

1. Product Features

1.1 Electrical features

- $V_{CES}=1200V$
- $I_{C\ nom}=150A / I_{CRM}=300A$
- Low switching losses
- Low inductance
- Fast switching and short tail current
- Integrated NTC temperature sensor
- High power and thermal cycling capability

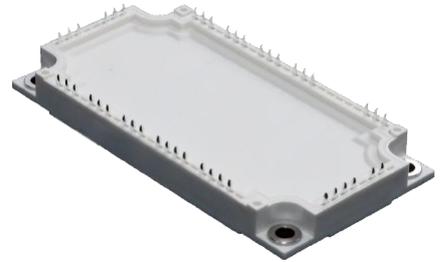


Figure 1 IGBT Module

1.2 Mechanical features

- Al_2O_3 substrate with low thermal resistance
- Copper base plate

2. Typical Applications

- Switching mode power supply
- Drive inverters with brake system
- Uninterruptible power supply
- AC and DC servo drive amplifier

3. Description

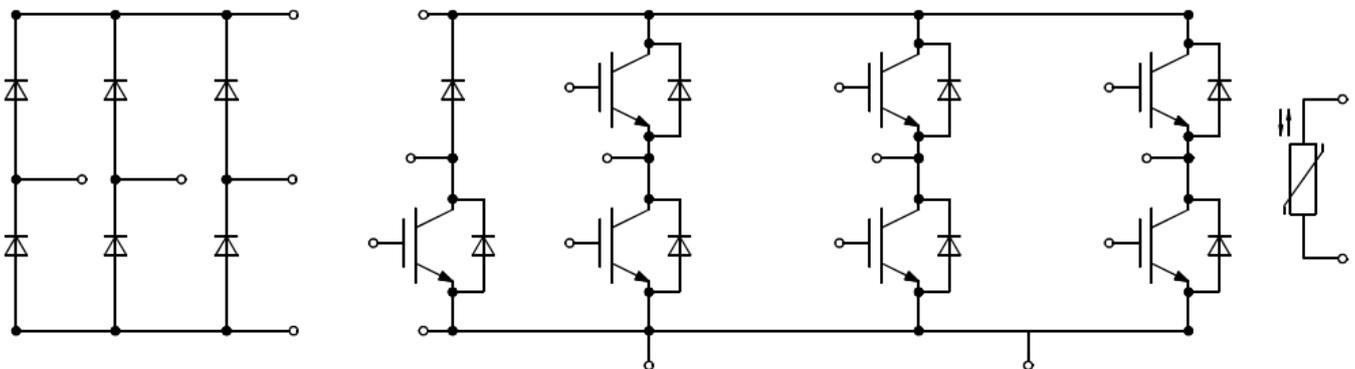


Figure 2 3 Phase Bridge +Rectifier+Brake

4. IGBT, Inverter

4.1 Maximum Rated Values

Parameter	Note or test condition	Symbol	Values	Unit
Collector-emitter voltage 集电极—发射极间电压	$T_{vj} = 25^{\circ}\text{C}$	V_{CES}	1200	V
Continuous DC collector current 连续集电极电流	$T_C = 85^{\circ}\text{C}, T_{vj} \text{ max} = 150^{\circ}\text{C}$	$I_{C \text{ nom}}$	150	A
Repetitive peak collector current 集电极峰值电流	$t_P = 1 \text{ ms}$	I_{CRM}	300	A
Total power dissipation 总功率损耗	$T_C = 25^{\circ}\text{C}, T_{vj} \text{ max} = 175^{\circ}\text{C}$	P_{tot}	566	W
Gate-emitter peak voltage 栅极—发射极峰值电压		V_{GES}	+/- 20	V

4.2 Characteristic value

Parameter	Note or test condition	Symbol	Values			Unit
			Min.	Typ.	Max.	
Collector-emitter saturation voltage 集电极—发射极饱和电压	$I_C = 150 \text{ A}, V_{GE} = 15 \text{ V}$	$V_{CE, \text{sat}}$		$T_{vj} = 25^{\circ}\text{C}$	1.45	V
				$T_{vj} = 125^{\circ}\text{C}$	1.59	V
				$T_{vj} = 150^{\circ}\text{C}$	1.63	V
Gate threshold voltage 栅极阈值电压	$I_C = 2.8 \text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$	$V_{GE, \text{th}}$	5.0	6.0	6.5	V
Gate charge 栅极电荷	$V_{GE} = -15 \text{ V} \dots +15 \text{ V}$	Q_G		1.73		μC
Internal gate resistor 内部栅极电阻	$T_{vj} = 25^{\circ}\text{C}$	$R_{G \text{ int}}$		2.10		Ω
Input capacitance 输入电容	$f = 1 \text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25 \text{ V}, V_{GE} = 0 \text{ V}$	C_{ies}		21.6		nF
Reverse transfer capacitance 反向传输电容	$f = 1 \text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25 \text{ V}, V_{GE} = 0 \text{ V}$	C_{res}		0.17		nF
Collector-emitter cut-off current 集电极-发射极截止电流	$V_{CE} = 1200 \text{ V}, V_{GE} = 0 \text{ V}, T_{vj} = 25^{\circ}\text{C}$	I_{CES}			1	mA
Gate-emitter leakage current 栅极-发射极漏电流	$V_{CE} = 0 \text{ V}, V_{GE} = 20 \text{ V}, T_{vj} = 25^{\circ}\text{C}$	I_{GES}			100	nA
Turn-on delay time, inductive load 开通延迟时间	$I_C = 150 \text{ A}, V_{CE} = 600 \text{ V}$ $V_{GE} = +15/-15 \text{ V}$ $R_{G, \text{on}} = 2.2 \Omega$	$t_{d, \text{on}}$		$T_{vj} = 25^{\circ}\text{C}$	0.15	μs
				$T_{vj} = 125^{\circ}\text{C}$	0.17	μs
				$T_{vj} = 150^{\circ}\text{C}$	0.17	μs
Rise time, inductive load 上升时间	$I_C = 150 \text{ A}, V_{CE} = 600 \text{ V}$ $V_{GE} = +15/-15 \text{ V}$ $R_{G, \text{on}} = 2.2 \Omega$	t_r		$T_{vj} = 25^{\circ}\text{C}$	0.05	μs
				$T_{vj} = 125^{\circ}\text{C}$	0.05	μs
				$T_{vj} = 150^{\circ}\text{C}$	0.06	μs

(table continues...) 待续

Parameter	Note or test condition	Symbol	Values			Unit	
			Min.	Typ.	Max.		
Turn-off delay time, inductive load 关断延迟时间	$I_C = 150A, V_{CE} = 600V$ $V_{GE} = +15/-15V$ $R_{G,on} = 2.2\Omega$	$T_{vj} = 25^\circ C$ $T_{vj} = 125^\circ C$ $T_{vj} = 150^\circ C$	$t_{d,off}$		0.07		us
					0.34		us
					0.35		us
Fall time, inductive load 下降时间	$I_C = 150A, V_{CE} = 600V$ $V_{GE} = +15/-15V$ $R_{G,on} = 2.2\Omega$	$T_{vj} = 25^\circ C$ $T_{vj} = 125^\circ C$ $T_{vj} = 150^\circ C$	t_f		0.20		us
					0.26		us
					0.26		us
Turn-on energy loss per pulse 开通损耗能量	$I_C = 150A, V_{CE} = 600V, L_s = 30nH$ $V_{GE} = +15/-15V, di/dt = 2180A/\mu s$ $R_{G,on} = 2.2\Omega (T_{vj} = 150^\circ C)$	$T_{vj} = 25^\circ C$ $T_{vj} = 125^\circ C$ $T_{vj} = 150^\circ C$	E_{on}		7.66		mJ
					15.1		mJ
					17.6		mJ
Turn-off energy loss per pulse 关断损耗能量	$I_C = 150A, V_{CE} = 600V, L_s = 30nH$ $V_{GE} = +15/-15V, dv/dt = 5020V/\mu s$ $R_{G,off} = 2.2\Omega (T_{vj} = 150^\circ C)$	$T_{vj} = 25^\circ C$ $T_{vj} = 125^\circ C$ $T_{vj} = 150^\circ C$	E_{off}		9.70		mJ
					14.1		mJ
					14.3		mJ
SC data 短路数据	$V_{GE} \leq 15V, V_{CC} = 600V, t_P \leq 8\mu s, T_{vj} = 150^\circ C,$ $C_{GE} = 0.0\mu F, V_{CEmax} = V_{CES} - L_{SCE} \cdot di/dt$	I_{sc}		1070		A	
Thermal resistance, junction to case 结-外壳热阻	Per IGBT	$R_{th,jc}$			0.23	K/W	

5. Diode, Inverter

5.1 Maximum Rated Values

Parameter	Note or test condition	Symbol	Values	Unit
Repetitive peak reverse voltage 反向重复峰值电压	$T_{vj} = 25^\circ C$	V_{RRM}	1200	V
Continuous DC forward current 连续正向直流电流		I_F	150	A
Repetitive peak forward current 正向重复峰值电流	$t_P = 1ms$	I_{FRM}	300	A

5.2 Characteristic value

Parameter	Note or test condition	Symbol	Values			Unit
			Min.	Typ.	Max.	
Forward voltage 正向电压	$I_F = 150A, V_{GE} = 0V$	V_F		2.00		V
				1.64		V
				1.56		V

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Parameter	Note or test condition	Symbol	Values			Unit
			Min.	Typ.	Max.	
Peak reverse recovery current 反向恢复峰值电流	$I_F = 150A, V_R = 600V$ $V_{GE} = -15V, -di_F/dt = 2640 A/\mu s$ $R_{G,off} = 2.2\Omega (T_{vj} = 150^\circ C)$	$T_{vj} = 25^\circ C$ $T_{vj} = 125^\circ C$ $T_{vj} = 150^\circ C$	I_{RM}		170	A
					235	A
					249	A
Recovered charge 恢复电荷	$I_F = 150A, V_R = 600V$ $V_{GE} = -15V, -di_F/dt = 2640 A/\mu s$ $R_{G,off} = 2.2\Omega (T_{vj} = 150^\circ C)$	$T_{vj} = 25^\circ C$ $T_{vj} = 125^\circ C$ $T_{vj} = 150^\circ C$	Q_r		12.0	μC
					27.7	μC
					33.1	μC
Reverse recovery energy 反向恢复损耗 (每脉冲)	$I_F = 150A, V_R = 600V$ $V_{GE} = -15V, -di_F/dt = 2640 A/\mu s$ $R_{G,off} = 2.2\Omega (T_{vj} = 150^\circ C)$	$T_{vj} = 25^\circ C$ $T_{vj} = 125^\circ C$ $T_{vj} = 150^\circ C$	E_{rec}		2.97	mJ
					8.13	mJ
					10.1	mJ
Thermal resistance, junction to case 结-外壳热阻	Per diode	$R_{th,JC}$			0.31	K/W

6. Diode, Rectifier

6.1 Maximum Rated Values

Parameter	Note or test condition	Symbol	Values	Unit
Repetitive peak reverse voltage 反向重复峰值电压	$T_{vj} = 25^\circ C$	V_{RRM}	1600	V
Average Rectified Output current 整流器输出均方根电流	$V_F = 1.2, T_{vj} = 150^\circ C$	I_F	150	A
Surge forward current 正向浪涌电流	$t_p = 10 ms, T_{vj} = 150^\circ C$	I_{FSM}	1120	A
I^2t - value I^2t -值	$t_p = 10 ms, T_{vj} = 150^\circ C$	I^2t	6272	A^2s

6.2 Characteristic value

Parameter	Note or test condition	Symbol	Values			Unit
			Min.	Typ.	Max.	
Forward voltage 正向电压	$T_{vj} = 150^\circ C, I_F = 150 A$	V_F		1.0		V
Reverse current 反向电流	$T_{vj} = 150^\circ C, V_R = 1600 V$	I_R		1		mA
Thermal resistance, junction to case 结-外壳热阻	Per diode	$R_{th,JC}$			0.29	K/W

7. IGBT, Brake-Chopper

7.1 Maximum Rated Values

Parameter	Note or test condition	Symbol	Values	Unit
Collector-emitter voltage 集电极—发射极间电压	$T_{vj} = 25^{\circ}\text{C}$	V_{CES}	1200	V
Continuous DC collector current 连续集电极电流	$T_C = 85^{\circ}\text{C}, T_{vj} \text{ max} = 150^{\circ}\text{C}$	$I_{C \text{ nom}}$	100	A
Repetitive peak collector current 集电极峰值电流	$t_P = 1 \text{ ms}$	I_{CRM}	150	A
Total power dissipation 总功率损耗	$T_C = 25^{\circ}\text{C}, T_{vj} \text{ max} = 175^{\circ}\text{C}$	P_{tot}	517	W
Gate-emitter peak voltage 栅极—发射极峰值电压		V_{GES}	+/- 20	V

7.2 Characteristic value

Parameter	Note or test condition	Symbol	Values			Unit
			Min.	Typ.	Max.	
Collector-emitter saturation voltage 集电极—发射极饱和电压	$I_C = 100 \text{ A}, V_{GE} = 15 \text{ V}$	$V_{CE, \text{sat}}$		$T_{vj} = 25^{\circ}\text{C}$	1.84	V
				$T_{vj} = 125^{\circ}\text{C}$	2.07	V
				$T_{vj} = 150^{\circ}\text{C}$	2.14	V
Gate threshold voltage 栅极阈值电压	$I_C = 2.8 \text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$	$V_{GE, \text{th}}$	5.0	5.8	6.5	V
Gate charge 栅极电荷	$V_{GE} = -15 \text{ V} \dots +15 \text{ V}$	Q_G		0.98		μC
Internal gate resistor 内部栅极电阻	$T_{vj} = 25^{\circ}\text{C}$	$R_{G \text{ int}}$		3.00		Ω
Input capacitance 输入电容	$f=1 \text{ MHz}, T_{vj}=25^{\circ}\text{C}, V_{CE}=25 \text{ V}, V_{GE}=0 \text{ V}$	C_{ies}		27.6		nF
Reverse transfer capacitance 反向传输电容	$f=1 \text{ MHz}, T_{vj}=25^{\circ}\text{C}, V_{CE}=25 \text{ V}, V_{GE}=0 \text{ V}$	C_{res}		0.22		nF
Collector-emitter cut-off current 集电极-发射极截止电流	$V_{CE} = 1200 \text{ V}, V_{GE} = 0 \text{ V}, T_{vj} = 25^{\circ}\text{C}$	I_{CES}			1	mA
Gate-emitter leakage current 栅极-发射极漏电流	$V_{CE} = 0 \text{ V}, V_{GE} = 20 \text{ V}, T_{vj} = 25^{\circ}\text{C}$	I_{GES}			100	nA
Turn-on delay time, inductive load 开通延迟时间	$I_C = 100 \text{ A}, V_{CE} = 600 \text{ V}$ $V_{GE} = +15/-15 \text{ V}$ $R_{G, \text{on}} = 6.8 \Omega$	$T_{d, \text{on}}$		$T_{vj} = 25^{\circ}\text{C}$	0.16	μs
				$T_{vj} = 125^{\circ}\text{C}$	0.18	μs
				$T_{vj} = 150^{\circ}\text{C}$	0.21	μs
Rise time, inductive load 上升时间	$I_C = 100 \text{ A}, V_{CE} = 600 \text{ V}$ $V_{GE} = +15/-15 \text{ V}$ $R_{G, \text{on}} = 6.8 \Omega$	T_r		$T_{vj} = 25^{\circ}\text{C}$	0.05	μs
				$T_{vj} = 125^{\circ}\text{C}$	0.06	μs
				$T_{vj} = 150^{\circ}\text{C}$	0.08	μs

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Parameter	Note or test condition	Symbol	Values			Unit	
			Min.	Typ.	Max.		
Turn-off delay time, inductive load 关断延迟时间	$I_C = 100A, V_{CE} = 600V$ $V_{GE} = +15/-15V$ $R_{G,on} = 6.8\Omega$	$T_{vj} = 25^\circ C$ $T_{vj} = 125^\circ C$ $T_{vj} = 150^\circ C$	$T_{d,off}$		0.32		us
					0.34		us
					0.35		us
Fall time, inductive load 下降时间	$I_C = 100A, V_{CE} = 600V$ $V_{GE} = +15/-15V$ $R_{G,on} = 6.8\Omega$	$T_{vj} = 25^\circ C$ $T_{vj} = 125^\circ C$ $T_{vj} = 150^\circ C$	T_f		0.12		us
					0.12		us
					0.12		us
Turn-on energy loss per pulse 开通损耗能量	$I_C = 100A, V_{CE} = 600V, L_s = 30nH$ $V_{GE} = +15/-15V, di/dt = 1300A/\mu s$ $R_{G,on} = 6.8\Omega (T_{vj} = 150^\circ C)$	$T_{vj} = 25^\circ C$ $T_{vj} = 125^\circ C$ $T_{vj} = 150^\circ C$	E_{on}		8.81		mJ
					14.1		mJ
					18.4		mJ
Turn-off energy loss per pulse 关断损耗能量	$I_C = 100A, V_{CE} = 600V, L_s = 30nH$ $V_{GE} = +15/-15V, dv/dt = 5900V/\mu s$ $R_{G,off} = 6.8\Omega (T_{vj} = 150^\circ C)$	$T_{vj} = 25^\circ C$ $T_{vj} = 125^\circ C$ $T_{vj} = 150^\circ C$	E_{off}		9.36		mJ
					9.00		mJ
					10.3		mJ
SC data 短路数据	$V_{GE} \leq 15V, V_{CC} = 600V, t_P \leq 8 \mu s, T_{vj} = 150^\circ C,$ $C_{GE} = 0.0\mu F, V_{CEmax} = V_{CES} - L_{SCE} \cdot di/dt$	I_{sc}		810		A	
Thermal resistance, junction to case 结-外壳热阻	Per IGBT	$R_{th,jc}$			0.29	K/W	

8. Diode, Brake-Chopper

8.1 Maximum Rated Values

Parameter	Note or test condition	Symbol	Values	Unit
Repetitive peak reverse voltage 反向重复峰值电压	$T_{vj} = 25^\circ C$	V_{RRM}	1200	V
Continuous DC forward current 连续正向直流电流		I_F	75	A
Repetitive peak forward current 正向重复峰值电流	$t_P = 1 ms$	I_{FRM}	150	A

8.2 Characteristic value

Parameter	Note or test condition	Symbol	Values			Unit
			Min.	Typ.	Max.	
Forward voltage 正向电压	$I_F = 100 A, V_{GE} = 0 V$	V_F		1.70		V
				1.67		V
				1.59		V

(table continues...) 待续

Parameter	Note or test condition	Symbol	Values			Unit
			Min.	Typ.	Max.	
Peak reverse recovery current 反向恢复峰值电流	$I_F = 100A, V_R = 600V$	$T_{vj} = 25^\circ C$		81.9		A
	$V_{GE} = -15V, -di_F/dt = 914 A/\mu s$	$T_{vj} = 125^\circ C$	I_{RM}	113		A
	$R_{G,off} = 6.8\Omega (T_{vj} = 150^\circ C)$	$T_{vj} = 150^\circ C$		118		A
Recovered charge 恢复电荷	$I_F = 100A, V_R = 600V$	$T_{vj} = 25^\circ C$			7.97	
	$V_{GE} = -15V, -di_F/dt = 914 A/\mu s$	$T_{vj} = 125^\circ C$	Q_r	21.0		μC
	$R_{G,off} = 6.8\Omega (T_{vj} = 150^\circ C)$	$T_{vj} = 150^\circ C$		25.1		μC
Reverse recovery energy 反向恢复损耗 (每脉冲)	$I_F = 100A, V_R = 600V$	$T_{vj} = 25^\circ C$			1.13	
	$V_{GE} = -15V, -di_F/dt = 914 A/\mu s$	$T_{vj} = 125^\circ C$	E_{rec}	4.71		mJ
	$R_{G,off} = 6.8\Omega (T_{vj} = 150^\circ C)$	$T_{vj} = 150^\circ C$		6.20		mJ
Thermal resistance, junction to case 结-外壳热阻	Per diode	$R_{th,jc}$				0.38

9. NTC-Thermistor

9.1 Characteristic value

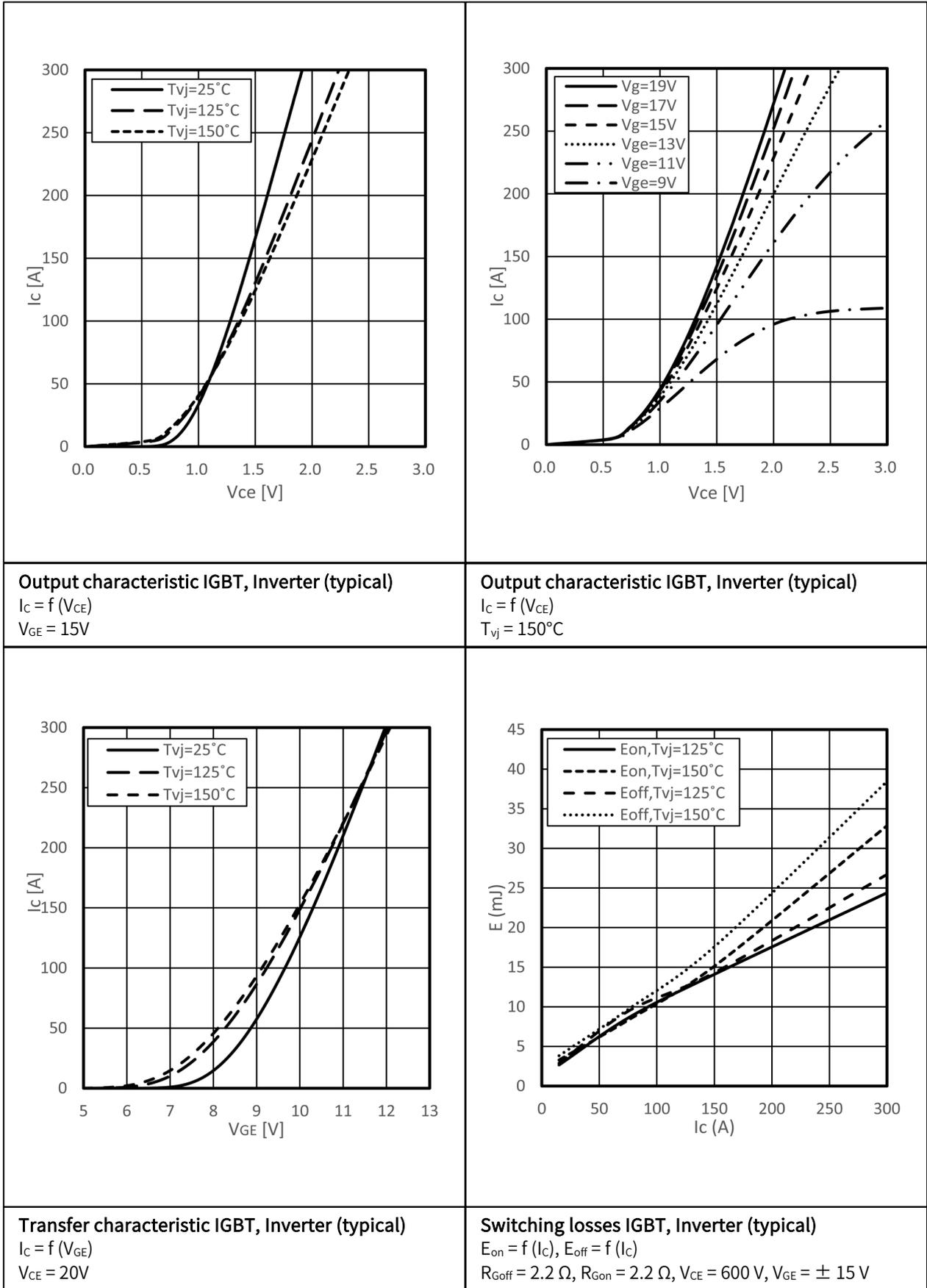
Parameter	Note or test condition	Symbol	Values			Unit
			Min.	Typ.	Max.	
Rated resistance 额定电阻值	$T_c = 25^\circ C$	R_{25}		5.00		$K\Omega$
Power dissipation 耗散功耗	$T_c = 25^\circ C$	P_{25}			20	mW
B-value B-Z 值	$R_2 = R_{25} \exp[B_{25/50}(1/T_2 - 1/(298, 15K))]$	B_{25}/B_{50}		3400		K
B-value B-Z 值	$R_2 = R_{25} \exp[B_{25/75}(1/T_2 - 1/(298, 15K))]$	B_{25}/B_{75}		3430		K
B-value B-Z 值	$R_2 = R_{25} \exp[B_{25/100}(1/T_2 - 1/(298, 15K))]$	B_{25}/B_{100}		3445		K

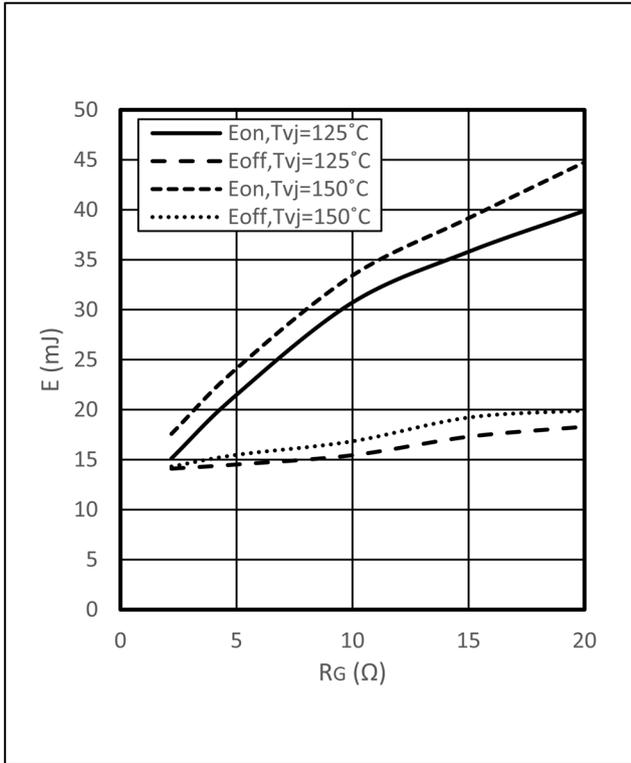
10. Module

10.1 Characteristic value

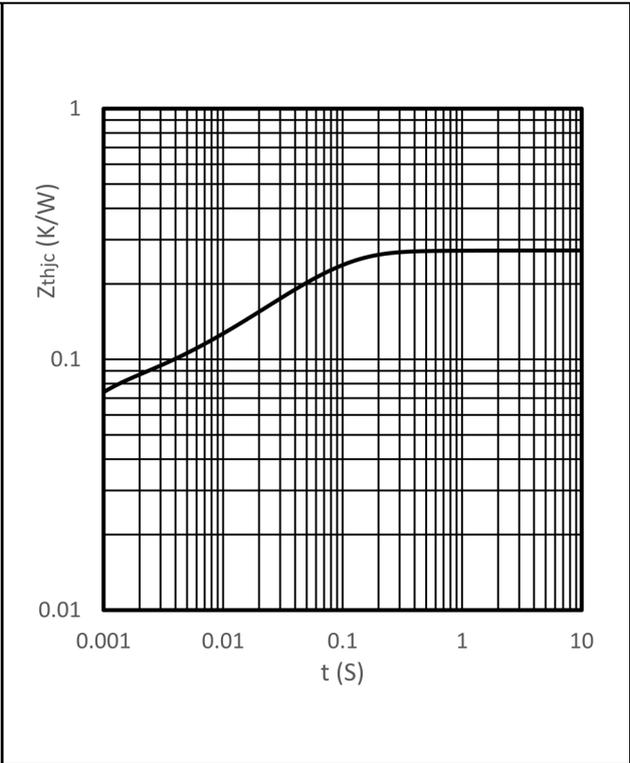
Parameter	Note or test condition	Symbol	Values			Unit
			Min.	Typ.	Max.	
Isolation Voltage 隔离电压	RMS, f=50HZ,1min	V _{ISOL}			2500	V
Stray inductance module 杂散电感		L _{SCE}		25		nH
Operation Junction Temperature 结温		T _{JOP}	-40		150	°C
Storage Temperature Range 存储温度范围		T _{stg}	-40		125	°C
Mounting Torque 安装扭矩	Screw M5	M	3		6	N.m
Weight of Module 重量		G		300		g

11. Characteristics diagrams

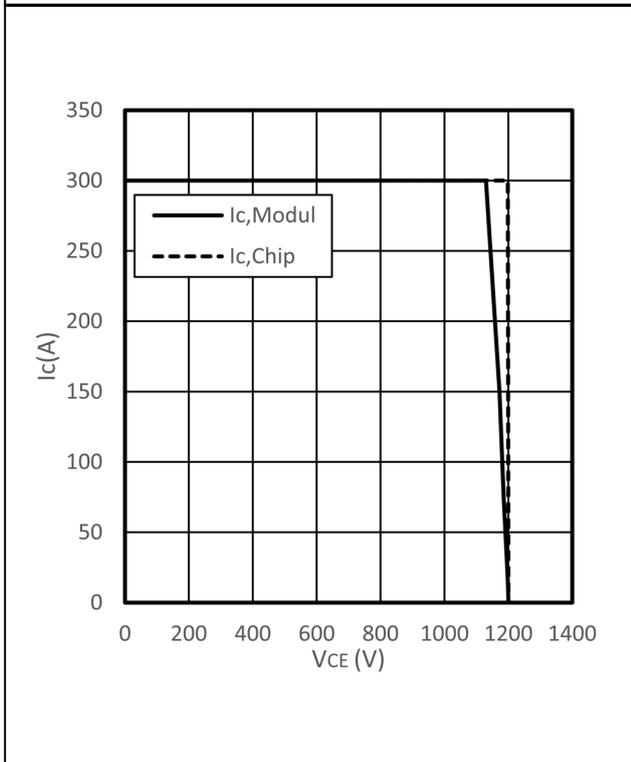




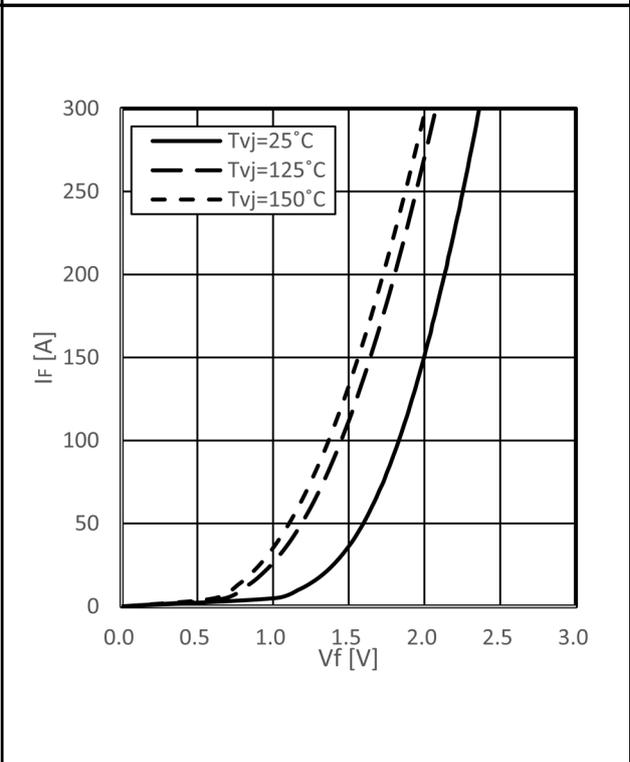
Switching losses IGBT, Inverter (typical)
 $E_{on} = f(R_G)$, $E_{off} = f(R_G)$
 $I_C = 150\text{ A}$, $V_{CE} = 600\text{ V}$, $V_{GE} = \pm 15\text{ V}$



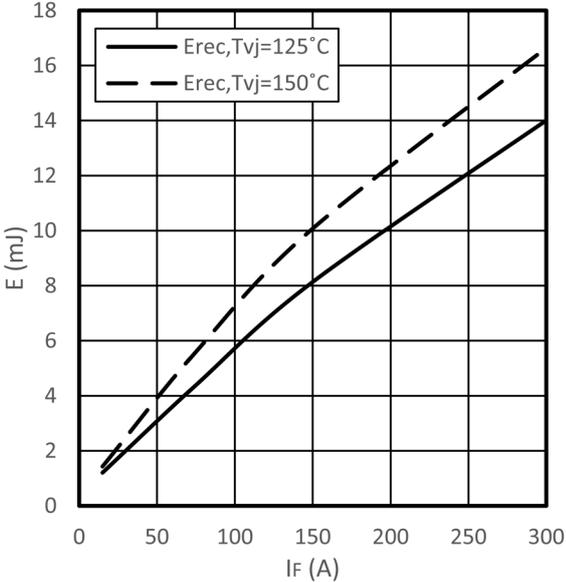
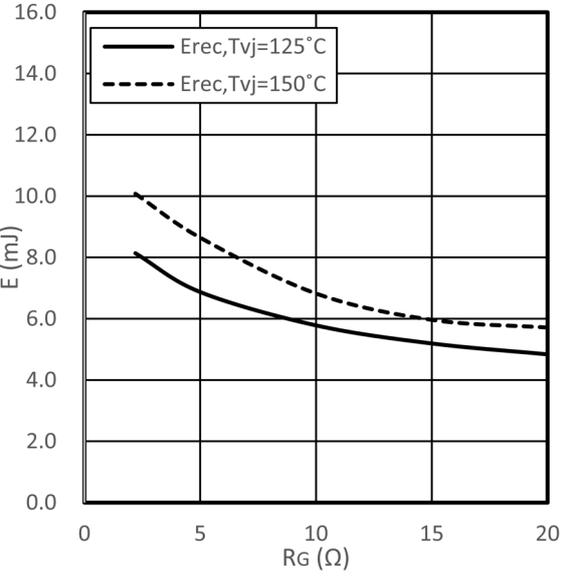
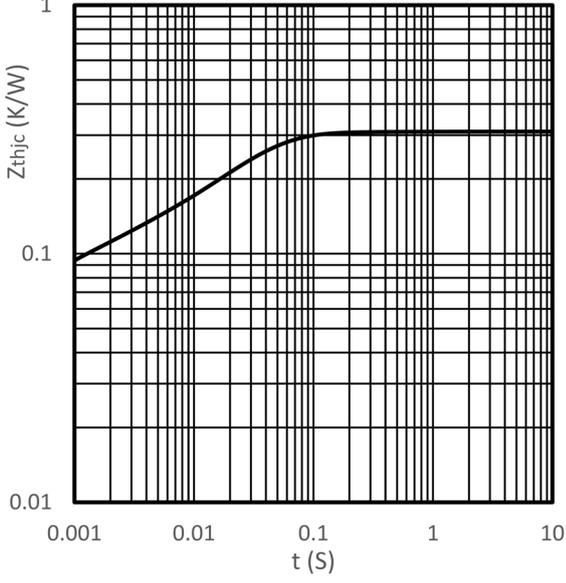
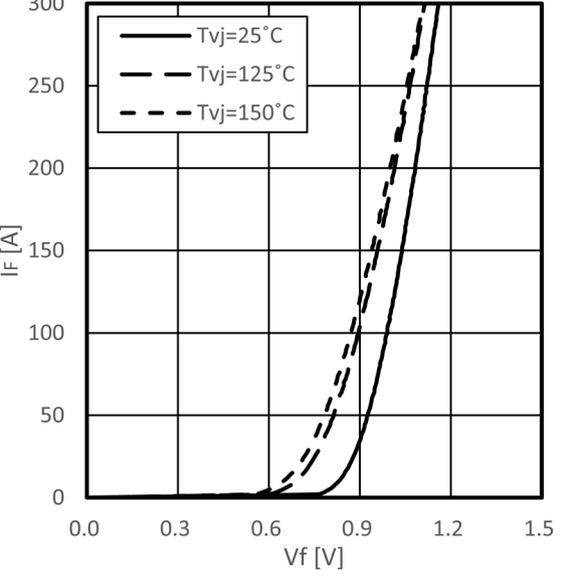
Transient thermal impedance IGBT, Inverter
 $Z_{thJC} = f(t)$

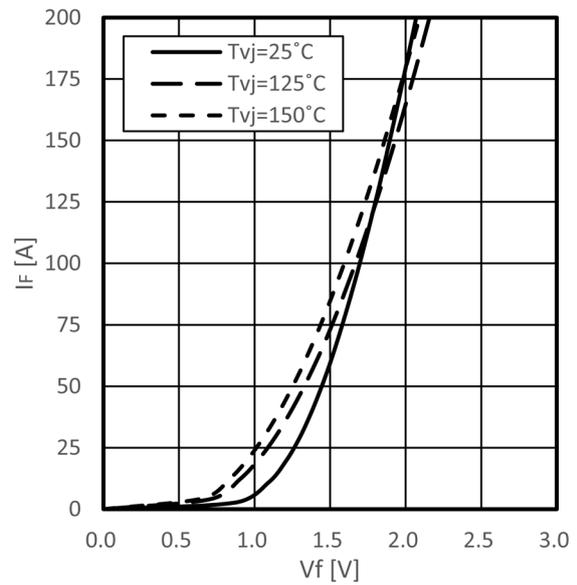
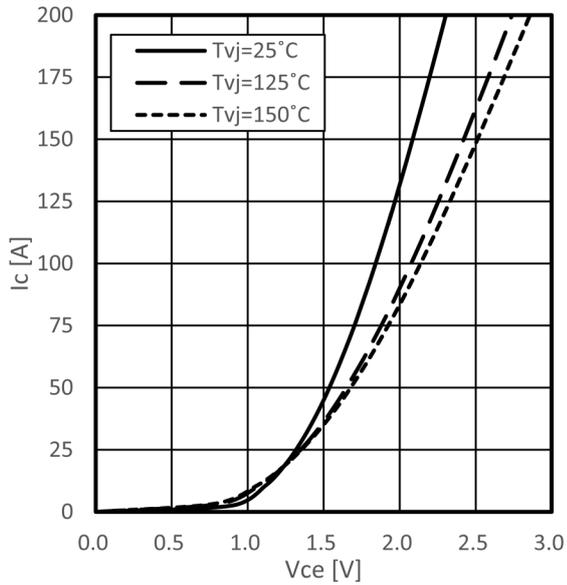


Reverse bias safe operating area IGBT, Inverter (RBSOA)
 $I_C = f(V_{CE})$
 $V_{GE} = 15\text{ V}$, $R_{Goff} = 2.2\ \Omega$, $T_{vj} = 150^\circ\text{C}$



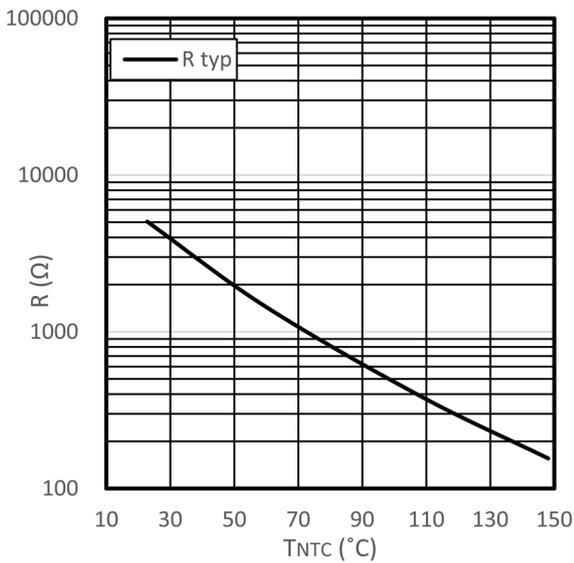
Forward characteristic of Diode, Inverter (typical)
 $I_F = f(V_f)$

	
<p>Switching losses Diode, Inverter (typical) $E_{rec} = f(I_F)$ $R_{Gon} = 2.2 \Omega, V_{CE} = 600 V$</p>	<p>Switching losses Diode, Inverter (typical) $E_{rec} = f(R_G)$ $I_F = 150 A, V_{CE} = 600 V$</p>
	
<p>Transient thermal impedance Diode, Inverter $Z_{thjc} = f(t)$</p>	<p>Forward characteristic of Diode, Rectifier (typical) $I_F = f(V_F)$</p>



Output characteristic IGBT, Brake-Chopper (typical)
 $I_c = f(V_{ce})$

Forward characteristic of Diode, Brake-Chopper (typical)
 $I_F = f(V_f)$



NTC-Thermistor-temperature characteristic (typical)
 $R = f(T_{NTC})$

12. Circuit Diagram

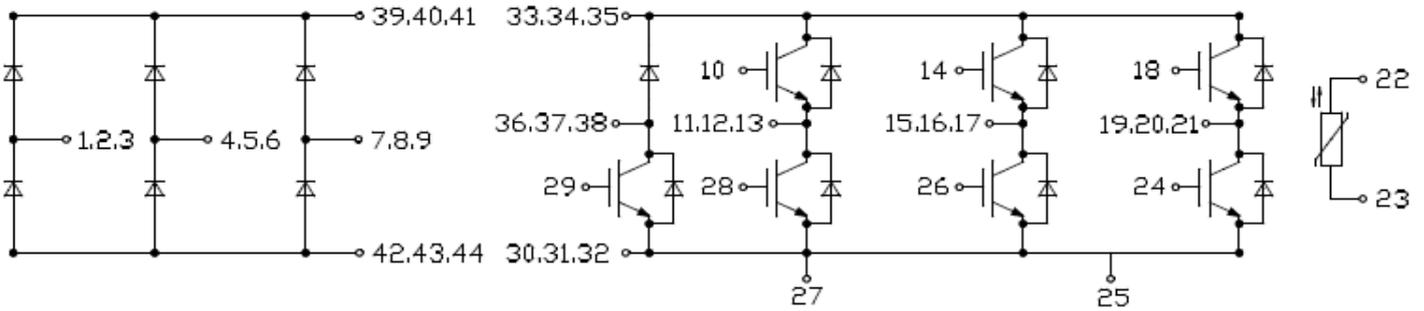


Figure 3

13. Package Outlines

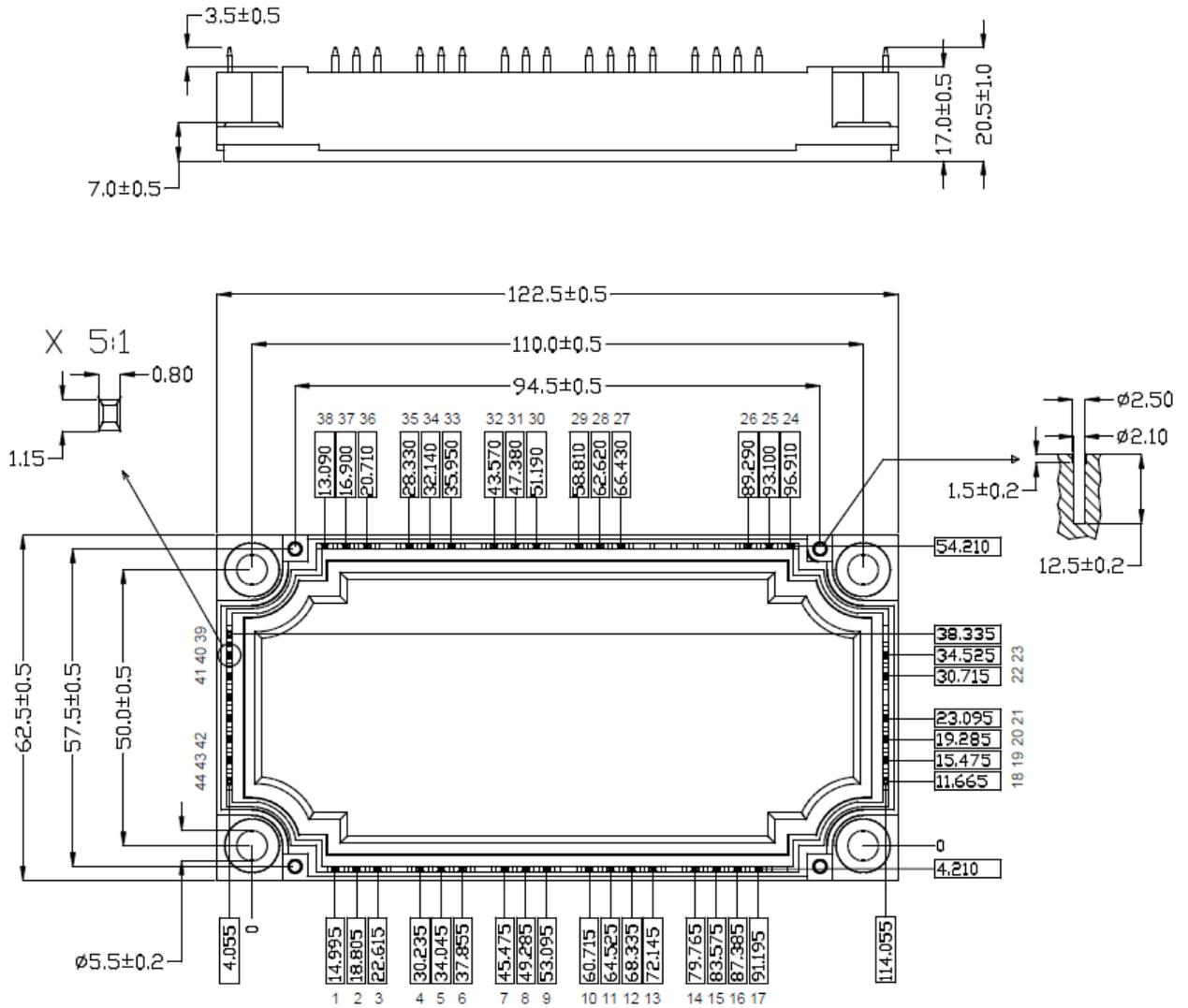


Figure 4