## General Description：

Using owner proprietary trench design and advanced Field Stop (FS) technology, offering superior conduction and Switching performances. RoHS Compliant.

| | | |
|---|---|---|
| $V_{CES}$ | 650 | V |
| $I_C$ | 75 | A |
| $P_{tot}$ ($T_C$=25℃) | 468 | W |
| $V_{CE(sat)}$ | 1.45 | V |

Outline ： TO-247




## Features：

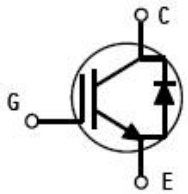
- Qualified to AEC-Q101;
- FS Trench Technology, Positive temperature coefficient;
- Low saturation voltage：

  $V_{CE(sat)}$,TYP=1.45V @$I_C$=75A,$V_{GE}$=15V;
- Low switching loss.

## Applications

- OBC

Inner Circuit:




## Package Parameters

| Type | Marking | Package | Packing | Qty |
|---|---|---|---|---|
| CRG75T65AK5SCDQ | G75T65AK5SCDQ | TO-247 | Tube | 25 |

## Absolute Maximum Ratings（$T_C$= 25℃ unless otherwise specified）：

| Symbol | Parameter | Rating | Unit |
|---|---|---|---|
| $V_{CES}$ | Collector-Emitter Voltage | 650 | V |
| $V_{GES}$ | Gate- Emitter Voltage | ±20 | V |
| $V_{GES}$ | Gate- Emitter Voltage（tp≤10us,D<0.01） | ±30 | V |
| $I_C$[a1] | Collector Current @$T_C$ = 25 °C | 90 | A |
| | Collector Current @$T_C$ = 100 °C | 75 | |
| $I_{CM}$[a1] | Pulsed Collector Current | 300 | A |
| $I_F$[a2] | Diode Continuous Forward Current @$T_C$ =25 °C | 80 | A |
| | Diode Continuous Forward Current @$T_C$ = 100 °C | 64 | |
| $I_{FM}$ | Diode Maximum Forward Current | 180 | A |
| $P_D$ | Power Dissipation @ $T_C$ = 25°C | 468 | W |
| | Power Dissipation @ $T_C$ = 100°C | 234 | W |
| $T_j$[a3] | Operating Junction temperature range | -40～175 | ℃ |
| $T_{stg}$ | Storage Temperature Range | -55～150 | ℃ |
| $T_L$ | Maximum Temperature for Soldering | 270 | ℃ |

## Thermal Characteristics

| Symbol | Parameter | Typ. | Max. | Unit |
|---|---|---|---|---|
| $R\theta_{JC}$ | Thermal Resistance, Junction to case for IGBT | -- | 0.32 | ℃/W |
| $R\theta_{JC}$ | Thermal Resistance, Junction to case for Diode | -- | 1.03 | ℃/W |
| $R\theta_{JA}$ | Thermal Resistance, Junction to Ambient | -- | 40 | ℃/W |

## Electrical Characteristics of the IGBT（$T_C$= 25℃ unless otherwise specified）：

| Symbol | Parameter | Conditions | Value | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | |
| **OFF Characteristics** | | | | | | |
| $V_{(BR)CES}$ | Collector-Emitter Breakdown Voltage | $V_{GE}$=0V,$I_{CE}$=250uA | 650 | -- | -- | V |
| $I_{CES}$ | Collector Cut-off Current | $V_{GE}$=0V,$V_{CE}$=650V | -- | -- | 1.0 | mA |
| $I_{GES(F)}$ | Gate-Emitter Forward Leakage Current | $V_{GE}$=+20V | -- | -- | +250 | nA |
| $I_{GES(R)}$ | Gate-Emitter Reverse Leakage Current | $V_{GE}$ =-20V | -- | -- | -250 | nA |
| **ON Characteristics** | | | | | | |
| $V_{CE(sat)}$ | Collector-Emitter Saturation Voltage | $I_C$=75A,$V_{GE}$=15V @ $T_C$ = 25°C | -- | 1.45 | 1.9 | V |
| | | $I_C$=75A,$V_{GE}$=15V @ $T_C$ =175°C | -- | 1.80 | -- | V |
| $V_{GE(th)}$ | Gate - Emitter Threshold Voltage | $I_C$=0.25mA,$V_{CE}$=$V_{GE}$ | 3.5 | -- | 6.5 | V |
| Pulse width tp≤300μs,δ≤2% | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Dynamic Characteristics** | | | | | | | |
| $C_{ies}$ | Input Capacitance | $V_{CE}$=30V,$V_{GE}$=0V f=1MHz | | -- | 5371 | -- | pF |
| $C_{oes}$ | Output Capacitance | | | -- | 524 | -- | |
| $C_{res}$ | Reverse Transfer Capacitance | | | -- | 21 | -- | |
| **Switching Characteristics** | | | | | | | |
| $t_{d(on)}$ | Turn-on Delay Time | $V_{CE}$=400V,$I_C$=75A, $R_g$=10Ω,$V_{GE}$=15V, Inductive Load, $T_J$=25℃, | | -- | 30 | -- | nS |
| $t_r$ | Rise Time | | | -- | 25 | -- | |
| $t_{d(off)}$ | Turn-Off Delay Time | | | -- | 241 | -- | |
| $t_f$ | Fall Time | | | -- | 20.5 | -- | |
| $E_{on}$ [a4] | Turn-On Switching Loss | | | -- | 0.62 | -- | mJ |
| $E_{off}$ | Turn-Off Switching Loss | | | -- | 1.09 | -- | |
| $E_{ts}$ | Total Switching Loss | | | -- | 1.71 | -- | |
| $t_{d(on)}$ | Turn-on Delay Time | $V_{CE}$=400V,$I_C$=75A, $R_g$=10Ω,$V_{GE}$=15V, Inductive Load, $T_J$=175℃ | | -- | 28.5 | -- | nS |
| $t_r$ | Rise Time | | | -- | 31 | -- | |
| $t_{d(off)}$ | Turn-Off Delay Time | | | -- | 275 | -- | |
| $t_f$ | Fall Time | | | -- | 42.2 | -- | |
| $E_{on}$ [a4] | Turn-On Switching Loss | | | -- | 0.82 | -- | mJ |
| $E_{off}$ | Turn-Off Switching Loss | | | -- | 1.51 | -- | |
| $E_{ts}$ | Total Switching Loss | | | -- | 2.33 | -- | |
| $Q_g$ | Total Gate Charge | $V_{CE}$=520V,$I_C$=75A, $V_{GE}$=15V, | | -- | 184 | -- | nC |
| $Q_{ge}$ | Gate to Emitter Charge | | | -- | 37 | -- | |
| $Q_{gc}$ | Gate to Collector Charge | | | -- | 90 | -- | |
| **Electrical Characteristics of the DIODE** | | | | | | | |
| $V_F$ | Diode Forward Voltage | $I_F$=75A | TC=25℃ | -- | 1.85 | 2.5 | V |
| | | | TC=175℃ | -- | 2.5 | -- | V |
| $t_{rr}$ | Reverse Recovery Time | $V_R$=400V,$R_g$=10Ω, $I_F$=75A, di/dt=200A/μS, TC=25℃ | | -- | 29 | -- | nS |
| $Q_{rr}$ | Reverse Recovery Charge | | | -- | 50 | -- | nC |
| $I_{rrm}$ | Reverse Recovery Current | | | -- | 3.5 | -- | A |

Notes：

a1：The collector DC current is limited by the maximum junction temperature, limited by the bond wire current capacity at 25° C

a2：FRD DC forward current is limited by the maximum junction temperature, limited by the bond wire current capacity at 25° C

a3：Repetitive rating; pulse width limited by maximum junction temperature; Under overloading conditions, it is allowed to operate under the maximum junction temperature $T_j$=175℃, and the maximum duty cycle is less than 20% (maximum lasting 60s)

a4：Turn-on losses include diode losses

## Typical Performance Characteristics

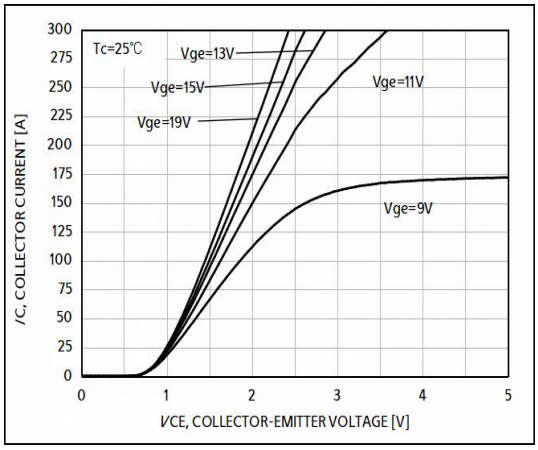



Figure 1. Output Characteristics

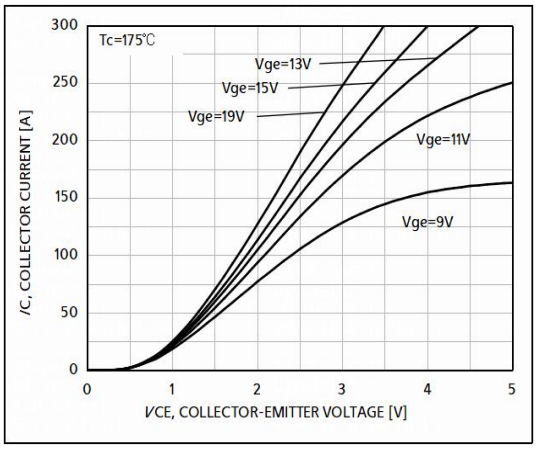



Figure 2. Output Characteristics

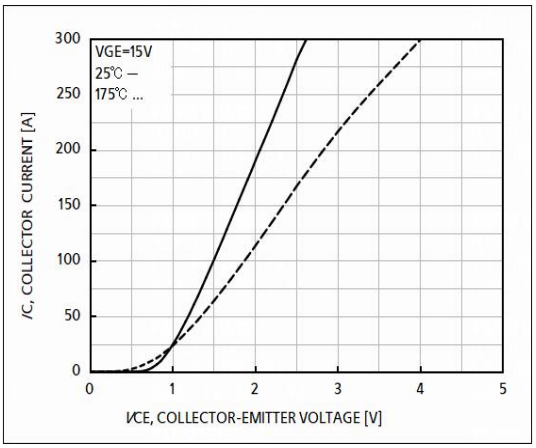



Figure 3. Saturation Voltage Characteristics

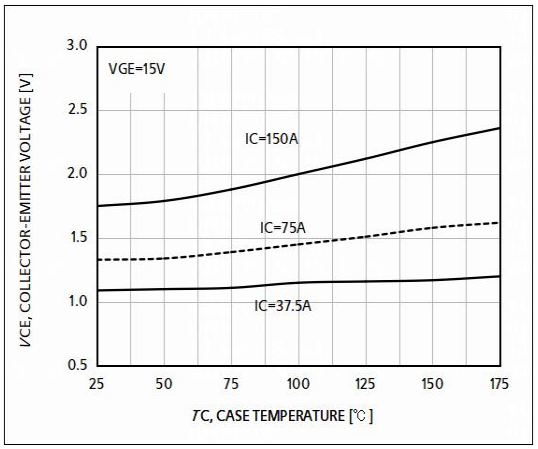



Figure 4. Saturation Voltage -$T_C$ Characteristics

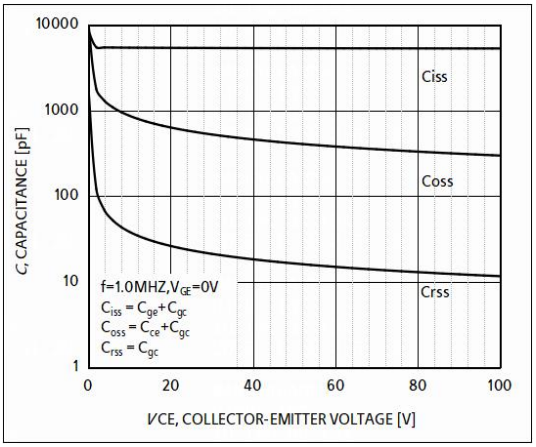



Figure 5. Capacitance Characteristics

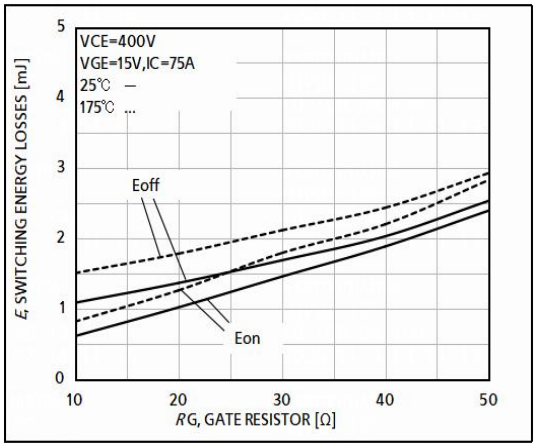



Figure 6. Switching Loss-$R_G$ Characteristics

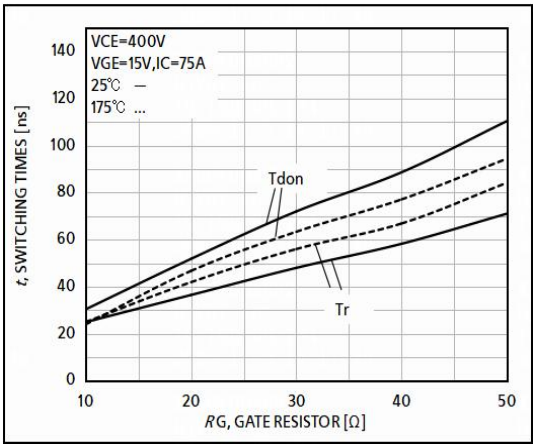



Figure 7. Switching Time-$R_G$ Characteristics

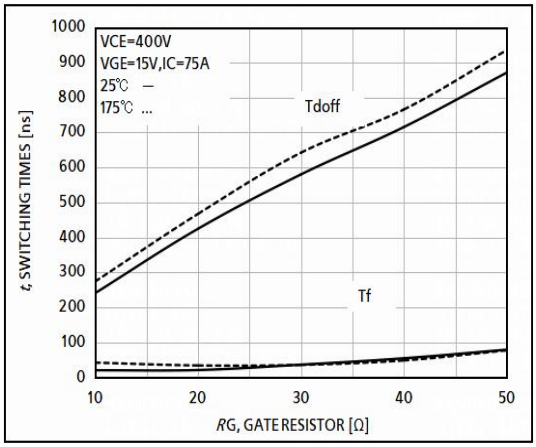



Figure 8. Switching Time-$R_G$ Characteristics

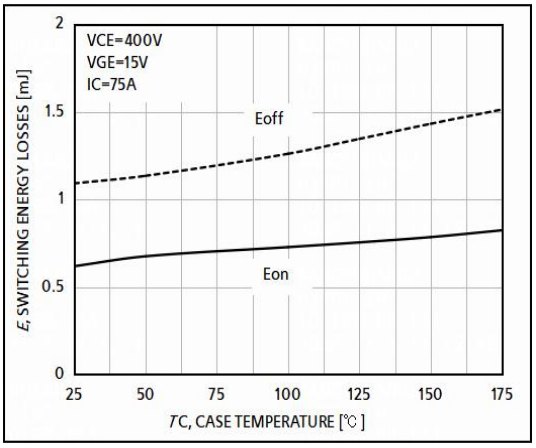



Figure 9. Switching Loss-$T_C$ Characteristics

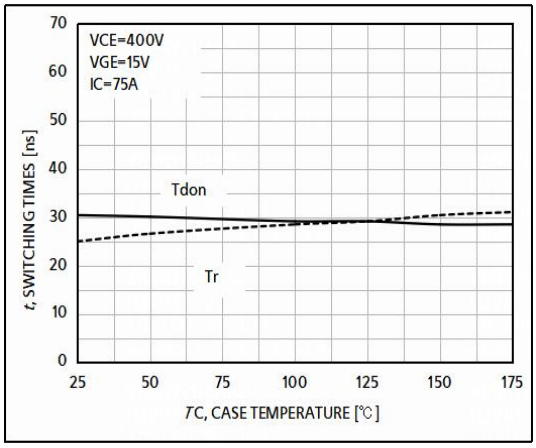



Figure 10. Switching Time-$T_C$ Characteristics

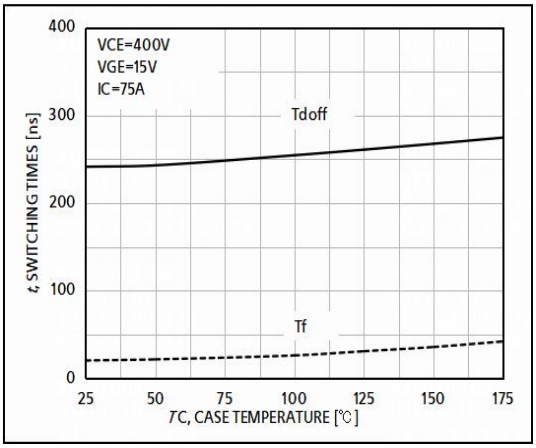



Figure 11. Switching Time-$T_C$ Characteristics

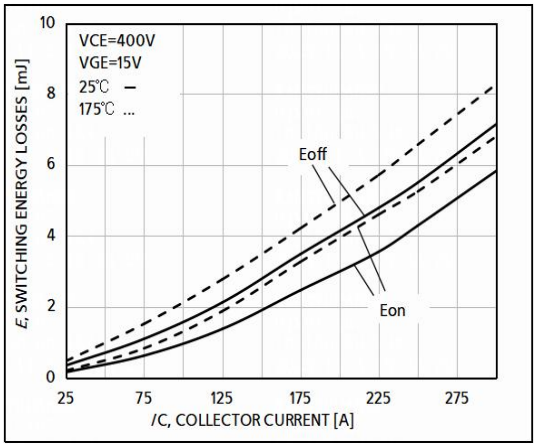



Figure 12. Switching Loss-$I_C$ Characteristics

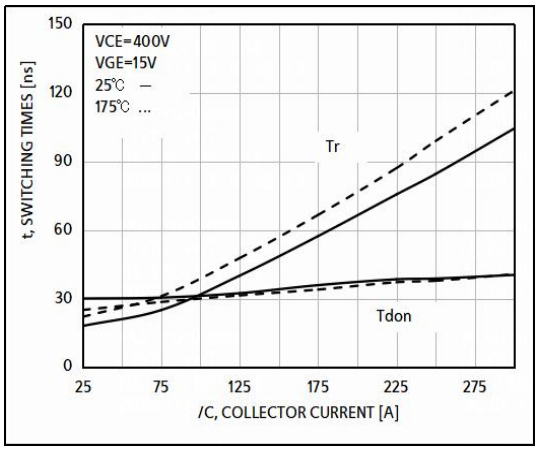



Figure 13. Switching Time-$I_C$ Characteristics

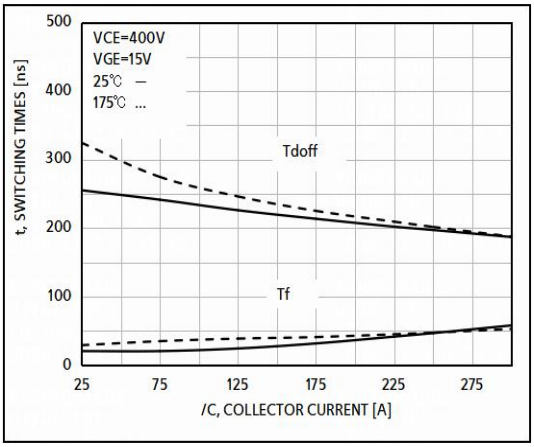



Figure 14. Switching Time-$I_C$ Characteristics

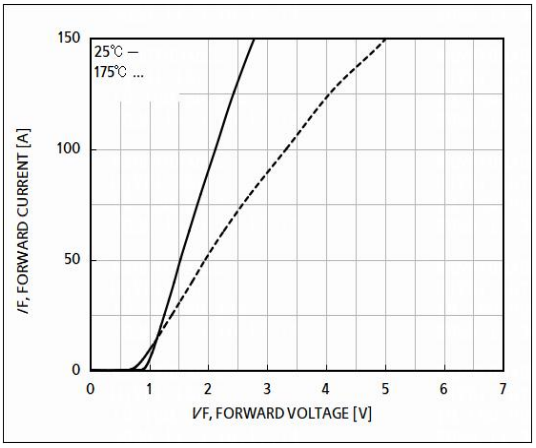



Figure 15. Diode Forward Characteristics

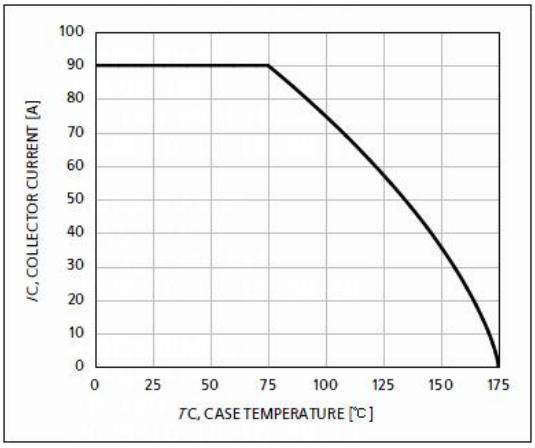



Figure 16. Collector Current-$T_C$ Characteristics
(Tj ≤175℃)

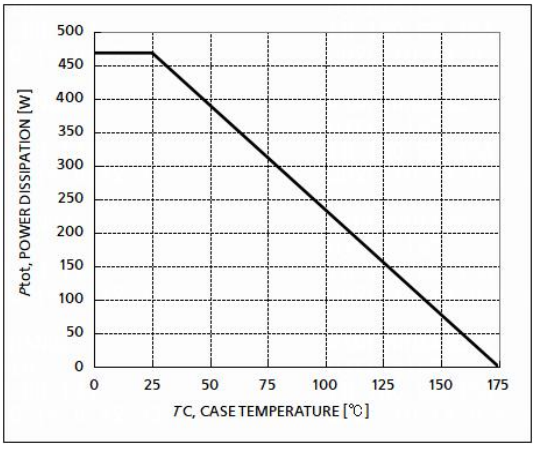



Figure 17. Power Dissipation-$T_C$ Characteristics
(Tj ≤175℃)

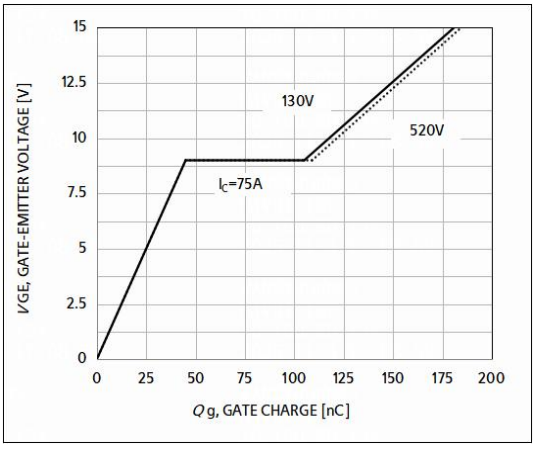



Figure 18. Gate Charge Characteristics

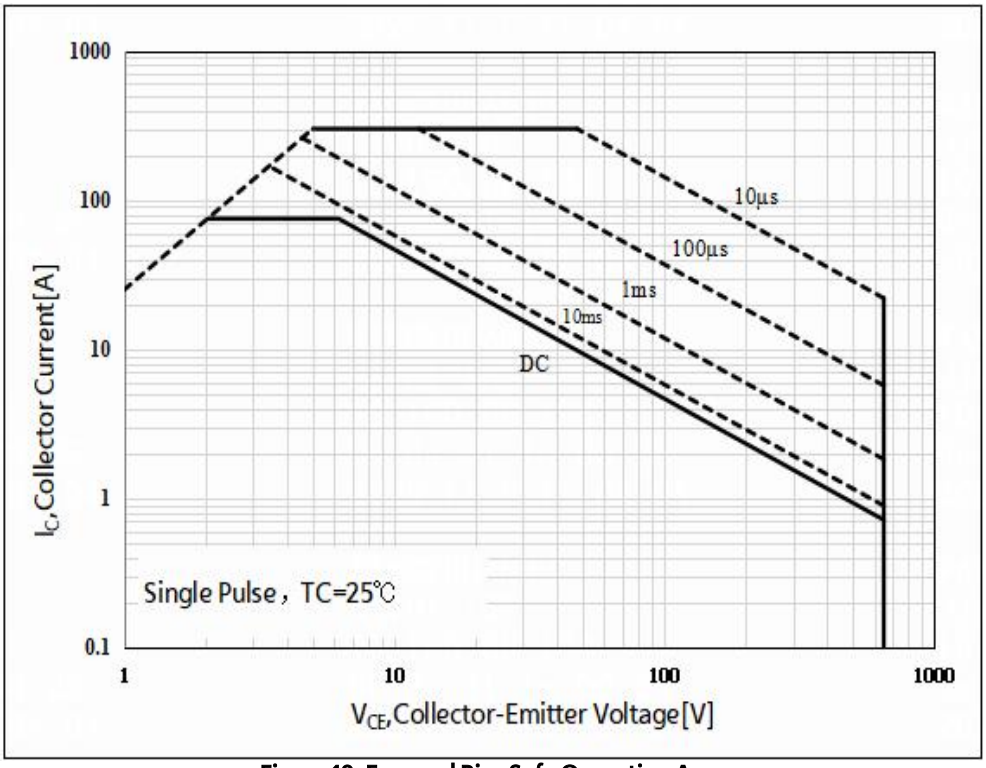



Figure 19. Forward Bias Safe Operating Area

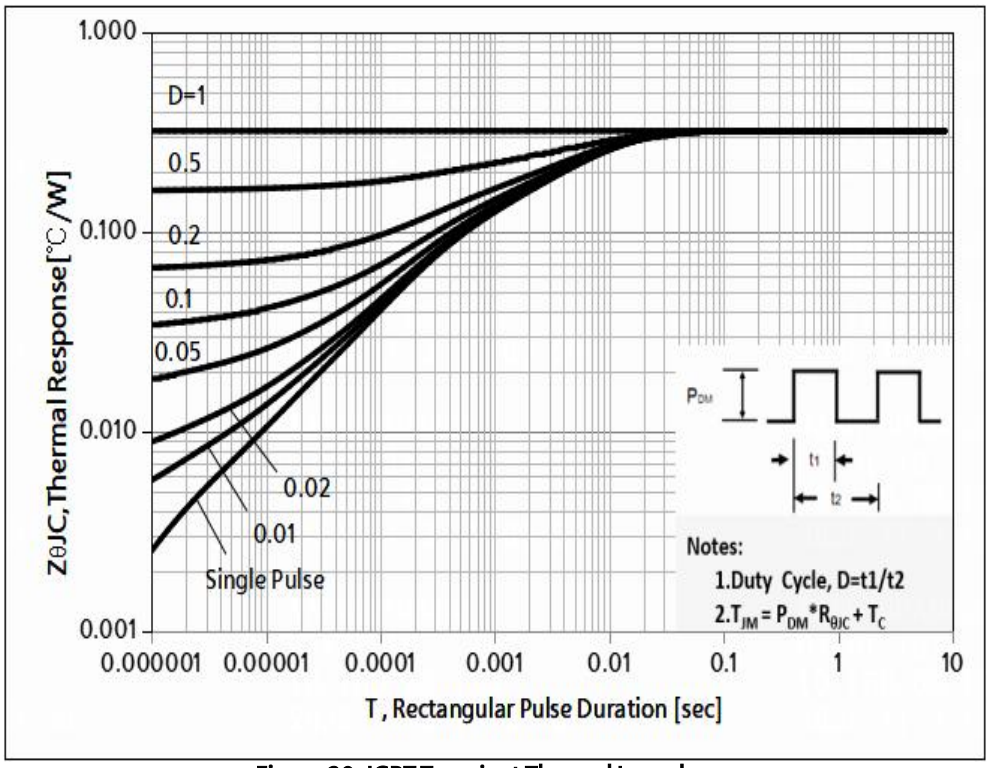
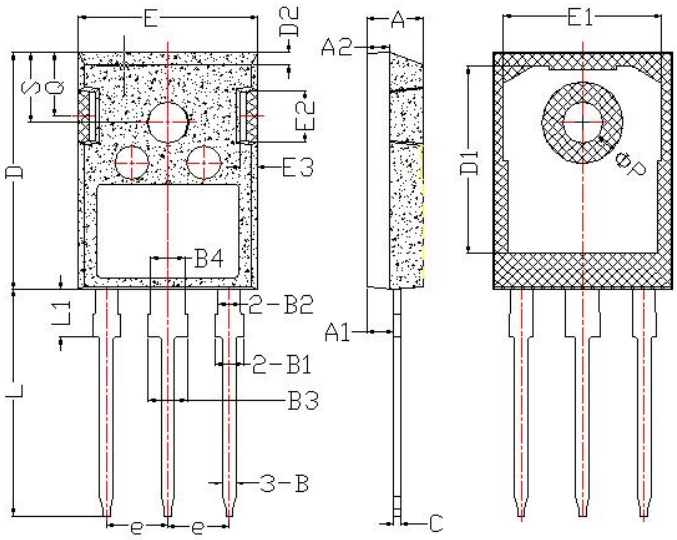



Figure 20. IGBT Transient Thermal Impedance

## Package Information




| Items | Values(mm) | |
|---|---|---|
| | MIN | MAX |
| A | 4.6 | 5.2 |
| A1 | 2,2 | 2.6 |
| B | 0.9 | 1.4 |
| B1 | 1.75 | 2.35 |
| B2 | 1.75 | 2.15 |
| B3 | 2.8 | 3.35 |
| B4 | 2.8 | 3.15 |
| C | 0.5 | 0.7 |
| D | 20.60 | 21.30 |
| D1 | 16 | 18 |
| E | 15.5 | 16.10 |
| E1 | 13 | 14.7 |
| E2 | 3.80 | 5.3 |
| E3 | 0.8 | 2.60 |
| e | 5.2 | 5.7 |
| L | 19 | 20.5 |
| L1 | 3.9 | 4.6 |
| ΦP | 3.3 | 3.70 |
| Q | 5.2 | 6.00 |
| S | 5.8 | 6.6 |

TO-247 Package

## The name and content of poisonous and harmful material in products

| Part's Name | Hazardous Substance | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Pb | Hg | Cd | Cr(VI) | PBB | PBDE | DIBP | DEHP | DBP | BBP |
| Limit | ⩽ 0.1% | ⩽ 0.1% | ⩽0.01 % | ⩽0.1% | ⩽0.1 % | ⩽0.1 % | ⩽0.1 % | ⩽0.1 % | ⩽0.1 % | ⩽0.1 % |
| Lead Frame | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Molding | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Chip | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Wire Bonding | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Plating | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Solder | × | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Note | ○: Indicates that the content of this hazardous substance meets the limit requirements of EU RoHS Directive.<br>×: Indicates that the content of this hazardous substance exceeds the limit requirements of EU RoHS Directive.<br>The solder used in the product contains lead (Pb), but it falls within the exemption scope of the EU RoHS Directive. | | | | | | | | | |

## Warnings

1. Exceeding the maximum ratings of the device in performance may cause damage to the device, even the permanent failure, which may affect the dependability of the machine. It is suggested to be used under 80 percent of the maximum ratings of the device.
2. When installing the heat sink, please pay attention to the torsional moment and the smoothness of the heat sink.
3. IGBTs is the device which is sensitive to the static electricity, it is necessary to protect the device from being damaged by the static electricity when using it.
4. This publication is made by Huajing Microelectronics and subject to regular change without notice.

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| Revison History | | |
|---|---|---|
| Revision | Date | Major changes |
| 1.0 | 2025/11/5 | Initial release |