

FGA20S120M

1200V, 20A ShortedAnode™ IGBT

Features

- High speed switching
- Low saturation voltage: $V_{CE(sat)} = 1.55V @ I_C = 20A$
- High input impedance
- RoHS compliant

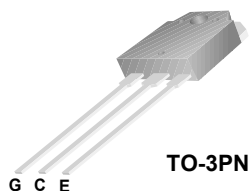
Applications

- Induction Heating and Microwave Oven
- Soft switching Application

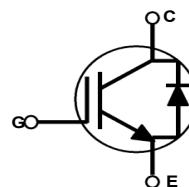


General Description

Using advanced Field Stop Trench and ShortedAnode technology, Fairchild's 1200V ShortedAnode™ Trench IGBTs offer superior conduction and switching performances, and easy parallel operation with exceptional avalanche capability. This device is designed for Induction Heating and Microwave Oven.



TO-3PN



Absolute Maximum Ratings $T_C = 25^\circ C$ unless otherwise noted

| Symbol | Description | Ratings | Units |
|-------------|---|-------------|------------|
| V_{CES} | Collector to Emitter Voltage | 1200 | V |
| V_{GES} | Gate to Emitter Voltage | ± 25 | V |
| I_C | Collector Current @ $T_C = 25^\circ C$ | 40 | A |
| | Collector Current @ $T_C = 100^\circ C$ | 20 | A |
| $I_{CM(1)}$ | Pulsed Collector Current | 60 | A |
| I_F | Diode Continuous Forward Current @ $T_C = 25^\circ C$ | 40 | A |
| | Diode Continuous Forward Current @ $T_C = 100^\circ C$ | 20 | A |
| P_D | Maximum Power Dissipation @ $T_C = 25^\circ C$ | 348 | W |
| | Maximum Power Dissipation @ $T_C = 100^\circ C$ | 174 | W |
| T_J | Operating Junction Temperature | -55 to +175 | $^\circ C$ |
| T_{stg} | Storage Temperature Range | -55 to +175 | $^\circ C$ |
| T_L | Maximum Lead Temp. for soldering Purposes, 1/8" from case for 5 seconds | 300 | $^\circ C$ |

Thermal Characteristics

| Symbol | Parameter | Typ. | Max. | Units |
|------------------------|---|------|------|--------------|
| $R_{\theta JC}(IGBT)$ | Thermal Resistance, Junction to Case | -- | 0.43 | $^\circ C/W$ |
| $R_{\theta JC}(Diode)$ | Thermal Resistance, Junction to Case | -- | 0.43 | $^\circ C/W$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient | -- | 40 | $^\circ C/W$ |

Notes:
1: Limited by T_{jmax}

Package Marking and Ordering Information

| Device Marking | Device | Package | Reel Size | Tape Width | Quantity |
|----------------|------------|---------|-----------|------------|----------|
| FGA20S120M | FGA20S120M | TO-3PN | - | - | 30 |

Electrical Characteristics of the IGBT T_C = 25°C unless otherwise noted

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Units |
|----------------------------------|---|---|------|------|------|-------|
| Off Characteristics | | | | | | |
| BV _{CES} | Collector to Emitter Breakdown Voltage | V _{GE} = 0V, I _C = 2mA | 1200 | - | - | V |
| I _{CES} | Collector Cut-Off Current | V _{CE} = V _{CES} , V _{GE} = 0V | - | - | 1 | mA |
| I _{GES} | G-E Leakage Current | V _{GE} = V _{GES} , V _{CE} = 0V | - | - | ±250 | nA |
| On Characteristics | | | | | | |
| V _{GE(th)} | G-E Threshold Voltage | I _C = 20mA, V _{CE} = V _{GE} | 4.5 | 6.0 | 7.5 | V |
| V _{CE(sat)} | Collector to Emitter Saturation Voltage | I _C = 20A, V _{GE} = 15V T _C = 25°C | - | 1.55 | 1.85 | V |
| | | I _C = 20A, V _{GE} = 15V, T _C = 125°C | - | 1.75 | - | V |
| | | I _C = 20A, V _{GE} = 15V, T _C = 175°C | - | 1.85 | - | V |
| V _{FM} | Diode Forward Voltage | I _F = 20A, T _C = 25°C | -- | 1.7 | 2.2 | V |
| | | I _F = 20A, T _C = 175°C | -- | 2.1 | - | V |
| Dynamic Characteristics | | | | | | |
| C _{ies} | Input Capacitance | V _{CE} = 30V, V _{GE} = 0V, f = 1MHz | -- | 2680 | -- | pF |
| C _{oes} | Output Capacitance | | -- | 53 | -- | pF |
| C _{res} | Reverse Transfer Capacitance | | -- | 43 | -- | pF |
| Switching Characteristics | | | | | | |
| t _{d(on)} | Turn-On Delay Time | V _{CC} = 600V, I _C = 20A, R _G = 10Ω, V _{GE} = 15V, Resistive Load, T _C = 25°C | - | 43 | - | ns |
| t _r | Rise Time | | - | 176 | - | ns |
| t _{d(off)} | Turn-Off Delay Time | | - | 310 | - | ns |
| t _f | Fall Time | | - | 320 | 480 | ns |
| E _{on} | Turn-On Switching Loss | | - | 0.52 | - | mJ |
| E _{off} | Turn-Off Switching Loss | | - | 1.43 | 2.15 | mJ |
| E _{ts} | Total Switching Loss | | - | 1.95 | - | mJ |
| t _{d(on)} | Turn-On Delay Time | V _{CC} = 600V, I _C = 20A, R _G = 10Ω, V _{GE} = 15V, Resistive Load, T _C = 175°C | - | 41 | - | ns |
| t _r | Rise Time | | - | 260 | - | ns |
| t _{d(off)} | Turn-Off Delay Time | | - | 345 | - | ns |
| t _f | Fall Time | | - | 520 | - | ns |
| E _{on} | Turn-On Switching Loss | | - | 0.78 | - | mJ |
| E _{off} | Turn-Off Switching Loss | | - | 1.97 | - | mJ |
| E _{ts} | Total Switching Loss | | - | 2.75 | - | mJ |
| Q _g | Total Gate Charge | V _{CE} = 600V, I _C = 20A, V _{GE} = 15V | - | 208 | - | nC |
| Q _{ge} | Gate to Emitter Charge | | - | 18 | - | nC |
| Q _{gc} | Gate to Collector Charge | | - | 119 | - | nC |

Typical Performance Characteristics

Figure 1. Typical Output Characteristics

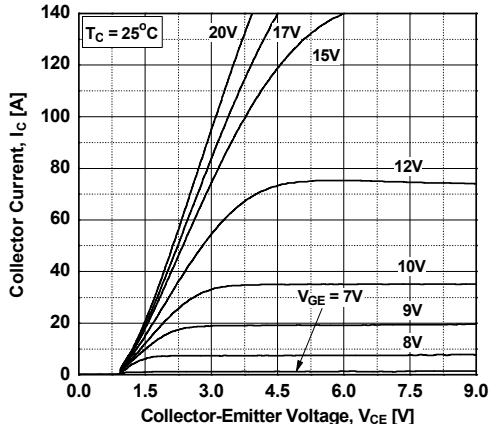


Figure 2. Typical Output Characteristics

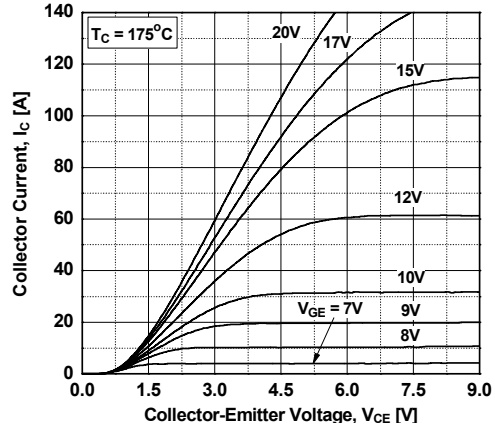


Figure 3. Typical Saturation Voltage Characteristics

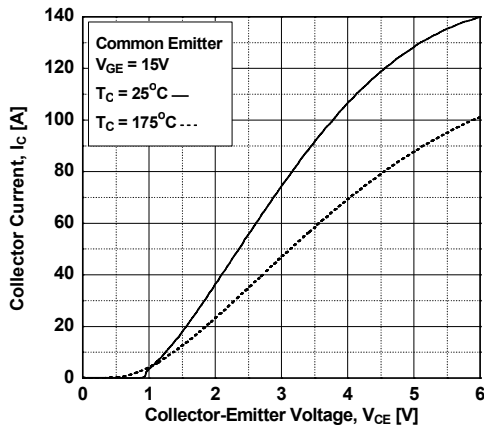


Figure 4. Transfer Characteristics

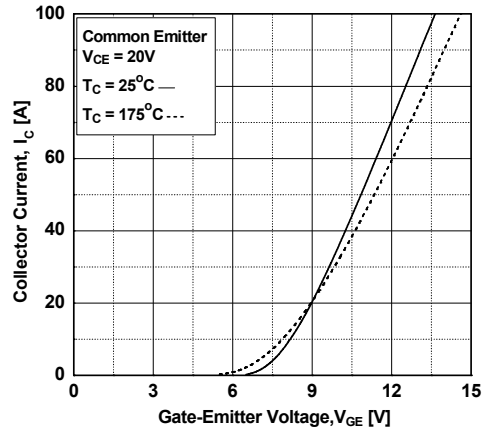


Figure 5. Saturation Voltage vs. Case Temperature at Variant Current Level

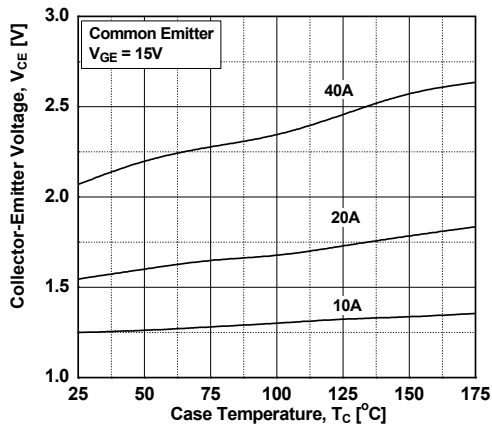
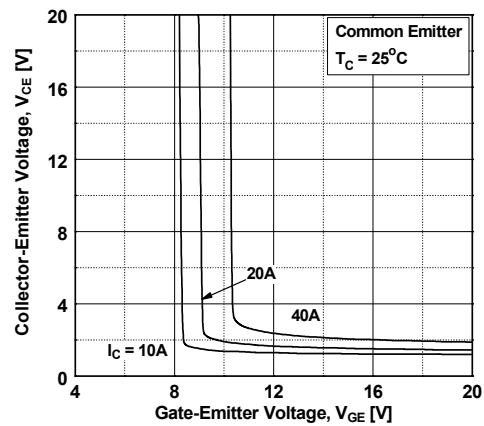


Figure 6. Saturation Voltage vs. Vge



Typical Performance Characteristics

Figure 7. Saturation Voltage vs. V_{GE}

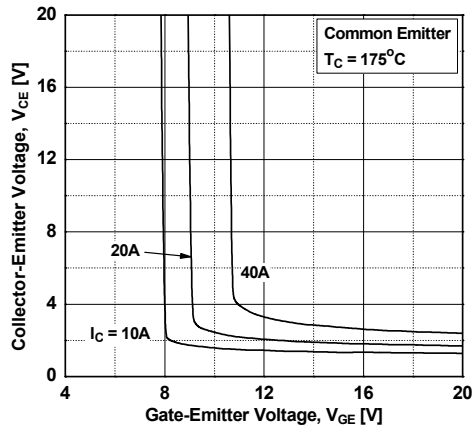


Figure 8. Capacitance Characteristics

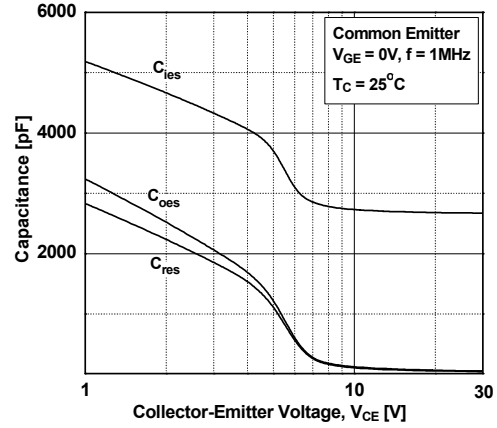


Figure 9. Gate Charge Characteristics

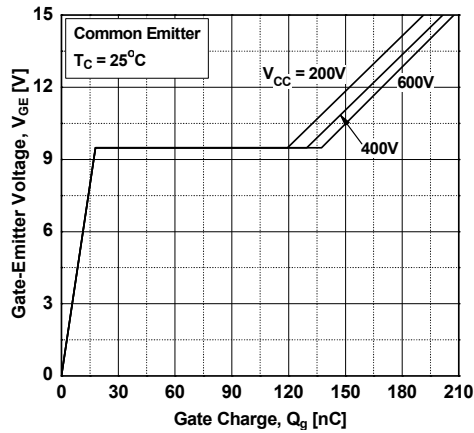


Figure 10. SOA Characteristics

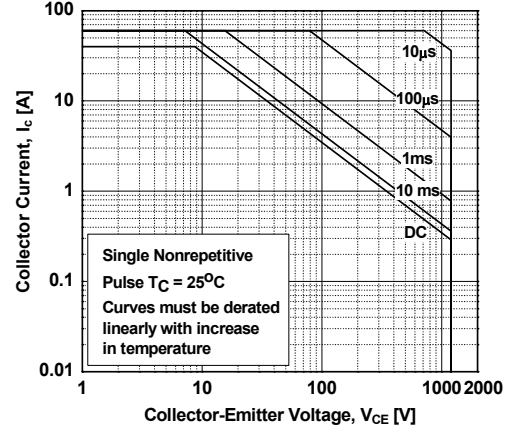


Figure 11. Turn-On Characteristics vs. Gate Resistance

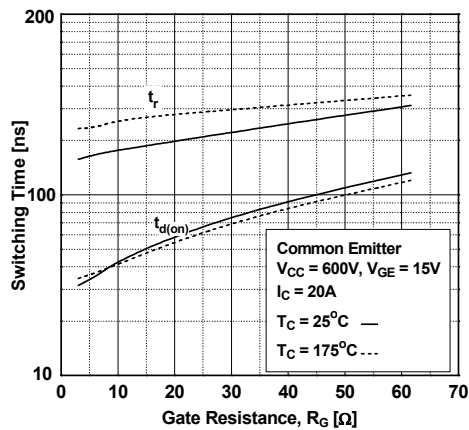
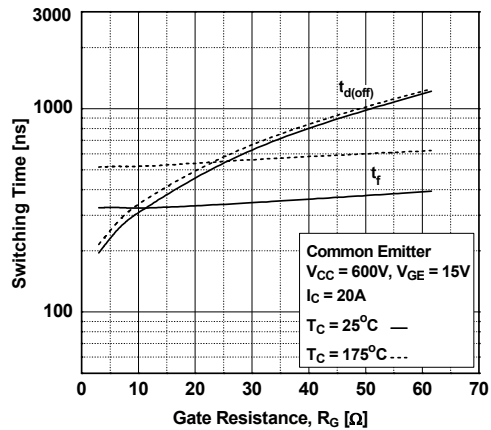


Figure 12. Turn-Off Characteristics vs. Gate Resistance



Typical Performance Characteristics

Figure 13. Turn-On Characteristics vs. Collector Current

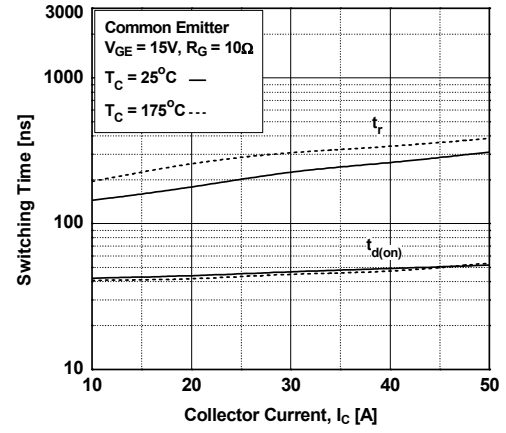


Figure 14. Turn-off Characteristics vs. Collector Current

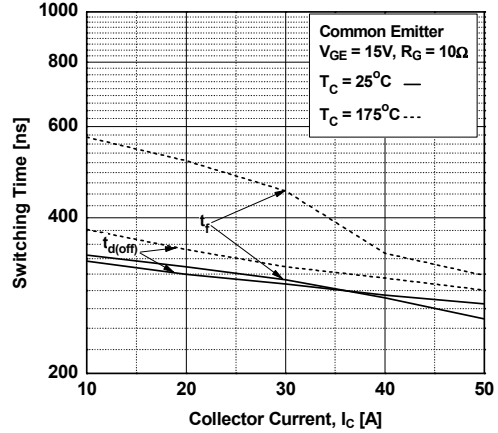


Figure 15. Switching Loss vs. Gate resistance

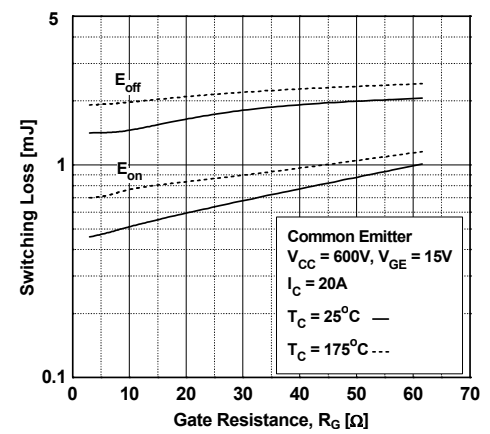


Figure 16. Switching Loss vs. Collector Current

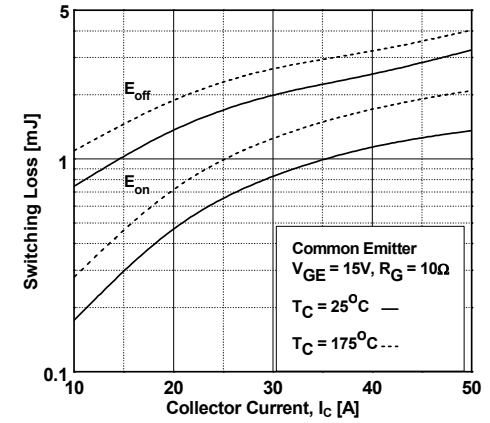


Figure 17. Turn-Off Switching SOA Characteristics Collector Current

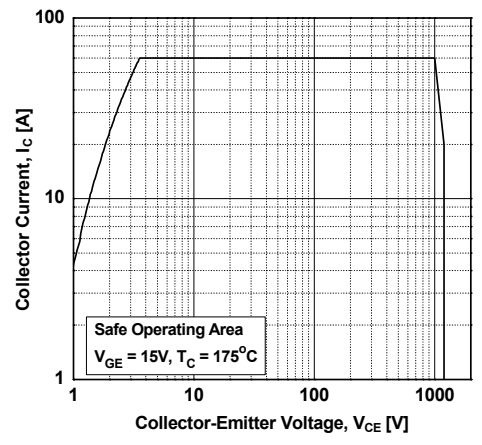


Figure 18. Diode Forward Characteristics

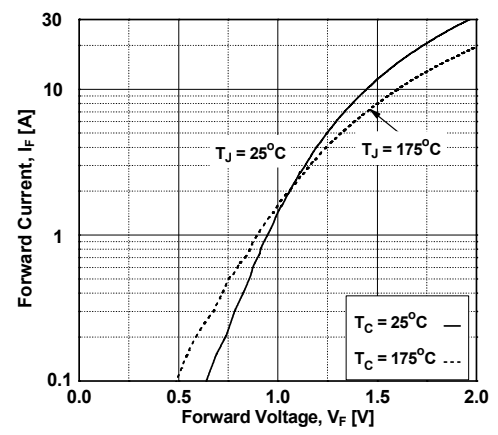
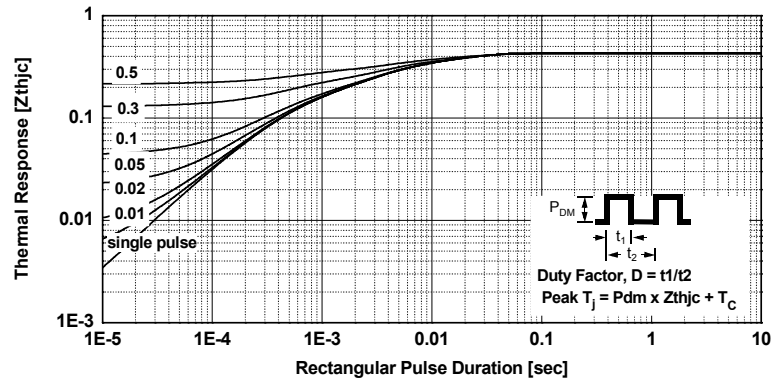
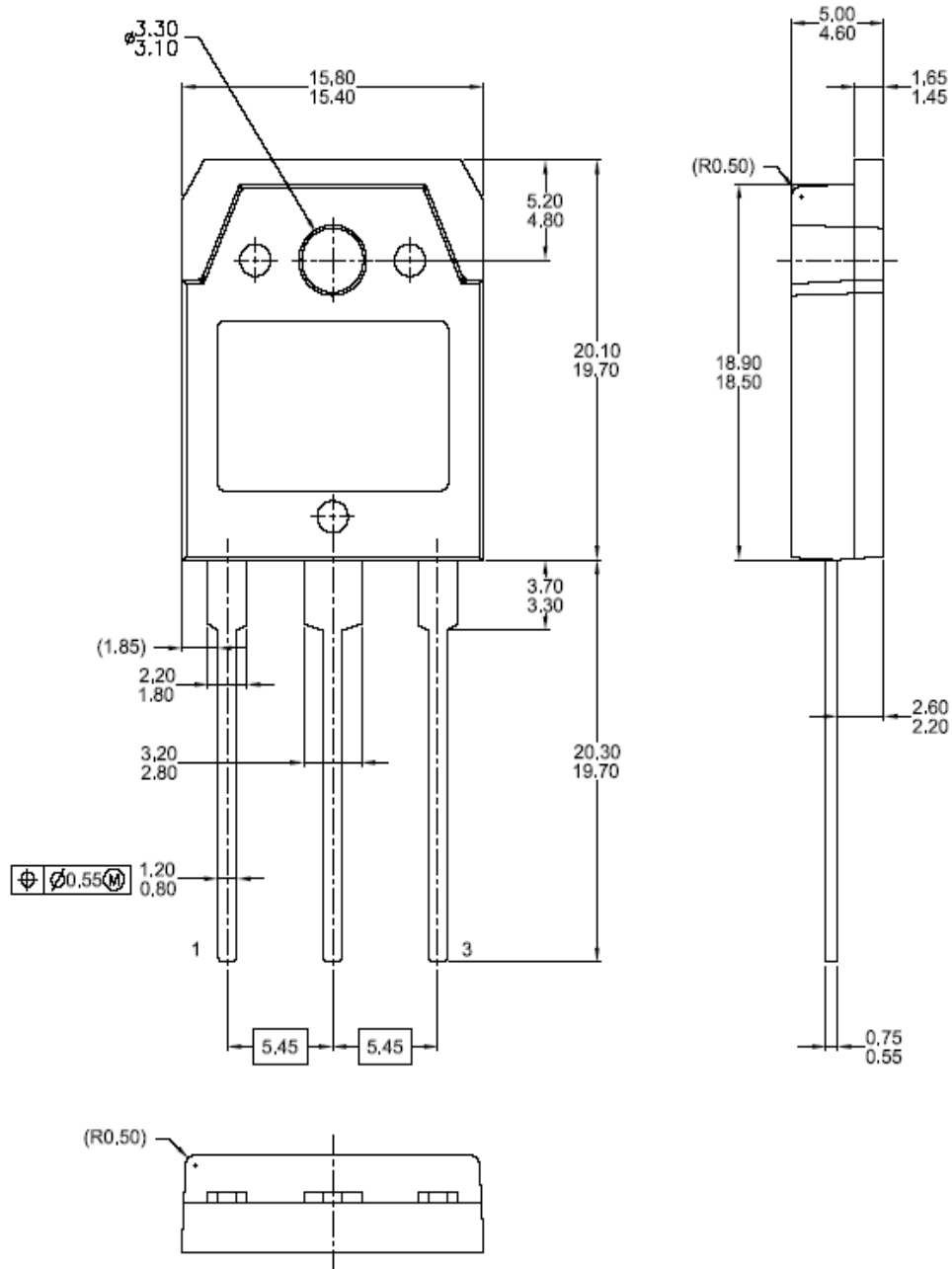


Figure 19. Transient Thermal Impedance of IGBT



Mechanical Dimensions

TO-3PN



Dimensions in Millimeters



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