# IGBT - PT

## 600 V, 30 A

# FGH30N60LSD

### Description

Using ON Semiconductor's advanced PT technology, the FGA30N60LSD IGBT offers superior conduction performances, which offer the optimum performance for medium switching application such as solar inverter, UPS applications where low conduction losses are the most important factor.

### Features

- Low Saturation Voltage: $V_{CE(sat)}$ =1.1 V @ $I_C$ = 30 A
- High Input Impedance
- Low Conduction Loss
- This Device is Pb−Free and is RoHS Compliant

### Applications

- Solar Inverter, UPS

**ON Semiconductor®**

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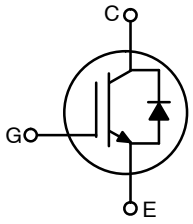
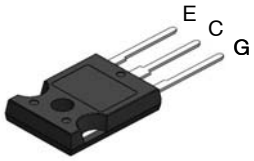
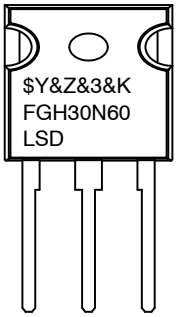



**TO−247−3LD**
**CASE 340CK**

### MARKING DIAGRAM




| | |
|---|---|
| $Y | = ON Semiconductor Logo |
| &Z | = Assembly Plant Code |
| &3 | = Numeric Date Code |
| &K | = Lot Code |
| FGH30N60LSD | = Specific Device Code |

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 2 of this data sheet.

## ABSOLUTE MAXIMUM RATINGS ($T_C$ = 25°C unless otherwise noted)

| Description | | Symbol | Rating | Unit |
|---|---|---|---|---|
| Collector to Emitter Voltage | | $V_{CES}$ | 600 | V |
| Gate to Emitter Voltage | | $V_{GES}$ | ±20 | V |
| Collector Current | $T_C$ = 25°C | $I_C$ | 60 | A |
| Collector Current | $T_C$ = 100°C | | 30 | A |
| Pulsed Collector Current | | $I_{CM}$ (Note 1) | 90 | A |
| Non−repetitive Peak Surge Current 60 Hz Single Half−Sine Wave | | $I_{FSM}$ | 150 | A |
| Maximum Power Dissipation | $T_C$ = 25°C | $P_D$ | 480 | W |
| Maximum Power Dissipation | $T_C$ = 100°C | | 192 | W |
| Operating Junction Temperature | | $T_J$ | −55 to +150 | °C |
| Storage Temperature Range | | $T_{stg}$ | −55 to +150 | °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. Repetitive Rating: Pulse width limited by max. junction temperature.

## THERMAL CHARACTERISTICS

| Parameter | Symbol | Typ | Max | Unit |
|---|---|---|---|---|
| Thermal Resistance, Junction to Case | $R_{\theta JC}$(IGBT) | – | 0.26 | °C/W |
| Thermal Resistance, Junction to Case | $R_{\theta JC}$(Diode) | – | 0.92 | °C/W |
| Thermal Resistance, Junction to Ambient | $R_{\theta JA}$ | – | 40 | °C/W |

## PACKAGE MARKING AND ORDERING INFORMATION

| Part Number | Top Mark | Package | Packing Method | Reel Size | Tape Width | Quantity |
|---|---|---|---|---|---|---|
| FGH30N60LSDTU | FGH30N60LSD | TO−247 | Tube | N/A | N/A | 30 |

## ELECTRICAL CHARACTERISTICS OF THE IGBT ($T_C$ = 25°C unless otherwise noted)

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | |
| Collector to Emitter Breakdown Voltage | $BV_{CES}$ | $V_{GE}$ = 0 V, $I_C$ = 250 μA | 600 | – | – | V |
| Temperature Coefficient of Breakdown Voltage | $\Delta BV_{CES}/\Delta T_J$ | $V_{GE}$ = 0 V, $I_C$ = 250 μA | – | 0.6 | – | V/°C |
| Collector Cut−Off Current | $I_{CES}$ | $V_{CE}$ = $V_{CES}$, $V_{GE}$ = 0 V | – | – | 250 | μA |
| G−E Leakage Current | $I_{GES}$ | $V_{GE}$ = $V_{GES}$, $V_{CE}$ = 0 V | – | – | ±250 | nA |
| **ON CHARACTERISTICs** | | | | | | |
| G−E Threshold Voltage | $V_{GE(th)}$ | $I_C$ = 250 μA, $V_{CE}$ = $V_{GE}$ | 4.0 | 5.5 | 7.0 | V |
| Collector to Emitter Saturation Voltage | $V_{CE(sat)}$ | $I_C$ = 30 A, $V_{GE}$ = 15 V | – | 1.1 | 1.4 | V |
| | | $I_C$ = 30 A, $V_{GE}$ = 15 V, $T_C$ = 125°C | – | 1.0 | – | V |
| | | $I_C$ = 60 A, $V_{GE}$ = 15 V | – | 1.3 | – | V |

**ELECTRICAL CHARACTERISTICS OF THE IGBT** ($T_C$ = 25°C unless otherwise noted) (continued)

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **DYNAMIC CHARACTERISTICS** | | | | | | |
| Input Capacitance | $C_{ies}$ | $V_{CE}$ = 30 V, $V_{GE}$ = 0 V, f = 1 MHz | – | 3550 | – | pF |
| Output Capacitance | $C_{oes}$ | | – | 245 | – | pF |
| Reverse Transfer Capacitance | $C_{res}$ | | – | 90 | – | pF |
| **SWITCHING CHARACTERISTICS** | | | | | | |
| Turn−On Delay Time | $t_{d(on)}$ | $V_{CC}$ = 400 V, $I_C$ = 30 A, $R_G$ = 6.8 Ω, $V_{GE}$ = 15 V, Inductive Load, $T_C$ = 25°C | – | 18 | – | ns |
| Rise Time | $t_r$ | | – | 46 | – | ns |
| Turn−Off Delay Time | $t_{d(off)}$ | | – | 250 | – | ns |
| Fall Time | $t_f$ | | – | 1.3 | 2.0 | μs |
| Turn−On Switching Loss | $E_{on}$ | | – | 1.1 | – | mJ |
| Turn−Off Switching Loss | $E_{off}$ | | – | 21 | – | mJ |
| Turn−On Delay Time | $t_{d(on)}$ | $V_{CC}$ = 400 V, $I_C$ = 30 A, $R_G$ = 6.8 Ω, $V_{GE}$ = 15 V, Inductive Load, $T_C$ = 125°C | – | 17 | – | ns |
| Rise Time | $t_r$ | | – | 45 | – | ns |
| Turn−Off Delay Time | $t_{d(off)}$ | | – | 270 | – | ns |
| Fall Time | $t_f$ | | – | 2.6 | – | μs |
| Turn−On Switching Loss | $E_{on}$ | | – | 1.1 | – | mJ |
| Turn−Off Switching Loss | $E_{off}$ | | – | 36 | – | mJ |
| Total Gate Charge | $Q_g$ | $V_{CE}$ = 600 V, $I_C$ = 30 A, $V_{GE}$ = 15 V | – | 225 | – | nC |
| Gate to Emitter Charge | $Q_{ge}$ | | – | 30 | – | nC |
| Gate to Collector Charge | $Q_{gc}$ | | – | 105 | – | nC |
| Internal Emitter Inductance | $L_e$ | Measured 5 mm from PKG | – | 7 | – | nH |

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

| Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $V_{FM}$ | $I_F$ = 15 A | $T_C$ = 25°C | – | 1.8 | 2.2 | V |
| | $I_F$ = 15 A | $T_C$ = 125°C | – | 1.6 | – | |
| $I_{RM}$ | $V_R$ = 600 V | $T_C$ = 25°C | – | – | 100 | μA |
| $t_{rr}$ | $I_F$ = 1 A, $di_F$ / dt = 100 A/μs, $V_R$ = 30 V | $T_C$ = 25°C | – | – | 35 | ns |
| | $I_F$ = 15 A, $di_F$ / dt = 100 A/μs, $V_R$ = 390 V | $T_C$ = 25°C | – | – | 40 | |
| $t_a$ | $I_F$ = 15 A, $di_F$ / dt = 100 A/μs, $V_R$ = 390 V | $T_C$ = 25°C | – | 18 | – | ns |
| $t_b$ | | $T_C$ = 25°C | – | 13 | – | |
| $Q_{rr}$ | | $T_C$ = 25°C | – | 27.5 | – | 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 PERFORMANCE CHARACTERISTICS

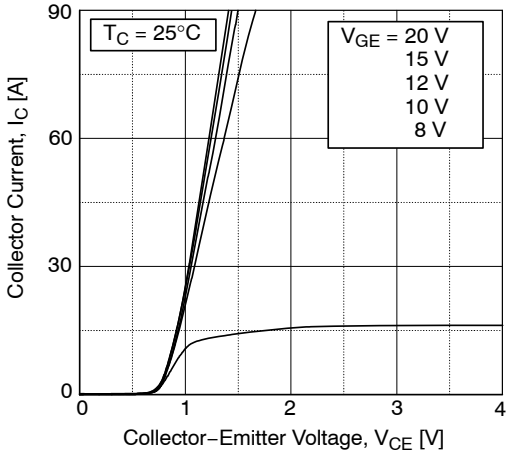



**Figure 1. Typical Output Characteristics**

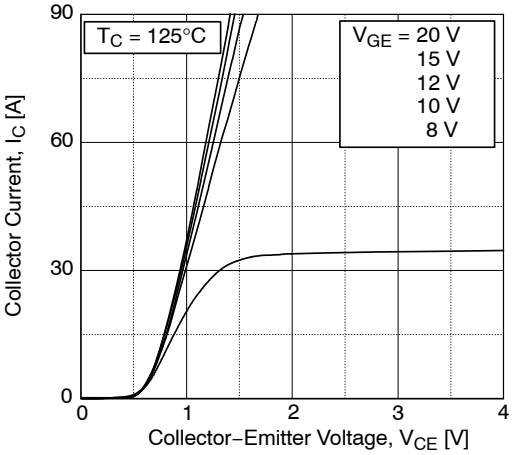



**Figure 2. Typical Saturation Voltage Characteristics**

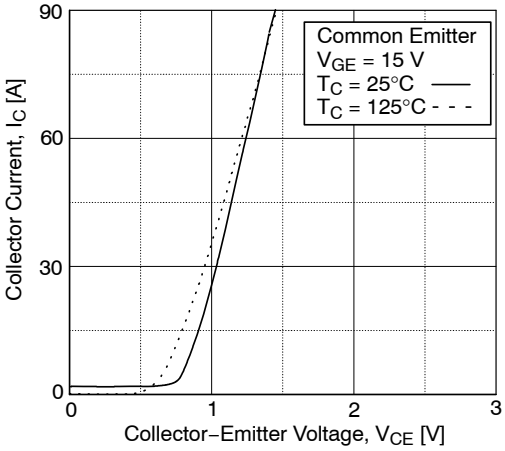



**Figure 3. Typical Saturation Voltage Characteristics**

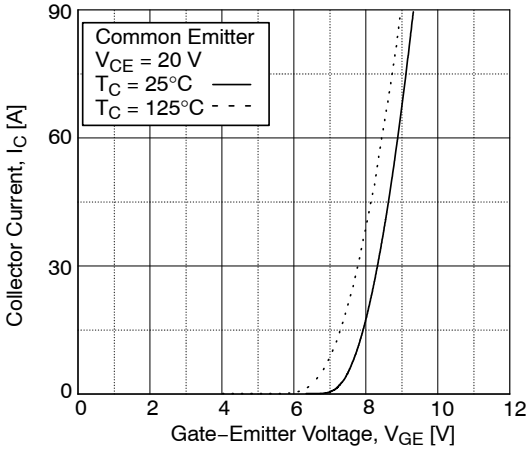



**Figure 4. Transfer Characteristics**

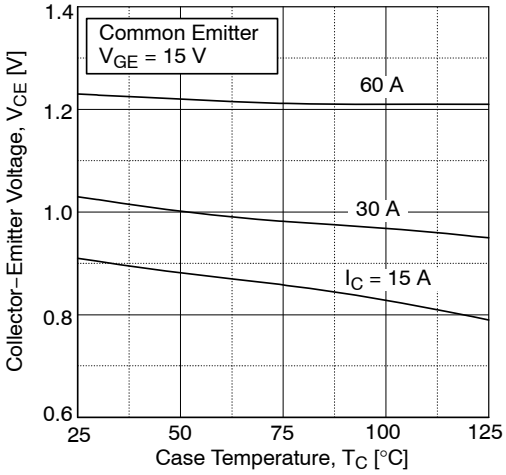



**Figure 5. Saturation Voltage vs. Case Temperature at Variant Current Level**

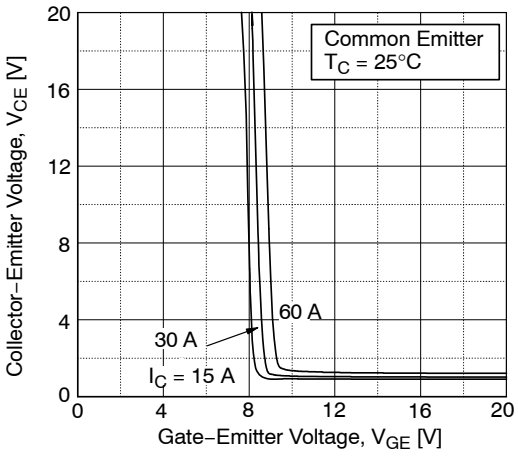



**Figure 6. Saturation Voltage vs $V_{GE}$**

## TYPICAL PERFORMANCE CHARACTERISTICS (continued)

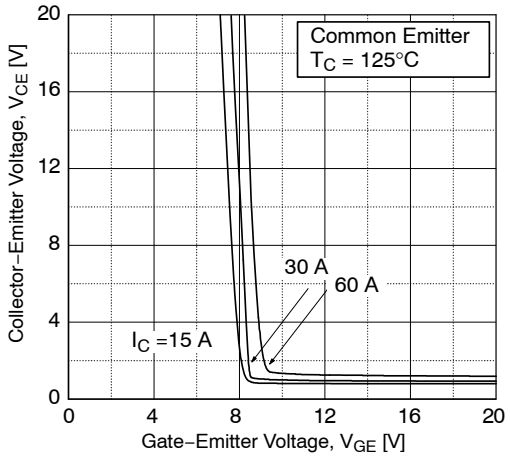



**Figure 7. Saturation Voltage vs. $V_{GE}$**

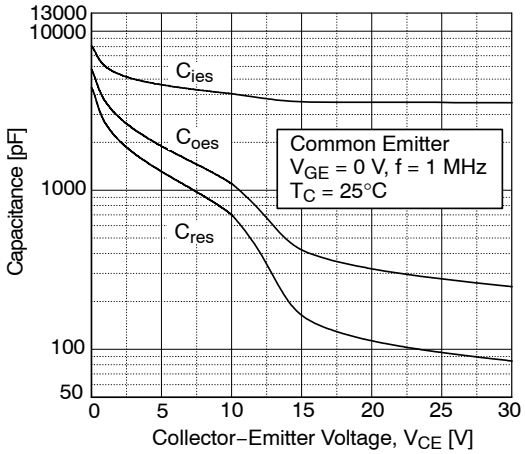



**Figure 8. Capacitance Characteristic**

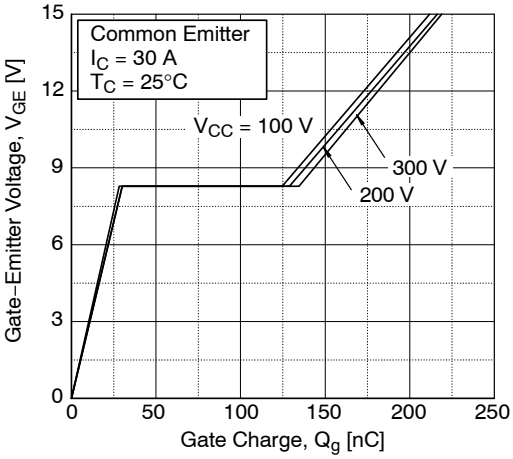



**Figure 9. Gate Charge Characteristics**

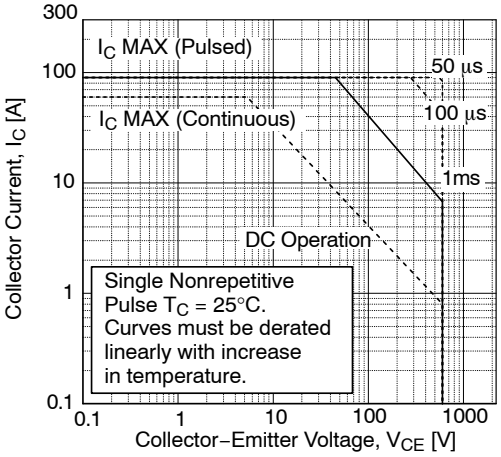



**Figure 10. SOA Characteristics**

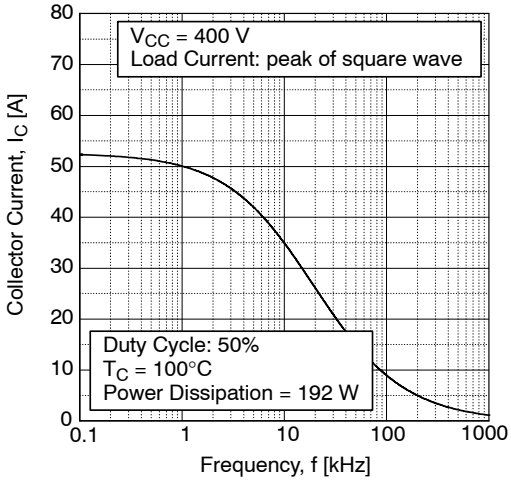



**Figure 11. Load Current vs. Frequency**

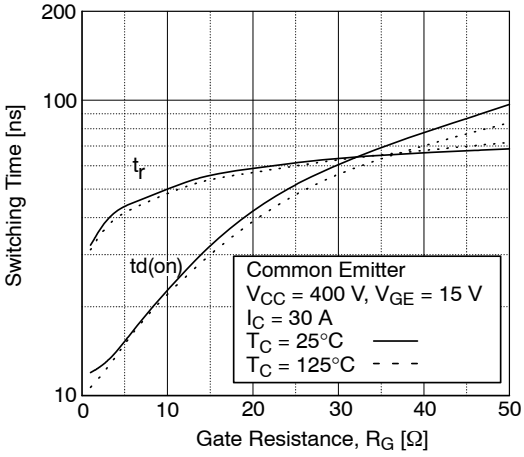



**Figure 12. Turn−On Characteristics vs. Gate Resistance**

## TYPICAL PERFORMANCE CHARACTERISTICS (continued)

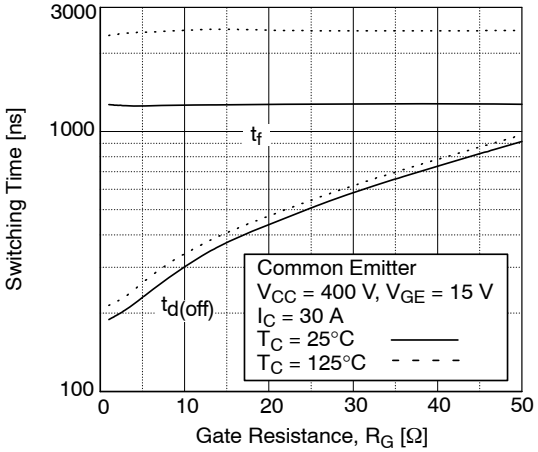



**Figure 13. Turn−Off Characteristics vs. Gate Resistance**

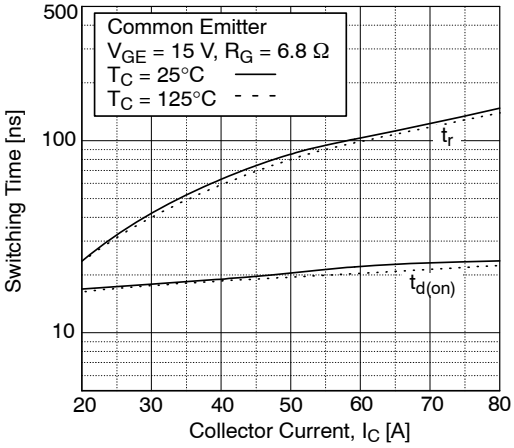



**Figure 14. Turn−On Characteristics vs. Collector Current**

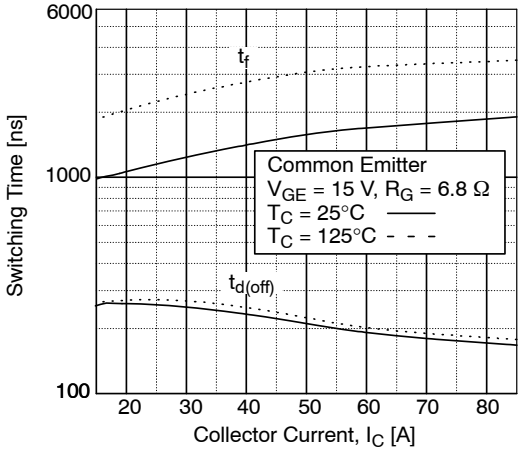



**Figure 15. Turn−Off Characteristics vs. Collector Current**

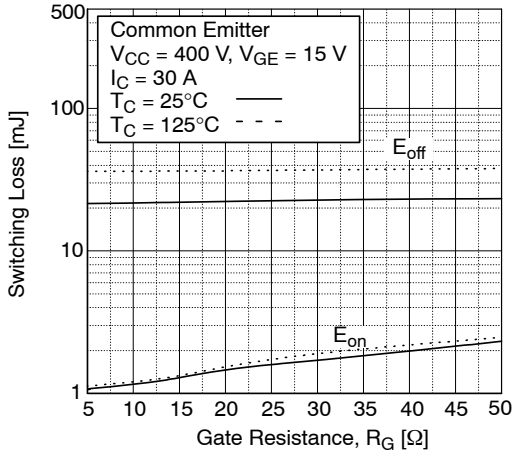



**Figure 16. Switching Loss vs. Gate Resistance**

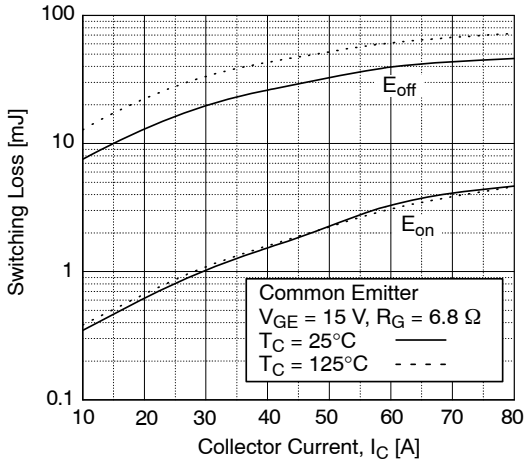



**Figure 17. Switching Loss vs. Collector Current**

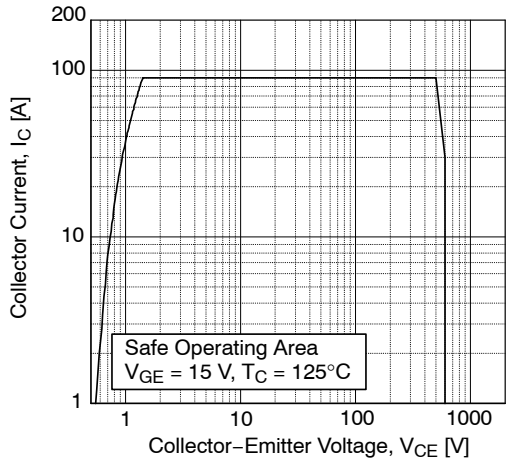



**Figure 18. Turn−Off Switching SOA Characteristics**

## TYPICAL PERFORMANCE CHARACTERISTICS (continued)

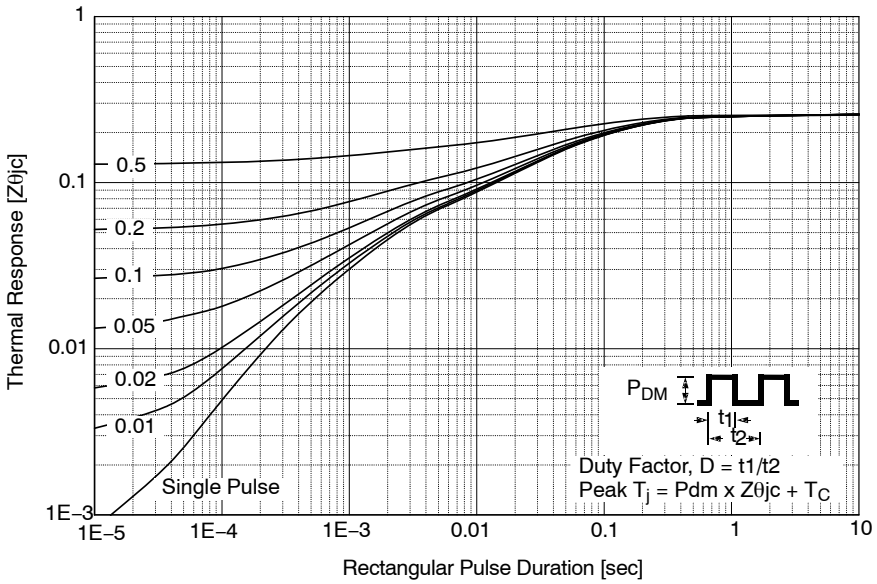



**Figure 19. Transient Thermal Impedance of IGBT**

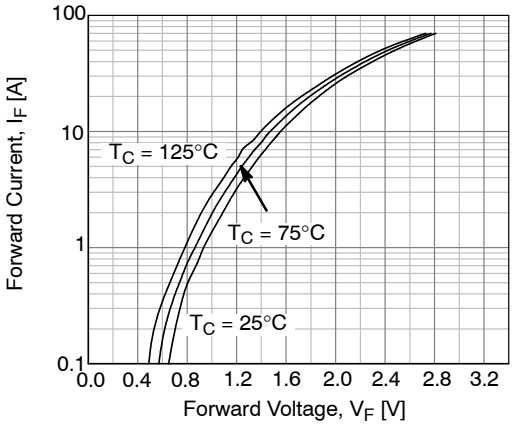



**Figure 20. Forward Characteristics**

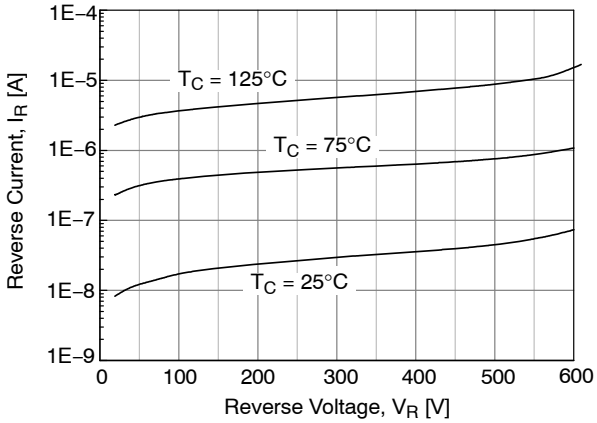



**Figure 21. Reverse Current**

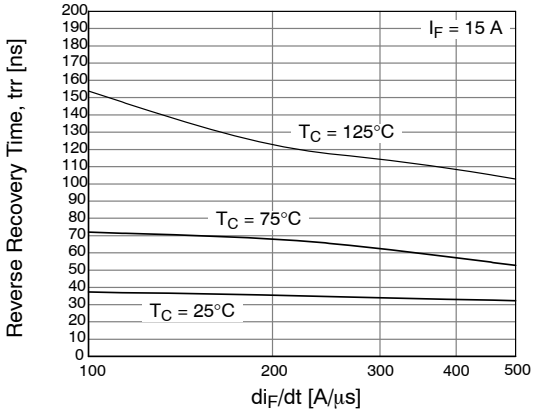


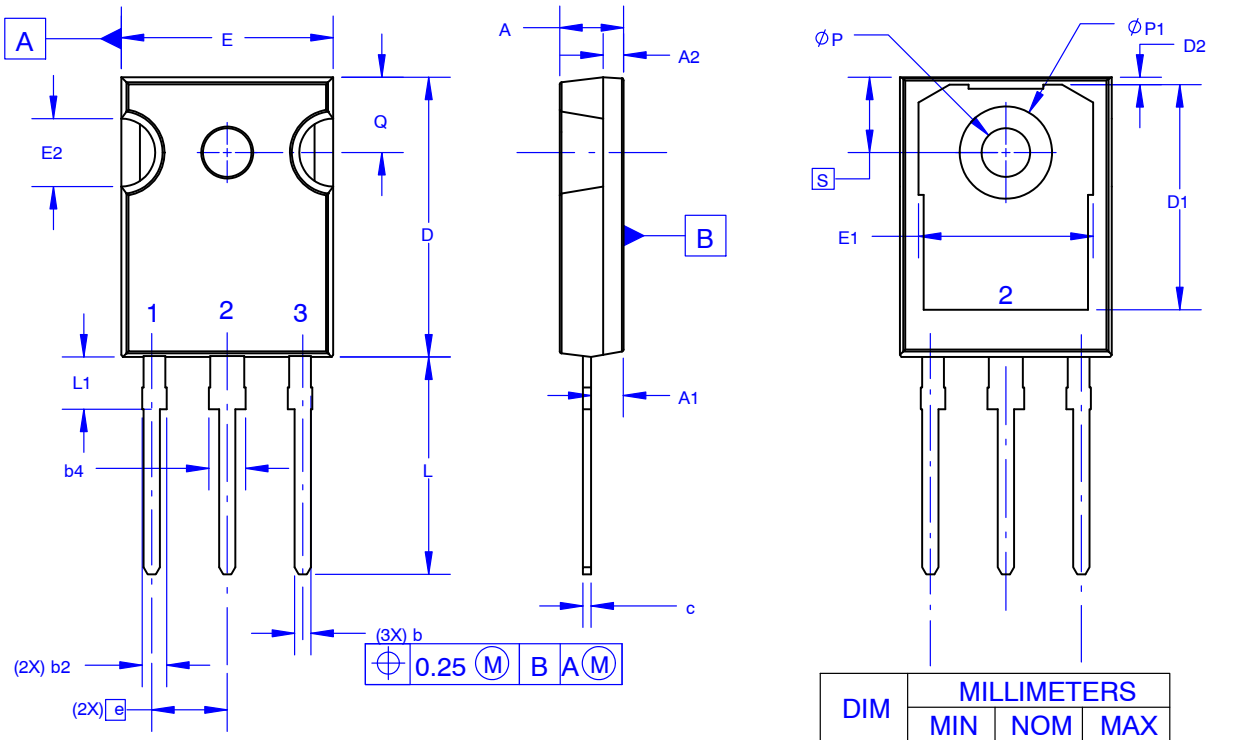

**Figure 22. Reverse Recovery Time**

# MECHANICAL CASE OUTLINE
## PACKAGE DIMENSIONS

ON Semiconductor®

**TO−247−3LD SHORT LEAD**
CASE 340CK
ISSUE A

DATE 31 JAN 2019

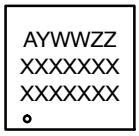



| DIM | MILLIMETERS | | |
|---|---|---|---|
| | MIN | NOM | MAX |
| A | 4.58 | 4.70 | 4.82 |
| A1 | 2.20 | 2.40 | 2.60 |
| A2 | 1.40 | 1.50 | 1.60 |
| b | 1.17 | 1.26 | 1.35 |
| b2 | 1.53 | 1.65 | 1.77 |
| b4 | 2.42 | 2.54 | 2.66 |
| c | 0.51 | 0.61 | 0.71 |
| D | 20.32 | 20.57 | 20.82 |
| D1 | 13.08 | ~ | ~ |
| D2 | 0.51 | 0.93 | 1.35 |
| E | 15.37 | 15.62 | 15.87 |
| E1 | 12.81 | ~ | ~ |
| E2 | 4.96 | 5.08 | 5.20 |
| e | ~ | 5.56 | ~ |
| L | 15.75 | 16.00 | 16.25 |
| L1 | 3.69 | 3.81 | 3.93 |
| ØP | 3.51 | 3.58 | 3.65 |
| ØP1 | 6.60 | 6.80 | 7.00 |
| Q | 5.34 | 5.46 | 5.58 |
| S | 5.34 | 5.46 | 5.58 |

NOTES: UNLESS OTHERWISE SPECIFIED.

A. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.
B. ALL DIMENSIONS ARE IN MILLIMETERS.
C. DRAWING CONFORMS TO ASME Y14.5 - 2009.
D. DIMENSION A1 TO BE MEASURED IN THE REGION DEFINED BY L1.
E. LEAD FINISH IS UNCONTROLLED IN THE REGION DEFINED BY L1.

**GENERIC**
**MARKING DIAGRAM***




XXXX = Specific Device Code
A = Assembly Location
Y = Year
WW = Work Week
ZZ = Assembly Lot Code

*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:** | **98AON13851G** | 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 SHORT LEAD** | **PAGE 1 OF 1** |

## PUBLICATION ORDERING INFORMATION

**LITERATURE FULFILLMENT**:
**Email Requests to:** orderlit@onsemi.com

**ON Semiconductor Website:** www.onsemi.com

**TECHNICAL SUPPORT**
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Phone: 011 421 33 790 2910

**Europe, Middle East and Africa Technical Support:**
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For additional information, please contact your local Sales Representative

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