1. Product Features

1.1 Electrical features

- V_{CES}=1200V
- $I_{C\ nom}$=450A / I_{CRM}=900A
- Low switching losses
- Low inductance
- Fast switching and short tail current
- Integrated NTC temperature sensor
- High power and thermal cycling capability

Figure1 IGBT Module

1.2 Mechanical features

- Integrated NTC temperature sensor
- High power and thermal cycling capability
- 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

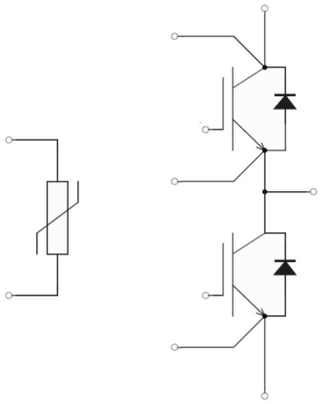


Figure 2 Half Bridge

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°C	V_{CES}	1200	V
Continuous DC collector current 连续集电极电流	T_C = 100°C, $T_{vj,\,max}$ = 150°C	$I_{C\ nom}$	450	A
Repetitive peak collector current 集电极峰值电流	t_P = 1 ms	I_{CRM}	900	A
Total power dissipation 总功率损耗	T_C = 25°C, $T_{vj,\,max}$ = 150 °C	P_{tot}	1150	W
Gate-emitter peak voltage 栅极一发射极峰值电压		V_{GES}	+/- 20	V

4.2 Characteristic value

Parameter	Note or test condition		Symbol	Values			Unit
				Min.	Typ.	Max.	
Collector-emitter saturation voltage 集电极一发射极饱和电压	I_C = 450 A, V_{GE} = 15 V	T_{vj} = 25°C	$V_{CE,sat}$		1.5	1.9	V
		T_{vj} = 125°C			1.8		V
		T_{vj} = 150°C			1.9		V
Gate threshold voltage 栅极阈值电压	I_C = 17.1mA, V_{CE} = V_{GE}, T_{vj} = 25°C		$V_{GE,th}$	5.0	6.0	6.5	V
Gate charge 栅极电荷	V_{GE} = -15 V ... +15 V		Q_G		1.7		µC
Internal gate resistor 内部栅极电阻	T_{vj} = 25°C		R_{Gint}		2.1		Ω
Input capacitance 输入电容	f=1MHz, T_{vj}=25°C, V_{CE}=25V, V_{GE}=0V		C_{ies}		21.6		nF
Reverse transfer capacitance 反向传输电容	f=1MHz, T_{vj}=25°C, V_{CE}=25V, V_{GE}=0V		C_{res}		0.17		nF
Collector-emitter cut-off current 集电极-发射极截止电流	V_{CE} = 1200 V, V_{GE} = 0 V, T_{vj} = 25°C		I_{CES}			3	mA
Gate-emitter leakage current 栅极-发射极漏电流	V_{CE} = 0 V, V_{GE} = 20 V, T_{vj} = 25°C		I_{GES}			300	nA
Turn-on delay time, inductive load 开通延迟时间	I_C = 450A, V_{CE} = 600V	T_{vj} = 25°C	$t_{d,on}$		0.23		us
	V_{GE} = +15/-15V	T_{vj} = 125°C			0.23		us
	$R_{G,on}$ = 2.2Ω	T_{vj} = 150°C			0.23		us
Rise time, inductive load 上升时间	I_C = 450A, V_{CE} = 600V	T_{vj} = 25°C	t_r		0.13		us
	V_{GE} = +15/-15V	T_{vj} = 125°C			0.15		us
	$R_{G,on}$ = 2.2Ω	T_{vj} = 150°C			0.15		us

(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 = 450A, V_{CE} = 600V	T_{vj} = 25°C	$t_{d,off}$		0.54		us
	V_{GE} = +15/-15V	T_{vj} = 125°C			0.58		us
	$R_{G,off}$ = 2.2Ω	T_{vj} = 150°C			0.60		us
Fall time, inductive load 下降时间	I_C = 450A, V_{CE} = 600V	T_{vj} = 25°C	t_f		0.16		us
	V_{GE} = +15/-15V	T_{vj} = 125°C			0.28		us
	$R_{G,off}$ = 2.2Ω	T_{vj} = 150°C			0.31		us
Turn-on energy loss per pulse 开通损耗能量	I_C = 450A, V_{CE} = 600V, L_s=35nH	T_{vj} = 25°C	E_{on}		25.5		mJ
	V_{GE} = +15/-15V, di/dt =2300A/µs	T_{vj} = 125°C			40.0		mJ
	$R_{G,on}$ = 2.2Ω (T_{vj} = 150°C)	T_{vj} = 150°C			45.0		mJ
Turn-off energy loss per pulse 关断损耗能量	I_C = 450A, V_{CE} = 600V, L_s=35nH	T_{vj} = 25°C	E_{off}		36.2		mJ
	V_{GE} = +15/-15V, dv/dt =3400V/µs	T_{vj} = 125°C			52.0		mJ
	$R_{G,off}$ = 2.2Ω (T_{vj} = 150°C)	T_{vj} = 150°C			56.0		mJ
SC data 短路数据	V_{GE} ⩽15V, V_{CC}=600 V, t_P ⩽ 8 µs, T_{vj} = 150°C , C_{GE} = 0.0uF , V_{CEmax} = V_{CES} -L_{sCE} · di/dt		I_{SC}		2100		A
Thermal resistance, junction to case 结一外壳热阻	Per IGBT		$R_{th,JC}$			0.095	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°C	V_{RRM}	1200	V
Continuous DC forward current 连续正向直流电流		I_F	450	A
Repetitive peak forward current 正向重复峰值电流	t_P = 1 ms	I_{FRM}	900	A

5.2 Characteristic value

Parameter	Note or test condition		Symbol	Values			Unit
				Min.	Typ.	Max.	
Forward voltage 正向电压	I_F = 450 A, V_{GE} = 0 V	T_{vj} = 25°C	V_F		2.00	2.40	V
		T_{vj} = 125°C			1.70		V
		T_{vj} = 150°C			1.60		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 = 450A, V_R = 600V	T_{vj} = 25°C	I_{RM}		230		A
	V_{GE} = -15V , - di_F/dt = 3000 A/µs	T_{vj} = 125°C			380		A
	(T_{vj}=150°C)	T_{vj} = 150°C			412		A
Recovered charge 恢复电荷	I_F = 450A, V_R = 600V	T_{vj} = 25°C	Q_r		24.5		µC
	V_{GE} = -15V , - di_F/dt = 3000 A/µs	T_{vj} = 125°C			65.4		µC
	(T_{vj}=150°C)	T_{vj} = 150°C			79.8		µC
Reverse recovery energy 反向恢复损耗（每脉冲）	I_F = 450A, V_R = 600V	T_{vj} = 25°C	E_{rec}		2.6		mJ
	V_{GE} = -15V , - di_F/dt = 3000 A/µs	T_{vj} = 125°C			10.6		mJ
	(T_{vj}=150°C)	T_{vj} = 150°C			15.3		mJ
Thermal resistance, junction to case 结一外壳热阻	Per diode		$R_{th,JC}$			0.12	K/W

6. NTC-Thermistor

6.1 Characteristic value

Parameter	Note or test condition	Symbol	Values			Unit
			Min.	Typ.	Max.	
Rated resistance 额定电阻值	Tc = 25°C	R_{25}		5.00		KΩ
Power dissipation 耗散功耗	Tc = 25°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}		3375		K
B-value B-Z 值	$R_2=R_{25}\exp[B_{25/75}(1/T_2-1/(298, 15K))]$	B_{25}/B_{75}		3408		K
B-value B-Z 值	$R_2=R_{25}\exp[B_{25/100}(1/T_2-1/(298, 15K))]$	B_{25}/B_{100}		3436		K

7. Module

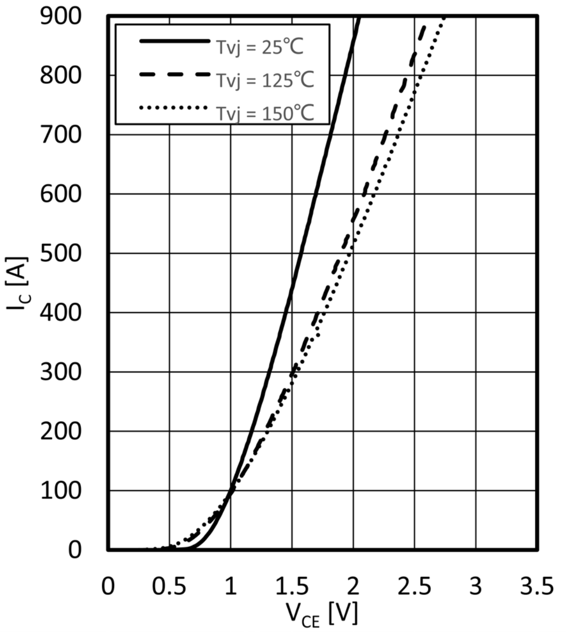
7.1 Characteristic value

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}		35		nH

(table continues...) 待续

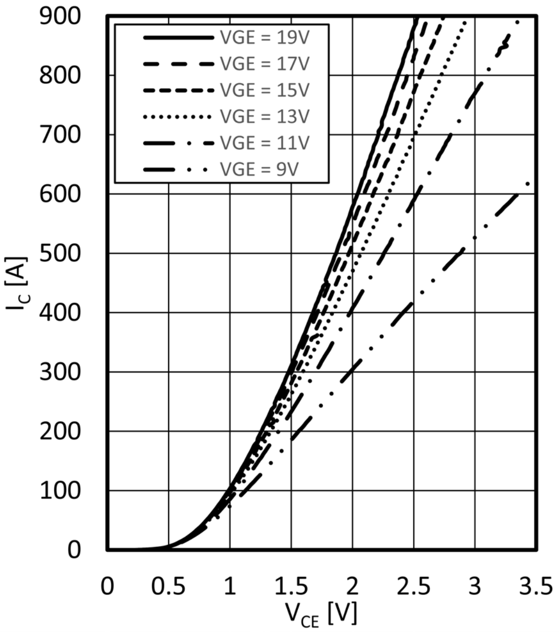
Parameter	Note or test condition	Symbol	Values			Unit
			Min.	Typ.	Max.	
Operation Junction Temperature 结温		T_{jop}	-40		150	˚C
Storage Temperature Range 存储温度范围		T_{stg}	-40		125	˚C
Mounting Torque 安装扭矩	Screw M5	M	3		6	N.m
Weight of Module 重量		G		350		g

8. Characteristics diagrams



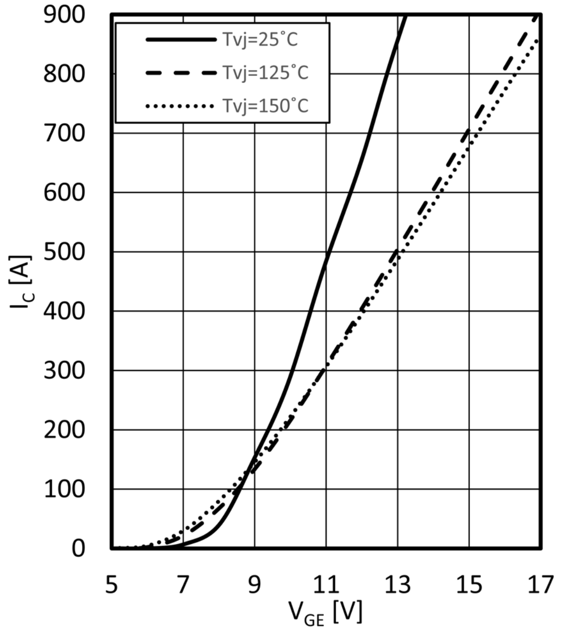
Output characteristic IGBT, Inverter (typical)

$I_C = f(V_{CE})$ $V_{GE} = 15V$



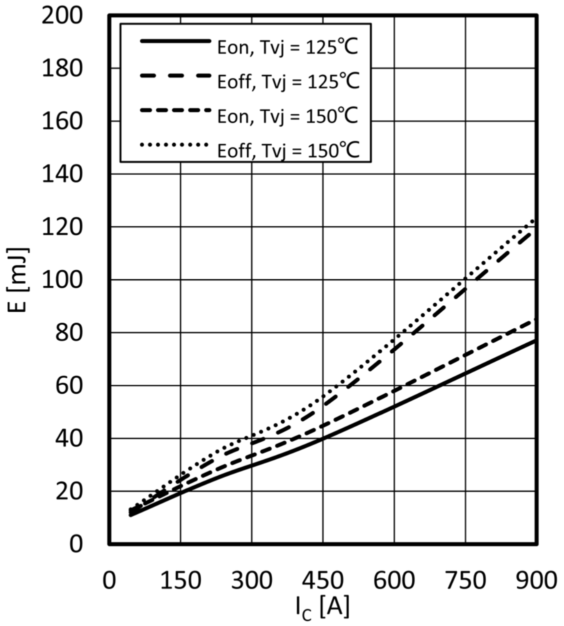
Output characteristic IGBT, Inverter (typical)

$I_C = f(V_{CE})$ $T_{vj} = 150°C$



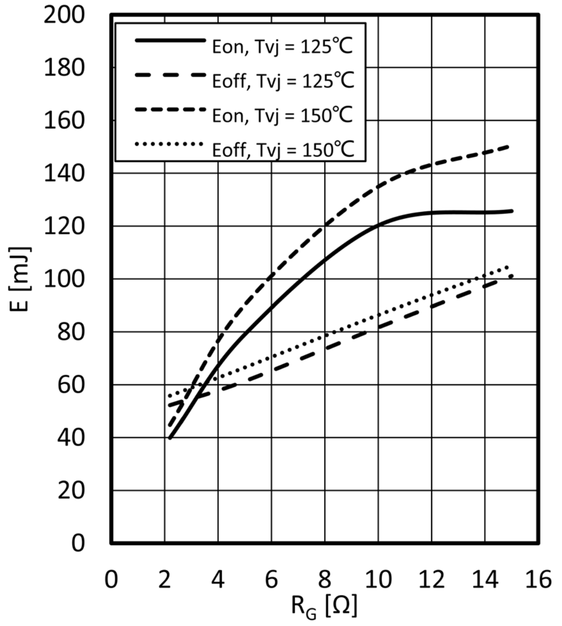
Transfer characteristic IGBT, Inverter (typical)

$I_C = f(V_{GE})$ $V_{CE} = 20V$



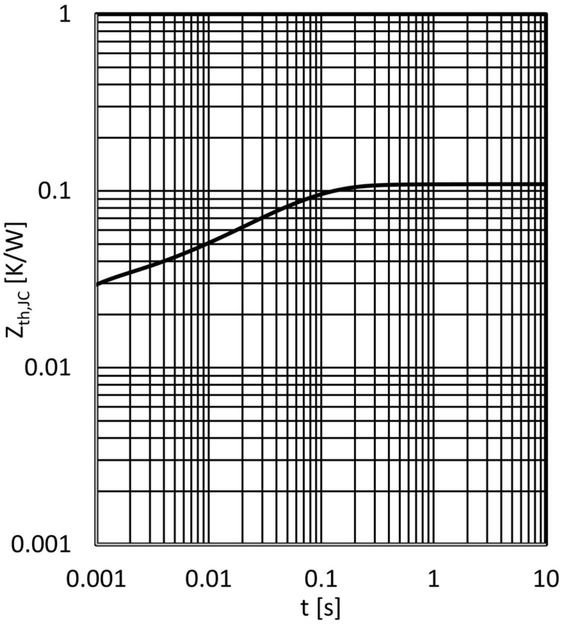
Switching losses IGBT, Inverter (typical)

$E_{on}=f(I_C)$, $E_{off} = f(I_C)$ $V_{GE} = \pm 15V$, $R_{Gon} = 2.2\ \Omega$ $R_{Goff} = 2.2\ \Omega$, $V_{CE} = 600V$



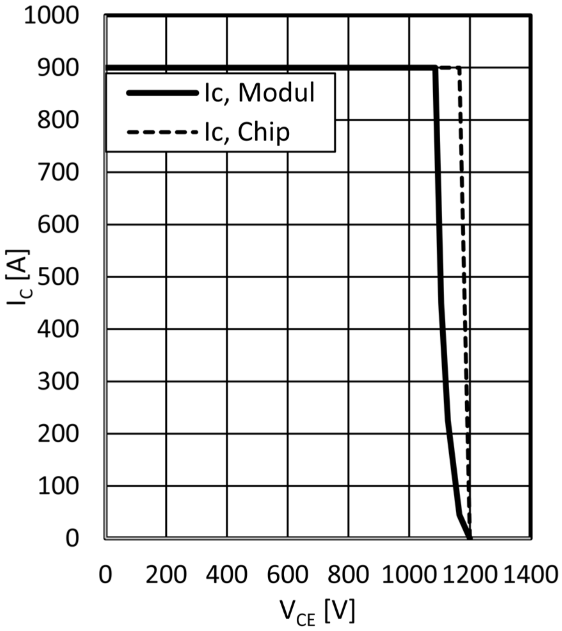
Switching losses IGBT, Inverter (typical)

$E_{on} = f(R_G)$, $E_{off} = f(R_G)$ $V_{GE} = \pm15V$, $I_C = 450A$, $V_{CE} = 600V$



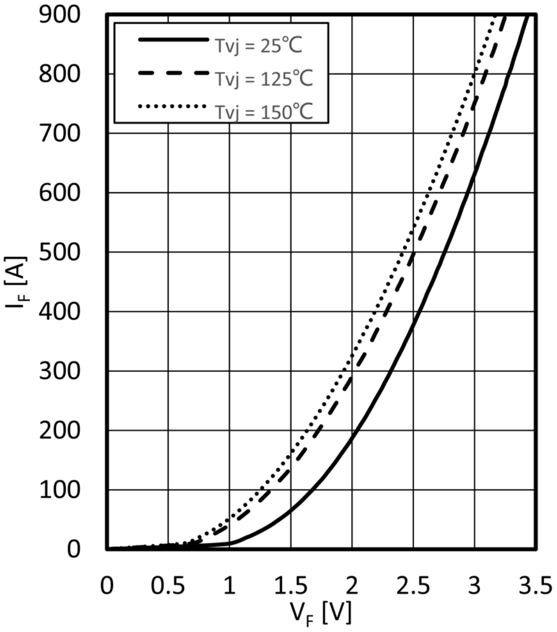
Transient thermal impedance IGBT, Inverter

$Z_{thJC} = f(t)$



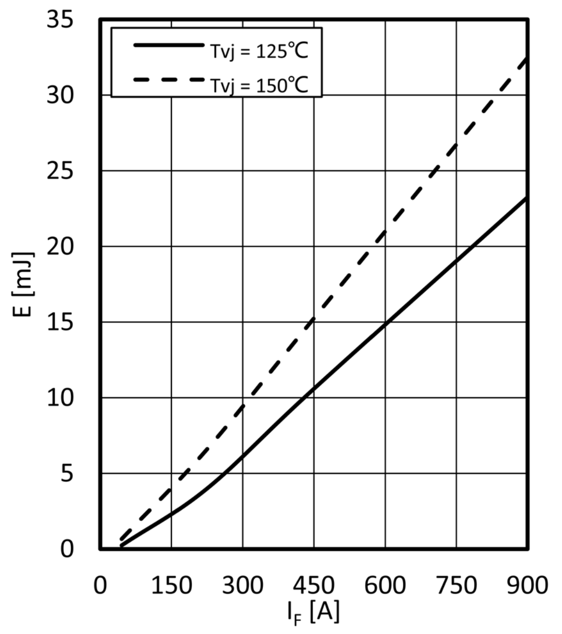
Reverse bias safe operating area IGBT, Inverter (RBSOA)

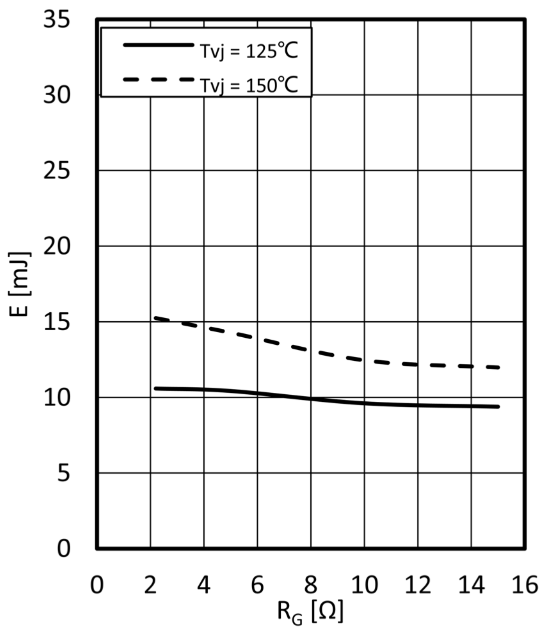
$I_C = f(V_{CE})$ $V_{GE} = \pm15V$ $R_{Goff} = 2.2\Omega$, $T_{vj} = 150°C$



Forward characteristic of Diode, Inverter (typical)

$I_F = f(V_F)$



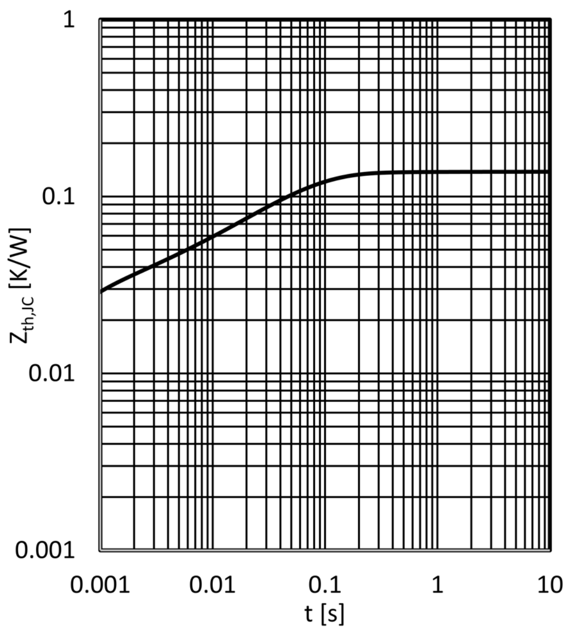


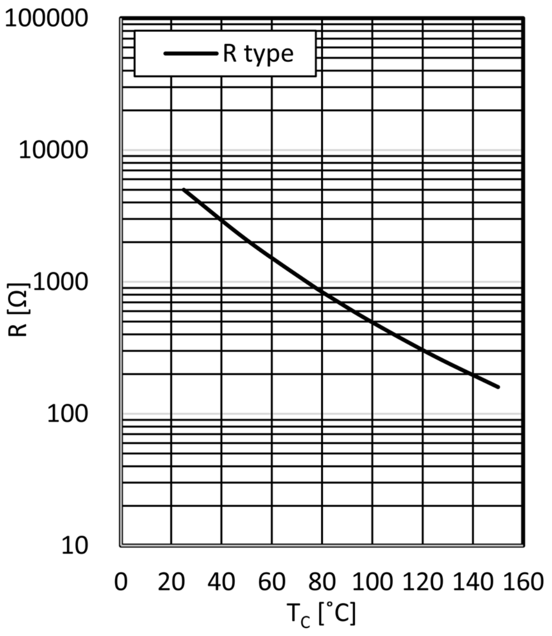
Switching losses Diode, Inverter (typical)

E_{rec} = f (I_F) R_{Gon} = 2.2 Ω, V_{CC} = 600V

Switching losses Diode, Inverter (typical)

E_{rec} = f (R_G) I_F = 450 A, V_{CC} = 600V





Transient thermal impedance Diode Inverter

Z_{thJC} = f (t)

NTC-Thermistor-temperature characteristic (typical)

R=f(T)

9. Circuit Diagram

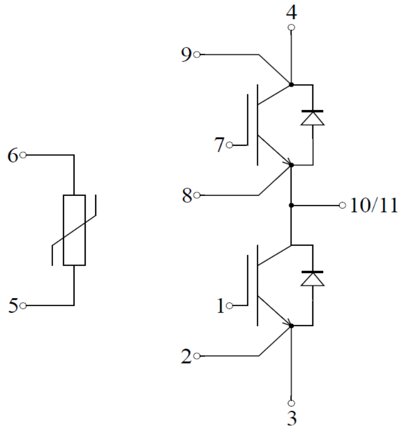


Figure 3

10. Package Outlines

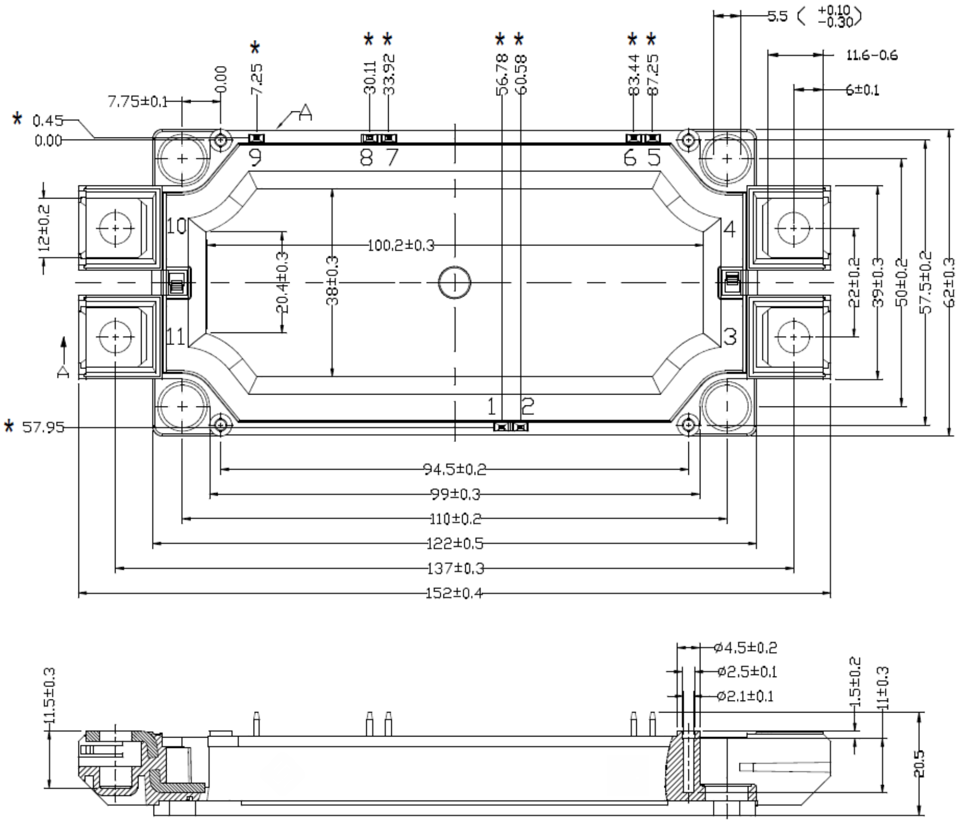


Figure 4