

关键参数

Key Parameters

V_{CES}		1200	V
$V_{CE(sat)}$	Typ.	1.60	V
I_C	Max.	75	A
$I_{C(RM)}$	Max.	150	A

典型应用

Typical Applications

- 马达驱动 Motor Drives
- 辅助逆变器 Auxiliary Inverters
- 伺服驱动 Servo Drives

特点

Features

- NTC 温度传感器 Integrated NTC Temp Sensor
- 氧化铝衬板 Al_2O_3 Substrates
- 高热循环能力 High Thermal Cycling Capability
- 高功率密度 High Power Density

电路结构

Circuit Configuration

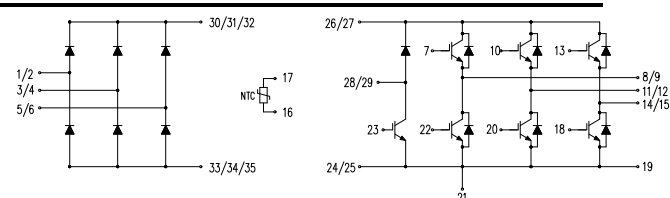


图 1. 电路结构

Fig. 1 Circuit configuration

模块外形

Module Appearance

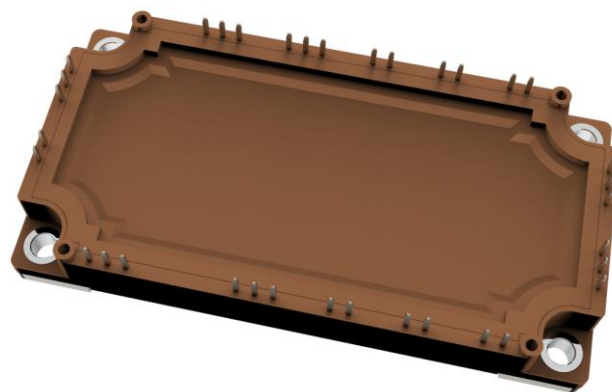


图 2. 模块外形

Fig. 2 Module appearance

模块标签说明

Module Label Code Instruction



数据位置 Data position	数据内容 Content of data
1--8	模块批次号 Module batch number
9--12	模块序列号 Module serial number

逆变端
Inverter
最大额定值
Absolute Maximum Ratings

符号 Symbol	参数名称 Parameter	测试条件 Test Conditions	数值 Value	单位 Unit
V_{CES}	集电极-发射极电压 Collector-emitter voltage	$V_{GE} = 0V, T_C = 25\text{ }^{\circ}\text{C}$	1200	V
V_{GES}	栅极-发射极电压 Gate-emitter voltage	$T_C = 25\text{ }^{\circ}\text{C}$	± 20	V
I_C	集电极电流 Collector-emitter current	$T_C = 100\text{ }^{\circ}\text{C}, T_{vj\text{ max}}=175^{\circ}\text{C}$	75	A
$I_{C(RM)}$	集电极峰值电流 Peak collector current	$t_P=1\text{ms}$	150	A
P_{max}	晶体管部分最大损耗 Max. transistor power dissipation	$T_C = 25\text{ }^{\circ}\text{C}, T_{vj\text{ max}}=175^{\circ}\text{C}$	341	W
I^2t	二极管 I^2t 值 Diode I^2t	$V_R = 0V, t_P = 10\text{ms}, T_{vj} = 175\text{ }^{\circ}\text{C}$	3.2	kA^2s
V_{isol}	绝缘电压(模块) Isolation voltage – per module	短接所有端子，端子与基板间施加电压 (Connected terminals to base plate), AC RMS, 1 min, 50Hz, $T_C = 25\text{ }^{\circ}\text{C}$	2500	V

热和机械数据
Thermal & Mechanical Data

参数 Symbol	说明 Explanation	值 Value	单位 Unit
爬电距离 Creepage distance	端子-散热器 Terminal to heatsink	10.0	mm
	端子-端子 Terminal to terminal	/	mm
绝缘间隙 Clearance	端子-散热器 Terminal to heatsink	7.5	mm
	端子-端子 Terminal to terminal	/	mm
相对漏电起痕指数 CTI (Comparative Tracking Index)		>200	

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符号 Symbol	参数名称 Parameter	测试条件 Test Conditions	最小值 Min.	典型值 Typ.	最大值 Max.	单位 Unit
$R_{th(J-C)} \text{ IGBT}$	IGBT 结壳热阻 Thermal resistance – IGBT			0.44		K / W
$R_{th(J-C)} \text{ Diode}$	二极管结壳热阻 Thermal resistance – Diode			0.70		K / W
$R_{th(C-H)} \text{ IGBT}$	接触热阻(IGBT) Thermal resistance – case to heatsink (IGBT)	安装力矩 3.5Nm, 导热脂 1W/m·K Mounting torque 3.5Nm, with mounting grease 1W/m·K		0.07		K / W
$R_{th(C-H)} \text{ Diode}$	接触热阻(Diode) Thermal resistance – case to heatsink (Diode)	安装力矩 3.5Nm, 导热脂 1W/m·K Mounting torque 3.5Nm, with mounting grease 1W/m·K		0.08		K / W
$T_{vj \text{ op}}$	工作结温 Operating junction temperature	IGBT 芯片 (IGBT)	-40		175	°C
		二极管芯片 (Diode)	-40		175	°C
T_{stg}	存储温度 Storage temperature range		-40		150	°C
M	安装力矩 Screw torque	安装紧固用– M6 Mounting – M6	3		6	Nm

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除非特别声明，否则 $T_C = 25\text{ }^{\circ}\text{C}$
 $T_C = 25\text{ }^{\circ}\text{C}$ unless otherwise stated

符号 Symbol	参数名称 Parameter	条件 Test Conditions	最小值 Min.	典型值 Typ.	最大值 Max.	单位 Unit
I_{CES}	集电极截止电流 Collector cut-off current	$V_{GE} = 0V, V_{CE} = V_{CES}$			0.1	mA
		$V_{GE} = 0V, V_{CE} = V_{CES}, T_{vj} = 150\text{ }^{\circ}\text{C}$			5	mA
		$V_{GE} = 0V, V_{CE} = V_{CES}, T_{vj} = 175\text{ }^{\circ}\text{C}$			10	mA
I_{GES}	栅极漏电流 Gate leakage current	$V_{GE} = \pm 20V, V_{CE} = 0V$			0.5	μA
$V_{GE(th)}$	栅极-发射极阈值电压 Gate threshold voltage	$I_C = 1.7\text{mA}, V_{GE} = V_{CE}$	5.20	5.80	6.40	V
$V_{CE(sat)}^{(*1)}$	集电极-发射极饱和电压 Collector-emitter saturation voltage	$V_{GE} = 15V, I_C = 75A$		1.60		V
		$V_{GE} = 15V, I_C = 75A, T_{vj} = 150\text{ }^{\circ}\text{C}$		1.85		V
		$V_{GE} = 15V, I_C = 75A, T_{vj} = 175\text{ }^{\circ}\text{C}$		1.90		V
I_F	二极管正向直流电流 Diode forward current	DC		75		A
I_{FRM}	二极管正向重复峰值电流 Diode peak forward current	$t_p = 1\text{ms}$		150		A
$V_F^{(*1)}$	二极管正向电压 Diode forward voltage	$I_F = 75A, V_{GE} = 0V$		1.55		V
		$I_F = 75A, V_{GE} = 0V, T_{vj} = 150\text{ }^{\circ}\text{C}$		1.60		V
		$I_F = 75A, V_{GE} = 0V, T_{vj} = 175\text{ }^{\circ}\text{C}$		1.65		V
I_{SC}	短路电流 Short circuit current	$V_{CC} = 800V, V_{GE} \leq 15V,$ $V_{CE(max)} = V_{CES} - L^{(*2)} \times di/dt,$ IEC 60747-9		350		A

注意: 1. (*1) 表示该参数的测试点为辅助母排端子 (*1) indicates it is measured at the auxiliary busbar terminal),

Note: 2. (*2) 表示 L 是电路杂散电感加上 L_{sCE} (*2) indicates L is the circuit stray inductance plus L_{sCE}).

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符号 Symbol	参数名称 Parameter	条件 Test Conditions	最小值 Min.	典型值 Typ.	最大值 Max.	单位 Unit
C_{ies}	输入电容 Input capacitance	$V_{CE} = 25V, V_{GE} = 0V, f = 100kHz$		17.28		nF
Q_g	栅极电荷 Gate charge	$\pm 15V$		0.9		μC
C_{res}	反向传输电容 Reverse transfer capacitance	$V_{CE} = 25V, V_{GE} = 0V, f = 100kHz$		0.05		nF
L_{sCE}	模块电感 Module inductance			35		nH
$R_{CC'+EE'}$	模块引线电阻, 端子-芯片 Module lead resistance, terminal-chip			3.9		m Ω
R_{Gint}	内部栅极电阻 Internal gate resistor			2.7		Ω

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符号 Symbol	参数名称 Parameter	测试条件 Test Conditions		最小值 Min.	典型值 Typ.	最大值 Max.	单位 Unit
$t_{d(off)}$	关断延迟时间 Turn-off delay time	$I_C=75A$, $V_{CE}=600V$, $V_{GE}=\pm 15V$, $R_{G(OFF)}=5.6\Omega$, $L_S=26nH$, $dv/dt=4750V/\mu s$ ($T_{vj}=175\text{ }^{\circ}C$).	$T_{vj}=25\text{ }^{\circ}C$		273		ns
			$T_{vj}=150\text{ }^{\circ}C$		305		
			$T_{vj}=175\text{ }^{\circ}C$		315		
t_f	下降时间 Fall time		$T_{vj}=25\text{ }^{\circ}C$		98		ns
			$T_{vj}=150\text{ }^{\circ}C$		176		
			$T_{vj}=175\text{ }^{\circ}C$		191		
E_{OFF}	关断损耗 Turn-off energy loss		$T_{vj}=25\text{ }^{\circ}C$		5.99		mJ
			$T_{vj}=150\text{ }^{\circ}C$		6.37		
			$T_{vj}=175\text{ }^{\circ}C$		6.48		
$t_{d(on)}$	开通延迟时间 Turn-on delay time	$T_{vj}=25\text{ }^{\circ}C$		120		ns	
		$T_{vj}=150\text{ }^{\circ}C$		112			
		$T_{vj}=175\text{ }^{\circ}C$		105			
t_r	上升时间 Rise time	$T_{vj}=25\text{ }^{\circ}C$		34		ns	
		$T_{vj}=150\text{ }^{\circ}C$		46			
		$T_{vj}=175\text{ }^{\circ}C$		56			
E_{ON}	开通损耗 Turn-on energy loss	$T_{vj}=25\text{ }^{\circ}C$		3.77		mJ	
		$T_{vj}=150\text{ }^{\circ}C$		9.95			
		$T_{vj}=175\text{ }^{\circ}C$		11.06			
Q_{rr}	二极管反向恢复电荷 Diode reverse recovery charge	$T_{vj}=25\text{ }^{\circ}C$		7		μC	
		$T_{vj}=150\text{ }^{\circ}C$		13			
		$T_{vj}=175\text{ }^{\circ}C$		14			
I_{rr}	二极管反向恢复电流 Diode reverse recovery current	$T_{vj}=25\text{ }^{\circ}C$		69		A	
		$T_{vj}=150\text{ }^{\circ}C$		50			
		$T_{vj}=175\text{ }^{\circ}C$		47			
E_{rec}	二极管反向恢复损耗 Diode reverse recovery energy	$T_{vj}=25\text{ }^{\circ}C$		3.17		mJ	
		$T_{vj}=150\text{ }^{\circ}C$		4.21			
		$T_{vj}=175\text{ }^{\circ}C$		5.00			

斩波
Brake-Chopper
最大额定值
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符号 Symbol	参数名称 Parameter	测试条件 Test Conditions	数值 Value	单位 Unit
V_{CES}	集电极-发射极电压 Collector-emitter voltage	$V_{GE} = 0V, T_C = 25\text{ }^{\circ}\text{C}$	1200	V
V_{GES}	栅极-发射极电压 Gate-emitter voltage	$T_C = 25\text{ }^{\circ}\text{C}$	± 20	V
I_C	集电极电流 Collector-emitter current	$T_C = 110\text{ }^{\circ}\text{C}, T_{vj\text{ max}}=175^{\circ}\text{C}$	50	A
$I_{C(RM)}$	集电极峰值电流 Peak collector current	$t_P=1\text{ms}$	100	A
P_{max}	晶体管部分最大损耗 Max. transistor power dissipation	$T_C = 25\text{ }^{\circ}\text{C}, T_{vj\text{ max}}=175^{\circ}\text{C}$	250	W
I^2t	二极管 I^2t 值 Diode I^2t	$V_R = 0V, t_P = 10\text{ms}, T_{vj} = 175\text{ }^{\circ}\text{C}$	1152	A^2s
V_{isol}	绝缘电压(模块) Isolation voltage – per module	短接所有端子，端子与基板间施加电压 (Connected terminals to base plate), AC RMS,1 min, 50Hz, $T_C = 25\text{ }^{\circ}\text{C}$	2500	V

斩波
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符号 Symbol	参数名称 Parameter	测试条件 Test Conditions	最小值 Min.	典型值 Typ.	最大值 Max.	单位 Unit
$R_{th(J-C)} \text{ IGBT}$	IGBT 结壳热阻 Thermal resistance – IGBT			0.60		K / W
$R_{th(J-C)} \text{ Diode}$	二极管结壳热阻 Thermal resistance – Diode			1.58		K / W
$R_{th(C-H)} \text{ IGBT}$	接触热阻(IGBT) Thermal resistance – case to heatsink (IGBT)	安装力矩 3.5Nm, 导热脂 1W/m·K Mounting torque 3.5Nm, with mounting grease 1W/m·K		0.08		K / W
$R_{th(C-H)} \text{ Diode}$	接触热阻(Diode) Thermal resistance – case to heatsink (Diode)	安装力矩 3.5Nm, 导热脂 1W/m·K Mounting torque 3.5Nm, with mounting grease 1W/m·K		0.18		K / W
$T_{vj \text{ op}}$	工作结温 Operating junction temperature	IGBT 芯片(IGBT)	-40		175	°C
		二极管芯片(Diode)	-40		175	°C
T_{stg}	存储温度 Storage temperature range		-40		150	°C
M	安装力矩 Screw torque	安装紧固用– M6 Mounting – M6	3		6	Nm

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 $T_C = 25\text{ }^{\circ}\text{C}$ unless otherwise stated

符号 Symbol	参数名称 Parameter	条件 Test Conditions	最小值 Min.	典型值 Typ.	最大值 Max.	单位 Unit
I_{CES}	集电极截止电流 Collector cut-off current	$V_{GE} = 0V, V_{CE} = V_{CES}$			0.1	mA
		$V_{GE} = 0V, V_{CE} = V_{CES}, T_{vj} = 150\text{ }^{\circ}\text{C}$			5	mA
		$V_{GE} = 0V, V_{CE} = V_{CES}, T_{vj} = 175\text{ }^{\circ}\text{C}$			10	mA
I_{GES}	栅极漏电流 Gate leakage current	$V_{GE} = \pm 20V, V_{CE} = 0V$			0.5	μA
$V_{GE(th)}$	栅极-发射极阈值电压 Gate threshold voltage	$I_C = 1.28\text{mA}, V_{GE} = V_{CE}$	5.20	5.80	6.40	V
$V_{CE(sat)}^{(*1)}$	集电极-发射极饱和电压 Collector-emitter saturation voltage	$V_{GE} = 15V, I_C = 50A$		1.55		V
		$V_{GE} = 15V, I_C = 50A, T_{vj} = 150\text{ }^{\circ}\text{C}$		1.85		V
		$V_{GE} = 15V, I_C = 50A, T_{vj} = 175\text{ }^{\circ}\text{C}$		1.90		V
I_F	二极管正向直流电流 Diode forward current	DC		50		A
I_{FRM}	二极管正向重复峰值电流 Diode peak forward current	$t_p = 1\text{ms}$		100		A
$V_F^{(*1)}$	二极管正向电压 Diode forward voltage	$I_F = 25A, V_{GE} = 0V$		1.20		V
		$I_F = 25A, V_{GE} = 0V, T_{vj} = 150\text{ }^{\circ}\text{C}$		1.25		V
		$I_F = 25A, V_{GE} = 0V, T_{vj} = 175\text{ }^{\circ}\text{C}$		1.25		V
I_{SC}	短路电流 Short circuit current	$V_{CC} = 800V, V_{GE} \leq 15V,$ $V_{CE(max)} = V_{CES} - L^{(*2)} \times di/dt,$ IEC 60747-9		300		A

注意: 1. (*1) 表示该参数的测试点为辅助母排端子 (*1) indicates it is measured at the auxiliary busbar terminal),

Note: 2. (*2) 表示 L 是电路杂散电感加上 L_{SCE} (*2) indicates L is the circuit stray inductance plus L_{SCE}).

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 $T_C = 25\text{ }^{\circ}\text{C}$ unless otherwise stated

符号 Symbol	参数名称 Parameter	条件 Test Conditions	最小值 Min.	典型值 Typ.	最大值 Max.	单位 Unit
C_{ies}	输入电容 Input capacitance	$V_{CE} = 25V, V_{GE} = 0V, f = 100kHz$		11.05		nF
Q_g	栅极电荷 Gate charge	$\pm 15V$		0.6		μC
C_{res}	反向传输电容 Reverse transfer capacitance	$V_{CE} = 25V, V_{GE} = 0V, f = 100kHz$		0.04		nF
L_{sCE}	模块电感 Module inductance			35		nH
$R_{CC'+EE'}$	模块引线电阻, 端子-芯片 Module lead resistance, terminal-chip			3.9		m Ω
R_{Gint}	内部栅极电阻 Internal gate resistor			6.2		Ω

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符号 Symbol	参数名称 Parameter	测试条件 Test Conditions		最小值 Min.	典型值 Typ.	最大值 Max.	单位 Unit
$t_{d(off)}$	关断延迟时间 Turn-off delay time	$I_C = 50A,$ $V_{CE} = 600V,$ $V_{GE} = \pm 15V,$ $R_{G(OFF)} = 7.5\Omega,$ $L_S = 45nH,$ $dv/dt = 3000V/\mu s$ ($T_{vj} = 175\text{ }^{\circ}C$).	$T_{vj} = 25\text{ }^{\circ}C$		241		ns
			$T_{vj} = 150\text{ }^{\circ}C$		295		
			$T_{vj} = 175\text{ }^{\circ}C$		305		
t_f	下降时间 Fall time		$T_{vj} = 25\text{ }^{\circ}C$		146		ns
			$T_{vj} = 150\text{ }^{\circ}C$		238		
			$T_{vj} = 175\text{ }^{\circ}C$		264		
E_{OFF}	关断损耗 Turn-off energy loss		$T_{vj} = 25\text{ }^{\circ}C$		3.28		mJ
			$T_{vj} = 150\text{ }^{\circ}C$		5.01		
			$T_{vj} = 175\text{ }^{\circ}C$		5.50		
$t_{d(on)}$	开通延迟时间 Turn-on delay time	$T_{vj} = 25\text{ }^{\circ}C$		34		ns	
		$T_{vj} = 150\text{ }^{\circ}C$		29			
		$T_{vj} = 175\text{ }^{\circ}C$		28			
t_r	上升时间 Rise time	$T_{vj} = 25\text{ }^{\circ}C$		45		ns	
		$T_{vj} = 150\text{ }^{\circ}C$		53			
		$T_{vj} = 175\text{ }^{\circ}C$		53			
E_{ON}	开通损耗 Turn-on energy loss	$T_{vj} = 25\text{ }^{\circ}C$		3.61		mJ	
		$T_{vj} = 150\text{ }^{\circ}C$		4.50			
		$T_{vj} = 175\text{ }^{\circ}C$		4.71			
Q_{rr}	二极管反向恢复电荷 Diode reverse recovery charge	$T_{vj} = 25\text{ }^{\circ}C$		3		μC	
		$T_{vj} = 150\text{ }^{\circ}C$		6			
		$T_{vj} = 175\text{ }^{\circ}C$		7			
I_{rr}	二极管反向恢复电流 Diode reverse recovery current	$T_{vj} = 25\text{ }^{\circ}C$		19		A	
		$T_{vj} = 150\text{ }^{\circ}C$		24			
		$T_{vj} = 175\text{ }^{\circ}C$		25			
E_{rec}	二极管反向恢复损耗 Diode reverse recovery energy	$T_{vj} = 25\text{ }^{\circ}C$		1.34		mJ	
		$T_{vj} = 150\text{ }^{\circ}C$		2.36			
		$T_{vj} = 175\text{ }^{\circ}C$		3.16			

整流端二极管
Inverter Diode
最大额定值
Absolute Maximum Ratings

符号 Symbol	参数名称 Parameter	测试条件 Test Conditions	最小值 Min.	数值 Value	最大值 Max.	单位 Unit
V_{RRM}	反向重复峰值电压 Repetitive peak reverse voltage	$V_{GE} = 0V, T_C = 25\text{ }^{\circ}\text{C}$		1600		V
I_F	二极管正向直流电流 Diode forward current	$T_H = 95\text{ }^{\circ}\text{C}$		75		A
I_{FRM}	集电极峰值电流 Peak collector current	$t_P = 1\text{ms}$		150		A
V_F	二极管正向电压 Diode forward voltage	$I_F = 75\text{A}, V_{GE} = 0V$		1.20		V
		$I_F = 75\text{A}, V_{GE} = 0V, T_{vj} = 125\text{ }^{\circ}\text{C}$		1.15		V
		$I_F = 75\text{A}, V_{GE} = 0V, T_{vj} = 150\text{ }^{\circ}\text{C}$		1.15		V
I_R	反向电流 Reverse current	$V_{GE} = 0V, V_{CE} = V_{CES}, T_{vj} = 150\text{ }^{\circ}\text{C}$			1	mA

注意: 1. (*1) 表示该参数的测试点为辅助母排端子 (*1) indicates it is measured at the auxiliary busbar terminal),

Note: 2. (*2) 表示 L 是电路杂散电感加上 L_{sCE} (*2) indicates L is the circuit stray inductance plus L_{sCE}).

整流端二极管
Inverter Diode
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符号 Symbol	参数名称 Parameter	测试条件 Test Conditions	最小值 Min.	典型值 Typ.	最大值 Max.	单位 Unit
$R_{th(J-C)} \text{ Diode}$	二极管结壳热阻 Thermal resistance – Diode			0.58		K / W
$R_{th(C-H)} \text{ Diode}$	接触热阻(Diode) Thermal resistance – case to heatsink (Diode)	安装力矩 3.5Nm, 导热脂 1W/m·K Mounting torque 3.5Nm, with mounting grease 1W/m·K		0.08		K / W
$T_{vj\text{ op}}$	工作结温 Operating junction temperature	二极管芯片 (Diode)	-40		150	$^{\circ}\text{C}$
T_{stg}	存储温度 Storage temperature range		-40		150	$^{\circ}\text{C}$
M	安装力矩 Screw torque	安装紧固用– M6 Mounting – M6	3		6	Nm

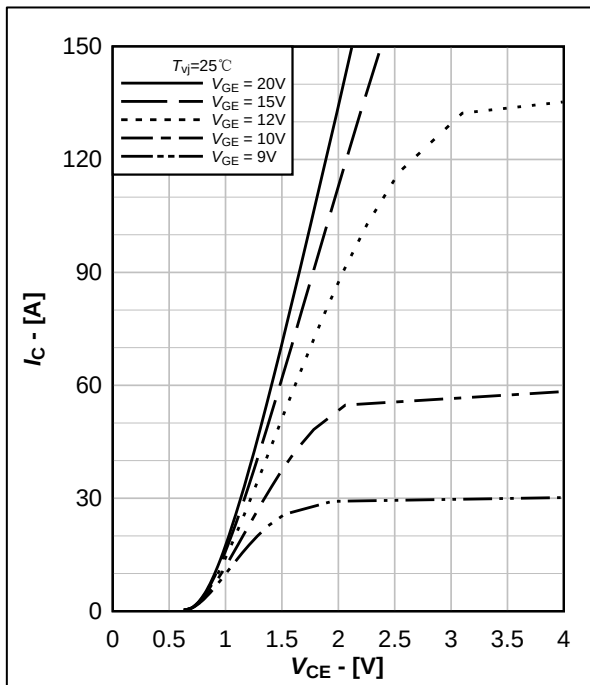

图 3. IGBT 输出特性典型曲线, $I_C = f(V_{CE})$ 逆变端

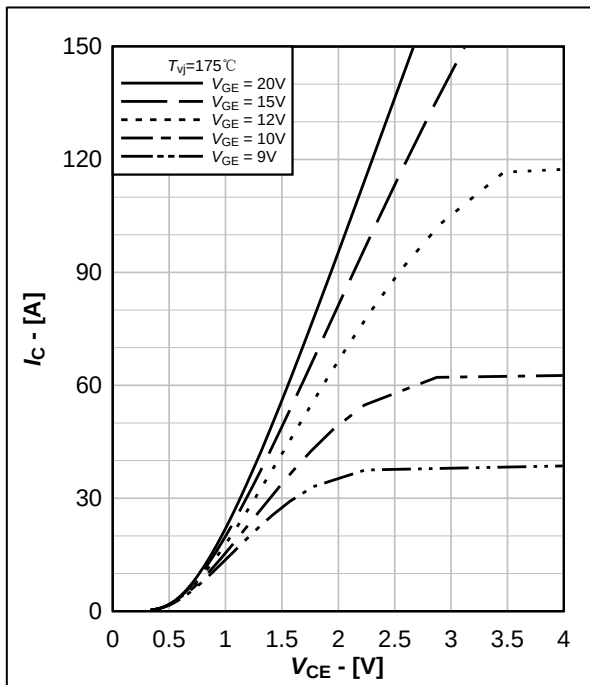
Fig.3 Typical IGBT output characteristic, $I_C = f(V_{CE})$, Inverter

图 4. IGBT 输出特性典型曲线, $I_C = f(V_{CE})$ 逆变端

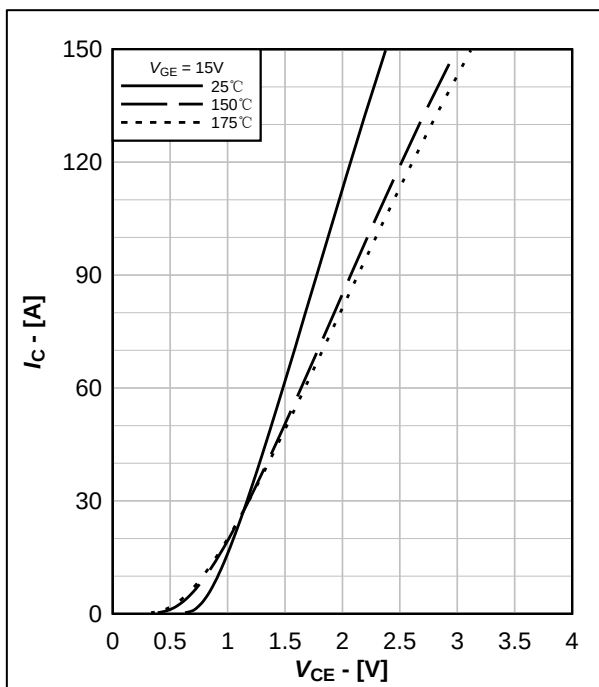
Fig.4 Typical IGBT output characteristic, $I_C = f(V_{CE})$, Inverter

图 5. IGBT 输出特性典型曲线, $I_C = f(V_{CE})$ 逆变端

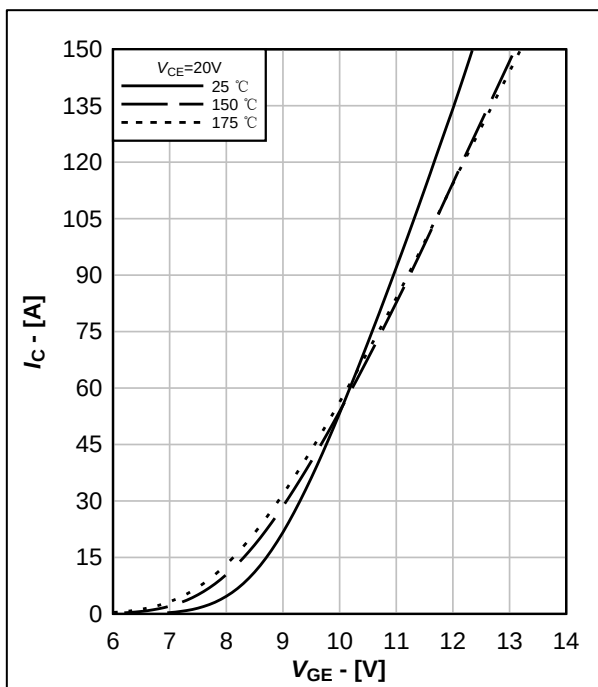
Fig.5 Typical IGBT output characteristic, $I_C = f(V_{CE})$, Inverter

图 6. IGBT 传输特性典型曲线, $I_C = f(V_{GE})$ 逆变端

Fig.6 Typical IGBT transfer characteristic, $I_C = f(V_{GE})$, Inverter

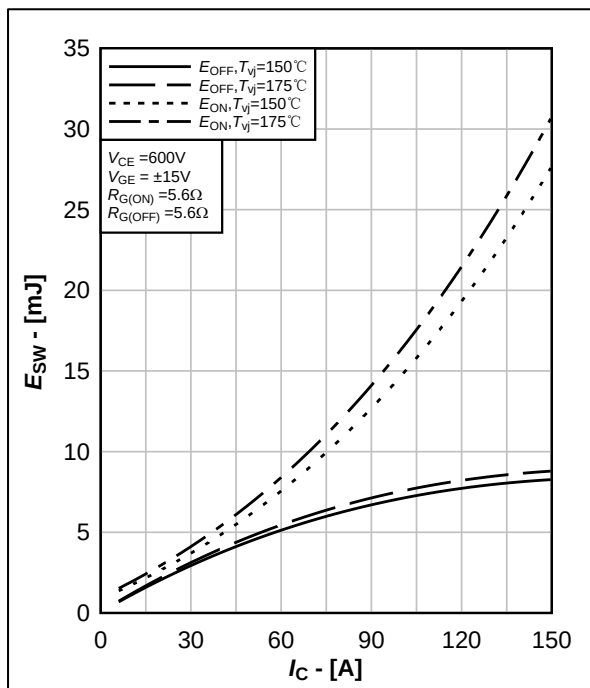

 图 7. IGBT 开关损耗典型曲线, $E_{on}=f(I_C)$, $E_{off}=f(I_C)$ 逆变端

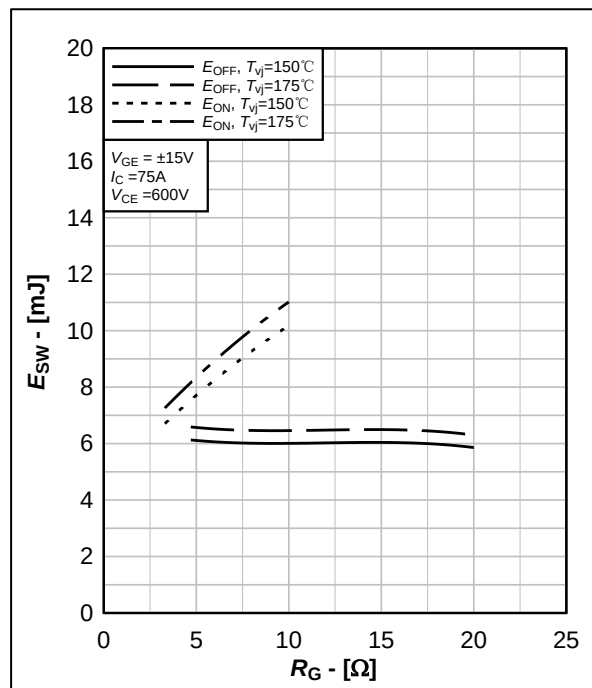
 Fig.7 Typical IGBT switching energy, $E_{on}=f(I_C)$, $E_{off}=f(I_C)$, Inverter

 图 8. IGBT 开关损耗典型曲线, $E_{on}=f(R_G)$, $E_{off}=f(R_G)$ 逆变端

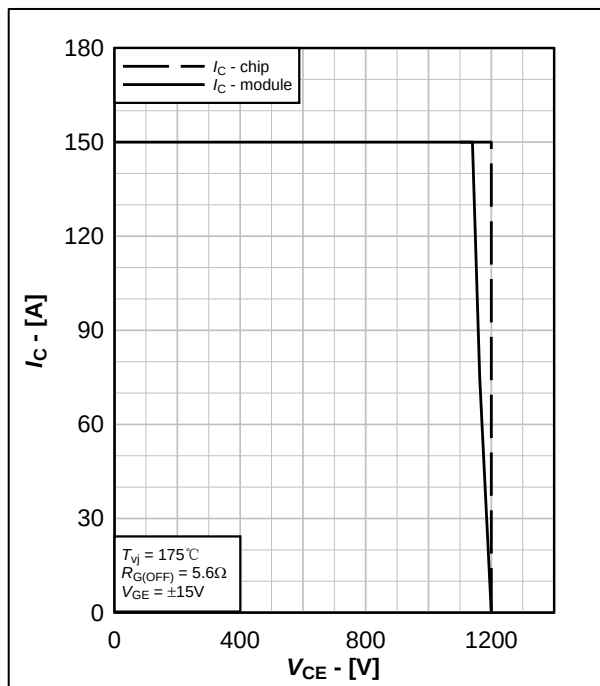
 Fig.8 Typical IGBT switching energy, $E_{on}=f(R_G)$, $E_{off}=f(R_G)$, Inverter

 图 9. IGBT 反偏安全工作区, $I_C=f(V_{CE})$ 逆变端

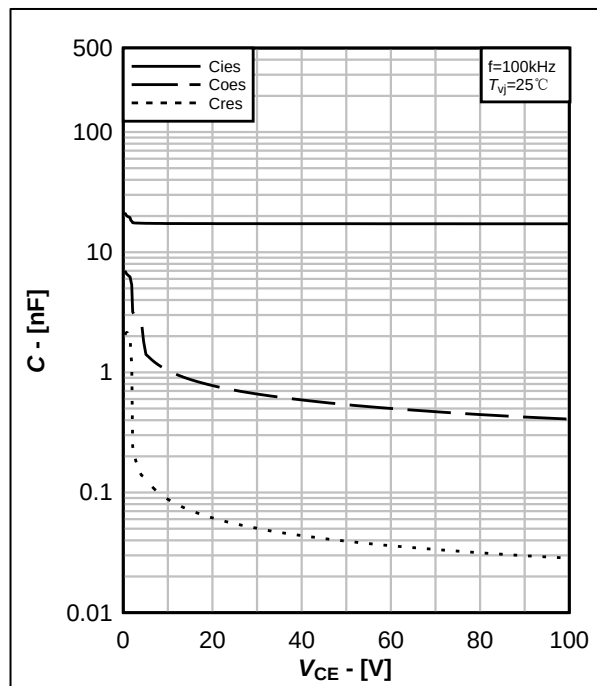
 Fig.9 Reverse bias safe operating area of IGBT, $I_C=f(V_{CE})$, Inverter

 图 10. 电容特性典型曲线, $C=f(V_{CE})$ 逆变端

 Fig.10 Typical capacity characteristic, $C=f(V_{CE})$, Inverter

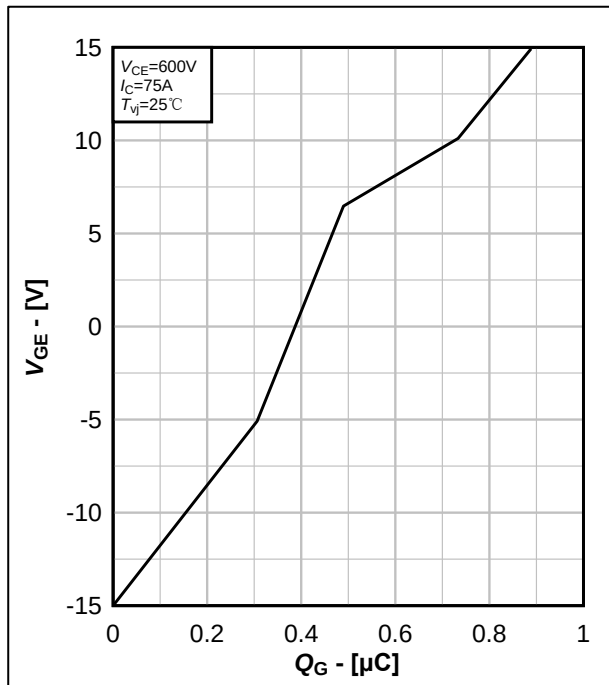

图 11. 栅极电荷特性典型曲线, $V_{GE} = f(Q_G)$ 逆变端

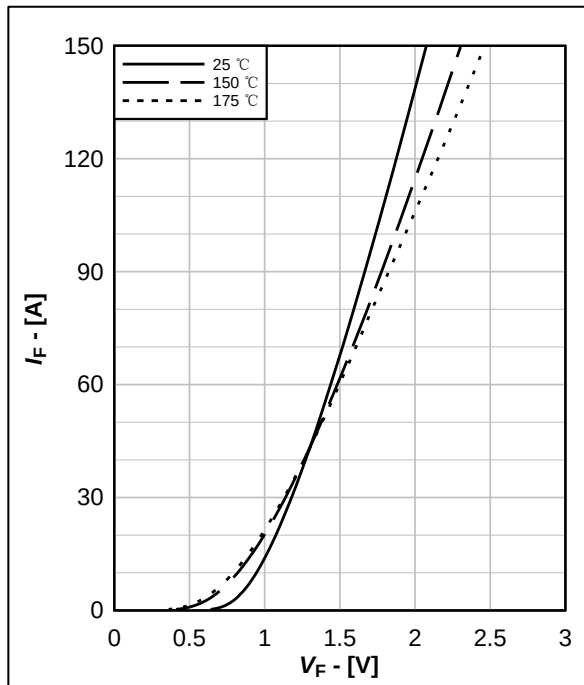
Fig.11 Typical gate charge characteristic, $V_{GE} = f(Q_G)$, Inverter

图 12. FRD 输出特性典型曲线, $I_F = f(V_F)$ 逆变端

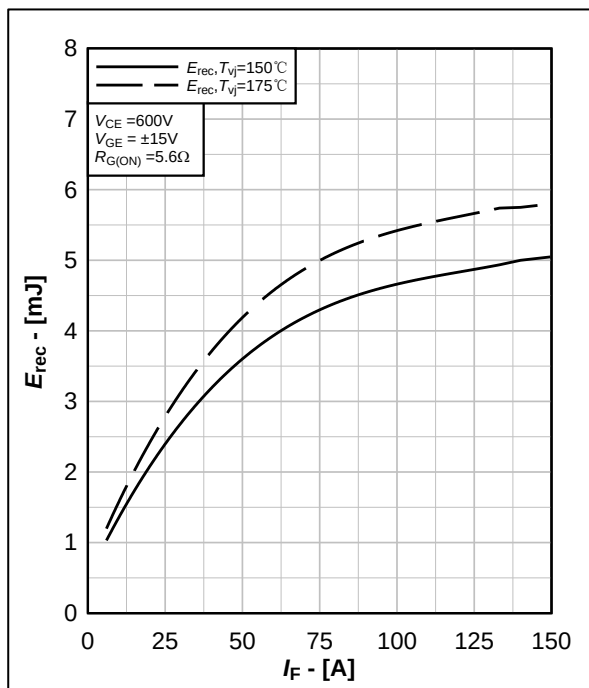
Fig.12 Typical FRD output characteristic, $I_F = f(V_F)$, Inverter

图 13. FRD 反向恢复损耗典型曲线, $E_{rec} = f(I_F)$ 逆变端

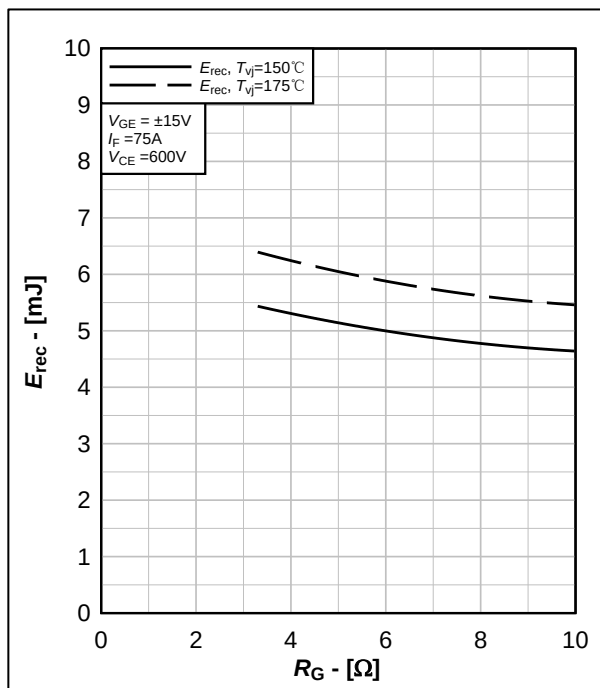
Fig.13 Typical FRD switching loss E_{rec} , $E_{rec} = f(I_F)$, Inverter

图 14. FRD 反向恢复损耗典型曲线, $E_{rec} = f(R_G)$ 逆变端

Fig.14 Typical FRD switching loss E_{rec} , $E_{rec} = f(R_G)$, Inverter

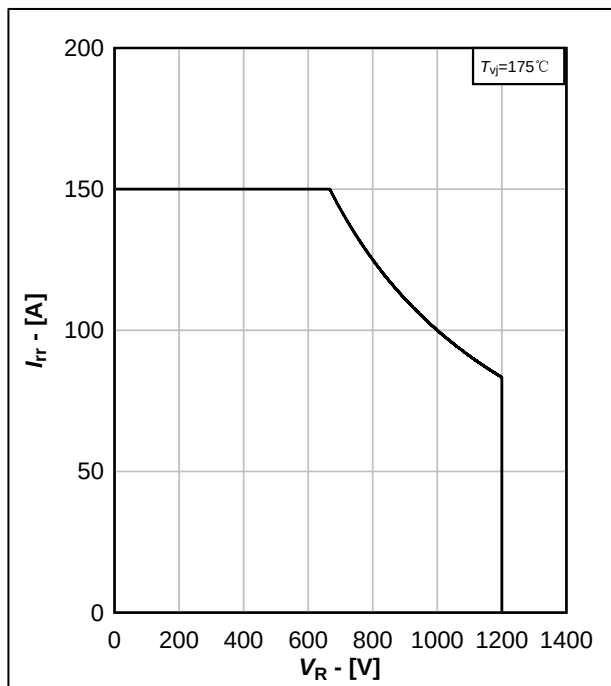

图 15. FRD 反偏安全工作区, $I_{rr} = f(V_R)$ 逆变端

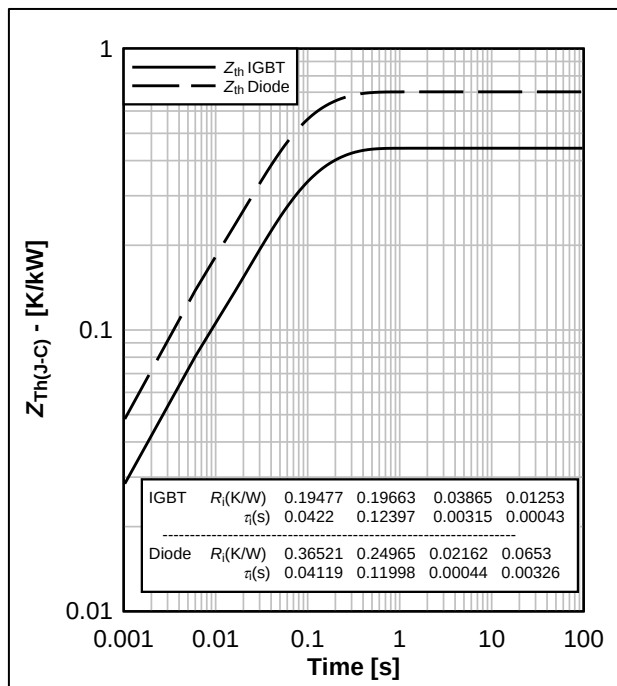
Fig.15 Reverse bias safe operating area of FRD, $I_{rr} = f(V_R)$, Inverter

图 16. 瞬态热阻抗曲线, $Z_{th(j-c)} = f(t_p)$ 逆变端

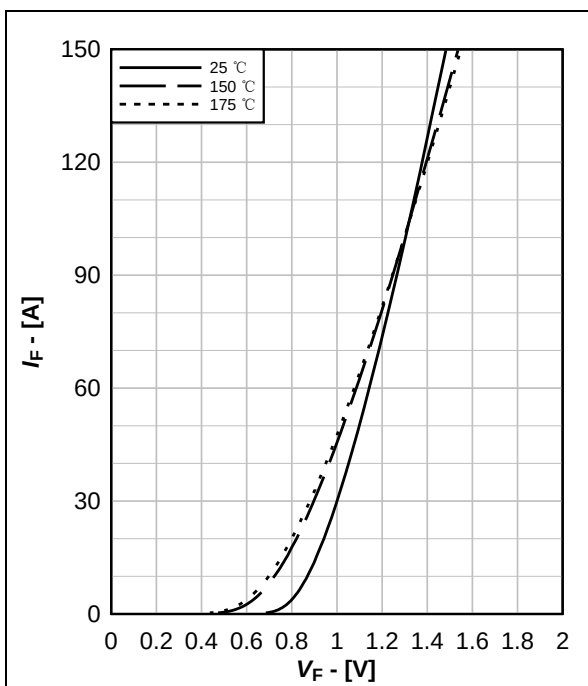
Fig.16 Transient thermal impedance, $Z_{th(j-c)} = f(t_p)$, Inverter

图 17. FRD 输出特性典型曲线, $I_F = f(V_F)$ 整流端

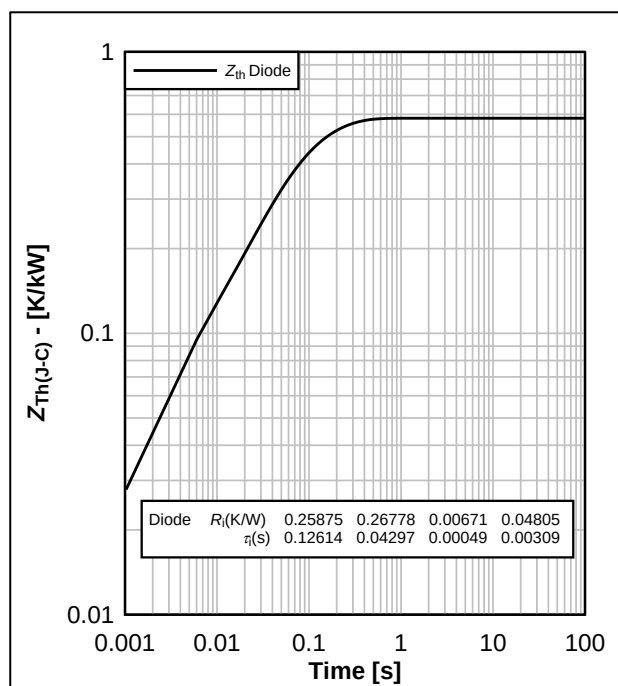
Fig.17 Typical FRD output characteristic, $I_F = f(V_F)$, Rectifier

图 18. 瞬态热阻抗曲线, $Z_{th(j-c)} = f(t_p)$ 整流端

Fig.18 Transient thermal impedance, $Z_{th(j-c)} = f(t_p)$, Rectifier

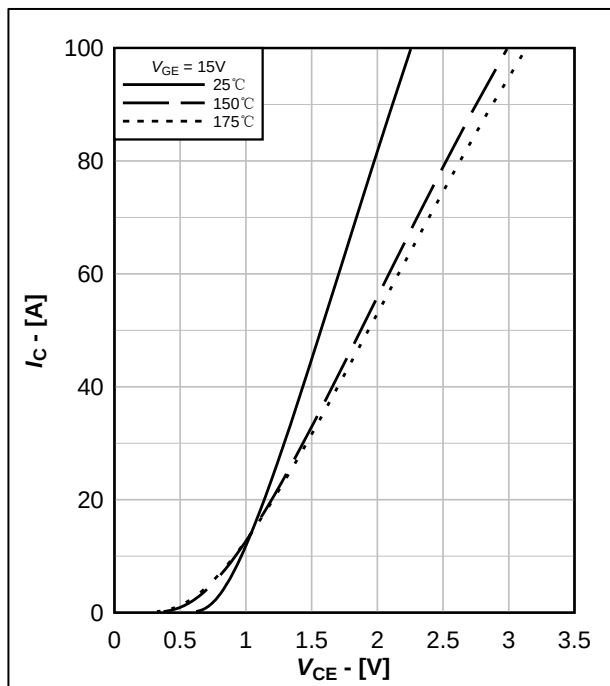


图 19. IGBT 输出特性典型曲线, $I_C = f(V_{CE})$ 斩波

Fig.19 Typical IGBT output characteristic, $I_C = f(V_{CE})$, Brake-Chopper

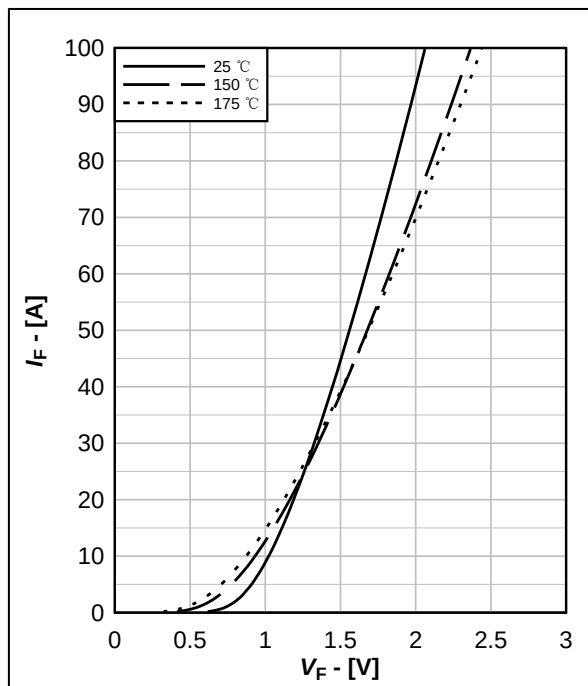


图 20. FRD 输出特性典型曲线, $I_F = f(V_F)$ 斩波

Fig.20 Typical FRD output characteristic, $I_F = f(V_F)$ Brake-Chopper

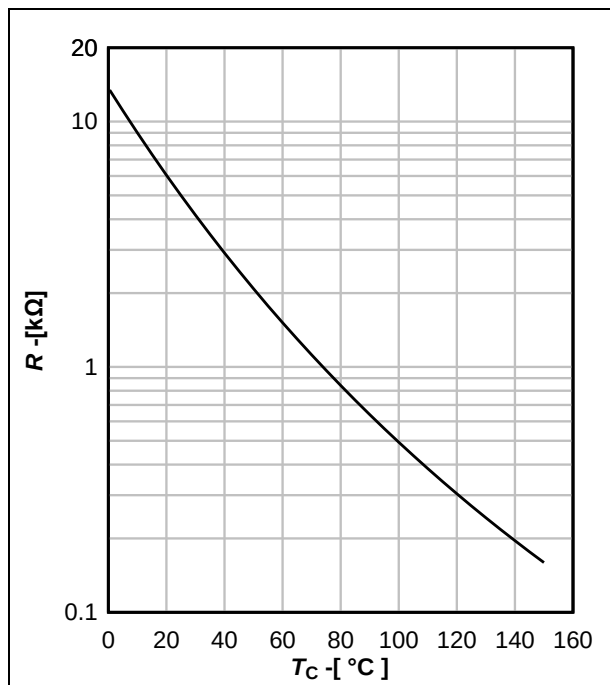
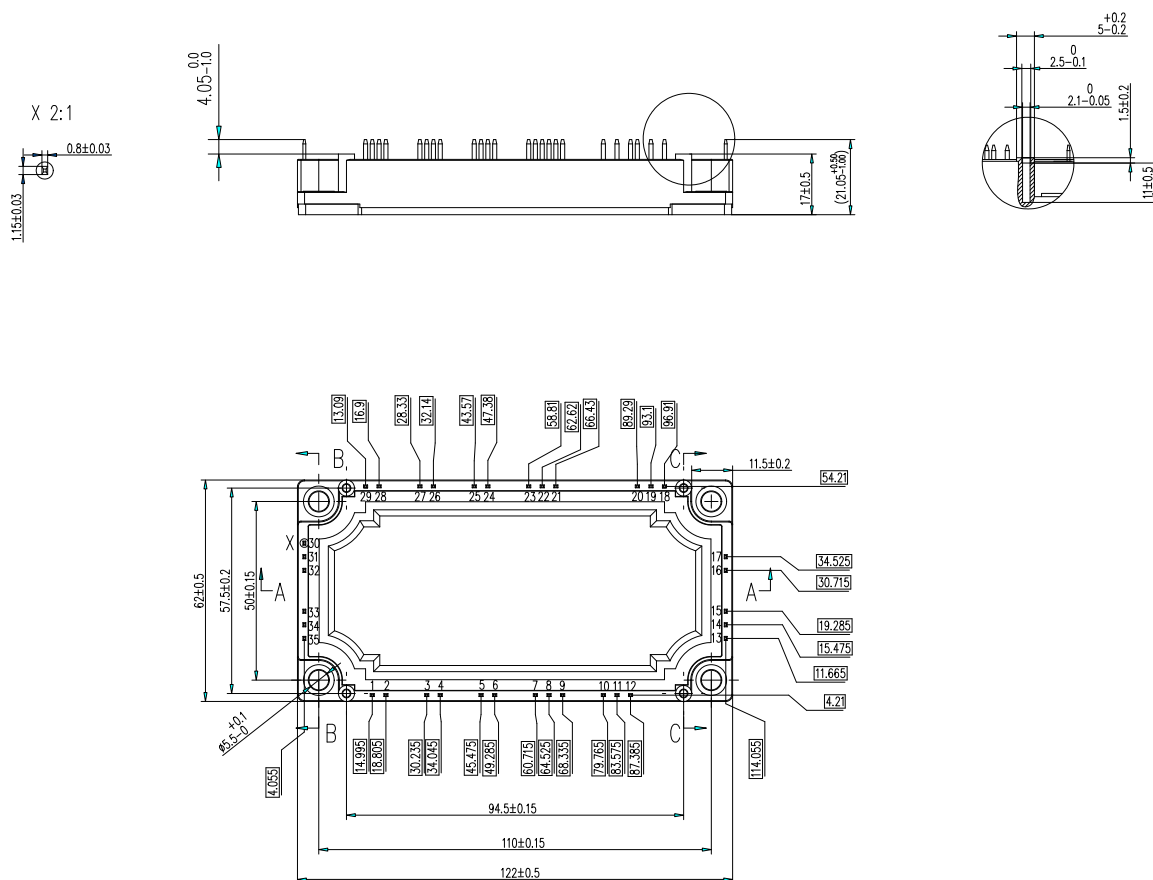


图 21. 热敏电阻典型特性曲线, $R = f(T_C)$

Fig.21 Typical NTC thermistor characteristic, $R = f(T_C)$



重量 Weight: 180g 模块外观类型 Module outline code: M3

图 22. 模块外观尺寸

Fig. 22 Module outlines

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