

IGBT - Shorted-anode

1500 V, 30 A

FGH30S150P

Description

Using advanced field stop trench and shorted-anode technology, ON Semiconductor's shorted-anode trench IGBTs offer superior conduction and switching performances for soft switching applications. The device can operate in parallel configuration with exceptional avalanche capability. This device is designed for induction heating and microwave oven.

Features

- High Speed Switching
- Low Saturation Voltage: $V_{CE(sat)} = 1.85 \text{ V @ } I_C = 30 \text{ A}$
- High Input Impedance
- This Device is Pb-Free and is RoHS Compliant

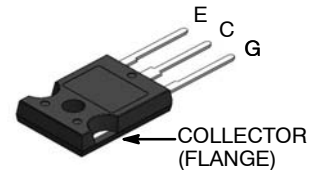
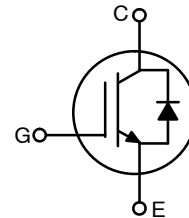
Applications

- Induction Heating, Microwave Oven



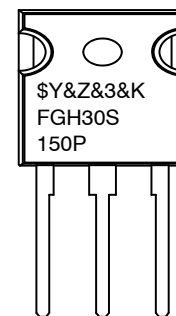
ON Semiconductor®

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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
FGH30S150P = Specific Device Code

ORDERING INFORMATION

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

FGH30S150P

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

| Description | | Symbol | Rating | Unit |
|---|------------------------|--------------------------|-------------|------|
| Collector to Emitter Voltage | | V _{CES} | 1500 | V |
| Gate to Emitter Voltage | | V _{GES} | ±25 | 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 |
| Diode Continuous Forward Current | T _C = 25°C | I _F | 60 | A |
| Diode Continuous Forward Current | T _C = 100°C | | 30 | A |
| Maximum Power Dissipation | T _C = 25°C | P _D | 500 | W |
| Maximum Power Dissipation | T _C = 100°C | | 250 | W |
| Operating Junction Temperature | | T _J | -55 to +175 | °C |
| Storage Temperature Range | | 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. Limited by T_{jmax}.

THERMAL CHARACTERISTICS

| Parameter | Symbol | Typ | Max | Unit |
|--|-------------------------|-----|-----|------|
| Thermal Resistance, Junction to Case, Max | R _{θJC} (IGBT) | - | 0.3 | °C/W |
| Thermal Resistance, Junction to Ambient, Max | R _{θJA} | - | 40 | °C/W |

PACKAGE MARKING AND ORDERING INFORMATION

| Part Number | Top Mark | Package | Reel Size | Tape Width | Quantity |
|-------------|------------|---------|-----------|------------|----------|
| FGH30S150P | FGH30S150P | TO-247 | - | - | 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 = 1 mA | 1500 | - | - | V |
| Temperature Coefficient of Breakdown Voltage | ΔBV _{CES} /ΔT _J | V _{GE} = 0 V, I _C = 1 mA | - | 1.5 | - | V/°C |
| Collector Cut-Off Current | I _{CES} | V _{CE} = 1500, V _{GE} = 0 V | - | - | 1 | mA |
| G-E Leakage Current | I _{GES} | V _{GE} = V _{GES} , V _{CE} = 0 V | - | - | ±500 | nA |

ON CHARACTERISTICS

| | | | | | | |
|---|----------------------|---|-----|------|-----|---|
| G-E Threshold Voltage | V _{GE(th)} | I _C = 30 mA, V _{CE} = V _{GE} | 4.5 | 6.0 | 7.5 | V |
| Collector to Emitter Saturation Voltage | V _{CE(sat)} | I _C = 30 A, V _{GE} = 15 V, T _C = 25°C | - | 1.85 | 2.4 | V |
| | | I _C = 30 A, V _{GE} = 15 V, T _C = 125°C | - | 2.06 | - | V |
| | | I _C = 30 A, V _{GE} = 15 V, T _C = 175°C | - | 2.15 | - | V |
| Diode Forward Voltage | V _{FM} | I _F = 30 A, T _C = 25°C | - | 1.61 | 2.2 | V |
| | | I _F = 30 A, T _C = 175°C | - | 1.96 | - | V |

FGH30S150P

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} | $V_{CE} = 30\text{ V}, V_{GE} = 0\text{ V}, f = 1\text{ MHz}$ | – | 3310 | – | pF |
| Output Capacitance | C_{oes} | | – | 70 | – | pF |
| Reverse Transfer Capacitance | C_{res} | | – | 55 | – | pF |
| SWITCHING CHARACTERISTICS | | | | | | |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{CC} = 600\text{ V}, I_C = 30\text{ A},$ $R_G = 10\ \Omega, V_{GE} = 15\text{ V},$ Resistive Load, $T_C = 25^\circ\text{C}$ | – | 32 | – | ns |
| Rise Time | t_r | | – | 292 | – | ns |
| Turn-Off Delay Time | $t_{d(off)}$ | | – | 492 | – | ns |
| Fall Time | t_f | | – | 214 | – | ns |
| Turn-On Switching Loss | E_{on} | | – | 1.16 | – | mJ |
| Turn-Off Switching Loss | E_{off} | | – | 0.9 | – | mJ |
| Total Switching Loss | E_{ts} | | – | 2.06 | – | mJ |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{CC} = 600\text{ V}, I_C = 30\text{ A},$ $R_G = 10\ \Omega, V_{GE} = 15\text{ V},$ Resistive Load, $T_C = 175^\circ\text{C}$ | – | 36 | – | ns |
| Rise Time | t_r | | – | 336 | – | ns |
| Turn-Off Delay Time | $t_{d(off)}$ | | – | 560 | – | ns |
| Fall Time | t_f | | – | 520 | – | ns |
| Turn-On Switching Loss | E_{on} | | – | 1.39 | – | mJ |
| Turn-Off Switching Loss | E_{off} | | – | 1.86 | – | mJ |
| Total Switching Loss | E_{ts} | | – | 3.25 | – | mJ |
| Total Gate Charge | Q_g | $V_{CE} = 600\text{ V}, I_C = 30\text{ A}, V_{GE} = 15\text{ V}$ | – | 369 | – | nC |
| Gate to Emitter Charge | Q_{ge} | | – | 23.5 | – | nC |
| Gate to Collector Charge | Q_{gc} | | – | 199 | – | 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

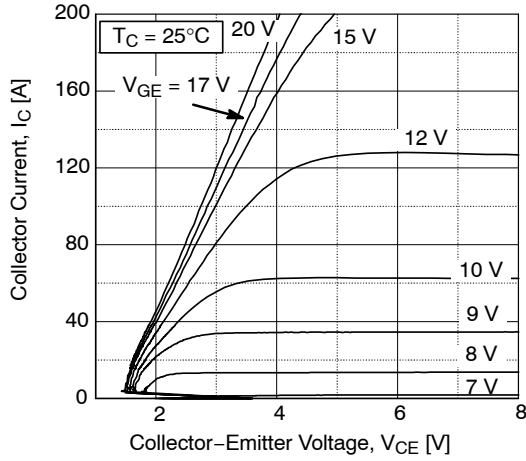


Figure 1. Typical Output Characteristics

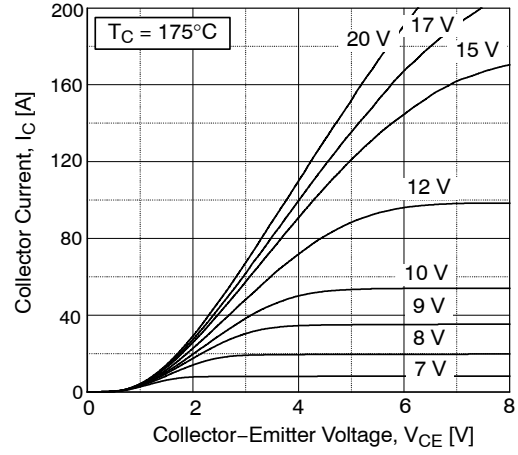


Figure 2. Typical Output Characteristics

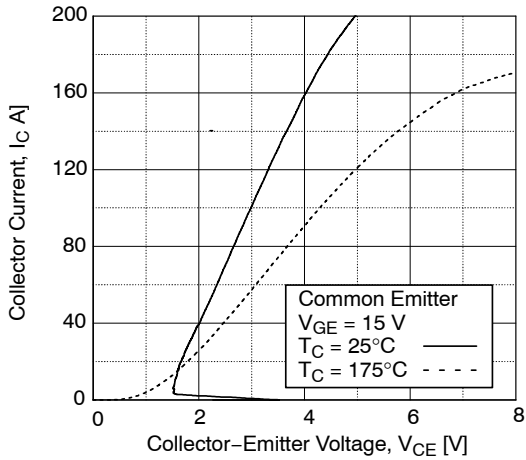


Figure 3. Typical Saturation Voltage Characteristics

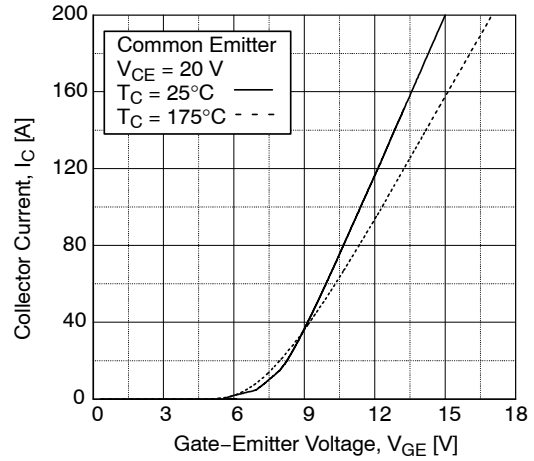


Figure 4. Transfer Characteristics

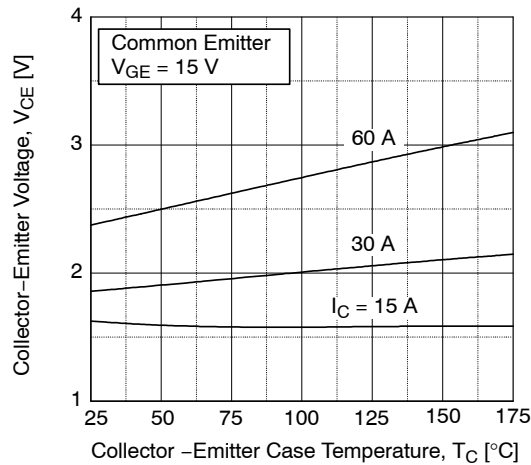


Figure 5. Saturation Voltage vs. Case Temperature at Variant Current Level

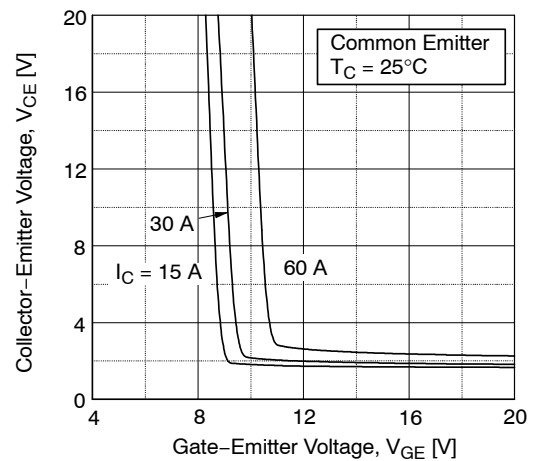


Figure 6. Saturation Voltage vs Vge

TYPICAL PERFORMANCE CHARACTERISTICS (continued)

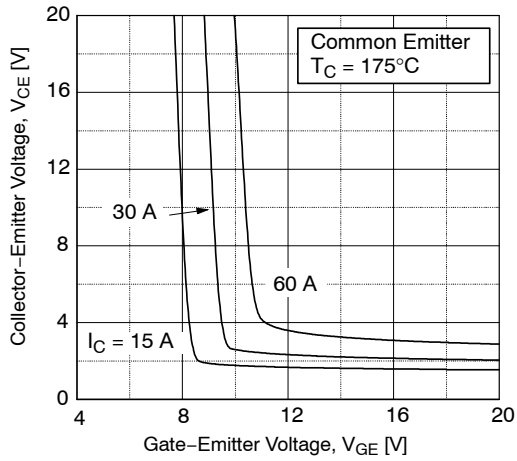


Figure 7. Saturation Voltage vs. V_{GE}

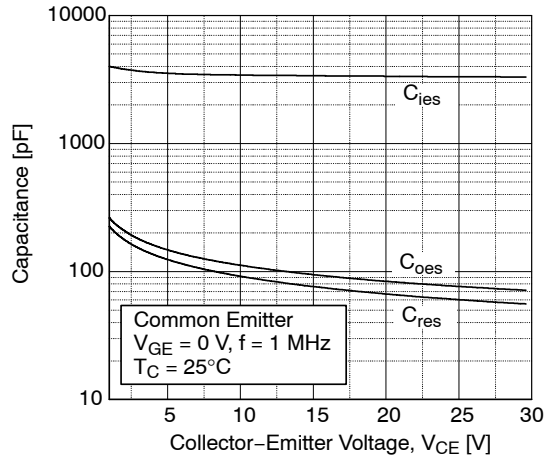


Figure 8. Capacitance Characteristic

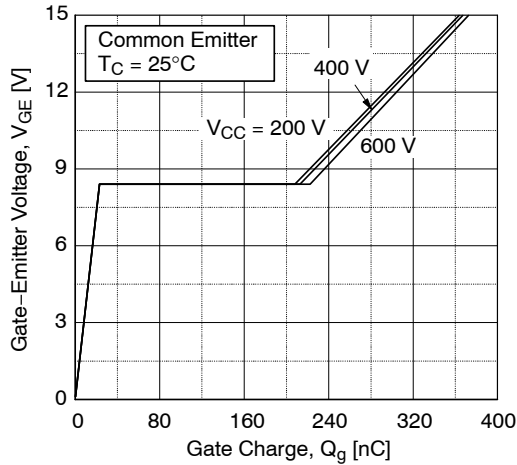


Figure 9. Gate Charge Characteristics

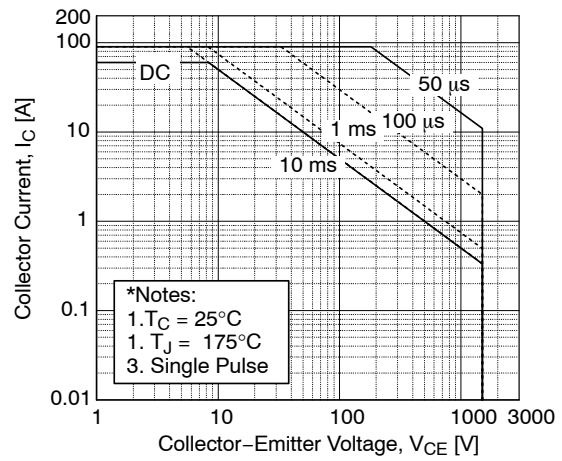


Figure 10. SOA Characteristics

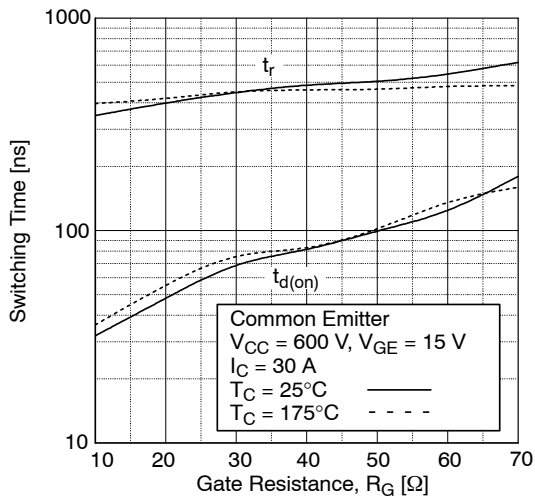


Figure 11. Turn-On Characteristics vs. Gate Resistance

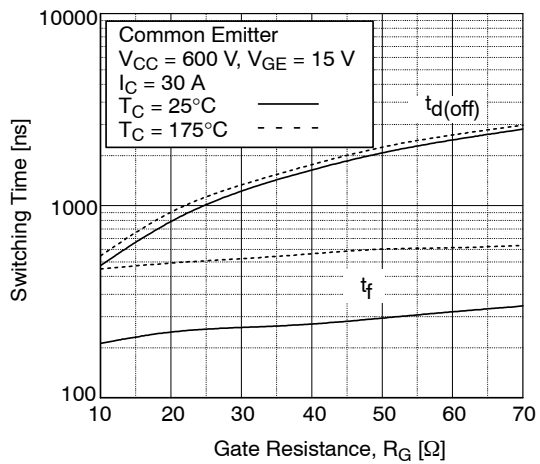


Figure 12. Turn-Off Characteristics vs. Gate Resistance

TYPICAL PERFORMANCE CHARACTERISTICS (continued)

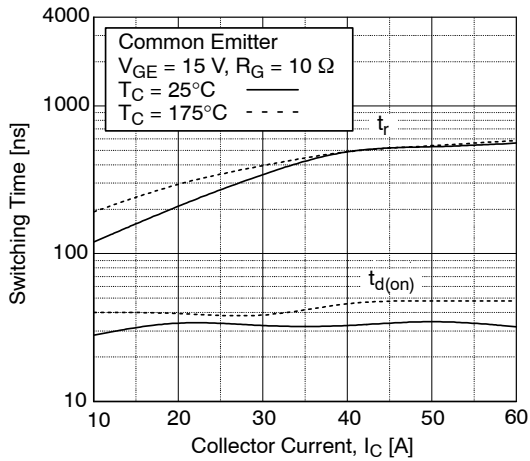


Figure 13. Turn-On Characteristics vs. Collector Current

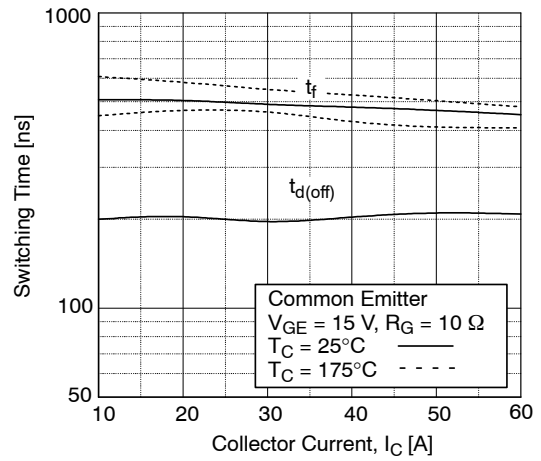


Figure 14. Turn-Off Characteristics vs. Collector Current

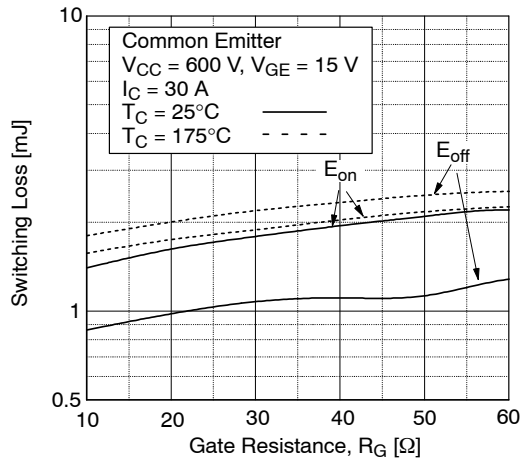


Figure 15. Switching Loss vs. Gate Resistance

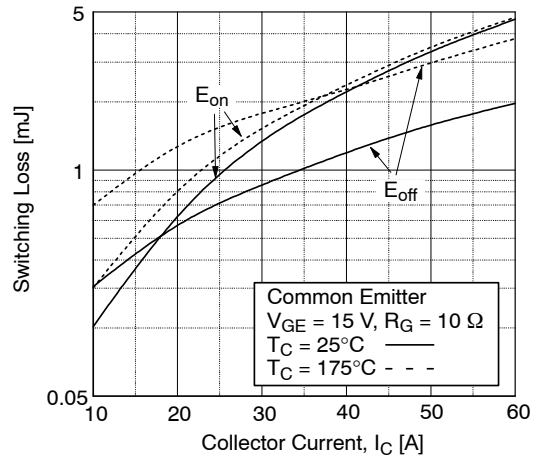


Figure 16. Switching Loss vs. Collector Current

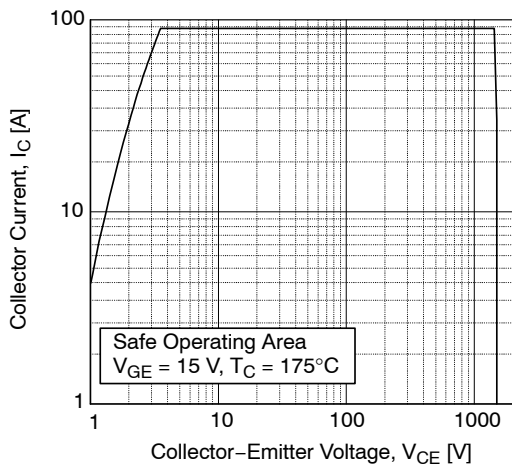


Figure 17. Turn-Off Switching SOA Characteristics

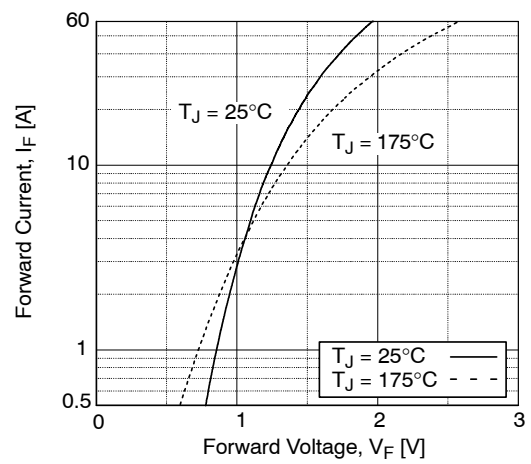


Figure 18. Forward Characteristics

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TYPICAL PERFORMANCE CHARACTERISTICS (continued)

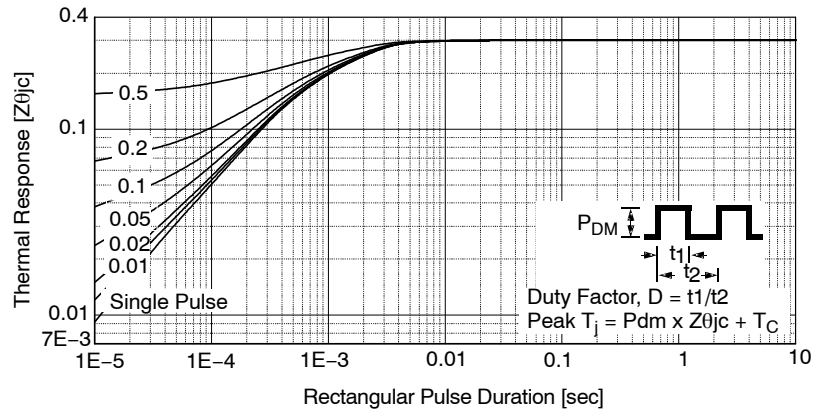
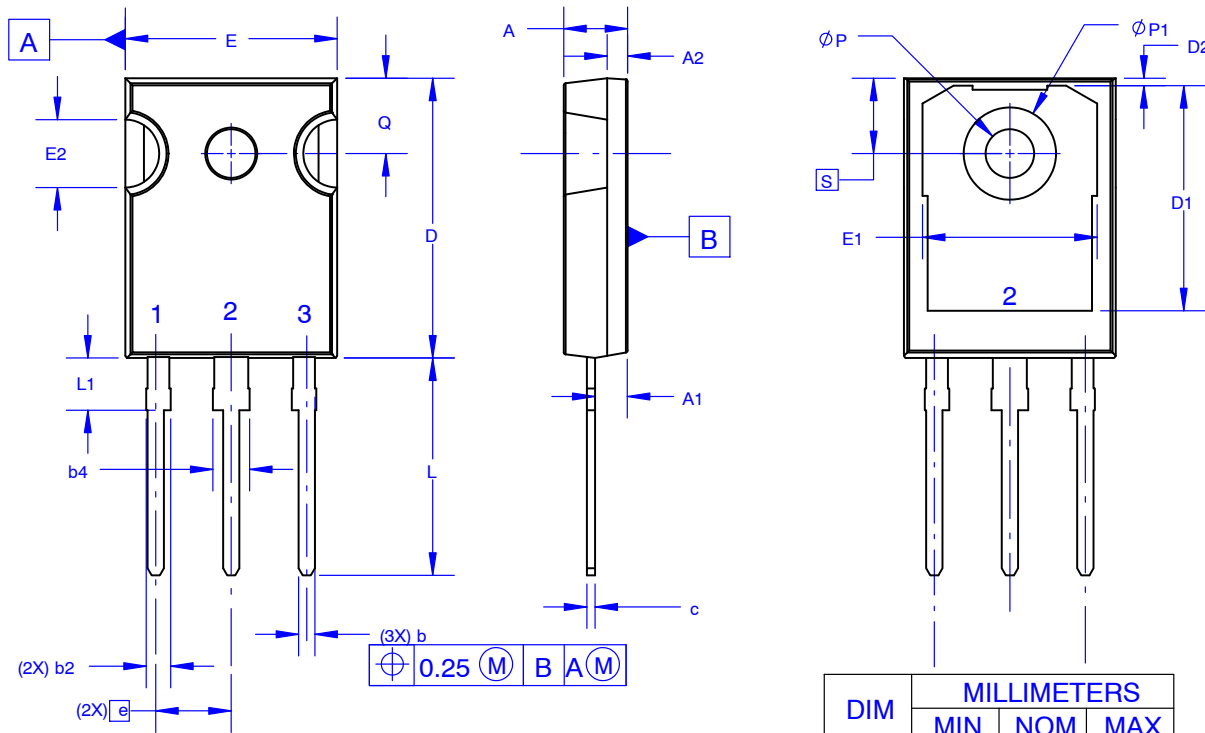


Figure 19. Transient Thermal Impedance of IGBT



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 |
| φP | 3.51 | 3.58 | 3.65 |
| φP1 | 6.60 | 6.80 | 7.00 |
| Q | 5.34 | 5.46 | 5.58 |
| S | 5.34 | 5.46 | 5.58 |

| | | |
|-------------------------|-----------------------|--|
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