

# 1. Product Features

## 1.1 Electrical features

- $V_{CES}=1200V$
- $I_{C\ nom}=75A / I_{CRM}=150A$
- Low switching losses
- Low inductance
- Fast switching and short tail current
- Integrated NTC temperature sensor
- High power and thermal cycling capability

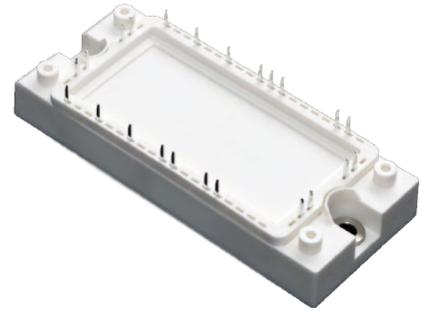


Figure1 IGBT Module

## 1.2 Mechanical features

- $Al_2O_3$  substrate with low thermal resistance
- Copper base plate

# 2. Typical Applications

- Auxiliary inverters
- Motor drives
- Servo drives

# 3. Description

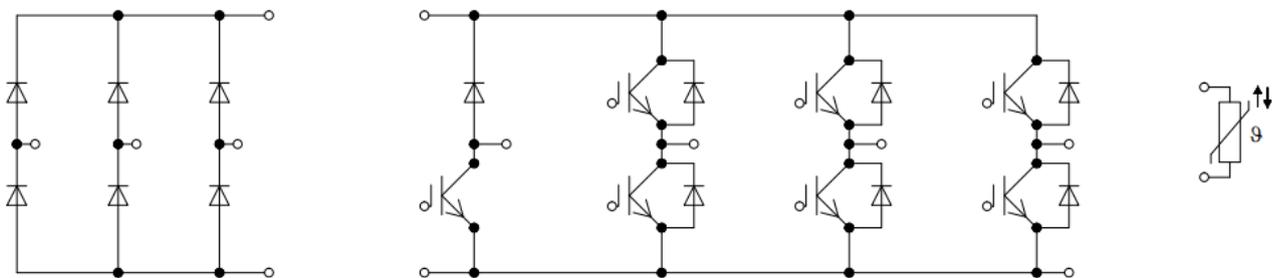


Figure 2 3 Phase Bridge+Rectifier+Brake

## 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	$T_C = 87^{\circ}\text{C}, T_{vj\ max} = 150^{\circ}\text{C}$	$I_{C\ nom}$	75	A
Repetitive peak collector current 集电极峰值电流	$t_P = 1\ ms$	$I_{CRM}$	150	A
Total power dissipation 总功率损耗	$T_C = 25^{\circ}\text{C}, T_{vj\ max} = 175^{\circ}\text{C}$	$P_{tot}$	357	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	$I_C = 75\ A, V_{GE} = 15\ V$	$V_{CE,sat}$		$T_{vj} = 25^{\circ}\text{C}$	1.7	V
				$T_{vj} = 125^{\circ}\text{C}$	1.9	V
				$T_{vj} = 150^{\circ}\text{C}$	2.0	V
Gate threshold voltage 栅极阈值电压	$I_C = 2.8\ mA, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$	$V_{GE,th}$		5.9		V
Gate charge 栅极电荷	$V_{GE} = -15\ V \dots +15\ V$	$Q_G$		0.8		$\mu\text{C}$
Internal gate resistor 内部栅极电阻	$T_{vj} = 25^{\circ}\text{C}$	$R_{Gint}$		2.7		$\Omega$
Input capacitance 输入电容	$f=1\text{MHz}, T_{vj}=25^{\circ}\text{C}, V_{CE}=25\text{V}, V_{GE}=0\text{V}$	$C_{ies}$		9.8		nF
Reverse transfer capacitance 反向传输电容	$f=1\text{MHz}, T_{vj}=25^{\circ}\text{C}, V_{CE}=25\text{V}, V_{GE}=0\text{V}$	$C_{res}$		0.1		nF
Collector-emitter cut-off current 集电极-发射极截止电流	$V_{CE} = 1200\ V, V_{GE} = 0\ V, T_{vj} = 25^{\circ}\text{C}$	$I_{CES}$			1	mA
Gate-emitter leakage current 栅极-发射极漏电流	$V_{CE} = 0\ V, V_{GE} = 20\ V, T_{vj} = 25^{\circ}\text{C}$	$I_{GES}$			100	nA
Turn-on delay time, inductive load 开通延迟时间	$I_C = 75\ A, V_{CE} = 600\ V$ $V_{GE} = +15/-15\ V$ $R_{G,on} = 8.2\ \Omega$	$T_{d,on}$		$T_{vj} = 25^{\circ}\text{C}$	0.13	$\mu\text{s}$
				$T_{vj} = 125^{\circ}\text{C}$	0.15	$\mu\text{s}$
				$T_{vj} = 150^{\circ}\text{C}$	0.16	$\mu\text{s}$
Rise time, inductive load 上升时间	$I_C = 75\ A, V_{CE} = 600\ V$ $V_{GE} = +15/-15\ V$ $R_{G,on} = 8.2\ \Omega$	$T_r$		$T_{vj} = 25^{\circ}\text{C}$	0.06	$\mu\text{s}$
				$T_{vj} = 125^{\circ}\text{C}$	0.08	$\mu\text{s}$
				$T_{vj} = 150^{\circ}\text{C}$	0.08	$\mu\text{s}$

(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	$I_C = 75A, V_{CE} = 600V$ $V_{GE} = +15/-15V$ $R_{G,off} = 8.2\Omega$	$T_{vj} = 25^\circ C$ $T_{vj} = 125^\circ C$ $T_{vj} = 150^\circ C$	$T_{d,off}$		0.27	us
					0.31	
					0.32	
Fall time, inductive load 下降时间	$I_C = 75A, V_{CE} = 600V$ $V_{GE} = +15/-15V$ $R_{G,off} = 8.2\Omega$	$T_{vj} = 25^\circ C$ $T_{vj} = 125^\circ C$ $T_{vj} = 150^\circ C$	$T_f$		0.24	us
					0.36	
					0.44	
Turn-on energy loss per pulse 开通损耗能量	$I_C = 75A, V_{CE} = 600V, L_s = 40nH$ $V_{GE} = +15/-15V, di/dt = 687A/\mu s$ $R_{G,on} = 8.2\Omega (T_{vj} = 150^\circ C)$	$T_{vj} = 25^\circ C$ $T_{vj} = 125^\circ C$ $T_{vj} = 150^\circ C$	$E_{on}$		11.3	mJ
					15.0	
					16.4	
Turn-off energy loss per pulse 关断损耗能量	$I_C = 75A, V_{CE} = 600V, L_s = 40nH$ $V_{GE} = +15/-15V, dv/dt = 4536V/\mu s$ $R_{G,off} = 8.2\Omega (T_{vj} = 150^\circ C)$	$T_{vj} = 25^\circ C$ $T_{vj} = 125^\circ C$ $T_{vj} = 150^\circ C$	$E_{off}$		5.9	mJ
					8.4	
					9.1	
SC data 短路数据	$V_{GE} \leq 15V, V_{CC} = 600V, t_p \leq 8\mu s, T_{vj} = 150^\circ C,$ $C_{GE} = 0.0\mu F, V_{CEmax} = V_{CES} - L_{SCE} \cdot di/dt$		$I_{sc}$		340	A
Thermal resistance, junction to case 结-外壳热阻	Per IGBT		$R_{th,jc}$			0.38 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		$I_F$	75	A
Repetitive peak forward current 正向重复峰值电流	$t_p = 1\text{ ms}$	$I_{FRM}$	150	A

### 5.2 Characteristic value

Parameter	Note or test condition	Symbol	Values			Unit
			Min.	Typ.	Max.	
Forward voltage 正向电压	$I_F = 75\text{ A}, V_{GE} = 0\text{ V}$	$V_F$		1.8	V	
				1.9		
				1.9		

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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	$I_F = 75A, V_R = 600V$ $V_{GE} = -15V, -di_F/dt = 306 A/\mu s$ $(T_{vj}=150^\circ C)$	$I_{RM}$		$T_{vj} = 25^\circ C$ 64.1	A	
				$T_{vj} = 125^\circ C$ 70.9	A	
				$T_{vj} = 150^\circ C$ 73.3	A	
Recovered charge 恢复电荷	$I_F = 75A, V_R = 600V$ $V_{GE} = -15V, -di_F/dt = 306 A/\mu s$ $(T_{vj}=150^\circ C)$	$Q_r$		$T_{vj} = 25^\circ C$ 5.1	$\mu C$	
				$T_{vj} = 125^\circ C$ 9.0	$\mu C$	
				$T_{vj} = 150^\circ C$ 10.8	$\mu C$	
Reverse recovery energy 反向恢复损耗 (每脉冲)	$I_F = 75A, V_R = 600V$ $V_{GE} = -15V, -di_F/dt = 306 A/\mu s$ $(T_{vj}=150^\circ C)$	$E_{rec}$		$T_{vj} = 25^\circ C$ 1.1	mJ	
				$T_{vj} = 125^\circ C$ 2.1	mJ	
				$T_{vj} = 150^\circ C$ 2.7	mJ	
Thermal resistance, junction to case 结—外壳热阻	Per diode	$R_{th,JC}$			0.48	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	$V_F = 1.2, T_{vj} = 150^\circ C$	$I_F$	50	A
Surge forward current 正向浪涌电流	$t_p = 10 ms, T_{vj} = 150^\circ C$	$I_{FSM}$	320	A
$I^2t$ - value $I^2t$ -值	$t_p = 10 ms, T_{vj} = 150^\circ C$	$I^2t$	510	$A^2s$

### 6.2 Characteristic value

Parameter	Note or test condition	Symbol	Values			Unit
			Min.	Typ.	Max.	
Forward voltage 正向电压	$T_{vj} = 150^\circ C, I_F = 50 A$	$V_F$		1.1		V
Reverse current 反向电流	$T_{vj} = 150^\circ C, V_R = 1600 V$	$I_R$		1.0		mA
Thermal resistance, junction to case 结—外壳热阻	Per diode	$R_{th,JC}$			0.63	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	$T_C = 86^{\circ}\text{C}, T_{vj} \text{ max} = 150^{\circ}\text{C}$	$I_{C \text{ nom}}$	50	A
Repetitive peak collector current 集电极峰值电流	$t_P = 1 \text{ ms}$	$I_{CRM}$	100	A
Total power dissipation 总功率损耗	$T_C = 25^{\circ}\text{C}, T_{vj} \text{ max} = 175^{\circ}\text{C}$	$P_{\text{tot}}$	245	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	$I_C = 50 \text{ A}, V_{GE} = 15 \text{ V}$	$V_{CE, \text{sat}}$		1.7		V
	$T_{vj} = 25^{\circ}\text{C}$			2.0		V
	$T_{vj} = 125^{\circ}\text{C}$			2.1		V
	$T_{vj} = 150^{\circ}\text{C}$					V
Gate threshold voltage 栅极阈值电压	$I_C = 0.25 \text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25^{\circ}\text{C}$	$V_{GE, \text{th}}$	5.0	5.8	6.5	V
Gate charge 栅极电荷	$V_{GE} = -15 \text{ V} \dots +15 \text{ V}$	$Q_G$		0.44		$\mu\text{C}$
Internal gate resistor 内部栅极电阻	$T_{vj} = 25^{\circ}\text{C}$	$R_{G \text{ int}}$		2.2		$\Omega$
Input capacitance 输入电容	$f = 1 \text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25 \text{ V}, V_{GE} = 0 \text{ V}$	$C_{\text{ies}}$		6.1		nF
Reverse transfer capacitance 反向传输电容	$f = 1 \text{ MHz}, T_{vj} = 25^{\circ}\text{C}, V_{CE} = 25 \text{ V}, V_{GE} = 0 \text{ V}$	$C_{\text{res}}$		0.1		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	$I_C = 50 \text{ A}, V_{CE} = 600 \text{ V}$	$T_{d, \text{on}}$		$T_{vj} = 25^{\circ}\text{C}$	0.038	us
	$V_{GE} = +15/-15 \text{ V}$			$T_{vj} = 125^{\circ}\text{C}$	0.036	us
	$R_{G, \text{on}} = 6.8 \Omega$			$T_{vj} = 150^{\circ}\text{C}$	0.037	us
Rise time, inductive load 上升时间	$I_C = 50 \text{ A}, V_{CE} = 600 \text{ V}$	$T_r$		$T_{vj} = 25^{\circ}\text{C}$	0.028	us
	$V_{GE} = +15/-15 \text{ V}$			$T_{vj} = 125^{\circ}\text{C}$	0.029	us
	$R_{G, \text{on}} = 6.8 \Omega$			$T_{vj} = 150^{\circ}\text{C}$	0.030	us

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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	$I_C = 50A, V_{CE} = 600V$ $V_{GE} = +15/-15V$ $R_{G,off} = 15\Omega$	$T_{vj} = 25^\circ C$ $T_{vj} = 125^\circ C$ $T_{vj} = 150^\circ C$	$T_{d,off}$		0.157		us
					0.188		us
					0.196		us
Fall time, inductive load 下降时间	$I_C = 50A, V_{CE} = 600V$ $V_{GE} = +15/-15V$ $R_{G,off} = 15\Omega$	$T_{vj} = 25^\circ C$ $T_{vj} = 125^\circ C$ $T_{vj} = 150^\circ C$	$T_f$		0.163		us
					0.285		us
					0.311		us
Turn-on energy loss per pulse 开通损耗能量	$I_C = 50A, V_{CE} = 600V, L_s=40H$ $V_{GE} = +15/-15V, di/dt = 580A/\mu s$ $R_{G,on} = 15\Omega (T_{vj} = 150^\circ C)$	$T_{vj} = 25^\circ C$ $T_{vj} = 125^\circ C$ $T_{vj} = 150^\circ C$	$E_{on}$		3.39		mJ
					4.24		mJ
					4.68		mJ
Turn-off energy loss per pulse 关断损耗能量	$I_C = 50A, V_{CE} = 600V, L_s=40H$ $V_{GE} = +15/-15V, dv/dt = 4700V/\mu s$ $R_{G,off} = 15\Omega (T_{vj} = 150^\circ C)$	$T_{vj} = 25^\circ C$ $T_{vj} = 125^\circ C$ $T_{vj} = 150^\circ C$	$E_{off}$		3.32		mJ
					4.26		mJ
					5.17		mJ
SC data 短路数据	$V_{GE} \leq 15V, V_{CC} = 600V, t_p \leq 8 \mu s, T_{vj} = 150^\circ C,$ $C_{GE} = 0.0\mu F, V_{CEmax} = V_{CES} - L_{SCE} \cdot di/dt$	$I_{sc}$		340		A	
Thermal resistance, junction to case 结-外壳热阻	Per IGBT	$R_{th,jc}$			0.61	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		$I_F$	50	A
Repetitive peak forward current 正向重复峰值电流	$t_p = 1 ms$	$I_{FRM}$	100	A

### 8.2 Characteristic value

Parameter	Note or test condition	Symbol	Values			Unit
			Min.	Typ.	Max.	
Forward voltage 正向电压	$I_F = 50 A, V_{GE} = 0 V$	$V_F$		2.35		V
				2.50		V
				2.50		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	$I_F = 50A, V_R = 600V$ $V_{GE} = -15V, -di_F/dt = 2060 A/\mu s$ $(T_{vj}=150^\circ C)$	$I_{RM}$		$T_{vj} = 25^\circ C$	61	A
				$T_{vj} = 125^\circ C$	76	A
				$T_{vj} = 150^\circ C$	80	A
Recovered charge 恢复电荷	$I_F = 50A, V_R = 600V$ $V_{GE} = -15V, -di_F/dt = 2060 A/\mu s$ $(T_{vj}=150^\circ C)$	$Q_r$		$T_{vj} = 25^\circ C$	3.30	$\mu C$
				$T_{vj} = 125^\circ C$	5.06	$\mu C$
				$T_{vj} = 150^\circ C$	6.05	$\mu C$
Reverse recovery energy 反向恢复损耗 (每脉冲)	$I_F = 50A, V_R = 600V$ $V_{GE} = -15V, -di_F/dt = 2060 A/\mu s$ $(T_{vj}=150^\circ C)$	$E_{rec}$		$T_{vj} = 25^\circ C$	0.79	mJ
				$T_{vj} = 125^\circ C$	1.57	mJ
				$T_{vj} = 150^\circ C$	2.03	mJ
Thermal resistance, junction to case 结-外壳热阻	Per diode	$R_{th,Jc}$			0.8	K/W

## 9. NTC-Thermistor

### 9.1 Characteristic value

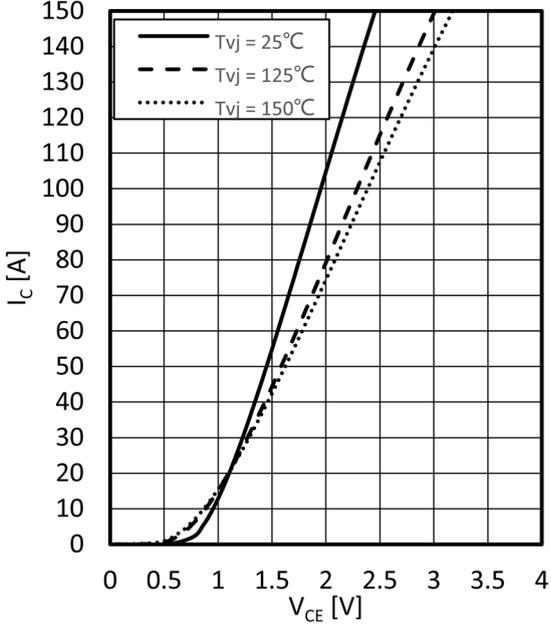
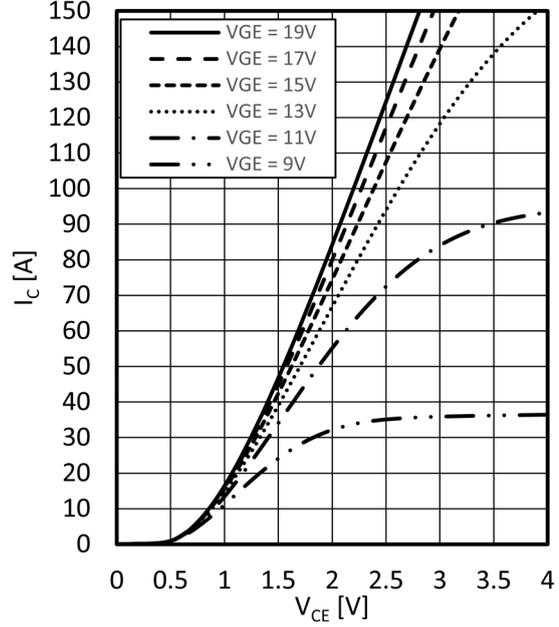
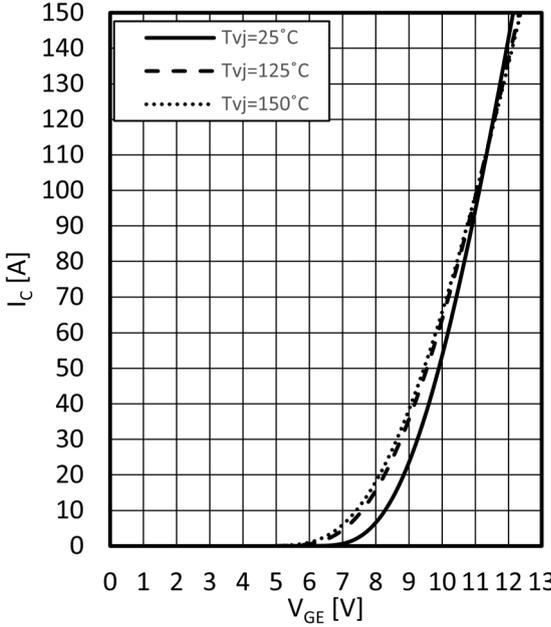
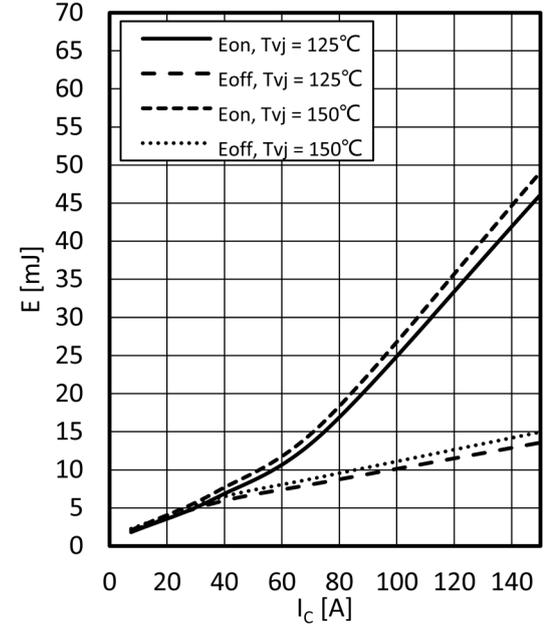
Parameter	Note or test condition	Symbol	Values			Unit
			Min.	Typ.	Max.	
Rated resistance 额定电阻值	$T_c = 25^\circ C$	$R_{25}$		5.00		K $\Omega$
Power dissipation 耗散功耗	$T_c = 25^\circ C$	$P_{25}$			20	mW
B-value B-Z 值	$R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298, 15K))]$	$B_{25}/B_{50}$		3400		K
B-value B-Z 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

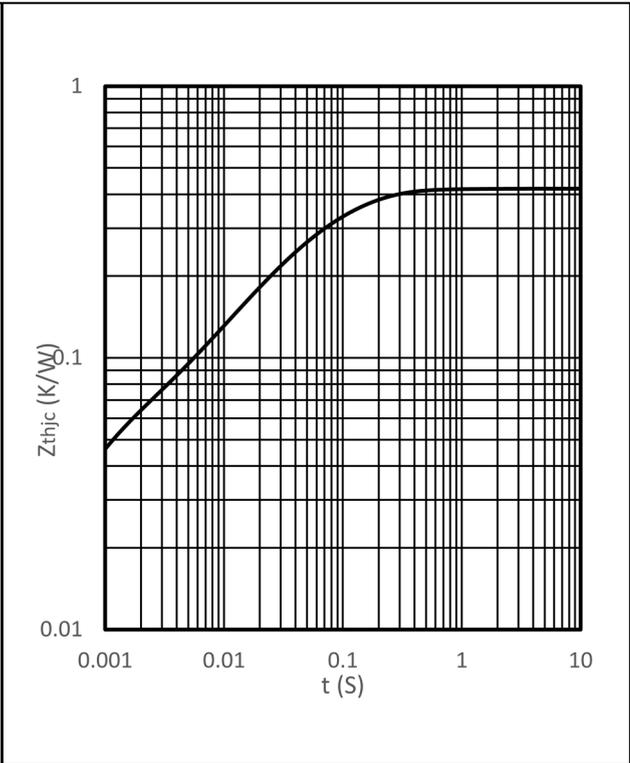
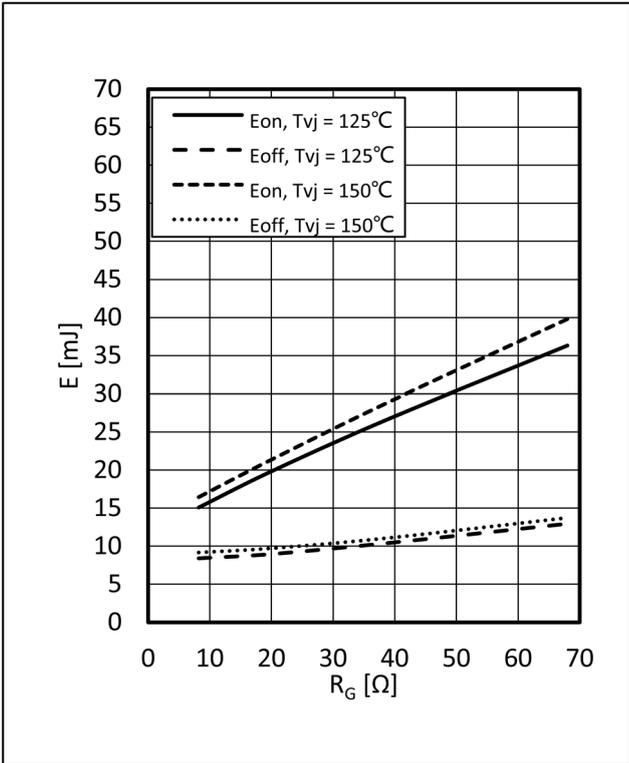
## 10. Module

### 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 <sub>ISOL</sub>			2500	V
Stray inductance module 杂散电感		L <sub>sCE</sub>		35		nH
Operation Junction Temperature 结温		T <sub>jop</sub>	-40		150	°C
Storage Temperature Range 存储温度范围		T <sub>stg</sub>	-40		125	°C
Mounting Torque 安装扭矩	Screw M5	M	3		6	N.m
Weight of Module 重量		G		180		g

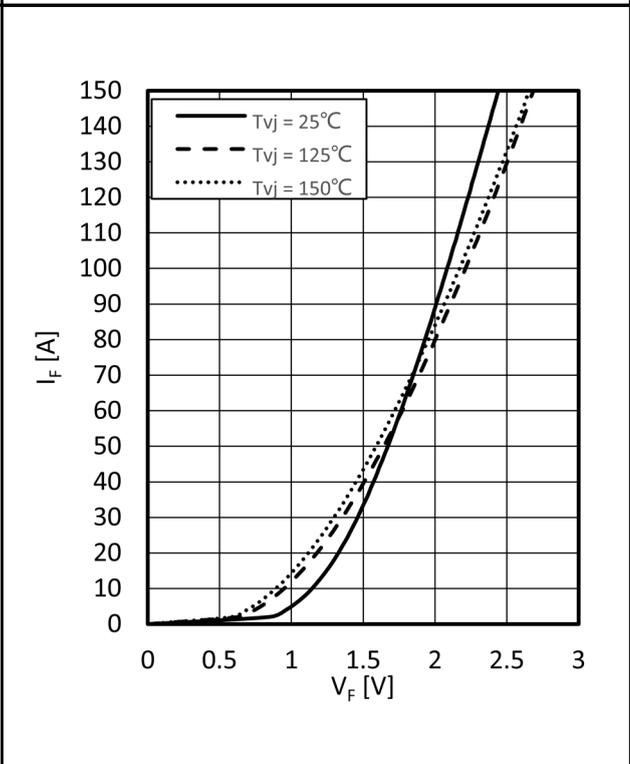
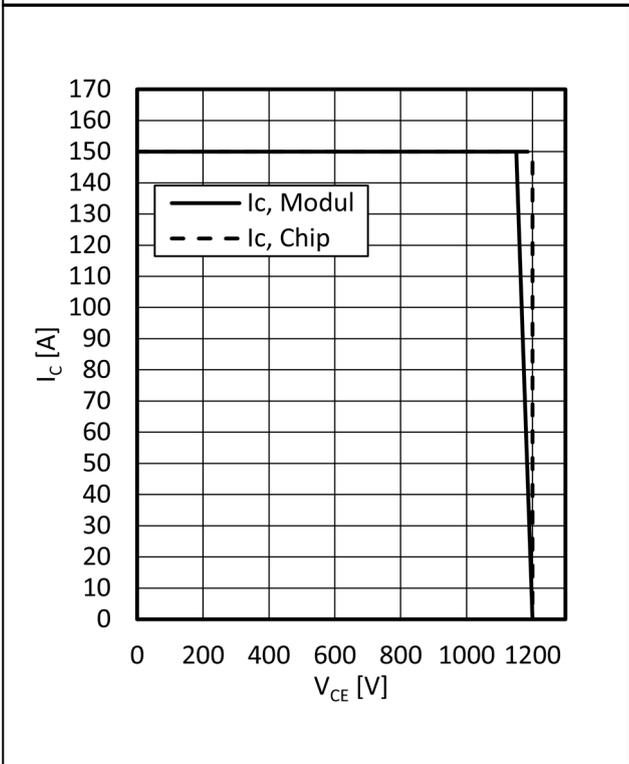
### 11. Characteristics diagrams

	
<p><b>Output characteristic IGBT, Inverter (typical)</b>  <math>I_c = f(V_{CE}), V_{GE} = 15V</math></p>	<p><b>Output characteristic IGBT, Inverter (typical)</b>  <math>I_c = f(V_{CE}), T_{vj} = 150^\circ C</math></p>
	
<p><b>Transfer characteristic IGBT, Inverter (typical)</b>  <math>I_c = f(V_{GE}), V_{CE} = 20V</math></p>	<p><b>Switching losses IGBT, Inverter (typical)</b>  <math>E_{on} = f(I_c), E_{off} = f(I_c), V_{GE} = \pm 15V, R_{Gon} = 8.2 \Omega</math>  <math>R_{Goff} = 8.2 \Omega, V_{CE} = 600V</math></p>



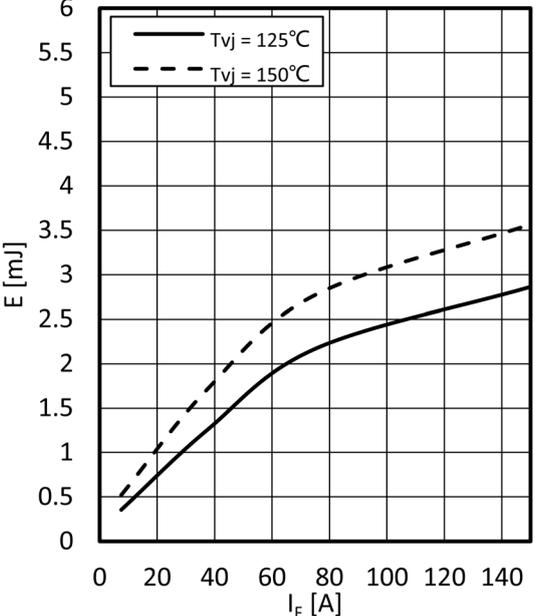
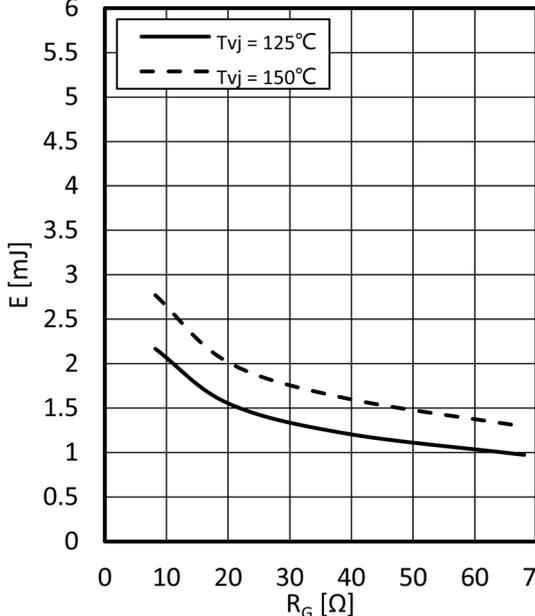
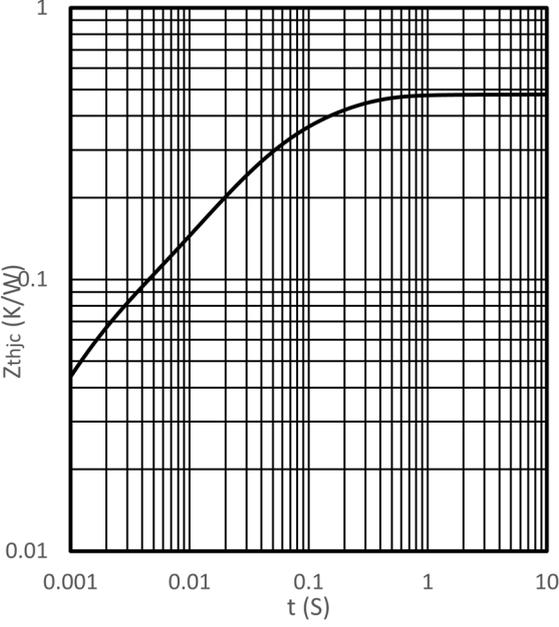
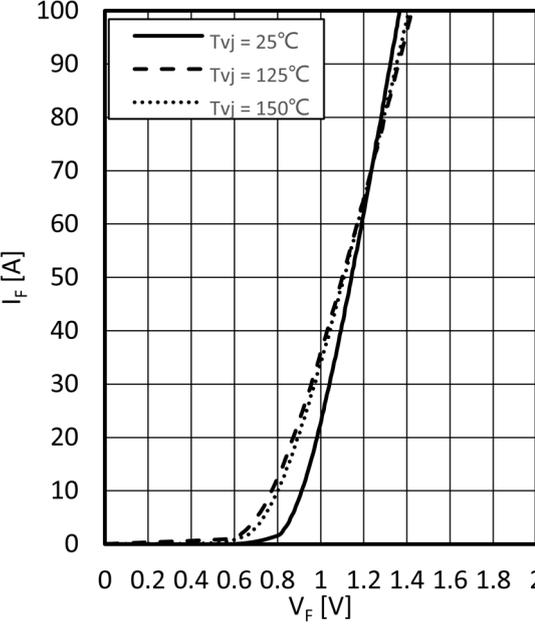
**Switching losses IGBT, Inverter (typical)**  
 $E_{on} = f(R_G)$ ,  $E_{off} = f(R_G)$ ,  $V_{GE} = \pm 15\text{V}$ ,  $I_C = 75\text{A}$ ,  $V_{CE} = 600\text{V}$

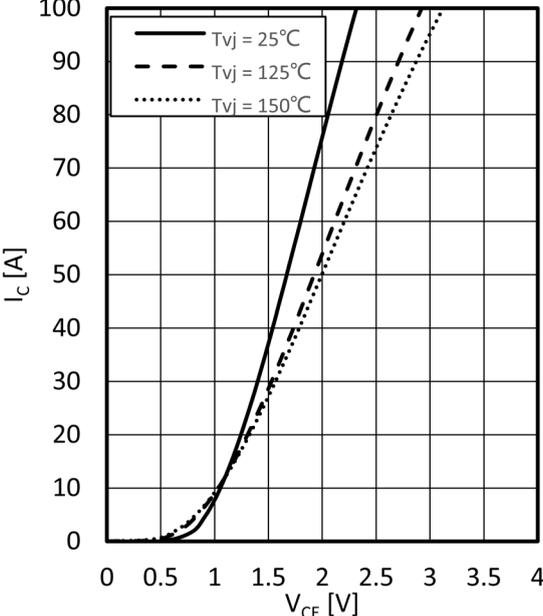
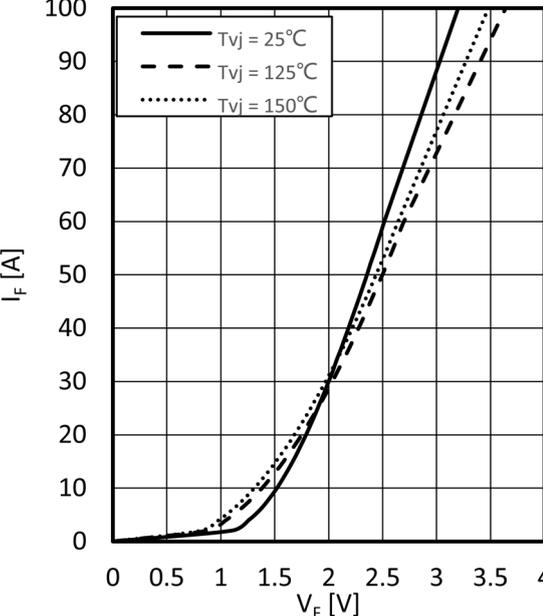
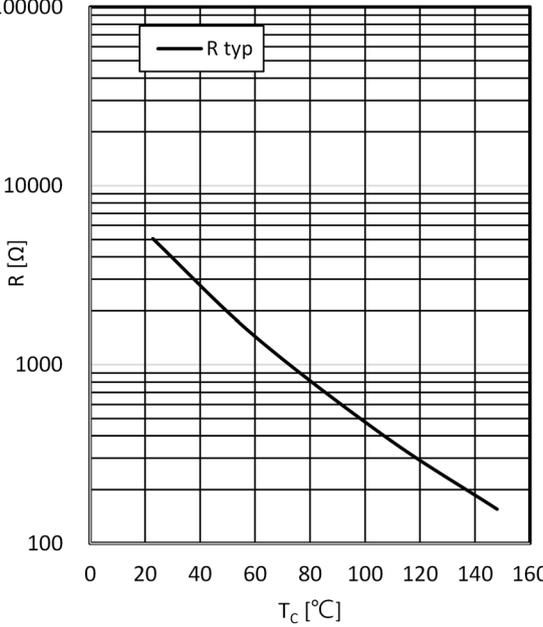
**Transient thermal impedance IGBT, Inverter**  
 $Z_{thjc} = f(t)$



**Reverse bias safe operating area IGBT, Inverter (RBSOA)**  
 $I_C = f(V_{CE})$ ,  $V_{GE} = \pm 15\text{V}$ ,  $R_{Goff} = 8.2\Omega$ ,  $T_{vj} = 150^\circ\text{C}$

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

	
<p><b>Switching losses Diode, Inverter (typical)</b>  <math>E_{rec} = f(I_F), R_{Gon} = 8.2 \Omega, V_{CE} = 600V</math></p>	<p><b>Switching losses Diode, Inverter (typical)</b>  <math>E_{rec} = f(R_G), I_F = 75 A, V_{CE} = 600V</math></p>
	
<p><b>Transient thermal impedance Diode Inverter</b>  <math>Z_{thjC} = f(t)</math></p>	<p><b>Forward characteristic of Diode, Rectifier (typical)</b>  <math>I_F = f(V_F)</math></p>

	
<p><b>Output characteristic IGBT, Brake-Chopper (typical)</b>  <math>I_c = f(V_{CE}), V_{GE} = 15V</math></p>	<p><b>Forward characteristic of Diode, Brake-Chopper (typical)</b>  <math>I_F = f(V_F)</math></p>
	
<p><b>NTC-Thermistor-temperature characteristic (typical)</b>  <math>R=f(T)</math></p>	

## 12. Circuit Diagram

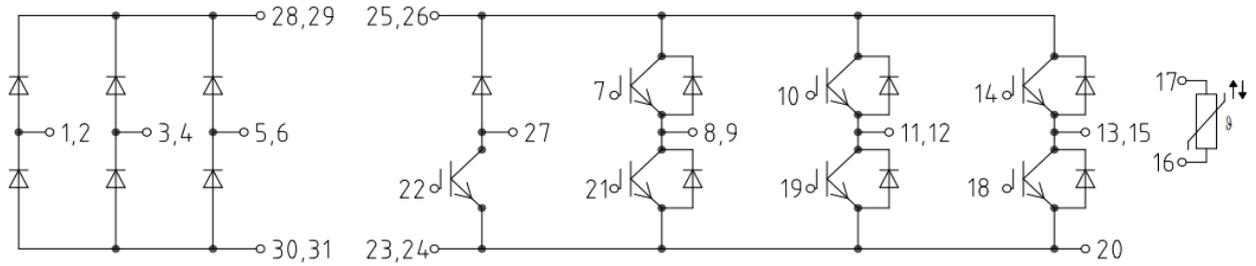


Figure 3

## 13. Package Outlines

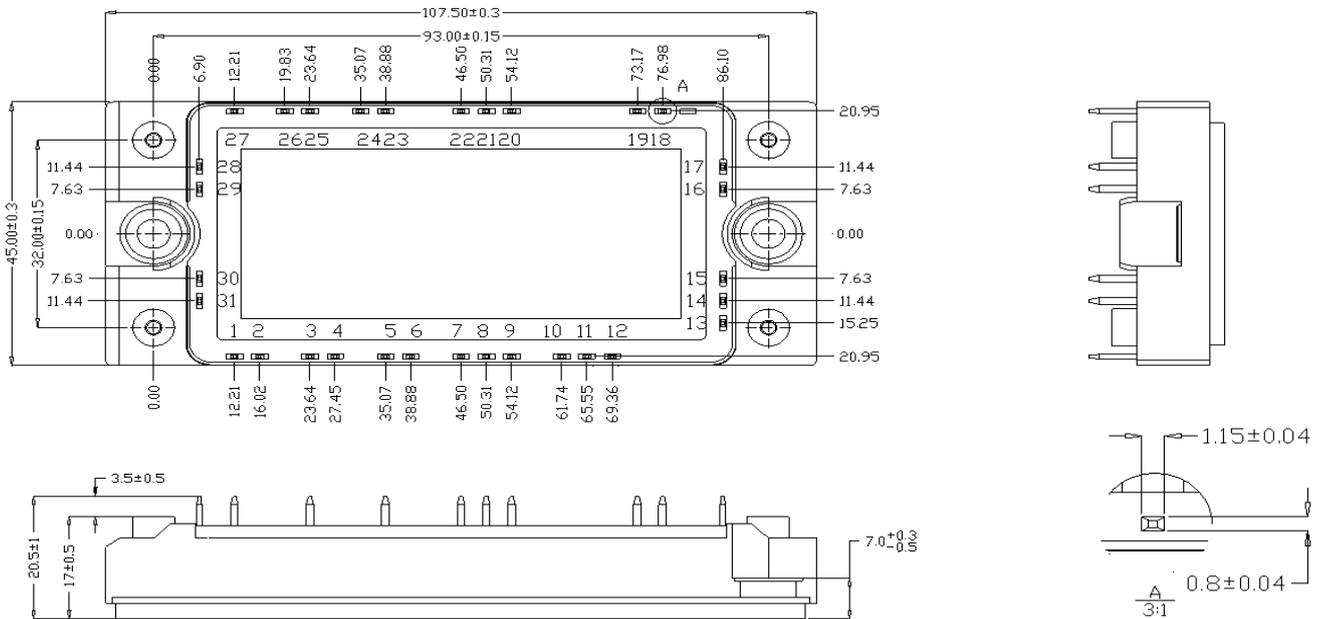


Figure 4