_{SC} \leq 10\mu s$	-	85	-	A

- **Diode, Inverter**

Absolute Maximum Ratings

Parameter	Symbol	Limit	Unit
Repetitive Peak Reverse Voltage	V_{RRM}	1200	V
Continuous DC Forward Current	I_F	25	A
Repetitive Peak Forward Current ($t_p=1ms$)	I_{FRM}	50	

Electrical Characteristics ⁽¹⁾

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Diode Forward Voltage	V_F	$I_F = 25A$	-	2.4	2.9	V
		$I_F = 25A$ $T_J = 125^\circ C$	-	2.1	-	
		$I_F = 25A$ $T_J = 150^\circ C$	-	2.0	-	
Diode Reverse-Recovery Charge	Q_{rr}	$V_R = 600V, I_F = 25A,$ $di_F/dt = -455 A/\mu s$	-	1.5	-	μC
Diode Peak Reverse-Recovery Current	I_{rrm}		-	15.0	-	A
Diode Reverse-Recovery Loss	E_{rr}		-	0.55	-	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 ($T_c = 100^\circ C, T_J = 175^\circ C$)	I_{CDC}	25	A
Repetitive Peak Collector Current ($t_p=1ms$)	I_{CRM}	50	

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	$V_{GE(th)}$	$V_{CE} = V_{GE}, I_C = 600\mu A$	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}	$V_{CE} = 25V,$	-	1980	-	pF
Output Capacitance	C_{oss}	$V_{GE} = 0V,$	-	110	-	
Reverse Transfer Capacitance	C_{riss}	$f = 1MHz$	-	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	-	
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	-	
Short Circuit Collector Current	$I_{C(SC)}$	$V_{GE} = 15V,$ $V_{CC} \leq 600V,$ $t_{SC} \leq 10\mu s$	-	85	-	A

• Diode, Brake-Chopper

Absolute Maximum Ratings

Parameter	Symbol	Limit	Unit
Repetitive Peak Reverse Voltage	V_{RRM}	1200	V
Continuous DC Forward Current	I_F	10	A
Repetitive Peak Forward Current ($t_p=1ms$)	I_{FRM}	20	

Electrical Characteristics ⁽¹⁾

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Diode Forward Voltage	V_F	$I_F = 10A$	-	2.2	2.65	V
		$I_F = 10A$ $T_J = 125^\circ C$	-	1.8	-	
		$I_F = 10A$ $T_J = 150^\circ C$	-	1.7	-	
Diode Reverse-Recovery Charge	Q_{rr}	$V_R = 600V, I_F = 10A,$ $dI_F/dt = -600 A/\mu s$	-	0.8	-	μC
Diode Peak Reverse-Recovery Current	I_{rrm}		-	11.0	-	A
Diode Reverse-Recovery Loss	E_{rr}		-	0.22	-	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 ($T_c = 100^\circ C$)	$I_{F(AV)}$	20	A
Maximum RMS Current at Rectifier Output ($T_c = 100^\circ C$)	I_{RMSM}	40	
Surge Forward Current ($V_R=0, t_p=10ms$)	I_{FSM}	270	
I^2t – value ($V_R=0, t_p = 10 ms$)	I^2t	360	A^2s

Electrical Characteristics

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Diode Forward Voltage	V_F	$I_F = 15A$ $T_J = 150^\circ C$	-	0.96	-	V
Diode Reverse Current	I_R	$V_R = 1600V$ $T_J = 150^\circ C$	-	-	1.0	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	$R_{CC'+EE'}$	-	8.0	-	mΩ
Module Lead Resistance, Terminal to Chip	$R_{AA'+CC'}$	-	6.0	-	
Junction-to-Case Thermal Resistance, per IGBT, Inverter	$R_{\theta JC}$	-	0.95	-	°C/W
Junction-to-Case Thermal Resistance, per Diode, Inverter		-	1.30	-	
Junction-to-Case Thermal Resistance, per IGBT, Brake-Chopper		-	0.95	-	
Junction-to-Case Thermal Resistance, per Diode, Brake-Chopper		-	1.75	-	
Junction-to-Case Thermal Resistance, per Diode, Rectifier		-	1.03	-	
Case-to-Heatsink Thermal Resistance, per IGBT, Inverter	$R_{\theta CH}$	-	0.95	-	°C/W
Case-to-Heatsink Thermal Resistance, per Diode, Inverter		-	1.02	-	
Case-to-Heatsink Thermal Resistance, per IGBT, Brake-Chopper		-	0.95	-	
Case-to-Heatsink Thermal Resistance, per Diode, Brake-Chopper		-	1.30	-	
Case-to-Heatsink Thermal Resistance, per Diode, Rectifier		-	1.17	-	
Case-to-Heatsink Thermal Resistance, per Module		-	0.058	-	
Mounting Force per Clamp	F	20	-	50	N
Weight per Module	G	-	25	-	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

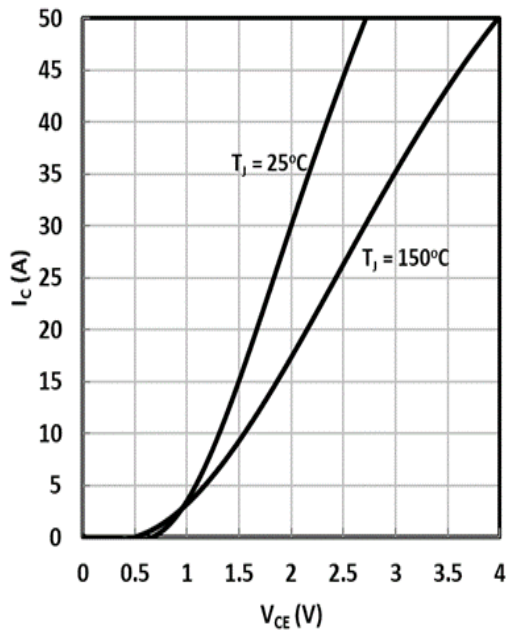


Fig. 1 IGBT (Inverter) Output Characteristics

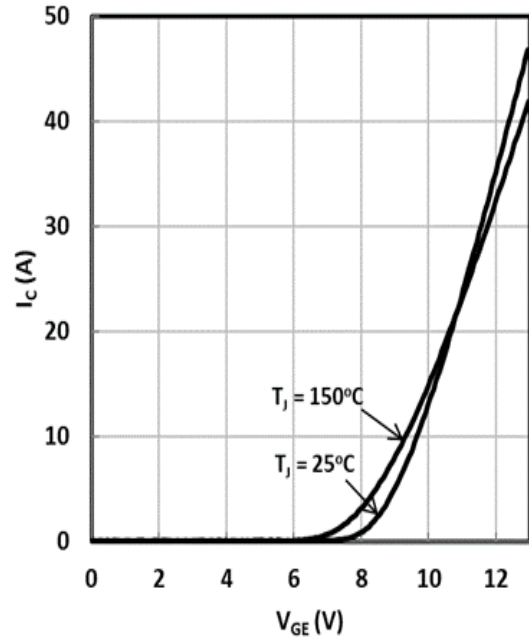


Fig. 2 IGBT (Inverter) Transfer Characteristics

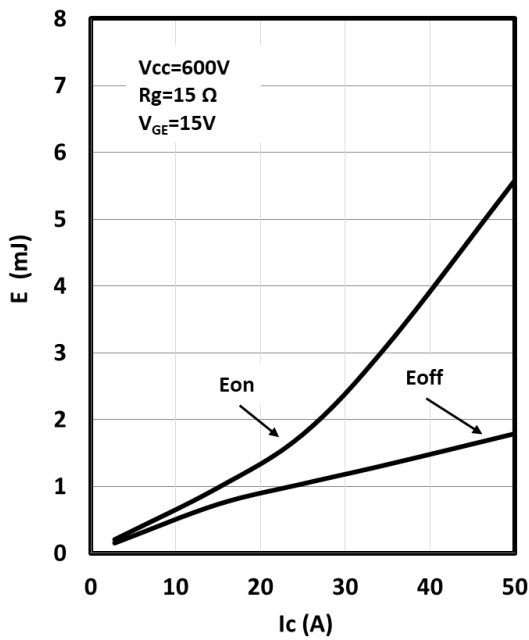


Fig. 3 IGBT (Inverter) Switching Loss vs. Ic

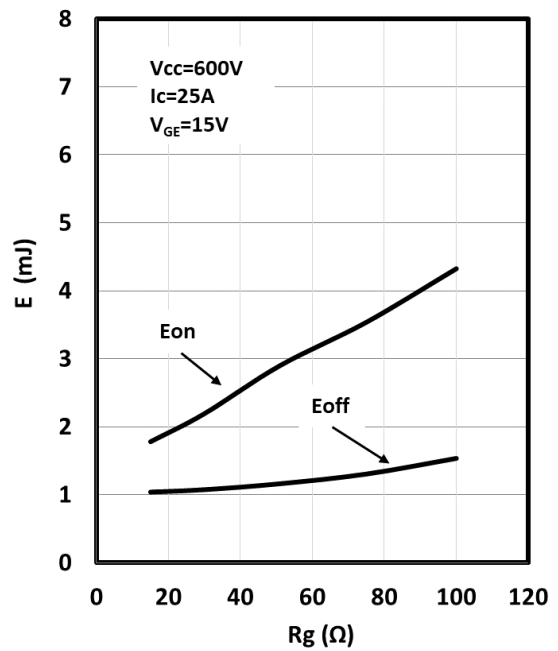


Fig. 4 IGBT (Inverter) Switching Loss vs. Rg

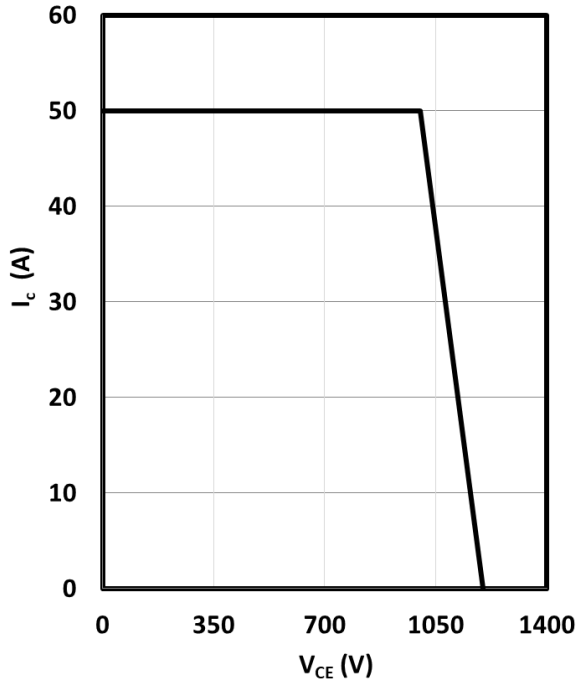


Fig. 5 RBSOA

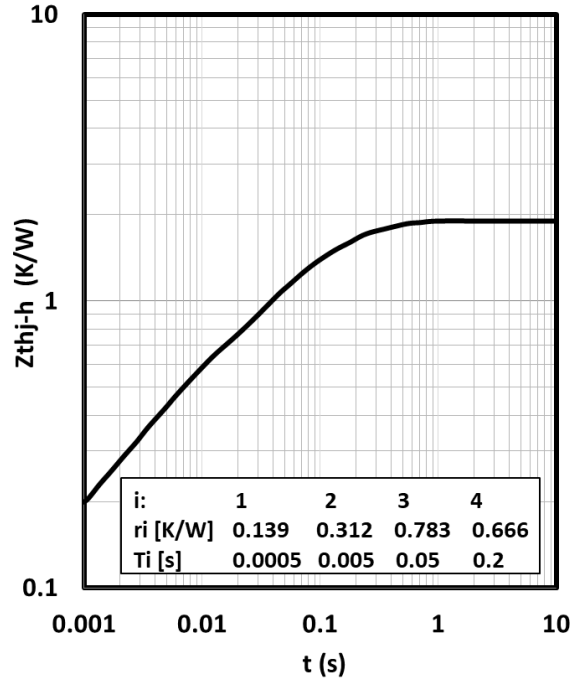


Fig. 6 IGBT (Inverter) Transient Thermal Impedance

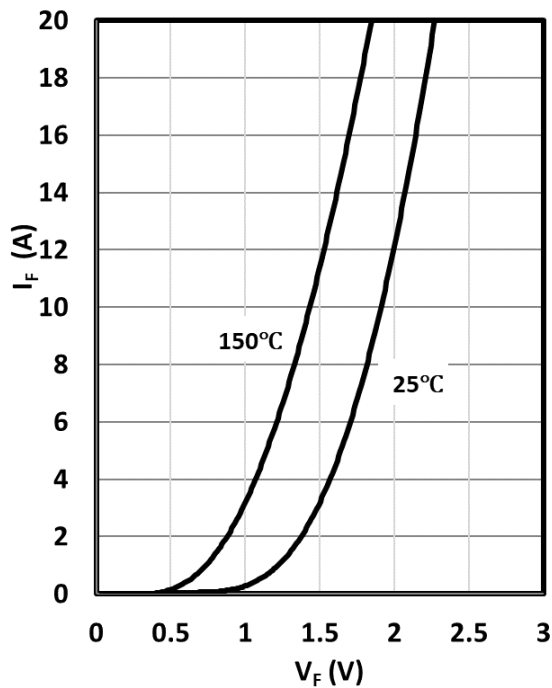


Fig. 7 Diode (Inverter) Forward Characteristics

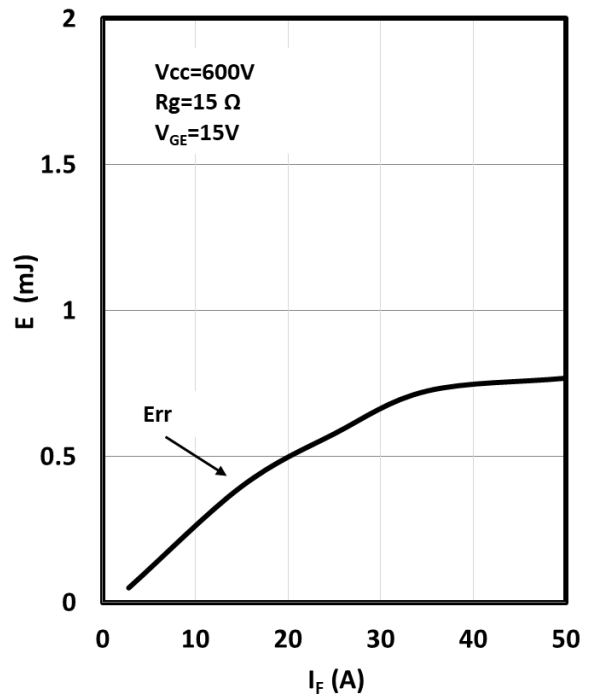


Fig. 8 Diode (Inverter) Reverse-Recovery Loss vs. If

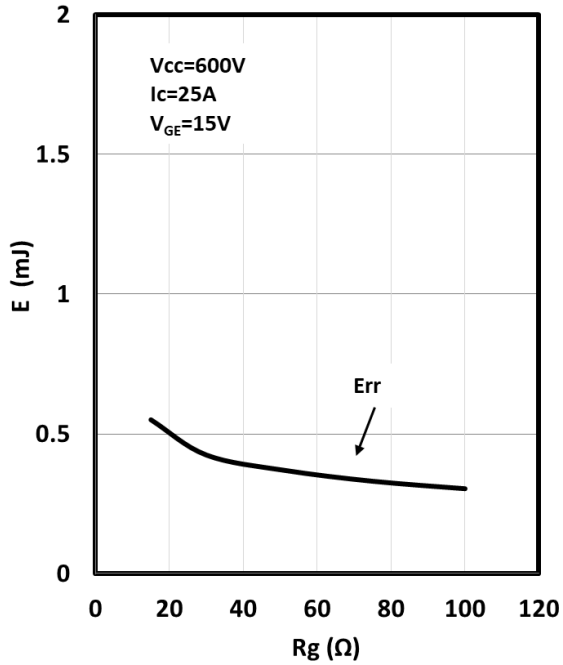


Fig. 9 Diode (Inverter) Reverse-Recovery Loss vs. Rg

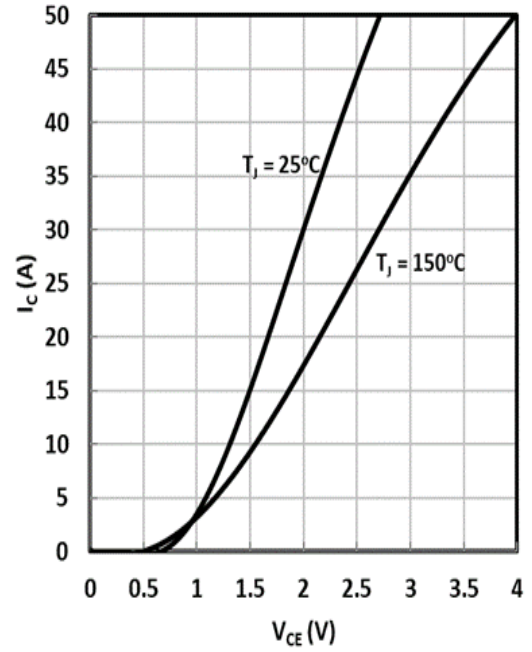


Fig. 10 IGBT (Brake-Chopper) Output Characteristics

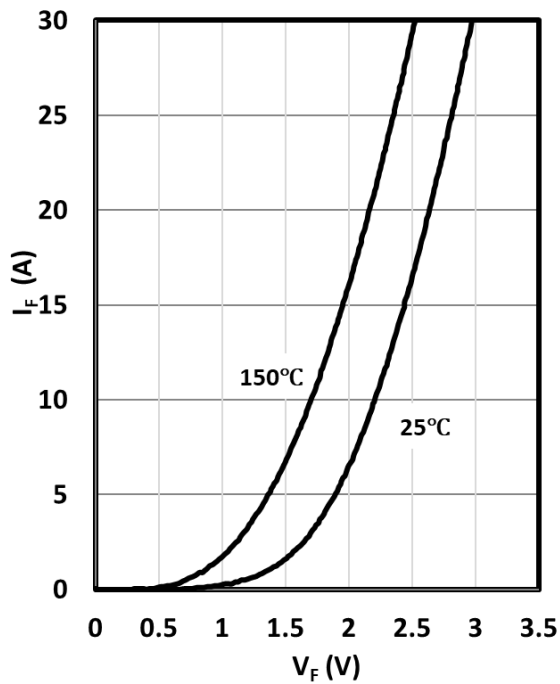


Fig. 11 Diode (Brake-Chopper) Output Characteristics

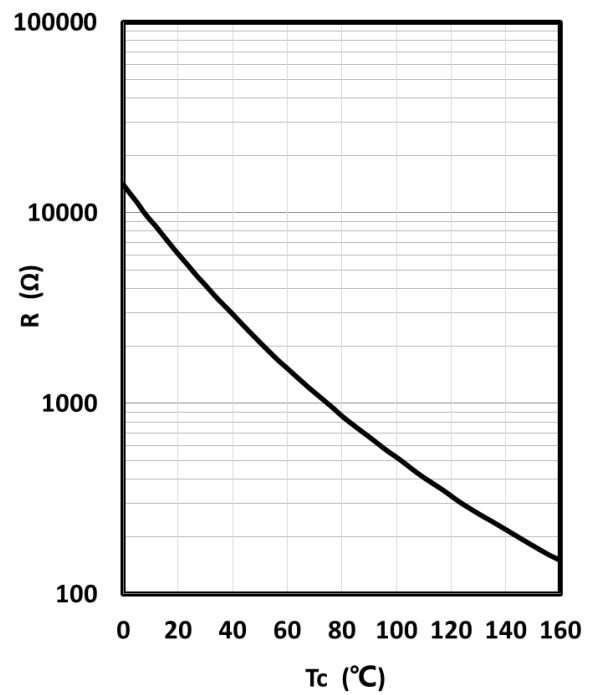
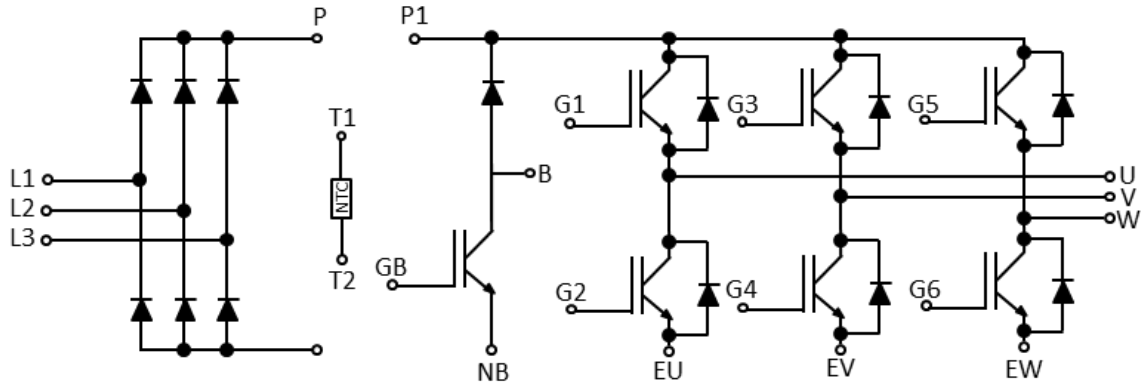
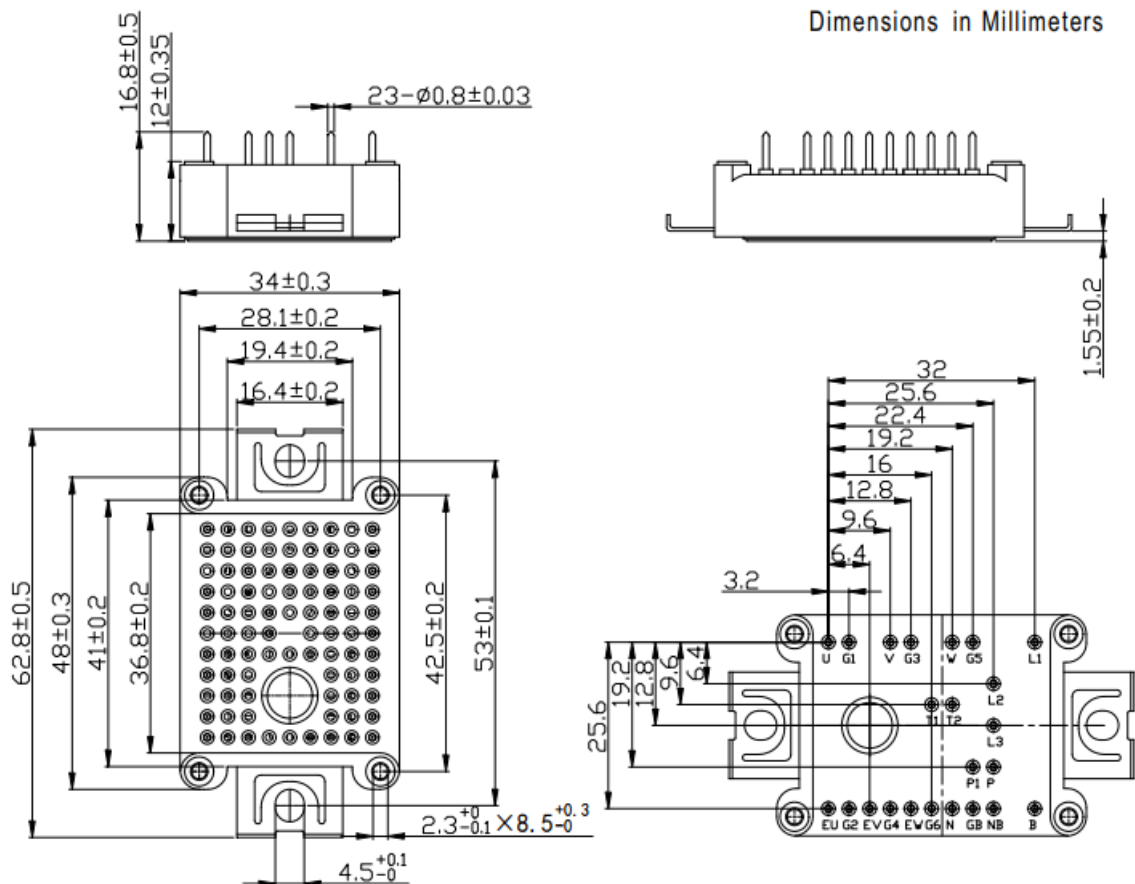


Fig. 12 NTC Temperature Characteristics

• Circuit diagram



• Package Dimensions



Revision history of JG1A25P120FG2 Specification

Version	Change Items	Effective Date
1.00	Initial Release.	20-Nov-20
1.01	Specification updates.	22-Feb-21
1.02	Diode specification updates.	20-Apr-21

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