1. Product Features

1.1 Electrical features

- V_{CES}=1200V
- $I_{C\,nom}$=50A / I_{CRM}=100A
- 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

- 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
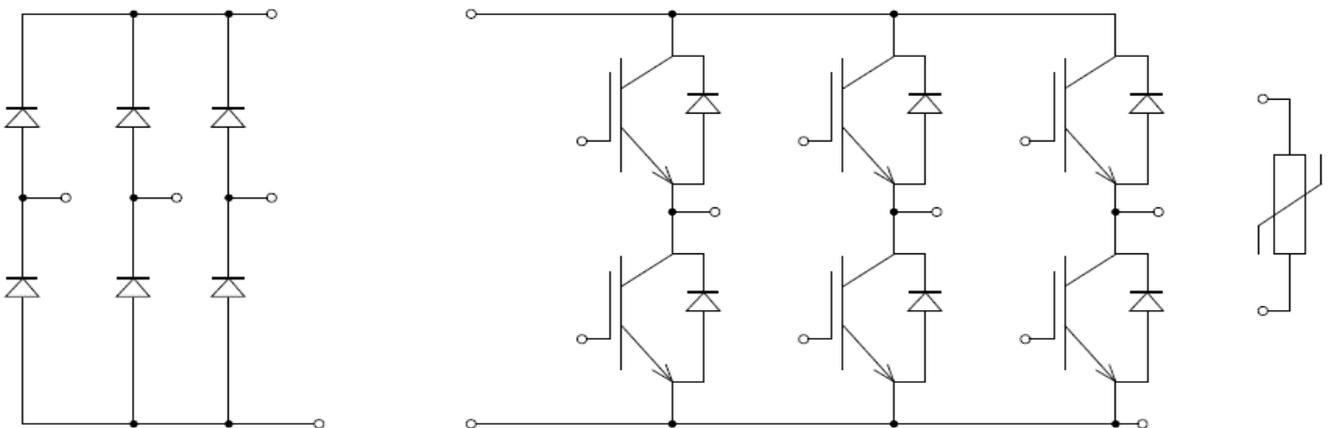- AC and DC servo drive amplifier

3. Description

Figure 2 3 Phase Bridge+Brake

Technical datasheet

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	$I_{C\ nom}$	50	A
Repetitive peak collector current 集电极峰值电流	t_P = 1 ms	I_{CRM}	100	A
Total power dissipation 总功率损耗	T_C = 25°C, $T_{vj\ max}$ = 150°C	P_{tot}	210	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 = 50 A, V_{GE} = 15 V	T_{vj} = 25°C	$V_{CE,sat}$	1.5	1.7	1.9	V
		T_{vj} = 125°C			2.0		V
		T_{vj} = 150°C			2.1		V
Gate threshold voltage 栅极阈值电压	I_C = 1mA, V_{CE} = V_{GE}, T_{vj} = 25°C		$V_{GE,th}$	5.0	5.6	6.5	V
Gate charge 栅极电荷	V_{GE} = -15 V … +15 V		Q_G		0.44		μC
Internal gate resistor 内部栅极电阻	T_{vj} = 25°C		R_{Gint}		2.2		Ω
Input capacitance 输入电容	f=1MHz, T_{vj}=25°C, V_{CE}=25V, V_{GE}=0V		C_{ies}		6.15		nF
Reverse transfer capacitance 反向传输电容	f=1MHz, T_{vj}=25°C, V_{CE}=25V, V_{GE}=0V		C_{res}		0.08		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}			1	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}			100	nA
Turn-on delay time, inductive load 开通延迟时间	I_C = 50A, V_{CE} = 600V	T_{vj} = 25°C	$t_{d,on}$		0.13		us
	V_{GE} = +15/-15V	T_{vj} = 125°C			0.14		us
	$R_{G,on}$ = 15Ω	T_{vj} = 150°C			0.14		us
Rise time, inductive load 上升时间	I_C = 50A, V_{CE} = 600V	T_{vj} = 25°C	t_r		0.06		us
	V_{GE} = +15/-15V	T_{vj} = 125°C			0.07		us
	$R_{G,on}$ = 15Ω	T_{vj} = 150°C			0.07		us

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(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 = 50A, V_{CE} = 600V	T_{vj} = 25°C	$t_{d,off}$		0.24		us
	V_{GE} = +15/-15V	T_{vj} = 125°C			0.27		us
	$R_{G,off}$ = 15Ω	T_{vj} = 150°C			0.28		us
Fall time, inductive load 下降时间	I_C = 50A, V_{CE} = 600V	T_{vj} = 25°C	t_f		0.28		us
	V_{GE} = +15/-15V	T_{vj} = 125°C			0.46		us
	$R_{G,off}$ = 5Ω	T_{vj} = 150°C			0.48		us
Turn-on energy loss per pulse 开通损耗能量	I_C = 50A, V_{CE} = 600V, L_s=35nH	T_{vj} = 25°C	E_{on}		6.83		mJ
	V_{GE} = +15/-15V, di/dt =580A/μs	T_{vj} = 125°C			9.00		mJ
	$R_{G,on}$ = 15Ω (T_{vj} = 150°C)	T_{vj} = 150°C			9.78		mJ
Turn-off energy loss per pulse 关断损耗能量	I_C = 50A, V_{CE} = 600V, L_s=35nH	T_{vj} = 25°C	E_{off}		3.37		mJ
	V_{GE} = +15/-15V, dv/dt =4700V/μs	T_{vj} = 125°C			4.86		mJ
	$R_{G,off}$ = 15Ω (T_{vj} = 150°C)	T_{vj} = 150°C			5.28		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}		340		A
Thermal resistance, junction to case 结一外壳热阻	Per IGBT		$R_{th,JC}$			0.50	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	50	A
Repetitive peak forward current 正向重复峰值电流	t_P = 1 ms	I_{FRM}	100	A

5.2 Characteristic value

Parameter	Note or test condition		Symbol	Values			Unit
				Min.	Typ.	Max.	
Forward voltage 正向电压	I_F = 50 A, V_{GE} = 0 V	T_{vj} = 25°C	V_F		1.79		V
		T_{vj} = 125°C			1.80		V
		T_{vj} = 150°C			1.74		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	$I_F = 50A$, $V_R = 600V$	$T_{vj} = 25°C$	I_{RM}		59		A
	$V_{GE} = -15V$, - $di_F/dt = 480\ A/\mu s$	$T_{vj} = 125°C$			68		A
	($T_{vj}=150°C$)	$T_{vj} = 150°C$			71		A
Recovered charge 恢复电荷	$I_F = 50A$, $V_R = 600V$	$T_{vj} = 25°C$	Q_r		3.6		μC
	$V_{GE} = -15V$, - $di_F/dt = 480\ A/\mu s$	$T_{vj} = 125°C$			6.3		μC
	($T_{vj}=150°C$)	$T_{vj} = 150°C$			7.4		μC
Reverse recovery energy 反向恢复损耗（每脉冲）	$I_F = 50A$, $V_R = 600V$	$T_{vj} = 25°C$	E_{rec}		0.5		mJ
	$V_{GE} = -15V$, - $di_F/dt = 480\ A/\mu s$	$T_{vj} = 125°C$			1.2		mJ
	($T_{vj}=150°C$)	$T_{vj} = 150°C$			1.6		mJ
Thermal resistance, junction to case 结－外壳热阻	Per diode		$R_{th,JC}$			0.54	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	$T_{vj} = 25°C$	V_{RRM}	1600	V
Average Rectified Output current 整流器输出均方根电流	$V_F = 1.2$, $T_{vj} = 150°C$	I_F	50	A
Surge forward current 正向浪涌电流	$t_p = 10\ ms$, $Tvj = 150°C$	I_{FSM}	320	A
I²t - value I²t-值	$t_p = 10\ ms$, $Tvj = 150°C$	I^2t	510	A²s

6.2 Characteristic value

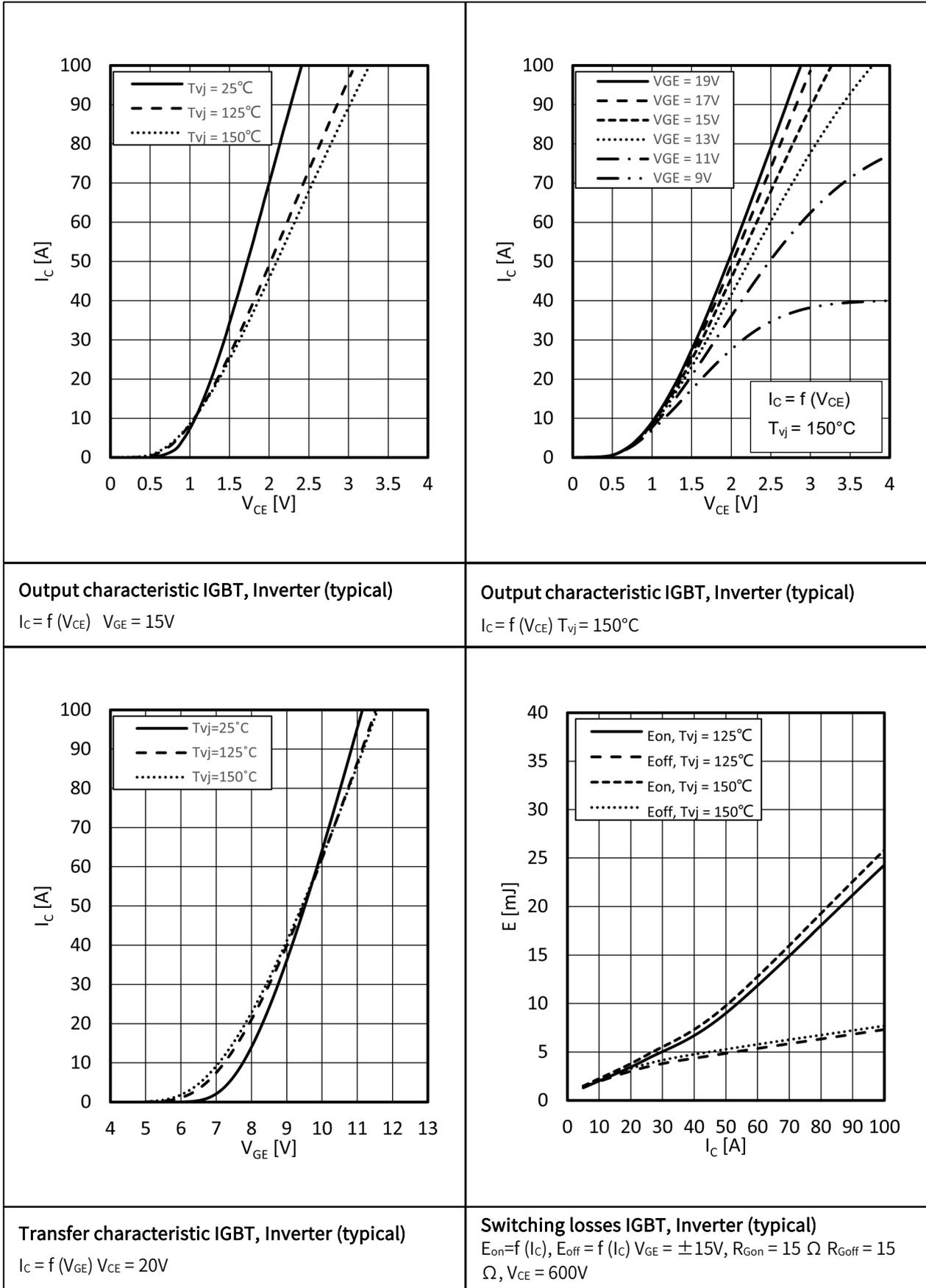| Parameter	Note or test condition	Symbol	Values			Unit
			Min.	Typ.	Max.	
Forward voltage 正向电压	$T_{vj} = 150°C$, $I_F = 50\ A$	V_F		1.1		V
Reverse current 反向电流	$T_{vj} = 150°C$, $V_R = 1600\ V$	I_R		1		mA
Thermal resistance, junction to case 结－外壳热阻	Per diode	R_{thJC}			0.75	K/W

7. NTC-Thermistor

7.1 Characteristic value

Parameter	Note or test condition	Symbol	Values			Unit
			Min.	Typ.	Max.	
Rated resistance 额定电阻值	Tc = 25℃	R_{25}		5.00		KΩ
Power dissipation 耗散功耗	Tc = 25℃	P_{25}			240	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

8. Module

8.1 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
Operation Junction Temperature 结温		T_{jop}	-40		150	℃
Storage Temperature Range 存储温度范围		T_{stg}	-40		125	℃
Mounting Torque 安装扭矩	Screw M5	M	3		6	N.m
Weight of Module 重量		G		180		g

VAHNDER

9. Characteristics diagrams

Output characteristic IGBT, Inverter (typical)
$I_C = f(V_{CE})$ $V_{GE} = 15V$

Output characteristic IGBT, Inverter (typical)
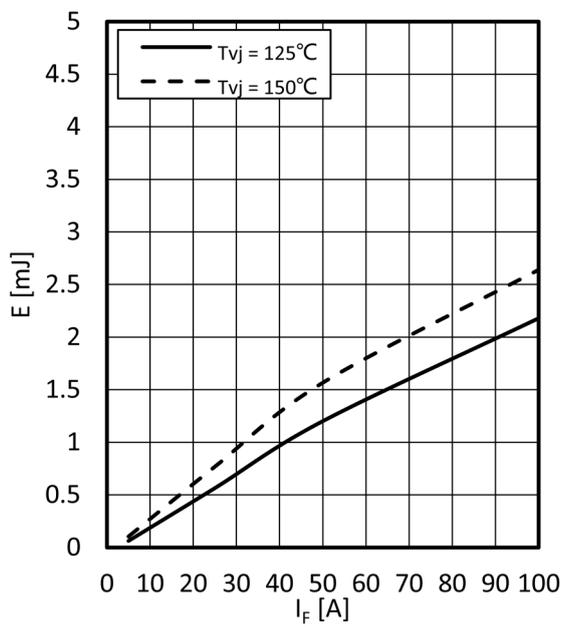$I_C = f(V_{CE})$ $T_{vj} = 150°C$

Transfer characteristic IGBT, Inverter (typical)
$I_C = f(V_{GE})$ $V_{CE} = 20V$

Switching losses IGBT, Inverter (typical)
$E_{on} = f(I_C)$, $E_{off} = f(I_C)$ $V_{GE} = \pm15V$, $R_{Gon} = 15\ \Omega$ $R_{Goff} = 15\ \Omega$, $V_{CE} = 600V$
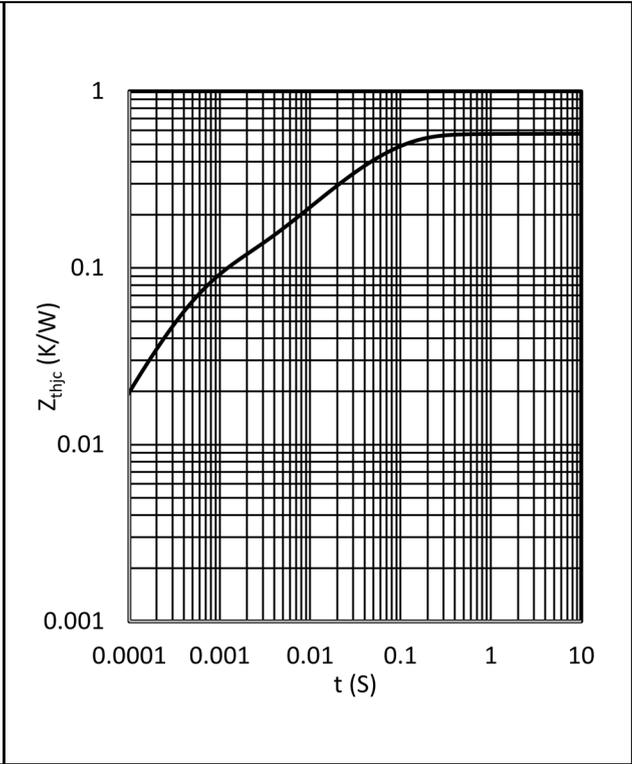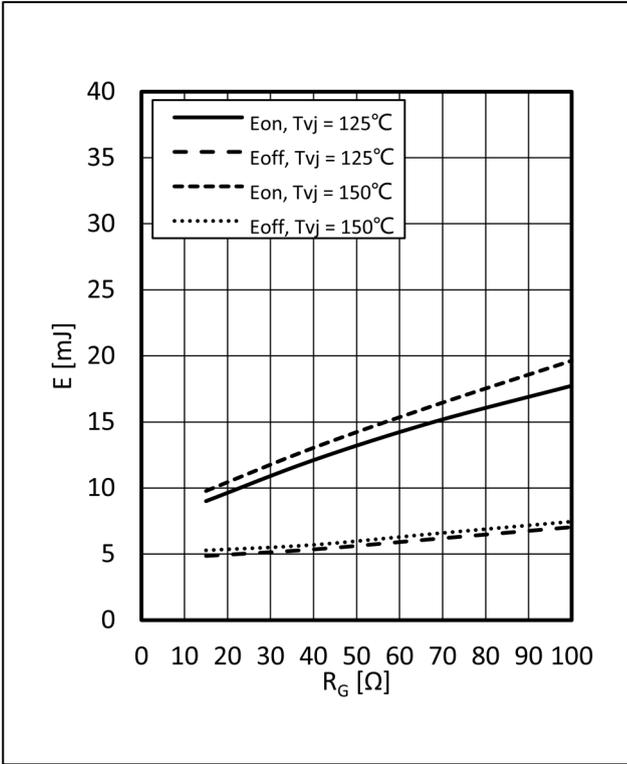
Switching losses IGBT, Inverter (typical)

$E_{on} = f(R_G)$, $E_{off} = f(R_G)$ $V_{GE} = \pm15V$, $I_C = 50A$, $V_{CE} = 600V$
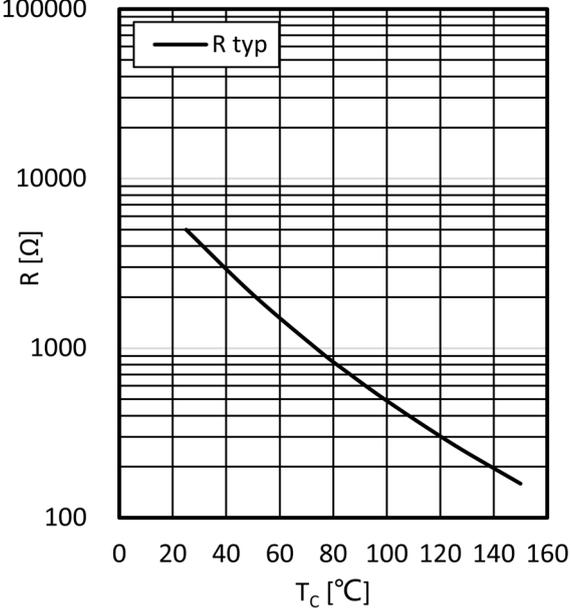

Transient thermal impedance IGBT, Inverter

$Z_{thJC} = f(t)$
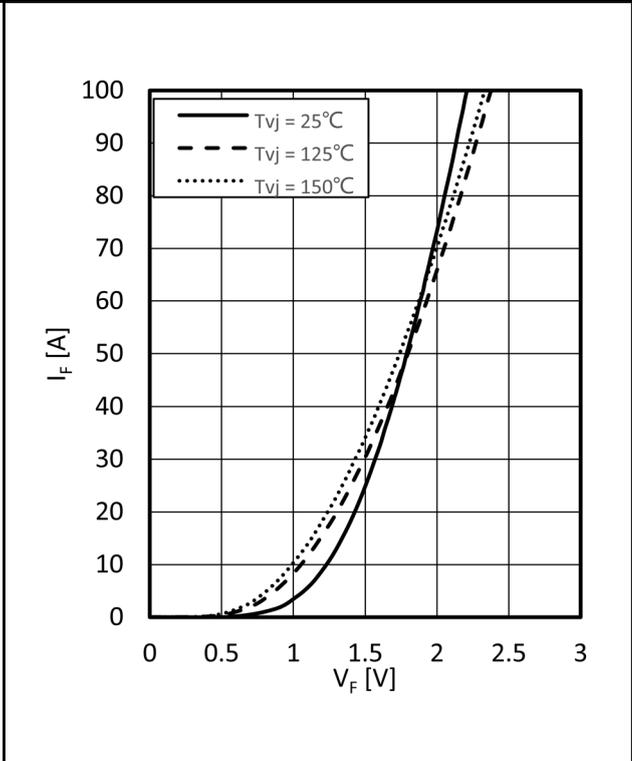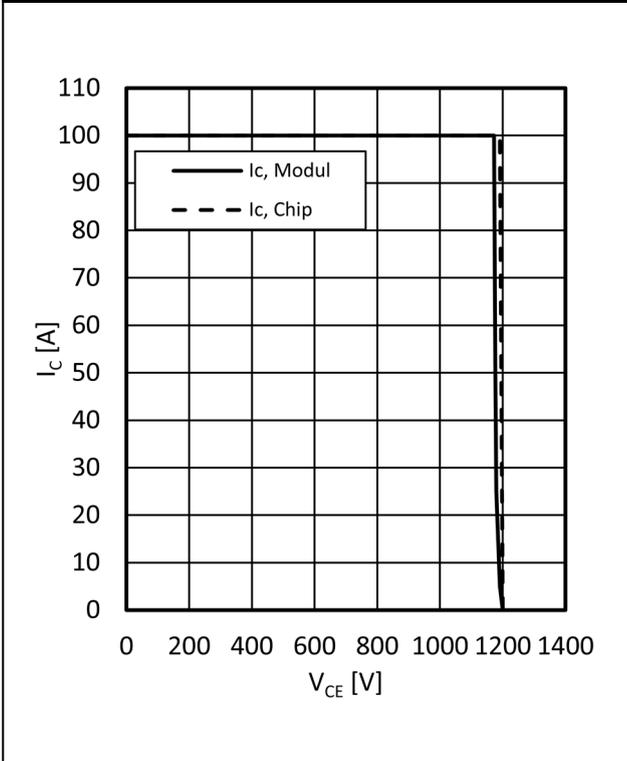
Reverse bias safe operating area IGBT, Inverter (RBSOA)

$I_C = f(V_{CE})$ $V_{GE} = \pm15V$ $R_{Goff} = 15\Omega$, $T_{vj} = 150°C$

Forward characteristic of Diode, Inverter (typical)

$I_F = f(V_F)$

Switching losses Diode, Inverter (typical)

$E_{rec} = f(I_F)$ $R_{Gon} = 15\,\Omega$, $V_{CE} = 600V$

Switching losses Diode, Inverter (typical)

$E_{rec} = f(R_G)$ $I_F = 50\,A$, $V_{CE} = 600V$
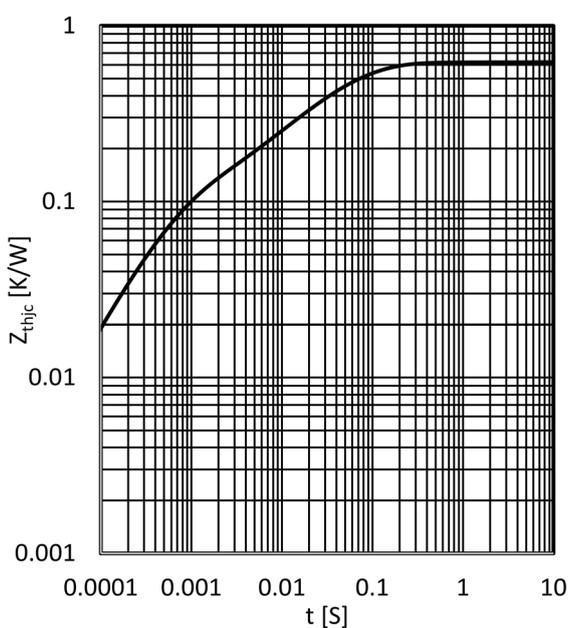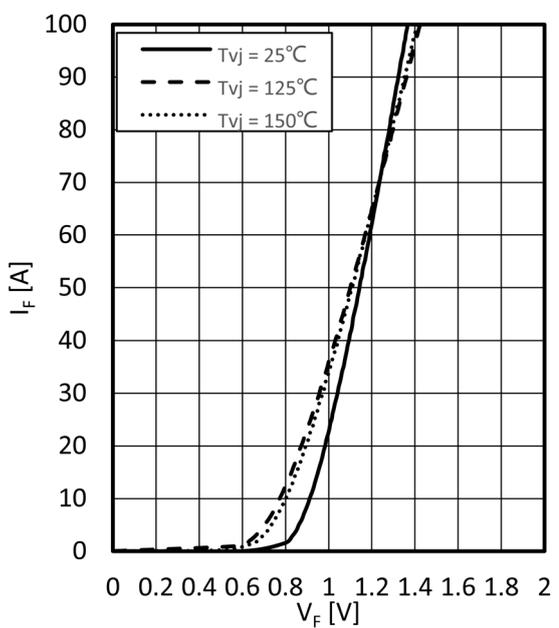
Transient thermal impedance Diode Inverter

$Z_{thJC} = f(t)$

Forward characteristic of Diode, Rectifier (typical)

$I_F = f(V_F)$

Technical datasheet

100000

10000

R [Ω]

1000

100

0 20 40 60 80 100 120 140 160

T$_C$ [°C]

R typ

NTC-Thermistor-temperature characteristic
(typical)
R=f(T)

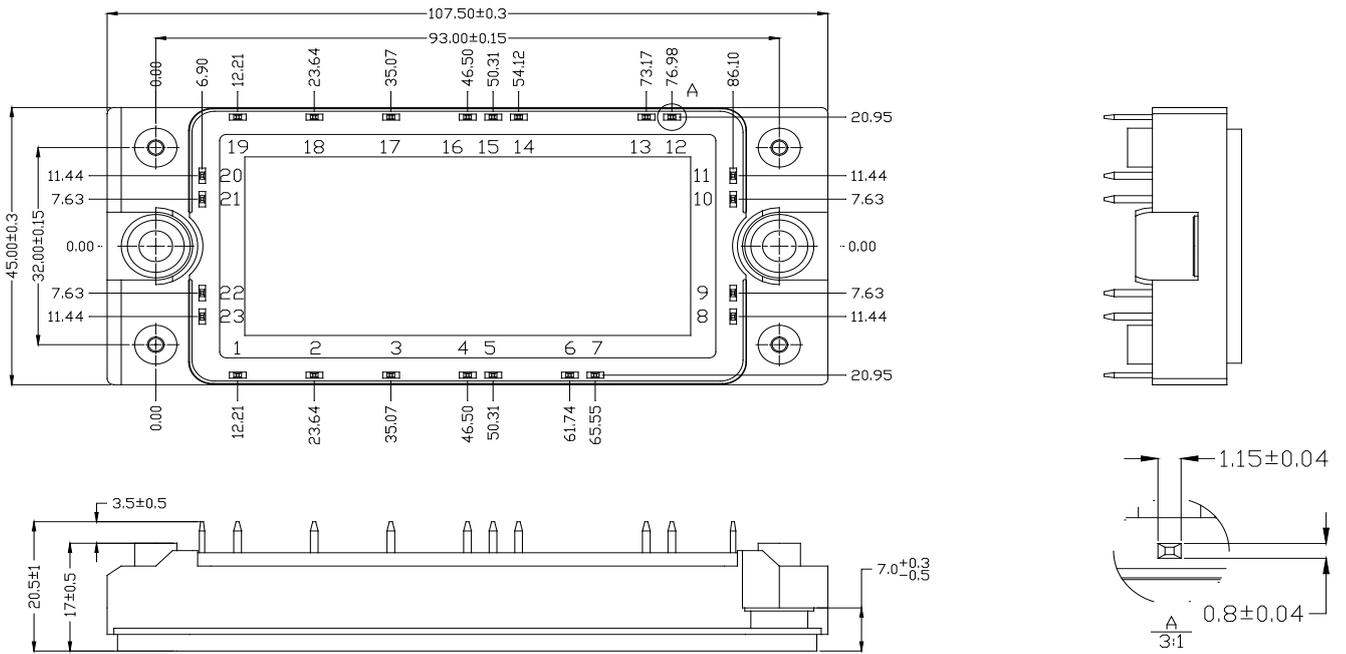## 10. Circuit Diagram
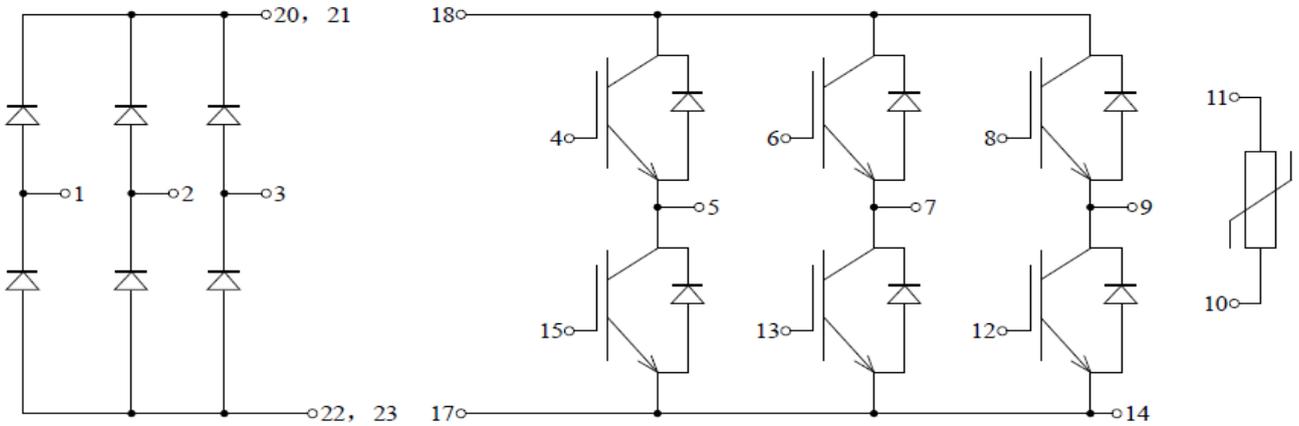
Figure 3

11. Package Outlines

Figure 4