## 描述 / Descriptions

TO-247 塑封封装绝缘栅双极晶体管。Insulated-Gate Bipolar Transistor in a TO-247 Plastic Package.

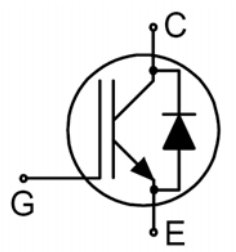
## 特征 / Features

低栅极电荷、正温度系数、低饱和压降、RoHS 产品。
Low gate charge,, Low saturation voltage ,Positive temperature coefficient, RoHS product.

## 用途 / Applications

逆变器、变频器、电磁炉、不间断电源。
General purpose inverter, Frequency converters, Induction Heating(IH), Uninterrupted Power Supply(UPS).

## 内部等效电路 / Equivalent Circuit




## 引脚排列 / Pinning


PIN1：Gate　　PIN 2：Collector　　PIN 3：Emitter

## 放大及印章代码 / $h_{FE}$ Classifications & Marking

见印章说明。See Marking Instructions.

## 极限参数 / Absolute Maximum Ratings(Ta=25℃)

| 参数<br>Parameter | 符号<br>Symbol | 数值<br>Rating | 单位<br>Unit |
|---|---|---|---|
| Collector-emitter voltage | $V_{CES}$ | 1200 | V |
| Gate-emitter voltage | $V_{GES}$ | ±20 | V |
| Collector current | $I_C$ | 50 | A |
| Collector current@$T_C$=100℃ | | 25 | A |
| Collector peak current,<br>$T_P$ limited by $T_{JMAX}$ | $I_{CM}$ | 60 | A |
| Diode forward current@$T_C$=100℃ | $I_F$ | 25 | A |
| Diode maximum forward current | $I_{FM}$ | 75 | A |
| Power dissipation($T_C$=25℃) | $P_D$ | 350 | W |
| Operating junction and storage temperature range | $T_J$, $T_{stg}$ | -55～150 | ℃ |
| Maximum temperature for soldering | $T_L$ | 300 | ℃ |
| IGBT thermal resistance,junction-case | $R_{th(j-c)}$ | 0.4 | ℃/W |
| Diode thermal resistance,junction-case | $R_{th(j-C)}$ | 2 | ℃/W |
| Thermal resistance,junction-ambient | $R_{th(j-a)}$ | 40 | ℃/W |

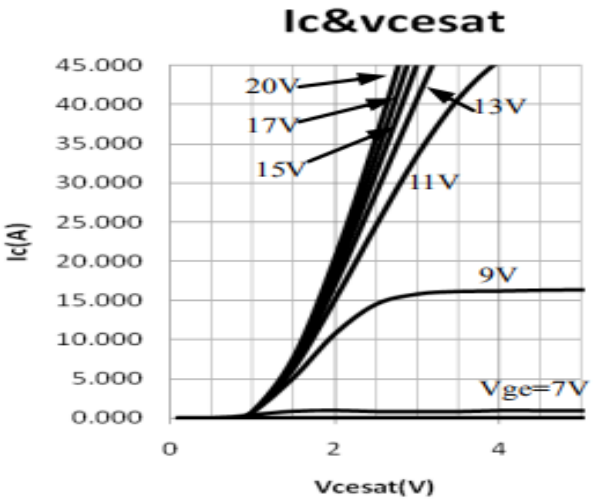
## 电性能参数 / Electrical Characteristics(Ta=25℃)

| 参数 Parameter | 符号 Symbol | 测试条件 Test Conditions | 最小值 Min | 典型值 Typ | 最大值 Max | 单位 Unit |
|---|---|---|---|---|---|---|
| Collector-emitter breakdown voltage | $V_{CES}$ | $V_{GE}$=0V $I_{CE}$=250uA | 1200 | - | - | V |
| Breakdown Voltage Temperature Coefficient | $\triangle BV_{CES}/\triangle T_J$ | $I_{CE}$=1mA;reference to 25℃ | | 0.6 | | V/℃ |
| Zero gate voltage Collector current | $I_{CES}$ | $V_{GE}$=0V;$V_{CE}$=1200V Tc=25℃ | - | - | 0.2 | mA |
| | | Tc=100℃ | | | 2 | mA |
| | | Tc=150℃ | | | 2.5 | mA |
| Gate-body leakage current | $I_{GES}$ | $V_{GE}$=±20V $V_{CE}$=0V | - | - | ±100 | nA |
| Gate threshold voltage | $V_{GE(th)}$ | $I_C$=600μA $V_{CE}$=$V_{GE}$ | 4.5 | - | 6.5 | V |
| Collector-emitter saturation voltage | $V_{CE(sat)}$ | $I_C$=25A; $V_{GE}$=15V Tc=25℃ | - | 1.8 | 2.45 | V |
| | | Tc=100℃ | | 2.0 | | V |
| | | Tc=150℃ | | 2.1 | | V |
| Short Collector current | $I_{C(SC)}$ | $V_{GE}$=15V;$V_{CE}$=600V; tsc＜10μs Tc=25℃ | | 160 | | A |
| Input capacitance | $C_{ies}$ | $V_{CE}$=25V $V_{GE}$=0V f=1MHz | - | 1600 | 2400 | pF |
| Output capacitance | $C_{oes}$ | | - | 120 | 190 | |
| Reverse transfer capacitance | $C_{res}$ | | - | 84 | 130 | |

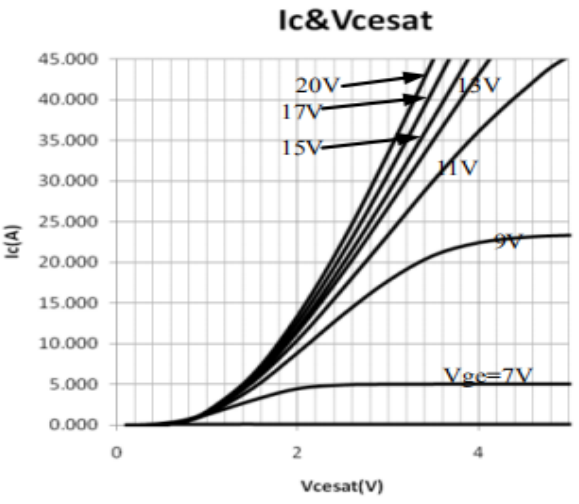
## 电性能参数 / Electrical Characteristics(Ta=25℃)

| 参数 Parameter | 符号 Symbol | 测试条件 Test Conditions | 最小值 Min | 典型值 Typ | 最大值 Max | 单位 Unit |
|---|---|---|---|---|---|---|
| Turn-on delay time | $t_{d(ON)}$ | $V_{CE}$=600V $I_C$=25A<br>$R_G$=10Ω<br>Inductive Load | - | 90 | - | ns |
| Rise time | $t_r$ | | - | 75 | - | |
| Turn-off delay time | $t_{d(OFF)}$ | | - | 210 | - | |
| Fall time | $t_f$ | | - | 100 | - | |
| Turn-On Switching Loss | $E_{on}$ | | - | 2.8 | - | mJ |
| Turn-Off Switching Loss | $E_{off}$ | | - | 1.1 | - | |
| Total Switching Loss | $E_{ts}$ | | - | 3.9 | - | |
| Total gate charge | $Q_G$ | $V_{CE}$=600V $I_C$=25A<br>$V_{GE}$=15V | - | 177 | 274 | nC |
| Gate-emitter charge | $Q_{G-E}$ | | - | 16 | 26 | |
| Gate-collector charge | $Q_{G-C}$ | | - | 61 | 94 | |
| Diode forward voltage | $V_F$ | $I_F$=25A | - | 1.7 | 2.9 | V |
| Reverse recovery time | Trr | $V_{GE}$=0V, VR=800V<br>$I_F$=25A<br>di/dt=200A/μS | - | 230 | | ns |
| Reverse recovery charge | Qrr | | - | 1200 | | nC |

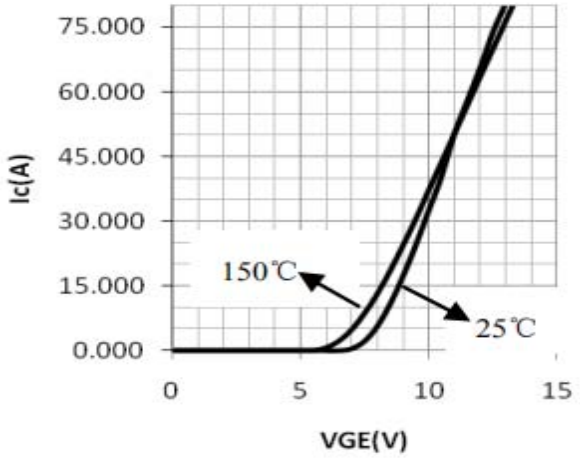
## 电参数曲线图 / Electrical Characteristic Curve



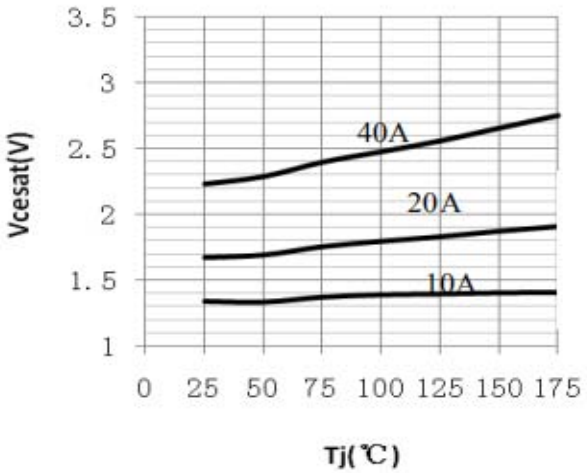

1.Typical Output Characteristics(Tj=25℃)



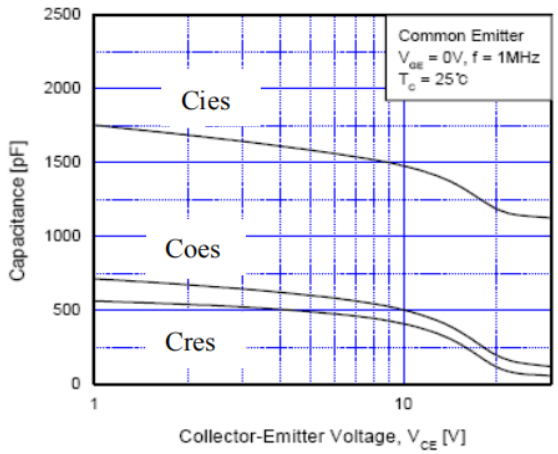

2.Typical Output Characteristics(Tj=150℃)



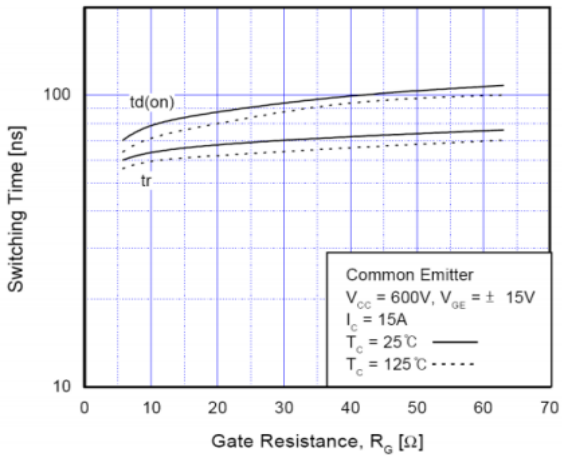

3.Typical Saturation Voltage Characteristics




4.Saturation Voltage vs. Case Temperature at Variant Current Level

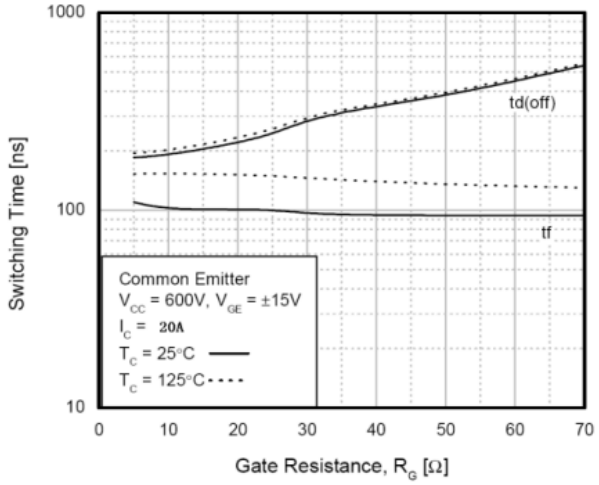



5.Capacitance Characteristics

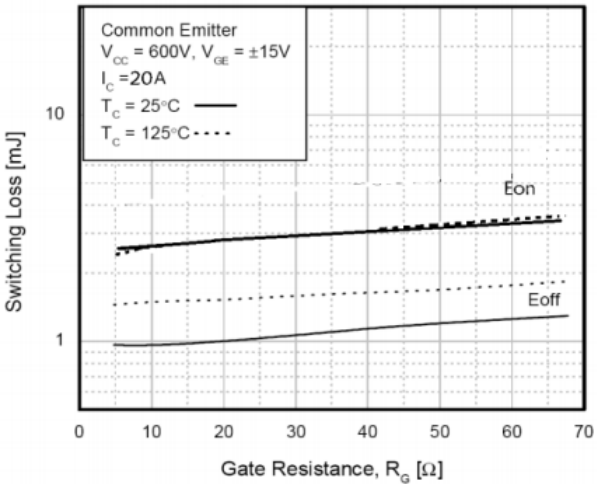



6.Turn-On Characteristics vs. Gate Resistance

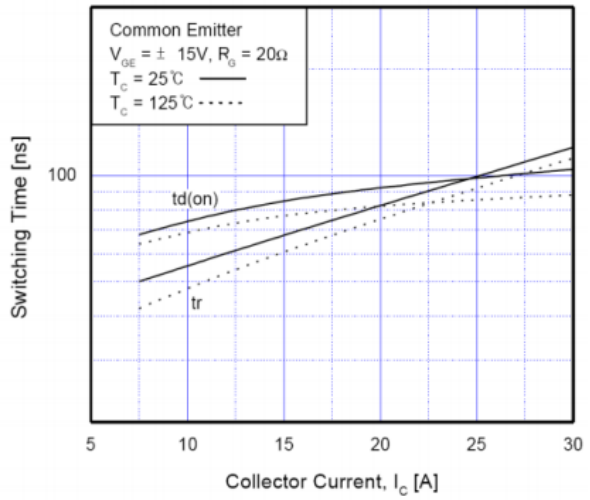
## 电参数曲线图 / Electrical Characteristic Curve



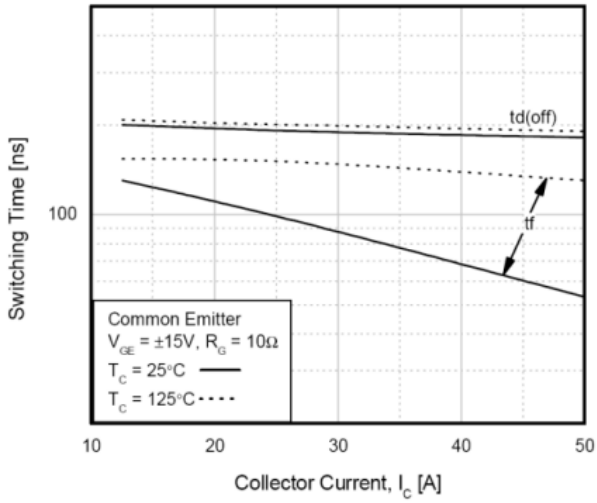

7.Turn-Off Characteristics vs. Gate Resistance



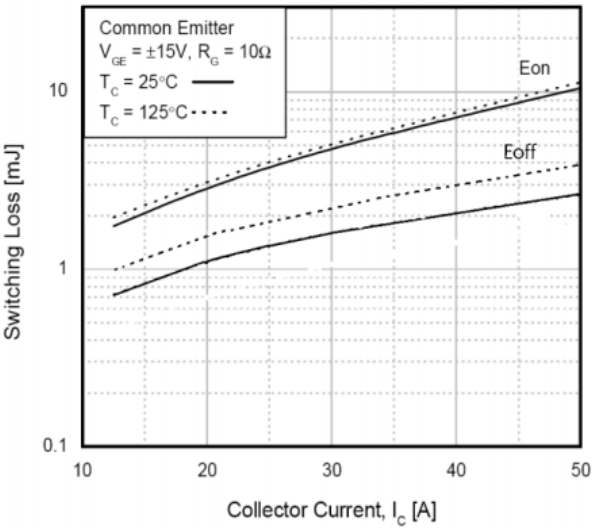

8.Switching Loss vs. Gate Resistance



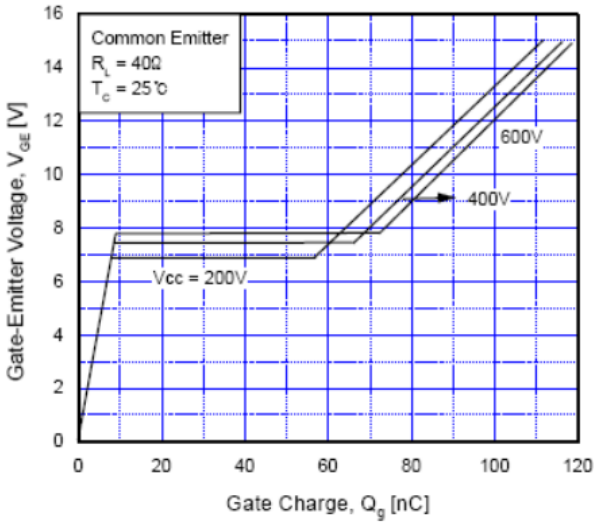

9.Turn-On Characteristics vs. Collector Current




10.Turn-Off Characteristics vs. Collector Current

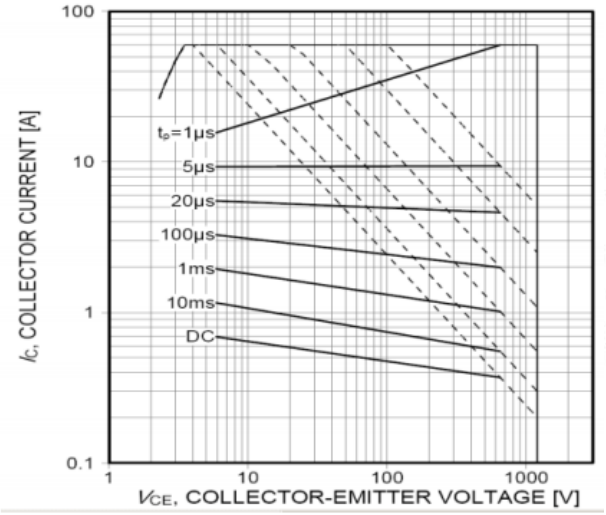



11.Switching Loss vs. Collector Current

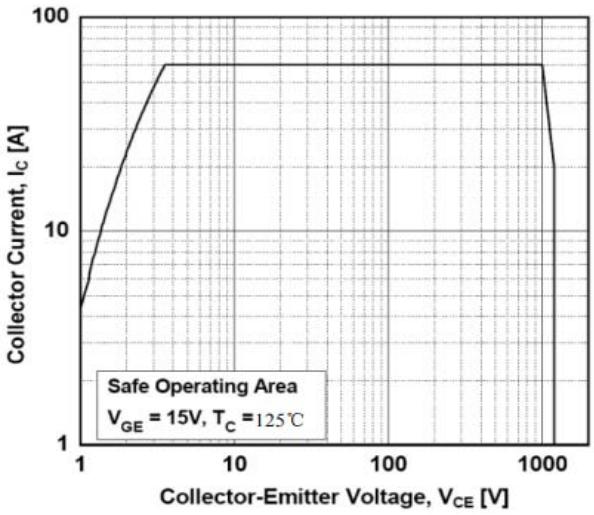



12.Gate Charge Characteristics

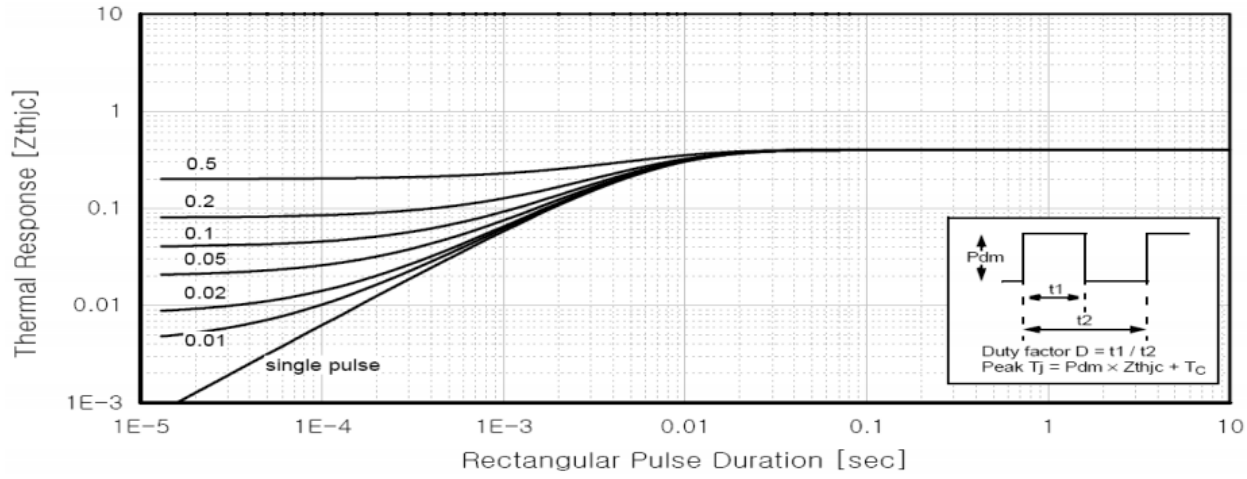
## 电参数曲线图 / Electrical Characteristic Curve



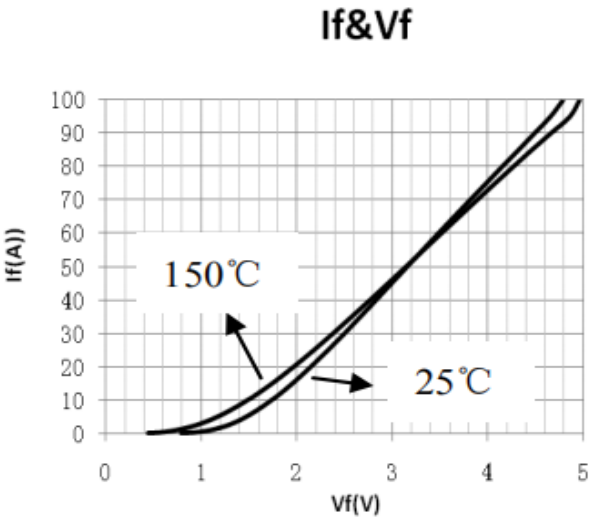

13.SOA Characteristics



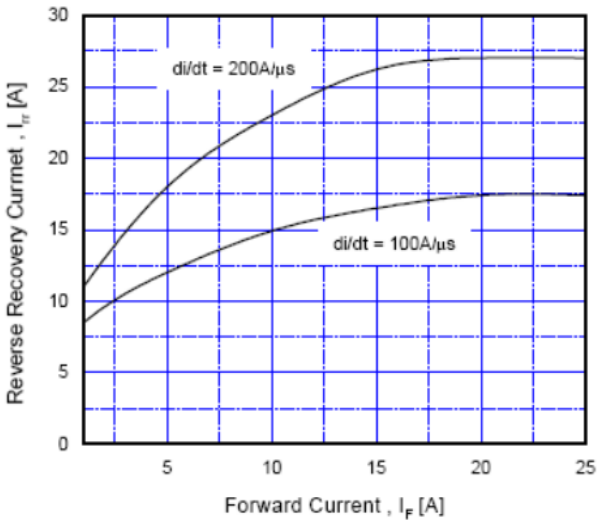

14.Turn-Off SOA




15.Transient Thermal Impedance

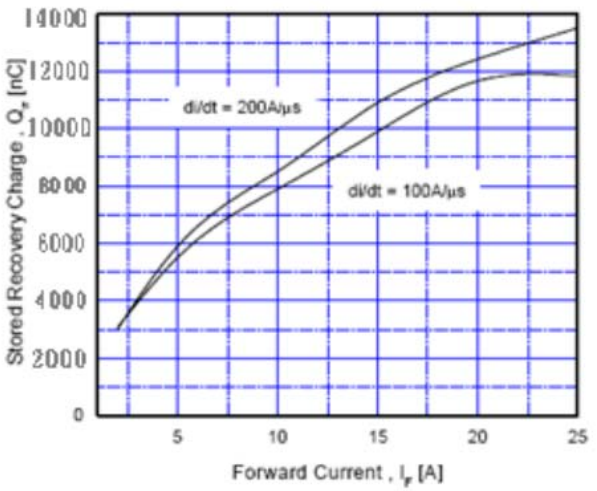



16.Forward Characteristics

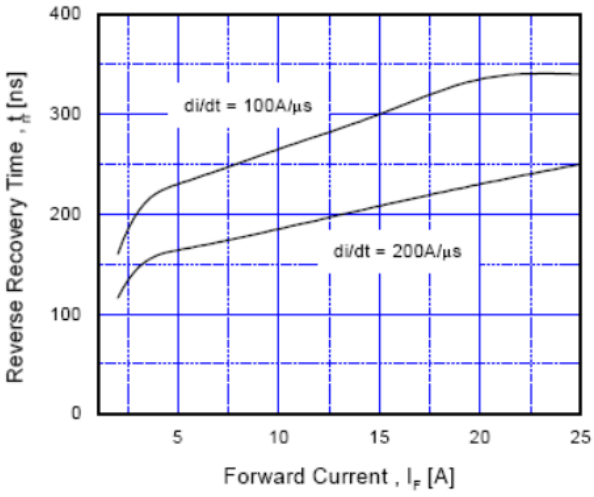



17.Reverse Recovery Current

## 电参数曲线图 / Electrical Characteristic Curve

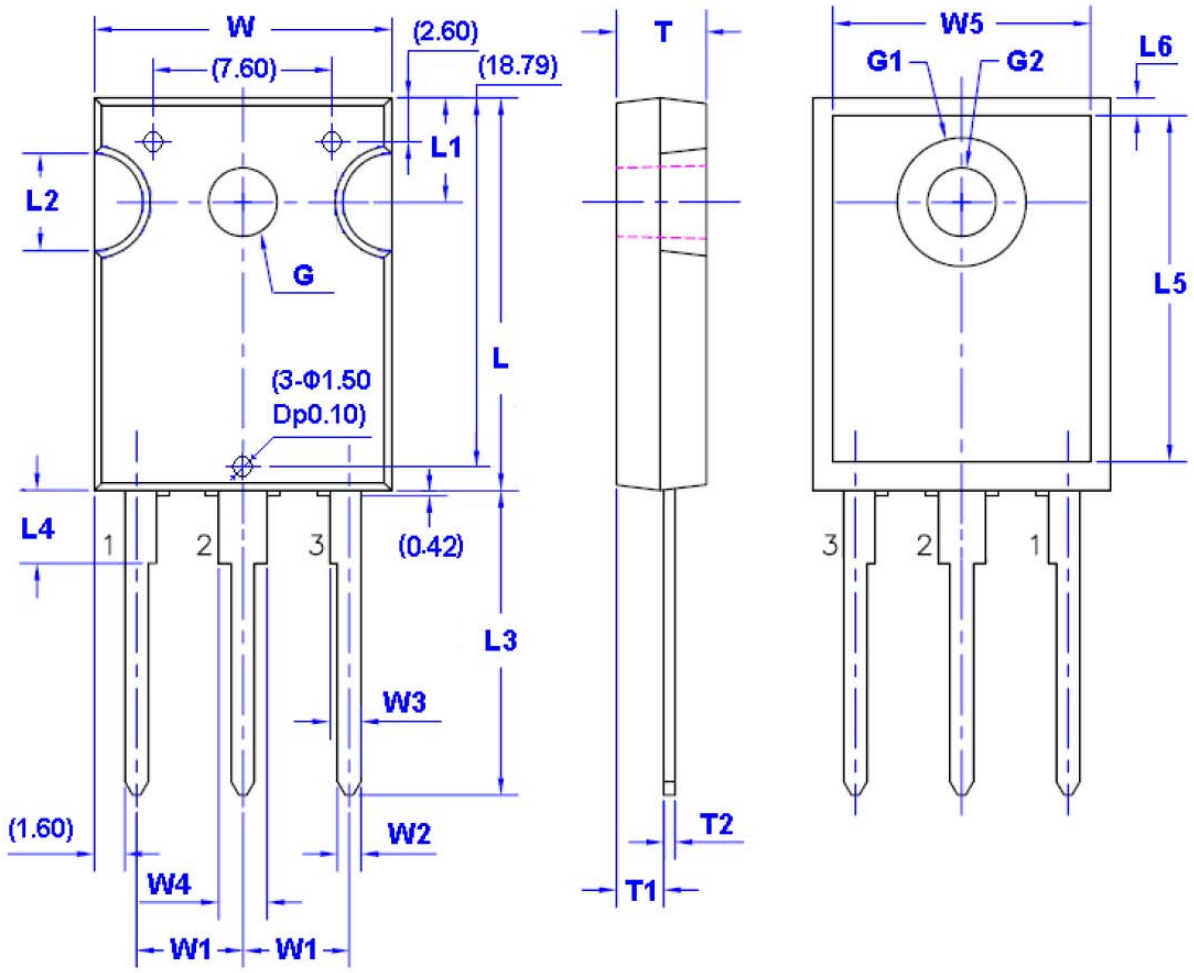



18.Stored Charge




19.Reverse Recovery Time

## 外形尺寸图 / Package Dimensions

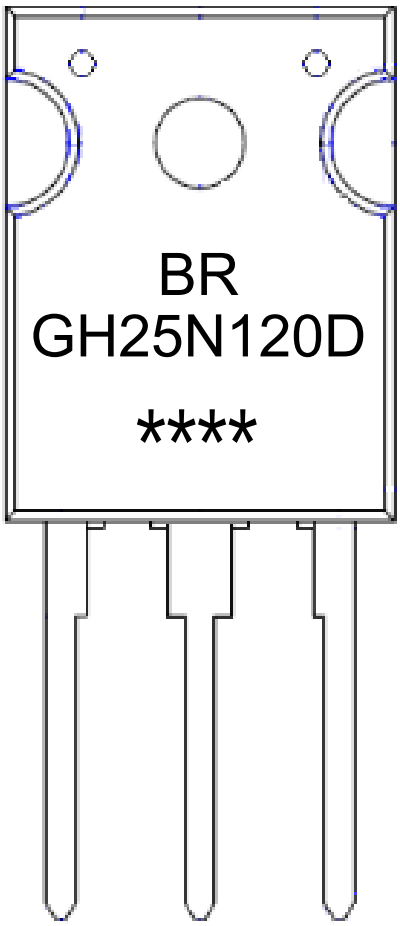



（单位: mm）

| 符号 | 尺寸 | | 符号 | 尺寸 | | 符号 | 尺寸 | | 符号 | 尺寸 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Min | Max | | Min | Max | | Min | Max | | Min | Max |
| W | 15.37 | 15.87 | W5 | 12.81 | -- | L4 | 3.69 | 3.93 | T2 | 0.51 | 0.71 |
| W1 | 5.56 (TYP) | | L | 20.32 | 20.82 | L5 | 13.08 | -- | G(Φ) | 3.51 | 3.65 |
| W2 | 1.17 | 1.35 | L1 | 5.34 | 5.58 | L6 | 0.51 | 1.35 | G1(Φ) | 6.61 | 6.85 |
| W3 | 1.53 | 1.77 | L2 | 4.96 | 5.20 | T | 4.58 | 4.82 | G2(Φ) | 3.51 | 3.65 |
| W4 | 2.42 | 2.66 | L3 | 15.75 | 16.25 | T1 | 2.29 | 2.66 | | | |

注：（）内数值为参考值。尺寸不包含毛刺及模具溢料。

## 印章说明 / Marking Instructions



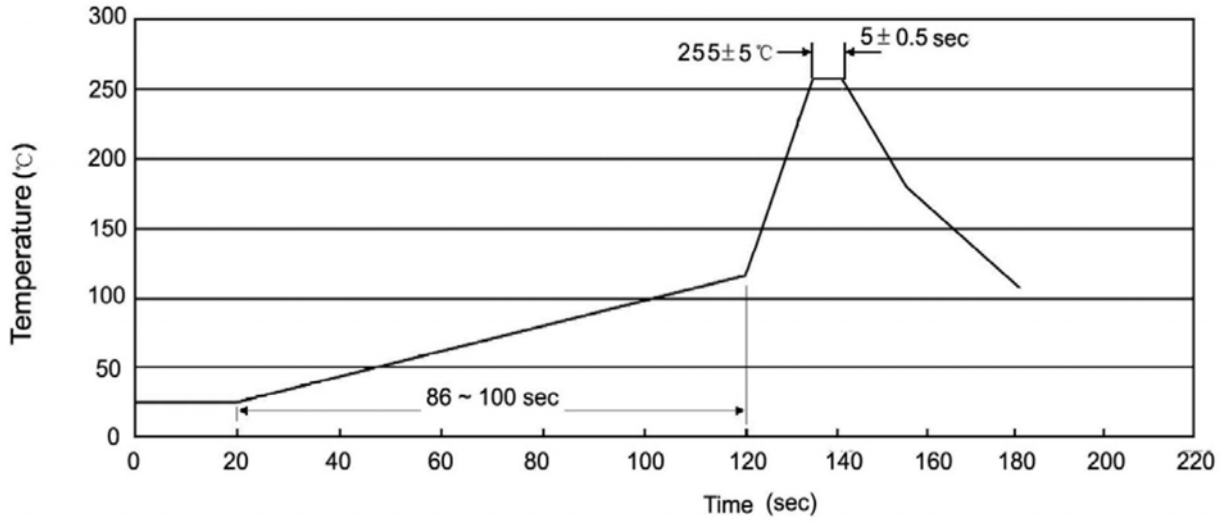

说明：

| | |
|---|---|
| BR: | 为公司代码 |
| G25N120D： | 为产品型号 |
| ****： | 为生产批号代码，随生产批号变化。 |

Note:

| | |
|---|---|
| BR: | Company Code. |
| G25N120D: | Product Type. |
| ****: | Lot No. Code, code change with Lot No. |

## 波峰焊温度曲线图(无铅) / Temperature Profile for Dip Soldering(Pb-Free)




说明：

1、预热温度 25～150℃，时间 60～90sec;

2、峰值温度 255±5℃，时间持续为 5±0.5sec;

3、焊接制程冷却速度为 2～10℃/sec.

Note:

1.Preheating:25~150℃, Time:60~90sec.

2.Peak Temp.:255±5℃, Duration:5±0.5sec.

3. Cooling Speed: 2~10℃/sec.

## 耐焊接热试验条件 / Resistance to Soldering Heat Test Conditions

温度：270±5℃ 时间：10±1 sec. Temp.:270±5℃ Time:10±1 sec

## 包装规格 / Packaging SPEC.

套管包装 / TUBE

| Package Type 封装形式 | Units 包装数量 | | | | | Dimension 包装尺寸 (unit: $mm^3$) | | |
|---|---|---|---|---|---|---|---|---|
| | Units/Tube 只/套管 | Tubes/Inner Box 套管/盒 | Units/Inner Box 只/盒 | Inner Boxes/Outer Box 盒/箱 | Units/Outer Box 只/箱 | Tube 套管 | Inner Box 盒 | Outer Box 箱 |
| TO-247 | 30 | 15 | 450 | 5 | 2250 | 497.5×46×8 | 555×164×50 | 575×290×180 |

## 使用说明 / Notices