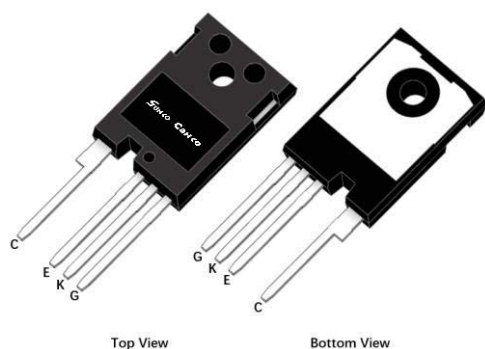
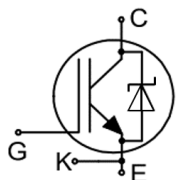




## IGBT Discrete

|                       |      |   |
|-----------------------|------|---|
| $V_{CE}$              | 650  | V |
| $I_C$                 | 75   | A |
| $V_{CE(SAT)} I_C=75A$ | 1.65 | V |

### Circuit



## Applications

- Solar converters
- Uninterruptible power supplies
- Welding converters
- Mid to high range switching frequency converters

## Features

- High speed smooth switching device for hard & soft switching
- Maximum junction temperature 175°C
- Positive temperature coefficient
- High ruggedness, temperature stable
- Including Sic FWD

## Maximum Ratings

| Parameter                                                                                                         | Symbol      | Value    | Unit |
|-------------------------------------------------------------------------------------------------------------------|-------------|----------|------|
| Collector-Emitter Breakdown Voltage                                                                               | $V_{CE}$    | 650      | V    |
| DC Collector Current, limited by $T_{jmax}$<br>$T_C=25^{\circ}C$ value limited by bondwire<br>$T_C=100^{\circ}C$  | $I_C$       | 85<br>80 | A    |
| Diode Forward Current, limited by $T_{jmax}$<br>$T_C=25^{\circ}C$ value limited by bondwire<br>$T_C=100^{\circ}C$ | $I_F$       | 85<br>80 | A    |
| Continuous Gate-Emitter Voltage                                                                                   | $V_{GE}$    | $\pm 20$ | V    |
| Transient Gate-Emitter Voltage<br>( $t_p \leq 10\mu s, D < 0.010$ )                                               | $V_{GE}$    | $\pm 30$ | V    |
| Turn off Safe Operating Area $V_{CE} \leq 650V$ ,<br>$T_j \leq 150^{\circ}C$                                      |             | 300      | A    |
| Pulsed Collector Current, $V_{GE}=15V$ ,<br>$t_p$ limited by $T_{jmax}$                                           | $I_{CM}$    | 300      | A    |
| Diode Pulsed Current, $t_p$ limited by $T_{jmax}$                                                                 | $I_{Fpuls}$ | 300      | A    |
| Power Dissipation, $T_j=175^{\circ}C$ , $T_C=25^{\circ}C$                                                         | $P_{tot}$   | 428      | W    |

|                                                                          |       |            |    |
|--------------------------------------------------------------------------|-------|------------|----|
| Operating Junction Temperature                                           | $T_j$ | -40...+175 | °C |
| Storage Temperature                                                      | $T_s$ | -55...+150 | °C |
| Soldering Temperature, wave soldering 1.6mm (0.063in.) from case for 10s |       | 260        | °C |

## Electrical Characteristics of the IGBT ( $T_j = 25^\circ\text{C}$ unless otherwise specified):

| Parameter                            | Symbol        | Conditions                                                                                             | Min. | Typ.                 | Max.         | Unit |
|--------------------------------------|---------------|--------------------------------------------------------------------------------------------------------|------|----------------------|--------------|------|
| <b>Static</b>                        |               |                                                                                                        |      |                      |              |      |
| Collector-Emitter Breakdown Voltage  | $BV_{CES}$    | $V_{GE}=0V, I_C=250\mu A$                                                                              | 650  |                      | -            | V    |
| Gate Threshold Voltage               | $V_{GE(th)}$  | $V_{GE}=V_{CE}, I_C=0.75mA$                                                                            | 3.2  | 4.0                  | 4.8          | V    |
| Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ | $V_{GE}=15V, I_C=75A$<br>$T_j=25^\circ\text{C},$<br>$T_j=125^\circ\text{C}$<br>$T_j=150^\circ\text{C}$ | 1.20 | 1.65<br>1.95<br>2.05 | 2.10         | V    |
| Zero Gate Voltage Collector Current  | $I_{CES}$     | $V_{CE}=650V, V_{GE}=0V$<br>$T_j=25^\circ\text{C},$<br>$T_j=150^\circ\text{C}$                         |      |                      | 0.25<br>3.00 | mA   |
| Gate-Emitter Leakage Current         | $I_{GES}$     | $V_{CE}=0V, V_{GE}= \pm 20V$                                                                           |      |                      | 100          | nA   |

| Parameter                    | Symbol    | Conditions                              | Min. | Typ. | Max. | Unit |
|------------------------------|-----------|-----------------------------------------|------|------|------|------|
| <b>Dynamic</b>               |           |                                         |      |      |      |      |
| Input Capacitance            | $C_{ies}$ | $V_{CE}=25V, V_{GE}=0V,$<br>$f=1MHz$    | -    | 4.59 | -    | nF   |
| Reverse Transfer Capacitance | $C_{res}$ |                                         | -    | 0.03 | -    |      |
| Gate Charge                  | $Q_G$     | $V_{CC}=520V, I_C=75A,$<br>$V_{GE}=15V$ | -    | 0.17 | -    | uC   |

## Switching Characteristic, Inductive Load

| Parameter                          | Symbol              | Conditions                                                                                                          | Min. | Typ. | Max. | Unit |
|------------------------------------|---------------------|---------------------------------------------------------------------------------------------------------------------|------|------|------|------|
| Dynamic , at T <sub>j</sub> = 25℃  |                     |                                                                                                                     |      |      |      |      |
| Turn-on Delay Time                 | t <sub>d(on)</sub>  | V <sub>CC</sub> =400V, I <sub>C</sub> =75A,<br>V <sub>GE</sub> = -5v~15V,<br>R <sub>g</sub> =10Ω,<br>Inductive Load | -    | 30   | -    | ns   |
| Rise Time                          | t <sub>r</sub>      |                                                                                                                     | -    | 95   | -    | ns   |
| Turn-on Energy                     | E <sub>on</sub>     |                                                                                                                     | -    | 2.61 | -    | mJ   |
| Turn-off Delay Time                | t <sub>d(off)</sub> |                                                                                                                     | -    | 142  | -    | ns   |
| Fall Time                          | t <sub>f</sub>      |                                                                                                                     | -    | 41   | -    | ns   |
| Turn-off Energy                    | E <sub>off</sub>    |                                                                                                                     | -    | 0.76 | -    | mJ   |
| Total switching energy             | E <sub>ts</sub>     |                                                                                                                     | -    | 3.37 | -    | mJ   |
| Dynamic , at T <sub>j</sub> = 125℃ |                     |                                                                                                                     |      |      |      |      |
| Turn-on Delay Time                 | t <sub>d(on)</sub>  | V <sub>CC</sub> =400V, I <sub>C</sub> =75A,<br>V <sub>GE</sub> = -5v~15V,<br>R <sub>g</sub> =10Ω,<br>Inductive Load | -    | 27   | -    | ns   |
| Rise Time                          | t <sub>r</sub>      |                                                                                                                     | -    | 88   | -    | ns   |
| Turn-on Energy                     | E <sub>on</sub>     |                                                                                                                     | -    | 2.71 | -    | mJ   |
| Turn-off Delay Time                | t <sub>d(off)</sub> |                                                                                                                     | -    | 151  | -    | ns   |
| Fall Time                          | t <sub>f</sub>      |                                                                                                                     | -    | 50   | -    | ns   |
| Turn-off Energy                    | E <sub>off</sub>    |                                                                                                                     | -    | 0.88 | -    | mJ   |
| Total switching energy             | E <sub>ts</sub>     |                                                                                                                     | -    | 3.59 | -    | mJ   |
| Dynamic , at T <sub>j</sub> = 150℃ |                     |                                                                                                                     |      |      |      |      |
| Turn-on Delay Time                 | t <sub>d(on)</sub>  | V <sub>CC</sub> =400V, I <sub>C</sub> =75A,<br>V <sub>GE</sub> = -5v~15V,<br>R <sub>g</sub> =10Ω,<br>Inductive Load | -    | 25   | -    | ns   |
| Rise Time                          | t <sub>r</sub>      |                                                                                                                     | -    | 84   | -    | ns   |
| Turn-on Energy                     | E <sub>on</sub>     |                                                                                                                     | -    | 2.78 | -    | mJ   |
| Turn-off Delay Time                | t <sub>d(off)</sub> |                                                                                                                     | -    | 159  | -    | ns   |
| Fall Time                          | t <sub>f</sub>      |                                                                                                                     | -    | 55   | -    | ns   |
| Turn-off Energy                    | E <sub>off</sub>    |                                                                                                                     | -    | 0.97 | -    | mJ   |
| Total switching energy             | E <sub>ts</sub>     |                                                                                                                     | -    | 3.75 | -    | mJ   |

## Electrical Characteristics of the DIODE

| Parameter               | Symbol | Conditions                                                 | Min. | Typ.               | Max. | Unit |
|-------------------------|--------|------------------------------------------------------------|------|--------------------|------|------|
| <b>Static</b>           |        |                                                            |      |                    |      |      |
| Diode Forward Voltage   | $V_F$  | $I_F = 75A$<br>$T_j = 25^\circ C$ ,<br>$T_j = 175^\circ C$ |      | 1.70<br>2.60       | 1.90 | V    |
| Diode Capacitive Charge | $Q_C$  | $V_R = 400V$ , $T_j = 25^\circ C$                          |      | 135                |      | nC   |
| Diode Capacitance       | $C$    | $f = 1MHz$<br>$V_R = 0V$ ,<br>$V_R = 200V$<br>$V_R = 400V$ |      | 2453<br>247<br>243 |      | pF   |

## Thermal Resistance

| Parameter                                 | Symbol        | Max. Value | Unit |
|-------------------------------------------|---------------|------------|------|
| IGBT Thermal Resistance, Junction - Case  | $R_{th(j-c)}$ | 0.35       | K/W  |
| Diode Thermal Resistance, Junction - Case | $R_{th(j-c)}$ | 0.50       | K/W  |
| Thermal Resistance, Junction - Ambient    | $R_{th(j-a)}$ | 40         | K/W  |

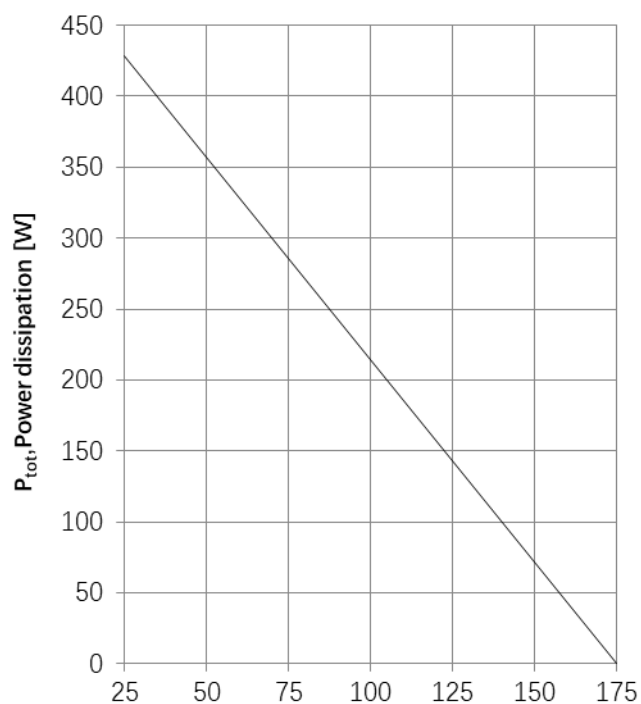


Fig1. Power dissipation as a function of case temperature ( $T_j \leq 175^\circ\text{C}$ )

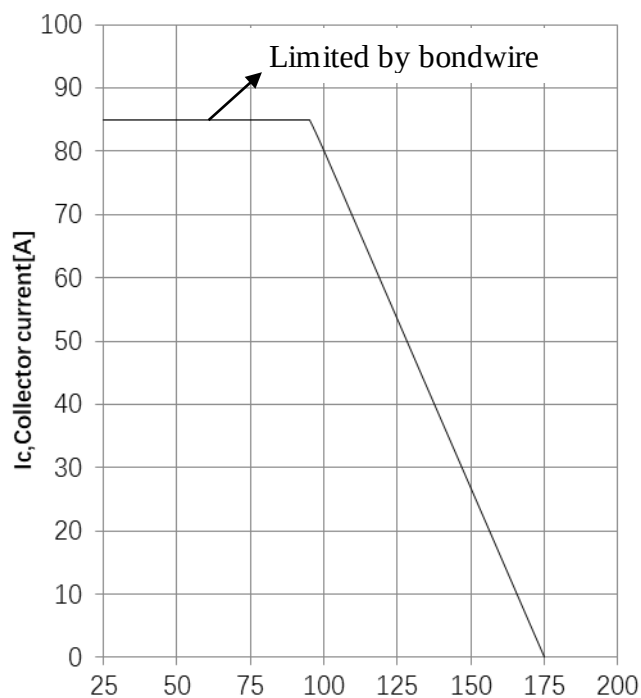


Fig2. Collector current as a function of case temperature ( $V_{ge} \geq 15\text{V}$ ,  $T_j \leq 175^\circ\text{C}$ )

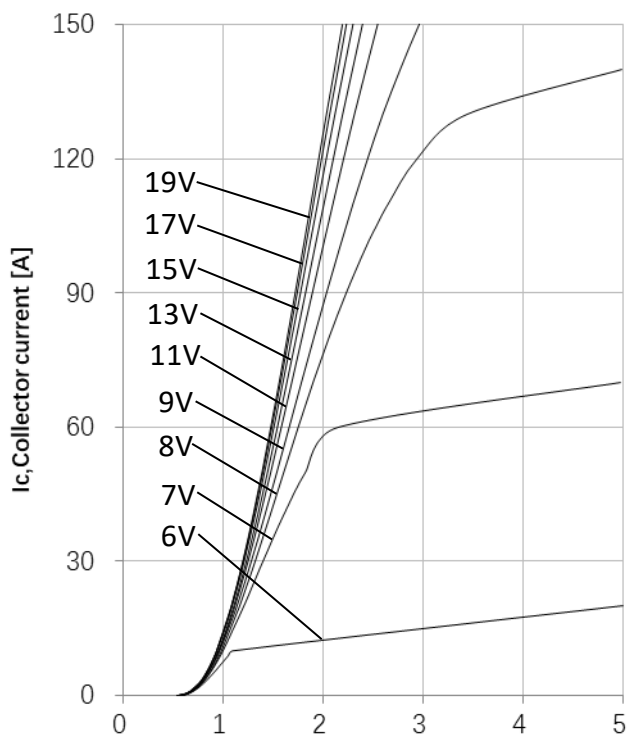


Fig3. Typical output characteristic ( $T_j = 25^\circ\text{C}$ )

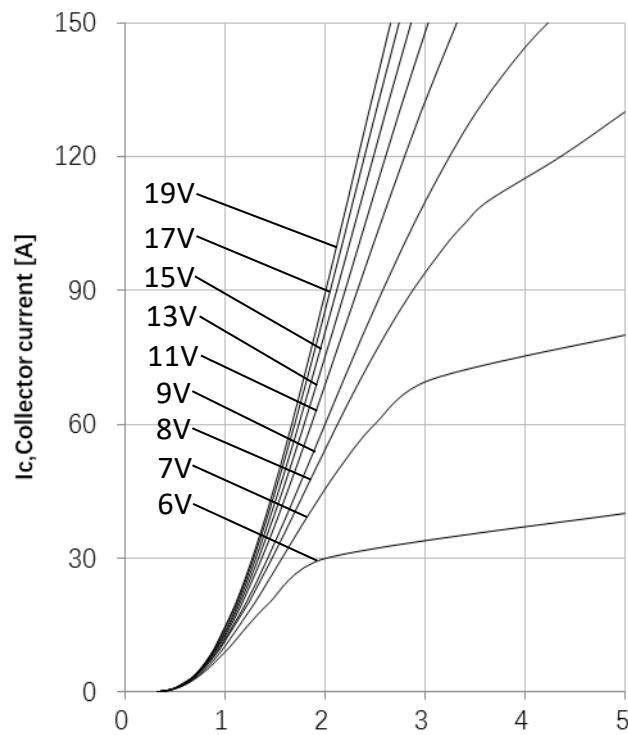
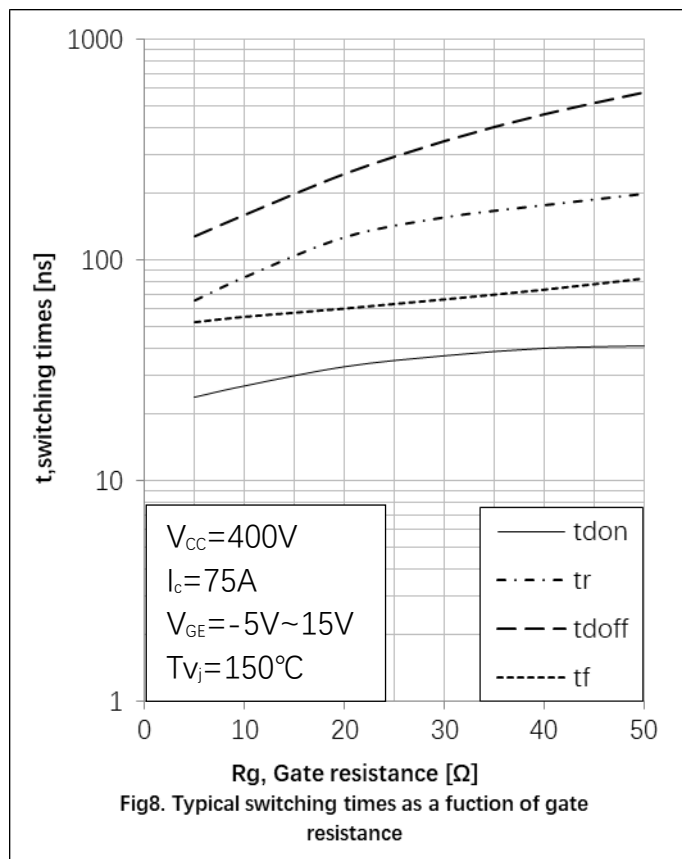
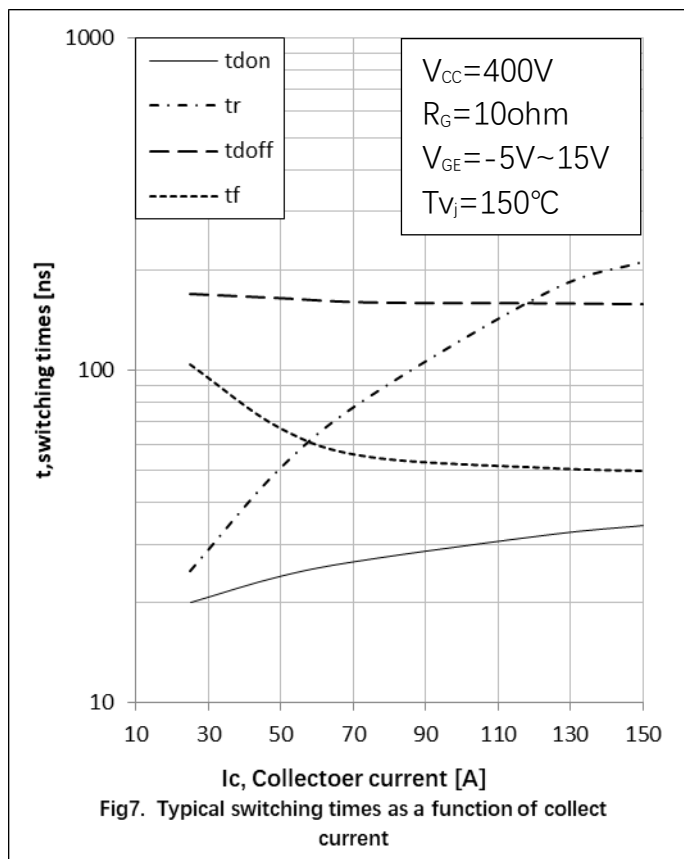
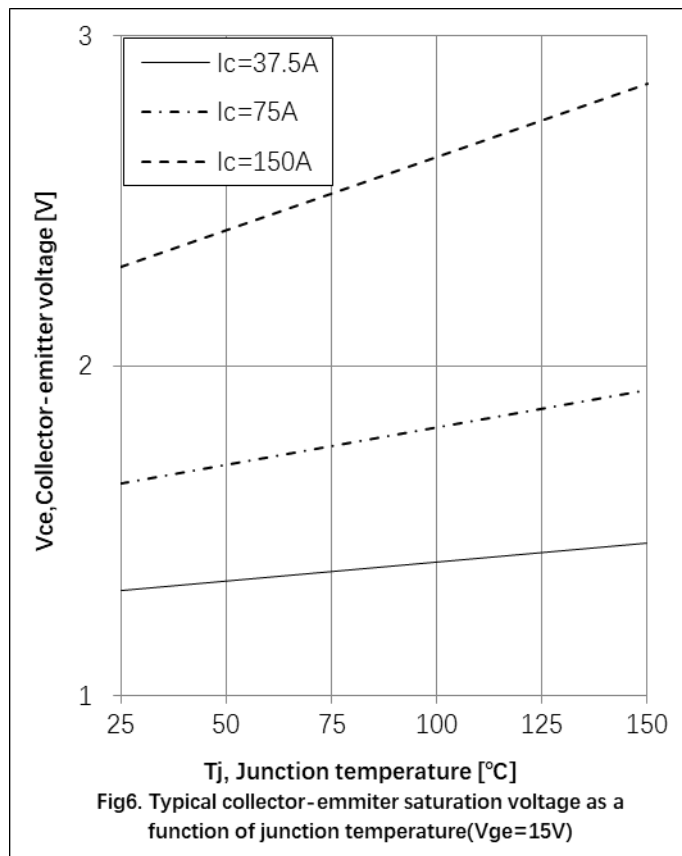
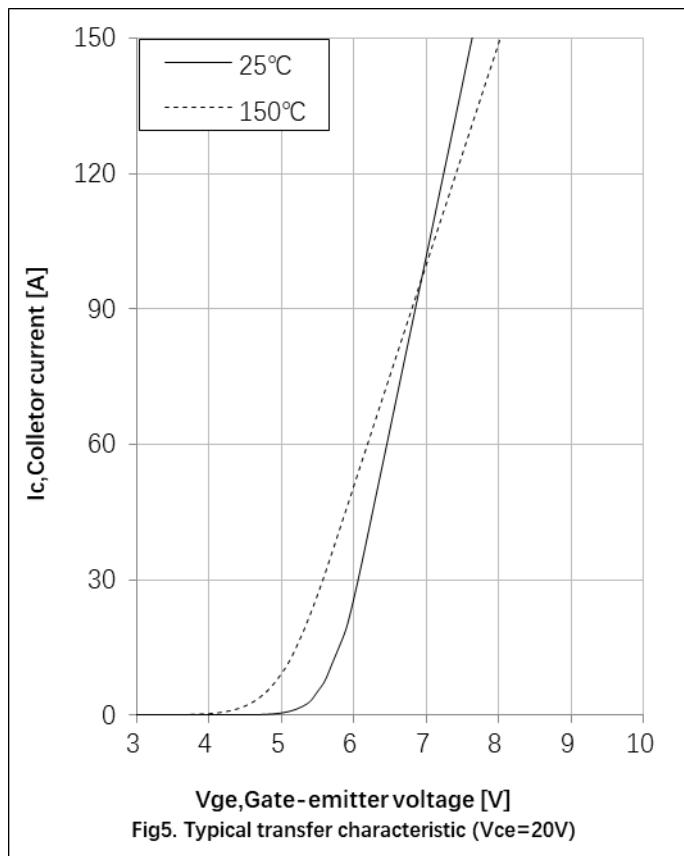
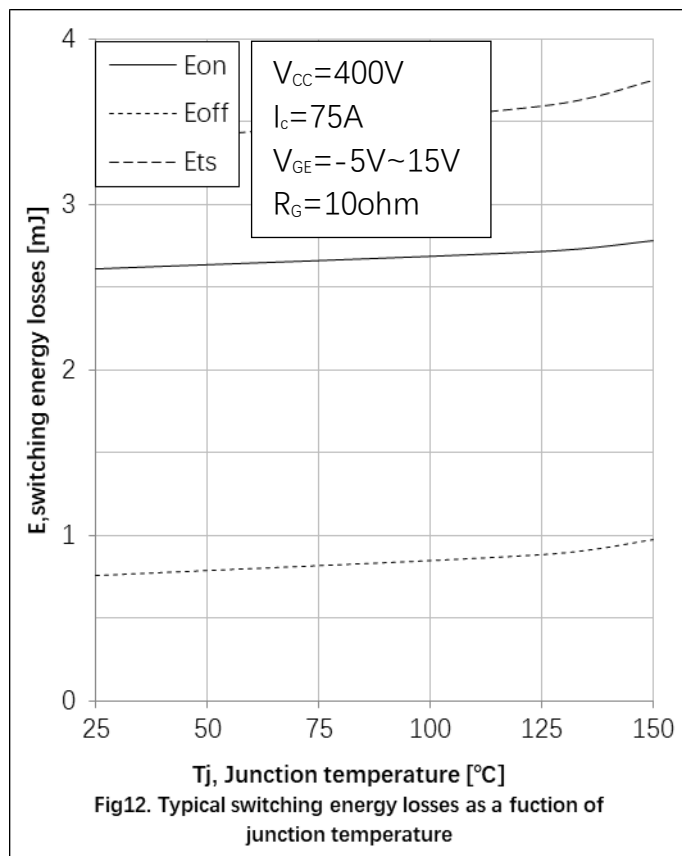
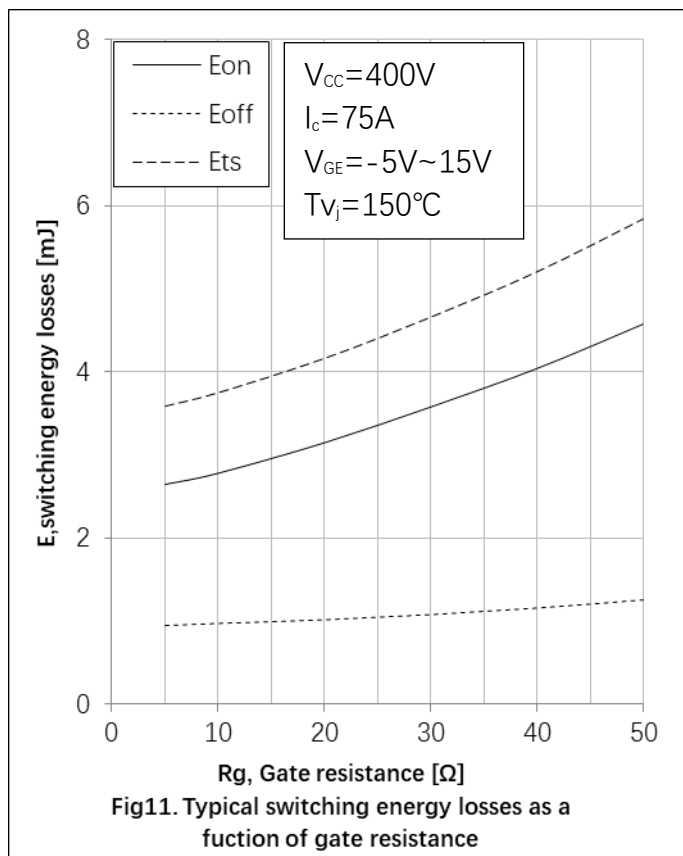
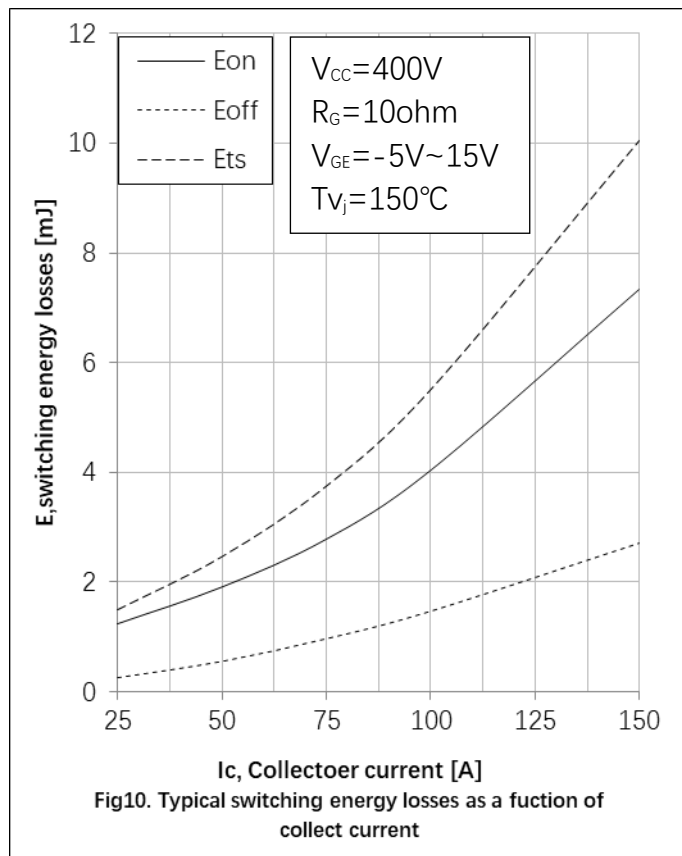
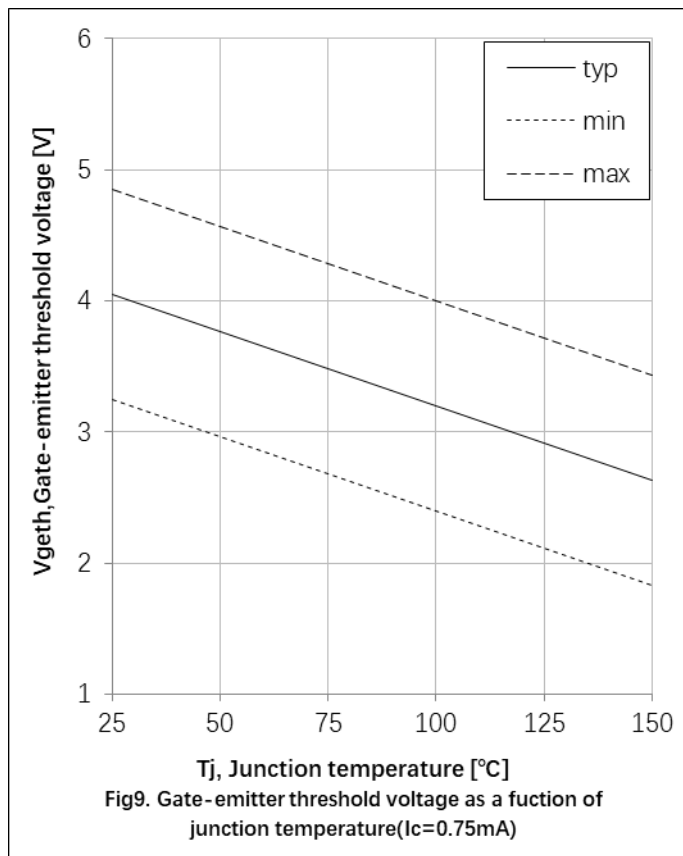
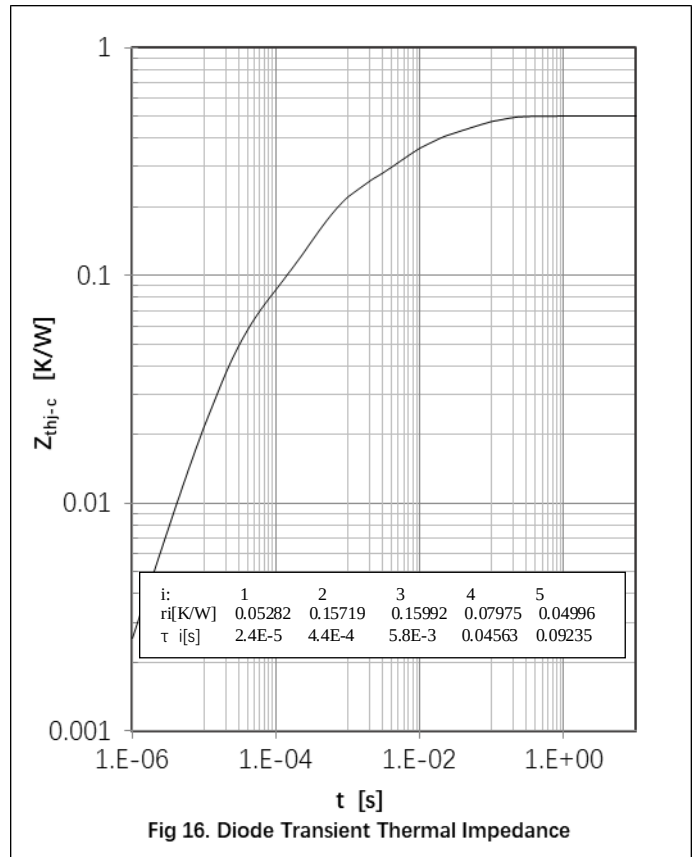
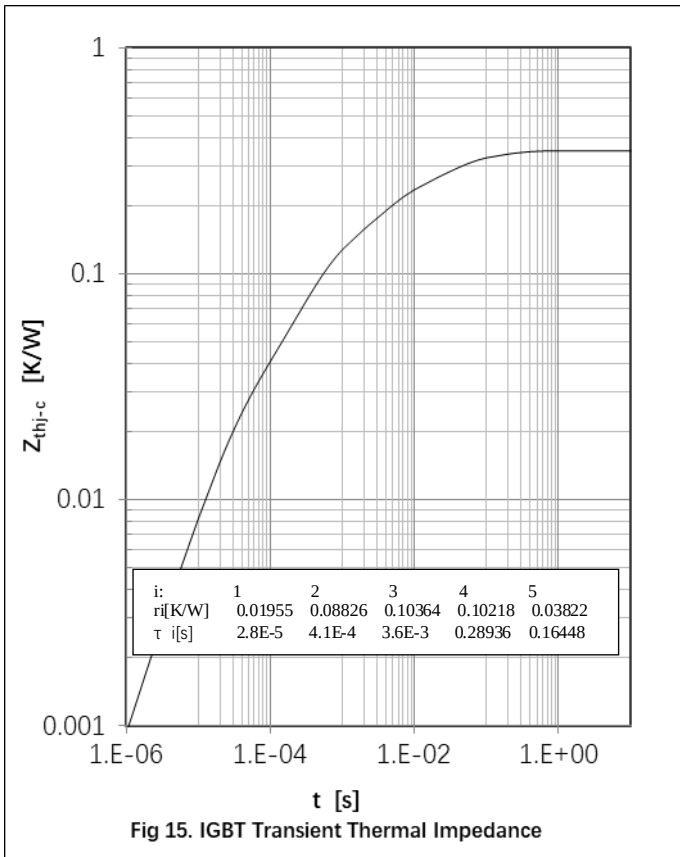
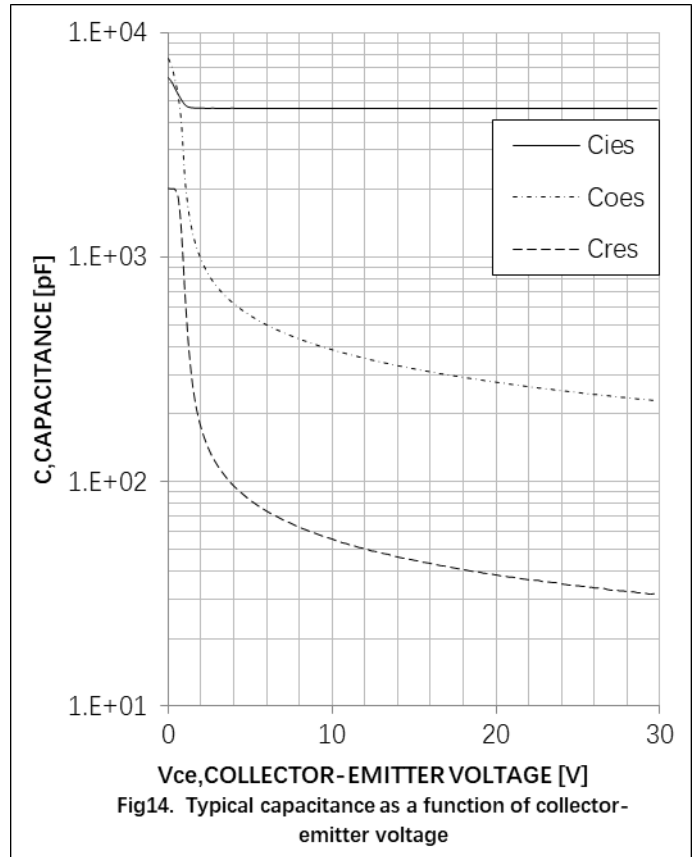
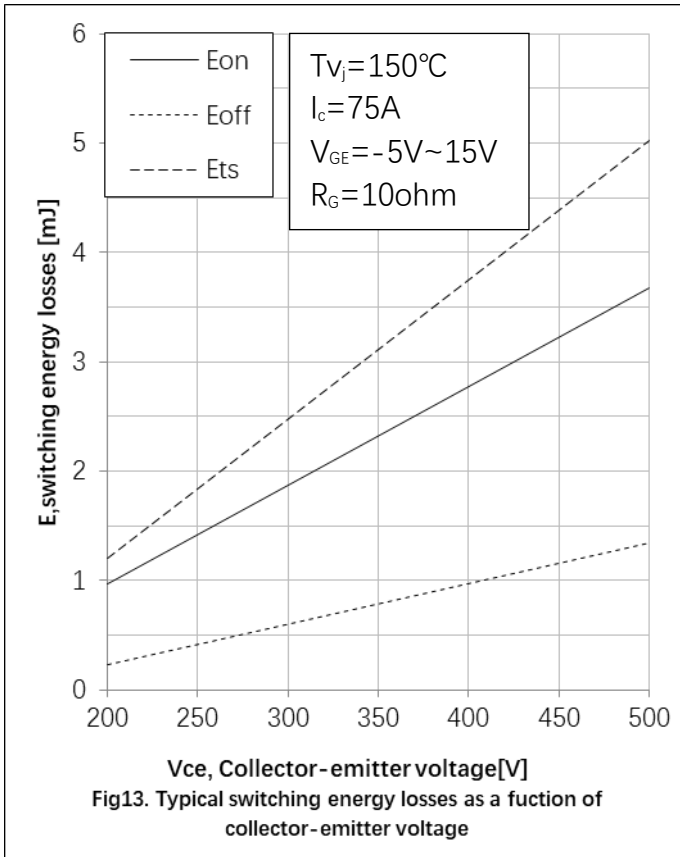


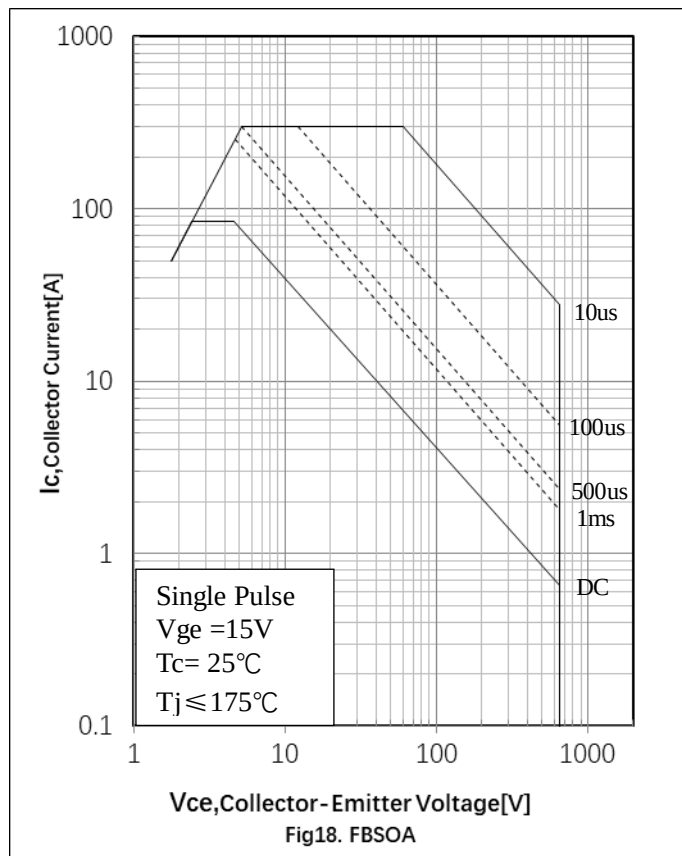
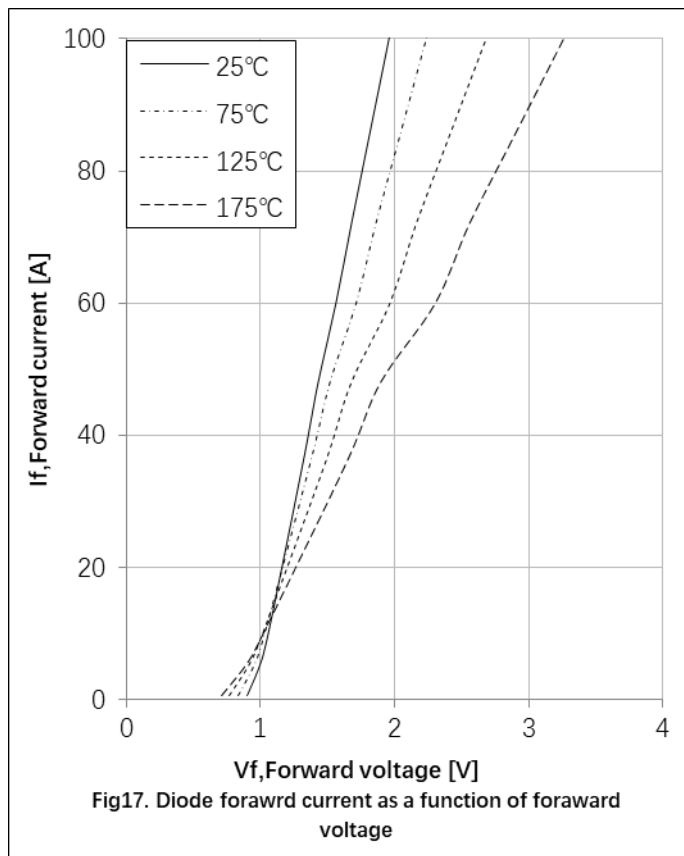
Fig4. Typical output characteristic ( $T_j = 150^\circ\text{C}$ )



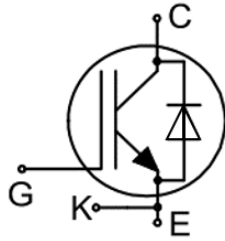






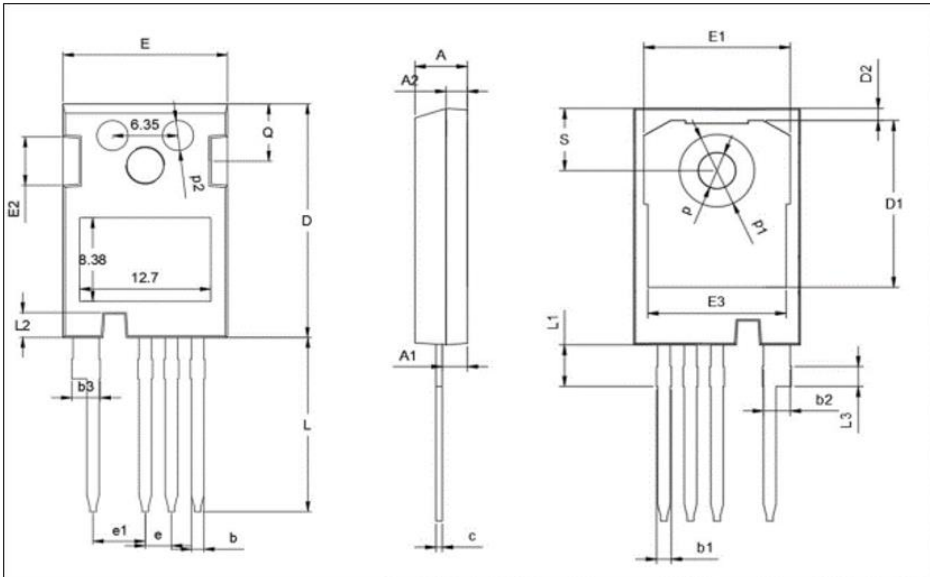


## ● Circuit Diagram



## ● Package Outline Information

CASE: TO 247-4L



| TO247-4L |         |       |       |
|----------|---------|-------|-------|
| Dim      | Min     | Norm  | Max   |
| A        | 4.80    | 5.00  | 5.20  |
| A1       | 2.30    | 2.40  | 2.50  |
| A2       | 1.88    | 1.98  | 2.08  |
| b        | 1.10    | 1.20  | 1.30  |
| b1       | 1.20    | /     | 1.50  |
| b2       | 2.35    | 2.55  | 2.75  |
| b3       | 2.45    | /     | 2.85  |
| c        | 0.55    | 0.60  | 0.65  |
| D        | 23.3    | 23.45 | 23.6  |
| D1       | 16.25   | 16.55 | 16.85 |
| D2       | 1.00    | /     | 1.30  |
| e        | TYP2.54 |       |       |
| e1       | TYP5.06 |       |       |
| E        | 15.75   | 15.90 | 16.05 |
| E1       | 13.80   | /     | 14.20 |
| E2       | 4.40    | 4.75  | 5.10  |
| E3       | 13.00   | /     | 13.45 |
| L        | 17.34   | 17.49 | 17.64 |
| L1       | 4.00    | /     | 4.30  |
| L2       | 2.35    | /     | 2.65  |
| L3       | TYP1.98 |       |       |
| Q        | 5.60    | 5.80  | 6.00  |
| S        | 6.05    | /     | 6.30  |
| p        | TYP3.58 |       |       |
| p1       | TYP7.18 |       |       |
| p2       | TYP3.00 |       |       |