

IGBT - NPT

1200 V, 40 A

FGH40N120AN

Description

Employing NPT technology, ON Semiconductor's AN series of IGBTs provides low conduction and switching losses. The AN series offers an solution for application such as induction heating (IH), motor control, general purpose inverters and uninterruptible power supplies (UPS).

Features

- High Speed Switching
- Low Saturation Voltage: $V_{CE(sat)} = 2.6 \text{ V @ } I_C = 40 \text{ A}$
- High Input Impedance
- This Device is Pb-Free and is RoHS Compliant

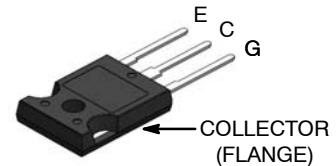
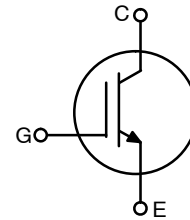
Applications

- Induction Heating, UPC, AC & DC Motor Controls and General Purpose Inverters



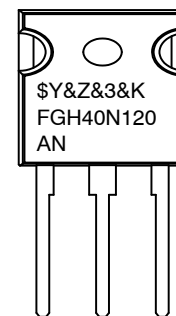
ON Semiconductor®

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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
FGH40N120AN = Specific Device Code

ORDERING INFORMATION

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

FGH40N120AN

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

| Parameter | Symbol | FGH40N120AN | Unit | |
|---|--------------------------|------------------------|------|---|
| Collector to Emitter Voltage | V _{CES} | 1200 | V | |
| Gate to Emitter Voltage | V _{GES} | ±25 | V | |
| Collector Current | I _C | T _C = 25°C | 64 | A |
| Collector Current | | T _C = 100°C | 40 | A |
| Pulsed Collector Current | I _{CM} (Note 1) | 160 | A | |
| Maximum Power Dissipation | P _D | T _C = 25°C | 417 | W |
| Maximum Power Dissipation | | T _C = 100°C | 167 | W |
| Short Circuit Withstand Time, V _{CE} = 600 V, V _{GE} = 15 V, T _C = 125°C | SCWT | 10 | μs | |
| 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. Pulse width limited by max. junction temperature.

THERMAL CHARACTERISTICS

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

PACKAGE MARKING AND ORDERING INFORMATION

| Device Marking | Device | Package | Reel Size | Tape Width | Quantity |
|----------------|-------------|---------|-----------|------------|----------|
| FGH40N120AN | FGH40N120AN | 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 | 1200 | - | - | V |
| Temperature Coefficient of Breakdown Voltage | ΔBV _{CES} /ΔT _J | V _{GE} = 0 V, I _C = 1 mA | - | 0.6 | - | V/°C |
| Collector Cut-Off Current | I _{CES} | V _{CE} = V _{CES} , V _{GE} = 0 V | - | - | 1 | mA |
| 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} | 3.5 | 5.5 | 7.5 | V |
| Collector to Emitter Saturation Voltage | V _{CE(sat)} | I _C = 40 A, V _{GE} = 15 V | - | 2.6 | 3.2 | V |
| | | I _C = 40 A, V _{GE} = 15 V, T _C = 125°C | - | 2.9 | - | V |
| | | I _C = 64 A, V _{GE} = 15 V | - | 3.15 | - | V |

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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 | – | 3200 | – | pF |
| Output Capacitance | C _{oes} | | – | 370 | – | pF |
| Reverse Transfer Capacitance | C _{res} | | – | 125 | – | pF |

SWITCHING CHARACTERISTICS

| | | | | | | |
|--------------------------|---------------------|--|---|-----|------|----|
| Turn-On Delay Time | t _{d(on)} | V _{CC} = 600 V, I _C = 40 A, R _G = 5 Ω, V _{GE} = 15 V, Inductive Load, T _C = 25°C | – | 15 | – | ns |
| Rise Time | t _r | | – | 20 | – | ns |
| Turn-Off Delay Time | t _{d(off)} | | – | 110 | – | ns |
| Fall Time | t _f | | – | 40 | 80 | ns |
| Turn-On Switching Loss | E _{on} | | – | 2.3 | 3.45 | mJ |
| Turn-Off Switching Loss | E _{off} | | – | 1.1 | 1.65 | mJ |
| Total Switching Loss | E _{ts} | | – | 3.4 | 5.1 | mJ |
| Turn-On Delay Time | t _{d(on)} | V _{CC} = 600 V, I _C = 40 A, R _G = 5 Ω, V _{GE} = 15 V, Inductive Load, T _C = 125°C | – | 20 | – | ns |
| Rise Time | t _r | | – | 25 | – | ns |
| Turn-Off Delay Time | t _{d(off)} | | – | 120 | – | ns |
| Fall Time | t _f | | – | 45 | – | ns |
| Turn-On Switching Loss | E _{on} | | – | 2.5 | – | mJ |
| Turn-Off Switching Loss | E _{off} | | – | 1.8 | – | mJ |
| Total Switching Loss | E _{ts} | | – | 4.3 | – | mJ |
| Total Gate Charge | Q _g | V _{CE} = 600 V, I _C = 40 A, V _{GE} = 15 V | – | 220 | – | nC |
| Gate to Emitter Charge | Q _{ge} | | – | 25 | – | nC |
| Gate to Collector Charge | Q _{gc} | | – | 130 | – | 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.

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TYPICAL PERFORMANCE CHARACTERISTICS

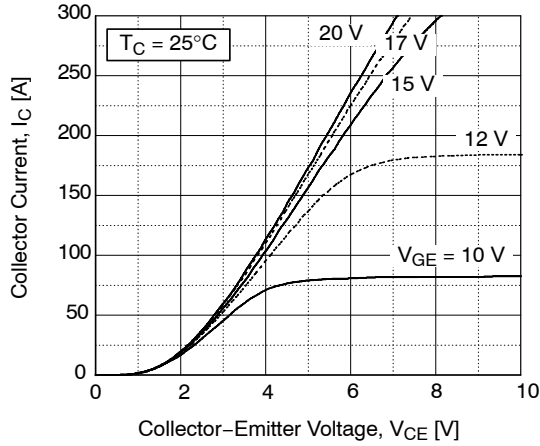


Figure 1. Typical Output Characteristics

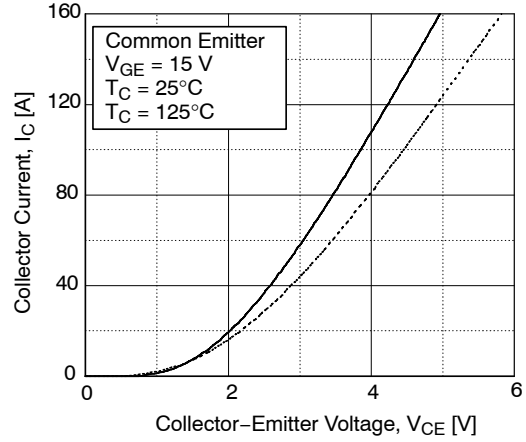


Figure 2. Typical Saturation Voltage Characteristics

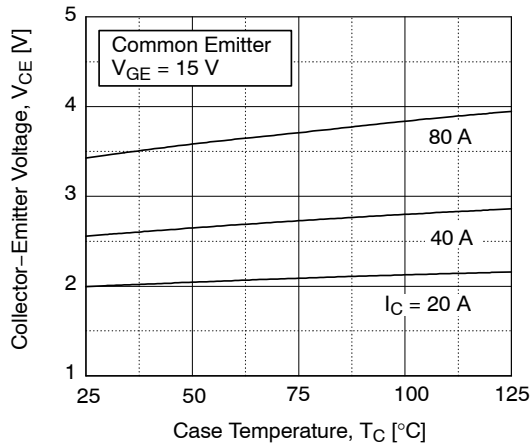


Figure 3. Saturation Voltage vs. Case Temperature at Variant Current Level

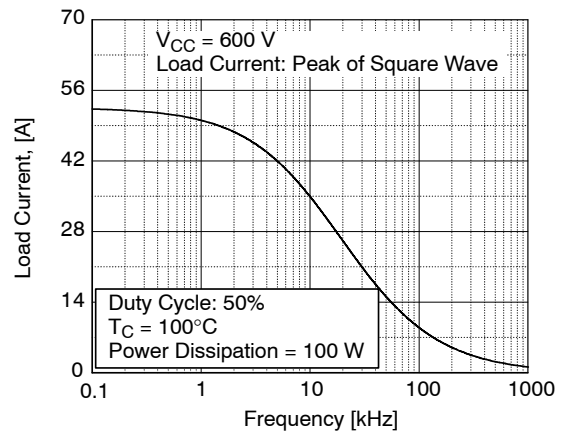


Figure 4. Load Current vs. Frequency

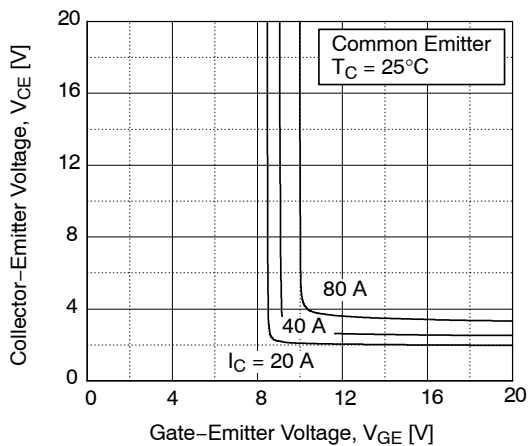


Figure 5. Saturation Voltage vs. V_{GE}

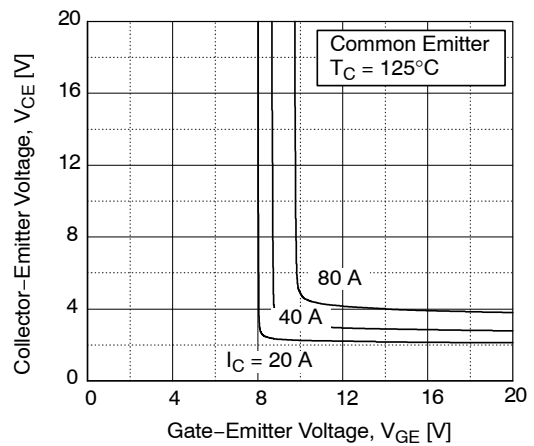


Figure 6. Saturation Voltage vs V_{GE}

TYPICAL PERFORMANCE CHARACTERISTICS (continued)

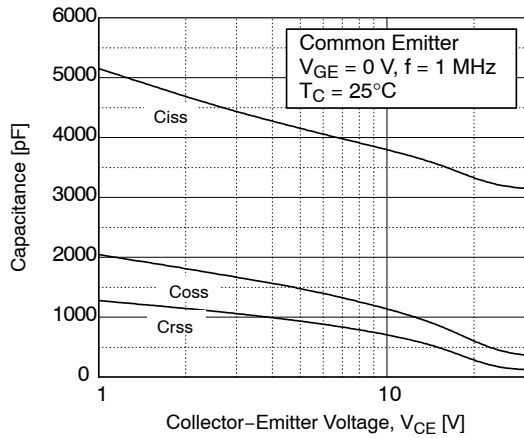


Figure 7. Capacitance Characteristics

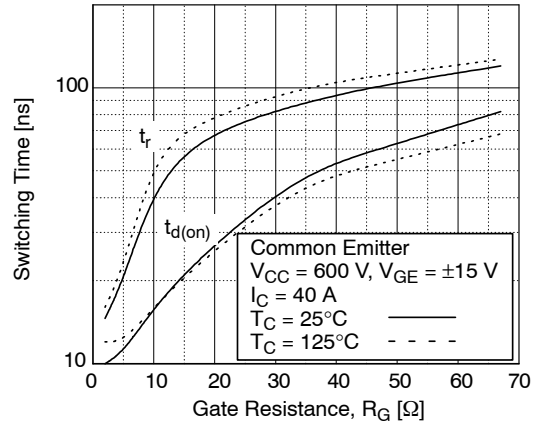


Figure 8. Turn-On Characteristic vs. Gate Resistance

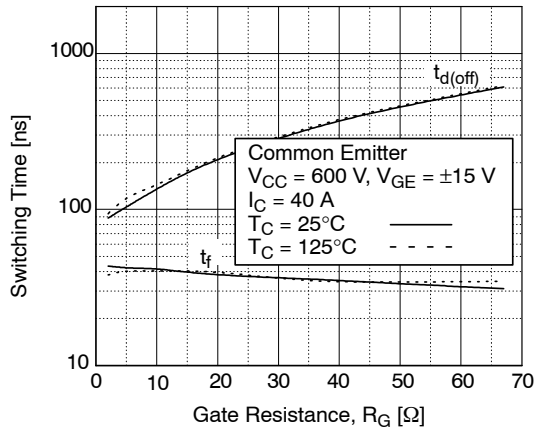


Figure 9. Turn-Off Characteristics vs. Gate Resistance

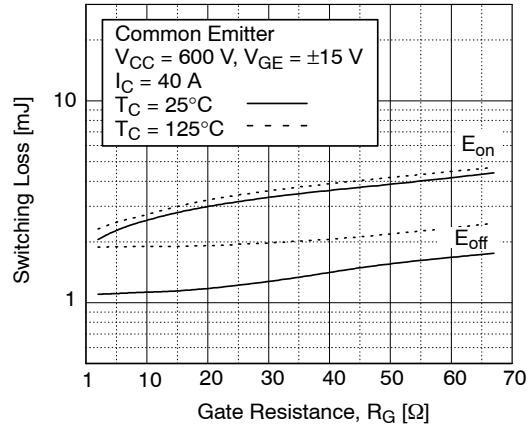


Figure 10. Switching Loss vs. Gate Resistance

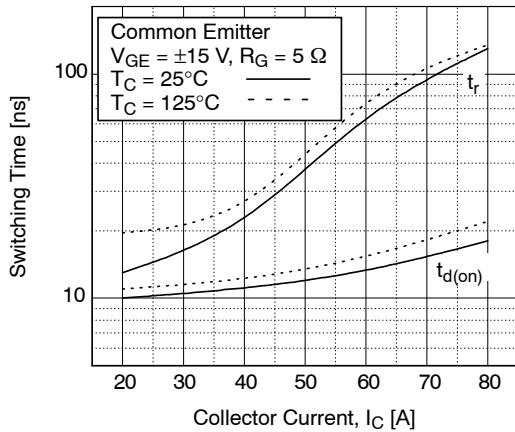


Figure 11. Turn-On Characteristics vs. Collector Current

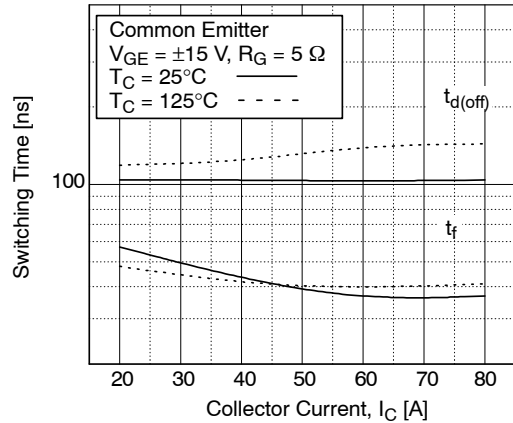


Figure 12. Turn-Off Characteristics vs. Collector Current

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TYPICAL PERFORMANCE CHARACTERISTICS (continued)

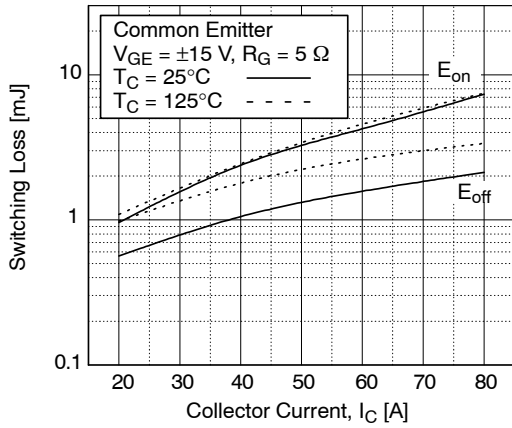


Figure 13. Switching Loss vs. Collector Current

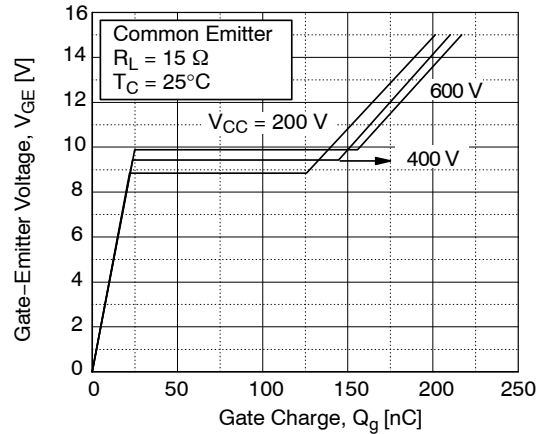


Figure 14. Gate Charge Characteristics

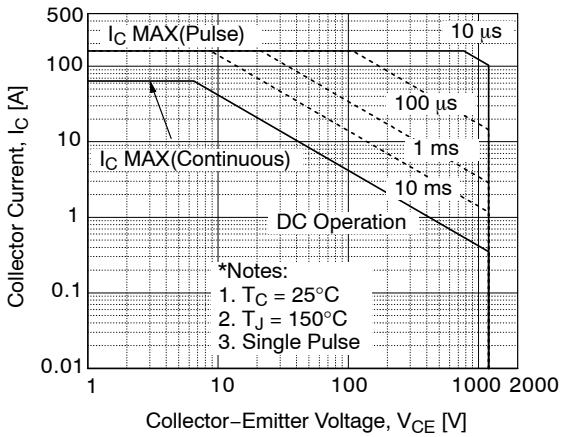


Figure 15. SOA Characteristics

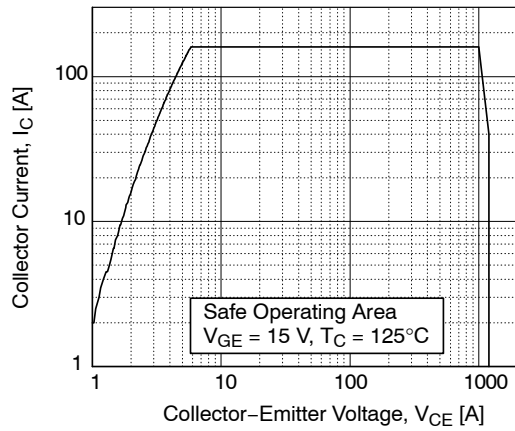


Figure 16. Turn-Off SOA

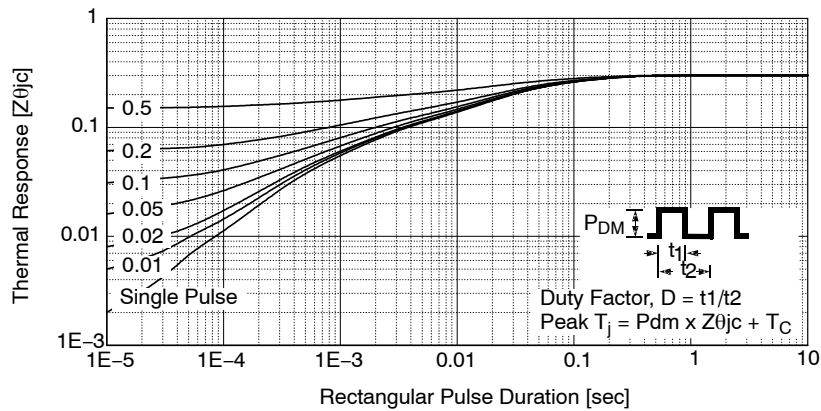
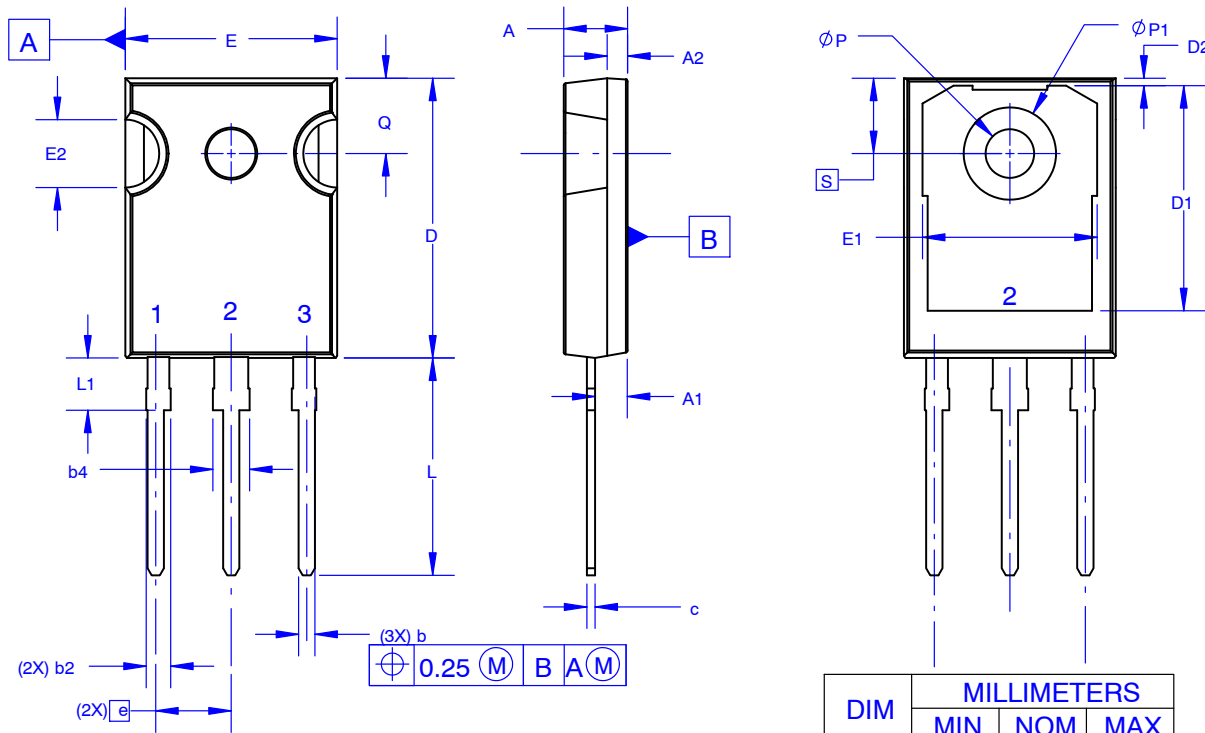


Figure 17. Transient Thermal Impedance of IGBT

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 |
| 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 |

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

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