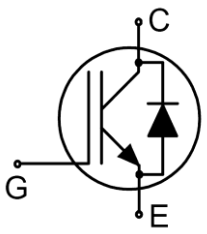
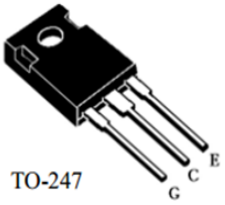
# TT025N120EQ

## 主要参数 MAIN CHARACTERISTICS

| | |
|---|---|
| $I_C$ | 25A |
| $V_{CE}$ | 1200V |
| $V_{CESAT-typ}$ | 1.50V |

封装 Package




## 用途

●逆变器

## APPLICATIONS

- General purpose inverter

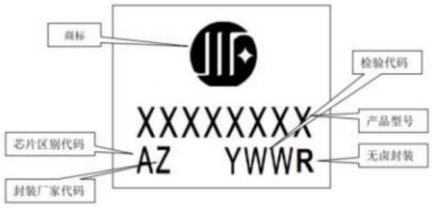
## 产品特性

●低栅极电荷
●Trench FS 技术
●RoHS 产品

## FEATURES

- Low gate charge
- Trench FS Technology
- RoHS product

## 印记定义 Mark definition




检验代码说明：Y(年代码，执行内部定义)+WW（周代码）
产品型号说明：产品类型+工艺平台+电流+频率+电压+工艺版本+特殊特性。

## 订货信息 ORDER MESSAGE

| 订 货 型 号 Order codes<br>无卤-条管<br>Halogen-Free-Tube | 印 记<br>Marking | 封 装<br>Package |
|---|---|---|
| TT025N120EQ-GE-BR | TT025N120EQ | TO-247 |

## 绝对最大额定值 ABSOLUTE RATINGS (Tc=25℃)

| 项 目 Parameter | 符 号 Symbol | 数 值 Value | 单 位 Unit |
|---|---|---|---|
| | | TO-247 | |
| 最高集电极－发射极直流电压<br>Collector-Emitter Voltage | $V_{CE}$ | 1200 | V |
| *连续集电极电流<br>Collector Current-continuous | $I_C$<br>$T_C$=25°C<br>$T_C$=100°C | <br>50<br>25 | A |
| 最大脉冲集电极极电流（注 1）<br>Collector Current – pulse（note 1） | $I_{CM}$ | 100 | |
| 二极管正向测试电流<br>Diode RMS forward current | $I_F$<br>$T_C$=25°C<br>$T_C$=100°C | <br>50<br>25 | |
| 二极管正向脉冲电流<br>Diode pulse current | $I_{FSM}$ | 100 | |
| 最高栅极发射极电压<br>Gate-Emitter Voltage | $V_{GE}$ | ±20 | V |
| 耗散功率<br>Power Dissipation | $P_D$ $T_C$=25℃ | 300 | W |
| 存储温度<br>Storage Temperature Range | $T_{STG}$ | -55～+150 | ℃ |
| 结温<br>Junction Temperature Range | Tvj | -40～+175 | |
| 引线最高焊接温度<br>Maximum Lead Temperature for Soldering Purposes | $T_L$ | 260 | |

*连续集电极电流由最高结温限制

*Collector current limited by maximum junction temperature

注释：

1：脉冲宽度由最高结温限制

Notes:

1：Pulse width limited by maximum junction temperature

## 电特性 ELECTRICAL CHARACTERISTICS

| 项　　目<br>Parameter | 符　号<br>Symbol | 测试条件<br>Tests conditions | 最小<br>Min | 典型<br>Typ | 最大<br>Max | 单位<br>Units |
|---|---|---|---|---|---|---|
| **关态特性 Off –Characteristics** | | | | | | |
| 集电极－发射极击穿电压<br>Collector-Emitter Voltage | BVCES | IC=250μA, VGE=0V | 1200 | - | - | V |
| 零栅压下集电极漏电流<br>Zero Gate Voltage Collector Current | ICES | VCE=1200V,　VGE=0V, TC=25℃ | - | - | 200 | μA |
| | | VCE=1200V,　VGE=0V, TC=175℃ | - | 2 | - | mA |
| 正向栅极体漏电流<br>Gate-body leakage current,forward | IGESF | VCE=0V,　VGE =20V | - | - | 600 | nA |
| 反向栅极体漏电流<br>Gate-body leakage current,reverse | IGESR | VCE=0V,　VGE =-20V | - | - | -600 | nA |
| **通态特性 On-Characteristics** | | | | | | |
| 阈值电压<br>Gate Threshold Voltage | VGE(th) | VCE = VGE , IC=250μA | 5 | 5.8 | 6.6 | V |
| 饱和压降<br>Collector-Emitter saturation Voltage | VCESAT | VGE=15V　IC=25A　Tc=25℃ | - | 1.5 | 2.0 | |
| | | VGE=15V　IC=25A　Tc=125℃ | - | 1.7 | - | |
| | | VGE=15V　IC=25A　Tc=175℃ | - | 1.8 | - | |
| **动态特性 Dynamic Characteristics** | | | | | | |
| 输入电容<br>Input capacitance | Cies | VCE=25V,<br>VGE=0V,<br>f=1.0MHZ | - | 3642 | - | pF |
| 输出电容<br>Output capacitance | Coes | | - | 138 | - | |
| 反向传输电容<br>Reverse transfer capacitance | Cres | | - | 85 | - | |
| 栅极电荷总量 Total Gate Charge | Qg | VCC=960V,Ic=25A,VGE=15 V<br>TC=25℃ | - | 239 | - | nC |
| 栅极-反射极 Gate to emitter charge | Qge | | - | 13 | - | |
| 栅极-集电极 Gate to collector charge | Qgc | | - | 178 | - | |
| 栅极电阻-Gate resistance | Rg | f=1 MHz, open collector | - | 7 | - | Ω |
| 短路电流-short current | Isc | Vge=15V，Vce=600V，t≦10us | | 130 | | A |

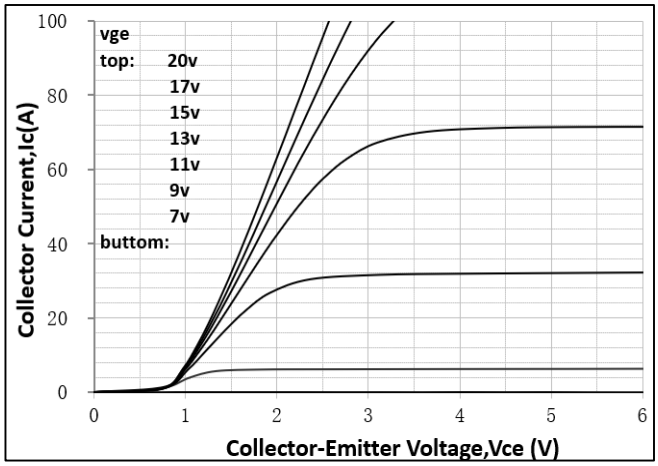
## 电特性 ELECTRICAL CHARACTERISTICS

| 开关特性 Switching Characteristics | | | | | | |
|---|---|---|---|---|---|---|
| 项　　目<br>Parameter | 符　号<br>Symbol | 测试条件<br>Tests conditions | 最 小<br>Min | 典 型<br>Typ | 最 大<br>Max | 位<br>Units |
| 开启延迟时间 Turn-On delay time | td(on) | VCC=600V,Ic=25A,Rg=15Ω<br>VGE=15 V<br>TC=25℃ | - | 38 | - | ns |
| 上升时间 Turn-On rise time | tr | | - | 42 | - | |
| 关断延迟时间 Turn-Off delay time | td(off) | | - | 308 | - | |
| 下降时间 Turn-Off Fall time | tf | | - | 498 | - | |
| 开通损耗 Turn-On energy | Eon | | - | 0.59 | - | mJ |
| 关断损耗 Turn-off energy | Eoff | | - | 3.39 | - | |
| 总开关损耗 Total switching energy | Etot | | - | 3.98 | - | |
| 开启延迟时间 Turn-On delay time | td(on) | VCC=600V,Ic=25A,Rg=15Ω<br>VGE=15 V<br>TC=175℃ | - | 36 | - | ns |
| 上升时间 Turn-On rise time | tr | | - | 58 | - | |
| 关断延迟时间 Turn-Off delay time | td(off) | | - | 372 | - | |
| 下降时间 Turn-Off Fall time | tf | | - | 788 | - | |
| 开通损耗 Turn-On energy | Eon | | - | 1.14 | - | mJ |
| 关断损耗 Turn-off energy | Eoff | | - | 5.03 | - | |
| 总开关损耗 Total switching energy | Etot | | - | 6.17 | - | |
| **反并联二极管特性及最大额定值 Anti-Parallel Diode Characteristics and Maximum Ratings** | | | | | | |
| 正向压降<br>Drain-Source Diode Forward Voltage | VF | VGE=0V, $I_F$=25A, Tvj=25℃ | - | 2.3 | 2.7 | V |
| | | VGE=0V, $I_F$=25A, Tvj=125℃ | - | 1.85 | - | |
| | | VGE=0V, $I_F$=25A, Tvj=175℃ | - | 1.7 | - | |
| 反向恢复时间<br>Diode Reverse recovery time | trr | VGE=0V, VR=600V,$I_F$=25A<br>dIF/dt=450A/μs<br>Tvj=25℃ | - | 371 | - | ns |
| 反向恢复电荷<br>Diode Reverse recovery charge | Qrr | | - | 1506 | - | nC |
| 反向恢复电流<br>Diode Reverse recovery Current | Irrm | | - | 9.7 | - | A |
| 反向恢复时间<br>Diode Reverse recovery time | trr | VGE=0V, VR=600V,$I_F$=25A<br>dIF/dt=450A/μs<br>Tvj=175℃ | - | 558 | - | ns |
| 反向恢复电荷<br>Diode Reverse recovery charge | Qrr | | - | 4765 | - | nC |
| 反向恢复电流<br>Diode Reverse recovery Current | Irrm | | - | 19.5 | - | A |

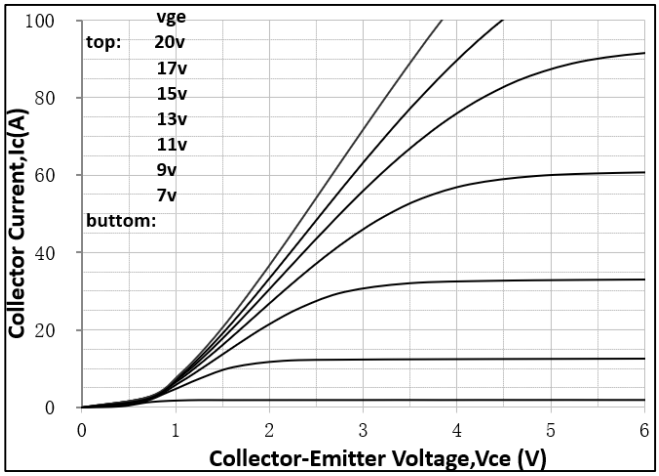
| 项　　目 Parameter | 符　号 Symbol | 最大 MAX<br>TO-247 | 单 位 Unit |
|---|---|---|---|
| 结到管壳的热阻<br>Thermal Resistance, Junction to Case | Rth(j-c) IGBT | 0.5 | ℃/W |
| | Rth(j-c) FWD | 1.0 | |
| 结到环境的热阻<br>Thermal Resistance, Junction to Ambient | Rth(j-A) | 40 | |

## 特征曲线 ELECTRICAL CHARACTERISTICS (curves)

### Output Characteristics（ Tvj =25℃）

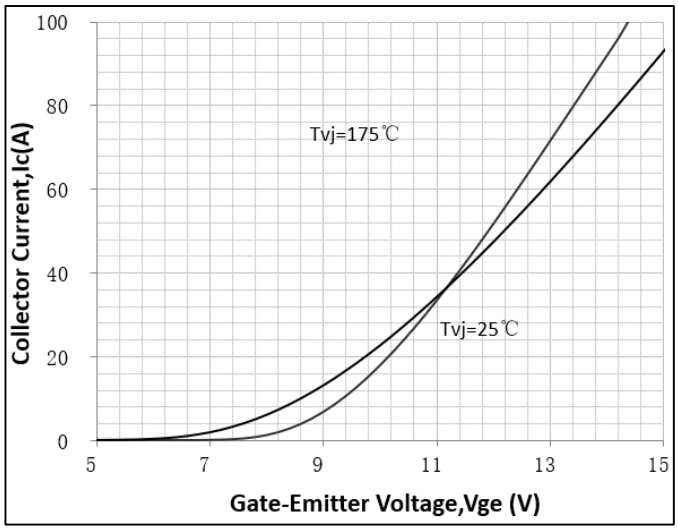



### Output Characteristics（ Tvj =175℃）



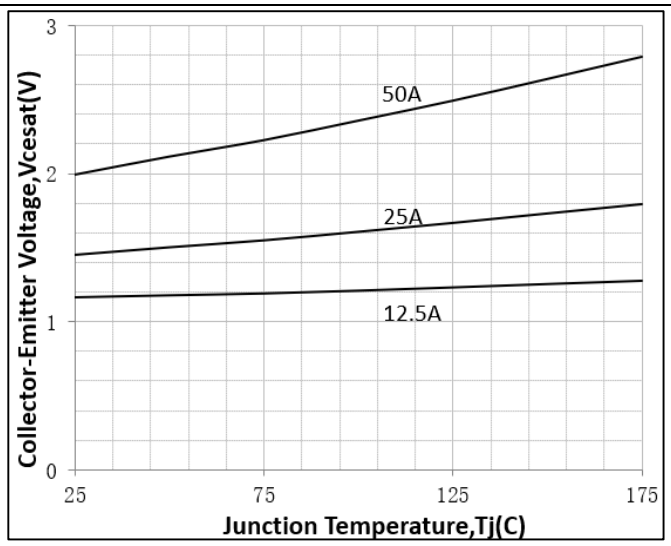

### Transfer Characteristics

Vce=20 V




### Vcesat vs. Tvj

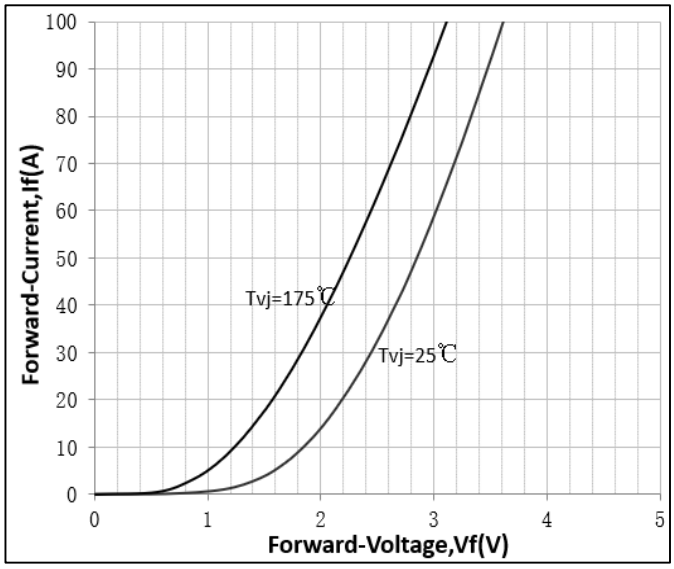
Vge=15V, Ic=12.5A、25A、50A



## 特征曲线 ELECTRICAL CHARACTERISTICS (curves)

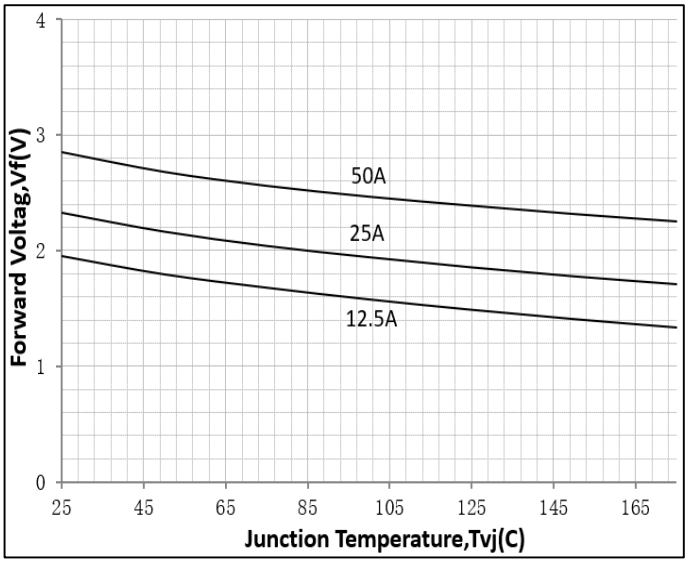
### Diode Characteristic

Tvj=25℃、Tvj=175℃



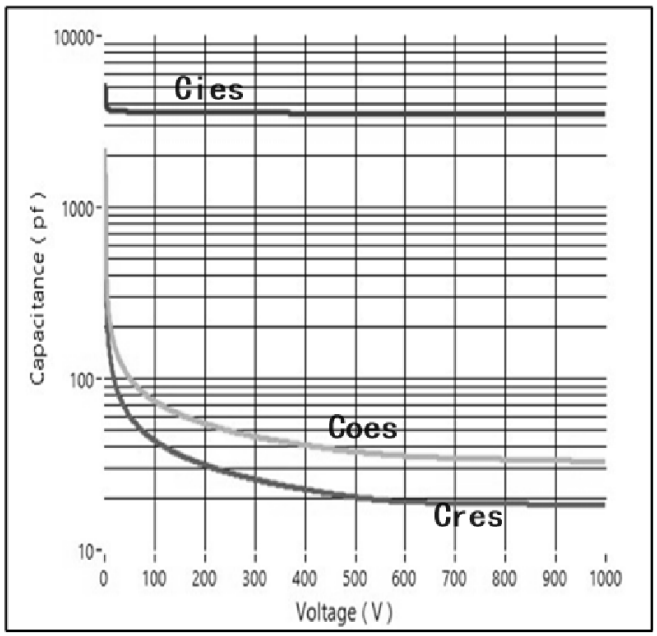

### Vf vs. Tvj

Ic=12.5A、25A、50A



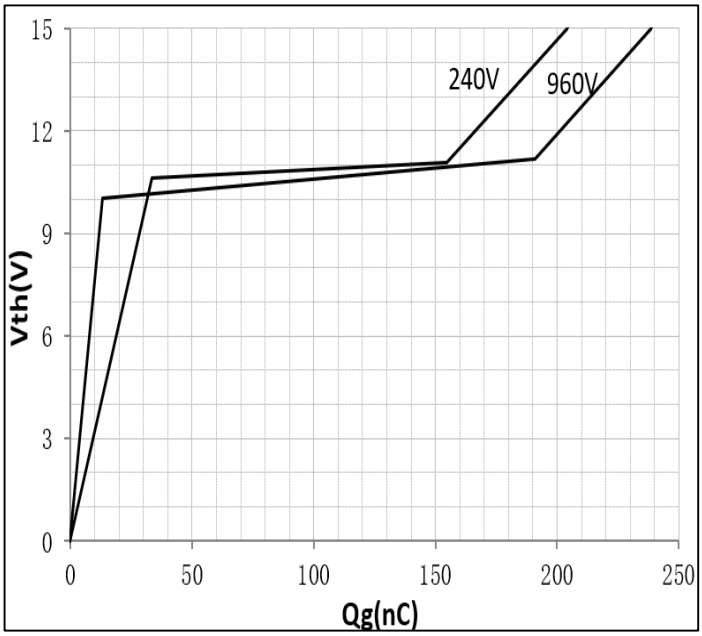

### Capacitance Characteristic

f=1.0MHZ




### Gate Charge Characteristics

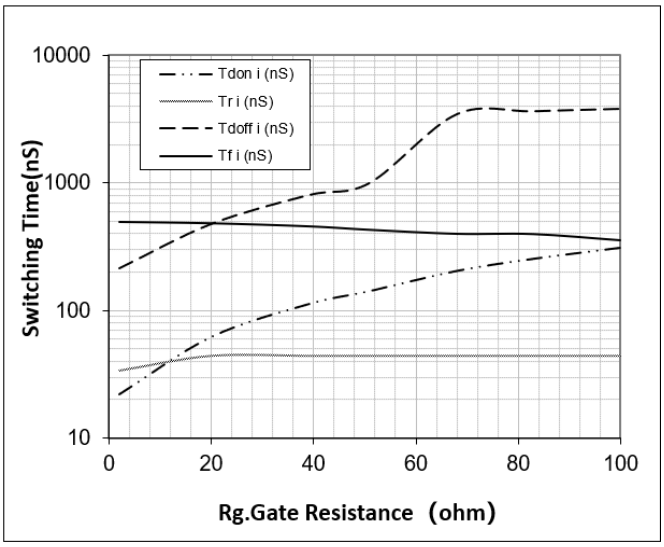
VGE=15V,IC=25A,VCE=240V/960V



## 特征曲线 ELECTRICAL CHARACTERISTICS (curves)

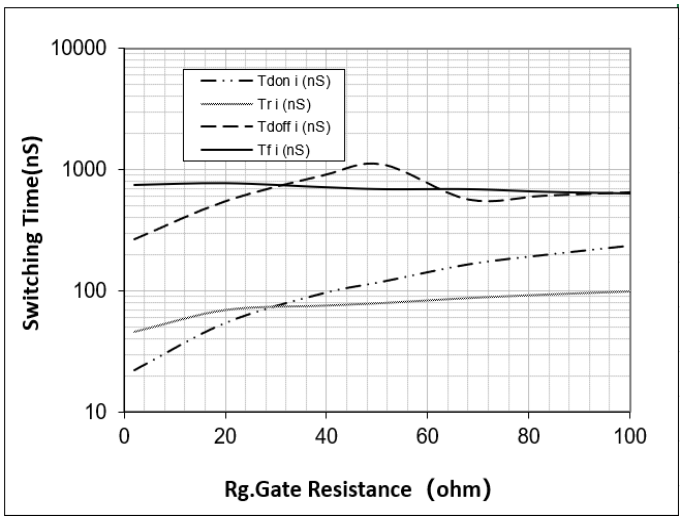
### Switching Time vs. Rg(25℃)

VGE=15V,VCE=600V, IC:25A



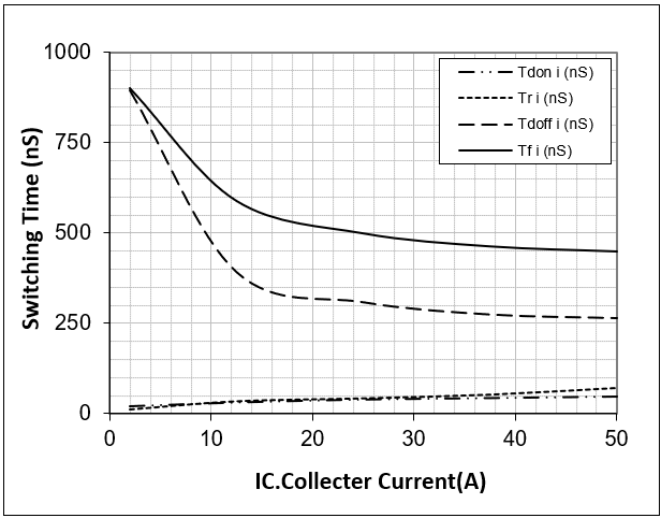

### Switching Time vs. Rg(175℃)

VGE=15V,VCE=600V, IC:25A



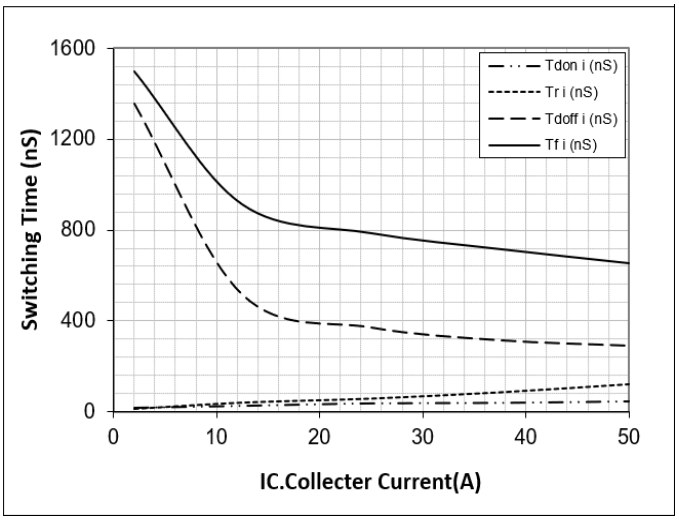

### Switching Time vs. IC(25℃)

VCE=600V,VGE=15V, RG=10Ω




### Switching Time vs. IC(175℃)

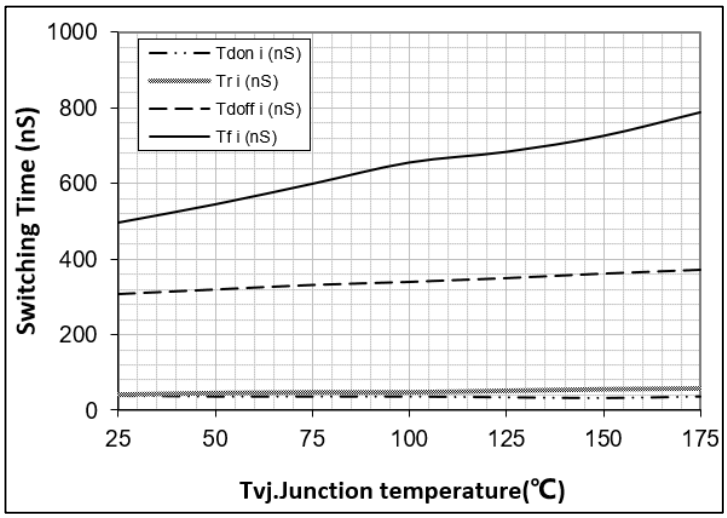
VCE=600V,VGE=15V, RG=10Ω



## 特征曲线 ELECTRICAL CHARACTERISTICS (curves)

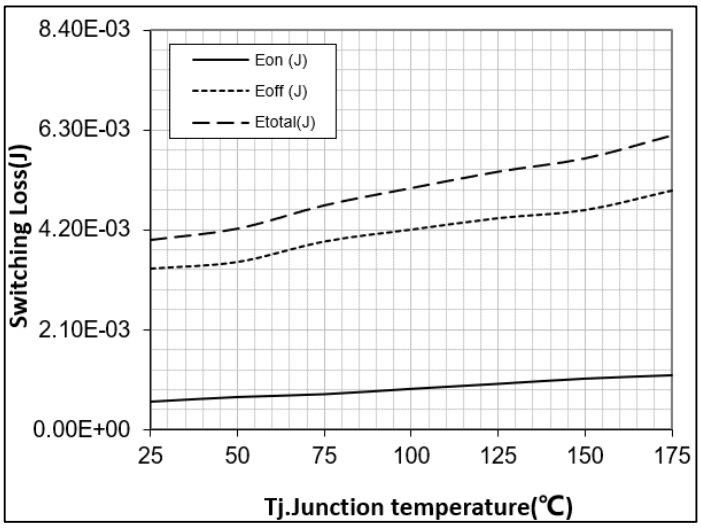
### Switching Time vs.Tvj

VGE=15V，VCE=600V，IC=25A，Rg=10Ω



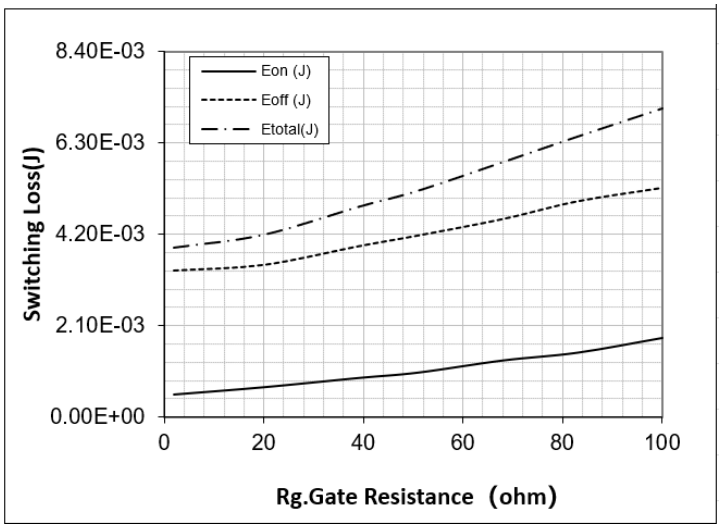

### Switching Loss vs. Tvj

VGE=15V，VCE=600V，IC=25A ，Rg=10Ω



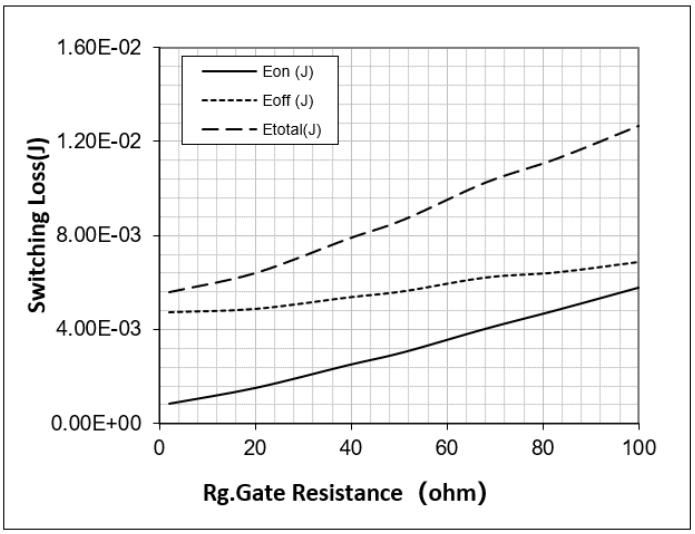

### Switching Loss vs. Rg(25℃)

VGE=15V,VCE=600V, IC=25A




### Switching Loss vs. Rg(175℃)

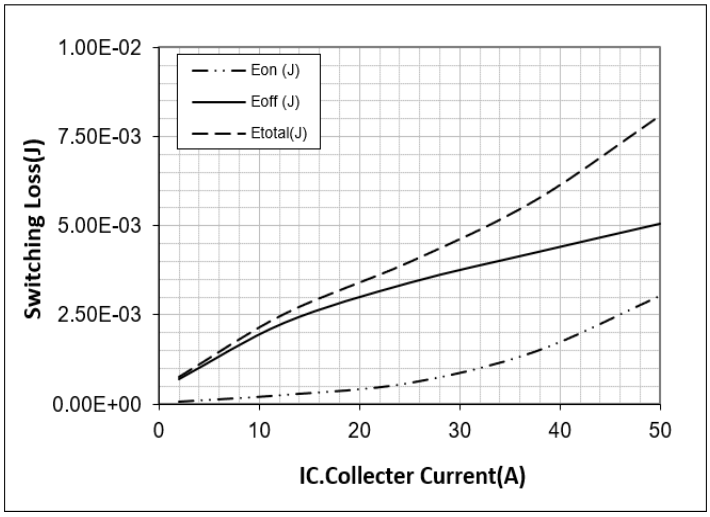
VGE=15V,VCE=600V, IC=25A



## 特征曲线 ELECTRICAL CHARACTERISTICS (curves)

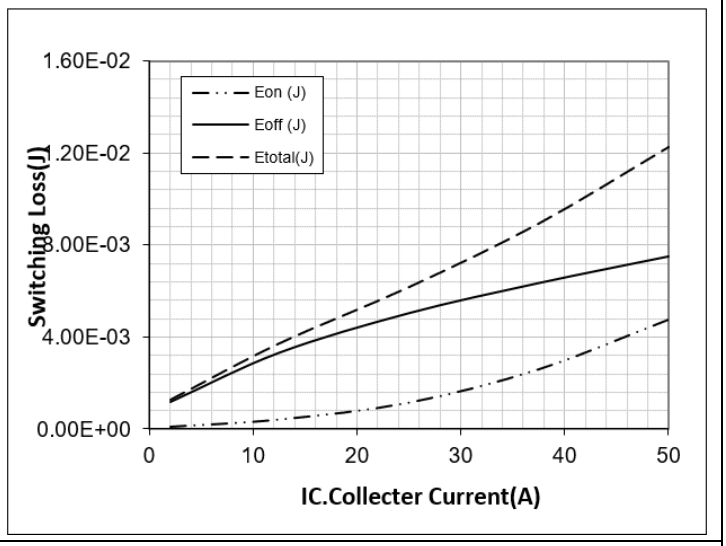
### Switching Loss vs. IC(25℃)

VGE=15V,VCE=600V,Rg=10Ω

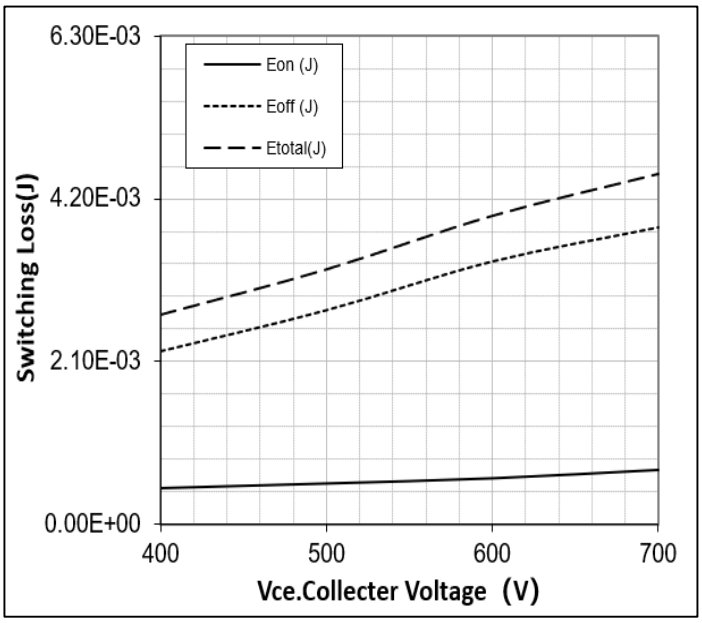



### Switching Loss vs. IC(175℃)

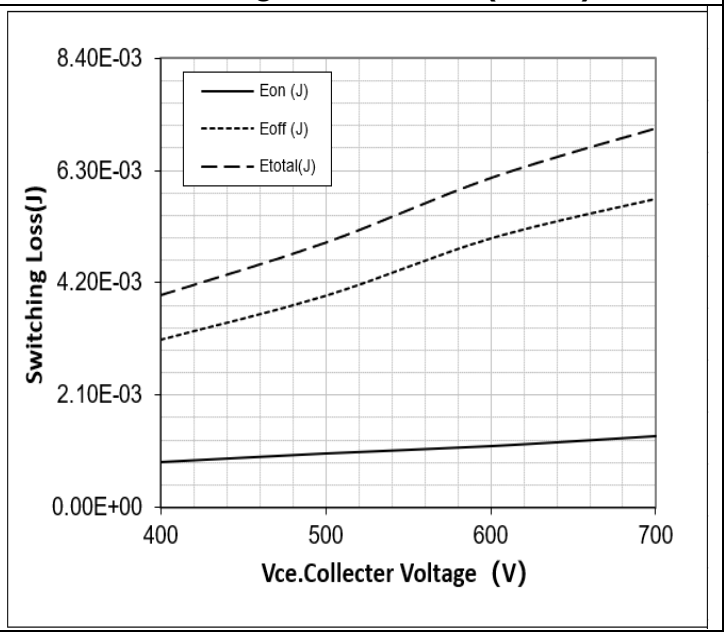
VGE=15V,VCE=600V,Rg=10Ω




### Switching Loss vs. VCE(25℃)



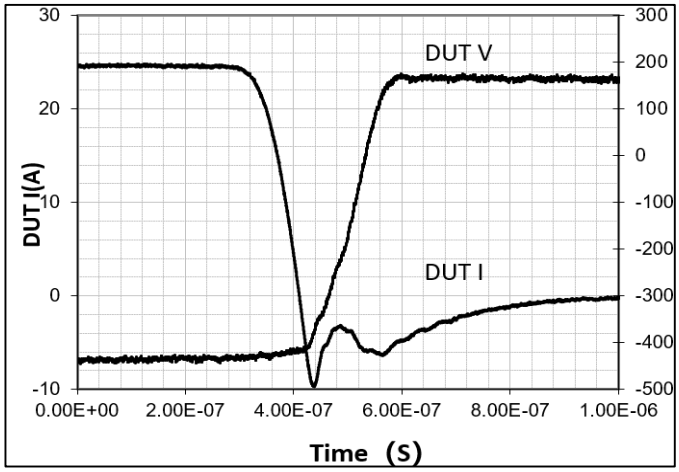

### Switching Loss vs. VCE(175℃)



## 特征曲线 ELECTRICAL CHARACTERISTICS (curves)

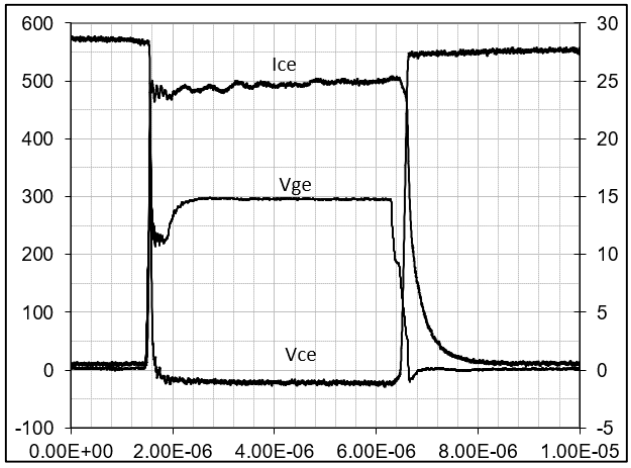
### Diode Peak Reverse Recovery Current

IF=25A Tvj=25℃



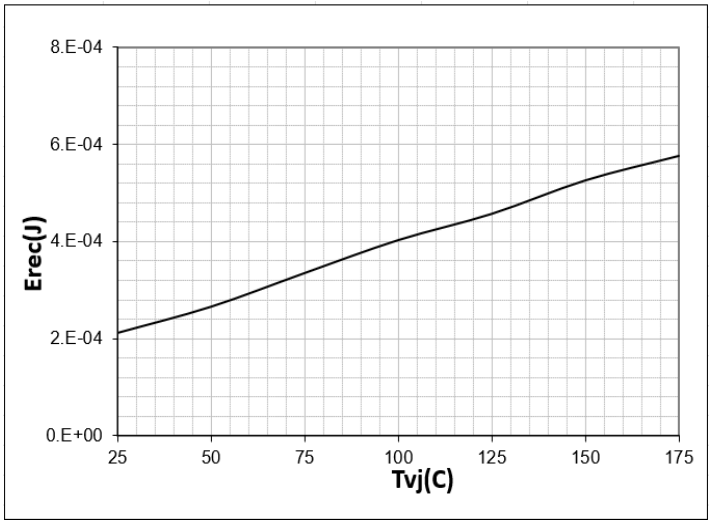

### IGBT Switch

VGE=15V,IC=25A,VCE=600V,Tvj=25℃



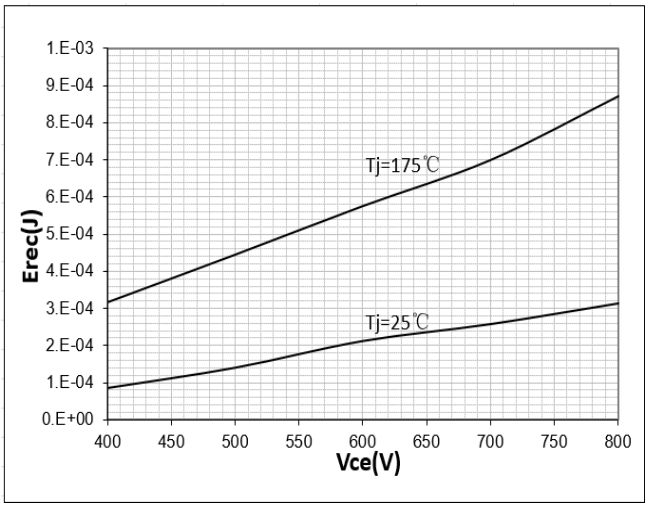

### Erec 与 Tj 的曲线

VGE=15V,VCE=600V,Rg=10Ω




### Erec 与 Vce 的曲线

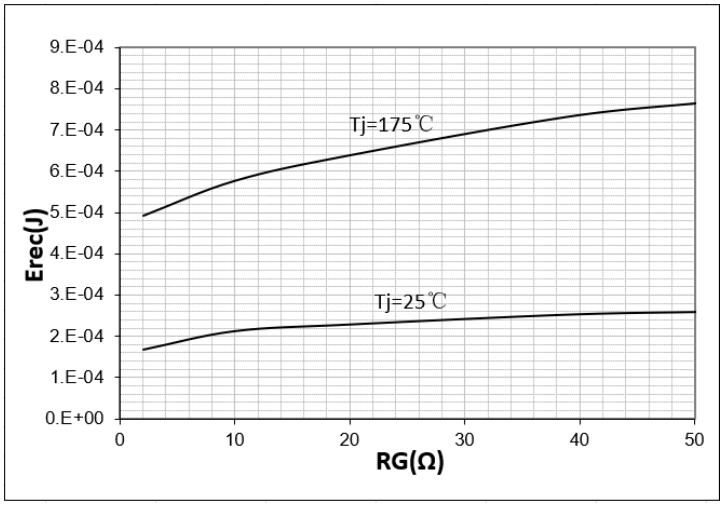
VGE=15V,Rg=10Ω



## 特征曲线　ELECTRICAL CHARACTERISTICS (curves)

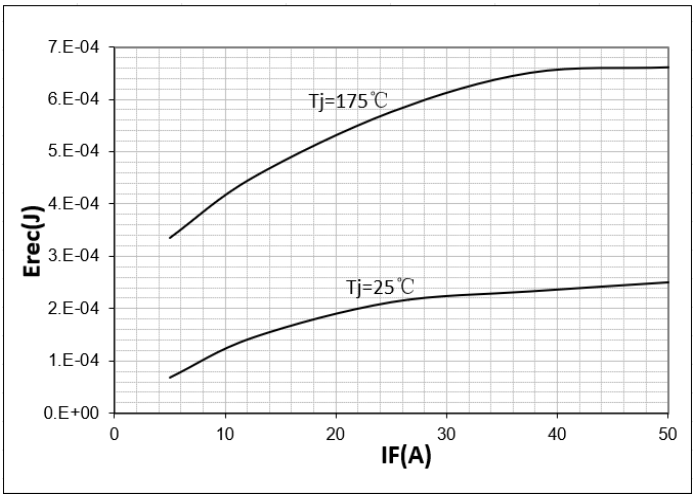
**Erec 与 Rg 的曲线**

VGE=15V,VCE=600V,Rg=10Ω



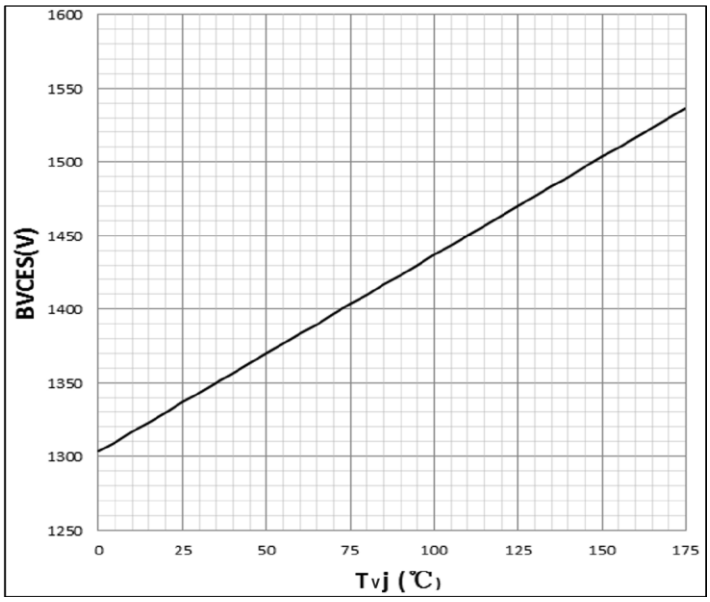

**Erec 与 If 的曲线**

VGE=15V,VCE=600V,Rg=10Ω

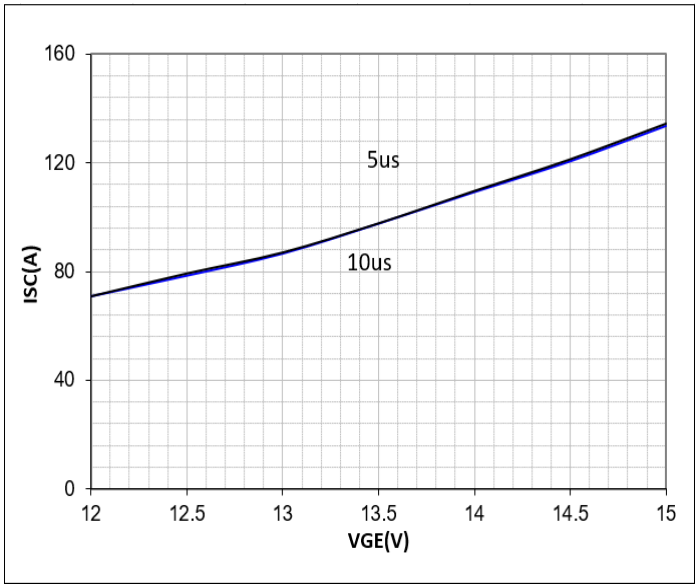



**BVCES vs. Tvj**

Ic=250uA

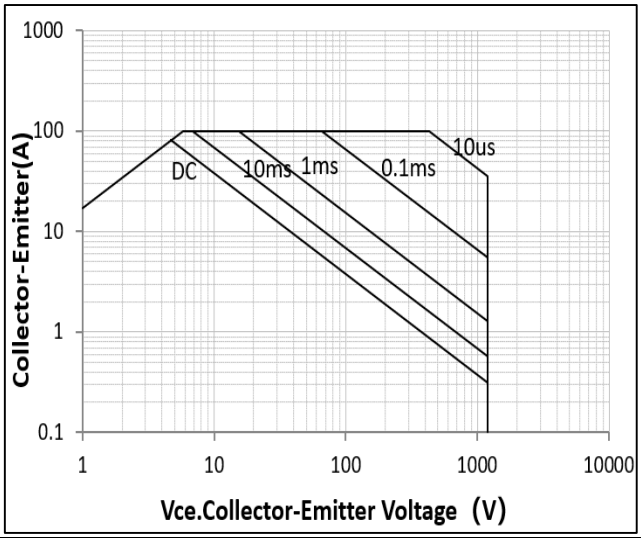



**Isc 与 VGE 的曲线（25℃，Vce=600V）**



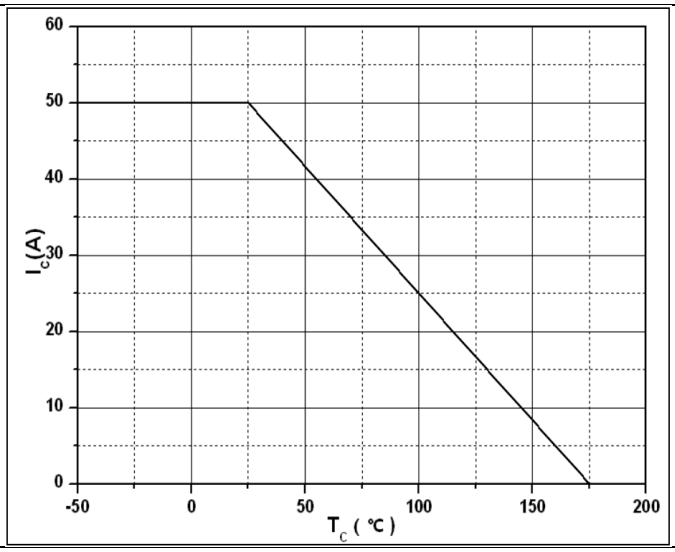

## 特征曲线　ELECTRICAL CHARACTERISTICS (curves)

## Forward Bias SOA

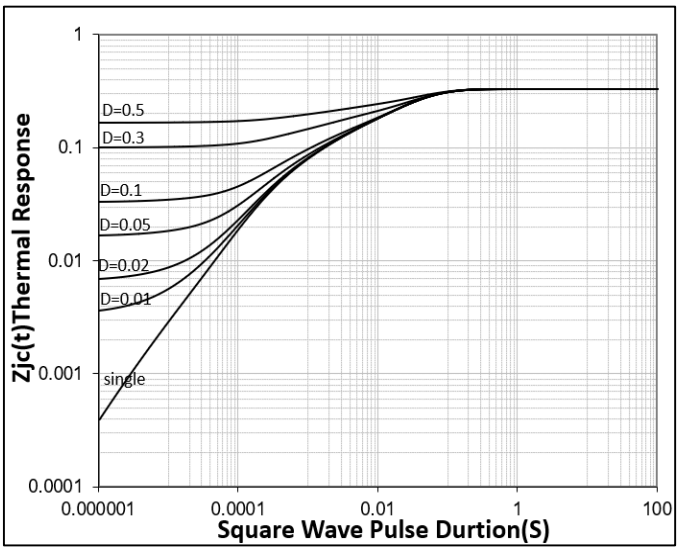



## Colletcor current vs.case temperature

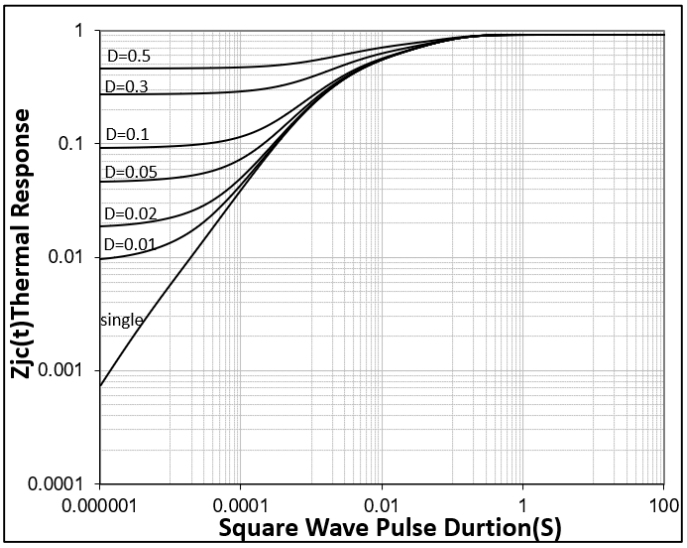
VGE≥15V，Tvj≤175℃




## Normalized Transient Thermal Impedance for IGBT （TO-247）




## Normalized Transient Thermal Impedance for FRD （TO-247）

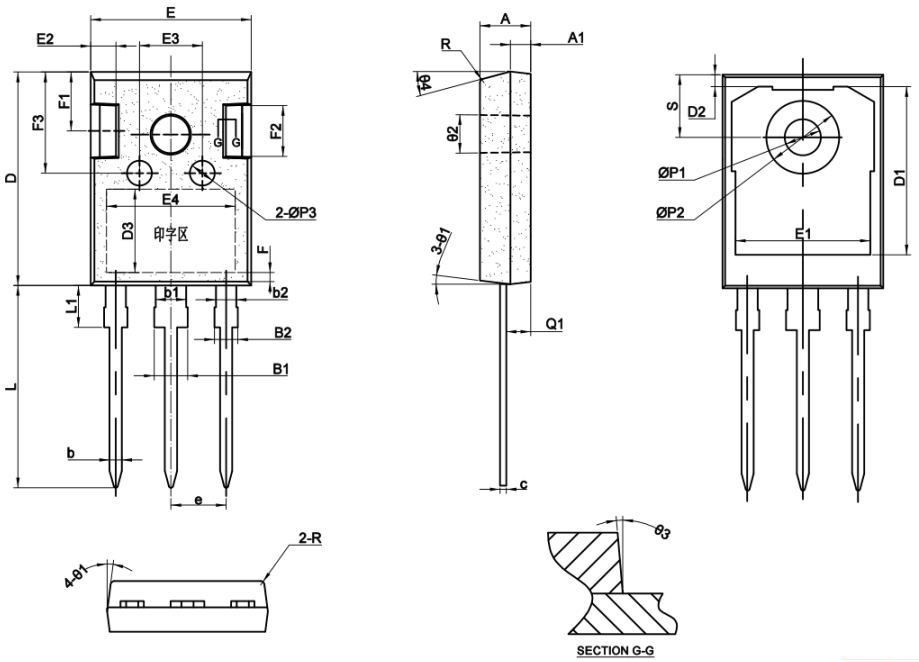


外形尺寸 **PACKAGE MECHANICAL DATA**

**TO-247**

重点尺寸：**b、e、A、D、E。**

**单位 Unit：mm**




| SYMBOL | MM | | |
|---|---|---|---|
| | MIN | NOM | MAX |
| *A | 4.90 | 5.00 | 5.10 |
| A1 | 1.90 | 2.00 | 2.10 |
| *b | 1.15 | 1.20 | 1.25 |
| b1 | 2.95 | 3.00 | 3.05 |
| b2 | 1.95 | 2.00 | 2.05 |
| *B1 | 3.00 | 3.10 | 3.20 |
| *B2 | 2.00 | 2.10 | 2.20 |
| *c | 0.55 | 0.60 | 0.65 |
| *D | 20.90 | 21.00 | 21.10 |
| D1 | 16.45 | 16.55 | 16.65 |
| D2 | 1.07 | 1.17 | 1.27 |
| D3 | 8.15 | 8.20 | 8.25 |
| *E | 15.70 | 15.80 | 15.90 |
| E1 | 13.16 | 13.26 | 13.36 |
| E2 | 2.40 | 2.50 | 2.60 |
| E3 | 6.10 | 6.20 | 6.30 |
| E4 | 12.70 | 12.80 | 12.90 |
| F | 0.75 | 0.85 | 0.95 |
| F1 | 5.70 | 5.80 | 5.90 |
| F2 | 4.90 | 5.00 | 5.10 |
| F3 | 9.90 | 10.00 | 10.10 |
| *e | 5.39 | 5.44 | 5.49 |
| *L | 19.72 | 19.92 | 20.12 |
| *L1 | 4.03 | 4.13 | 4.23 |
| θ1 | 5° | 7° | 9° |
| θ2 | 1° | 2° | 3° |
| θ4 | 13° | 15° | 17° |
| *ΦP1 | 3.50 | 3.60 | 3.70 |
| ΦP2 | 7.09 | 7.19 | 7.29 |
| ΦP3 | 2.40 | 2.50 | 2.60 |
| *Q1 | 2.31 | 2.41 | 2.51 |
| S | 6.05 | 6.15 | 6.25 |
| R | 0.30 | 0.40 | 0.50 |

## 注意事项

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