

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

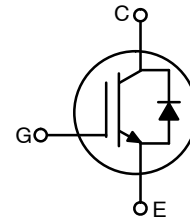
Applications

- Solar Inverter, UPS



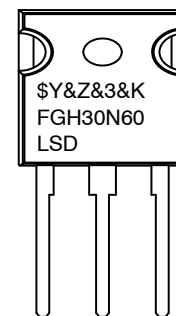
ON Semiconductor®

www.onsemi.com



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.

FGH30N60LSD

ABSOLUTE MAXIMUM RATINGS ($T_C = 25^\circ\text{C}$ 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 | $T_C = 25^\circ\text{C}$ | I_C | 60 | A |
| Collector Current | $T_C = 100^\circ\text{C}$ | | 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 | $T_C = 25^\circ\text{C}$ | P_D | 480 | W |
| Maximum Power Dissipation | $T_C = 100^\circ\text{C}$ | | 192 | W |
| Operating Junction Temperature | | T_J | -55 to +150 | $^\circ\text{C}$ |
| Storage Temperature Range | | T_{stg} | -55 to +150 | $^\circ\text{C}$ |
| 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. 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 | $^\circ\text{C}/\text{W}$ |
| Thermal Resistance, Junction to Case | $R_{\theta JC}$ (Diode) | - | 0.92 | $^\circ\text{C}/\text{W}$ |
| Thermal Resistance, Junction to Ambient | $R_{\theta JA}$ | - | 40 | $^\circ\text{C}/\text{W}$ |

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

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

OFF CHARACTERISTICS

| | | | | | | |
|--|------------------------------|---|-----|-----|-----------|---------------------------|
| Collector to Emitter Breakdown Voltage | BV_{CES} | $V_{GE} = 0\text{ V}, I_C = 250\ \mu\text{A}$ | 600 | - | - | V |
| Temperature Coefficient of Breakdown Voltage | $\Delta BV_{CES}/\Delta T_J$ | $V_{GE} = 0\text{ V}, I_C = 250\ \mu\text{A}$ | - | 0.6 | - | $\text{V}/^\circ\text{C}$ |
| Collector Cut-Off Current | I_{CES} | $V_{CE} = V_{CES}, V_{GE} = 0\text{ V}$ | - | - | 250 | μA |
| G-E Leakage Current | I_{GES} | $V_{GE} = V_{GES}, V_{CE} = 0\text{ V}$ | - | - | ± 250 | nA |

ON CHARACTERISTICS

| | | | | | | |
|---|---------------|--|-----|-----|-----|---|
| G-E Threshold Voltage | $V_{GE(th)}$ | $I_C = 250\ \mu\text{A}, V_{CE} = V_{GE}$ | 4.0 | 5.5 | 7.0 | V |
| Collector to Emitter Saturation Voltage | $V_{CE(sat)}$ | $I_C = 30\text{ A}, V_{GE} = 15\text{ V}$ | - | 1.1 | 1.4 | V |
| | | $I_C = 30\text{ A}, V_{GE} = 15\text{ V}, T_C = 125^\circ\text{C}$ | - | 1.0 | - | V |
| | | $I_C = 60\text{ A}, V_{GE} = 15\text{ V}$ | - | 1.3 | - | V |

FGH30N60LSD

ELECTRICAL CHARACTERISTICS OF THE IGBT ($T_C = 25^\circ\text{C}$ unless otherwise noted) (continued)

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Unit |
|--------------------------------|-----------|---|-----|------|-----|------|
| DYNAMIC CHARACTERISTICS | | | | | | |
| Input Capacitance | C_{ies} | $V_{CE} = 30\text{ V}, V_{GE} = 0\text{ V}, f = 1\text{ MHz}$ | - | 3550 | - | pF |
| Output Capacitance | C_{oes} | | - | 245 | - | pF |
| Reverse Transfer Capacitance | C_{res} | | - | 90 | - | pF |

SWITCHING CHARACTERISTICS

| | | | | | | |
|-----------------------------|--------------|---|---|-----|-----|---------------|
| Turn-On Delay Time | $t_{d(on)}$ | $V_{CC} = 400\text{ V}, I_C = 30\text{ A}, R_G = 6.8\ \Omega, V_{GE} = 15\text{ V},$ Inductive Load, $T_C = 25^\circ\text{C}$ | - | 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 | $t_{d(on)}$ | $V_{CC} = 400\text{ V}, I_C = 30\text{ A}, R_G = 6.8\ \Omega, V_{GE} = 15\text{ V},$ Inductive Load, $T_C = 125^\circ\text{C}$ | - | 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 | $V_{CE} = 600\text{ V}, I_C = 30\text{ A}, V_{GE} = 15\text{ V}$ | - | 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 ($T_J = 25^\circ\text{C}$ unless otherwise noted)

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

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

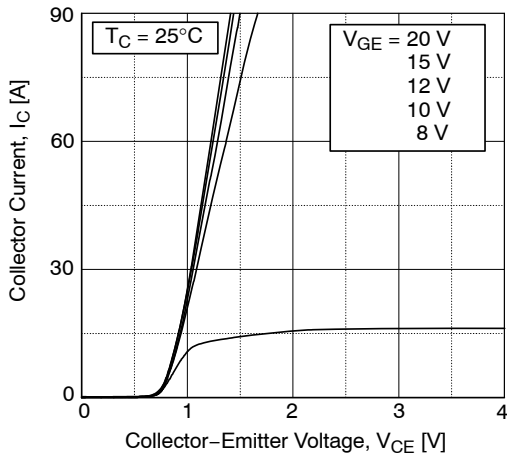


Figure 1. Typical Output Characteristics

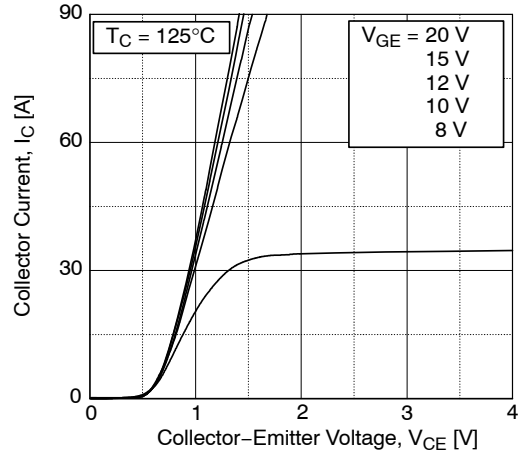


Figure 2. Typical Saturation Voltage Characteristics

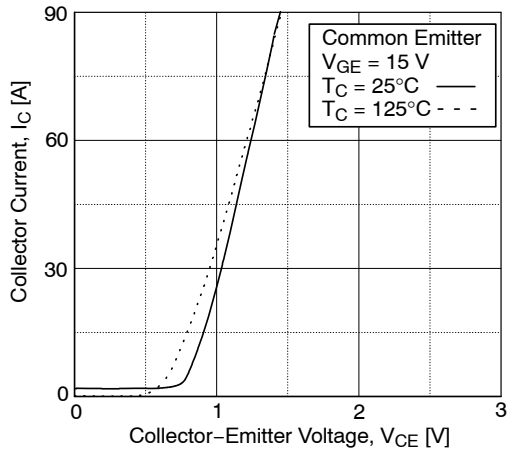


Figure 3. Typical Saturation Voltage Characteristics

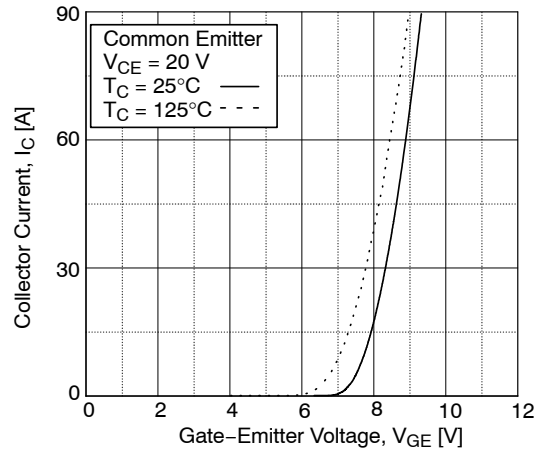


Figure 4. Transfer Characteristics

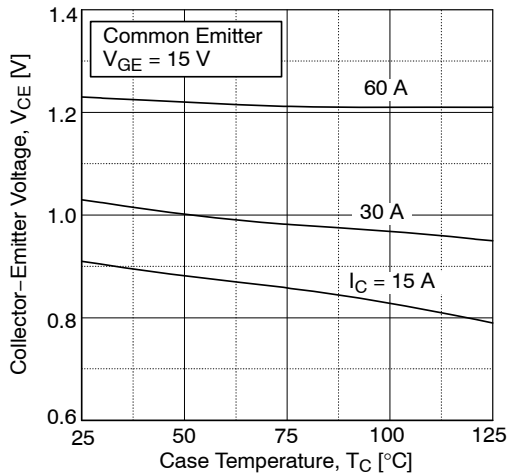


Figure 5. Saturation Voltage vs. Case Temperature at Variant Current Level

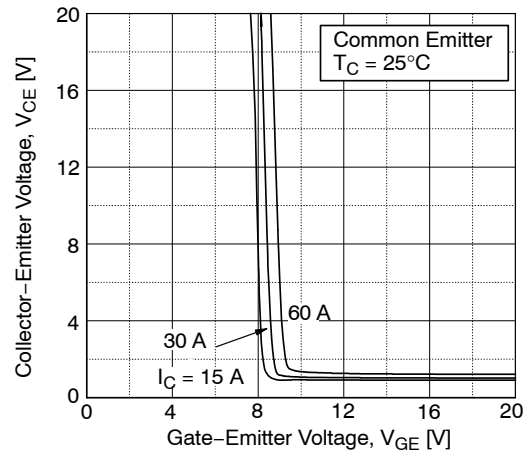


Figure 6. Saturation Voltage vs V_{GE}

TYPICAL PERFORMANCE CHARACTERISTICS (continued)

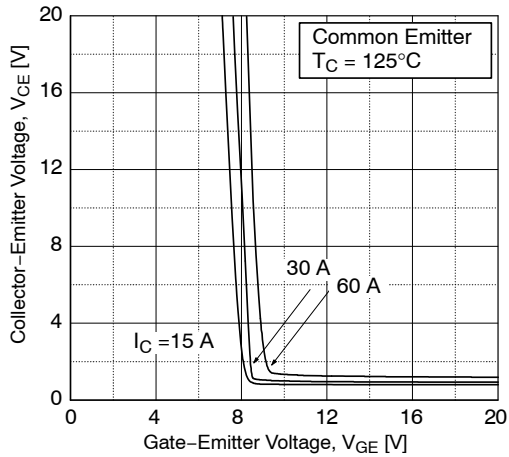


Figure 7. Saturation Voltage vs. V_{GE}

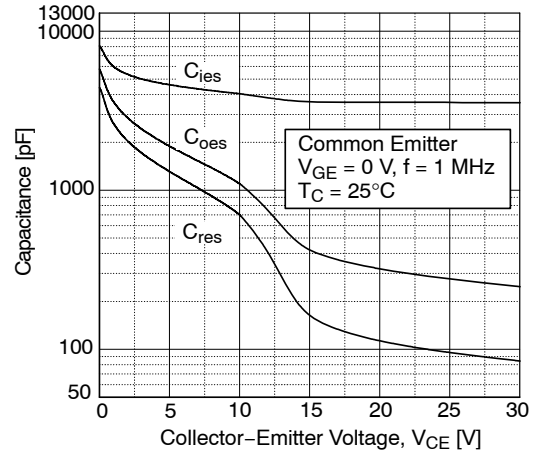


Figure 8. Capacitance Characteristic

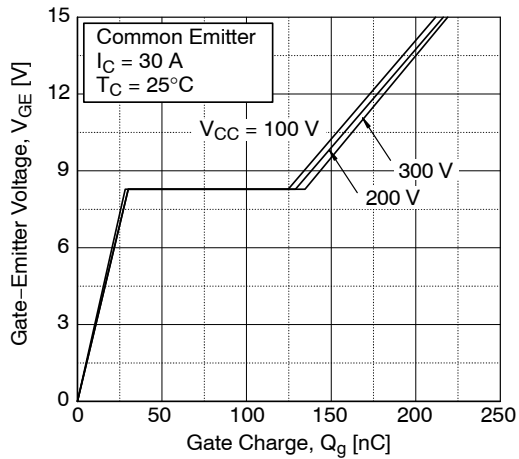


Figure 9. Gate Charge Characteristics

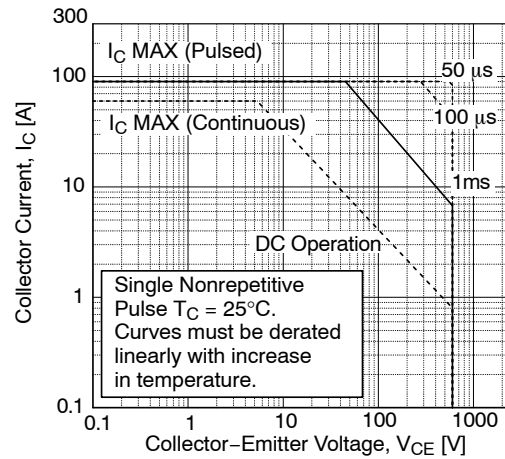


Figure 10. SOA Characteristics

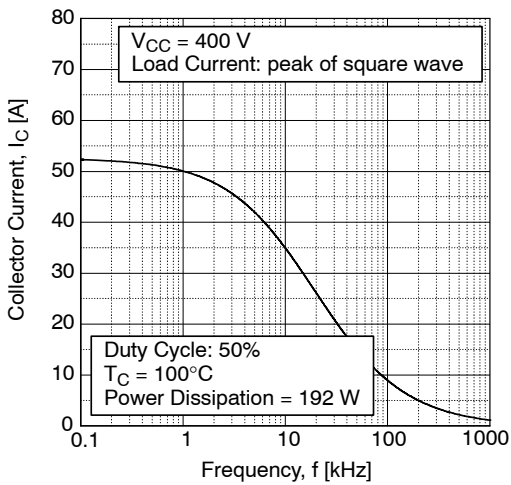


Figure 11. Load Current vs. Frequency

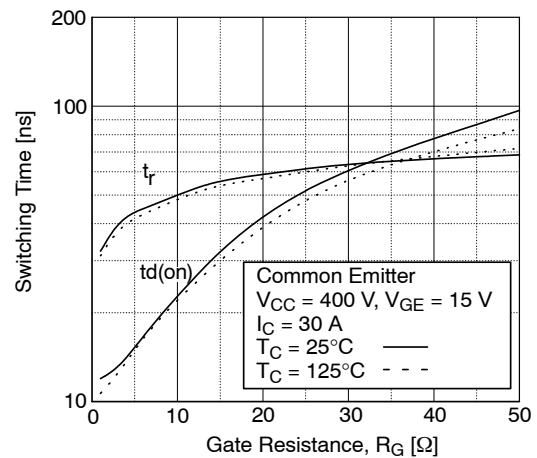


Figure 12. Turn-On Characteristics vs. Gate Resistance

TYPICAL PERFORMANCE CHARACTERISTICS (continued)

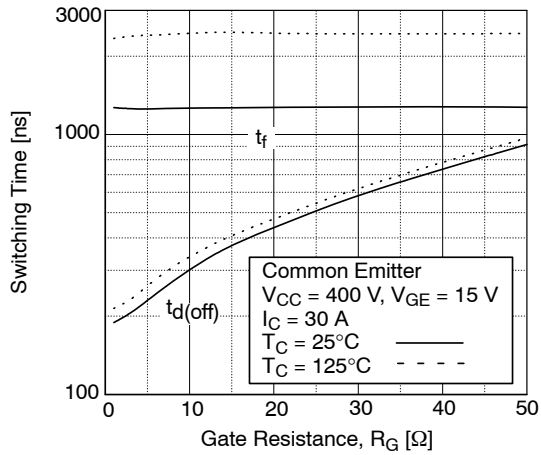


Figure 13. Turn-Off Characteristics vs. Gate Resistance

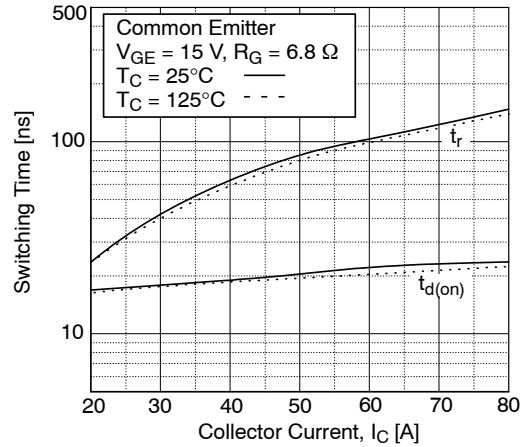


Figure 14. Turn-On Characteristics vs. Collector Current

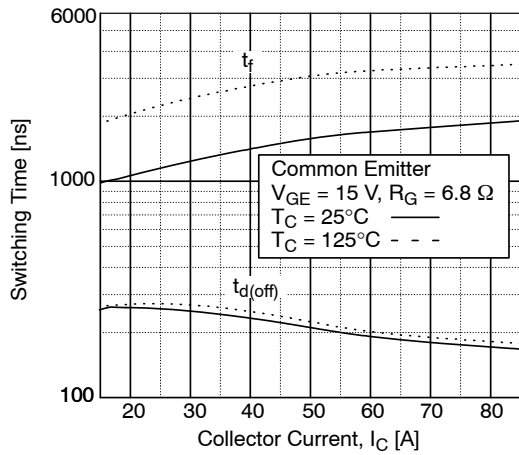


Figure 15. Turn-Off Characteristics vs. Collector Current

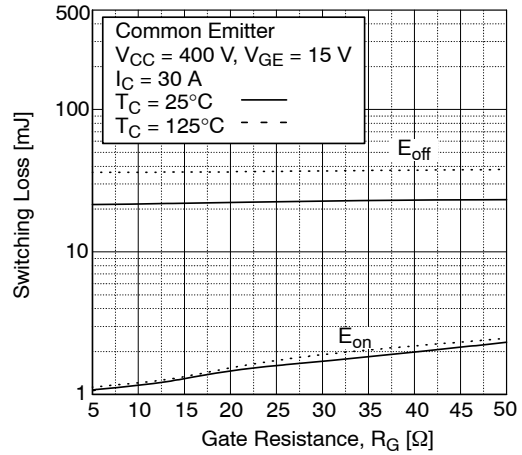


Figure 16. Switching Loss vs. Gate Resistance

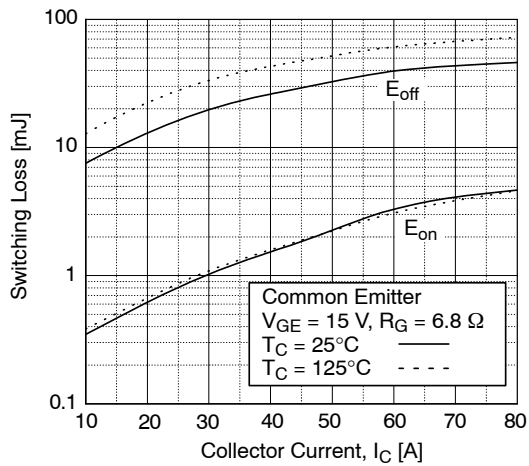


Figure 17. Switching Loss vs. Collector Current

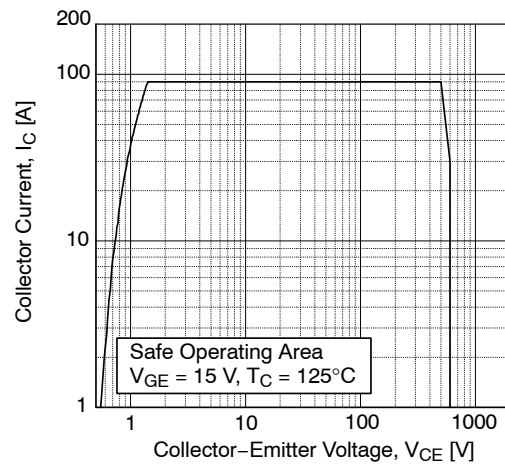


Figure 18. Turn-Off Switching SOA Characteristics

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TYPICAL PERFORMANCE CHARACTERISTICS (continued)

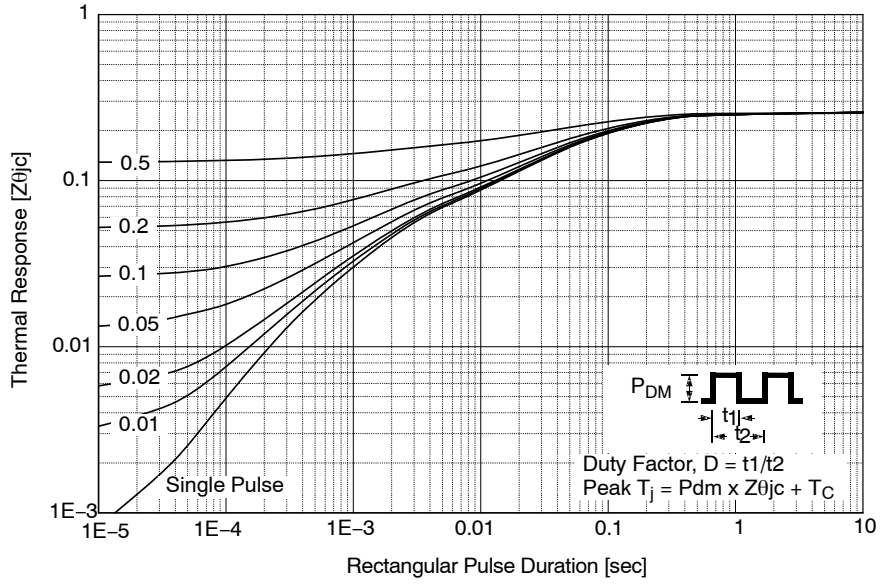


Figure 19. Transient Thermal Impedance of IGBT

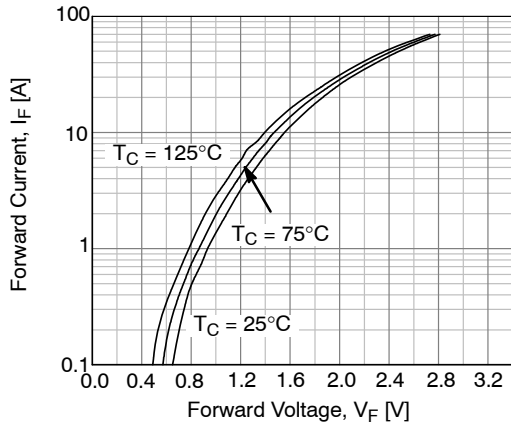


Figure 20. Forward Characteristics

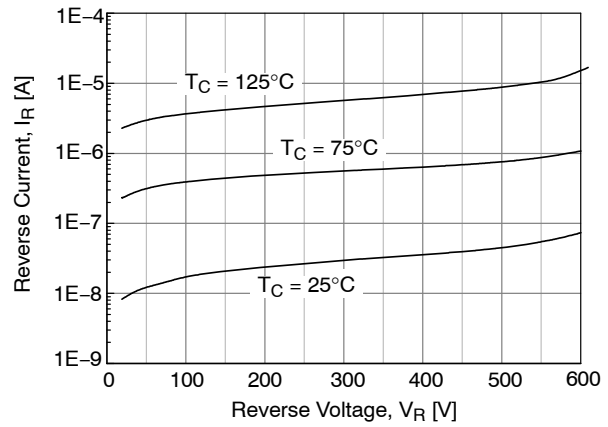


Figure 21. Reverse Current

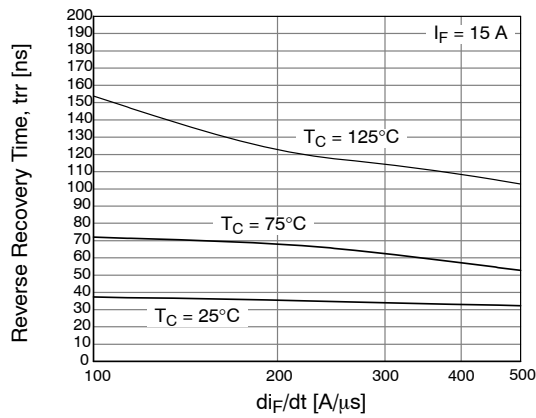


Figure 22. Reverse Recovery Time



TO-247-3LD SHORT LEAD
CASE 340CK
ISSUE A

DATE 31 JAN 2019



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.

| 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 |
| ∅P | 3.51 | 3.58 | 3.65 |
| ∅P1 | 6.60 | 6.80 | 7.00 |
| Q | 5.34 | 5.46 | 5.58 |
| S | 5.34 | 5.46 | 5.58 |

| | | |
|-------------------------|-----------------------|--|
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| DESCRIPTION: | TO-247-3LD SHORT LEAD | PAGE 1 OF 1 |

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