3-Level IGBT Module

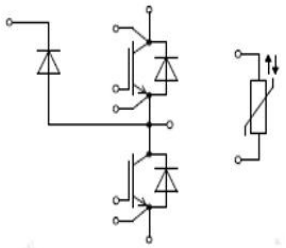
电气特性:

- 1200V 沟槽栅/场终止工艺

  1200V trench gate/field termination process
- 低开关损耗

  Low switching losses
- Vcesat 正温度系数

  Vcesat has a positive temperature coefficient



典型应用:

- 三电平应用

  3-Level-Applications
- 储能

  Energy storage inverter
- APF

  Annual Performance Factor
- UPS

  UPS Systems

V_{CES} =1200V，$I_{C\ nom}$ =300A / I_{CRM} =600A

IGBT，逆变器 / IGBT, Inverter

最大额定值 / Maximum Ratings

Parameter	Conditions	Symbol	Value	Unit
集电极-发射极电压 Collector-Emitter voltage	T_{vj}=25°C	V_{CES}	1200	V
连续集电极直流电流 Continuous DC collector current	T_C=100°C, $T_{vj\ max}$=175°C	$I_{C\ nom}$	300	A
集电极重复峰值电流 Repetitive peak collector current	t_P= 1 ms	I_{CRM}	600	A
总功率损耗 Total power dissipation	T_C = 25°C, $T_{vj\ max}$ = 175°C	P_{tot}	580	W
栅极-发射极电压 Gate emitter voltage		V_{GE}	±20	V

特征值 / Characteristic Values

Parameter	Conditions		Symbol	Value			Unit
				Min.	Typ.	Max.	
集电极-发射极饱和电压 Collector-Emitter saturation voltage	V_{GE}=15V, I_C=300A V_{GE}=15V, I_C=300A V_{GE}=15V, I_C=300A	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	$V_{CE\ sat}$		1.6 1.8 1.9	2.07	V
栅极-发射极阈值电压 Gate-Emitter threshold voltage	I_C=11.5mA, V_{GE}= V_{CE}	T_{vj}=25°C	V_{GEth}	5.4	6.0	6.6	
栅电荷 Gate charge	V_{GE}=-15V...+15V		Q_G		3.14		μC
内部栅极电阻 Internal gate resistor	T_{vj}=25°C		R_{Gint}		0.53		Ω
输入电容 Input capacitance	f=100kHz, V_{CE}=25V, V_{GE}=0 V	T_{vj}=25°C	C_{ies}		47.7		nF
反向传输电容 Reverse transfer capacitance			C_{res}		0.43		
集电极-发射极截止电流 Collector-emitter cut-off current	V_{CE}=1200V , V_{GE}= 0 V	T_{vj}=25°C	I_{CES}			2	mA
栅极-发射极漏电流 Gate-emitter leakage current	V_{CE}=0 V, V_{GE}= 20 V	T_{vj}=25°C	I_{GES}			200	nA
开通延迟时间 Turn-on delay time	I_C=300 A, V_{CE}=600 V V_{GE}=±15 V, R_G=2.5Ω (电感负载) / (inductive load)	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	$t_{d\ on}$		109 111 112		ns
上升时间 Rise time	I_C=300 A, V_{CE}=600 V V_{GE}=±15 V, R_G=2.5Ω (电感负载) / (inductive load)	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	t_r		103 111 112		
关断延迟时间 Turn-off delay time	I_C=300 A, V_{CE}=600 V V_{GE}=±15 V, R_G=2.5Ω (电感负载) / (inductive load)	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	$t_{d\ off}$		362 411 424		
下降时间 Fall time	I_C=300 A, V_{CE}=600 V V_{GE}=±15 V, R_G=2.5Ω (电感负载) / (inductive load)	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	t_f		149 227 251		
开通损耗能量（每脉冲） Turn-on energy loss per pulse	I_C=300A,V_{CE}=600V, V_{GE}=±15V, R_G=2.5Ω, di/dt=2150A/us(Tvj =150℃) (电感负载) / (inductive load)	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	E_{on}		41.05 63.23 69.16		mJ
关断损耗能量（每脉冲） Turn-off energy loss per pulse	I_C=300A,V_{CE}=600V, V_{GE}=±15V, R_G=2.5Ω, du/dt=4330V/us(Tvj =150℃) (电感负载) / (inductive load)	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	E_{off}		22.53 28.57 31.73		mJ
短路数据 SC data	V_{GE}≤15V, Vcc=800V V_{CEmax}=V_{CES}-L_{sCE}·di/dt	t_P≤10us, T_{vj}=150°C	I_{SC}		1300		A
结-外壳热阻 Thermal resistance, junction to case	每个 IGBT / per IGBT		R_{thJC}			0.26	K/W
在开关状态下温度 Temperature under switching conditions			Tvj op	-40		150	°C

二极管，逆变&三电平 / Diode, Inverter&3-Level

最大额定值 / Maximum Ratings

Parameter	Conditions	Symbol	Value	Unit
反向重复峰值电压 Repetitive peak reverse voltage	T_{vj}=25°C	V_{RRM}	1200	V
连续正向直流电流 Continuous DC forward current		I_F	300	A
正向重复峰值电流 Repetitive peak forward current	t_p=1ms	I_{FRM}	600	A
I2t-值 I2t-value	V_R =0V, tp=10ms, Tvj=125°C	I2t	29000	A

特征值 / Characteristic Values

Parameter	Conditions		Symbol	Value			Unit
				Min.	Typ.	Max.	
正向电压 Forward voltage	I_F=300A, V_{GE}=0V I_F=300A, V_{GE}=0V I_F=300A, V_{GE}=0V	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	V_F		1.98 1.69 1.61	2.40	V
反向恢复峰值电流 Peak reverse recovery current	I_F=300A,V_R=600V, V_{GE}=-15V, R_G=2.5Ω, -diF/dt=1640 A/us(Tvj=150℃)	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	I_{RM}		93 159 184		A
恢复电荷 Recovered charge	I_F=300A,V_R=600V, V_{GE}=-15V, R_G=2.5Ω, -diF/dt=1640A/us(Tvj=150℃)	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	Q_r		18.25 48.94 60.29		μC
反向恢复损耗（每脉冲） Reverse recovered energy	I_F=300A,V_R=600V, V_{GE}=-15V, R_G=2.5Ω, -diF/dt=1640A/us(Tvj=150℃)	T_{vj}=25°C T_{vj}=125°C T_{vj}=150°C	E_{rec}		7.09 15.12 19.97		mJ
结-外壳热阻 Thermal resistance, junction to case	每个二极管 / per diode		R_{thJC}			0.33	K/W
在开关状态下温度 Temperature under switching conditions			$T_{vj\ op}$	-40		150	°C

负温度系数热敏电阻 / NTC-Thermistor

特征值 / Characteristic Values

Parameter	Conditions	Symbol	Value			Unit
			Min.	Typ.	Max.	
额定电阻值 Rated resistances	T_c=25°C，±5%	R_{25}		5.0		KΩ
B-值 B-value	±2%	$B_{25/50}$		3375		K

模块 / Module

Parameter	Conditions	Symbol	Value			Unit
绝缘测试电压 Isolation test voltage	RMS, f=50Hz, t=1min	V_{ISOL}		2500		V
内部绝缘 Internal isolation				Al_2O_3		
储存温度 Storage temperature		T_{stg}	-40		125	°C
模块安装的扭矩 Mounting torque for modul mounting		M	3.0		6.0	Nm
端子联接扭距 Terminal connection torque		M	3.0		6.0	Nm
重量 Weight		W		340		g

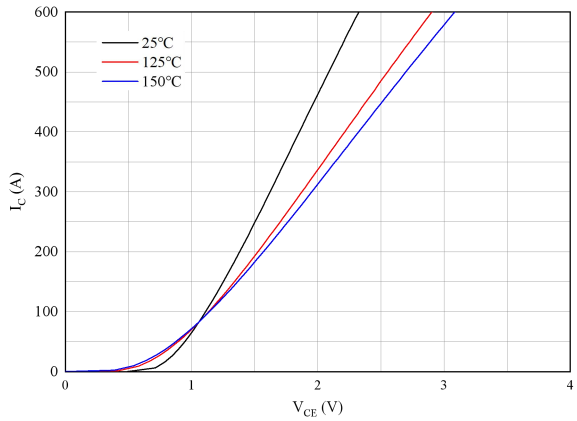


图 1. 典型输出特性 (V_{GE}=15V)

Figure 1. Typical output characteristics (V_{GE}=15V)

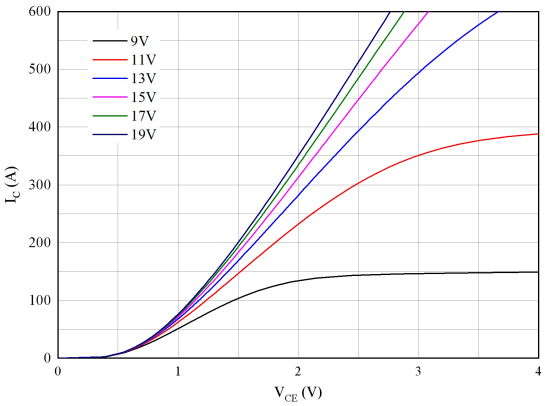


图 2. 典型输出特性 (T_{vj}=150℃)

Figure 2. Typical output characteristics (T_{vj}=150℃)

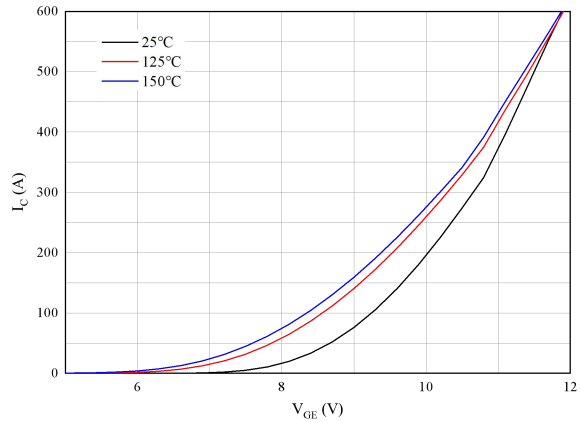


图 3. 典型传输特性 (V_{CE}=20V)

Figure 3. Typical transfer characteristic(V_{CE}=20V)

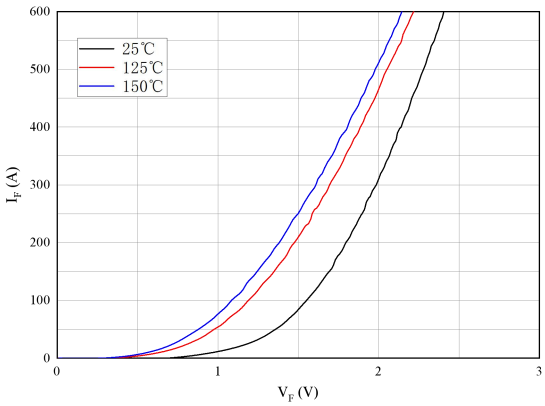
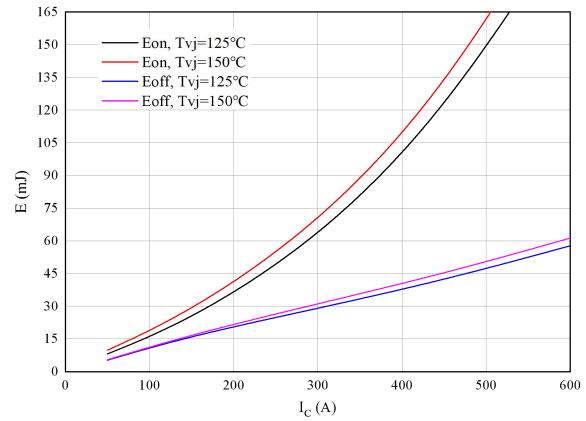


图 4. 正向偏压特性 二极管

Figure 4. Forward characteristic of Diode



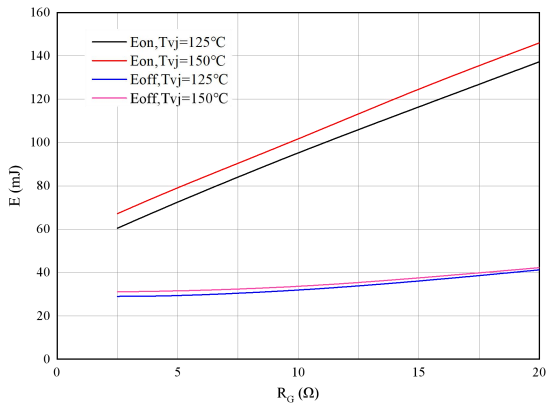


图 5. 开关损耗 逆变器

Figure 5. Switching losses of IGBT

V_{GE}=±15V, RGon=2.5Ω, RGoff=2.5Ω, V_{CE}=600V

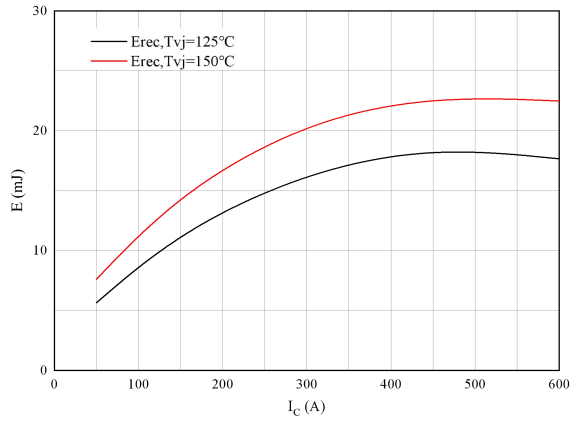


图 6. 开关损耗 逆变器

Figure 6. Switching losses of IGBT

V_{GE}=±15V, I_C=300A , V_{CE}=600V

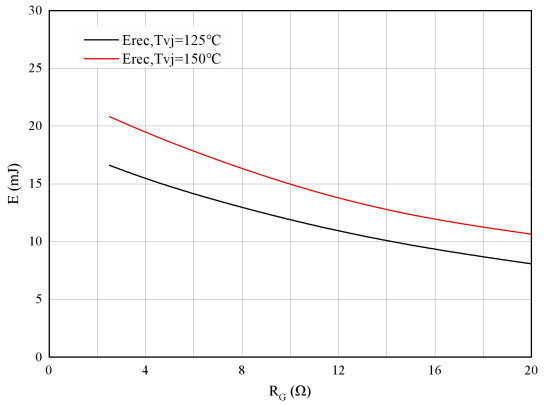


图 7. 开关损耗 二极管

Figure 7. Switching losses of Diode

RGon=2.5Ω, V_{CE}=600V

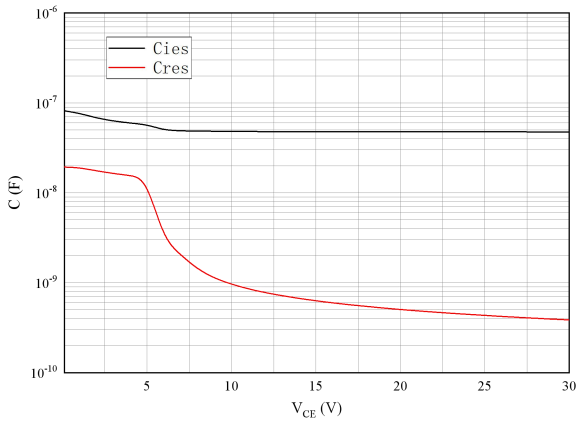


图 8. 开关损耗 二极管

Figure 8. Switching losses of Diode

I_C=300A, V_{CE}=600V

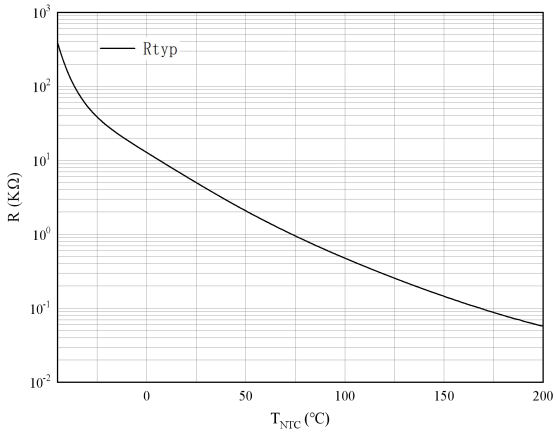


图 9. 电容特性

Figure 9. Capacitance characteristic

图 10. 负温系数热敏电阻 温度特性

Figure10. NTC-Thermistor-temperaturecharacteristic

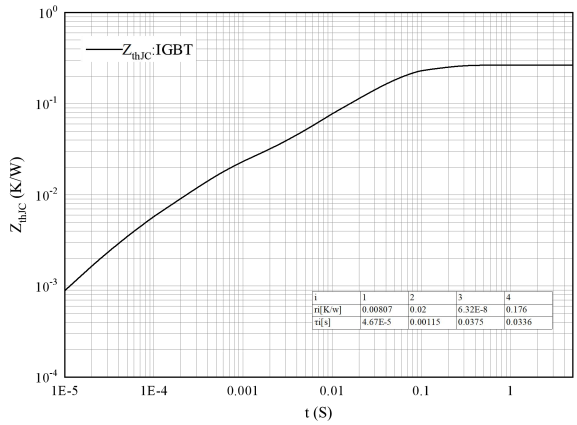


图 11. 瞬态热阻抗 IGBT 逆变器

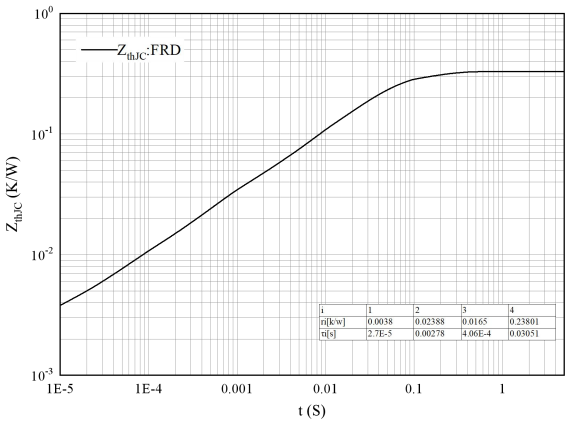
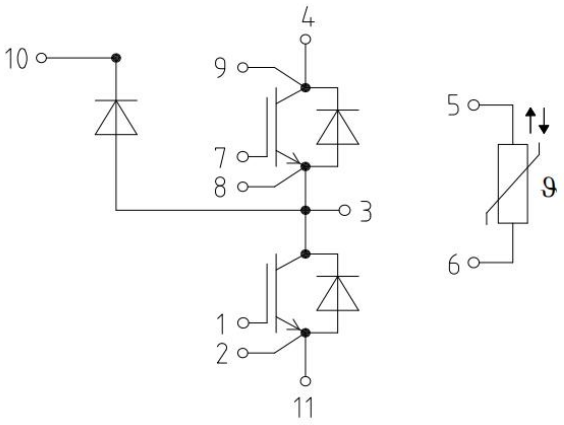


图 12. 瞬态热阻抗 FRD 逆变器

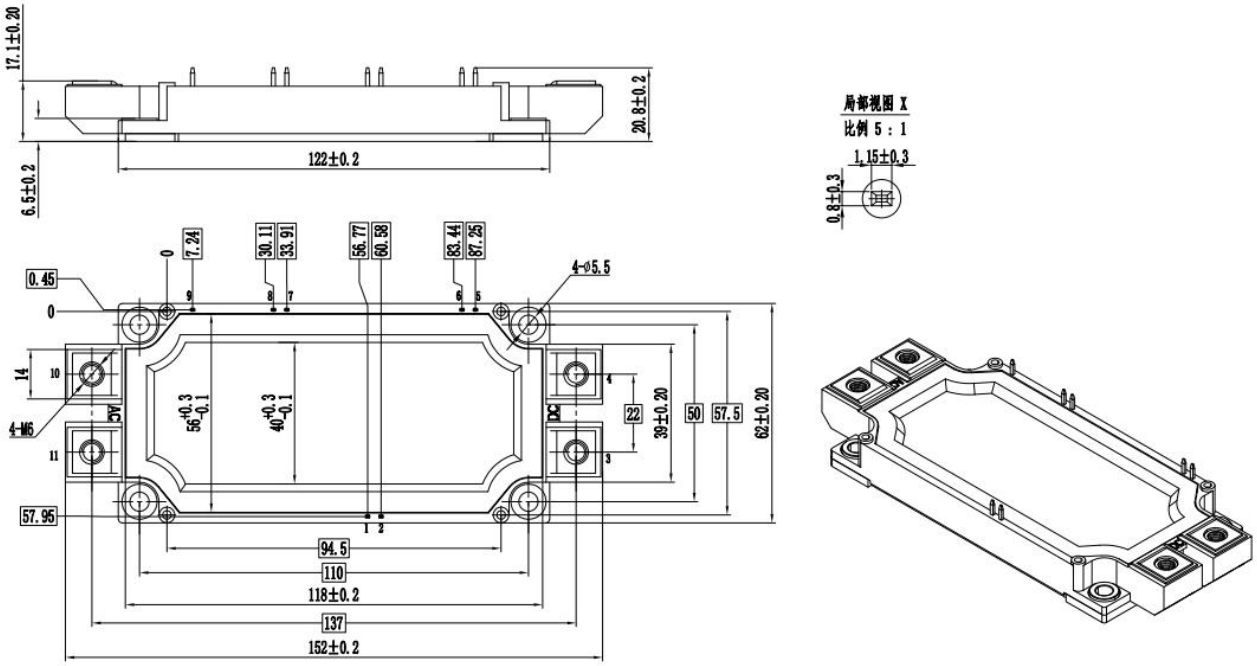
Figure11. Transient thermal impedance IGBT,Inverter $Z_{thJC}=f(t)$

Figure12. Transient thermal impedance FRD ,Inverter $Z_{thJC}=f(t)$

接线图 / Circuit diagram



封装尺寸 / Package outlines


17.1±0.20
20.8±0.2
122±0.2
6.5±0.2
局部视图 X
比例 5 : 1
1.15±0.3
0.8±0.3
0.45
0
7.24
30.11
33.91
56.77
60.58
83.44
87.25
4-φ5.5
14
4-M6
57.95
94.5
110
118±0.2
137
152±0.2
22
39±0.20
50
57.5
62±0.20