

## Descriptions

This is 650V 50A Trench FS Technology IGBT.

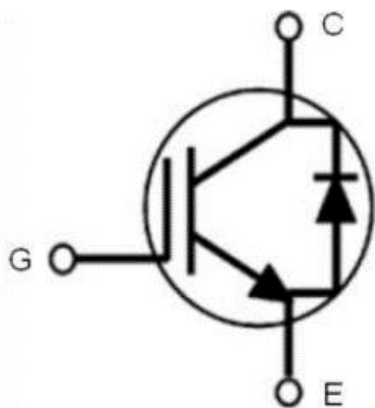
## Features

- Trench and field-stop technology.
- Easy parallel switching capability.
- High efficiency for inverter.
- High ruggedness performance.
- RoHS compliant.

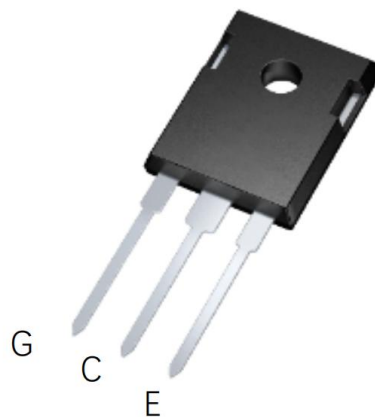
## Application

- PFC applications
- Uninterruptible power supplies
- Solar inverters

## Internal Circuit & Pinning



**TO-247**



## Marking

See Marking Instructions.

## Electrical Characteristics of IGBT

| Parameter                               | Symbol        | Test Condition  |                  | Min. | Typ. | Max.      | Unit    |
|---|---------------|---|------------------|------|------|-----------|---------|
| Collector to Emitter Breakdown Voltage  | $BV_{CES}$    | $I_C=250\mu A, V_{GE}=0V$   | $T_J=25^\circ C$ | 650  | -    | -         | V       |
| Collector to Emitter Saturation Voltage | $V_{CE(sat)}$ | $I_C=50A, V_{GE}=15V$   | $T_J=25^\circ C$ | -    | 1.9  | -         | V       |
| Gate Threshold Voltage                  | $V_{GE(th)}$  | $I_C=1mA, V_{GE}=V_{CE}$  | $T_J=25^\circ C$ | 5.0  | 5.4  | 5.6       | V       |
| Zero Gate Voltage Collector current     | $I_{CES}$     | $V_{CE}=650V, V_{GS}=0V$  | $T_J=25^\circ C$ | -    | -    | 50        | $\mu A$ |
| Gate to Emitter Leakage Current         | $I_{GES}$     | $V_{GE}=\pm 20V, V_{CE}=0V$   | $T_J=25^\circ C$ | -    | -    | $\pm 100$ | nA      |
| Input Capacitance                       | $C_{ies}$     | $f=1MHz, V_{CE}=30V, V_{GE}=0V$   | $T_J=25^\circ C$ | -    | 4820 | -         | pF      |
| Output Capacitance                      | $C_{oes}$     |   |                  | -    | 136  | -         |         |
| Reverse Transfer Capacitance            | $C_{res}$     |   |                  | -    | 37   | -         |         |
| Total Gate Charge                       | $Q_g$         | $V_{CC}=520V, I_C=50A, V_{GE}=15V$  |                  | -    | 158  | -         | nc      |
| Short Circuit Withstand Time            | $t_{SC}$      | $V_{CC}=400V, V_{GE}=15V$   | $T_J=25^\circ C$ | 5    | -    | -         | $\mu s$ |
| Turn-on Delay Time                      | $t_{d(on)}$   | $V_{CC}=400V, I_C=50A, V_{GE}=0/15V, R_G=10\Omega, \text{Inductive load}$ | $T_J=25^\circ C$ | -    | 50   | -         | ns      |
| Rising Time                             | $t_r$         |   | $T_J=25^\circ C$ | -    | 81   | -         | ns      |
| Turn-off Delay Time                     | $t_{d(off)}$  |   | $T_J=25^\circ C$ | -    | 190  | -         | ns      |
| Falling Time                            | $t_f$         |   | $T_J=25^\circ C$ | -    | 59   | -         | ns      |
| Turn-on Switching Loss                  | $E_{on}$      |   | $T_J=25^\circ C$ | -    | 1.7  | -         | mJ      |
| Turn-off Switching Loss                 | $E_{off}$     |   | $T_J=25^\circ C$ | -    | 0.9  | -         | mJ      |
| Total Switching Energy                  | $E_{total}$   |   | $T_J=25^\circ C$ | -    | 2.6  | -         | mJ      |

## Electrical Characteristics of Diode

| Parameter                           | Symbol   | Test Condition  |                   | Min. | Typ. | Max. | Unit |
|-------------------------------------|----------|---|-------------------|------|------|------|------|
| Diode Forward Voltage               | $V_F$    | $I_F=50A$   | $T_J=25^\circ C$  | -    | 1.6  | -    | V    |
|                                     |          |   | $T_J=175^\circ C$ | -    | 1.3  | -    |      |
| Diode Peak Reverse Recovery Current | $I_{RM}$ |   | $T_J=25^\circ C$  | -    | 15   | -    | A    |
|                                     |          |   | $T_J=175^\circ C$ | -    | 26   | -    |      |
| Diode Reverse Recovery Time         | $t_{rr}$ | $I_F=50A$<br>$di/dt=-$<br>$450A/\mu s$<br>$V_{CC}=400V$ | $T_J=25^\circ C$  | -    | 82   | -    | ns   |
|                                     |          |   | $T_J=175^\circ C$ | -    | 132  | -    |      |
| Diode Reverse Recovery Charge       | $Q_{rr}$ |   | $T_J=25^\circ C$  | -    | 698  | -    | nC   |
|                                     |          |   | $T_J=175^\circ C$ | -    | 2194 | -    |      |

Typical Characteristics

Fig.1 Typical output characteristic( $T_{vj}=25^{\circ}\text{C}$ )

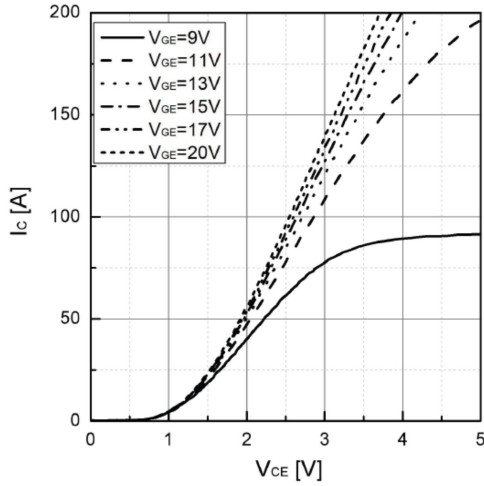


Fig.2 Typical output characteristic( $T_{vj}=175^{\circ}\text{C}$ )

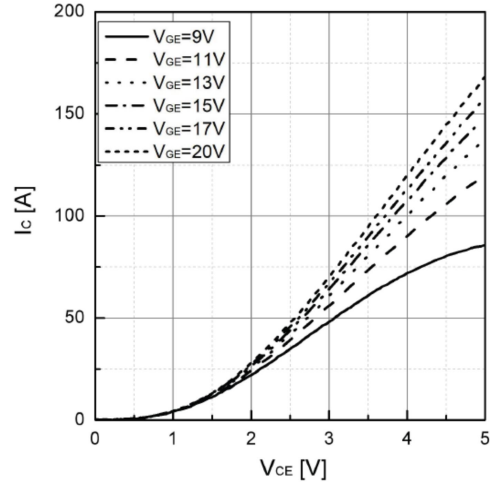


Fig.3 Power dissipation as a function of  $T_c$

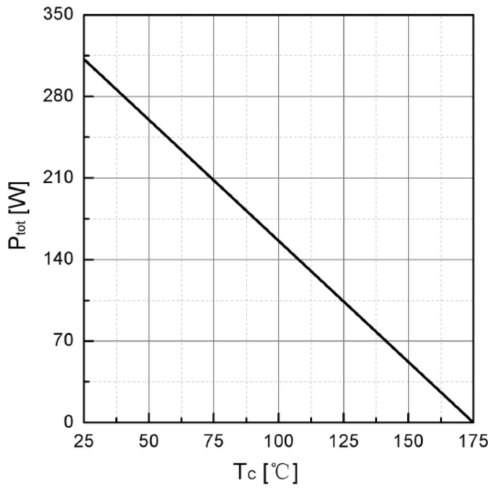


Fig.8 Typical Gate charge

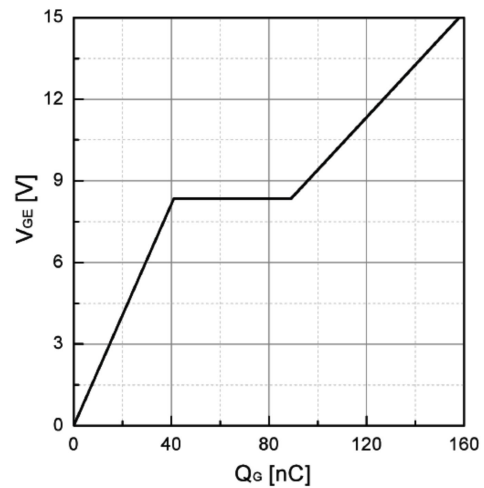


Fig.5 Typical  $V_{GE(th)}$  as a function of  $T_{vj}$  ( $I_c=1\text{mA}$ )

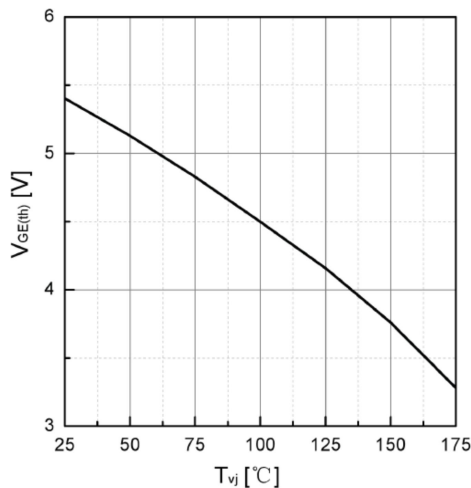
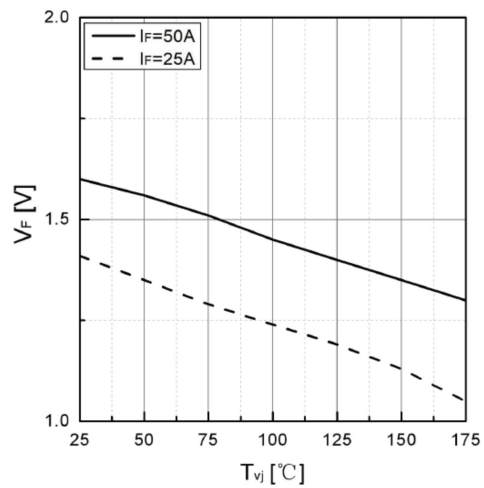


Fig.6 Typical  $V_F$  as a function of  $T_{vj}$



Typical Characteristics

Fig.7 Typical  $V_{CEsat}$  as a function of  $T_{vj}$

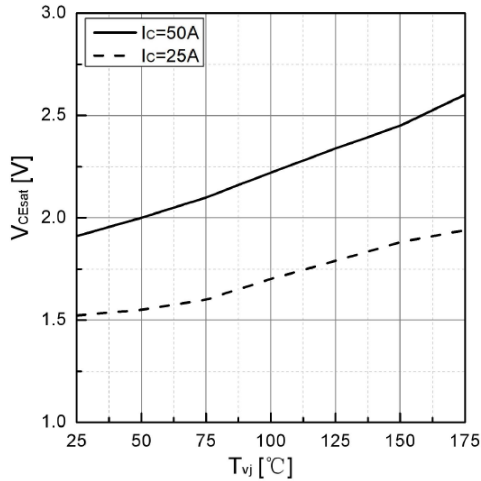


Fig 8 Typical  $I_F$  as a function of  $V_F$

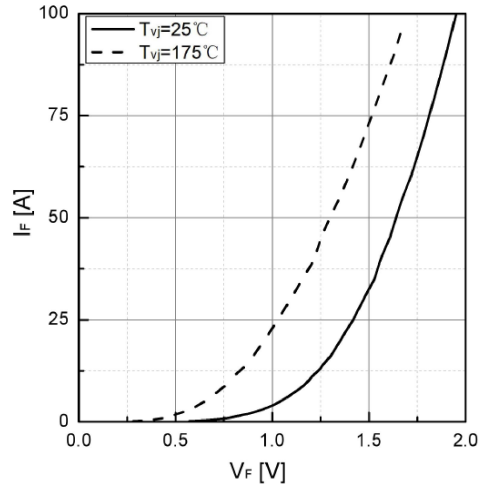


Fig.9 Typical switching times as a function of  $R_G$

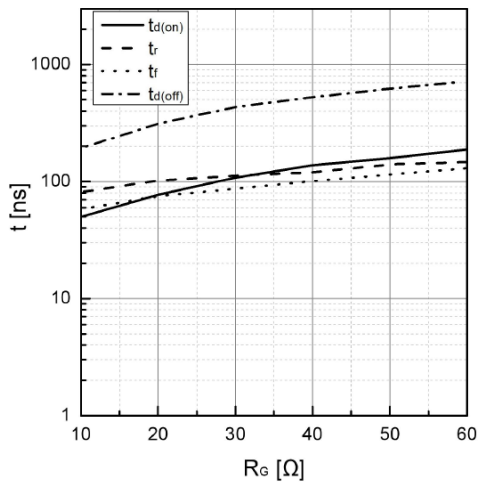


Fig.10 Typical switching time as a function of  $I_c$

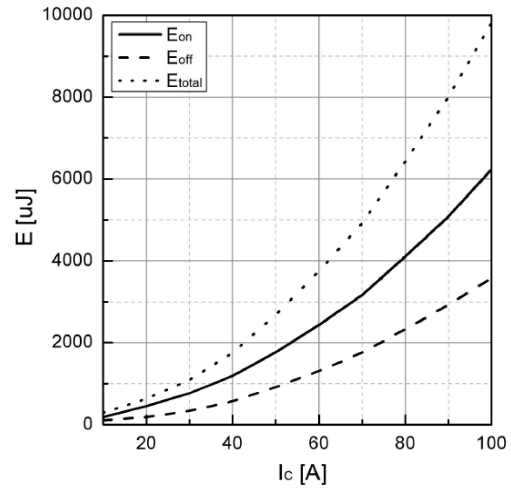


Fig 11 Typical switching energy losses as a function of  $R_G$

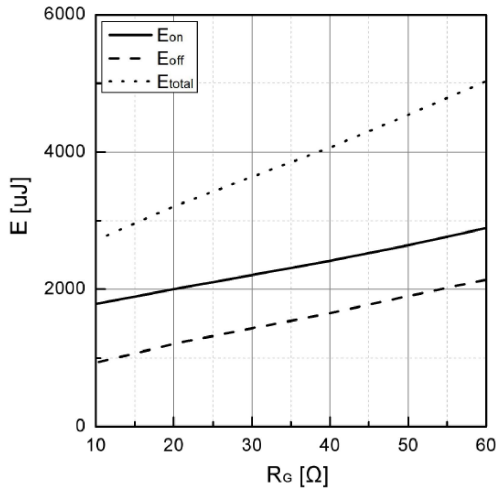
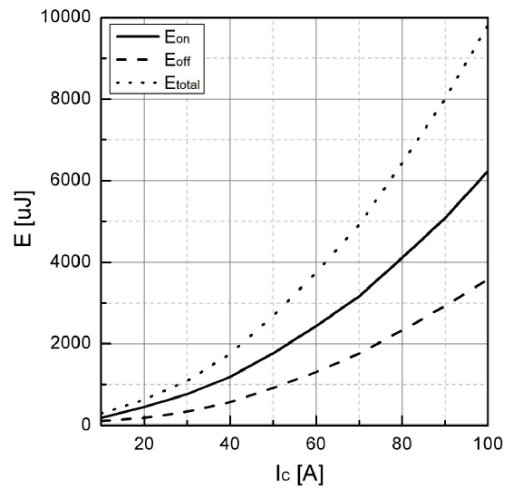


Fig 12 Typical switching energy losses as a function of  $I_c$



**Typical Characteristics**

Fig 13. Typical capacitance as a function of  $V_C$   
( $f=1\text{MHz}$ ,  $V_{GE}=0\text{V}$ )

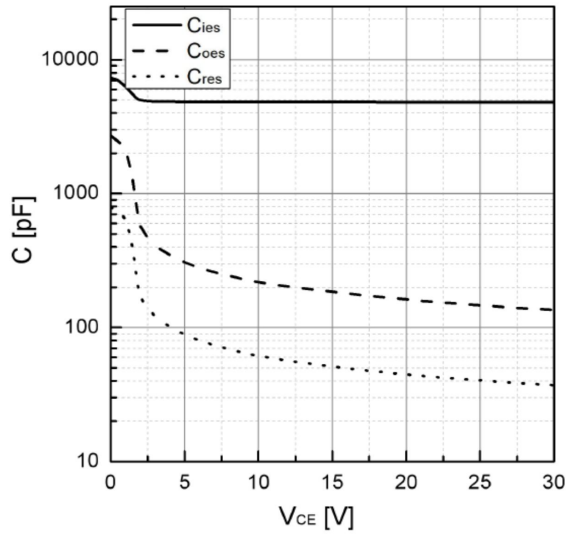
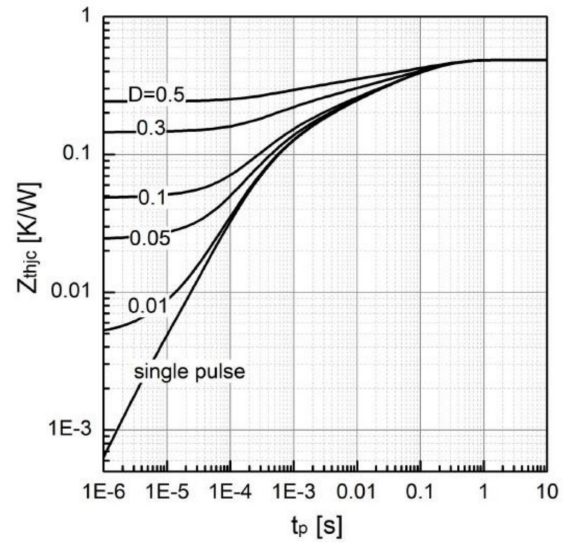
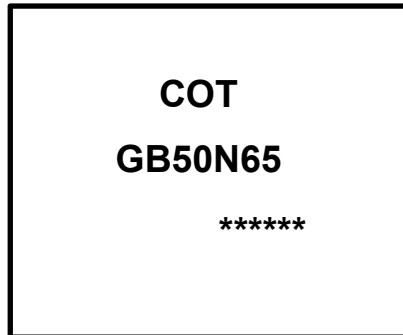


Fig 14. Transient thermal impedance of IGBT



**Ordering Information & Marking**



Note:

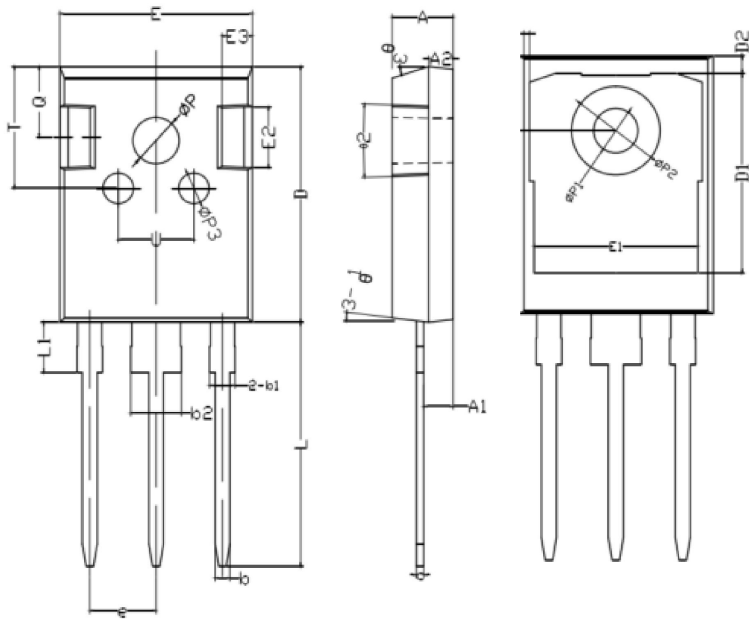
COT: Company Name

50N65: Product Type.

\*\*\*\*\*: \*: Inner Code \* : Year Code \*\*: Week Code \*\*: Lot Code

| Part         | Marking | Package  | Packing method | Minimum packing number |
|--------------|---------|----------|----------------|------------------------|
| CTGB50N65FHA | 50N65   | TO-247-3 | Tube           | 30 / Tube              |

**Mechanical Dimensions for TO-247**



**COMMON DIMENSIONS**

| SYMBOL | MM    |       |
|--------|-------|-------|
|        | MIN   | MAX   |
| A      | 4.80  | 5.20  |
| A1     | 2.21  | 2.59  |
| A2     | 1.85  | 2.15  |
| b      | 1.11  | 1.36  |
| b1     | 1.91  | 2.25  |
| b2     | 2.91  | 3.25  |
| c      | 0.51  | 0.75  |
| D      | 20.70 | 21.30 |
| D1     | 16.25 | 16.85 |
| E      | 15.50 | 16.10 |
| E1     | 13.00 | 13.60 |
| E2     | 4.80  | 5.20  |
| E3     | 2.30  | 2.70  |
| e      | 5.40  | 5.48  |
| L      | 19.62 | 20.22 |
| L1     | -     | 4.30  |
| ØP     | 3.40  | 3.80  |
| ØP2    | 6.90  | 7.30  |
| S      | 6.05  | 6.25  |