



June 2014

FGY75N60SMD 600 V, 75 A Field Stop IGBT

Features

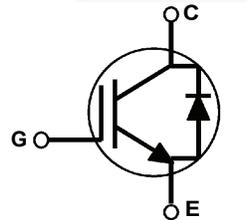
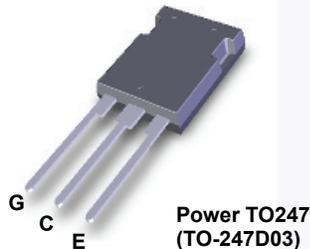
- High Current Capability
- Low Saturation Voltage: $V_{CE(sat)} = 1.9\text{ V @ } I_C = 75\text{ A}$
- High Input Impedance
- Fast Switching : $E_{OFF} = 10\text{ uJ/A}$
- RoHS Compliant

General Description

Using novel field stop IGBT technology, Fairchild's new series of field stop 2nd generation IGBTs offer the optimum performance for solar inverter, UPS, welder and PFC applications where low conduction and switching losses are essential.

Application

- Solar Inverter, UPS, Welder, SMPS, PFC



Absolute Maximum Ratings

| Symbol | Description | Ratings | Unit |
|-------------|---|-------------|------------------|
| V_{CES} | Collector to Emitter Voltage | 600 | V |
| V_{GES} | Gate to Emitter Voltage | ± 20 | V |
| | Transient Gate to Emitter Voltage | ± 30 | V |
| I_C | Collector Current @ $T_C = 25^\circ\text{C}$ | 150 | A |
| | Collector Current @ $T_C = 100^\circ\text{C}$ | 75 | A |
| $I_{CM(1)}$ | Pulsed Collector Current @ $T_C = 25^\circ\text{C}$ | 225 | A |
| I_F | Diode Forward Current @ $T_C = 25^\circ\text{C}$ | 75 | A |
| | Diode Forward Current @ $T_C = 100^\circ\text{C}$ | 50 | A |
| $I_{FM(1)}$ | Pulsed Diode Maximum Forward Current | 225 | A |
| P_D | Maximum Power Dissipation @ $T_C = 25^\circ\text{C}$ | 750 | W |
| | Maximum Power Dissipation @ $T_C = 100^\circ\text{C}$ | 375 | W |
| T_J | Operating Junction Temperature | -55 to +175 | $^\circ\text{C}$ |
| T_{stg} | Storage Temperature Range | -55 to +175 | $^\circ\text{C}$ |
| T_L | Maximum Lead Temp. for soldering Purposes, 1/8" from case for 5 seconds | 300 | $^\circ\text{C}$ |

Notes:

1: Repetitive rating: Pulse width limited by max. junction temperature.

FGY75N60SMD — 600 V, 75 A Field Stop IGBT

Thermal Characteristics

| Symbol | Parameter | Typ. | Max. | Unit |
|------------------------|---|------|------|---------------|
| $R_{\theta JC}(IGBT)$ | Thermal Resistance, Junction to Case | - | 0.2 | $^{\circ}C/W$ |
| $R_{\theta JC}(Diode)$ | Thermal Resistance, Junction to Case | - | 0.48 | $^{\circ}C/W$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient | - | 40 | $^{\circ}C/W$ |

Package Marking and Ordering Information

| Part Number | Top Mark | Package | Packing Method | Reel Size | Tape Width | Quantity |
|-------------|-------------|-----------|----------------|-----------|------------|----------|
| FGY75N60SMD | FGY75N60SMD | TO-247D03 | Tube | N/A | N/A | 30 |

Electrical Characteristics of the IGBT $T_C = 25^{\circ}C$ unless otherwise noted

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|--------------------------------------|--|--|------|------|-----------|---------------|
| Off Characteristics | | | | | | |
| BV_{CES} | Collector to Emitter Breakdown Voltage | $V_{GE} = 0 V, I_C = 250 \mu A$ | 600 | - | - | V |
| $\frac{\Delta BV_{CES}}{\Delta T_J}$ | Temperature Coefficient of Breakdown Voltage | $V_{GE} = 0 V, I_C = 250 \mu A$ | - | 0.67 | - | $V/^{\circ}C$ |
| I_{CES} | Collector Cut-Off Current | $V_{CE} = V_{CES}, V_{GE} = 0 V$ | - | - | 250 | μA |
| I_{GES} | G-E Leakage Current | $V_{GE} = V_{GES}, V_{CE} = 0 V$ | - | - | ± 400 | nA |
| On Characteristics | | | | | | |
| $V_{GE(th)}$ | G-E Threshold Voltage | $I_C = 250 \mu A, V_{CE} = V_{GE}$ | 3.5 | 5.0 | 6.5 | V |
| $V_{CE(sat)}$ | Collector to Emitter Saturation Voltage | $I_C = 75 A, V_{GE} = 15 V$ | - | 1.90 | 2.50 | V |
| | | $I_C = 75 A, V_{GE} = 15 V, T_C = 175^{\circ}C$ | - | 2.14 | - | V |
| Dynamic Characteristics | | | | | | |
| C_{ies} | Input Capacitance | $V_{CE} = 30 V, V_{GE} = 0 V, f = 1 MHz$ | - | 3800 | - | pF |
| C_{oes} | Output Capacitance | | - | 390 | - | pF |
| C_{res} | Reverse Transfer Capacitance | | - | 105 | - | pF |
| Switching Characteristics | | | | | | |
| $t_{d(on)}$ | Turn-On Delay Time | $V_{CC} = 400 V, I_C = 75 A, R_G = 3 \Omega, V_{GE} = 15 V, \text{Inductive Load}, T_C = 25^{\circ}C$ | - | 24 | 32 | ns |
| t_r | Rise Time | | - | 56 | 73 | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | - | 136 | 177 | ns |
| t_f | Fall Time | | - | 22 | 29 | ns |
| E_{on} | Turn-On Switching Loss | | - | 2.3 | 2.99 | mJ |
| E_{off} | Turn-Off Switching Loss | | - | 0.77 | 1.00 | mJ |
| E_{ts} | Total Switching Loss | - | 3.07 | 3.99 | mJ | |
| $t_{d(on)}$ | Turn-On Delay Time | $V_{CC} = 400 V, I_C = 75 A, R_G = 3 \Omega, V_{GE} = 15 V, \text{Inductive Load}, T_C = 175^{\circ}C$ | - | 23 | - | ns |
| t_r | Rise Time | | - | 53 | - | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | - | 146 | - | ns |
| t_f | Fall Time | | - | 15 | - | ns |
| E_{on} | Turn-On Switching Loss | | - | 3.60 | - | mJ |
| E_{off} | Turn-Off Switching Loss | | - | 1.11 | - | mJ |
| E_{ts} | Total Switching Loss | | - | 4.71 | - | mJ |

Electrical Characteristics of the IGBT $T_C = 25^\circ\text{C}$ unless otherwise noted

| | | | | | | |
|----------|--------------------------|---|---|-----|-----|----|
| Q_g | Total Gate Charge | $V_{CE} = 400\text{ V}, I_C = 75\text{ A},$ $V_{GE} = 15\text{ V}$ | - | 248 | 370 | nC |
| Q_{ge} | Gate to Emitter Charge | | - | 28 | 42 | nC |
| Q_{gc} | Gate to Collector Charge | | - | 129 | 195 | nC |

Electrical Characteristics of the Diode $T_C = 25^\circ\text{C}$ unless otherwise noted

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max | Units | |
|-----------|-------------------------------|---|---------------------------|------|------|-------|----|
| V_{FM} | Diode Forward Voltage | $I_F = 50\text{ A}$ | $T_C = 25^\circ\text{C}$ | - | 1.75 | 2.1 | V |
| | | | $T_C = 175^\circ\text{C}$ | - | 1.35 | - | |
| E_{rec} | Reverse Recovery Energy | $I_F = 50\text{ A}, di_F/dt = 200\text{ A}/\mu\text{s}$ $V_R = 400\text{ V}$ | $T_C = 175^\circ\text{C}$ | - | 0.14 | - | mJ |
| t_{rr} | Diode Reverse Recovery Time | | $T_C = 25^\circ\text{C}$ | - | 41 | 55 | ns |
| | | | $T_C = 175^\circ\text{C}$ | - | 126 | - | |
| Q_{rr} | Diode Reverse Recovery Charge | | $T_C = 25^\circ\text{C}$ | - | 81 | 115 | nC |
| | | $T_C = 175^\circ\text{C}$ | - | 736 | - | | |



Typical Performance Characteristics

Figure 1. Typical Output Characteristics

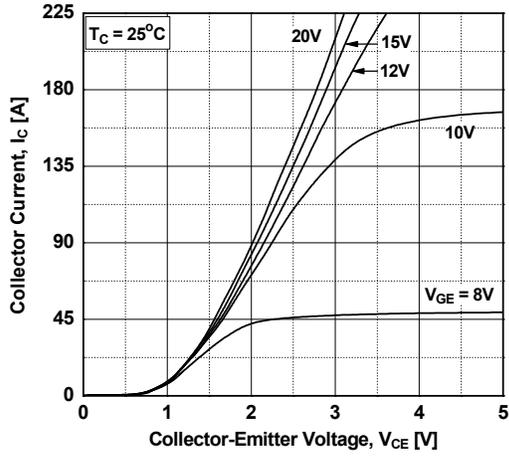


Figure 2. Typical Output Characteristics

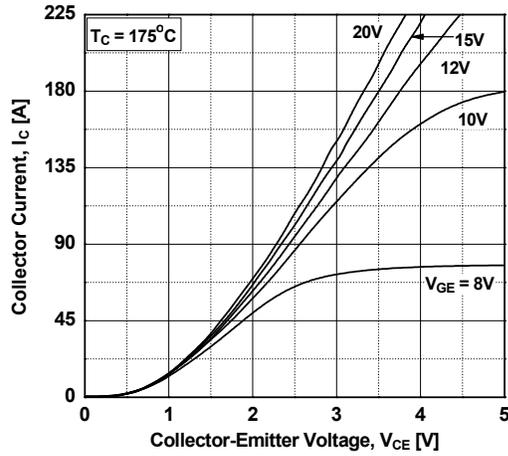


Figure 3. Typical Saturation Voltage Characteristics

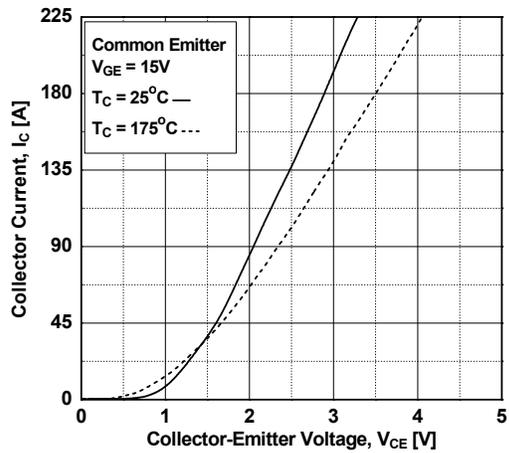


Figure 4. Transfer Characteristics

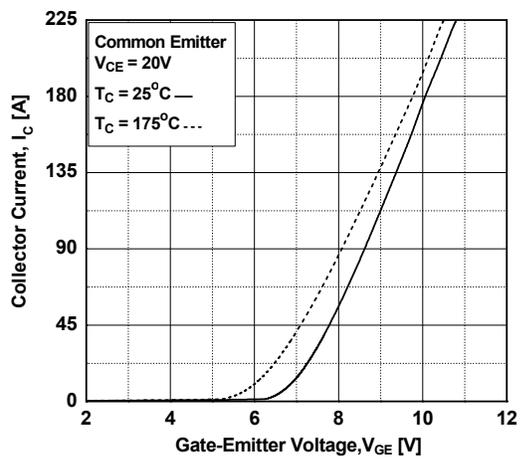


Figure 5. Saturation Voltage vs. Case Temperature at Variant Current Level

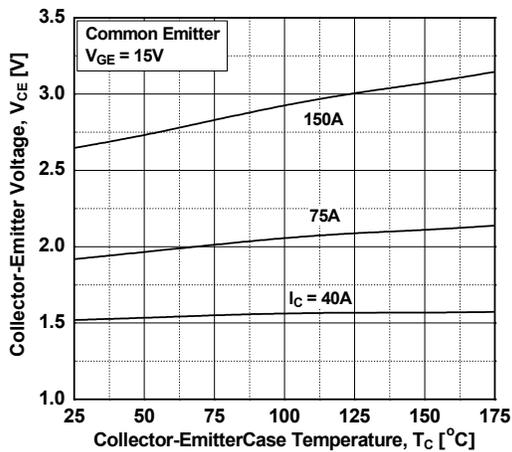
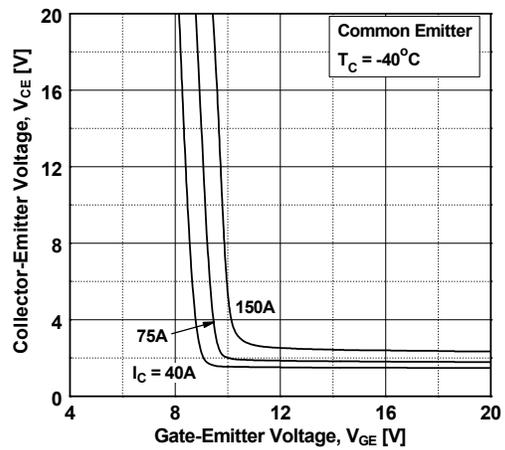


Figure 6. Saturation Voltage vs. Vge



Typical Performance Characteristics

Figure 7. Saturation Voltage vs. V_{GE}

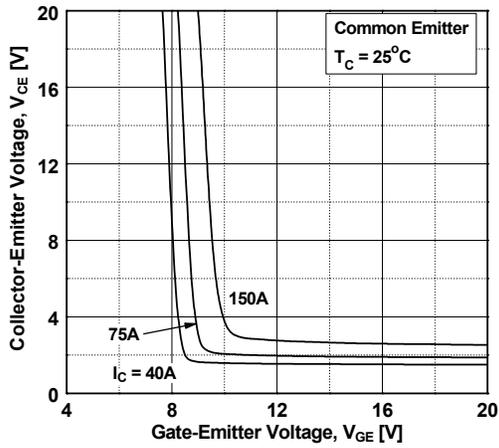


Figure 8. Saturation Voltage vs. V_{GE}

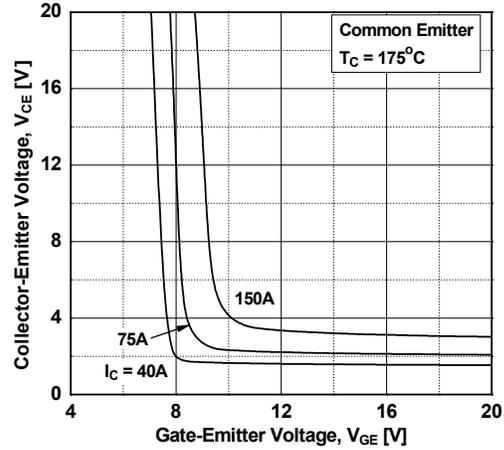


Figure 9. Capacitance Characteristics

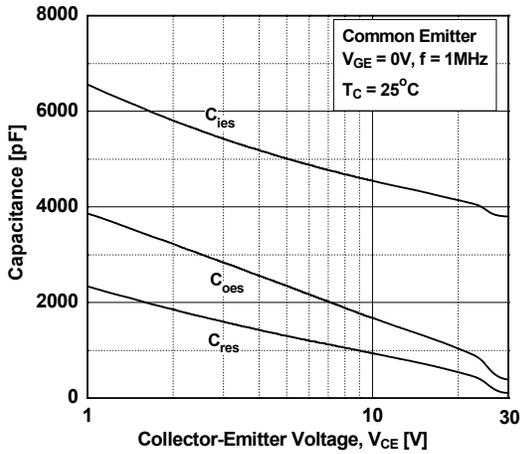


Figure 10. Gate charge Characteristics

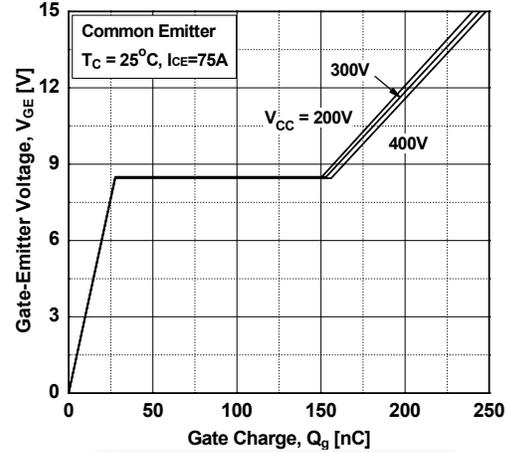


Figure 11. Turn-off Characteristics vs. Gate Resistance

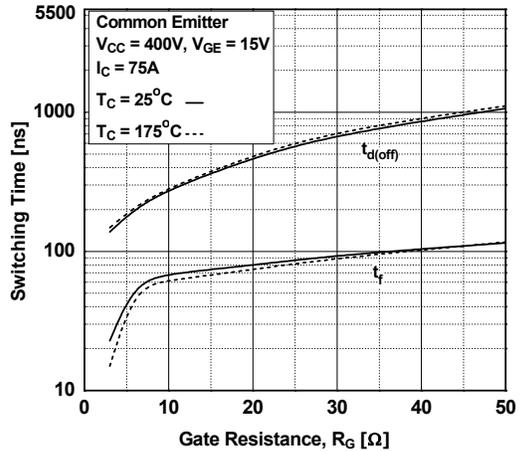
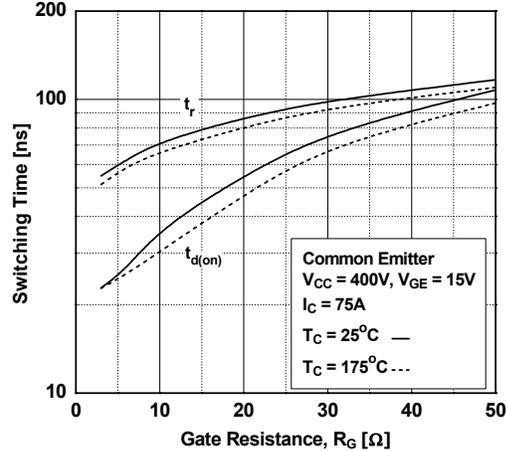


Figure 12. Turn-on Characteristics vs. Gate Resistance



Typical Performance Characteristics

Figure 13. Turn-off Characteristics vs. Collector Current

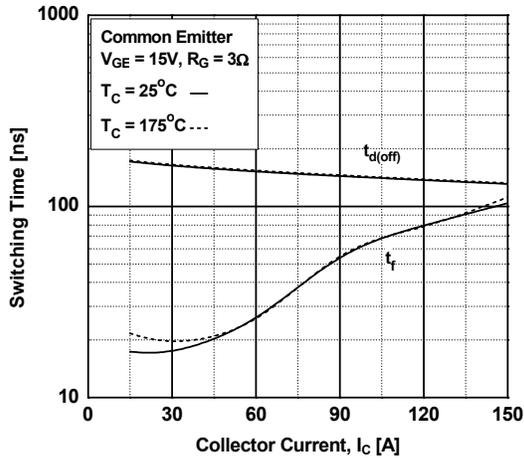


Figure 14. Turn-on Characteristics vs. Collector Current

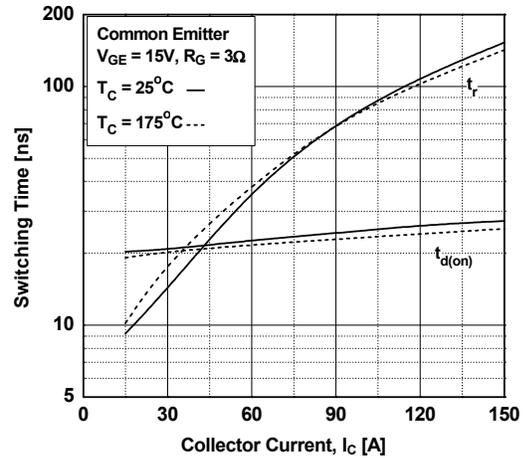


Figure 15. Switching Loss vs. Collector Current

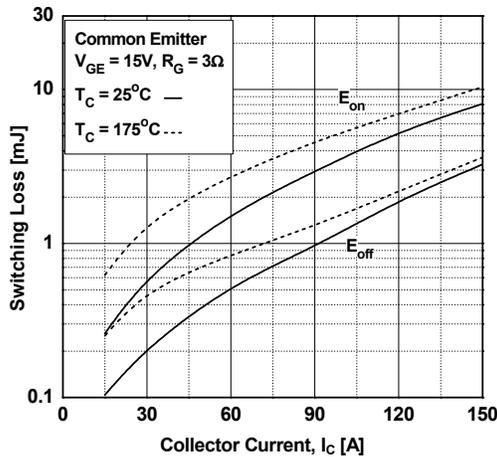


Figure 16. Switching Loss vs. Gate Resistance

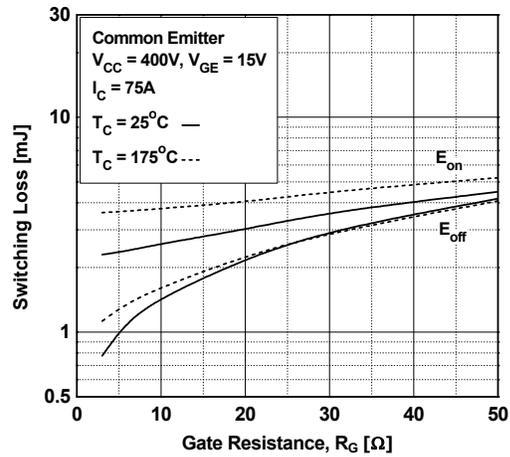


Figure 17. SOA Characteristics

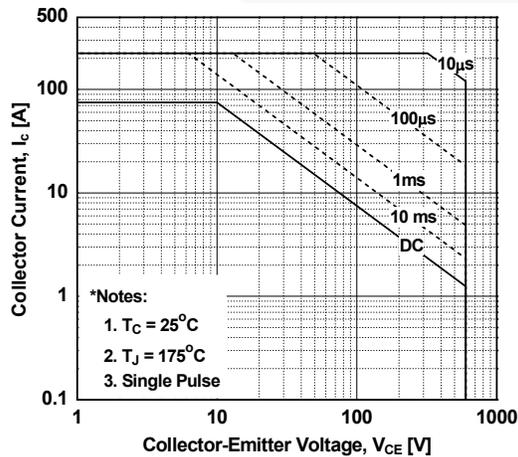
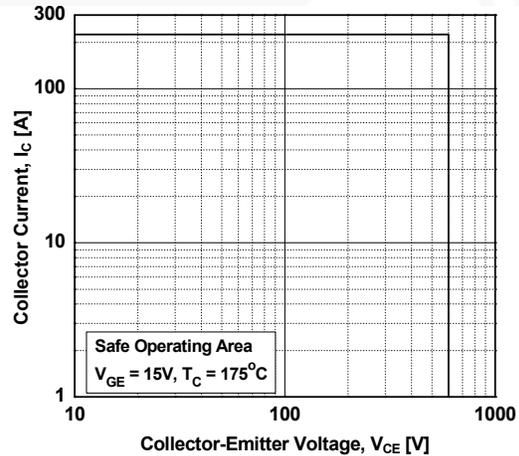


Figure 18. Turn off Switching SOA Characteristics



Typical Performance Characteristics

Figure 19. Current Derating

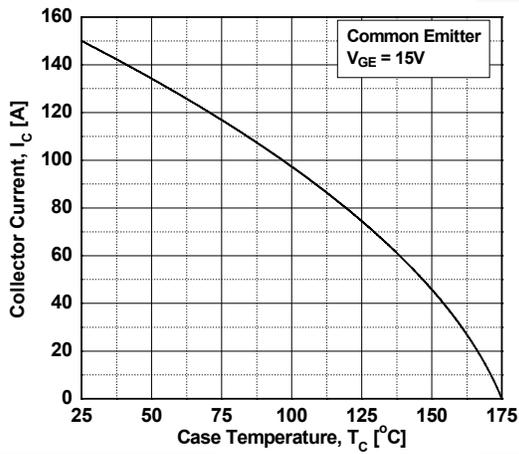


Figure 20. Load Current vs. Frequency

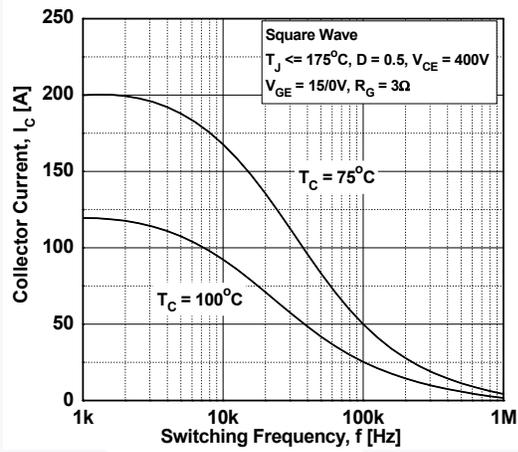


Figure 21. Forward Characteristics

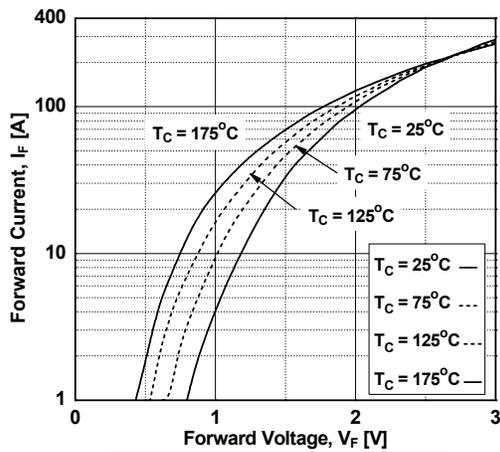


Figure 22. Reverse Current

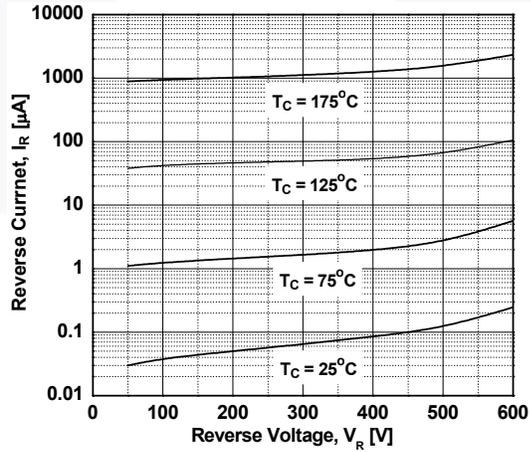


Figure 23. Stored Charge

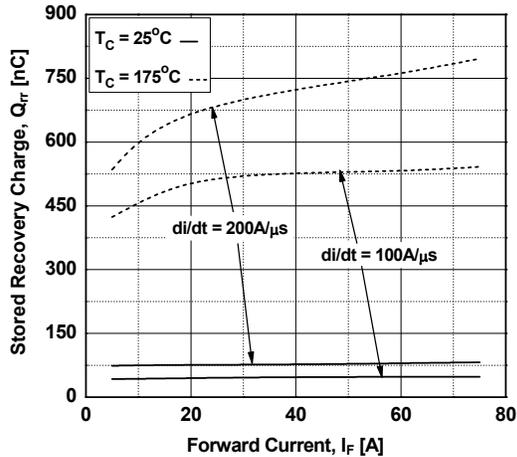
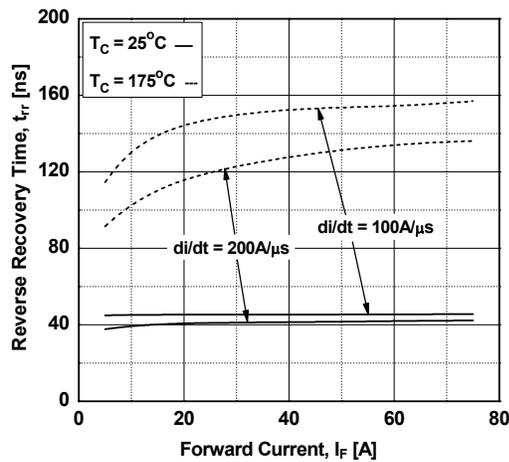


Figure 24. Reverse Recovery Current



Typical Performance Characteristics

Figure 25. Transient Thermal Impedance of IGBT

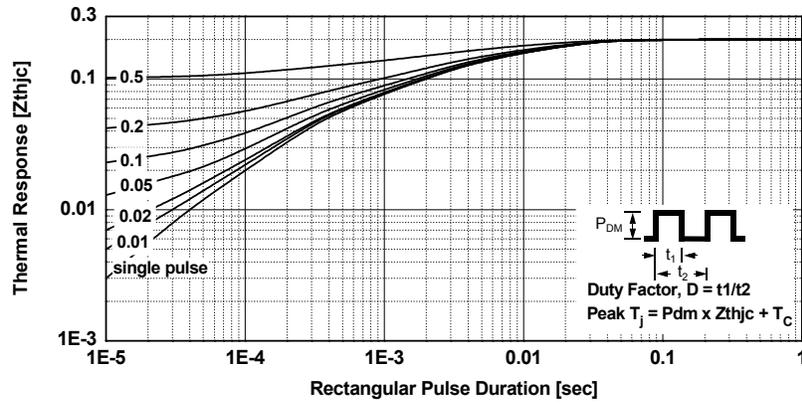
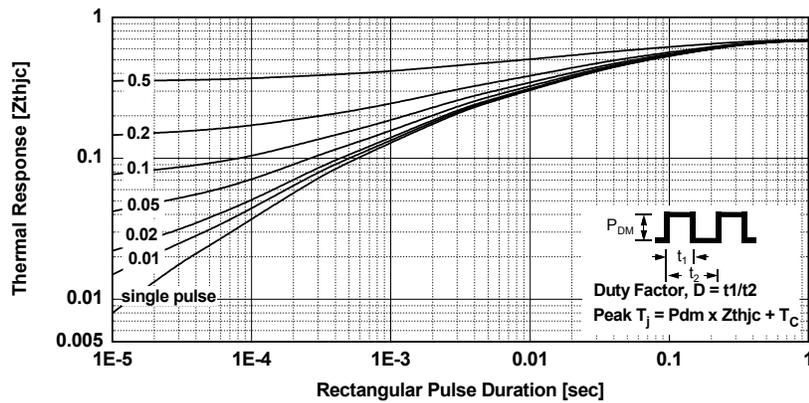
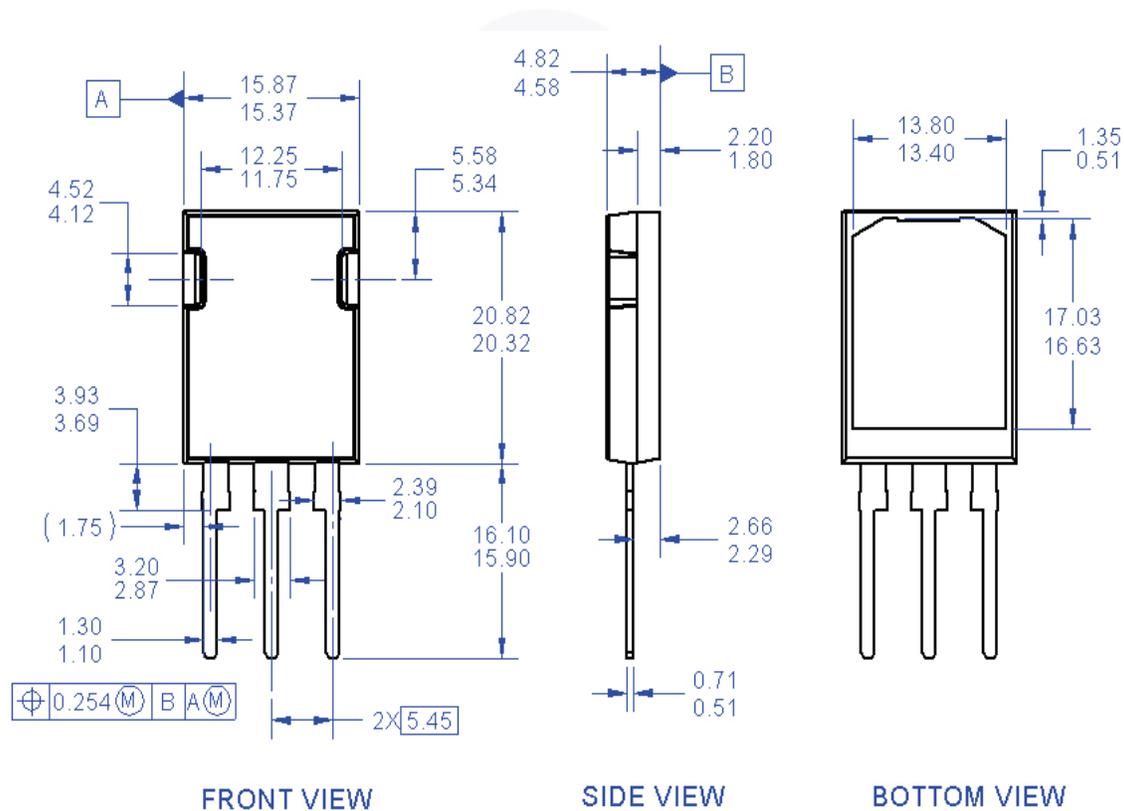


Figure 26. Transient Thermal Impedance of Diode



Mechanical dimensions



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.
- E. DRAWING FILE NAME: TO247D03REV3



Figure 27. TO-247 3L - 3LDS, POWER TO247, NON JEDEC

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Definition of Terms

| Datasheet Identification | Product Status | Definition |
|--------------------------|-----------------------|---|
| Advance Information | Formative / In Design | Datasheet contains the design specifications for product development. Specifications may change in any manner without notice. |
| Preliminary | First Production | Datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design. |
| No Identification Needed | Full Production | Datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design. |
| Obsolete | Not In Production | Datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only. |

Rev. I68

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