



# TT075U065FQB

## 主要参数 MAIN CHARACTERISTICS

|                 |      |
|-----------------|------|
| $I_c$           | 75A  |
| $V_{CE}$        | 650V |
| $V_{CEsat-TYP}$ | 1.8V |

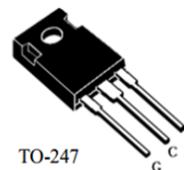
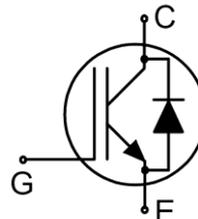
### 用途

- 充电桩
- UPS 电源
- 光伏

### APPLICATIONS

- Charging pile
- UPS
- Solar converters

## 封装 Package



### 产品特性

- 低栅极电荷
- Trench FS 技术
- RoHS 产品
- 快开关速度
- 低开关损耗
- $V_{CE(sat)}$  正温度系数

### FEATURES

- Low gate charge
- Trench FS Technology
- RoHS product
- Fast switching speed
- Low switching losses
- $V_{CE(sat)}$  with positive temperature coefficient

## 订货信息 ORDER MESSAGE

|                            |                |                |
|----------------------------|----------------|----------------|
| 订货型号 Order codes           | 印 记<br>Marking | 封 装<br>Package |
| 无卤-条管<br>Halogen-Free-Tube |                |                |
| TT075U065FQB-GE-BR         | TT075U065FQB   | TO-247         |

绝对最大额定值 ABSOLUTE RATINGS ( $T_C=25^\circ\text{C}$ )

| 项 目<br>Parameter   | 符 号<br>Symbol | 数 值 Value                      | 单 位<br>Unit      |
|--|---------------|--------------------------------|------------------|
| 最高集电极—发射极直流电压<br>Collector-emitter voltage   | $V_{CE}$      | 650                            | V                |
| *连续集电极电流<br>Collector current-continuous   | $I_C$         | 150( $T_C=25^\circ\text{C}$ )  | A                |
|  |               | 75( $T_C=100^\circ\text{C}$ )  | A                |
| 最大脉冲集电极极电流 (注 1)<br>Collector current – pulse (note 1)                                       | $I_{CM}$      | 300                            | A                |
| 二极管正向测试电流<br>Diode RMS forward current   | $I_F$         | 150( $T_C=25^\circ\text{C}$ )  | A                |
|  |               | 75 ( $T_C=100^\circ\text{C}$ ) | A                |
| 二极管正向不重复峰值电流 (浪涌电流)<br>Surge non repetitive forward current $t_p=10\text{ ms}$<br>sinusoidal | $I_{FSM}$     | 300                            | A                |
| 最高栅极发射极电压<br>Gate-emitter voltage  | $V_{GE}$      | $\pm 20$                       | V                |
| 瞬态栅极发射极电压<br>Transient gate-emitter voltage( $t_p \leq 10\mu\text{s}$ , $D < 0.010$ )        | $V_{GE}$      | $\pm 30$                       | V                |
| 安全工作区<br>Turn-off safe area  | -             | 300                            | A                |
| 耗散功率<br>Power dissipation  | $P_D$         | $T_C=25^\circ\text{C}$         | 428              |
|  |               | $T_C=100^\circ\text{C}$        | 214              |
| 工作结温<br>Operating junction temperature range   | $T_{VJ}$      | $-40 \sim +175$                | $^\circ\text{C}$ |
| 存储温度<br>Storage temperature  | $T_{STG}$     | $-55 \sim +150$                | $^\circ\text{C}$ |
| 引线焊接温度<br>Soldering temperature,<br>wave soldering 1.6mm (0.063in.) from case for 10s        | $T_L$         | 260                            | $^\circ\text{C}$ |

\*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 |
|---|---------------|--|-----------|-----------|-----------|-------------|
| <b>关态特性 Off –Characteristics</b>                  |               |  |           |           |           |             |
| 集电极—发射极击穿电压<br>Collector-emitter voltage          | $BV_{CES}$    | $I_C=250\mu A, V_{GE}=0V$                  | 650       | -         | -         | V           |
| 零栅压下集电极漏电流<br>Zero gate voltage collector current | $I_{CES}$     | $V_{CE}=650V, V_{GE}=0V,$                  | -         | -         | 80        | $\mu A$     |
| 正向栅极体漏电流<br>Gate-body leakage current, forward    | $I_{GESF}$    | $V_{CE}=0V, V_{GE}=20V$                    | -         | -         | 200       | nA          |
| 反向栅极体漏电流<br>Gate-body leakage current, reverse    | $I_{GESR}$    | $V_{CE}=0V, V_{GE}=-20V$                   | -         | -         | -200      | nA          |
| <b>通态特性 On-Characteristics</b>                    |               |  |           |           |           |             |
| 阈值电压<br>Gate threshold voltage                    | $V_{GE(th)}$  | $V_{CE} = V_{GE}, I_C=1mA$                 | 3.5       | 4.5       | 5.5       | V           |
| 饱和压降<br>Collector-emitter saturation voltage      | $V_{CESAT}$   | $V_{GE}=15V, I_C=75A$<br>$T_C=25^\circ C$  | -         | 1.8       | 2.4       | V           |
| <b>动态特性 Dynamic Characteristics</b>               |               |  |           |           |           |             |
| 输入电容<br>Input capacitance                         | $C_{ies}$     | $V_{CE}=25V,$<br>$V_{GE}=0V$<br>$f=1.0MHz$ | -         | 3500      | -         | pF          |
| 输出电容<br>Output capacitance                        | $C_{oes}$     |  | -         | 345       | -         | pF          |
| 反向传输电容<br>Reverse transfer capacitance            | $C_{res}$     |  | -         | 72        | -         | pF          |
| 栅极电荷总量<br>Total gate charge                       | $Q_G$         | $V_{CC}=520V, I_C=75A, V_{GE}=15V$         | -         | 146       | -         | nC          |
| 栅极-发射极电荷<br>Gate to emitter charge                | $Q_{GE}$      |  | -         | 23        | -         |             |
| 栅极-集电极电荷<br>Gate to collector charge              | $Q_{GC}$      |  | -         | 81        | -         |             |



## 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 | 单位<br>Units |
|------------------------------|---------------|--|-----------|-----------|-----------|-------------|
| 开启延迟时间 Turn-on delay time    | $t_{d(on)}$   | $V_{CC}=400V, I_c=75A, R_G=5\Omega$<br>$V_{GE}=15V$<br>$T_C=25^\circ C$    | -         | 12        | -         | ns          |
| 上升时间 Turn-on rise time       | $t_r$         |  | -         | 87        | -         | ns          |
| 关断延迟时间 Turn-off delay time   | $t_{d(off)}$  |  | -         | 101       | -         | ns          |
| 下降时间 Turn-off fall time      | $t_f$         |  | -         | 75        | -         | ns          |
| 开通损耗 Turn-on energy          | $E_{on}$      |  | -         | 1.93      | -         | mJ          |
| 关断损耗 Turn-off energy         | $E_{off}$     |  | -         | 1.29      | -         | mJ          |
| 总开关损耗 Total switching energy | $E_{tot}$     |  | -         | 3.22      | -         | mJ          |
| 开启延迟时间 Turn-on delay time    | $t_{d(on)}$   | $V_{CC}=400V, I_c=75A, R_G=5\Omega$<br>$V_{GE}=15V$<br>$T_C=175^\circ C$   | -         | 15        | -         | ns          |
| 上升时间 Turn-on rise time       | $t_r$         |  | -         | 83        | -         | ns          |
| 关断延迟时间 Turn-off delay time   | $t_{d(off)}$  |  | -         | 115       | -         | ns          |
| 下降时间 Turn-off fall time      | $t_f$         |  | -         | 98        | -         | ns          |
| 开通损耗 Turn-on energy          | $E_{on}$      |  | -         | 2.05      | -         | mJ          |
| 关断损耗 Turn-off energy         | $E_{off}$     |  | -         | 1.97      | -         | mJ          |
| 总开关损耗 Total switching energy | $E_{tot}$     |  | -         | 4.02      | -         | mJ          |
| 开启延迟时间 Turn-on delay time    | $t_{d(on)}$   | $V_{CC}=400V, I_c=37.5A, R_G=5\Omega$<br>$V_{GE}=15V$<br>$T_C=25^\circ C$  | -         | 8         | -         | ns          |
| 上升时间 Turn-on rise time       | $t_r$         |  | -         | 42        | -         | ns          |
| 关断延迟时间 Turn-off delay time   | $t_{d(off)}$  |  | -         | 115       | -         | ns          |
| 下降时间 Turn-off fall time      | $t_f$         |  | -         | 56        | -         | ns          |
| 开通损耗 Turn-on energy          | $E_{on}$      |  | -         | 0.53      | -         | mJ          |
| 关断损耗 Turn-off energy         | $E_{off}$     |  | -         | 0.67      | -         | mJ          |
| 总开关损耗 Total switching energy | $E_{tot}$     |  | -         | 1.20      | -         | mJ          |
| 开启延迟时间 Turn-on delay time    | $t_{d(on)}$   | $V_{CC}=400V, I_c=37.5A, R_G=5\Omega$<br>$V_{GE}=15V$<br>$T_C=175^\circ C$ | -         | 6         | -         | ns          |
| 上升时间 Turn-on rise time       | $t_r$         |  | -         | 42        | -         | ns          |
| 关断延迟时间 Turn-off delay time   | $t_{d(off)}$  |  | -         | 146       | -         | ns          |
| 下降时间 Turn-off fall time      | $t_f$         |  | -         | 125       | -         | ns          |
| 开通损耗 Turn-On energy          | $E_{on}$      |  | -         | 0.54      | -         | mJ          |
| 关断损耗 Turn-off energy         | $E_{off}$     |  | -         | 0.79      | -         | mJ          |
| 总开关损耗 Total switching energy | $E_{tot}$     |  | -         | 1.33      | -         | mJ          |

## 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>Diode forward voltage           | $V_F$     | $I_F=75A, T_C=25^\circ C$                | - | 1.45 | 1.85 | V  |
|   |           | $I_F=75A, T_C=150^\circ C$               | - | 1.40 | -    | V  |
| 反向恢复时间<br>Diode reverse recovery time   | $t_{rr}$  | $V_R=200V, I_F=75A$                      | - | 152  | -    | ns |
| 反向恢复电荷<br>Diode reverse recovery charge | $Q_{rr}$  | $di_F/dt=200A/\mu s$<br>$T_C=25^\circ C$ | - | 748  | -    | nC |
| 反向恢复电流                                  | $I_{rrm}$ |  | - | 9.2  | -    | A  |





|  |           |  |   |     |   |         |
|--|-----------|--|---|-----|---|---------|
| Diode reverse recovery current           |           |  |   |     |   |         |
| 反向恢复时间<br>Diode reverse recovery time    | $t_{rr}$  | $V_{GE}=0V, V_R=200V I_F=75A$<br>$di_F/dt=200A/\mu s$<br>$T_C=175^\circ C$ | - | 270 | - | ns      |
| 反向恢复电荷<br>Diode reverse recovery charge  | $Q_{rr}$  |  | - | 3.3 | - | $\mu C$ |
| 反向恢复电流<br>Diode reverse recovery current | $I_{rrm}$ |  | - | 21  | - | A       |

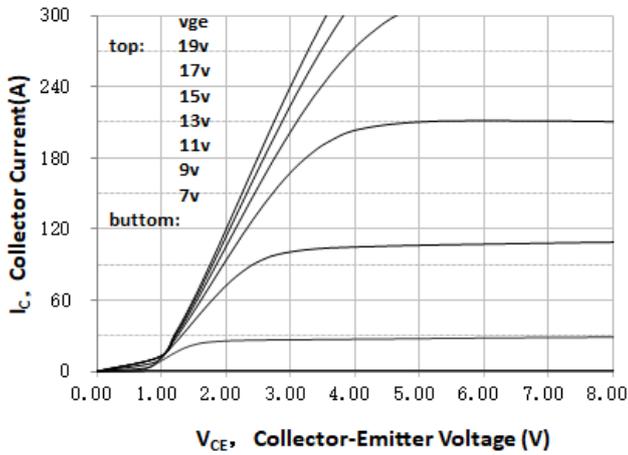
| 项 目 Parameter                  | 符 号 Symbol    | 典型值 TYP | 最大值 MAX | 单 位 Unit     |
|--------------------------------|---------------|---------|---------|--------------|
| 结到管壳的热阻 Junction to case IGBT  | $R_{th(j-c)}$ | 0.28    | 0.35    | $^\circ C/W$ |
| 结到管壳的热阻 Junction to case diode | $R_{th(j-c)}$ | 0.34    | 0.42    | $^\circ C/W$ |
| 结到环境的热阻 Junction to ambient    | $R_{th(j-A)}$ | -       | 40      | $^\circ C/W$ |



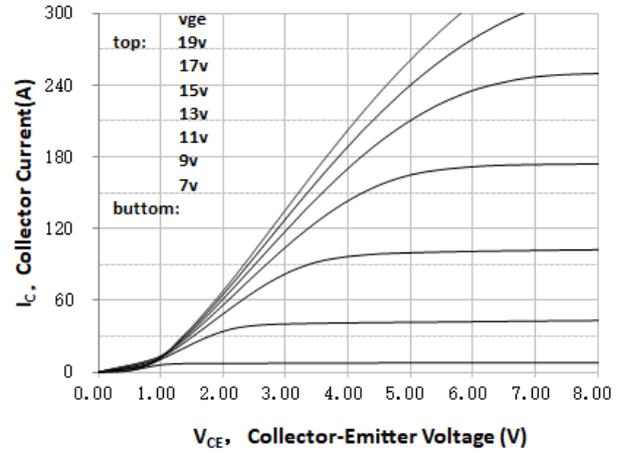


## 特征曲线 ELECTRICAL CHARACTERISTICS (curves)

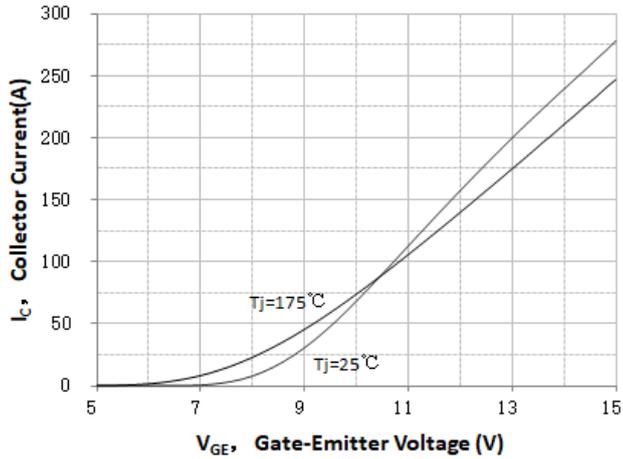
Output Characteristics (25°C)



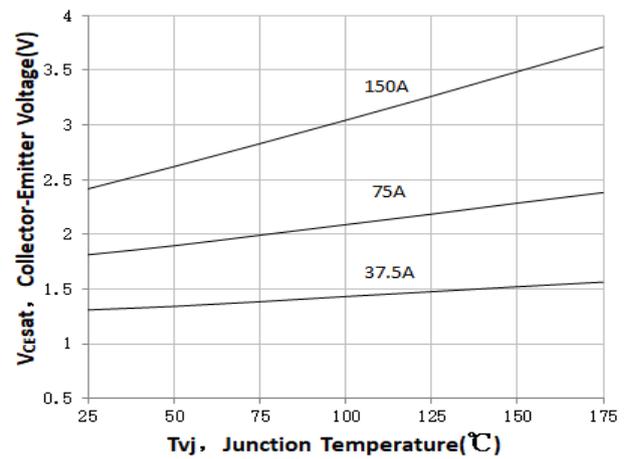
Output Characteristics (175°C)



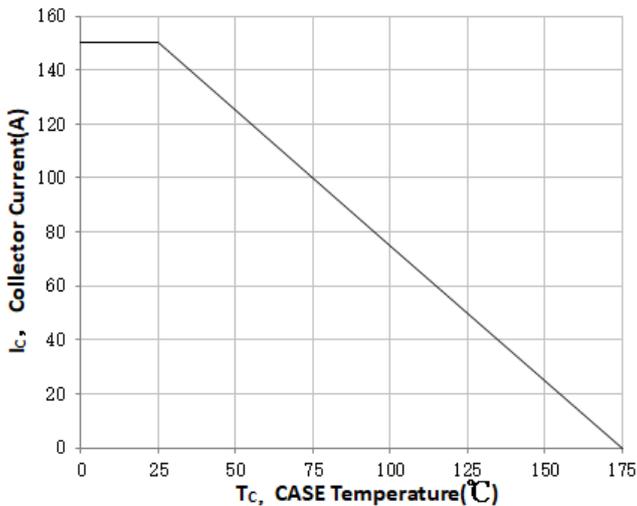
Transfer Characteristics



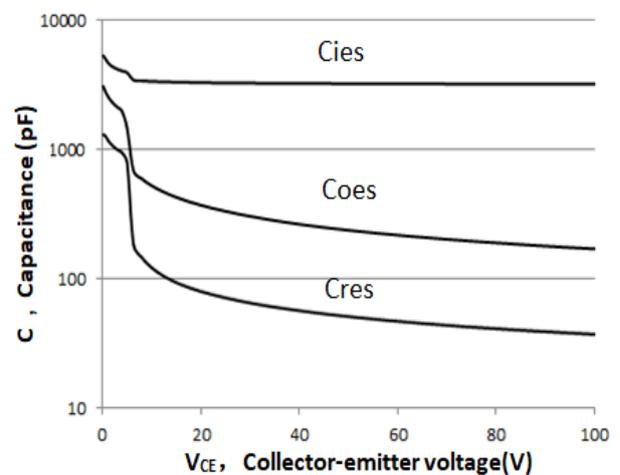
VCEsat vs. Tvj



Collector current vs. case temperature

 $V_{GE} \geq 15V, T_{vj} \leq 175^\circ\text{C}$ 

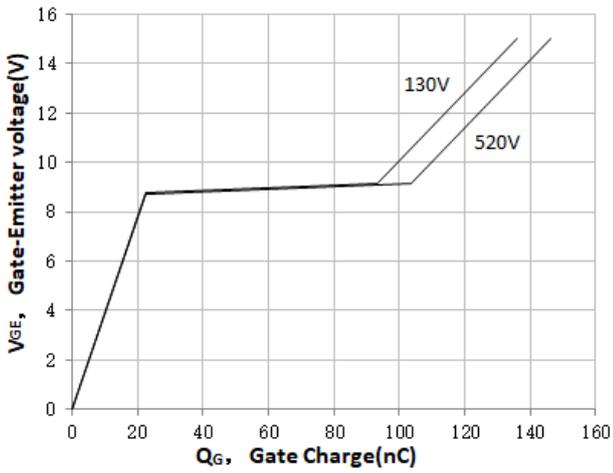
Capacitance Characteristic

 $V_{GE} = 0V, f = 1\text{MHz}$ 



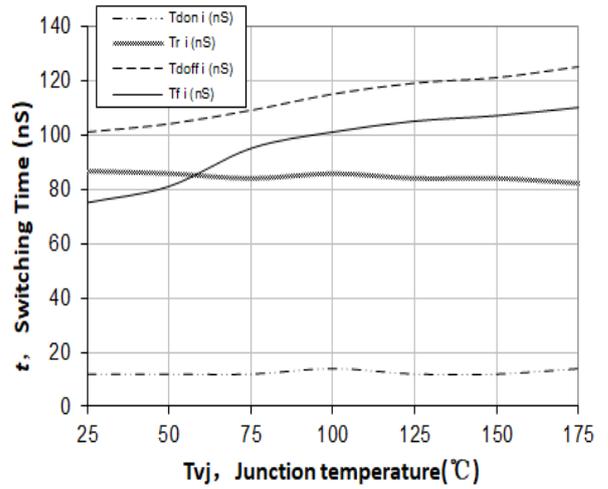
**Gate Charge Characteristics**

$V_{GE}=15V, I_C=75A$



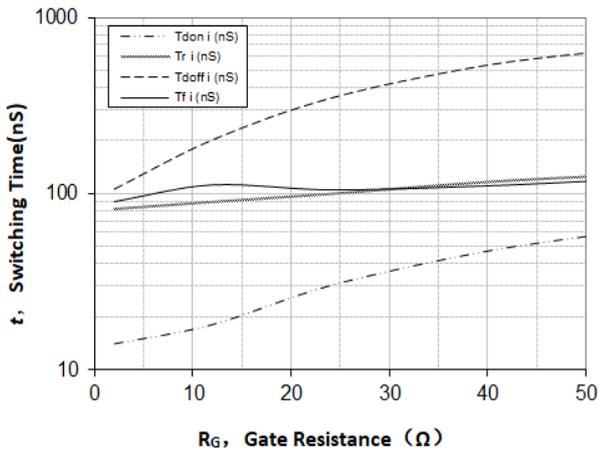
**Switching Time vs.  $T_{vj}$**

$V_{GE}=15V, V_{CE}=400V, I_C=75A, R_G=5\Omega$



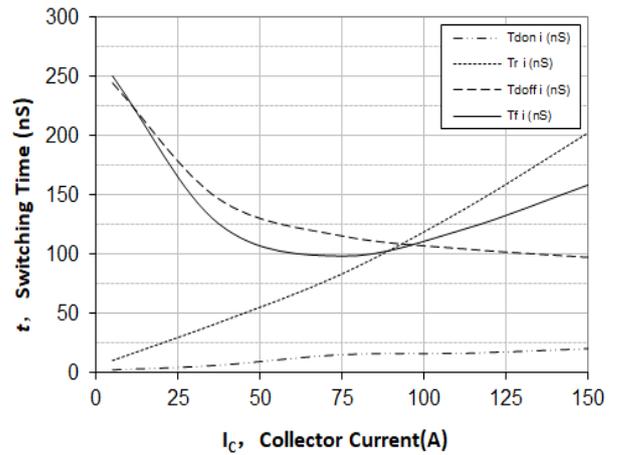
**Switching Time vs.  $R_G(175^\circ C)$**

$V_{GE}=15V, V_{CE}=400V, I_C=75A$



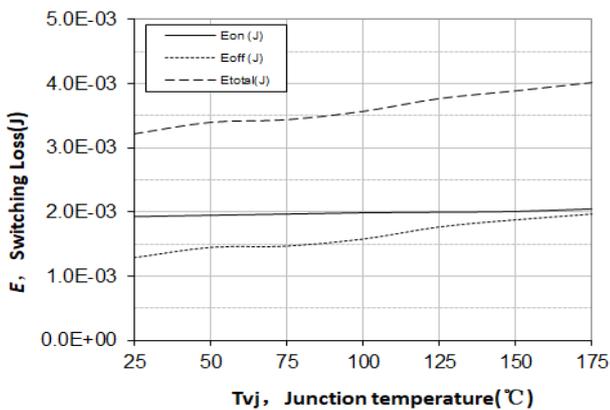
**Switching Time vs.  $I_C(175^\circ C)$**

$V_{CE}=400V, V_{GE}=15V, R_G=5\Omega$



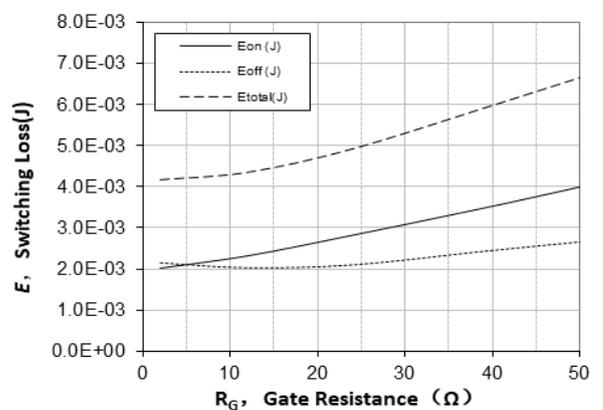
**Switching Loss vs.  $T_{vj}$**

$V_{GE}=15V, V_{CE}=400V, I_C=75A, R_G=5\Omega$



**Switching Loss vs.  $R_G(175^\circ C)$**

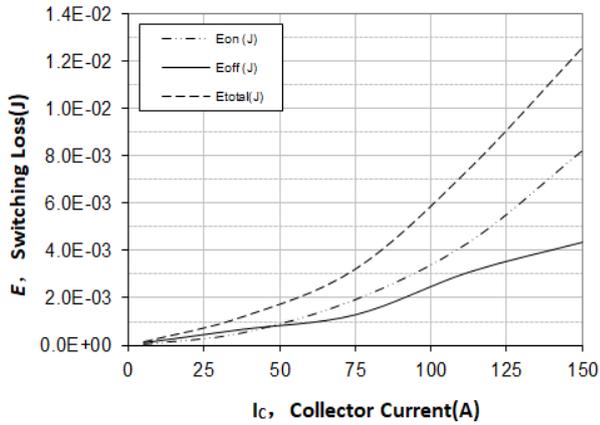
$V_{GE}=15V, V_{CE}=400V, I_C=75A$





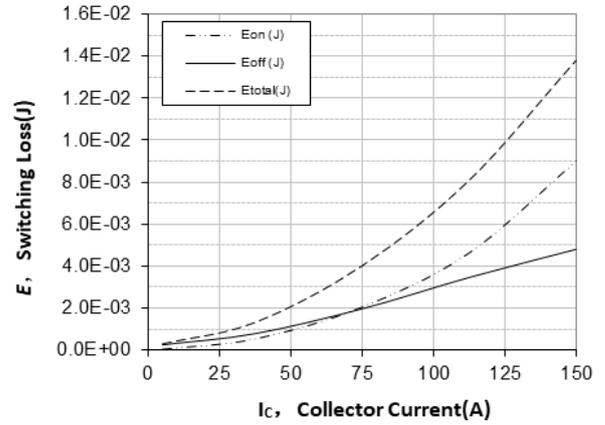
Switching Loss vs.  $I_c(25^\circ\text{C})$

$V_{CE}=400\text{V}, V_{GE}=15\text{V}, R_G=5\Omega$



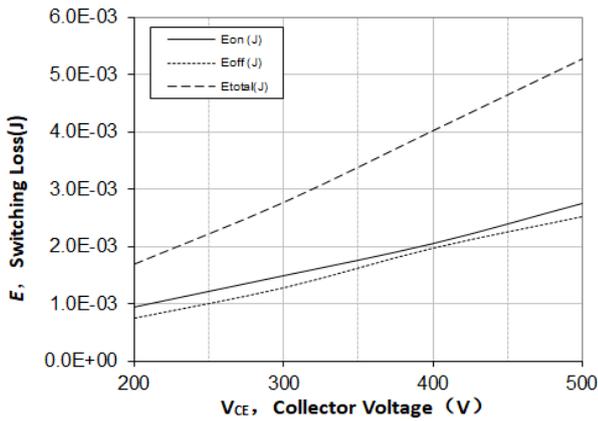
Switching Loss vs.  $I_c(175^\circ\text{C})$

$V_{CE}=400\text{V}, V_{GE}=15\text{V}, R_G=5\Omega$

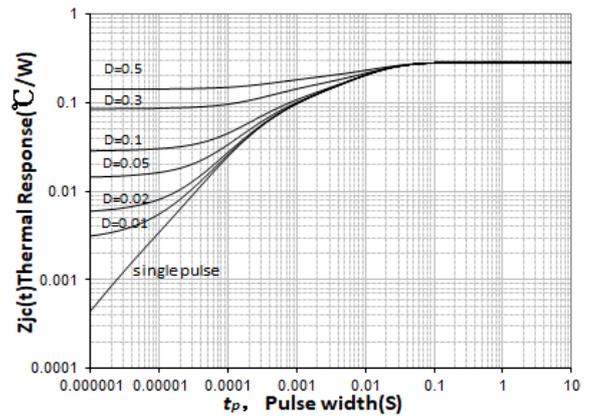


Switching Loss vs.  $V_{CE}(175^\circ\text{C})$

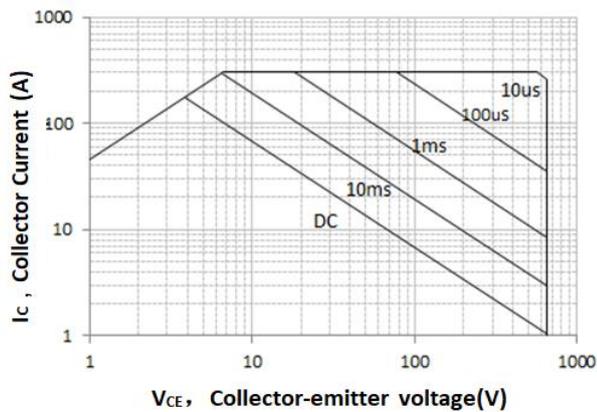
$V_{GE}=15\text{V}, I_c=75\text{A}, R_G=5\Omega$



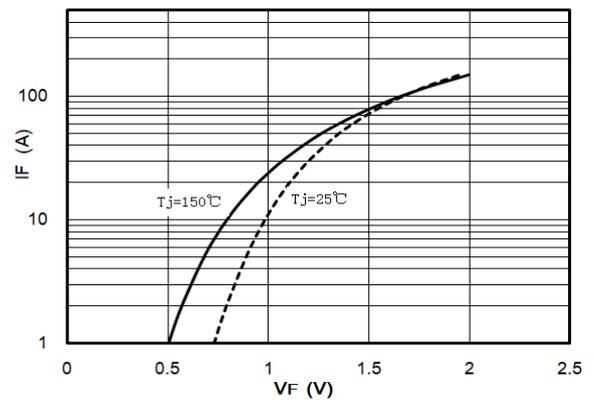
Transient Thermal Impedance IGBT  $R_{th(j-c)}$



Safe Operating Area For TO-247

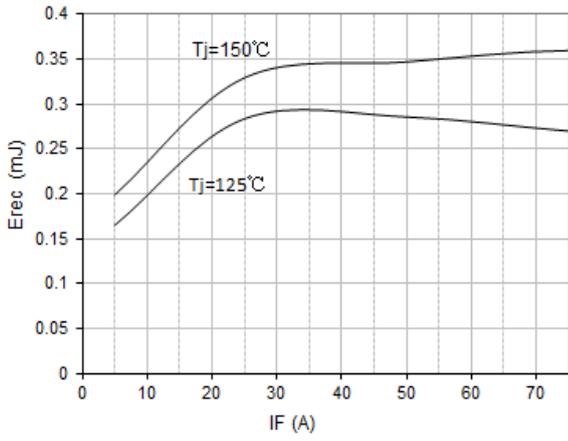


IF vs. VF

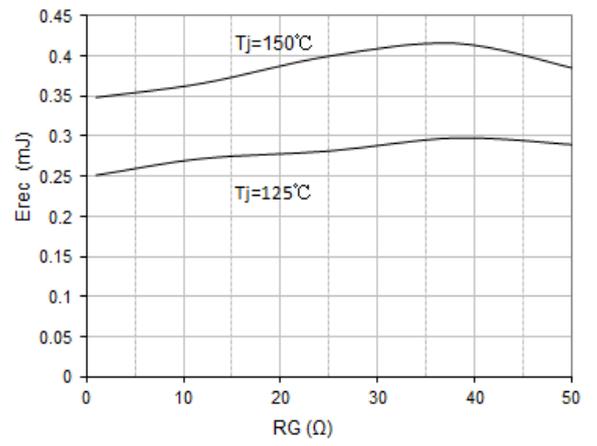




Erec vs. IF



Erec vs. RG

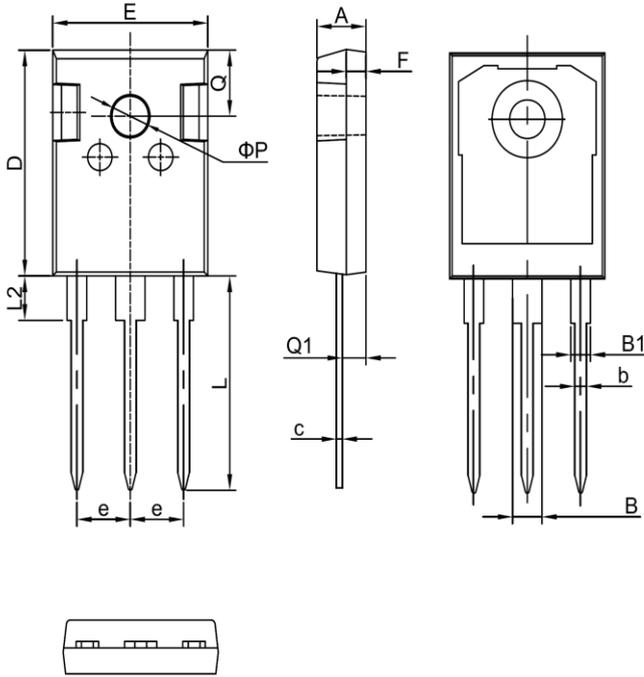




## 外形尺寸 PACKAGE MECHANICAL DATA

TO-247

单位 Unit: mm



| 符号<br>symbol | MIN   | MAX   |
|--------------|-------|-------|
| A            | 4.90  | 5.10  |
| B            | 2.95  | 3.35  |
| B1           | 1.95  | 2.35  |
| b            | 1.15  | 1.35  |
| c            | 0.50  | 0.70  |
| D            | 20.90 | 21.10 |
| E            | 15.70 | 15.90 |
| e            | 5.34  | 5.54  |
| F            | 1.90  | 2.10  |
| L            | 19.40 | 20.40 |
| L2           | 4.03  | 4.23  |
| Q            | 6.00  | 6.40  |
| Q1           | 2.30  | 2.50  |
| P            | 3.50  | 3.70  |



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4. 本说明书如有版本变更不另外告知。

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2. We strongly recommend customers check carefully on the trademark when buying our product, if there is any question, please don't be hesitate to contact us.
3. Please do not exceed the absolute maximum ratings of the device when circuit designing.
4. Jilin Sino-microelectronics co., Ltd reserves the right to make changes in this. specification sheet and is subject to change without prior notice.

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