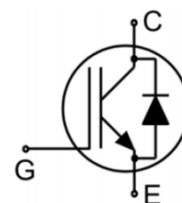


**Main Product Characteristics:**

|               |      |
|---------------|------|
| $V_{CES}$     | 700V |
| $I_C$         | 50A  |
| $V_{CE(sat)}$ | 1.8V |


**TO-247**

**Schematic Diagram**
**Features and Benefits:**

- Trench FS technology offering
- High speed switching
- Low gate charge and  $V_{CE(sat)}$
- High ruggedness, temperature stable behavior
- Maximum junction temperature 175°C


**Applications:**

- Solar Inverters
- Uninterruptible power supplies
- Motor drives
- Air condition

**Absolute Max Rating:**

| Symbol          | Parameter   | Value       | Units            |
|-----------------|---|-------------|------------------|
| $V_{CES}$       | Collector-Emitter Voltage   | 700         | V                |
| $V_{GES}$       | Gate- Emitter Voltage   | $\pm 30$    | V                |
| $I_C$           | Collector Current   | 100         | A                |
|                 | Collector Current @ $T_c = 100\text{ }^\circ\text{C}$                 | 50          |                  |
| $I_{Cpuls}$     | Pulsed Collector Current, $t_p$ limited by $T_{Jmax}$                 | 200         |                  |
| -               | Turn off safe operating area, $V_{CE}=650V$ , $T_J=175^\circ\text{C}$ | 200         |                  |
| $I_F$           | Diode Continuous Forward Current @ $T_c = 25\text{ }^\circ\text{C}$   | 100         | A                |
|                 | Diode Continuous Forward Current @ $T_c = 100\text{ }^\circ\text{C}$  | 50          |                  |
| $I_{FM}$        | Diode Maximum Forward Current   | 200         |                  |
| $P_D$           | Power Dissipation @ $T_c = 25^\circ\text{C}$                          | 500         | W                |
| $T_J$ $T_{STG}$ | Operating Junction and Storage Temperature Range                      | -55 to +175 | $^\circ\text{C}$ |
| $T_L$           | Maium Temperature for Soldering                                       | 260         | $^\circ\text{C}$ |

**Thermal Resistance**

| Symbol           | Characterizes                                  | Typ. | Max. | Units |
|------------------|--|------|------|-------|
| R <sub>θJC</sub> | Thermal Resistance, Junction-to-case for IGBT  | —    | 0.3  | °C/W  |
|                  | Thermal Resistance, Junction-to-case for Diode | —    | 0.45 | °C/W  |
| R <sub>θJA</sub> | Thermal Resistance, Junction-to-ambient        | —    | 40   | °C/W  |

**Electrical Characteristics @T<sub>A</sub>=25°C unless otherwise specified**

| Symbol               | Parameter   | Min. | Typ. | Max. | Units | Conditions  |
|----------------------|---|------|------|------|-------|---|
| V <sub>(BR)CES</sub> | Collector-Emitter Breakdown Voltage                           | 700  | —    | —    | V     | V <sub>GE</sub> =0V, I <sub>CE</sub> =1mA   |
| V <sub>CE(sat)</sub> | Collector-Emitter Saturation Voltage                          | —    | 1.8  | 2.1  | V     | I <sub>C</sub> =50A, V <sub>GE</sub> =15V<br>@T <sub>J</sub> =25°C                          |
| V <sub>GE(th)</sub>  | Gate Threshold Voltage  | 4.5  | —    | 6    | V     | I <sub>C</sub> =250μA, V <sub>CE</sub> =V <sub>GE</sub>                                     |
| I <sub>CES</sub>     | Collector-Emitter Leakage Current                             | —    | —    | 1    | μA    | V <sub>GE</sub> =0V, V <sub>CE</sub> =700V  |
| I <sub>GES</sub>     | Gate to Emitter Reverse Leakage                               | —    | —    | 100  | nA    | V <sub>GE</sub> =25V, V <sub>CE</sub> =0V   |
|                      |   | —    | —    | -100 |       | V <sub>GE</sub> =-25V, V <sub>CE</sub> =0V  |
| C <sub>ies</sub>     | Input capacitance   | —    | 2804 | —    | pF    | V <sub>GS</sub> = 0V<br>V <sub>DS</sub> = 25V<br>f = 1MHz                                   |
| C <sub>oes</sub>     | Output capacitance  | —    | 162  | —    |       |   |
| C <sub>res</sub>     | Reverse transfer capacitance                                  | —    | 63   | —    |       |   |
| t <sub>d(on)</sub>   | Turn-on delay time  | —    | 30   | —    | ns    | V <sub>CC</sub> =400V, I <sub>C</sub> =50A,<br>V <sub>GE</sub> =0/15V, R <sub>G</sub> =10Ω, |
| t <sub>r</sub>       | Rise time   | —    | 50   | —    |       |   |
| t <sub>d(off)</sub>  | Turn-Off delay time   | —    | 149  | —    |       |   |
| t <sub>f</sub>       | Fall time   | —    | 61   | —    |       |   |
| E <sub>on</sub>      | Turn-On Switching Loss  | —    | 1.78 | —    | mJ    | V <sub>CC</sub> =400V, I <sub>C</sub> =50A,<br>V <sub>GE</sub> =0/15V, R <sub>G</sub> =10Ω, |
| E <sub>off</sub>     | Turn-Off Switching Loss                                       | —    | 0.72 | —    |       |   |
| E <sub>ts</sub>      | Total Switching Loss  | —    | 2.5  | —    |       |   |
| Q <sub>g</sub>       | Total Gate Charge   | —    | 106  | —    | nC    | V <sub>CC</sub> =480V, I <sub>C</sub> =50A,<br>V <sub>GE</sub> =15V                         |
| Q <sub>ge</sub>      | Gate to Emitter Charge  | —    | 38   | —    |       |   |
| Q <sub>gc</sub>      | Gate to Collector Charge                                      | —    | 40   | —    |       |   |
| I <sub>C(SC)</sub>   | Short circuit collector current                               | —    | 420  | —    | A     | V <sub>GE</sub> =15V, V <sub>CC</sub> ≤400V,<br>t <sub>sc</sub> ≤4                          |
|                      | Max.1000 short circuits<br>Time between short circuits: ≥1.0s |      |      |      |       |   |

**Electrical Characteristics of the Diode @T<sub>A</sub>=25°C unless otherwise specified**

| Symbol           | Parameter                           | Min. | Typ. | Max. | Units | Conditions   |
|------------------|-------------------------------------|------|------|------|-------|--|
| V <sub>FM</sub>  | Diode Forward Voltage               | —    | 1.58 | 2.9  | V     | I <sub>F</sub> =50A  |
| t <sub>rr</sub>  | Reverse Recovery Time               | —    | 89   | —    | ns    | T <sub>vj</sub> =25°C,<br>V <sub>R</sub> =400,<br>V <sub>GE</sub> =0.0/15.0V |
| Q <sub>rr</sub>  | Reverse Recovery Charge             | —    | 1.04 | —    | μC    |  |
| I <sub>RRM</sub> | Diode Peak Reverse Recovery Current | —    | 21   | —    | A     |  |

Typical Electrical and Thermal Characteristics

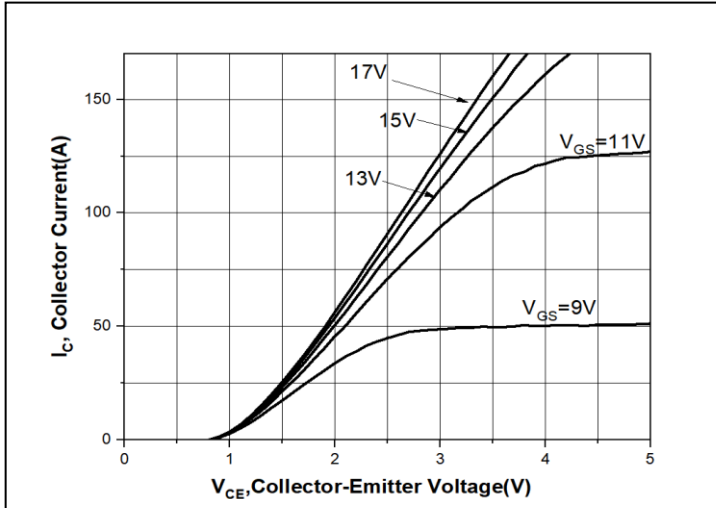


Figure1. Typical Output Characteristics

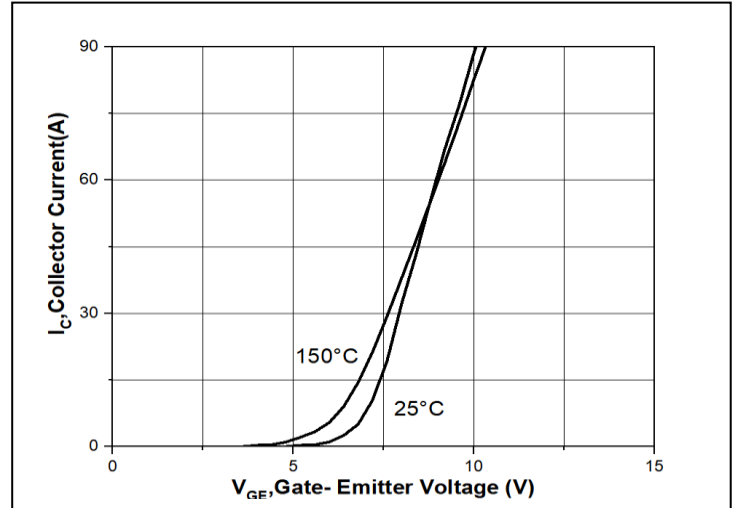


Figure2. Typical Transfer Characteristics

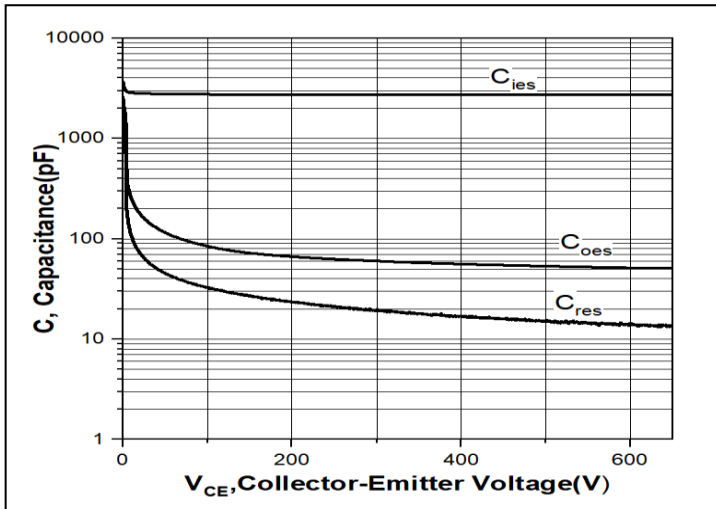


Figure3. Typical Capacitance

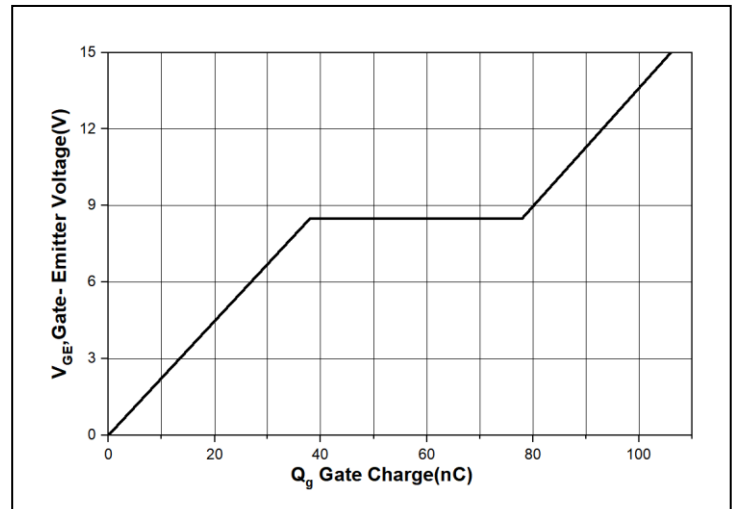


Figure4. Typical Gate Charge

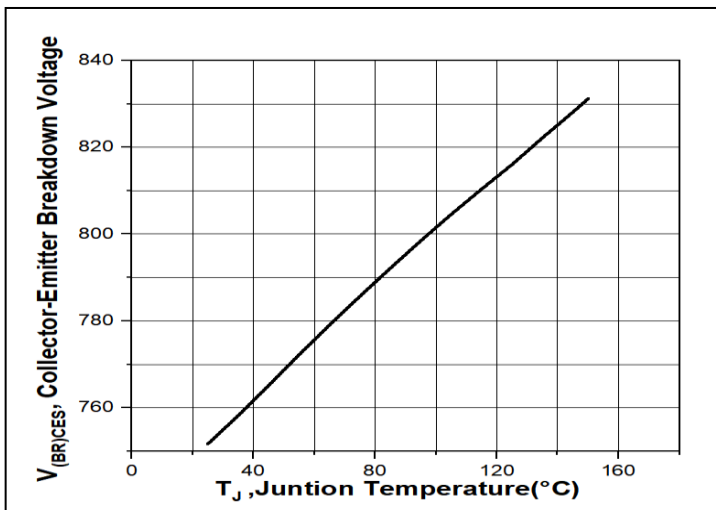


Figure5. Collector-Emitter Breakdown Voltage vs. Temperature

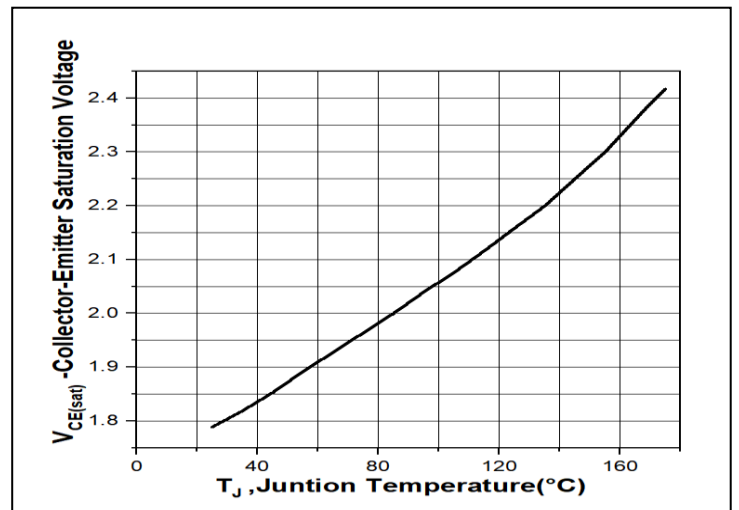


Figure6. Collector-Emitter Saturation Voltage vs. Temperature

Typical Electrical and Thermal Characteristics

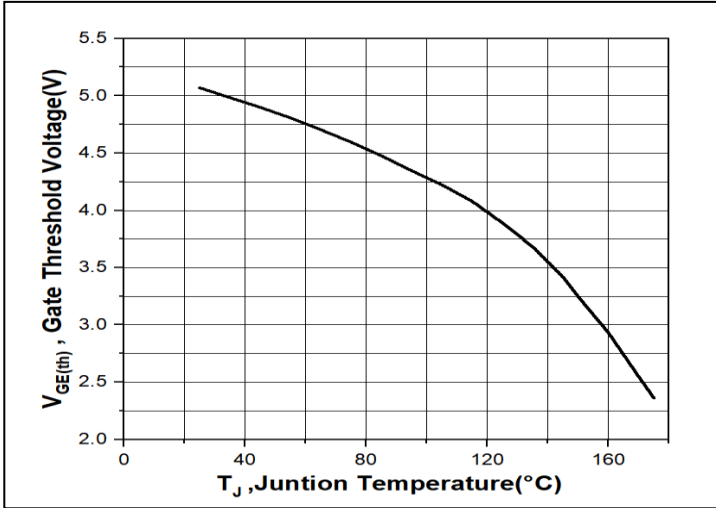


Figure7. Gate Threshold Voltage vs. Temperature

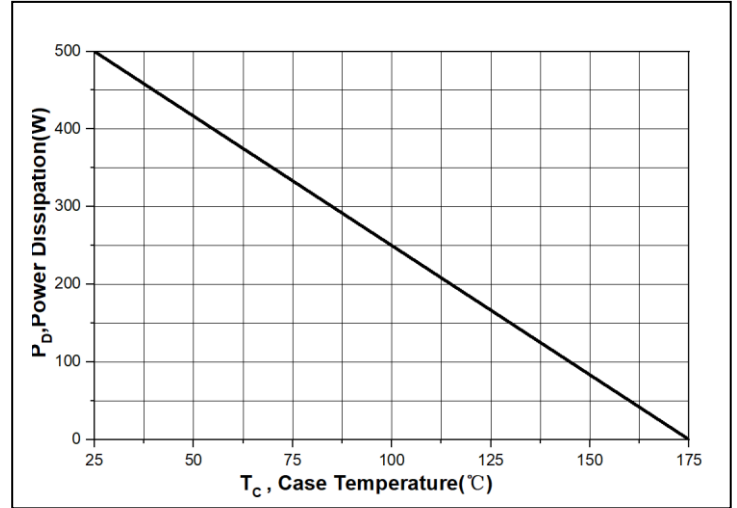


Figure8. Power Dissipation vs. Case Temperature

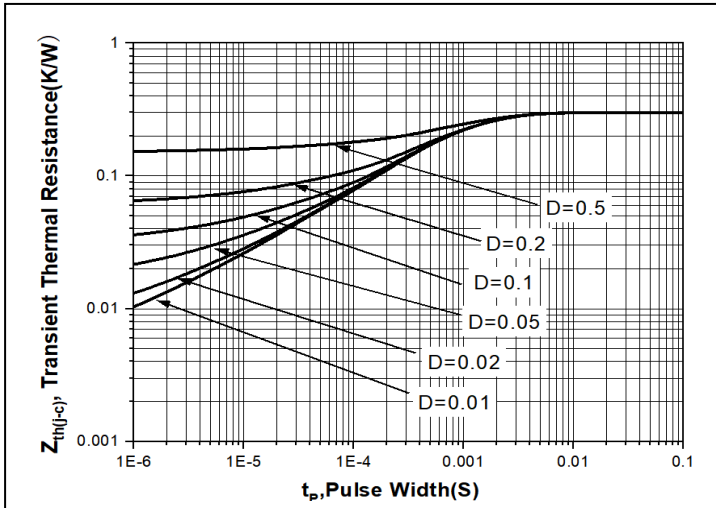


Figure9. IGBT transient thermal resistance ( $D = t_p/T$ )

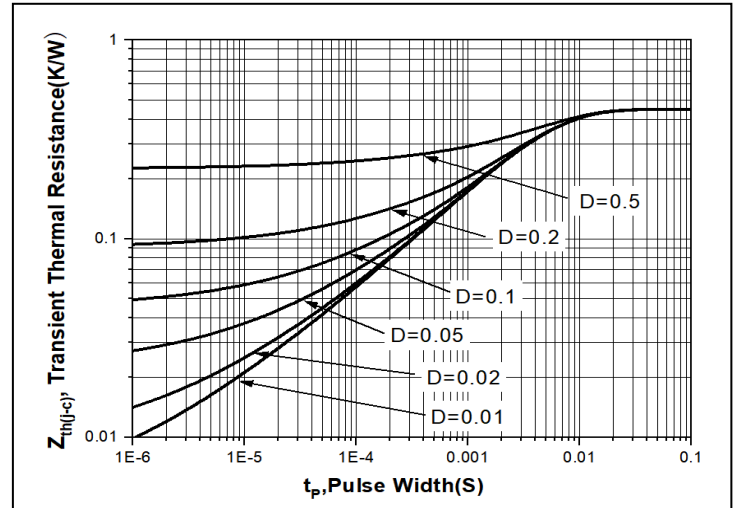
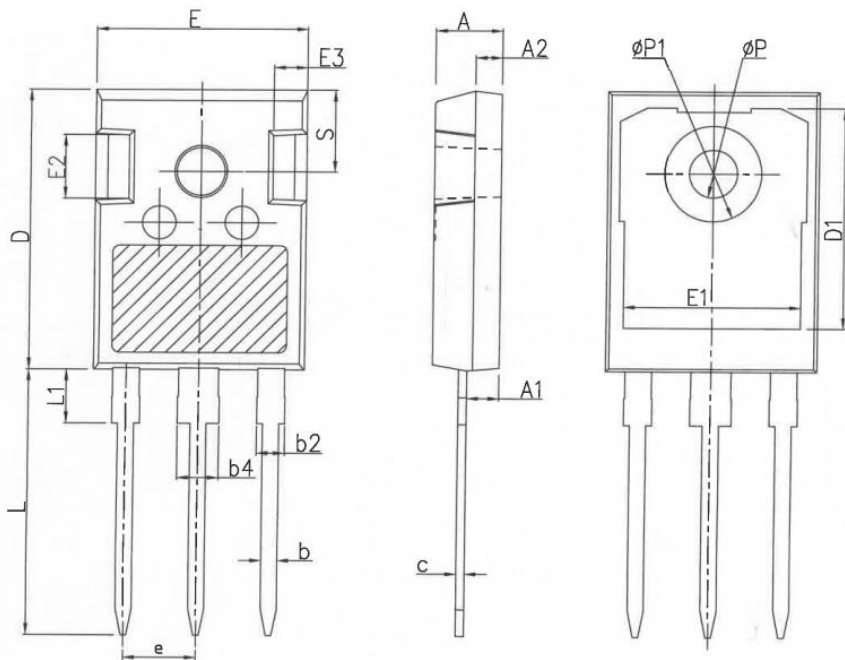


Figure10. Diode transient thermal impedance as a function of pulse width ( $D = t_p/T$ )

**Mechanical Data:**

Unit:mm



| SYMBOL | mm      |       |       |
|--------|---------|-------|-------|
|        | MIN     | NOM   | MAX   |
| A      | 4.80    | 5.00  | 5.20  |
| A1     | 2.21    | 2.41  | 2.59  |
| A2     | 1.85    | 2.00  | 2.15  |
| b      | 1.11    | 1.21  | 1.36  |
| b2     | 1.91    | 2.01  | 2.21  |
| b4     | 2.91    | 3.01  | 3.21  |
| c      | 0.51    | 0.61  | 0.75  |
| D      | 20.70   | 21.00 | 21.30 |
| D1     | 16.25   | 16.55 | 16.85 |
| E      | 15.50   | 15.80 | 16.10 |
| E1     | 13.00   | 13.30 | 13.60 |
| E2     | 4.80    | 5.00  | 5.20  |
| E3     | 2.30    | 2.50  | 2.70  |
| e      | 5.44BSC |       |       |
| L      | 19.62   | 19.92 | 20.22 |
| L1     | -       | -     | 4.30  |
| ΦP     | 3.40    | 3.60  | 3.80  |
| ΦP1    | -       | -     | 7.30  |
| S      | 6.15BSC |       |       |

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