# IGBT − Field Stop, Trench

## 75 A, 950 V

*Product Preview*

# FGY75T95LQDT

Trench Field Stop 4th generation Low Vcesat IGBT co−packaged with full current rated diode.

### Features

- Maximum Junction Temperature : $T_J$ = 175°C
- Positive Temperature Co−efficient for Easy Parallel Operating
- High Current Capability
- Low Saturation Voltage: $V_{CE(Sat)}$ = 1.31 V (Typ.) @ $I_C$ = 75 A
- Fast Switching
- Tighten Parameter Distribution
- These Devices are Pb−Free and are RoHS Compliant

### Applications

- Solar Inverter

### MAXIMUM RATINGS

| Rating | Symbol | Value | Unit |
|---|---|---|---|
| Collector to Emitter Voltage | $V_{CES}$ | 950 | V |
| Gate to Emitter Voltage<br>Transient Gate to Emitter Voltage | $V_{GES}$ | ±20<br>±30 | V |
| Collector Current @$T_C$ = 25°C<br>@$T_C$ = 100°C | $I_C$ | 150<br>75 | A |
| Pulsed Collector Current (Note 1) | $I_{LM}$ | 225 | A |
| Pulsed Collector Current (Note 2) | $I_{CM}$ | 225 | A |
| Diode Forward Current @$T_C$ = 25°C<br>@$T_C$ = 100°C | $I_F$ | 150<br>75 | A |
| Pulsed Diode Forward Current (Note 2) | $I_{FM}$ | 225 | A |
| Maximum Power Dissipation @$T_C$ = 25°C<br>@$T_C$ = 100°C | $P_D$ | 453<br>226 | W |
| Operating Junction / Storage Temperature Range | $T_J$, $T_{STG}$ | −55 to +175 | °C |
| Maximum Lead Temp. for Soldering Purposes, 1/8" from case for 5 seconds | $T_L$ | 300 | °C |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. VCC = 700 V, VGE = 15 V, IC = 225 A, RG = 26 Ω, Inductive Load, 100% Tested
2. Pulse width limited by max Junction temperature. Defined by design. Not subject to production test

This document contains information on a product under development. ON Semiconductor reserves the right to change or discontinue this product without notice.

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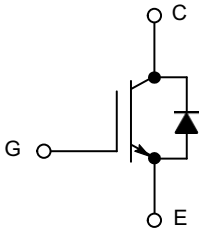
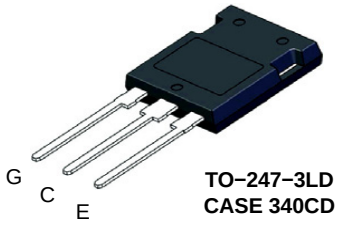
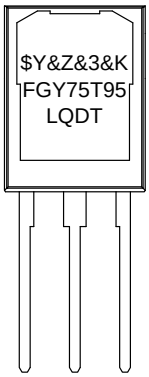
**75 A, 950 V**
**$V_{CESat}$ = 1.31 V (Typ.)**




**TO−247−3LD**
**CASE 340CD**

### MARKING DIAGRAM




| | |
|---|---|
| $Y | = ON Semiconductor Logo |
| &Z | = Assembly Plant Code |
| &3 | = Numeric Date Code |
| &K | = 2−Digit Lot Traceability Code |
| FGY75T95LQDT | = Specific Device Code |

### ORDERING INFORMATION

See detailed ordering and shipping information on page 2 of this data sheet.

## ORDERING INFORMATION

| Part Number | Top Marking | Package | Shipping |
|---|---|---|---|
| FGY75T95LQDT | FGY75T95LQDT | TO−247−3LD (Pb-Free) | 30 Units / Rail |

## THERMAL CHARACTERISTICS

| Rating | Symbol | Value | Unit |
|---|---|---|---|
| Thermal resistance junction−to−case, for IGBT | $R_{\theta JC}$ | 0.33 | °C/W |
| Thermal resistance junction−to−case, for Diode | $R_{\theta JC}$ | 0.23 | °C/W |
| Thermal resistance junction−to−ambient | $R_{\theta JA}$ | 40 | °C/W |

## ELECTRICAL CHARACTERISTICS ($T_J$ = 25°C unless otherwise noted)

| Parameter | Test Conditions | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | |
| Collector−emitter breakdown voltage, gate−emitter short−circuited | $V_{GE}$ = 0 V, $I_C$ = 1 mA | $BV_{CES}$ | 950 | | | V |
| Temperature Coefficient of Breakdown Voltage | $V_{GE}$ = 0 V, $I_C$ = 1 mA | $\frac{\Delta BV_{CES}}{\Delta T_J}$ | | 0.96 | | V/°C |
| Collector−emitter cut−off current, gate−emitter short−circuited | $V_{GE}$ = 0 V, $V_{CE}$ = 950 V | $I_{CES}$ | | | 250 | μA |
| Gate leakage current, collector−emitter short−circuited | $V_{GE}$ = 20 V , $V_{CE}$ = 0 V | $I_{GES}$ | | | ±400 | nA |
| **ON CHARACTERISTICS** | | | | | | |
| Gate−emitter threshold voltage | $V_{GE}$ = $V_{CE}$, $I_C$ = 75 mA | $V_{GE(th)}$ | 3.4 | 4.57 | 6.4 | V |
| Collector−emitter saturation voltage | $V_{GE}$ = 15 V, $I_C$ = 75 A<br>$V_{GE}$ = 15 V, $I_C$ = 75 A, $T_J$ = 175°C | $V_{CE(sat)}$ | | 1.31<br>1.52 | 1.69 | V |
| **DYNAMIC CHARACTERISTICS** | | | | | | |
| Input capacitance | $V_{CE}$ = 30 V, $V_{GE}$ = 0 V, f = 1 MHz | Cies | | 15400 | | pF |
| Output capacitance | | Coes | | 266 | | |
| Reverse transfer capacitance | | Cres | | 85.3 | | |
| Gate charge total | $V_{CE}$ = 600 V, $I_C$ = 75 V, $V_{GE}$ = 15 V | $Q_g$ | | 663.3 | | nC |
| Gate to emitter charge | | Qge | | 76.1 | | |
| Gate to collector charge | | Qgc | | 218.6 | | |
| **SWITCHING CHARACTERISTICS, INDUCTIVE LOAD** | | | | | | |
| Turn−on delay time | $T_J$ = 25°C<br>$V_{CC}$ = 600 V, $I_C$ = 37.5 A<br>Rg = 4.7 Ω<br>$V_{GE}$ = 15 V<br>Inductive Load | td(on) | | 52.0 | | ns |
| Rise time | | $t_r$ | | 24.0 | | |
| Turn−off delay time | | td(off) | | 496.0 | | |
| Fall time | | $t_f$ | | 108.0 | | |
| Turn−on switching loss | | Eon | | 2.0 | | mJ |
| Turn−off switching loss | | Eoff | | 1.8 | | |
| Total switching loss | | Ets | | 3.7 | | |

**ELECTRICAL CHARACTERISTICS** ($T_J$ = 25°C unless otherwise noted)

| Parameter | Test Conditions | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Turn−on delay time | $T_J$ = 25°C<br>$V_{CC}$ = 600 V, $I_C$ = 75 A<br>Rg = 4.7 Ω<br>$V_{GE}$ = 15 V<br>Inductive Load | td(on) | | 52.0 | | ns |
| Rise time | | $t_r$ | | 52.0 | | |
| Turn−off delay time | | td(off) | | 476.0 | | |
| Fall time | | $t_f$ | | 76.0 | | |
| Turn−on switching loss | | Eon | | 4.8 | | mJ |
| Turn−off switching loss | | Eoff | | 3.3 | | |
| Total switching loss | | Ets | | 8.1 | | |
| Turn−on delay time | $T_J$ = 175°C<br>$V_{CC}$ = 600 V, $I_C$ = 37.5 A<br>Rg = 4.7 Ω<br>$V_{GE}$ = 15 V<br>Inductive Load | td(on) | | 44.0 | | ns |
| Rise time | | $t_r$ | | 30.0 | | |
| Turn−off delay time | | td(off) | | 580.0 | | |
| Fall time | | $t_f$ | | 144.0 | | |
| Turn−on switching loss | | Eon | | 3.8 | | mJ |
| Turn−off switching loss | | Eoff | | 2.7 | | |
| Total switching loss | | Ets | | 6.5 | | |
| Turn−on delay time | $T_J$ = 175°C<br>$V_{CC}$ = 600 V, $I_C$ = 75 A<br>Rg = 4.7 Ω<br>$V_{GE}$ = 15 V<br>Inductive Load | td(on) | | 48.0 | | ns |
| Rise time | | $t_r$ | | 54.0 | | |
| Turn−off delay time | | td(off) | | 548.0 | | |
| Fall time | | $t_f$ | | 118.0 | | |
| Turn−on switching loss | | Eon | | 7.6 | | mJ |
| Turn−off switching loss | | Eoff | | 5.1 | | |
| Total switching loss | | Ets | | 12.7 | | |
| **DIODE CHARACTERISTICS** | | | | | | |
| Forward voltage | $I_F$ = 75 A<br>$I_F$ = 75 A, $T_J$ = 175°C | $V_F$ | | 2.03<br>1.76 | 2.51 | V |
| Reverse Recovery Energy | $T_J$ = 25°C<br>$V_R$ = 600 V, $I_F$ = 37.5 A<br>$dI_F/dt$ = 1000 A/μs | $E_{rec}$ | | 314 | | uJ |
| Reverse Recovery Time | | $t_{rr}$ | | 105 | | ns |
| Reverse Recovery Charge | | $Q_{rr}$ | | 1635 | | nC |
| Reverse Recovery Energy | $T_J$ = 25°C<br>$V_R$ = 600 V, $I_F$ = 75 A<br>$dI_F/dt$ = 1000 A/μs | $E_{rec}$ | | 2390 | | uJ |
| Reverse Recovery Time | | $t_{rr}$ | | 259 | | ns |
| Reverse Recovery Charge | | $Q_{rr}$ | | 7515 | | nC |
| Reverse Recovery Energy | $T_J$ = 175°C<br>$V_R$ = 600 V, $I_F$ = 37.5 A<br>$dI_F/dt$ = 1000 A/μs | $E_{rec}$ | | 454 | | uJ |
| Reverse Recovery Time | | $t_{rr}$ | | 148 | | ns |
| Reverse Recovery Charge | | $Q_{rr}$ | | 2436 | | nC |

**ELECTRICAL CHARACTERISTICS** ($T_J$ = 25°C unless otherwise noted)

| Parameter | Test Conditions | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Reverse Recovery Energy | $T_J$ = 175°C<br>$V_R$ = 600 V, $I_F$ = 75 A<br>$dI_F/dt$ = 1000 A/μs | $E_{rec}$ | | 2790 | | uJ |
| Reverse Recovery Time | | $t_{rr}$ | | 294 | | ns |
| Reverse Recovery Charge | | $Q_{rr}$ | | 9175 | | nC |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

## TYPICAL CHARACTERISTICS

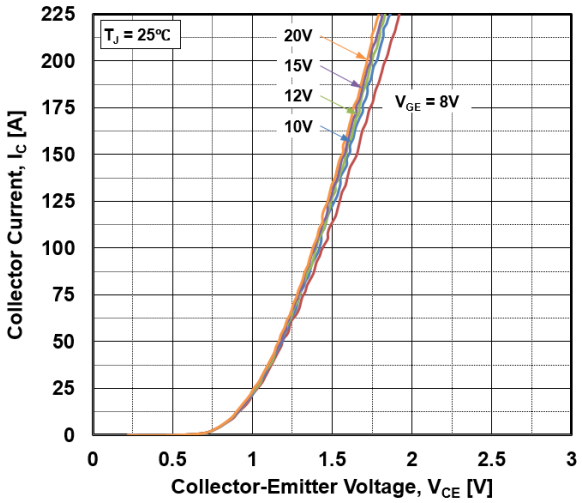



Figure 1. Typical Output Characteristics ($T_J$ = 25°C)

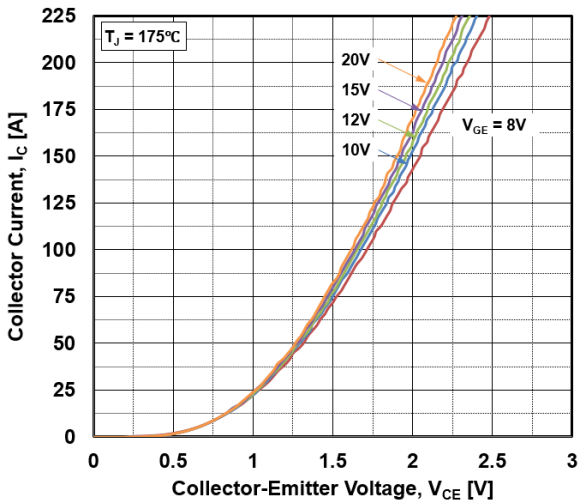



Figure 2. Typical Output Characteristics ($T_J$ = 175°C)

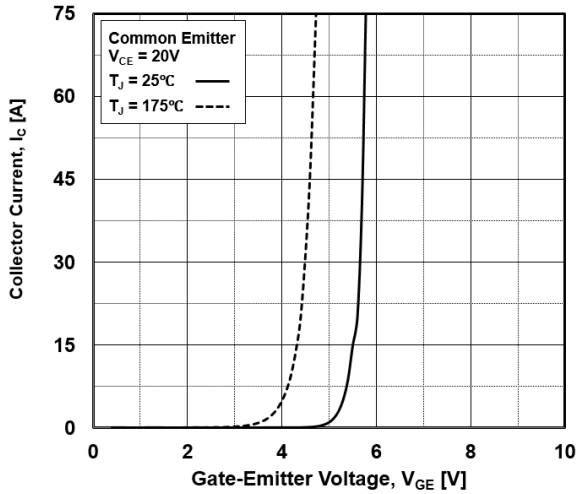



Figure 3. Transfer Characteristics

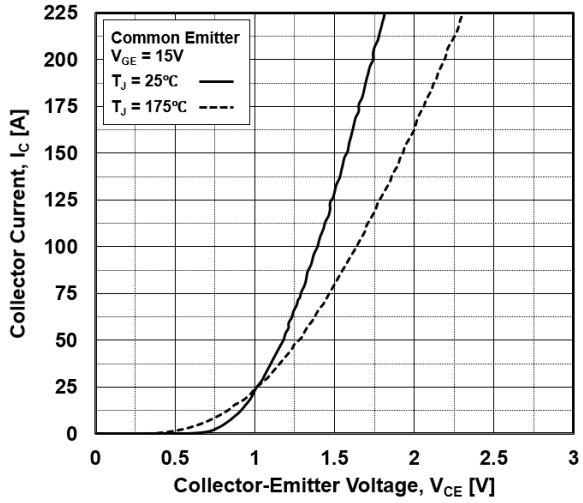



Figure 4. Typical Saturation Voltage Characteristics

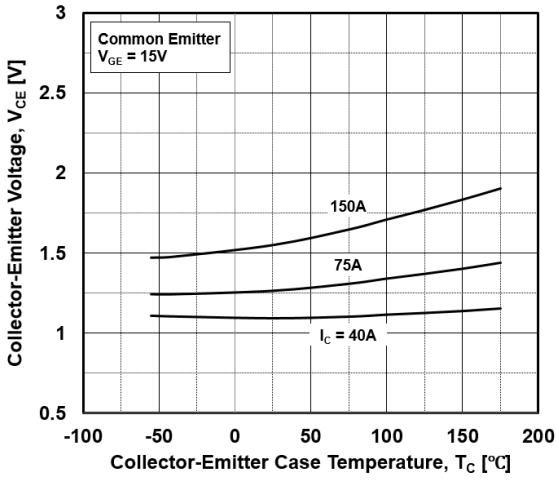



Figure 5. Saturation Voltage vs Case Temperature at Variant Current Level

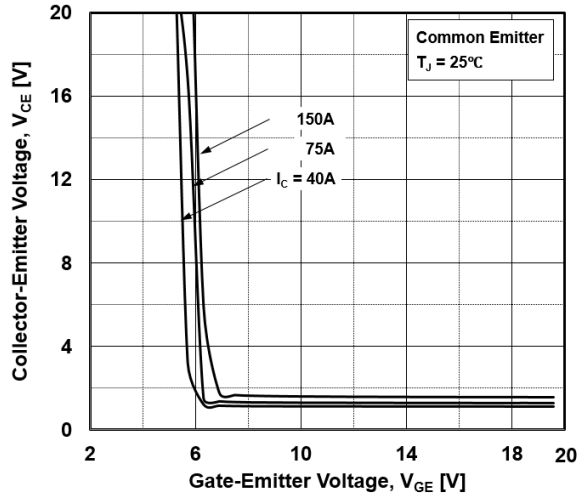



Figure 6. Saturation Voltage vs. $V_{GE}$ ($T_J$ = 25°C)

## TYPICAL CHARACTERISTICS

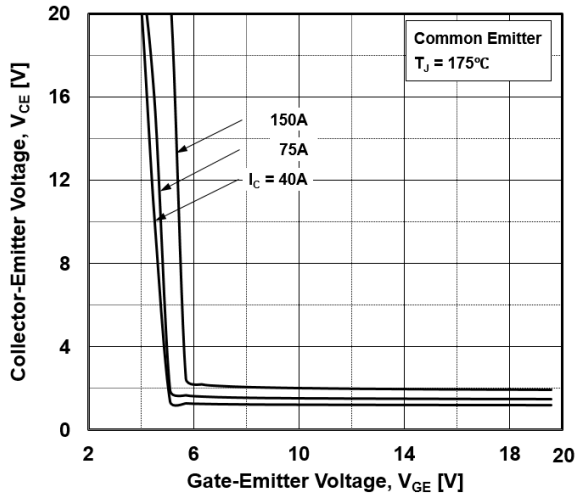



Figure 7. Saturation Voltage vs. $V_{GE}$ ($T_J$ = 175°C)

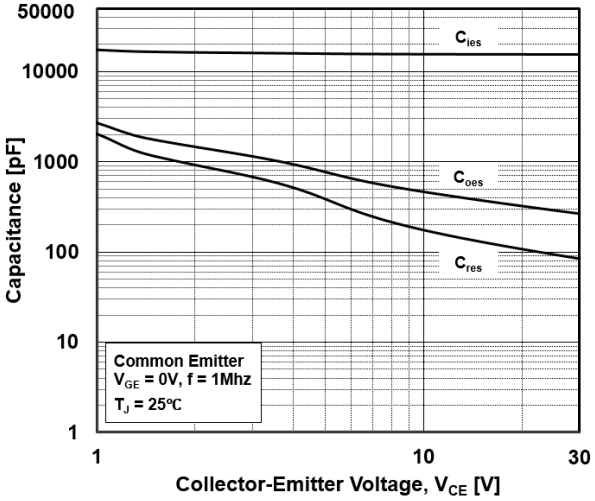



Figure 8. Capacitance Characteristics

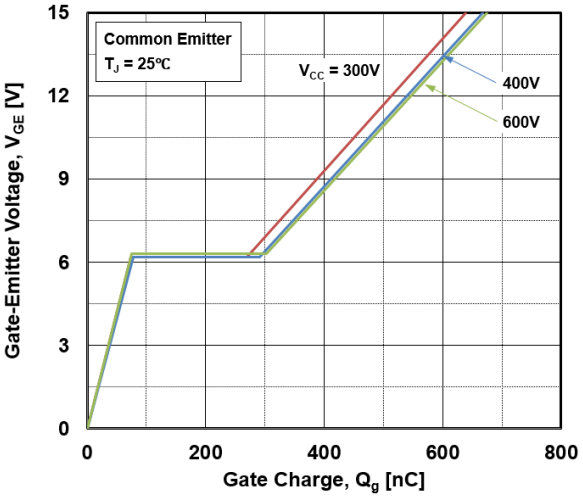



Figure 9. Gate Charge Characteristics ($T_J$ = 25°C)

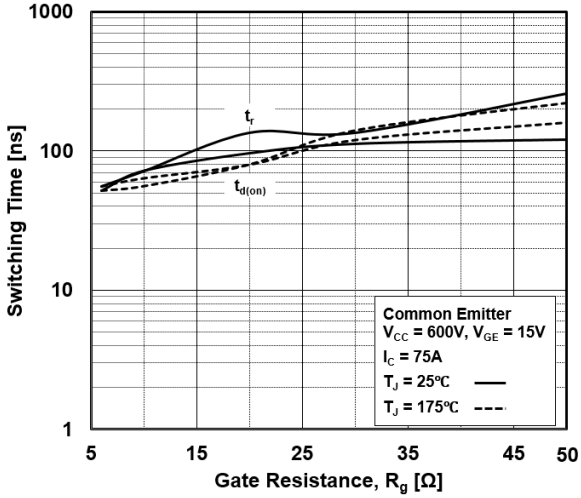



Figure 10. Turn−on Characteristics vs. Gate Resistance

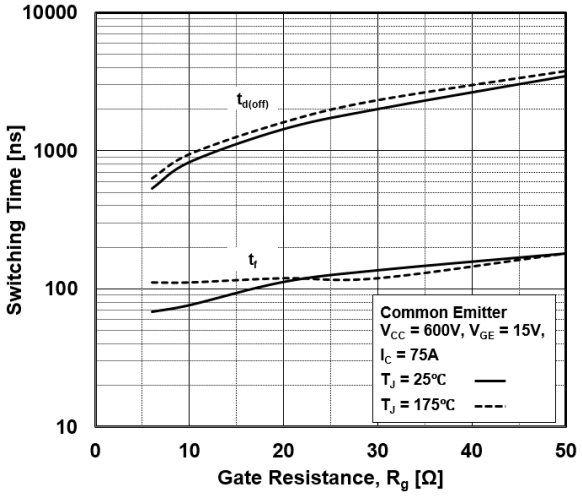



Figure 11. Turn−off Characteristics vs. Gate Resistance

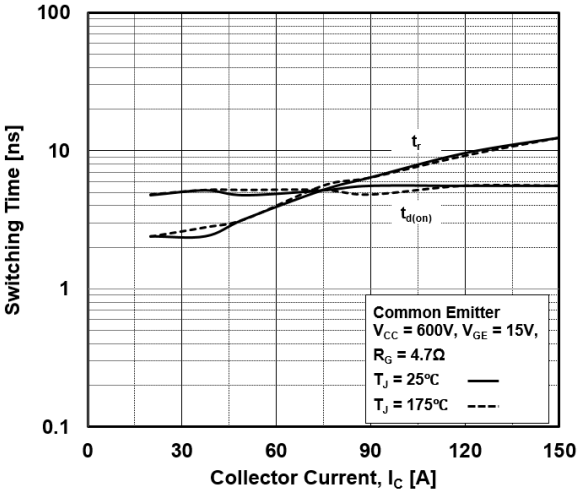



Figure 12. Turn−on Characteristics vs. Collector Current

## TYPICAL CHARACTERISTICS

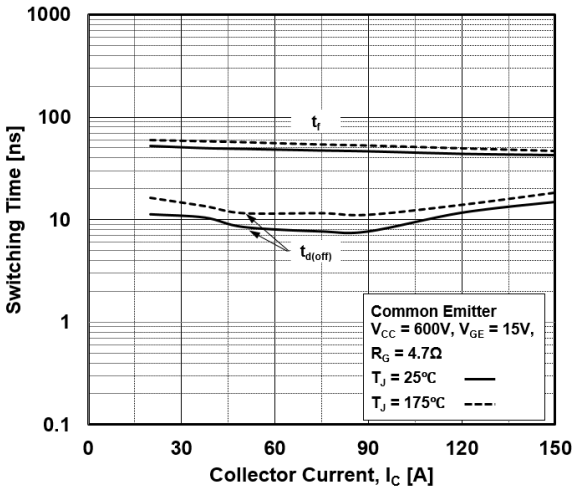



**Figure 13. Turn−off Characteristics vs. Collector Current**

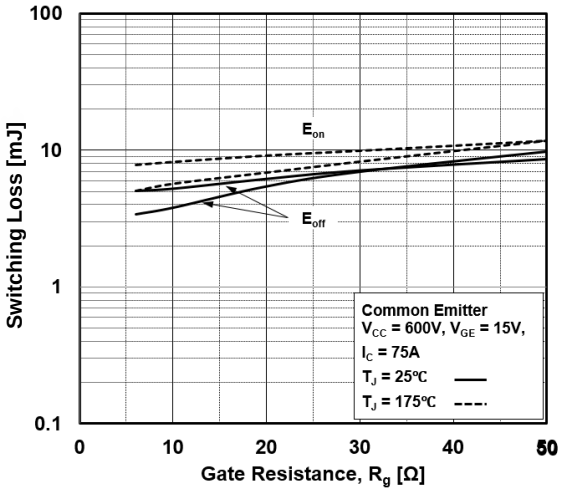



**Figure 14. Switching Loss vs. Gate Resistance**

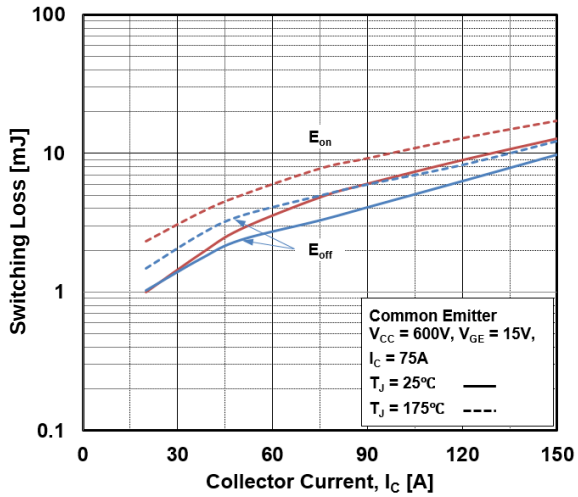



**Figure 15. Switching Loss vs. Collector Current**

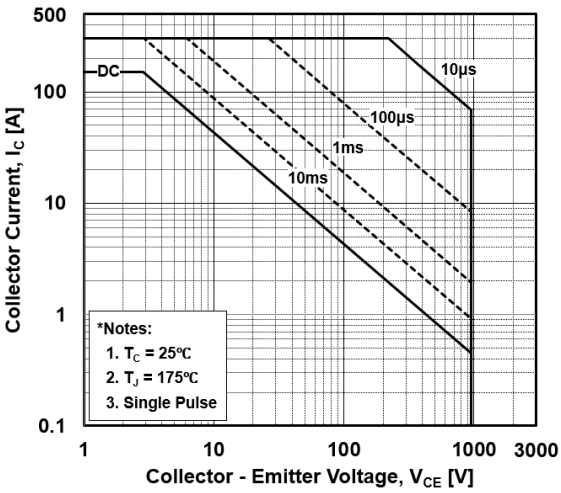



**Figure 16. SOA Characteristics (FBSOA)**

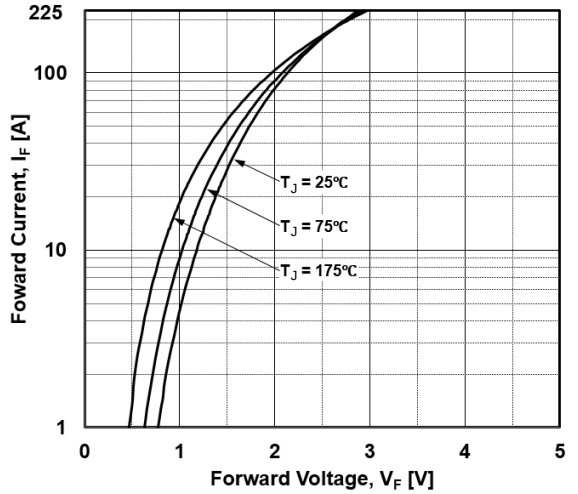



**Figure 17. (Diode) Forward Characteristics vs (Normal I−V)**

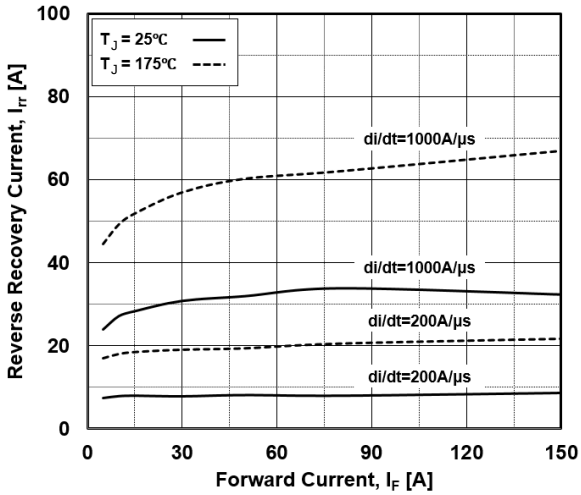



**Figure 18. (Diode) Reverse Recovery Current**

## TYPICAL CHARACTERISTICS

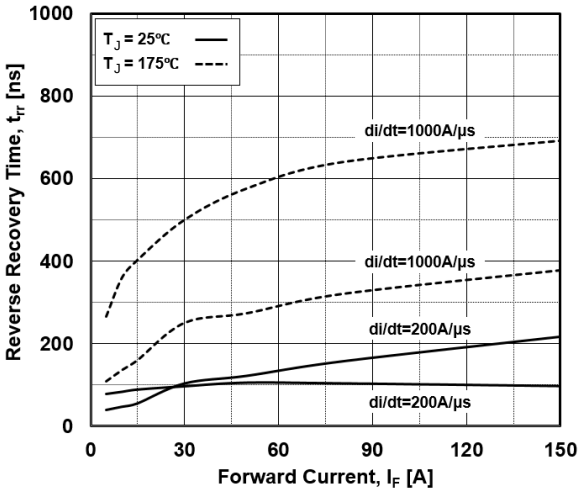



Figure 19. (Diode) Reverse Recovery Time

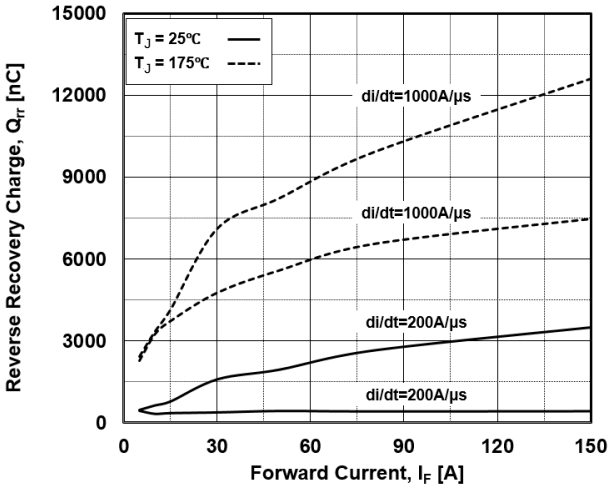



Figure 20. (Diode) Stored Charge

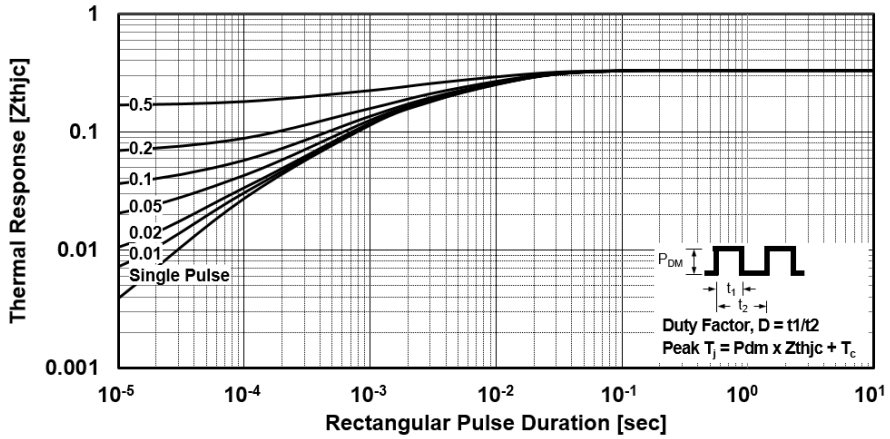



Figure 21. Transient Thermal Impedance of IGBT

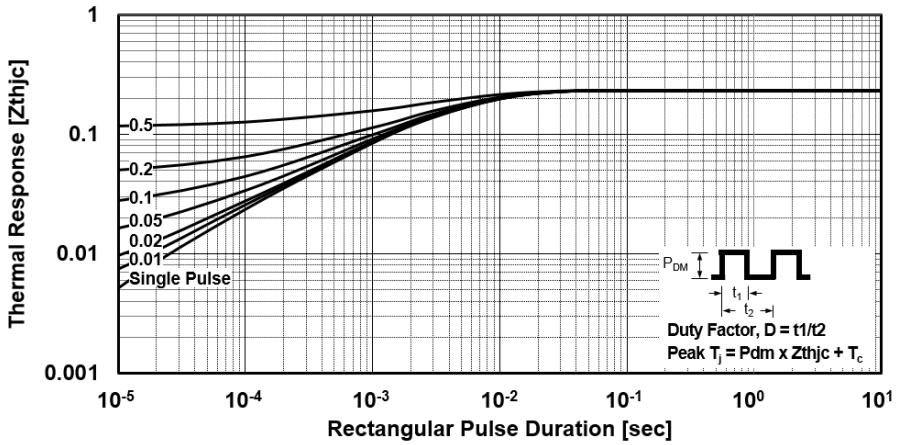
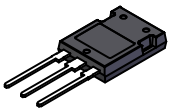



Figure 22. Transient Thermal Impedance of Diode

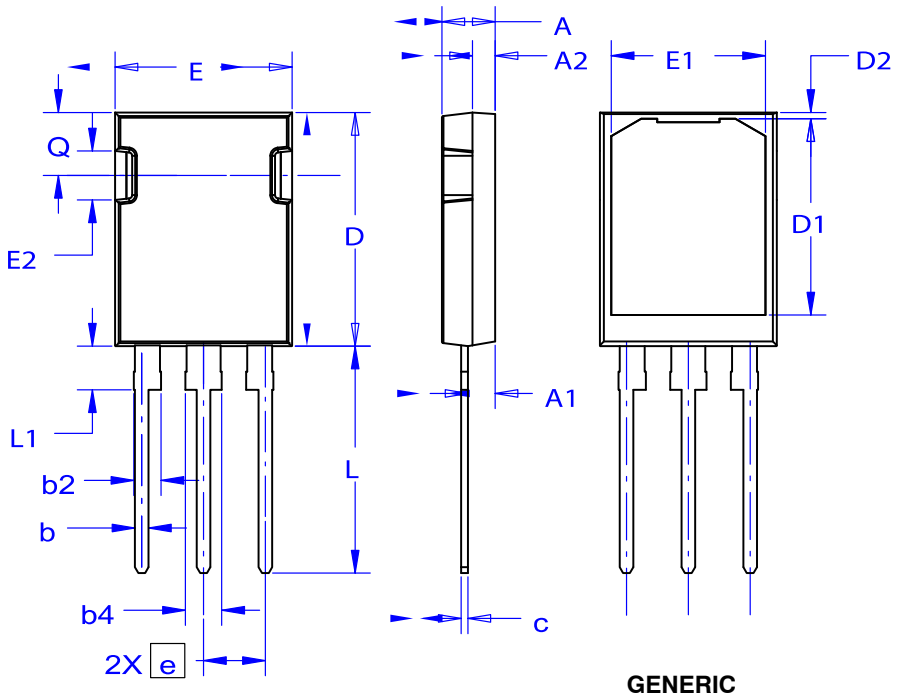


**TO−247−3LD**
CASE 340CD
ISSUE A

DATE 18 SEP 2018

NOTES:

A. THIS PACKAGE DOES NOT CONFORM TO ANY STANDARDS.
B. ALL DIMENSIONS ARE IN MILLIMETERS.
C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR PROTRUSIONS.
D. DIMENSION AND TOLERANCE AS PER ASME Y14.5-2009.




| DIM | MILLIMETERS | | |
|---|---|---|---|
| | MIN | NOM | MAX |
| A | 4.58 | 4.70 | 4.82 |
| A1 | 2.20 | 2.40 | 2.60 |
| A2 | 1.80 | 2.00 | 2.20 |
| D | 20.32 | 20.57 | 20.82 |
| E | 15.37 | 15.62 | 15.87 |
| E2 | 4.12 | 4.32 | 4.52 |
| e | ~ | 5.45 | ~ |
| L | 19.90 | 20.00 | 20.10 |
| L1 | 3.69 | 3.81 | 3.93 |
| Q | 5.34 | 5.46 | 5.58 |
| b | 1.10 | 1.20 | 1.30 |
| b2 | 2.10 | 2.24 | 2.39 |
| b4 | 2.87 | 3.04 | 3.20 |
| c | 0.51 | 0.61 | 0.71 |
| D1 | 16.63 | 16.83 | 17.03 |
| D2 | 0.51 | 0.93 | 1.35 |
| E1 | 13.40 | 13.60 | 13.80 |

**GENERIC MARKING DIAGRAM***


XXXX = Specific Device Code
A = Assembly Location
Y = Year
WW = Work Week
G = Pb−Free Package

*This information is generic. Please refer to device data sheet for actual part marking. Pb−Free indicator, “G” or microdot “▪”, may or may not be present. Some products may not follow the Generic Marking.

| | | |
|---|---|---|
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| **DESCRIPTION:** | **TO−247−3LD** | **PAGE 1 OF 1** |

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