1. Product Features

1.1 Electrical features

- V_{CES}=1700V
- $I_{C\ nom}$=1400A / I_{CRM}=2800A
- Low switching losses
- Low Vcesat
- High DC Stability
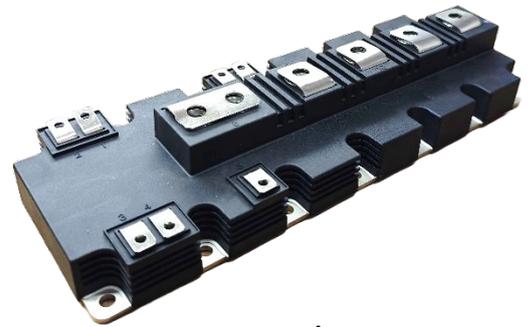- High current density
- Integrated NTC temperature sensor

Figure 1

1.2 Mechanical features

- Al2O3 substrate with low thermal resistance
- Copper base plate
- Package with CTI > 400
- High power and thermal cycling capability

2. Typical Applications

- 3-Level Applications
- Auxiliary Inverters
- High power converters
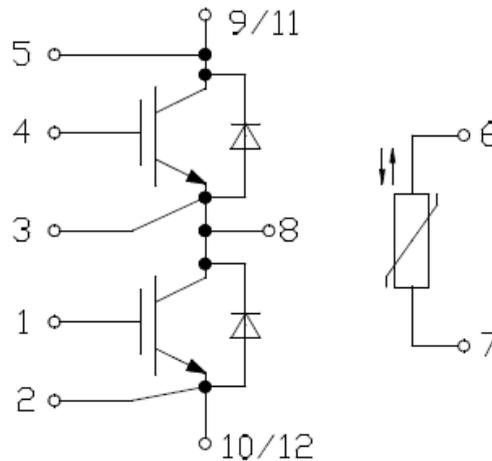- Motor Drives
- Wind Turbines

3. Description

Figure 2 Half Bridge

4. IGBT

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}	1700	V
Continuous DC collector current 连续集电极电流	$T_C = 104°C$, $T_{vj\ max} = 150°C$	$I_{C\ nom}$	1400	A
Repetitive peak collector current 集电极峰值电流	$t_P = 1$ ms	I_{CRM}	2800	A
Total power dissipation 总功率损耗	$T_C = 25°C$, $T_{vj\ max} = 175°C$	P_{tot}	9.26	KW
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 Min.	Values Typ.	Values Max.	Unit
Collector-emitter saturation voltage 集电极—发射极饱和电压	$I_C = 1400$ A, $V_{GE} = 15$ V	$T_{vj} = 25°C$	$V_{CE,sat}$		1.65		V
		$T_{vj} = 125°C$			1.96		V
		$T_{vj} = 150°C$			2.00		V
Gate threshold voltage 栅极阈值电压	$I_C = 8$mA, $V_{CE} = V_{GE}$, $T_{vj} = 25°C$		$V_{GE,th}$	5.0	5.6	6.2	V
Gate charge 栅极电荷	$V_{GE} = -15$ V … $+15$ V		Q_G		1.90		μC
Internal gate resistor 内部栅极电阻	$T_{vj} = 25°C$		R_{Gint}		0.45		Ω
Input capacitance 输入电容	f=1MHz, T_{vj}=25°C, V_{CE}=25V, V_{GE}=0V		C_{ies}		183		nF
Reverse transfer capacitance 反向传输电容	f=1MHz, T_{vj}=25°C, V_{CE}=25V, V_{GE}=0V		C_{res}		7.73		nF
Collector-emitter cut-off current 集电极-发射极截止电流	$V_{CE} = 1700$ V, $V_{GE} = 0$ V, $T_{vj} = 25°C$		I_{CES}			10	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}			1	uA
Turn-on delay time, inductive load 开通延迟时间	$I_C = 1400$A, $V_{CE} = 900$V $V_{GE} = +15/-15$V $R_{G,on} = 1.6$Ω	$T_{vj} = 25°C$	$t_{d,on}$		0.51		us
		$T_{vj} = 125°C$			0.52		us
		$T_{vj} = 150°C$			0.53		us
Rise time, inductive load 上升时间	$I_C = 1400$A, $V_{CE} = 900$V $V_{GE} = +15/-15$V $R_{G,on} = 1.6$Ω	$T_{vj} = 25°C$	t_r		0.14		us
		$T_{vj} = 125°C$			0.16		us
		$T_{vj} = 150°C$			0.17		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 = 1400A, V_{CE} = 900V	T_{vj} = 25°C	$t_{d,off}$		1.01		us
	V_{GE} = +15/-15V	T_{vj} = 125°C			1.08		us
	$R_{G,off}$ = 1.6Ω	T_{vj} = 150°C			1.11		us
Fall time, inductive load 下降时间	I_C = 1400A, V_{CE} = 900V	T_{vj} = 25°C	t_f		0.23		us
	V_{GE} = +15/-15V	T_{vj} = 125°C			0.41		us
	$R_{G,off}$ = 1.6Ω	T_{vj} = 150°C			0.47		us
Turn-on energy loss per pulse 开通损耗能量	I_C = 1400A, V_{CE} = 900V, L_s=30nH	T_{vj} = 25°C	E_{on}		161		mJ
	V_{GE} = +15/-15V, di/dt =6600A/μs	T_{vj} = 125°C			220		mJ
	$R_{G,on}$ = 1.6Ω (T_{vj} = 150°C)	T_{vj} = 150°C			242		mJ
Turn-off energy loss per pulse 关断损耗能量	I_C = 1400A, V_{CE} = 900V, L_s=30nH	T_{vj} = 25°C	E_{off}		314		mJ
	V_{GE} = +15/-15V, dv/dt =3930V/μs	T_{vj} = 125°C			410		mJ
	$R_{G,off}$ = 1.6Ω (T_{vj} = 150°C)	T_{vj} = 150°C			440		mJ
SC data 短路数据	V_{GE} ≤15V, V_{CC} =1000 V, t_P ≤ 8 μs, T_{vj} = 150°C , C_{GE} = 0.0uF , V_{CEmax} = V_{CES} - L_{sCE} · di/dt		I_{SC}		9600		A
Thermal resistance, junction to case 结－外壳热阻	Per IGBT		$R_{th,JC}$			16.2	K/KW

5. Diode

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}	1700	V
Continuous DC forward current 连续正向直流电流		I_F	1400	A
Repetitive peak forward current 正向重复峰值电流	t_P = 1 ms	I_{FRM}	2800	A

5.2 Characteristic value

Parameter	Note or test condition		Symbol	Values			Unit
				Min.	Typ.	Max.	
Forward voltage 正向电压	I_F = 1400 A, V_{GE} = 0 V	T_{vj} = 25°C	V_F		1.92		V
		T_{vj} = 125°C			2.07		V
		T_{vj} = 150°C			2.09		V

(table continues...) 待续

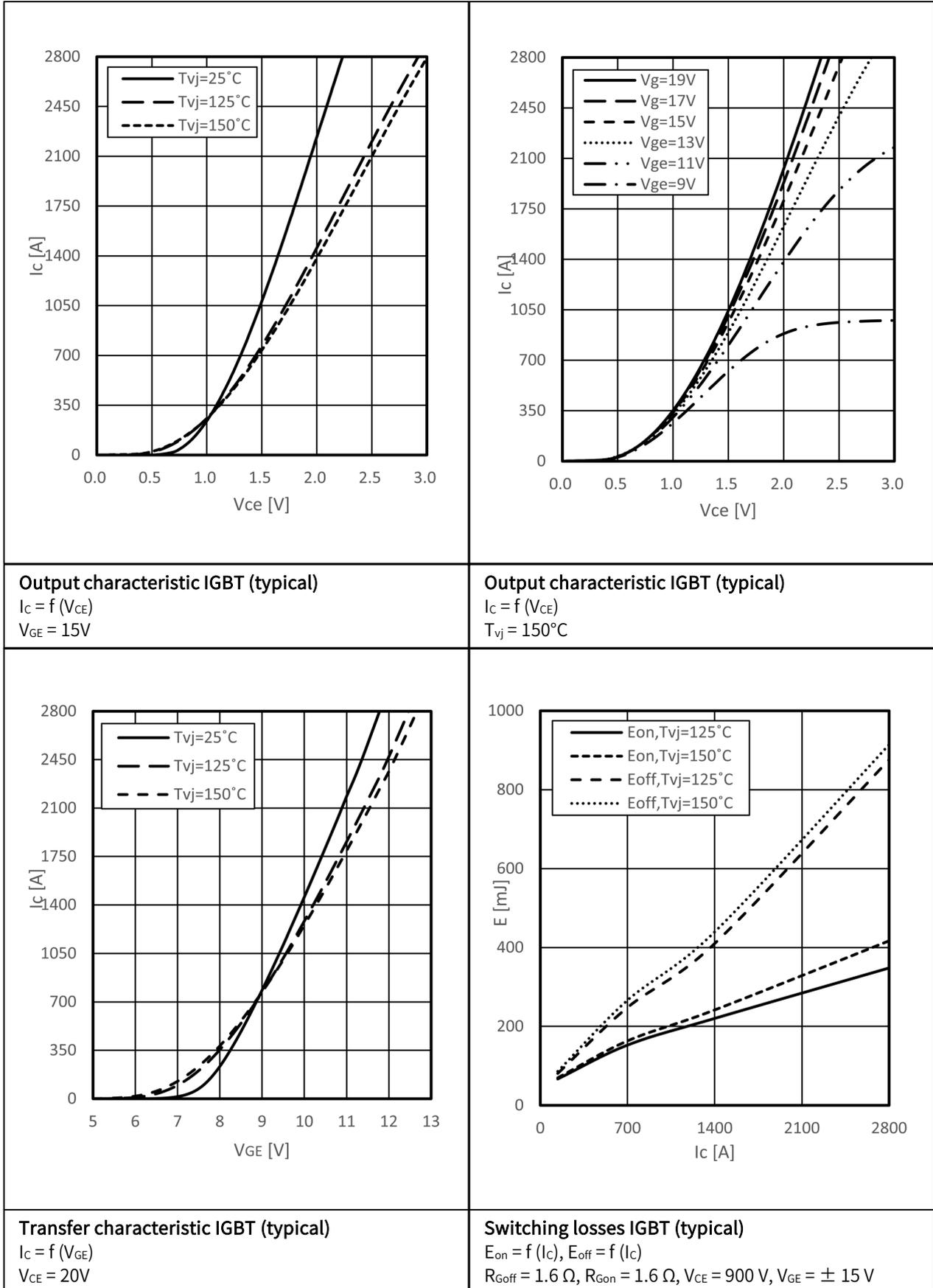| Parameter	Note or test condition		Symbol	Values			Unit
				Min.	Typ.	Max.	
Peak reverse recovery current 反向恢复峰值电流	I_F = 1400A, V_R = 900V	T_{vj} = 25°C	I_{RM}		1306		A
	V_{GE} = -15V , - di_F/dt = 7910 A/µs	T_{vj} = 125°C			1327		A
	(T_{vj}=150°C)	T_{vj} = 150°C			1342		A
Recovered charge 恢复电荷	I_F = 1400A, V_R = 900V	T_{vj} = 25°C	Q_r		291		µC
	V_{GE} = -15V , - di_F/dt = 7910 A/µs	T_{vj} = 125°C			397		µC
	(T_{vj}=150°C)	T_{vj} = 150°C			434		µC
Reverse recovery energy 反向恢复损耗（每脉冲）	I_F = 1400A, V_R = 900V	T_{vj} = 25°C	E_{rec}		171		mJ
	V_{GE} = -15V , - di_F/dt = 7910 A/µs	T_{vj} = 125°C			235		mJ
	(T_{vj}=150°C)	T_{vj} = 150°C			256		mJ
Thermal resistance, junction to case 结－外壳热阻	Per diode		$R_{th,JC}$			33.7	K/KW

6. NTC-Thermistor

6.1 Characteristic value

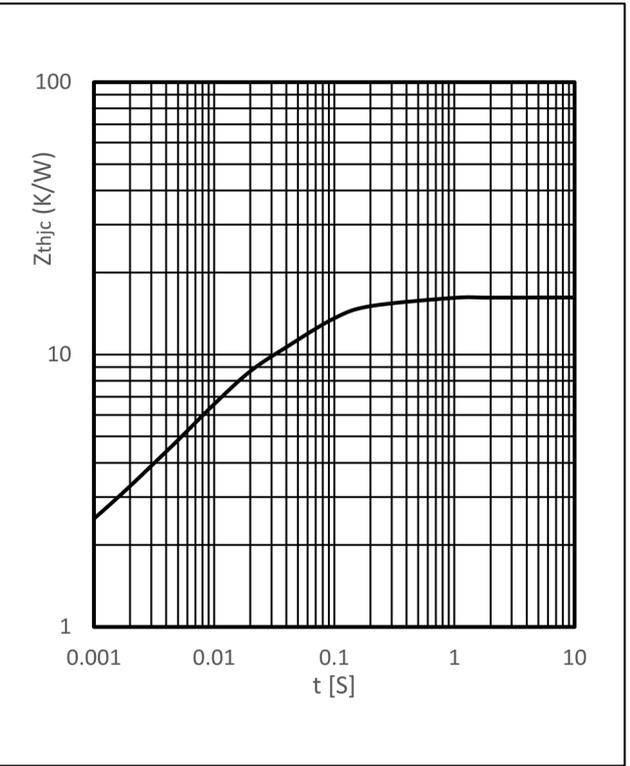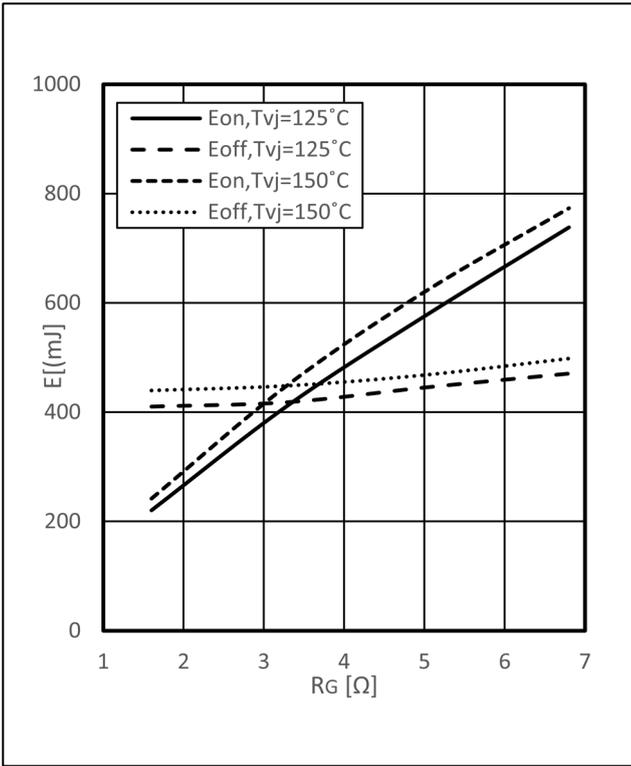| Parameter	Note or test condition	Symbol	Values			Unit
			Min.	Typ.	Max.	
Rated resistance 额定电阻值	Tc = 25°C	R_{25}		5.00		KΩ
Power dissipation 耗散功耗	Tc = 25°C	P_{25}			20	mW
B-value B-Z 值	$R_2=R_{25}exp[B_{25/50}(1/T_2-1/(298, 15K))]$	B_{25}/B_{50}		3375		K
B-value B-Z 值	$R_2=R_{25}exp[B_{25/75}(1/T_2-1/(298, 15K))]$	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}			4000	V
Stray inductance module 杂散电感		L_{sCE}		10		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	3.0		6.0	N.m
Terminal Connection Torque 端子扭矩 I	Screw M4	M	1.8		2.1	N.m
Terminal Connection Torque 端子扭矩 II	Screw M8	M	8.0		10	N.m
Weight of Module 重量		G		1200		g

Technical datasheet

8. Characteristics diagrams

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

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

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

Switching losses IGBT (typical)
$E_{on} = f (I_C)$, $E_{off} = f (I_C)$
$R_{Goff} = 1.6 \, \Omega$, $R_{Gon} = 1.6 \, \Omega$, $V_{CE} = 900 \, V$, $V_{GE} = \pm 15 \, V$

Technical datasheet

Switching losses IGBT (typical)
$E_{on} = f(R_G)$, $E_{off} = f(R_G)$
$I_C = 1400\ A$, $V_{CE} = 900\ V$, $V_{GE} = \pm 15\ V$

Transient thermal impedance IGBT
$Z_{thJC} = f(t)$
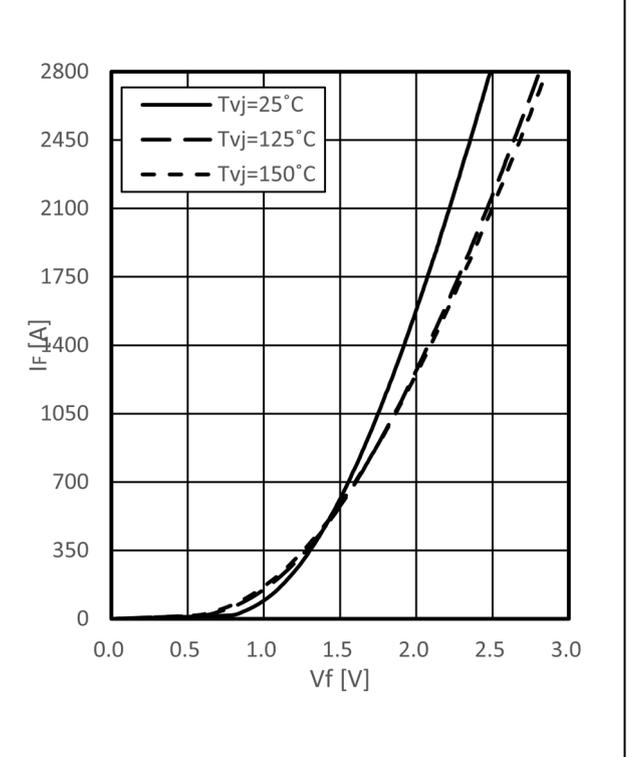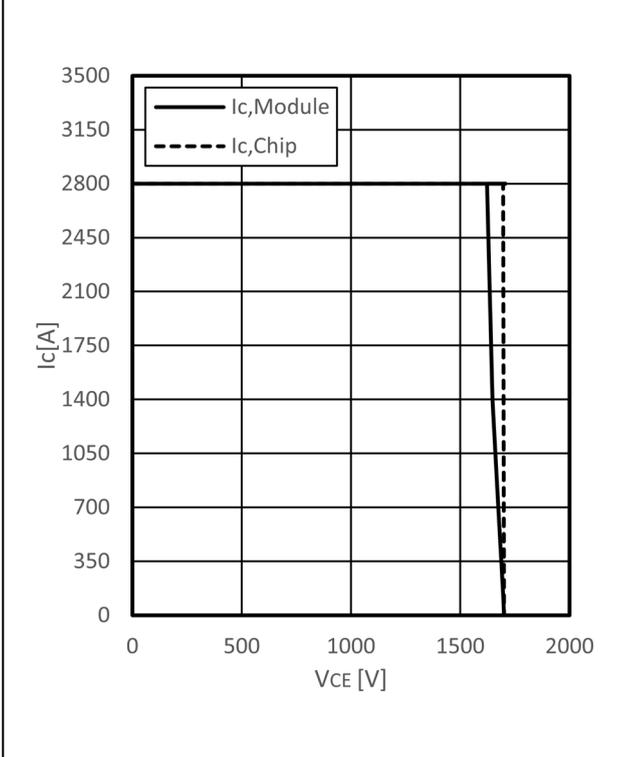
Reverse bias safe operating area IGBT (RBSOA)
$I_C = f(V_{CE})$
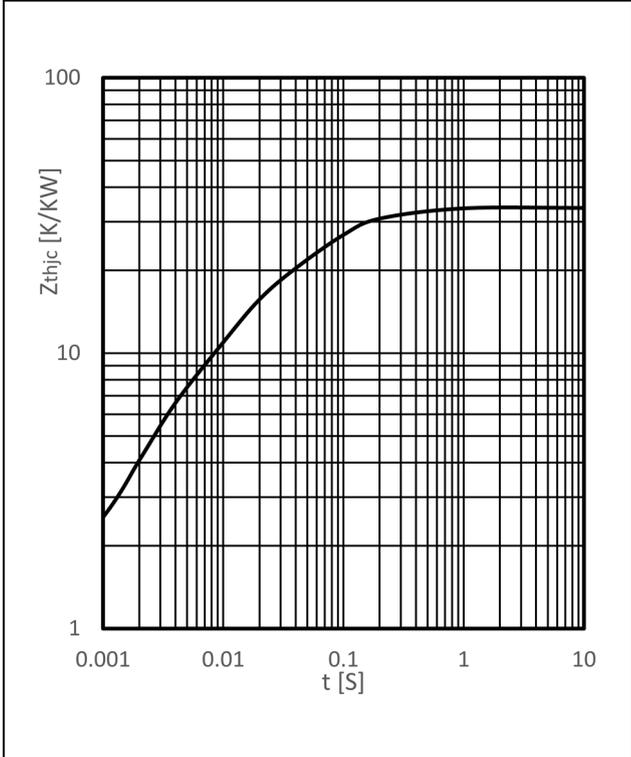$V_{GE} = 15\ V$, $R_{Goff} = 1.6\ \Omega$, $T_{vj} = 150\ °C$

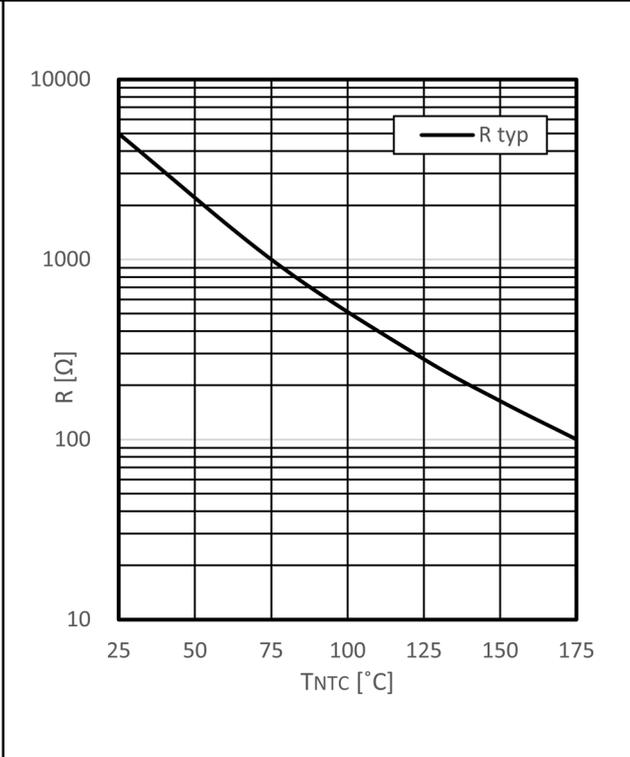**Forward characteristic of Diode (typical)**
$I_F = f(V_F)$

Technical datasheet
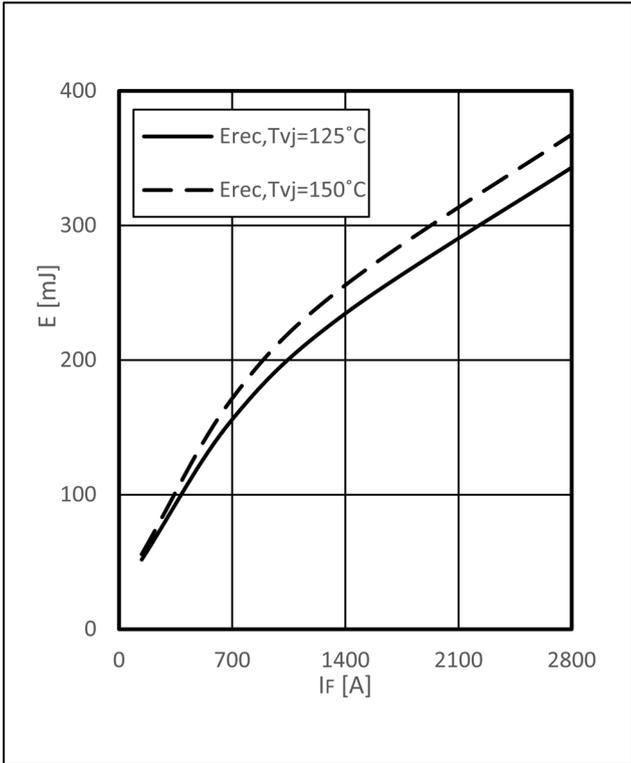
Switching losses Diode (typical)
$E_{rec} = f(I_F)$
$R_{Gon} = 1.6\ \Omega$, $V_{CE} = 900\ V$
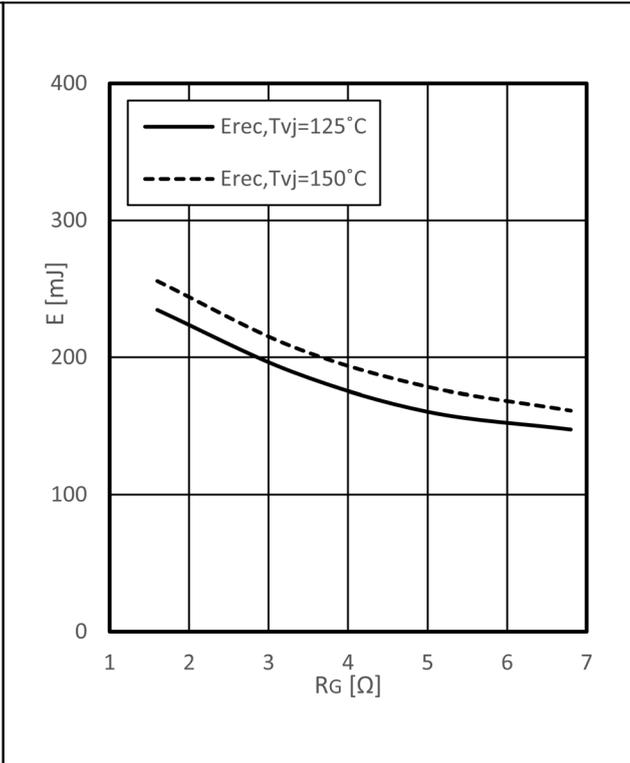
Switching losses Diode (typical)
$E_{rec} = f(R_G)$
$I_F = 1400\ A$, $V_{CE} = 900\ V$

Transient thermal impedance Diode
$Z_{thJC} = f(t)$

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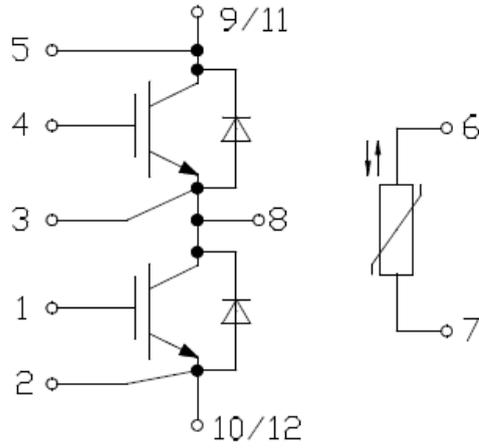$R = f(T_{NTC})$

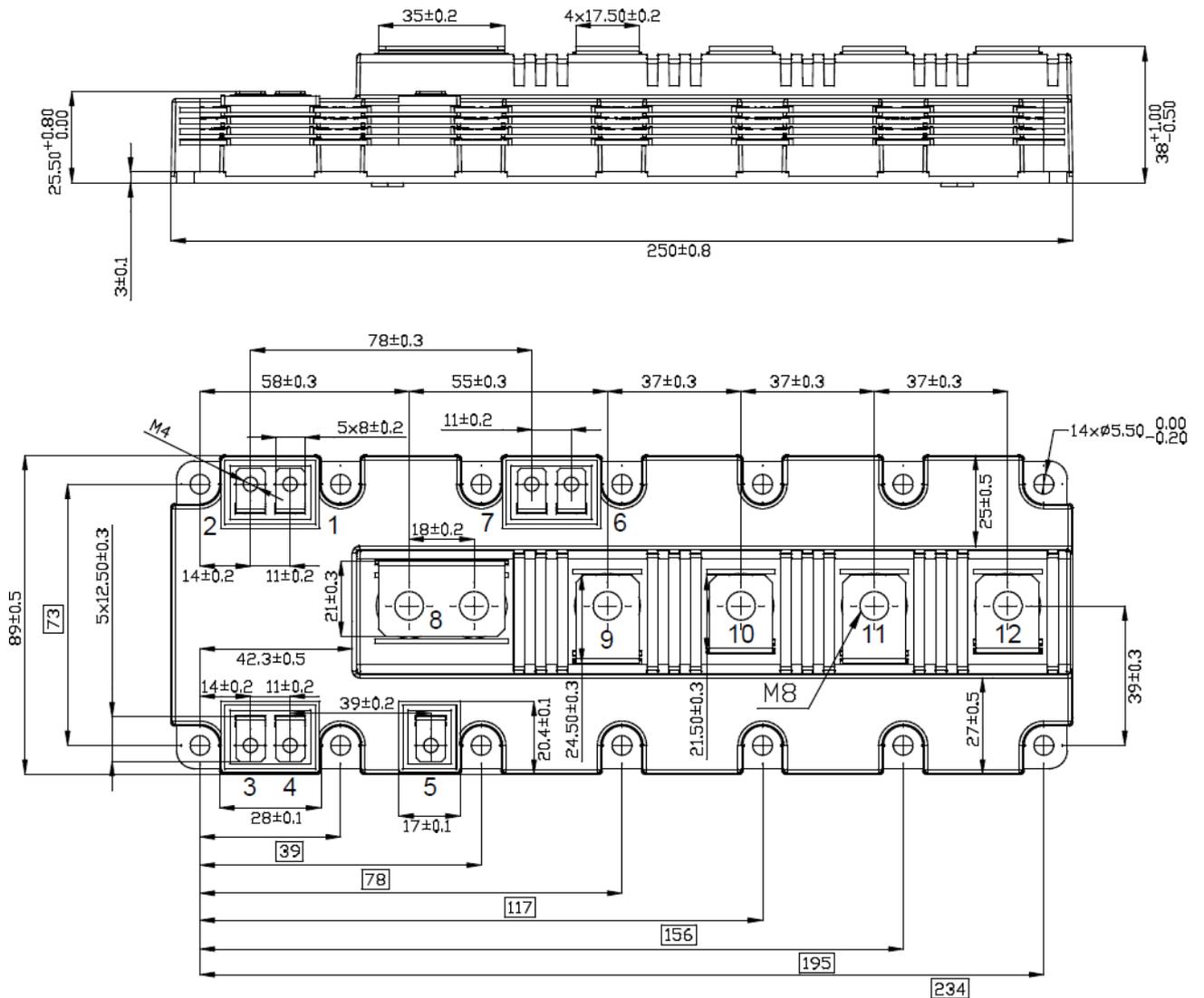## 9. Circuit Diagram

Figure 3

10. Package Outlines

Figure 4