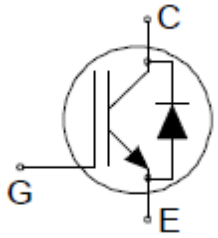
上海贝岭 SHANGHAI BELLING

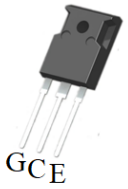
# BLQG50T65FDLA

IGBT

## 1. Description

BLQG50T65FDLA is obtained by advanced Trench Field Stop (T-FS) technology which is characteristic with low $V_{CE}$(sat) , optimized switching performance and low gate charge Qg. The IGBT is suitable device for Photovoltaic, UPS and high switching frequency applications.




TO-247

### KEY CHARACTERISTICS

| Parameter | Value | Unit |
|---|---|---|
| $V_{CES}$ | 650 | V |
| $I_C$ | 50 | A |
| $V_{CE(sat).typ}$ | 1.6 | V |

### FEATURES

- Fast Switching
- Low $V_{CE(sat)}$
- Positive temperature coefficient
- Fast recovery anti-parallel diode
- RoHS product
- AEC-Q101 Qualified

### APPLICATIONS

- Photovoltaic converters
- UPS

### ORDERING INFORMATION

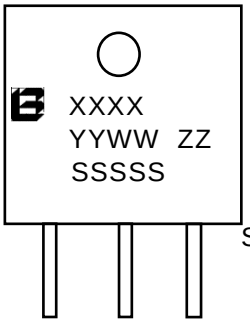
| Device Marking | Ordering Codes | Package | Product Code | Packing |
|---|---|---|---|---|
| 50T65FDLA | BLQG50T65FDLA-F | TO-247 | QG50T65FDLA | Tube |

BLQG50T65FDLA-F

(2) Package type

(1) Chip name

(1) BLQG50T65FDLA: 650V 50A
(2) F:TO-247




XXXX：Product Code

YYWW：Year & Week

ZZ：Assembly Code

SSSSS：Lot Code

## 2. ABSOLUTE RATINGS

| Symbol | Parameter | TO-247 | Units |
|---|---|---|---|
| $V_{CES}$ | Collector-Emitter Voltage | 650 | V |
| $I_C$ | Collector Current @$T_C$=25°C | 100 | A |
| | Collector Current @$T_C$=100°C | 50 | A |
| $I_{CM}$ | Pulsed Collector Current, tp limited by $T_{Jmax}$ | 200 | A |
| $I_F$ | Diode Continuous Forward Current @$T_C$=25°C | 100 | A |
| | Diode Continuous Forward Current @$T_C$=100°C | 50 | A |
| $I_{FM}$ | Diode Maximum Forward Current, limited by $T_{Jmax}$ | 200 | A |
| $V_{GES}$ | Gate-Emitter Voltage | ±30 | V |
| $t_{SC}$ | Short circuit withstand time $V_{GE}$=15V, $V_{CC}$≤400V, Allowed number of short circuits<1000,Times between short circuits: ≥ 1.0s,$T_J$ ≤ 175°C | 8 | μs |
| $P_D$ | Power Dissipation @$T_C$=25°C | 300 | W |
| $T_{Jmax}$, $T_{stg}$ | Operating Junction and Storage Temperature Range | 175, –55 to 175 | ℃ |
| $T_L$ | Maximum Temperature for Soldering | 260 | ℃ |

## 3. Thermal characteristics

| Symbol | Parameter | TO-247 | Units |
|---|---|---|---|
| $R_{\theta JC}$ | Junction-to-Case (IGBT) | 0.5 | ℃/W |
| $R_{\theta JC}$ | Junction-to-Case (Diode) | 0.65 | ℃/W |
| $R_{\theta JA}$ | Junction-to-Ambient | 40 | ℃/W |

## 4. Electrical Characteristics

at $T_C$ = 25°C, unless otherwise specified

### Static Characteristics

| Symbol | Parameter | Test Conditions | Values | | | Units |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| $V_{CES}$ | Collector-Emitter Breakdown Voltage | $V_{GE}$ = 0V, $I_C$ = 250μA | 650 | -- | -- | V |
| $V_{CE(sat)}$ | Collector-Emitter Saturation Voltage | $V_{GE}$ = 15V,$I_C$ = 50A<br>$T_J$=25℃<br>$T_J$=125℃<br>$T_J$=175℃ | <br>--<br>--<br>-- | <br>1.60<br>1.85<br>2.00 | <br>2.0<br>--<br>-- | V |
| $V_{GE(TH)}$ | Gate Threshold Voltage | $V_{CE}$ = $V_{GE}$,$I_C$ = 1mA | 4.7 | 5.5 | 6.2 | V |

| | | | | | | |
|---|---|---|---|---|---|---|
| $V_F$ | Diode Forward Voltage | $I_F$=50A<br>$T_J$=25℃<br>$T_J$=125℃<br>$T_J$=175℃ | --<br>--<br>-- | 2.30<br>1.95<br>1.80 | 3.00<br>--<br>-- | V |
| $I_{CES}$ | Collector-Emitter Leakage Current | $V_{CE}$ = 650V,<br>$V_{GE}$ = 0V | -- | -- | 35 | μA |
| $I_{GES(F)}$ | Gate-Emitter Forward Leakage Current | $V_{GE}$ = +30V | -- | -- | 200 | nA |
| $I_{GES(R)}$ | Gate-Emitter Reverse Leakage Current | $V_{GE}$ = -30V | -- | -- | -200 | nA |
| Pulse width tp≤300μs, δ≤2% | | | | | | |

## Dynamic Characteristics

| Symbol | Parameter | Test Conditions | Values | | | Units |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| $C_{iss}$ | Input Capacitance | $V_{GE}$=0V<br>$V_{CE}$=25V<br>f =1.0MHz | -- | 2109 | -- | pF |
| $C_{oss}$ | Output Capacitance | | -- | 158 | -- | |
| $C_{rss}$ | Reverse Transfer Capacitance | | -- | 24 | -- | |
| $Q_G$ | Gate charge | Vcc=520V<br>$I_{CE}$=50A<br>$V_{GE}$=15V | -- | 106 | -- | nC |
| $Q_{GC}$ | Gate-emitter charge | | -- | 53 | -- | |
| $Q_{GE}$ | Gate-collector charge | | -- | 22 | -- | |
| $I_{C(SC)}$ | Short circuit collector current Max.1000 short circuits, Times between short circuits: ≥ 1.0s | $V_{GE}$=15.0V,$V_{CC}$≤400V，<br>$t_{SC}$≤8us，$T_J$≤175℃ | | 250 | | A |

## IGBT Switching Characteristics, at $T_J$=25℃

| Symbol | Parameter | Test Conditions | Values | | | Units |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| $t_{d(on)}$ | Turn-on Delay Time | $I_C$ =50A<br>$V_{CE}$ = 400V<br>$V_{GE}$ = 15V<br>$R_G$ =5Ω<br>$T_J$=25°C<br>Inductive Load | -- | 22 | -- | ns |
| tr | Rise Time | | -- | 44 | -- | |
| $t_{d(off)}$ | Turn-Off Delay Time | | -- | 102 | -- | |
| $t_f$ | Fall Time | | -- | 59 | -- | |
| $E_{on}$ | Turn-On Switching Loss | | -- | 0.98 | -- | mJ |
| $E_{off}$ | Turn-Off Switching Loss | | -- | 0.81 | -- | |
| $E_{ts}$ | Total Switching Loss | | -- | 1.79 | -- | |

## IGBT Switching Characteristics, at $T_J$=175℃

| Symbol | Parameter | Test Conditions | Values | | | Units |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| $t_{d(on)}$ | Turn-on Delay Time | $I_C$ =50A<br>$V_{CE}$ = 400V<br>$V_{GE}$ = 15V<br>$R_G$ =5Ω<br>$T_J$=175°C<br>Inductive Load | -- | 22 | -- | ns |
| tr | Rise Time | | -- | 41 | -- | |
| $t_{d(off)}$ | Turn-Off Delay Time | | -- | 182 | -- | |
| $t_f$ | Fall Time | | -- | 115 | -- | |
| $E_{on}$ | Turn-On Switching Loss | | -- | 1.06 | -- | mJ |
| $E_{off}$ | Turn-Off Switching Loss | | -- | 1.48 | -- | |
| $E_{ts}$ | Total Switching Loss | | -- | 2.54 | -- | |

## Diode Characteristics, at $T_J$=25℃

| Symbol | Parameter | Test Conditions | Values | | | Units |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| $T_{rr}$ | Reverse Recovery Time | $I_F$=25A,<br>di/dt=200A/μs,<br>$T_J$=25°C | -- | 40 | -- | ns |
| $Q_{rr}$ | Reverse Recovery Charge | | -- | 86 | -- | nC |
| $I_{rrm}$ | Reverse Recovery Current | | -- | 3.0 | -- | A |
| $T_{rr}$ | Reverse Recovery Time | $I_F$=50A,<br>di/dt=200A/μs,<br>$T_J$=25°C | -- | 48 | -- | ns |
| $Q_{rr}$ | Reverse Recovery Charge | | -- | 103 | -- | nC |
| $I_{rrm}$ | Reverse Recovery Current | | -- | 3.7 | -- | A |

## Diode Characteristics, at $T_J$=175℃

| Symbol | Parameter | Test Conditions | Values | | | Units |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| $T_{rr}$ | Reverse Recovery Time | $I_F$=25A,<br>di/dt=200A/μs,<br>$T_J$=175°C | -- | 120 | -- | ns |
| $Q_{rr}$ | Reverse Recovery Charge | | -- | 136 | -- | nC |
| $I_{rrm}$ | Reverse Recovery Current | | -- | 3.9 | -- | A |
| $T_{rr}$ | Reverse Recovery Time | $I_F$=50A,<br>di/dt=200A/μs,<br>$T_J$=175°C | -- | 160 | -- | ns |
| $Q_{rr}$ | Reverse Recovery Charge | | -- | 175 | -- | nC |
| $I_{rrm}$ | Reverse Recovery Current | | -- | 4.8 | -- | A |

## 5. Characteristics Curves

**Figure 1. Forward Bias Safe Operating Area**

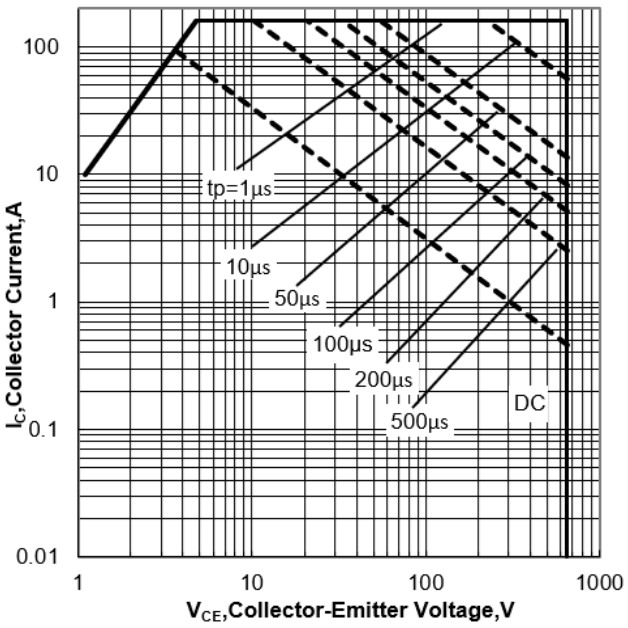



**Figure 2. Power Dissipation vs Case Temperature**

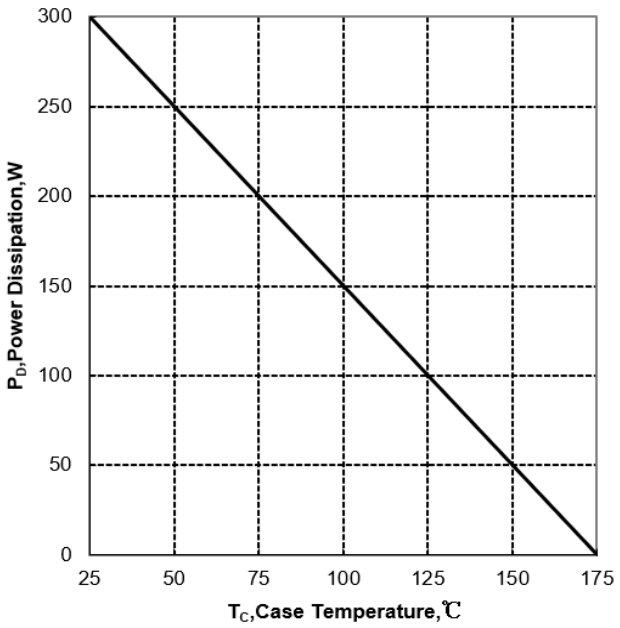



**Figure 3. Collector Current vs Case Temperature**

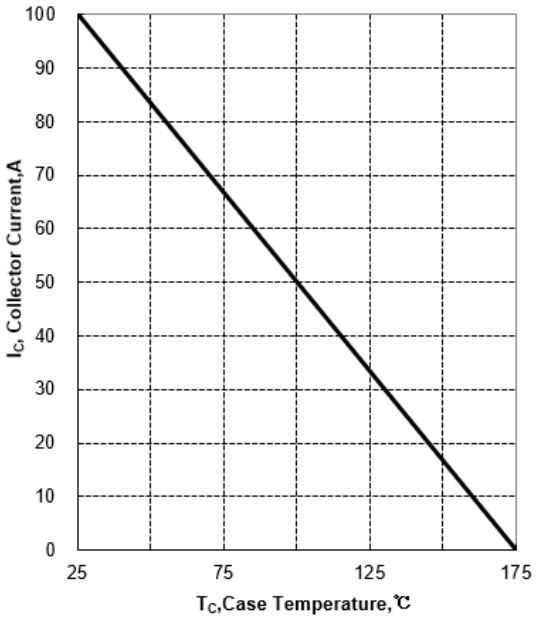



**Figure 4. Typical Transfer Characteristics**

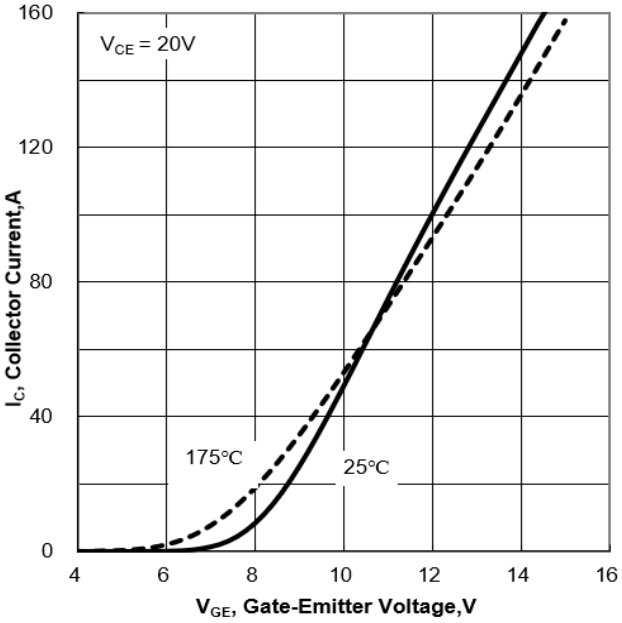


**Figure 5. Typical Output Characteristics ($T_J$=25℃)**

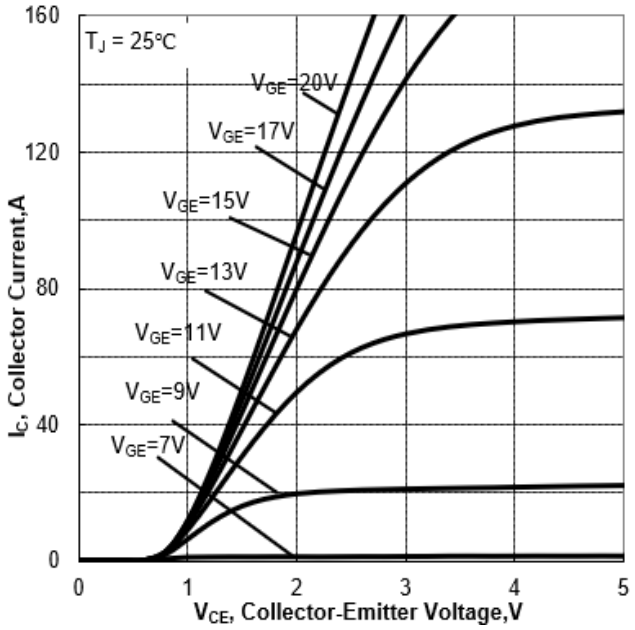



**Figure 6. Typical Output Characteristics ($T_J$=175℃)**

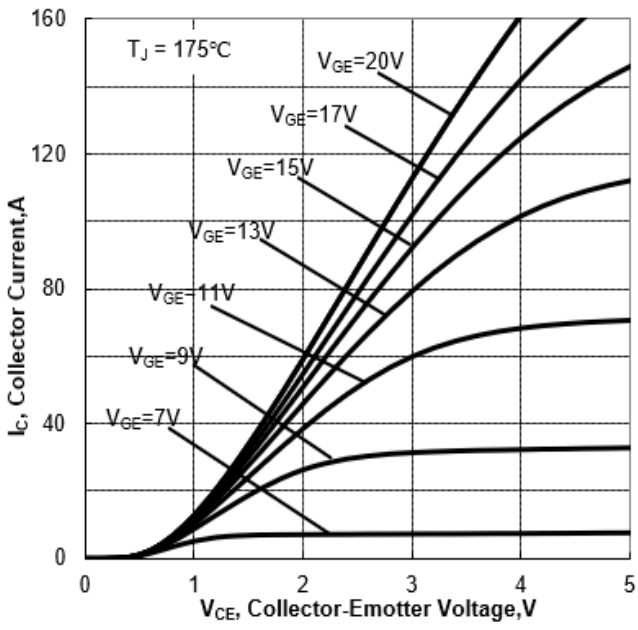



**Figure 7. Typical Collector-Emitter Saturation Voltage vs Junction Temperature**

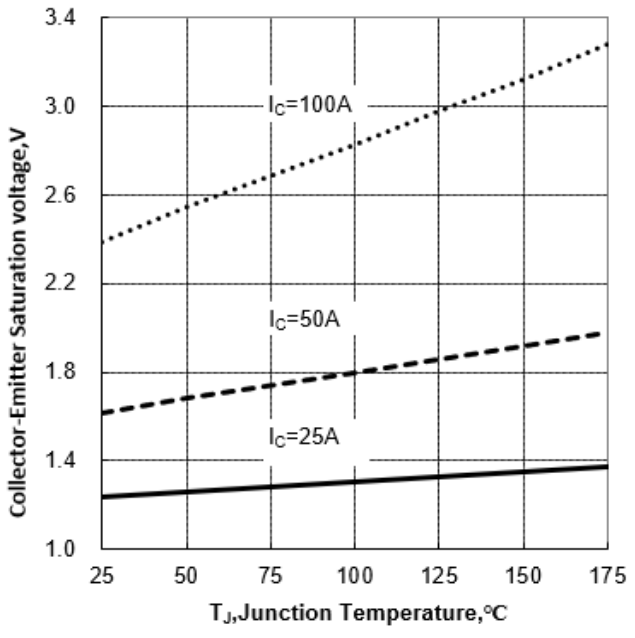



**Figure 8. Typical Gate-Emitter Threshold Voltage vs Junction Temperature**

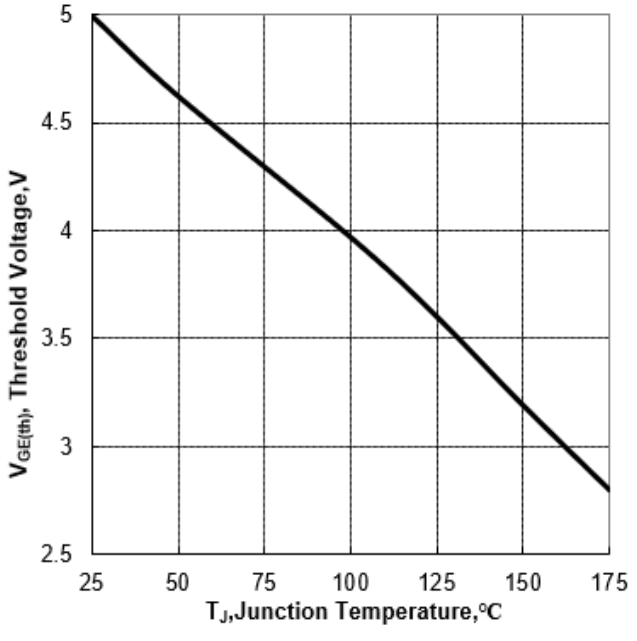


**Figure 9. Typical Switching Times vs Gate Resistor ($T_J$=25℃, $V_{CE}$=400V, $V_{GE}$=15/0V, $I_C$=50A)**

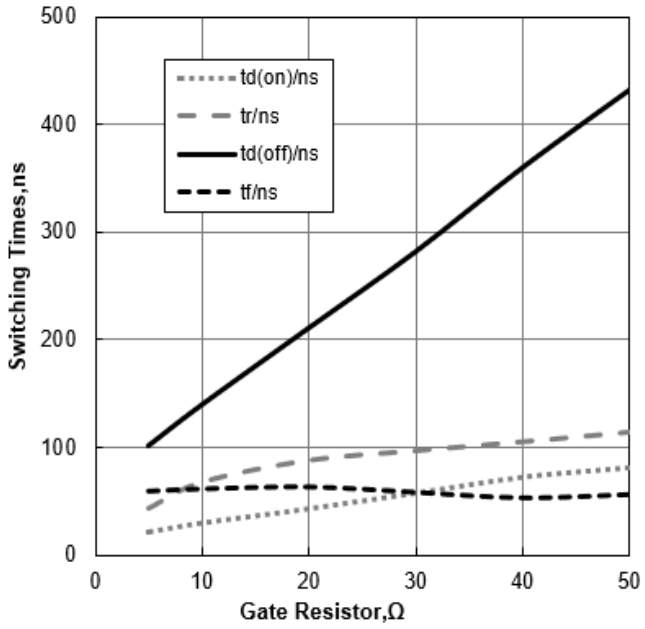



**Figure 10. Typical Switching Energy vs Gate Resistor ($T_J$=25℃, $V_{CE}$=400V, $V_{GE}$=15/0V, $I_C$=50A)**

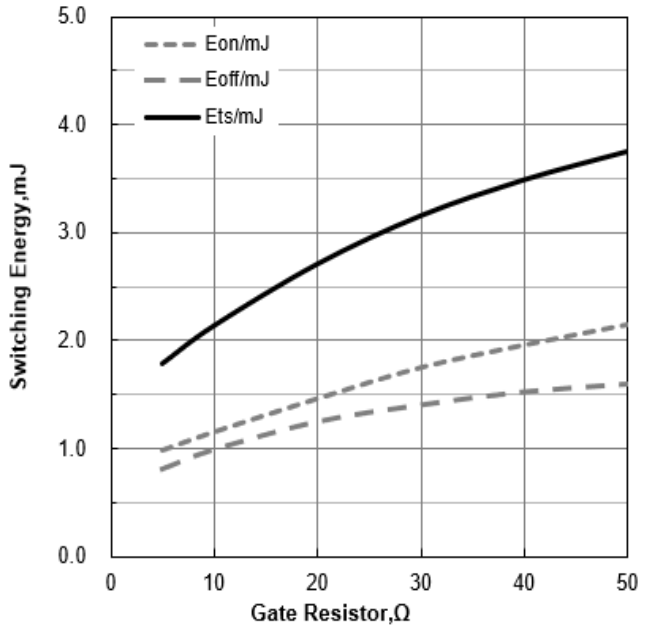



**Figure 11. Typical Switching Times vs Junction Temperature ( $V_{CE}$=400V, $V_{GE}$=15/0V, $I_C$=50A)**

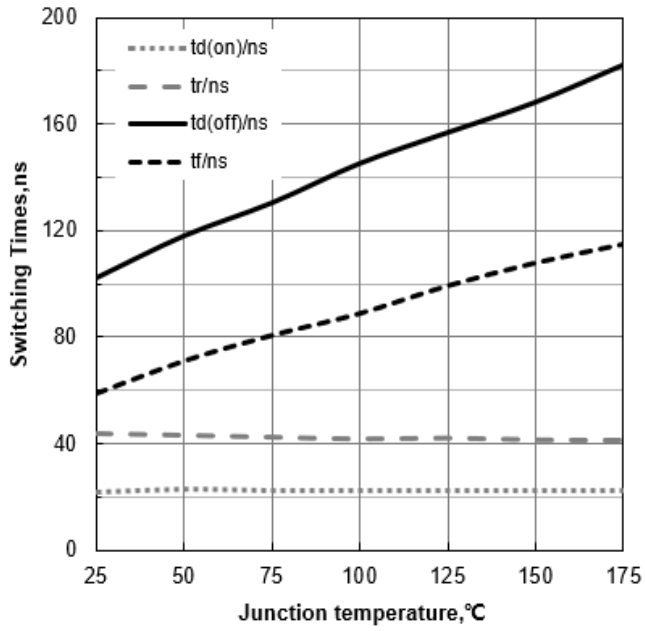



**Figure 12. Typical Switching Energy vs Junction Temperature ($V_{CE}$=400V, $V_{GE}$=15/0V, $I_C$=50A)**

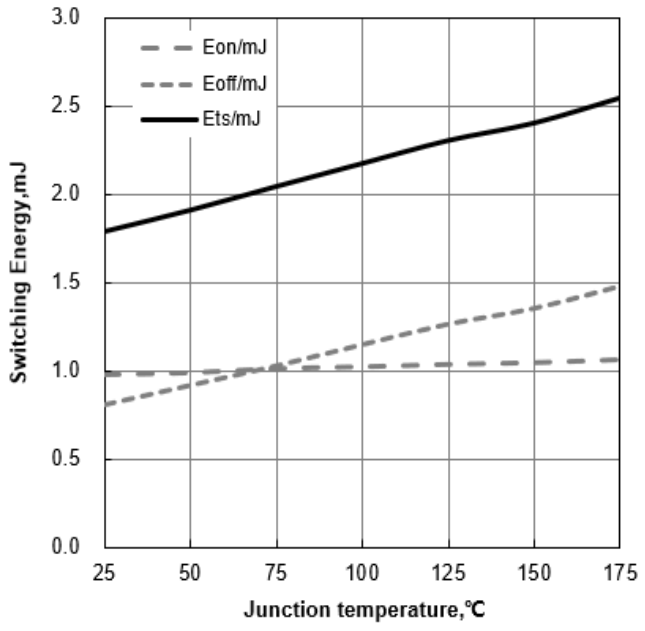


**Figure 13. Typical Switching Times vs Collector Current ($T_J$=25℃, $V_{CE}$=400V, $V_{GE}$=15/0V)**

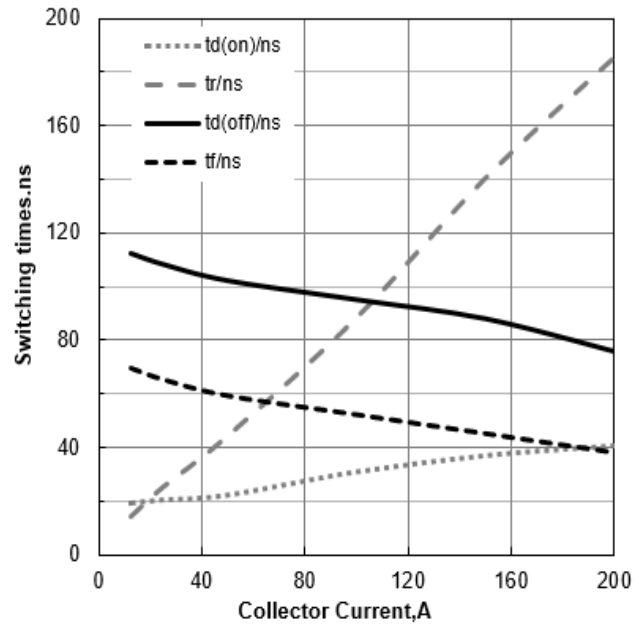



**Figure 14. Typical Switching Energy vs Collector Current ($T_J$=25℃, $V_{CE}$=400V, $V_{GE}$=15/0V)**

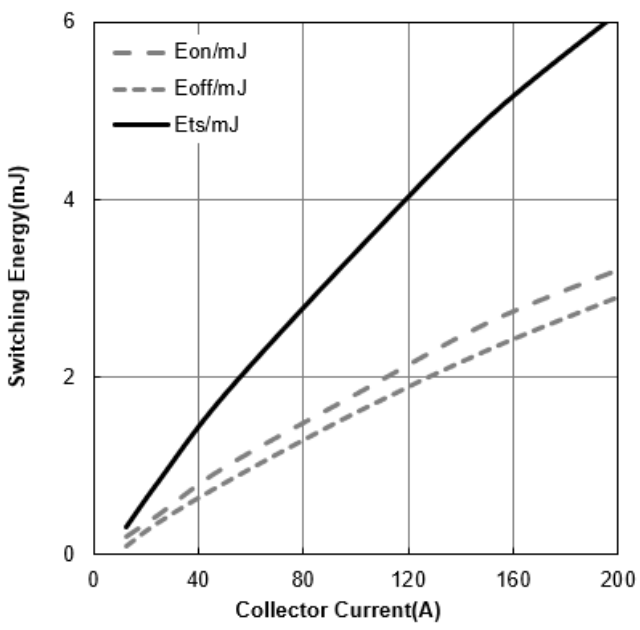



**Figure 15. Typical Switching Times vs $V_{CE}$ ( $T_J$=25℃, $V_{GE}$=15/0V, $I_C$=50A)**

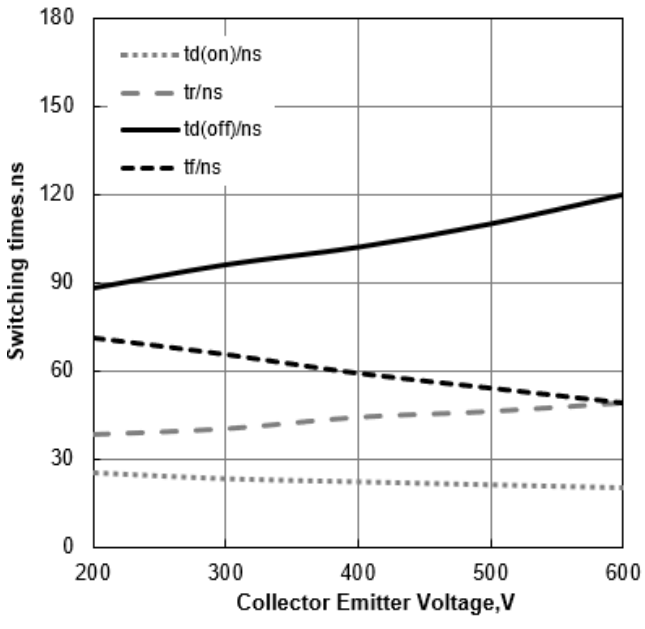



**Figure 16. Typical Switching Energy vs $V_{CE}$ ( $T_J$=25℃, $V_{GE}$=15/0V, $I_C$=50A)**

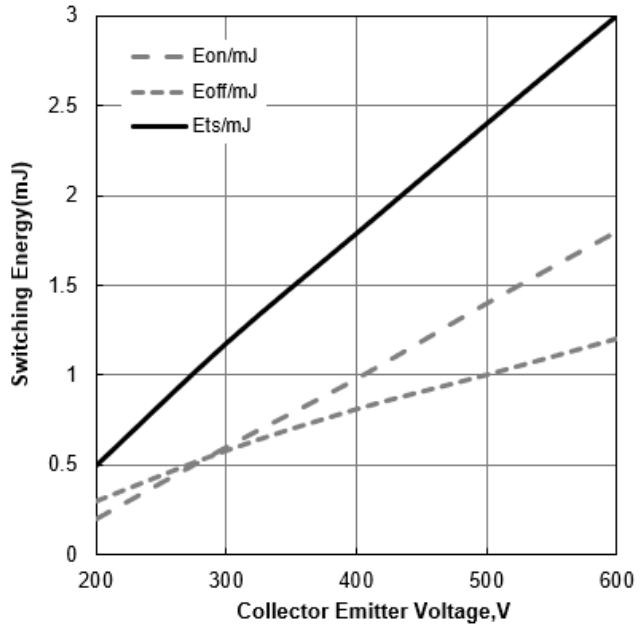


**Figure 17. Typical Gate Charge**

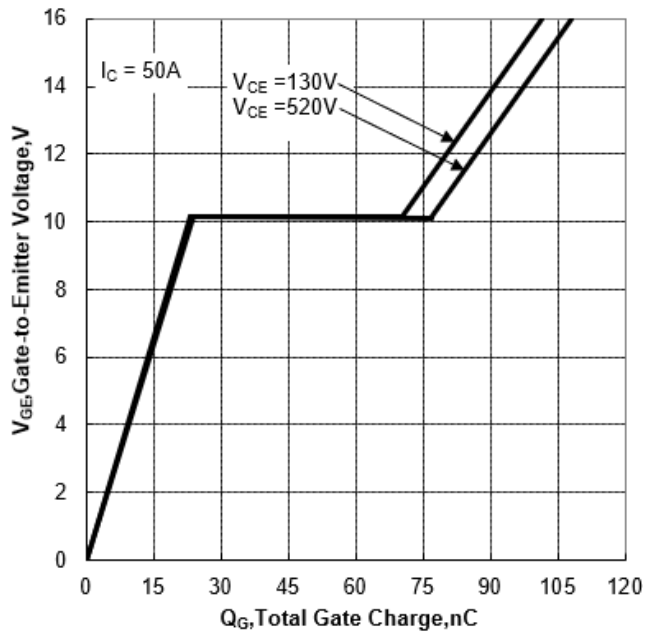



**Figure 18. Typical Capacitance vs Collector-Emitter Voltage**

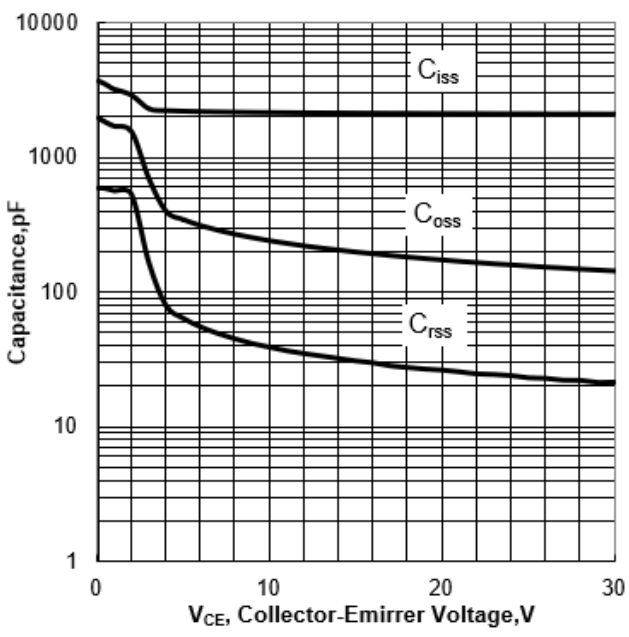



**Figure 19. IGBT Transient Thermal Impedance vs Pulse Width**

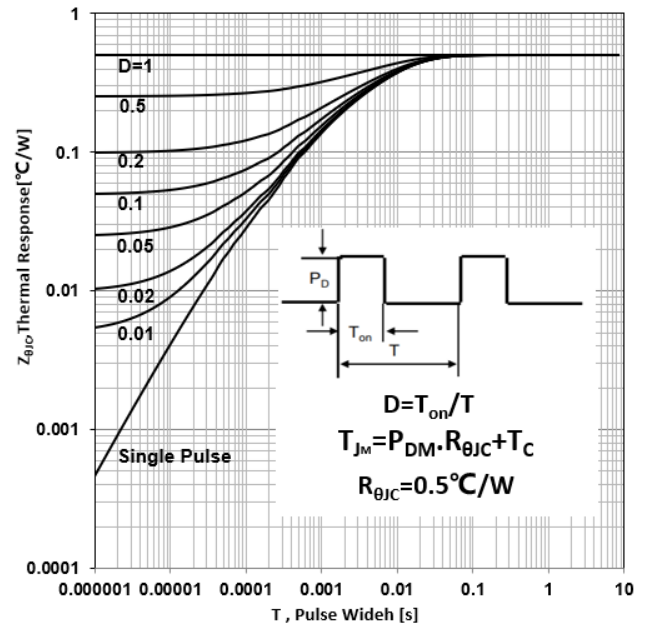



**Figure 20. Diode Transient Thermal Impedance vs Pulse Width**

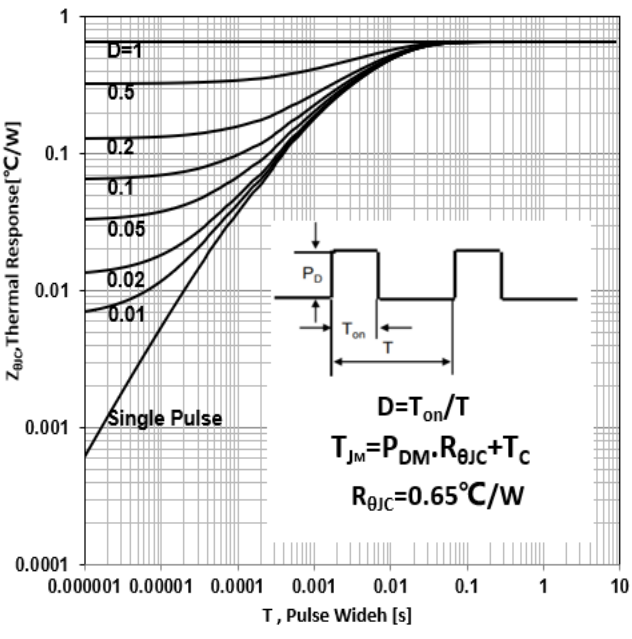
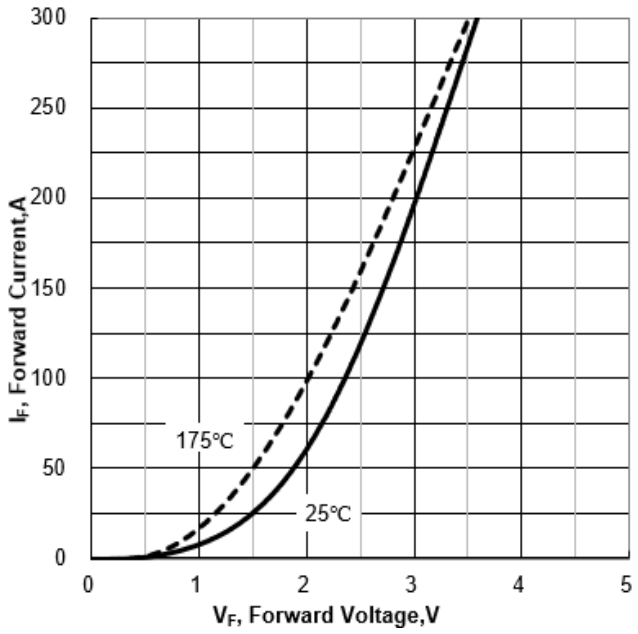


**Figure 21 Typical Diode Forward Current vs Forward Voltage**



## 6. Test Circuit and Waveform

**Figure 22. Inductive Switching Test Circuit**

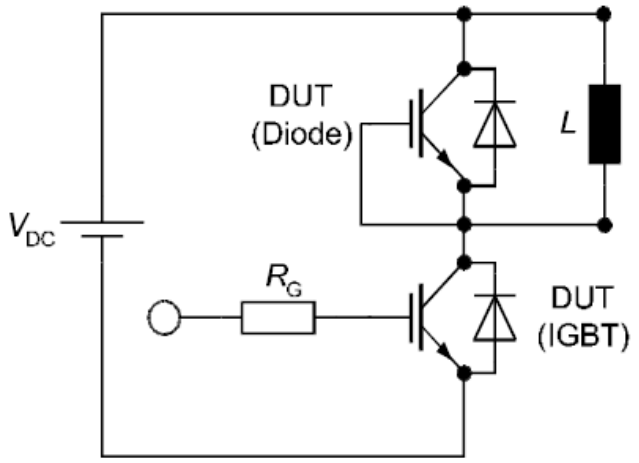



**Figure 23. Definition of switching times**

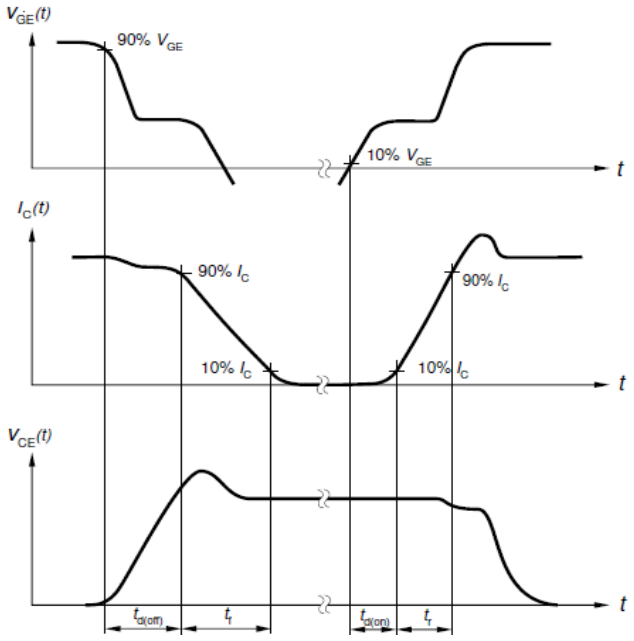



**Figure 24. Definition of switching losses**

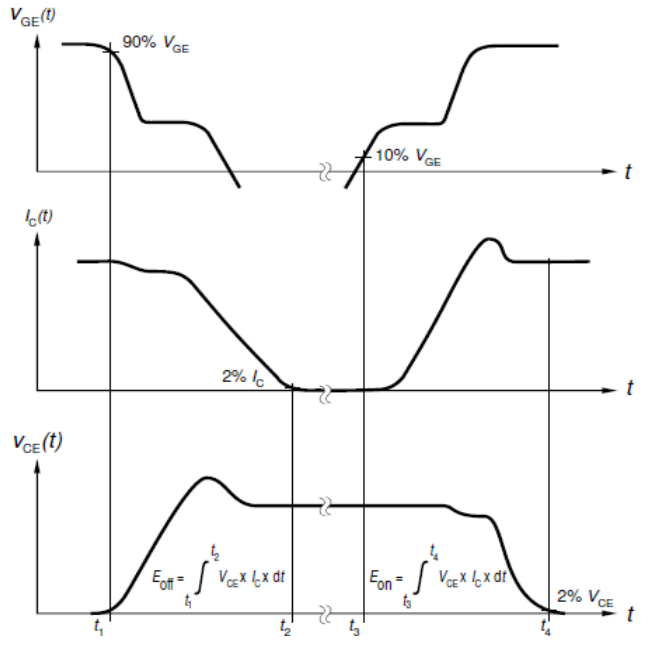
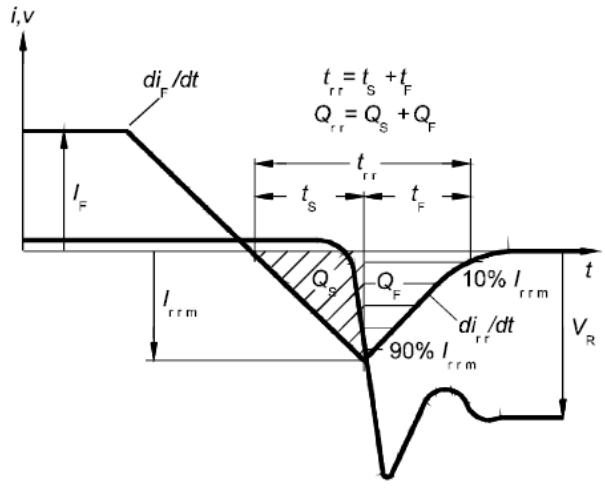
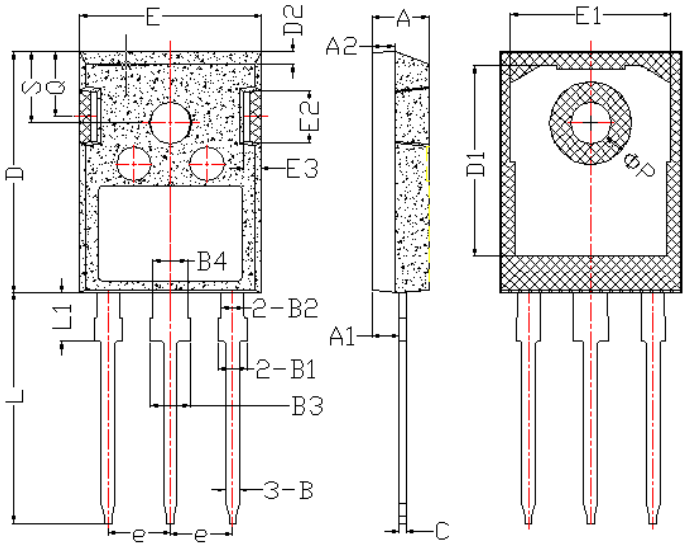



**Figure 25. Definition of diode switching characteristics**



## 7. Package Description




TO-247 Package

| Items | Values(mm) | |
|---|---|---|
| | MIN | MAX |
| A | 4.90 | 5.16 |
| A1 | 2,27 | 2.53 |
| A2 | 1.85 | 2.11 |
| B | 1.07 | 1.33 |
| B1 | 1.90 | 2.41 |
| B2 | 1.75 | 2.15 |
| B3 | 2.87 | 3.38 |
| B4 | 2.87 | 3.13 |
| C | 0.55 | 0.68 |
| D | 20.82 | 21.10 |
| D1 | 16.25 | 17.65 |
| D2 | 1.05 | 1.35 |
| E | 15.70 | 16.03 |
| E1 | 13.10 | 14.15 |
| E2 | 3.68 | 5.10 |
| E3 | 1.68 | 2.60 |
| e | 5.44 | |
| L | 19.80 | 20.31 |
| L1 | 4.17 | 4.47 |
| ΦP | 3.50 | 3.70 |
| Q | 5.49 | 6.00 |
| S | 6.04 | 6.30 |