

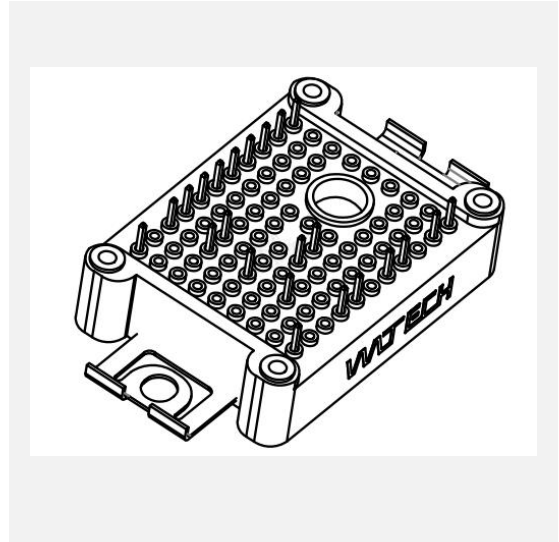
# PIM IGBT Power Module

## 初步规格书/Preliminary Datasheet

### 产品特性 / Product Features

- Low switching losses  
低开关损耗
- Low  $V_{CE(sat)}$  losses  
低  $V_{CE(sat)}$
- Low stray inductance design  
低电感设计
- Maximum junction temperature 175°C  
最大结温 175°C
- RoHS compliant  
符合 RoHS 标准

**HP15R12W1**



### 产品应用 / Product Applications

- Industrial application  
工业应用
- Solar String Inverter  
太阳能组串逆变器
- Energy Storage Inverter  
储能逆变器
- UPS  
UPS 系统

### 典型参数 / Typical Performance Parameters

Type	$V_{CE}$	$I_C$	$I_F$	$T_{vjmax}$	Marking	Package
HP15R12W1	1200V	15A	15A	175°C	HP15R12W1	W1

## IGBT(T1-T6)最大额定值 / IGBT (T1-T6) Maximum Rated Values

参数 Parameters	符号 Symbol	工作条件 Test Conditions	额定值 Ratings	Unit
集电极-发射极电压 Collector-emitter voltage	$V_{CES}$	$T_{vj} = 25^{\circ}\text{C}$	1200	V
连续集电极直流电流 Continuous DC collector current	$I_{C\text{ nom}}$	$T_C = 100^{\circ}\text{C}, T_{vj\text{ max}} = 175^{\circ}\text{C}$	15	A
	$I_C$	$T_C = 25^{\circ}\text{C}, T_{vj\text{ max}} = 175^{\circ}\text{C}$	23	A
集电极脉冲电流 Pulsed Collector Current	$I_{CRM}$	$t_p = 1\text{ ms}$	30	A
功率损耗 Power dissipation	$P_{tot}$	$T_C = 25^{\circ}\text{C}, T_{vj\text{ max}} = 175^{\circ}\text{C}$	167	W
栅极-发射极峰值电压 Gate-emitter peak voltage	$V_{GES}$	$V_{CE} = 0\text{V}, V_{GS} = 100\mu\text{A}$	$\pm 20$	V

## IGBT(T1-T6)特征值 / IGBT (T1-T6) Characteristic Values

( $T_{vj} = 25^{\circ}\text{C}$ , unless otherwise specified)

参数 Parameters	符号 Symbol	工作条件 Test Conditions	最小值 Min.	典型值 Typ.	最大值 Max.	单位 Unit
集电极-发射极饱和电压 Collector-emitter saturation voltage	$V_{CE(sat)}$	$I_C = 15\text{A}$ $V_{GE} = 15\text{V}$ $T_{vj} = 25^{\circ}\text{C}$ $T_{vj} = 125^{\circ}\text{C}$ $T_{vj} = 150^{\circ}\text{C}$		1.74 2.04 2.11	2.2	V
栅极阈值电压 Gate Threshold Voltage	$V_{GEth}$	$V_{GE} = V_{CE}, I_C = 0.375\text{mA}$	5.2	6.1	6.5	V
栅极电荷 Gate-charge	$Q_G$	$V_{GE} = -15\text{V} \dots +15\text{V}$		0.20		$\mu\text{C}$
内部栅极电阻 Internal gate resistor	$R_{Gint}$			1.41		$\Omega$
输入电容 Input capacitance	$C_{ies}$	$f = 1\text{ MHz}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$		3.46		nF
反向传输电容 Reverse transfer capacitance	$C_{res}$	$f = 1\text{ MHz}, V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$		0.026		nF
集电极-发射极截止电流 Collector-emitter cut-off current	$I_{CES}$	$V_{CE} = 1200, V_{GE} = 0\text{V}$			1.0	mA

栅极-发射极漏电流 Gate-emitter leakage current	$I_{GES}$	$V_{GE}=V_{CE}, V_{GE}=20V$			500	nA
---	-----------	-----------------------------	--	--	-----	----

参数 Parameters	符号 Symbol	工作条件 Test Conditions	最小值 Min.	典型值 Typ.	最大值 Max.	单位 Unit
开通损耗能量 Turn-On Switching Energy	$E_{on}$	$V_{CE}=600V, I_C=15A$ $T_{vj}=25^{\circ}C$ $R_{gext}=24\Omega, V_{GE}=\pm 15V$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$		0.75 1.31 1.43		mJ
关断损耗能量 Turn Off Switching Energy	$E_{off}$	$V_{CE}=600V, I_C=15A$ $T_{vj}=25^{\circ}C$ $R_{gext}=24\Omega, V_{GE}=\pm 15V$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$		1.17 1.49 1.64		
开通延迟时间 Turn-On Delay Time	$t_{d(on)}$	$V_{CE}=600V, I_C=15A$ $T_{vj}=25^{\circ}C$ $R_{gext}=24\Omega, V_{GE}=\pm 15V$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$		102 106 106		ns
上升时间 Rise Time	$t_r$	$V_{CE}=600V, I_C=15A$ $T_{vj}=25^{\circ}C$ $R_{gext}=24\Omega, V_{GE}=\pm 15V$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$		21 25 27		
关断延迟时间 Turn-Off Delay Time	$t_{d(off)}$	$V_{CE}=600V, I_C=15A$ $T_{vj}=25^{\circ}C$ $R_{gext}=24\Omega, V_{GE}=\pm 15V$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$		149 176 180		
下降时间 Fall Time	$t_f$	$V_{CE}=600V, I_C=15A$ $T_{vj}=25^{\circ}C$ $R_{gext}=24\Omega, V_{GE}=\pm 15V$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$		281 436 460		
结-壳热阻 Thermal Resistance from Junction to Case	$R_{th(j-c)}$	Per IGBT		0.78	0.90	$^{\circ}C/W$
在开关状态下温度 Temperature under switching conditions	$T_{vj,op}$		-40		150	$^{\circ}C$

## 二极管(D1-D6)最大额定值 / Diode(D1-D6) Maximum Rated Values

参数 Parameters	符号 Symbol	工作条件 Test Conditions	额定值 Ratings	Unit
反向重复峰值电压 Repetitive peak reverse voltage	$V_{RRM}$	$T_{vj}=25^{\circ}C$	1200	V

连续正向直流电流 Continuous DC forward current	$I_F$		15	A
正向重复峰值电流 Repetitive peak forward current	$I_{FRM}$	$t_P = 1 \text{ ms}$	30	A
$I^2t$ -值 $I^2t$ -value	$I^2t$	VR = 0 V, $t_P = 10 \text{ ms}$ , $T_{vj}=125^\circ\text{C}$ VR = 0 V, $t_P = 10 \text{ ms}$ , $T_{vj}=150^\circ\text{C}$	36.98 32	$\text{A}^2\text{s}$

## 二极管(D1-D6)特征值 / Diode(D1-D6) Characteristic Values

参数 Parameters	符号 Symbol	工作条件 Test Conditions	最小值 Min.	典型值 Typ.	最大值 Max.	单位 Unit
正向电压 Forward voltage	$V_F$	$I_F = 15\text{A}$ , $V_{GE} = 0\text{V}$ , $T_{vj} = 25^\circ\text{C}$ $I_F = 15\text{A}$ , $V_{GE} = 0\text{V}$ , $T_{vj} = 125^\circ\text{C}$ $I_F = 15\text{A}$ , $V_{GE} = 0\text{V}$ , $T_{vj} = 150^\circ\text{C}$		2.32 2.15 2.11	2.5	V
反向恢复峰值电流 Peak reverse recovery current	$I_{RM}$	$V_R = 600\text{V}$ , $I_F = 15\text{A}$ , $T_{vj} = 25^\circ\text{C}$ $V_{GE} = -15\text{V}$ , $T_{vj} = 125^\circ\text{C}$ $-di_F/dt = 530\text{A}/\mu\text{s}$ ( $T_{vj} = 150^\circ\text{C}$ ), $T_{vj} = 150^\circ\text{C}$		11.43 12.31 13.28		A
恢复电荷 Reverse Recovery Charge	$Q_{rr}$	$V_R = 600\text{V}$ , $I_F = 15\text{A}$ , $T_{vj} = 25^\circ\text{C}$ $V_{GE} = -15\text{V}$ , $T_{vj} = 125^\circ\text{C}$ $-di_F/dt = 530\text{A}/\mu\text{s}$ ( $T_{vj} = 150^\circ\text{C}$ ), $T_{vj} = 150^\circ\text{C}$		0.86 1.77 2.08		$\mu\text{C}$
反向恢复损耗 Reverse recovery energy	$E_{rec}$	$V_R = 600\text{V}$ , $I_F = 15\text{A}$ , $T_{vj} = 25^\circ\text{C}$ $V_{GE} = -15\text{V}$ , $T_{vj} = 125^\circ\text{C}$ $-di_F/dt = 530\text{A}/\mu\text{s}$ ( $T_{vj} = 150^\circ\text{C}$ ), $T_{vj} = 150^\circ\text{C}$		0.38 0.75 0.98		mJ
结-壳热阻 Thermal Resistance from Junction to Case	$R_{th(j-c)}$	per diode		2.03	2.33	$^\circ\text{C}/\text{W}$
在开关状态下温度 Temperature under switching condition	$T_{vj,op}$		-40		150	$^\circ\text{C}$

## IGBT(T7)最大额定值 / IGBT (T7) Maximum Rated Values

参数 Parameters	符号 Symbol	工作条件 Test Conditions	额定值 Ratings	Unit
集电极-发射极电压 Collector-emitter voltage	$V_{CES}$	$V_{GE} = 0V, I_C = 1mA, T_{vj} = 25^\circ C$	1200	V
连续集电极直流电流 Continuous DC collector current	$I_{C\ nom}$	$T_C = 100^\circ C, T_{vj\ max} = 175^\circ C$	15	A
	$I_C$	$T_C = 25^\circ C, T_{vj\ max} = 175^\circ C$	23	A
集电极脉冲电流 Pulsed Collector Current	$I_{CRM}$	$t_p = 1\ ms$	30	A
功率损耗 Power dissipation	$P_{tot}$	$T_C = 25^\circ C, T_{vj\ max} = 175^\circ C$	167	W
栅极-发射极峰值电压 Gate-emitter peak voltage	$V_{GES}$	$V_{CE} = 0V, V_{GS} = 100\ \mu A$	$\pm 20$	V

## IGBT(T7)特征值 / IGBT (T7) Characteristic Values

( $T_{vj} = 25^\circ C$ , unless otherwise specified)

参数 Parameters	符号 Symbol	工作条件 Test Conditions	最小值 Min.	典型值 Typ.	最大值 Max.	单位 Unit
集电极-发射极饱和电压 Collector-emitter saturation voltage	$V_{CE(sat)}$	$I_C = 15A, T_{vj} = 25^\circ C$ $V_{GE} = 15V, T_{vj} = 125^\circ C$ $T_{vj} = 150^\circ C$		1.74 2.04 2.11	2.2	V
栅极阈值电压 Gate Threshold Voltage	$V_{GEth}$	$V_{GE} = V_{CE}, I_C = 0.375mA$	5.2	6.1	6.5	V
栅极电荷 Gate-charge	$Q_G$	$V_{GE} = -15V \dots +15V$		0.20		$\mu C$
内部栅极电阻 Internal gate resistor	$R_{Gint}$			1.41		$\Omega$
输入电容 Input capacitance	$C_{ies}$	$f = 1\ MHz, V_{CE} = 25\ V, V_{GE} = 0\ V$		3.46		nF
反向传输电容 Reverse transfer capacitance	$C_{res}$	$f = 1\ MHz, V_{CE} = 25\ V, V_{GE} = 0\ V$		0.026		nF
集电极-发射极截止电流 Collector-emitter cut-off current	$I_{CES}$	$V_{CE} = 1200, V_{GE} = 0V$			1.0	mA

栅极-发射极漏电流 Gate-emitter leakage current	$I_{GES}$	$V_{GE}=V_{CE}, V_{GE}=20V$			500	nA
---	-----------	-----------------------------	--	--	-----	----

参数 Parameters	符号 Symbol	工作条件 Test Conditions	最小值 Min.	典型值 Typ.	最大值 Max.	单位 Unit
开通损耗能量 Turn-On Switching Energy	$E_{on}$	$V_{CE}=600V, I_C=15A$ $T_{vj}=25^{\circ}C$ $R_{gext}=33\Omega, V_{GE}=\pm 15V$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$		0.89 1.33 1.38		mJ
关断损耗能量 Turn Off Switching Energy	$E_{off}$	$V_{CE}=600V, I_C=15A$ $T_{vj}=25^{\circ}C$ $R_{gext}=33\Omega, V_{GE}=\pm 15V$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$		1.19 1.73 1.78		
开通延迟时间 Turn-On Delay Time	$t_{d(on)}$	$V_{CE}=600V, I_C=15A$ $T_{vj}=25^{\circ}C$ $R_{gext}=33\Omega, V_{GE}=\pm 15V$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$		127 127 127		ns
上升时间 Rise Time	$t_r$	$V_{CE}=600V, I_C=15A$ $T_{vj}=25^{\circ}C$ $R_{gext}=33\Omega, V_{GE}=\pm 15V$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$		46 52 53		
关断延迟时间 Turn-Off Delay Time	$t_{d(off)}$	$V_{CE}=600V, I_C=15A$ $T_{vj}=25^{\circ}C$ $R_{gext}=33\Omega, V_{GE}=\pm 15V$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$		147 169 173		
下降时间 Fall Time	$t_f$	$V_{CE}=600V, I_C=15A$ $T_{vj}=25^{\circ}C$ $R_{gext}=33\Omega, V_{GE}=\pm 15V$ $T_{vj}=125^{\circ}C$ $T_{vj}=150^{\circ}C$		320 399 412		
结-壳热阻 Thermal Resistance from Junction to Case	$R_{th(j-c)}$	Per IGBT		0.81	0.93	$^{\circ}C/W$
在开关状态下温度 Temperature under switching conditions	$T_{vj,op}$		-40		150	$^{\circ}C$

## 二极管(D7)最大额定值 / Diode (D7) Maximum Rated Values

参数 Parameters	符号 Symbol	工作条件 Test Conditions	额定值 Ratings	Unit
反向重复峰值电压 Repetitive peak reverse voltage	$V_{RRM}$	$T_{vj}=25^{\circ}C$	1200	V
连续正向直流电流 Continuous DC forward current	$I_F$		15	A

正向重复峰值电流 Repetitive peak forward current	$I_{FRM}$	$t_P = 1 \text{ ms}$	30	A
I <sup>2</sup> t-值 I <sup>2</sup> t-value	$I^2t$	VR = 0 V, tP = 10 ms, T <sub>vj</sub> =125°C VR = 0 V, tP = 10 ms, T <sub>vj</sub> =150°C	30.42 28.88	A <sup>2</sup> s

## 二极管(刹车)特征值 / Diode (Brake) Characteristic Values

参数 Parameters	符号 Symbol	工作条件 Test Conditions	最小值 Min.	典型值 Typ.	最大值 Max.	单位 Unit
正向电压 Forward voltage	$V_F$	$I_F = 15A, V_{GE} = 0V, T_{vj} = 25^\circ C$ $I_F = 15A, V_{GE} = 0V, T_{vj} = 125^\circ C$ $I_F = 15A, V_{GE} = 0V, T_{vj} = 150^\circ C$		2.32 2.15 2.11	2.5	V
反向恢复峰值电流 Peak reverse recovery current	$I_{RM}$	$V_R = 600V, I_F = 15A, T_{vj} = 25^\circ C$ $V_{GE} = -15V, T_{vj} = 125^\circ C$ $-di_F/dt = 245A/\mu s (T_{vj} = 150^\circ C), T_{vj} = 150^\circ C$		11.43 12.31 13.28		A
恢复电荷 Reverse Recovery Charge	$Q_{rr}$	$V_R = 600V, I_F = 15A, T_{vj} = 25^\circ C$ $V_{GE} = -15V, T_{vj} = 125^\circ C$ $-di_F/dt = 245A/\mu s (T_{vj} = 150^\circ C), T_{vj} = 150^\circ C$		0.86 1.77 2.08		$\mu C$
反向恢复损耗 Reverse recovery energy	$E_{rec}$	$V_R = 600V, I_F = 15A, T_{vj} = 25^\circ C$ $V_{GE} = -15V, T_{vj} = 125^\circ C$ $-di_F/dt = 245A/\mu s (T_{vj} = 150^\circ C), T_{vj} = 150^\circ C$		0.38 0.75 0.98		mJ
结-壳热阻 Thermal Resistance from Junction to Case	$R_{th(j-c)}$	per diode		2.03	2.33	$^\circ C/W$
在开关状态下温度 Temperature under switching condition	$T_{vj,op}$		-40		150	$^\circ C$

## 二极管(整流)最大额定值 / Diode (Rectifier) Maximum Rated Values

参数 Parameters	符号 Symbol	工作条件 Test Conditions	额定值 Ratings	单位 Unit
反向重复峰值电压 Repetitive peak reverse voltage	$V_{RRM}$	$T_{vj} = 25^\circ C$	1600	V
最大正向均方根电流(每芯片) Max. R.M.S forward current per diode	$I_{RMSM}$	$T_C = 100^\circ C$	15	A

最大整流器输出均方根电流 Max. R.M.S current at rectifier output	$I_{FSM}$	$T_C=100^\circ\text{C}$	30	A
正向浪涌电流 Surge forward current	$I_{FRM}$	$t_p = 10 \text{ ms}, T_{vj}=125^\circ\text{C}$	30	A
I <sup>2</sup> t-值 I <sup>2</sup> t-value	$I^2t$	$V_R = 0 \text{ V}, t_P = 10 \text{ ms}, T_{vj}=125^\circ\text{C}$ $V_R = 0 \text{ V}, t_P = 10 \text{ ms}, T_{vj}=150^\circ\text{C}$	264.5 255.38	A <sup>2</sup> s

## 二极管(整流)特征值 / Diode (Rectifier) Characteristic Values

参数 Parameters	符号 Symbol	工作条件 Test Conditions	最小值 Min.	典型值 Typ.	最大值 Max.	单位 Unit
正向电压 Forward voltage	$V_F$	$I_F = 15\text{A}, T_{vj} = 25^\circ\text{C}$ $I_F = 15\text{A}, T_{vj} = 125^\circ\text{C}$ $I_F = 15\text{A}, T_{vj} = 150^\circ\text{C}$		1.14 1.09 1.08	1.8	V
反向电流 Reverse leakage current	$I_R$	$V_R = 1600\text{V}, T_{vj}=25^\circ\text{C}$ $V_R = 1600\text{V}, T_{vj}=125^\circ\text{C}$ $V_R = 1600\text{V}, T_{vj}=150^\circ\text{C}$			1	mA
结-壳热阻 Thermal Resistance from Junction to Case	$R_{th(j-c)}$	每个二极管/per diode		1.04	1.20	$^\circ\text{C}/\text{W}$

## 负温度系数热敏电阻 / NTC-Thermistor Characteristic Values

参数 Parameters	符号 Symbol	工作条件 Test Conditions	最小值 Min.	典型值 Typ.	最大值 Max.	单位 Unit
额定电阻值 Rated resistance	$R_{25}$	$T_C=25^\circ\text{C}$		5		k $\Omega$
R100 偏差 Deviation of R100	R/R	$T_C = 100^\circ\text{C}, R_{100} = 493$	-5		5	%
耗散功率 Power Dissipation	$P_{25}$	$T_C=25^\circ\text{C}$			20	mW
B-值 B-value	$B_{25/50}$	$R_2 = R_{25} \exp [B_{25/50}(1/T_2 - 1/(298,15 \text{ K}))]$		3375		K
B-值 B-value	$B_{25/80}$	$R_2 = R_{25} \exp [B_{25/80}(1/T_2 - 1/(298,15 \text{ K}))]$		3411		K



B-值 B-value	B <sub>25/100</sub>	$R2 = R25 \exp [B25/100(1/T2 - 1/(298,15 K))]$		3433		K
----------------	---------------------	--	--	------	--	---

## 模块 / Module

参数 Parameters	符号 Symbol	工作条件 Test Conditions	典型值 Typ.	Unit
Isolation test voltage	V <sub>ISOL</sub>	RMS, f = 50 Hz, t = 1 min.	2.5	kV
Internal isolation		Basic insulation (class 1, IEC 61140)	Al <sub>2</sub> O <sub>3</sub>	
Creepage distance		terminal to heatsink	11.5	mm
		terminal to terminal	6.3	
Clearance		terminal to heatsink	10.0	mm
		terminal to terminal	5.0	
Comperative tracking index	CTI		>200	

参数 Parameters	符号 Symbol	工作条件 Test Conditions	最小值 Min.	典型值 Typ.	最大值 Max.	单位 Unit
杂散电感, 模块 Stray inductance module	L <sub>sCE</sub>			15		nH
模块引线电阻, 端子-芯片 Module lead resistance, terminals - chip	R <sub>CC+EE'</sub>			2.00		mΩ
存储温度 Storage temperature	T <sub>stg</sub>		-40		150	°C
每个夹具的安装力 Mounting force per clamp	F		40		80	N
重量 Weight	G			23		g

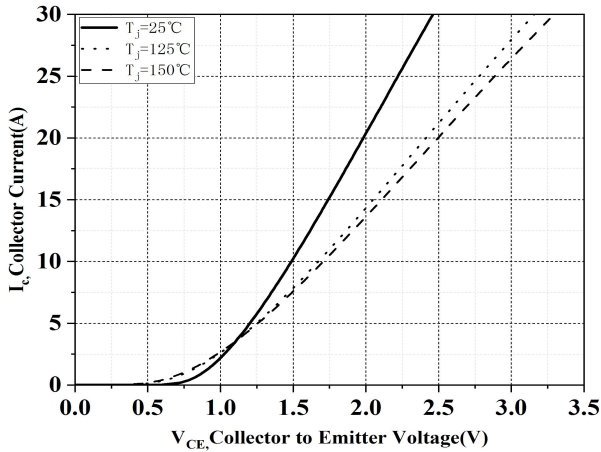


Fig.1. Output characteristic IGBT, Inverter (typical)  
 $I_C = f(V_{CE}), V_{GE} = 15V$

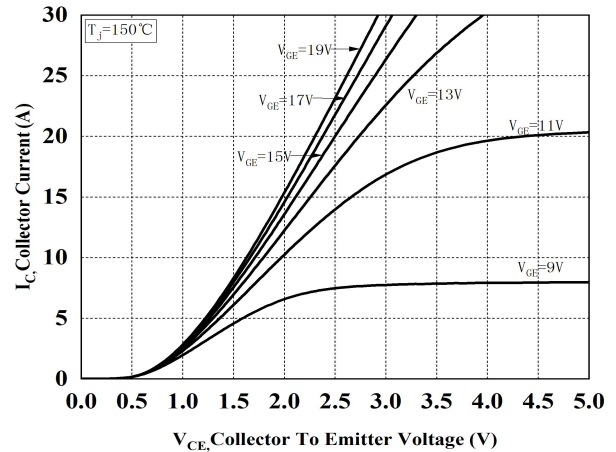


Fig.2. Output characteristic IGBT, Inverter (typical)  
 $I_C = f(V_{CE}), T_{vj} = 150^\circ C$

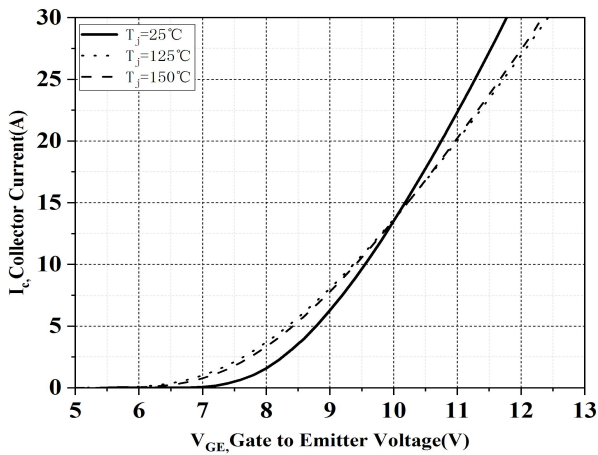


Fig.3. Transfer characteristic IGBT, Inverter (typical)  
 $I_C = f(V_{GE}), V_{CE} = 20V$

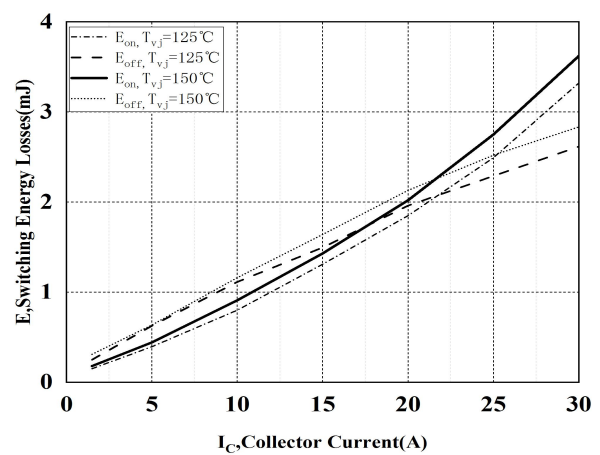


Fig.4. Switching losses IGBT, Inverter (typical)  
 $E_{on} = f(I_C), E_{off} = f(I_C), V_{GE} = \pm 15V,$   
 $R_{Gon} = 24 \Omega, R_{Goff} = 24 \Omega, V_{CE} = 600V$

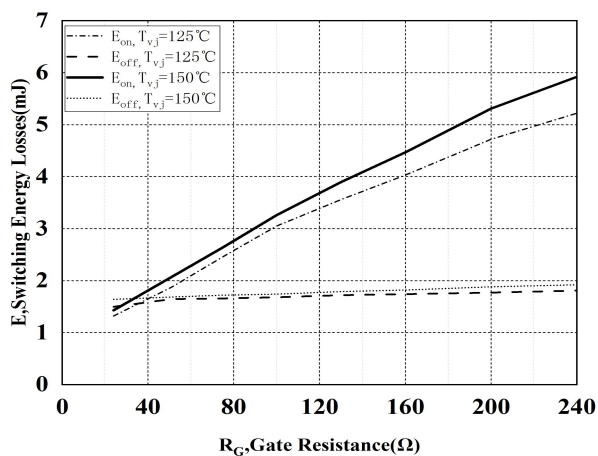


Fig.5. Switching losses IGBT, Inverter (typical)  
 $E_{on} = f(R_G), E_{off} = f(R_G), V_{GE} = \pm 15V, I_C = 15A, V_{CE} = 600V$

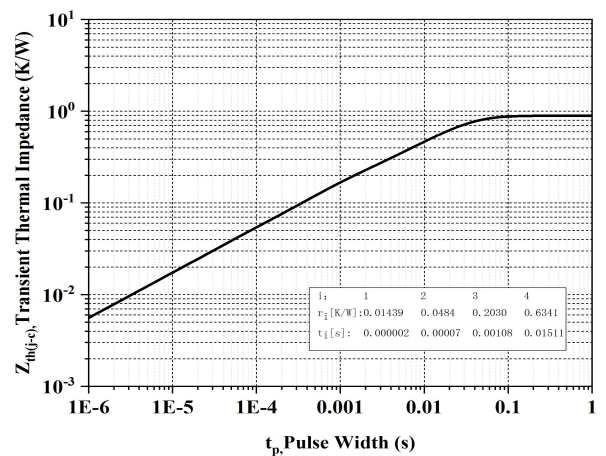
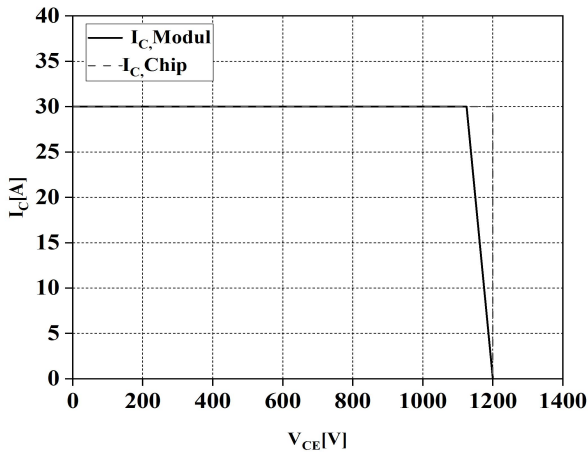


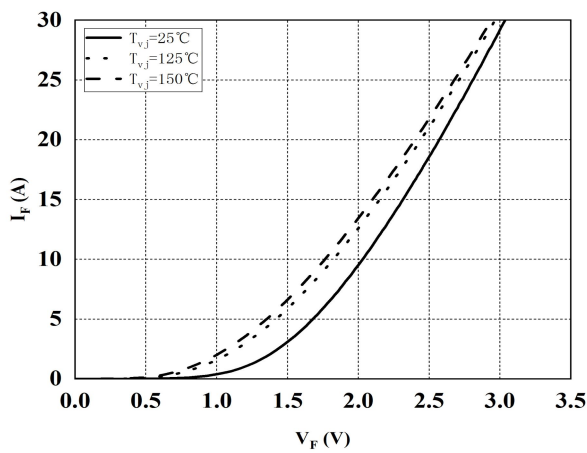
Fig.6. Transient thermal impedance IGBT, Inverter  
 $Z_{th, jH} = f(t)$



**Fig.7. Reverse bias safe operating area**  
IGBT, Inverter(RBSOA)

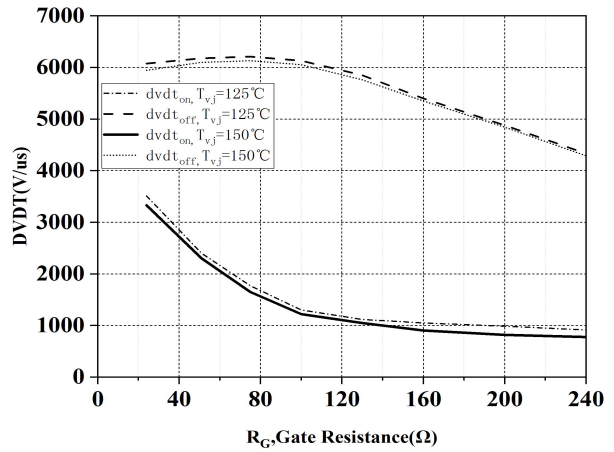
$I_C = f(V_{CE}), V_{GE} = \pm 15V, R_{Goff} = 24 \Omega, T_{vj} = 150^\circ C$

**Fig.9 Capacitance**



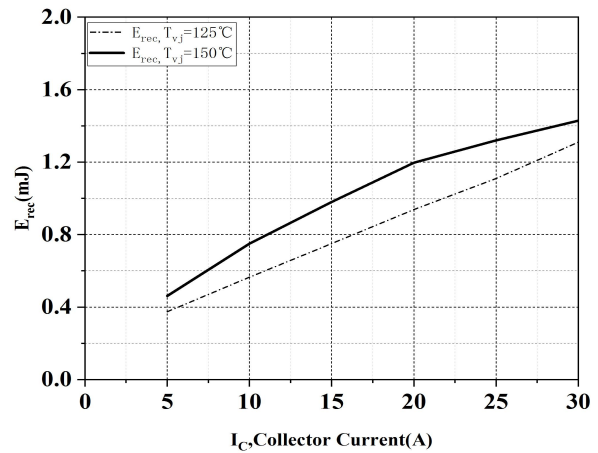
**Fig.9. Forward characteristic of**  
Diode, Inverter (typical)

$I_F = f(V_F)$



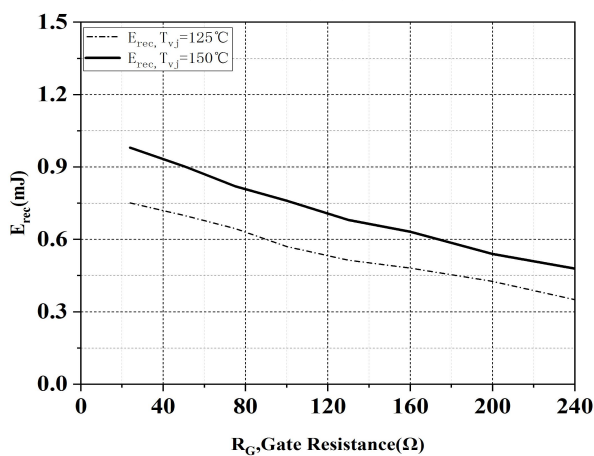
**Fig.8. DVDT vs. Rg**

**Fig.10 Gate Charge**



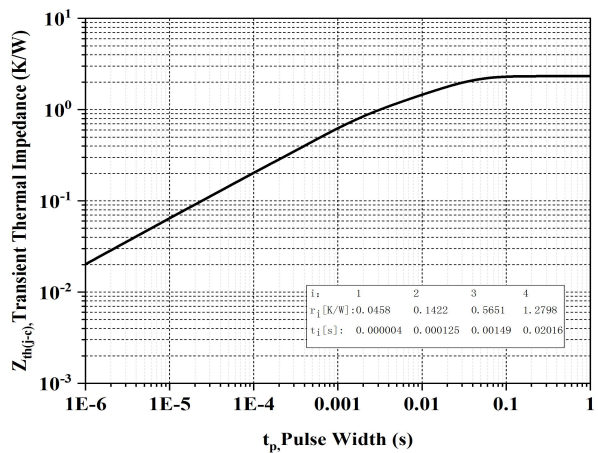
**Fig.10. Switching losses Diode, Inverter (typical)**

$E_{rec} = f(I_F), R_{Gon} = 24 \Omega, V_{CE} = 600V$



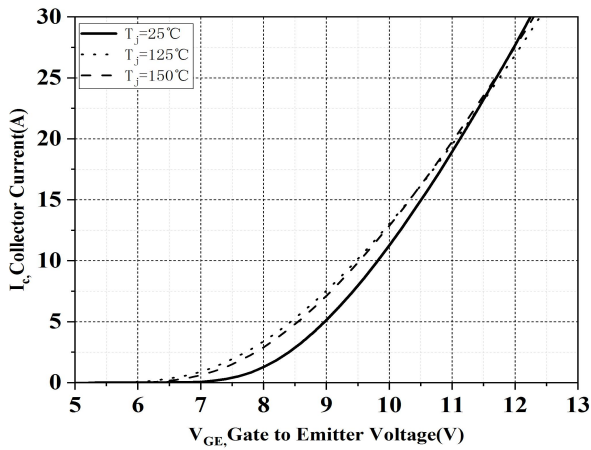
**Fig.11. Switching losses Diode, Inverter (typical)**

$E_{rec} = f(R_G), I_F = 15A, V_{CE} = 600V$

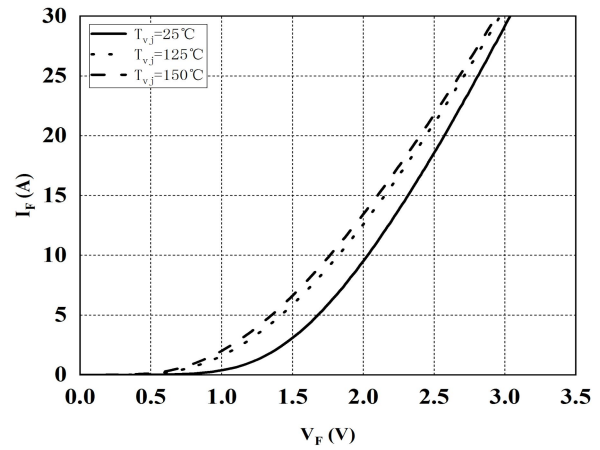


**Fig.12. Transient thermal impedance**

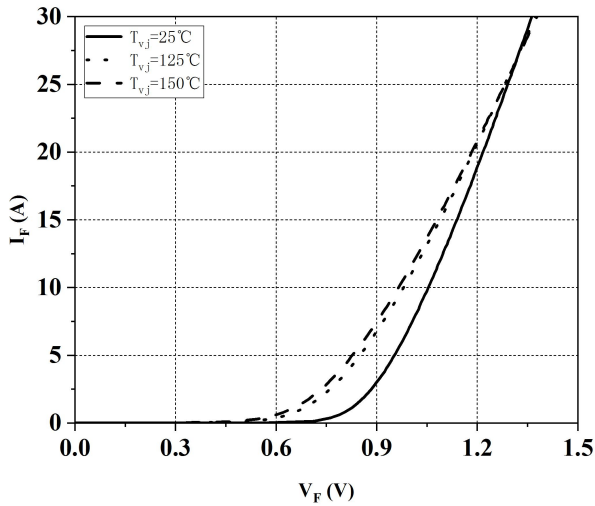
Diode, Inverter  $Z_{thJH} = f(t)$



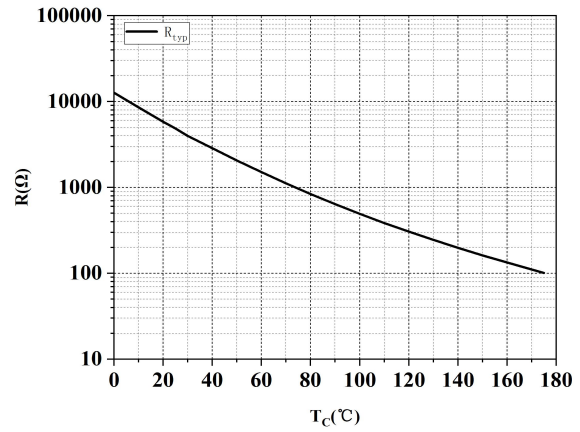
**Fig.13. Transfer characteristic IGBT, Brake (typical)**  
 $I_C = f(V_{GE}), V_{CE} = 20V$



**Fig.14. forward characteristic of Diode, Brake (typical)**  
 $I_F = f(V_F)$

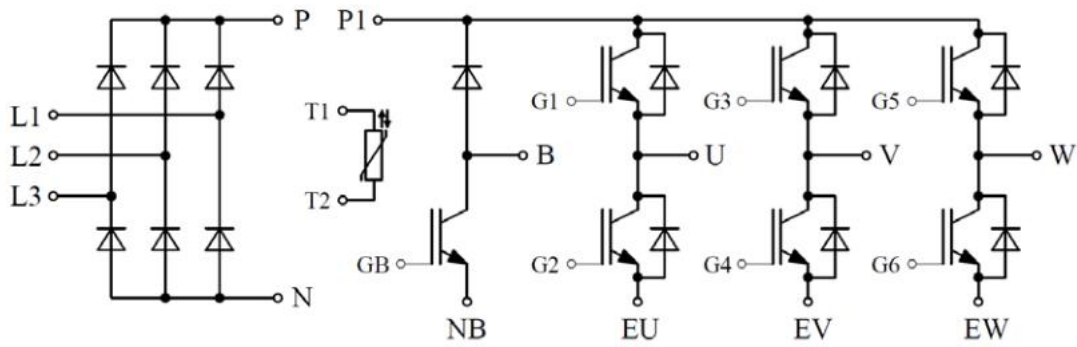


**Fig.15. forward characteristic of Diode, Rectifier (typical)**  
 $I_F = f(V_F)$

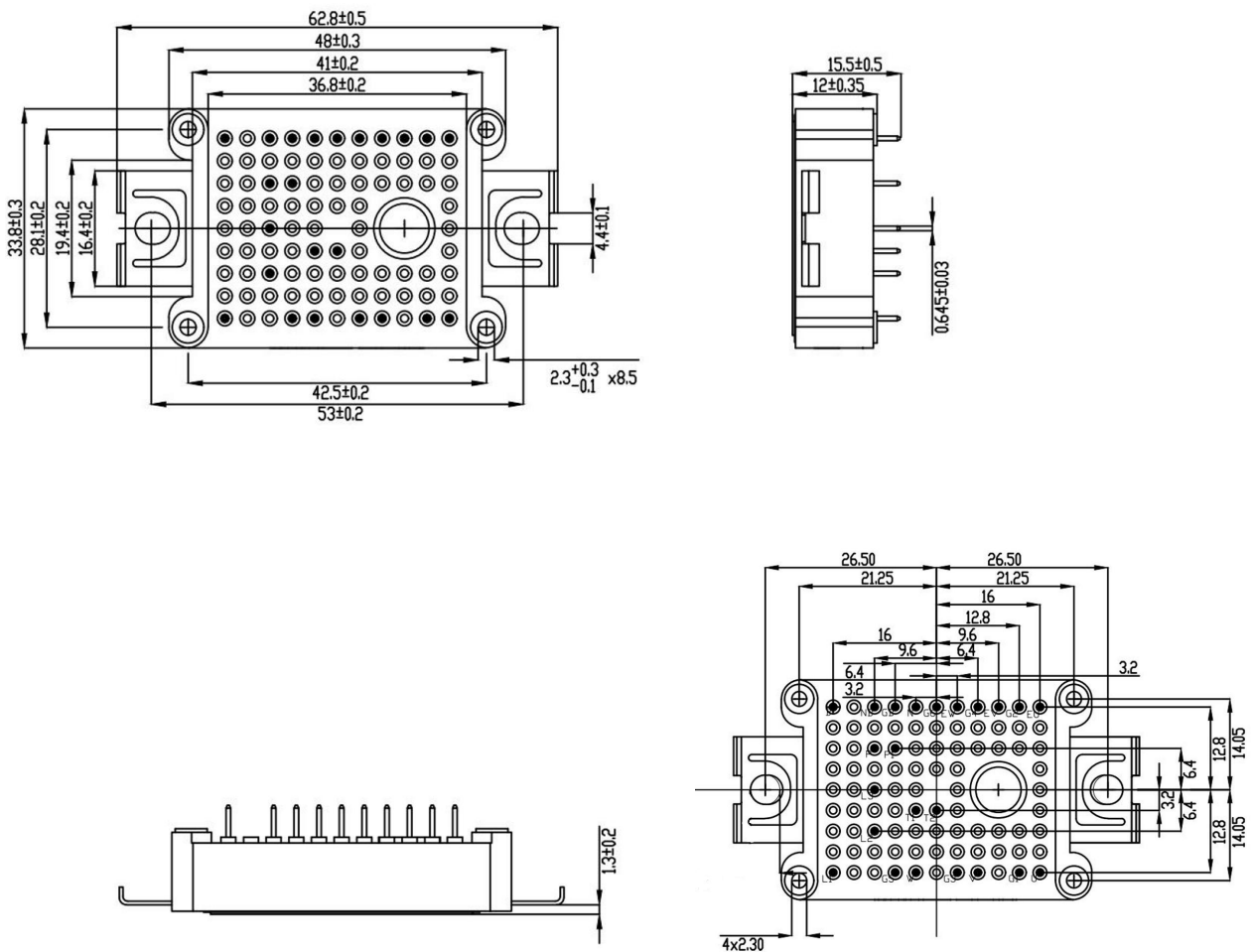


**Fig.16. NTC-Thermistor-temperature characteristic (typical)**  
 $R = f(T)$

接线图 / Circuit Diagram



封装尺寸 / Product Outline



## 14. Version Information

Version No.	Status	Date changed	Version revision record
V1.0	Preliminary version	2024/03	