

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 : $T_J = 175^{\circ}\text{C}$
- Positive Temperature Co-efficient for Easy Parallel Operating
- High Current Capability
- Low Saturation Voltage: $V_{CE(Sat)} = 1.31\text{ V (Typ.) @ } I_C = 75\text{ A}$
- 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 Transient Gate to Emitter Voltage | V_{GES} | ± 20 ± 30 | V |
| Collector Current @ $T_C = 25^{\circ}\text{C}$ @ $T_C = 100^{\circ}\text{C}$ | I_C | 150 75 | A |
| Pulsed Collector Current (Note 1) | I_{LM} | 225 | A |
| Pulsed Collector Current (Note 2) | I_{CM} | 225 | A |
| Diode Forward Current @ $T_C = 25^{\circ}\text{C}$ @ $T_C = 100^{\circ}\text{C}$ | I_F | 150 75 | A |
| Pulsed Diode Forward Current (Note 2) | I_{FM} | 225 | A |
| Maximum Power Dissipation @ $T_C = 25^{\circ}\text{C}$ @ $T_C = 100^{\circ}\text{C}$ | PD | 453 226 | W |
| Operating Junction / Storage Temperature Range | T_J, T_{STG} | -55 to +175 | $^{\circ}\text{C}$ |
| Maximum Lead Temp. for Soldering Purposes, 1/8" from case for 5 seconds | T_L | 300 | $^{\circ}\text{C}$ |

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. $V_{CC} = 700\text{ V}$, $V_{GE} = 15\text{ V}$, $I_C = 225\text{ A}$, $R_G = 26\ \Omega$, Inductive Load, 100% Tested
2. Pulse width limited by max Junction temperature. Defined by design. Not subject to production test

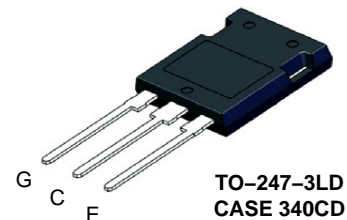
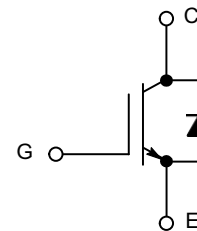
This document contains information on a product under development. ON Semiconductor reserves the right to change or discontinue this product without notice.



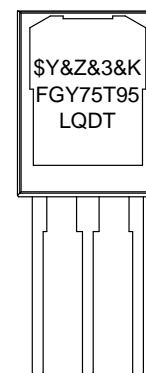
ON Semiconductor®

www.onsemi.com

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



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.

FGY75T95LQDT

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 ($T_J = 25^\circ\text{C}$ unless otherwise noted)

| Parameter | Test Conditions | Symbol | Min | Typ | Max | Unit |
|-----------|-----------------|--------|-----|-----|-----|------|
|-----------|-----------------|--------|-----|-----|-----|------|

OFF CHARACTERISTICS

| | | | | | | |
|---|--|--------------------------------------|-----|------|------|------|
| Collector-emitter breakdown voltage, gate-emitter short-circuited | $V_{GE} = 0\text{ V}, I_C = 1\text{ mA}$ | BV_{CES} | 950 | | | V |
| Temperature Coefficient of Breakdown Voltage | $V_{GE} = 0\text{ V}, I_C = 1\text{ mA}$ | $\frac{\Delta BV_{CES}}{\Delta T_J}$ | | 0.96 | | V/°C |
| Collector-emitter cut-off current, gate-emitter short-circuited | $V_{GE} = 0\text{ V}, V_{CE} = 950\text{ V}$ | I_{CES} | | | 250 | μA |
| Gate leakage current, collector-emitter short-circuited | $V_{GE} = 20\text{ V}, V_{CE} = 0\text{ V}$ | I_{GES} | | | ±400 | nA |

ON CHARACTERISTICS

| | | | | | | |
|--------------------------------------|---|---------------|-----|--------------|------|---|
| Gate-emitter threshold voltage | $V_{GE} = V_{CE}, I_C = 75\text{ mA}$ | $V_{GE(th)}$ | 3.4 | 4.57 | 6.4 | V |
| Collector-emitter saturation voltage | $V_{GE} = 15\text{ V}, I_C = 75\text{ A}$ $V_{GE} = 15\text{ V}, I_C = 75\text{ A}, T_J = 175^\circ\text{C}$ | $V_{CE(sat)}$ | | 1.31 1.52 | 1.69 | V |

DYNAMIC CHARACTERISTICS

| | | | | | | |
|------------------------------|--|-----------|--|-------|--|----|
| Input capacitance | $V_{CE} = 30\text{ V}, V_{GE} = 0\text{ V}, f = 1\text{ MHz}$ | C_{ies} | | 15400 | | pF |
| Output capacitance | | C_{oes} | | 266 | | |
| Reverse transfer capacitance | | C_{res} | | 85.3 | | |
| Gate charge total | $V_{CE} = 600\text{ V}, I_C = 75\text{ V}, V_{GE} = 15\text{ V}$ | Q_g | | 663.3 | | nC |
| Gate to emitter charge | | Q_{ge} | | 76.1 | | |
| Gate to collector charge | | Q_{gc} | | 218.6 | | |

SWITCHING CHARACTERISTICS, INDUCTIVE LOAD

| | | | | | | |
|-------------------------|---|--------------|--|-------|--|----|
| Turn-on delay time | $T_J = 25^\circ\text{C}$ $V_{CC} = 600\text{ V}, I_C = 37.5\text{ A}$ $R_g = 4.7\ \Omega$ $V_{GE} = 15\text{ V}$ Inductive Load | $t_{d(on)}$ | | 52.0 | | ns |
| Rise time | | t_r | | 24.0 | | |
| Turn-off delay time | | $t_{d(off)}$ | | 496.0 | | |
| Fall time | | t_f | | 108.0 | | |
| Turn-on switching loss | | E_{on} | | 2.0 | | mJ |
| Turn-off switching loss | | E_{off} | | 1.8 | | |
| Total switching loss | | E_{ts} | | 3.7 | | |

FGY75T95LQDT

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 V _{CC} = 600 V, I _C = 75 A R _g = 4.7 Ω V _{GE} = 15 V 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 | | E _{on} | | 4.8 | | mJ |
| Turn-off switching loss | | E _{off} | | 3.3 | | |
| Total switching loss | | E _{ts} | | 8.1 | | |
| Turn-on delay time | T _J = 175°C V _{CC} = 600 V, I _C = 37.5 A R _g = 4.7 Ω V _{GE} = 15 V 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 | | E _{on} | | 3.8 | | mJ |
| Turn-off switching loss | | E _{off} | | 2.7 | | |
| Total switching loss | | E _{ts} | | 6.5 | | |
| Turn-on delay time | T _J = 175°C V _{CC} = 600 V, I _C = 75 A R _g = 4.7 Ω V _{GE} = 15 V 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 | | E _{on} | | 7.6 | | mJ |
| Turn-off switching loss | | E _{off} | | 5.1 | | |
| Total switching loss | | E _{ts} | | 12.7 | | |

DIODE CHARACTERISTICS

| | | | | | | |
|-------------------------|--|------------------|--|--------------|------|----|
| Forward voltage | I _F = 75 A I _F = 75 A, T _J = 175°C | V _F | | 2.03 1.76 | 2.51 | V |
| Reverse Recovery Energy | T _J = 25°C V _R = 600 V, I _F = 37.5 A dI _F /dt = 1000 A/μs | E _{rec} | | 314 | | μJ |
| Reverse Recovery Time | | t _{rr} | | 105 | | ns |
| Reverse Recovery Charge | | Q _{rr} | | 1635 | | nC |
| Reverse Recovery Energy | T _J = 25°C V _R = 600 V, I _F = 75 A dI _F /dt = 1000 A/μs | E _{rec} | | 2390 | | μJ |
| Reverse Recovery Time | | t _{rr} | | 259 | | ns |
| Reverse Recovery Charge | | Q _{rr} | | 7515 | | nC |
| Reverse Recovery Energy | T _J = 175°C V _R = 600 V, I _F = 37.5 A dI _F /dt = 1000 A/μs | E _{rec} | | 454 | | μJ |
| Reverse Recovery Time | | t _{rr} | | 148 | | ns |
| Reverse Recovery Charge | | Q _{rr} | | 2436 | | nC |

FGY75T95LQDT

ELECTRICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$ unless otherwise noted)

| Parameter | Test Conditions | Symbol | Min | Typ | Max | Unit |
|-------------------------|--|-----------|-----|------|-----|---------------|
| Reverse Recovery Energy | $T_J = 175^\circ\text{C}$ $V_R = 600\text{ V}$, $I_F = 75\text{ A}$ $dI_F/dt = 1000\text{ A}/\mu\text{s}$ | E_{rec} | | 2790 | | μJ |
| 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.

FGY75T95LQDT

TYPICAL CHARACTERISTICS

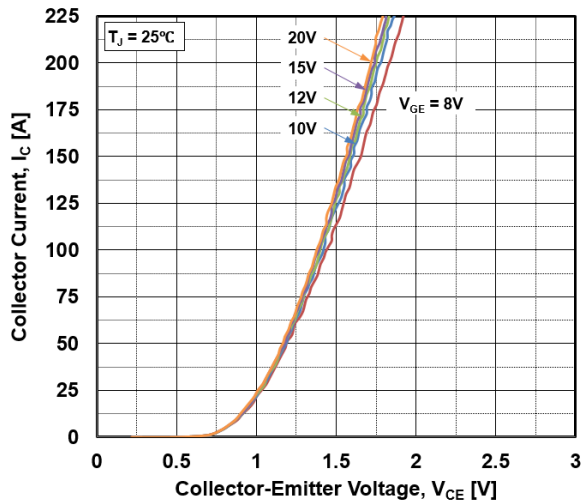


Figure 1. Typical Output Characteristics ($T_J = 25^\circ\text{C}$)

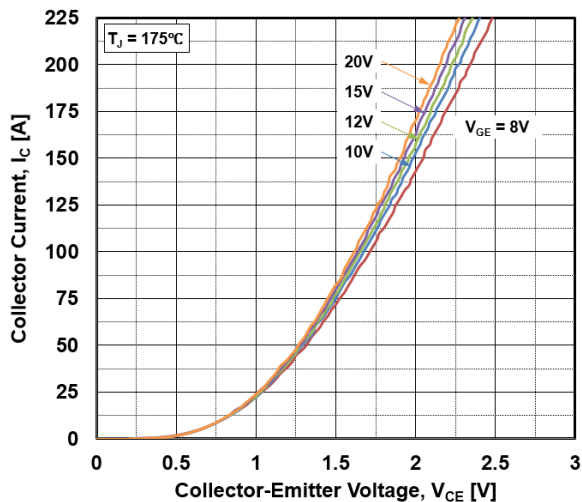


Figure 2. Typical Output Characteristics ($T_J = 175^\circ\text{C}$)

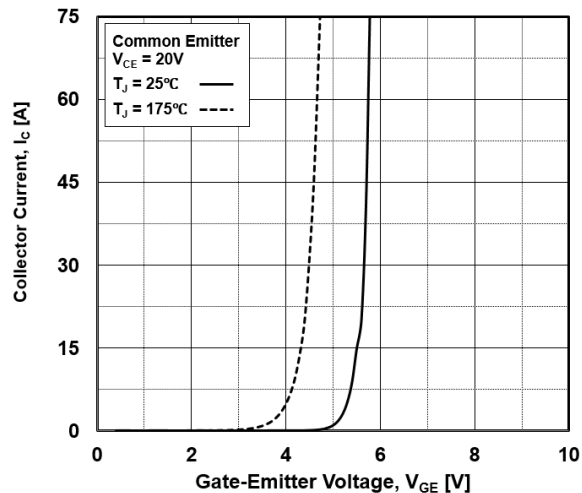


Figure 3. Transfer Characteristics

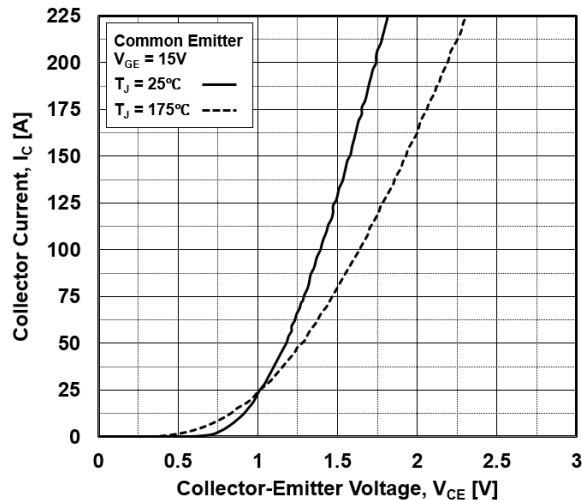


Figure 4. Typical Saturation Voltage Characteristics

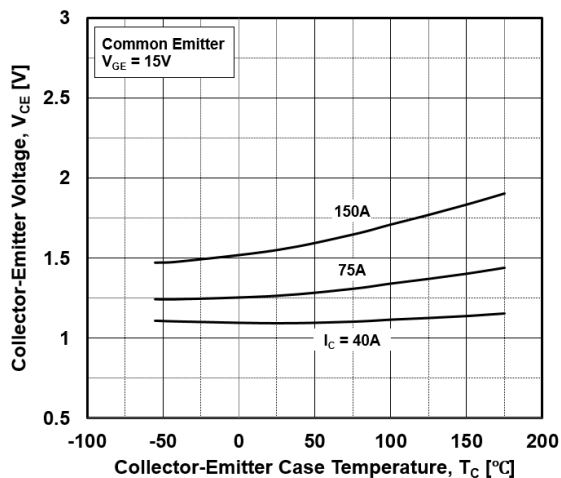


Figure 5. Saturation Voltage vs Case Temperature at Variant Current Level

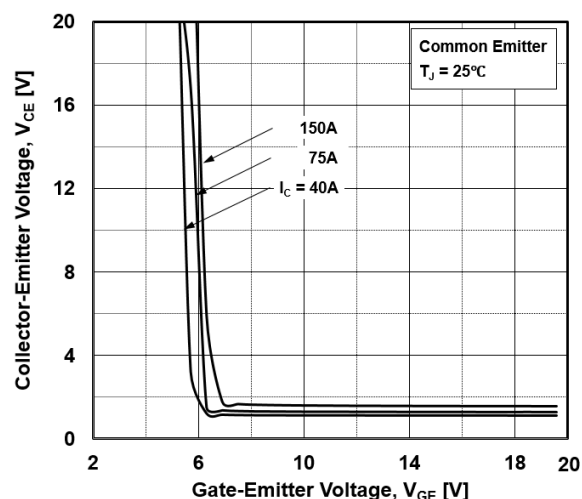


Figure 6. Saturation Voltage vs. V_{GE} ($T_J = 25^\circ\text{C}$)

TYPICAL CHARACTERISTICS

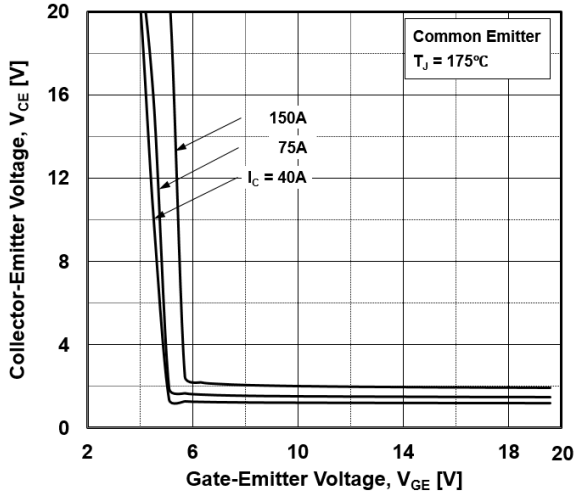


Figure 7. Saturation Voltage vs. V_{GE} ($T_J = 175^\circ\text{C}$)

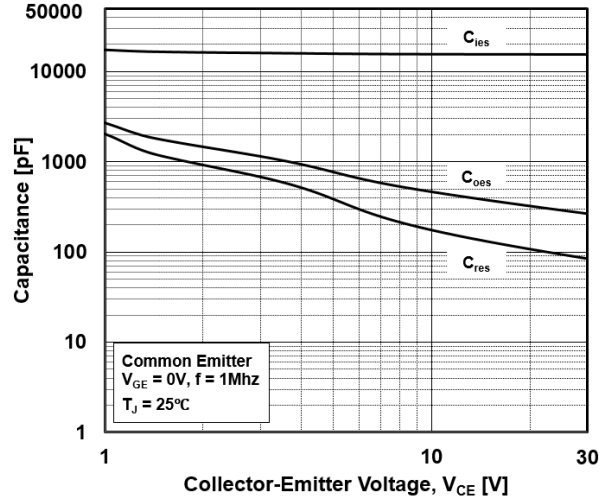


Figure 8. Capacitance Characteristics

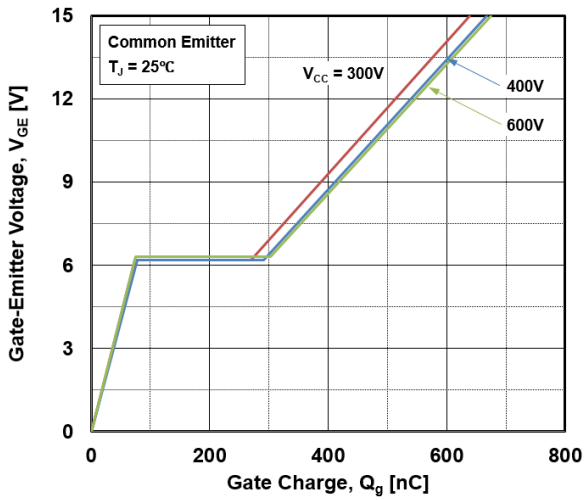


Figure 9. Gate Charge Characteristics ($T_J = 25^\circ\text{C}$)

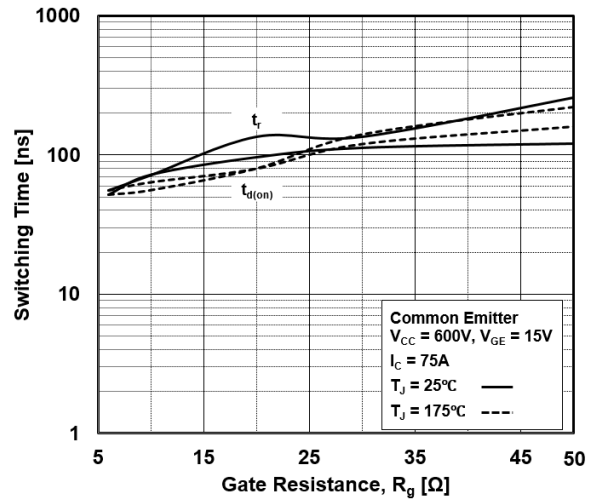


Figure 10. Turn-on Characteristics vs. Gate Resistance

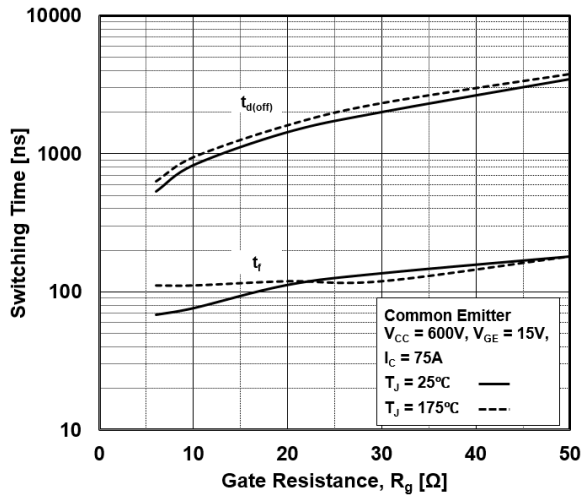


Figure 11. Turn-off Characteristics vs. Gate Resistance

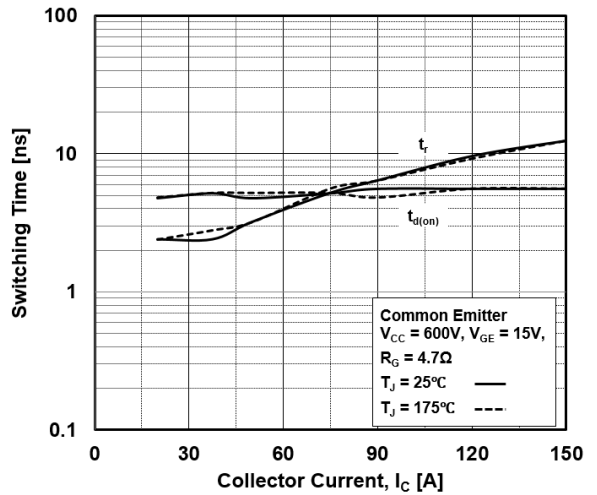


Figure 12. Turn-on Characteristics vs. Collector Current

FGY75T95LQDT

TYPICAL CHARACTERISTICS

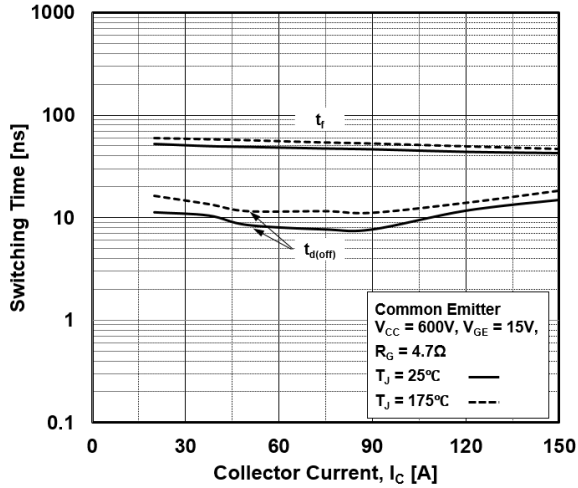


Figure 13. Turn-off Characteristics vs. Collector Current

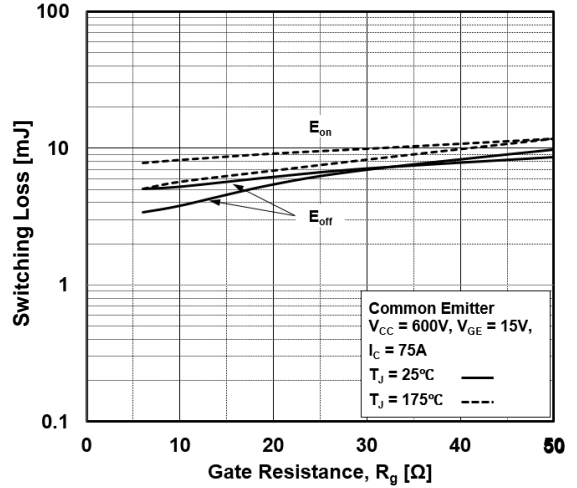


Figure 14. Switching Loss vs. Gate Resistance

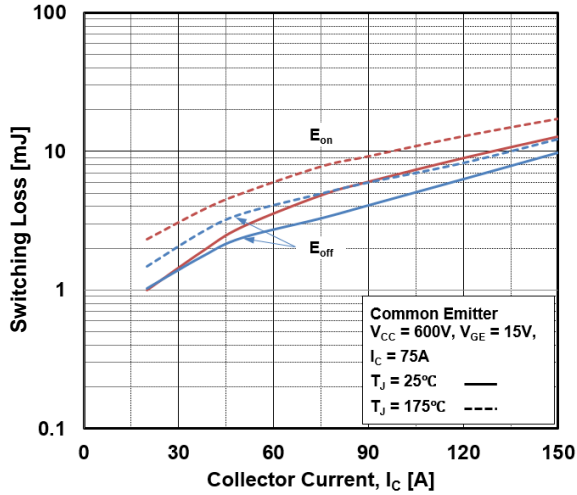


Figure 15. Switching Loss vs. Collector Current

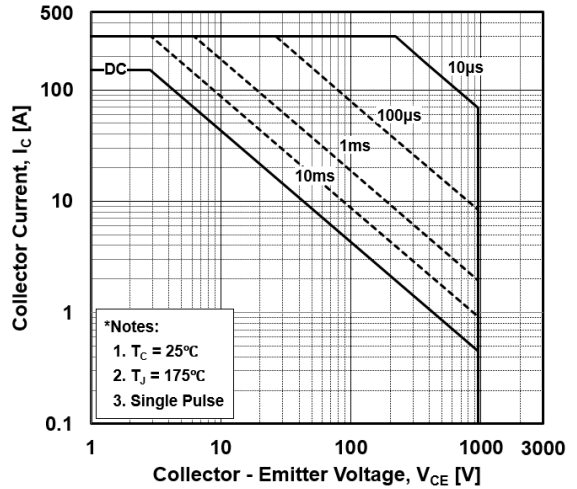


Figure 16. SOA Characteristics (FBSOA)

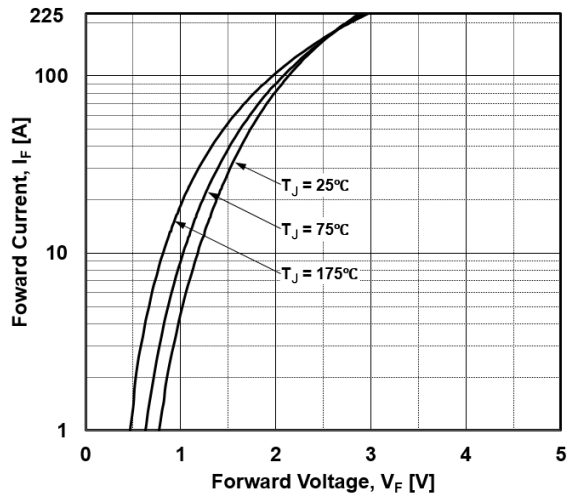


Figure 17. (Diode) Forward Characteristics vs (Normal I-V)

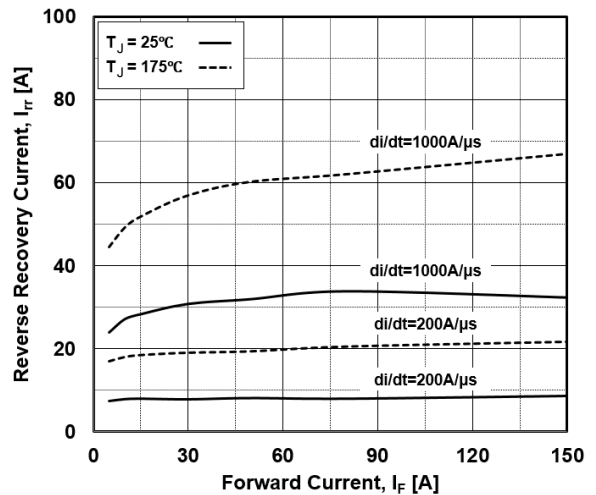


Figure 18. (Diode) Reverse Recovery Current

FGY75T95LQDT

TYPICAL CHARACTERISTICS

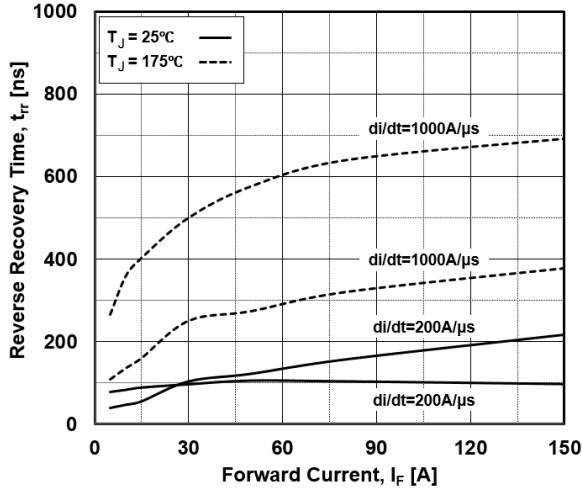


Figure 19. (Diode) Reverse Recovery Time

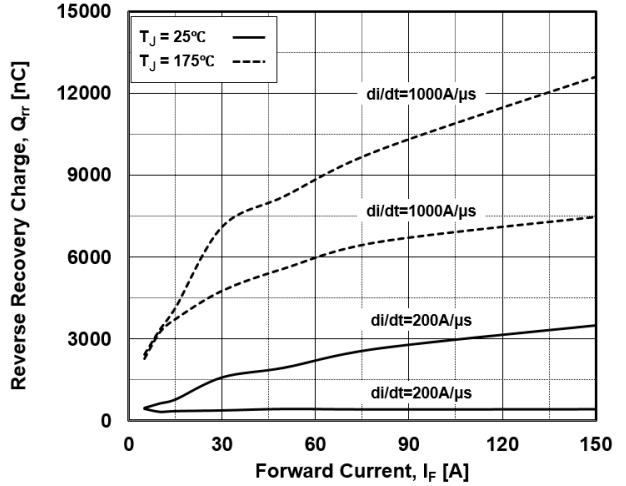


Figure 20. (Diode) Stored Charge

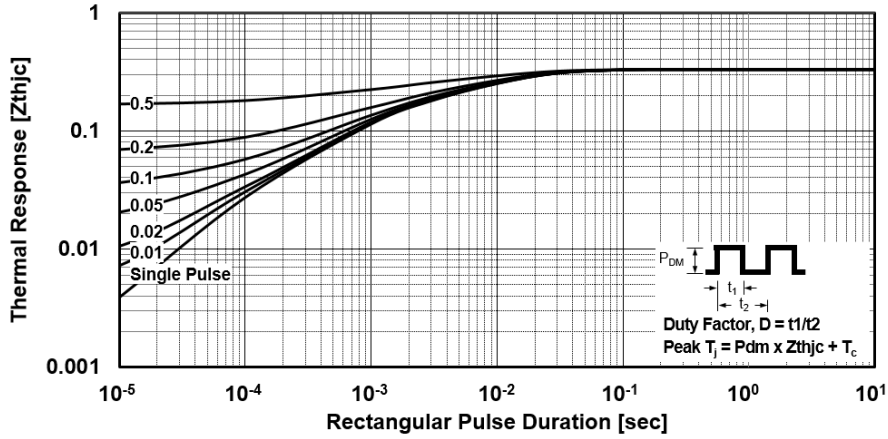


Figure 21. Transient Thermal Impedance of IGBT

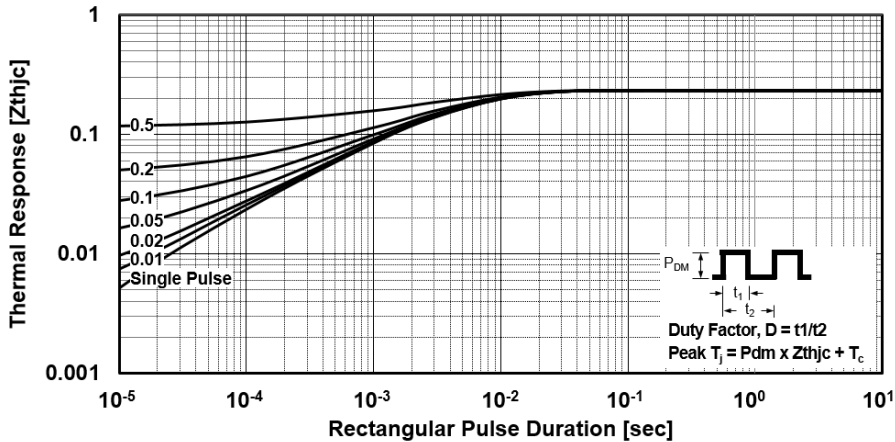
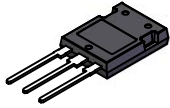


Figure 22. Transient Thermal Impedance of Diode

MECHANICAL CASE OUTLINE

PACKAGE DIMENSIONS

ON Semiconductor®

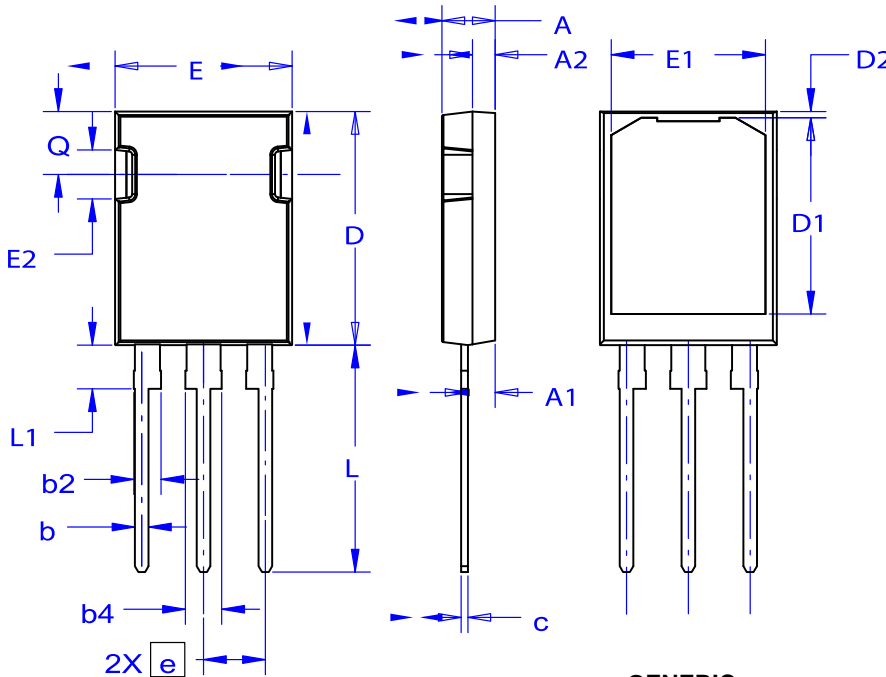


TO-247-3LD
CASE 340CD
ISSUE A

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.

| | | |
|-------------------------|--------------------|--|
| DOCUMENT NUMBER: | 98AON13857G | Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red. |
| DESCRIPTION: | TO-247-3LD | PAGE 1 OF 1 |

ON Semiconductor and are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. ON Semiconductor does not convey any license under its patent rights nor the rights of others.

onsemi, **Onsemi**, and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "**onsemi**" or its affiliates and/or subsidiaries in the United States and/or other countries. **onsemi** owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of **onsemi**'s product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. **onsemi** reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as-is" and **onsemi** makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does **onsemi** assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using **onsemi** products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by **onsemi**. "Typical" parameters which may be provided in **onsemi** data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. **onsemi** does not convey any license under any of its intellectual property rights nor the rights of others. **onsemi** products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use **onsemi** products for any such unintended or unauthorized application, Buyer shall indemnify and hold **onsemi** and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that **onsemi** was negligent regarding the design or manufacture of the part. **onsemi** is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

ADDITIONAL INFORMATION

TECHNICAL PUBLICATIONS:

Technical Library: www.onsemi.com/design/resources/technical-documentation
onsemi Website: www.onsemi.com

ONLINE SUPPORT: www.onsemi.com/support

For additional information, please contact your local Sales Representative at www.onsemi.com/support/sales