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August 2011



FGA70N33BTD 330V, 70A PDP IGBT

Features

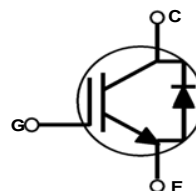
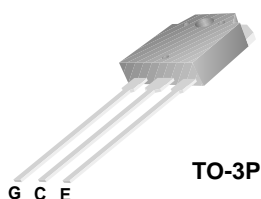
- High current capability
- Low saturation voltage: $V_{CE(sat)} = 1.7V @ I_C = 70A$
- High input impedance
- Fast switching
- RoHS Compliant

General Description

Using Novel Trench IGBT Technology, Fairchild's new series of trench IGBTs offer the optimum performance for PDP applications where low conduction and switching losses are essential.

Applications

- PDP System



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

| Symbol | Description | Ratings | Units |
|-------------------|--|-------------|------------|
| V_{CES} | Collector to Emitter Voltage | 330 | V |
| V_{GES} | Gate to Emitter Voltage | ± 30 | V |
| $I_{Cpulse(1)*}$ | Pulsed Collector Current @ $T_C = 25^\circ C$ | 160 | A |
| $I_{C pulse(2)*}$ | Pulsed Collector Current @ $T_C = 25^\circ C$ | 220 | A |
| P_D | Maximum Power Dissipation @ $T_C = 25^\circ C$ | 149 | W |
| | Maximum Power Dissipation @ $T_C = 100^\circ C$ | 60 | W |
| V_{RRM} | Peak Repetitive Reverse Voltage of Diode | 330 | V |
| $I_{F(AV)}$ | Average Rectified Forward Current of diode @ $T_C = 100^\circ C$ | 10 | A |
| I_{FSM} | Non-repetitive Peak Surge Current of diode 60Hz Single Half-Sine wave | 100 | A |
| T_J, T_{stg} | Operating Junction Temperature and Storage Temperature | -55 to +150 | $^\circ C$ |
| 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 | -- | 0.84 | $^\circ C/W$ |
| $R_{\theta JC}(Diode)$ | Thermal Resistance, Junction to Case | -- | 1.16 | $^\circ C/W$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient | -- | 40 | $^\circ C/W$ |

Notes:

- 1: Repetitive test, Pulse width=100usec, Duty=0.1
 - 2: Half Sine Wave, D< 0.01, pulse width < 5usec
- * I_{C_pulse} limited by max T_J

Package Marking and Ordering Information

| Device Marking | Device | Package | Packaging Type | Qty per Tube | Max Qty per Box |
|----------------|--------------|---------|----------------|--------------|-----------------|
| FGA70N33BTD | FGA70N33BTDU | TO-3P | Tube | 30ea | -- |

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

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Units |
|-------------------------------------|--|---|------|------|-----------|---------|
| Off Characteristics | | | | | | |
| V_{CES} | Collector to Emitter Breakdown Voltage | $V_{GE} = 0V, I_C = 250\mu A$ | 330 | -- | -- | V |
| $\frac{\Delta V_{CES}}{\Delta T_J}$ | Temperature Coefficient of Breakdown Voltage | $V_{GE} = 0V, I_C = 250\mu A$ | -- | 0.3 | -- | V/°C |
| I_{CES} | Collector Cut-Off Current | $V_{CE} = V_{CES}, V_{GE} = 0V$ | -- | -- | 250 | μA |
| I_{GES} | G-E Leakage Current | $V_{GE} = V_{GES}, V_{CE} = 0V$ | -- | -- | ± 400 | nA |
| On Characteristics | | | | | | |
| $V_{GE(th)}$ | G-E Threshold Voltage | $I_C = 250\mu A, V_{CE} = V_{GE}$ | 2.3 | 3.3 | 4.3 | V |
| $V_{CE(sat)}$ | Collector to Emitter Saturation Voltage | $I_C = 20A, V_{GE} = 15V$ | -- | 1.1 | -- | V |
| | | $I_C = 40A, V_{GE} = 15V,$ | -- | 1.4 | -- | V |
| | | $I_C = 70A, V_{GE} = 15V, T_C = 25^\circ C$ | -- | 1.7 | -- | V |
| | | $I_C = 70A, V_{GE} = 15V, T_C = 125^\circ C$ | -- | 1.8 | -- | V |
| Dynamic Characteristics | | | | | | |
| C_{ies} | Input Capacitance | $V_{CE} = 30V, V_{GE} = 0V, f = 1MHz$ | -- | 1380 | -- | pF |
| C_{oes} | Output Capacitance | | -- | 140 | -- | pF |
| C_{res} | Reverse Transfer Capacitance | | -- | 60 | -- | pF |
| Switching Characteristics | | | | | | |
| $t_{d(on)}$ | Turn-On Delay Time | $V_{CC} = 200V, I_C = 20A, R_G = 5\Omega, V_{GE} = 15V, \text{Resistive Load}, T_C = 25^\circ C$ | -- | 13 | -- | ns |
| t_r | Rise Time | | -- | 26 | -- | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | -- | 46 | -- | ns |
| t_f | Fall Time | | -- | 198 | -- | ns |
| $t_{d(on)}$ | Turn-On Delay Time | $V_{CC} = 200V, I_C = 20A, R_G = 5\Omega, V_{GE} = 15V, \text{Resistive Load}, T_C = 125^\circ C$ | -- | 13 | -- | ns |
| t_r | Rise Time | | -- | 28 | -- | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | -- | 48 | -- | ns |
| t_f | Fall Time | | -- | 268 | -- | ns |
| Q_g | Total Gate Charge | $V_{CE} = 200V, I_C = 20A, V_{GE} = 15V$ | -- | 49 | -- | nC |
| Q_{ge} | Gate to Emitter Charge | | -- | 6.8 | -- | nC |
| Q_{gc} | Gate to Collector Charge | | -- | 17.5 | -- | nC |

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

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max | Units | |
|-----------------|-------------------------------------|---------------------------------------|------------------------|------|------|-------|----|
| V _{FM} | Diode Forward Voltage | I _F = 10A | T _C = 25°C | -- | 1.1 | 1.5 | V |
| | | | T _C = 125°C | -- | 0.95 | -- | |
| t _{rr} | Diode Reverse Recovery Time | I _F = 10A, di/dt = 200A/μs | T _C = 25°C | -- | 23 | -- | ns |
| | | | T _C = 125°C | -- | 36 | -- | |
| I _{rr} | Diode Peak Reverse Recovery Current | I _F = 10A, di/dt = 200A/μs | T _C = 25°C | -- | 2.8 | -- | A |
| | | | T _C = 125°C | -- | 5.1 | -- | |
| Q _{rr} | Diode Reverse Recovery Charge | I _F = 10A, di/dt = 200A/μs | T _C = 25°C | -- | 32 | -- | nC |
| | | | T _C = 125°C | -- | 91 | -- | |

Typical Performance Characteristics

Figure 1. Typical Output Characteristics

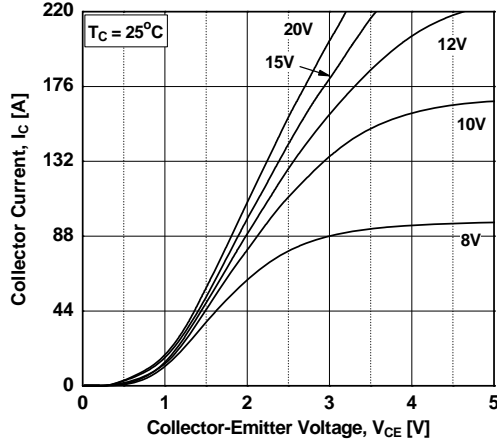


Figure 2. Typical Output Characteristics

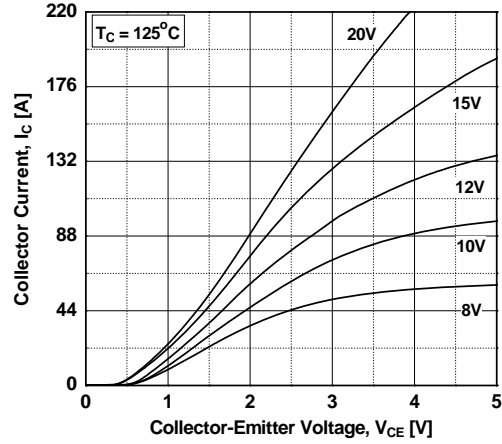


Figure 3. Typical Saturation Voltage Characteristics

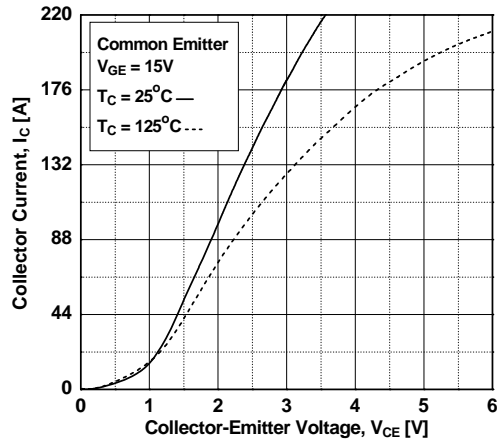


Figure 4. Transfer Characteristics

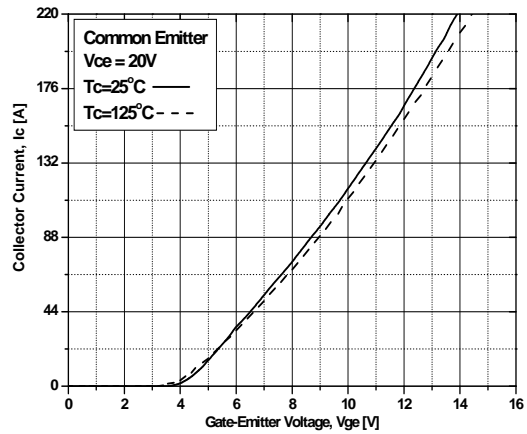


Figure 5. Saturation Voltage vs. Case Temperature at Variant Current Level

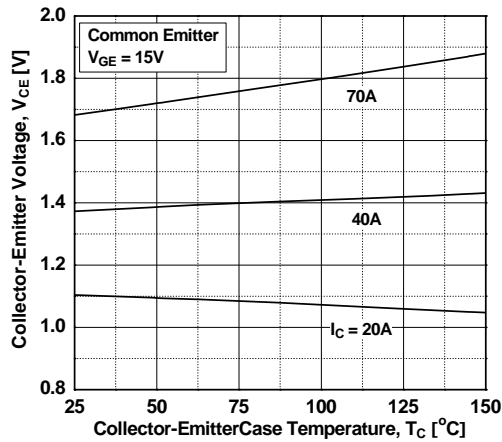
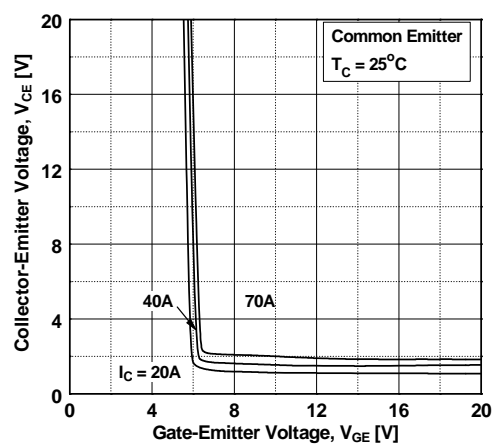


Figure 6. Saturation Voltage vs. V_{GE}



Typical Performance Characteristics

Figure 7. Saturation Voltage vs. V_{GE}

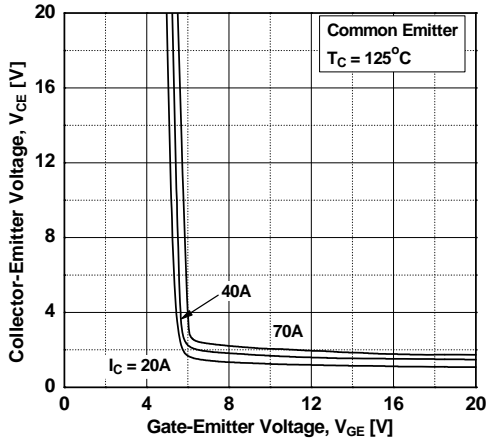


Figure 8. Capacitance Characteristics

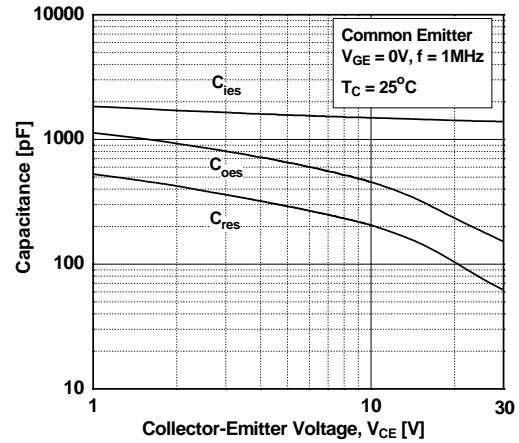


Figure 9. Gate charge Characteristics

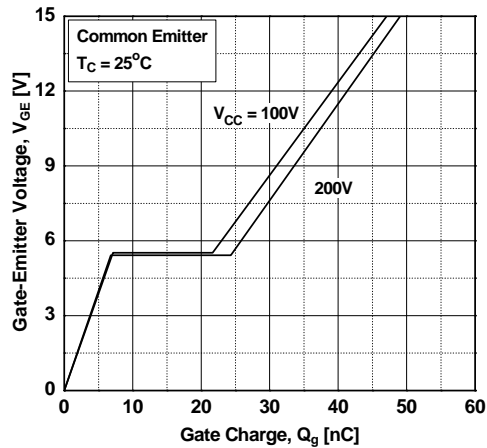


Figure 10. SOA Characteristics

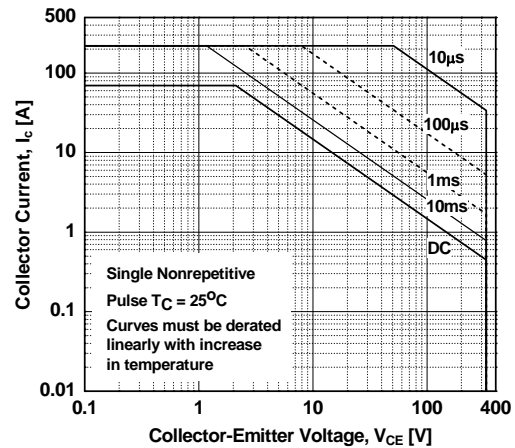


Figure 11. Turn-on Characteristics vs. Gate Resistance

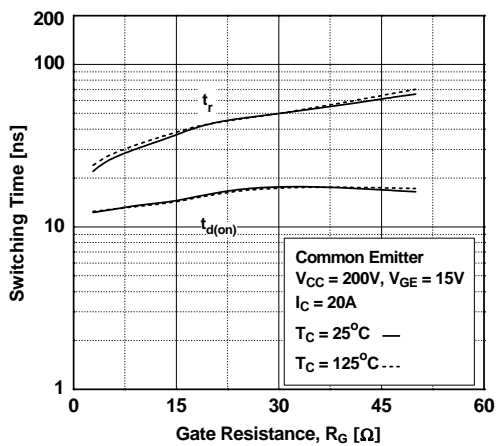
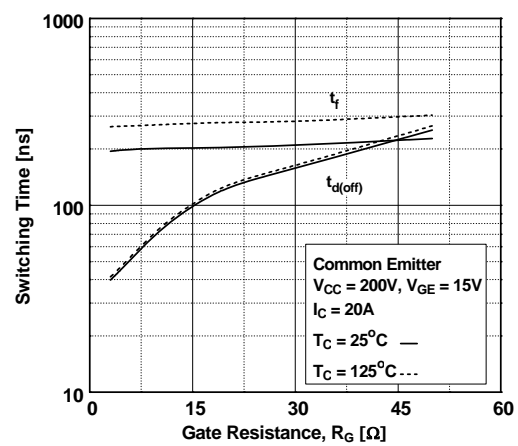


Figure 12. Turn-off Characteristics vs. Gate Resistance



Typical Performance Characteristics

Figure 13. Turn-on Characteristics vs. Collector Current

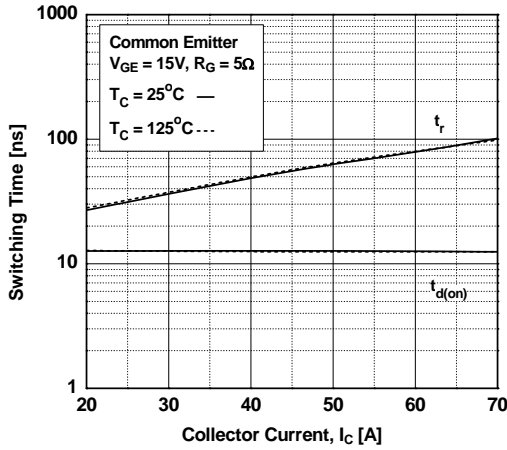


Figure 14. Turn-off Characteristics vs. Collector Current

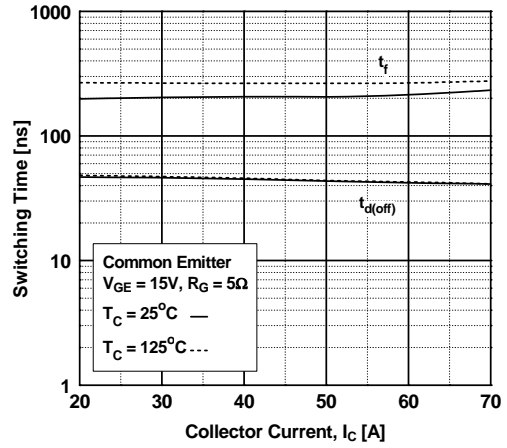


Figure 15. Switching Loss vs. Gate Resistance

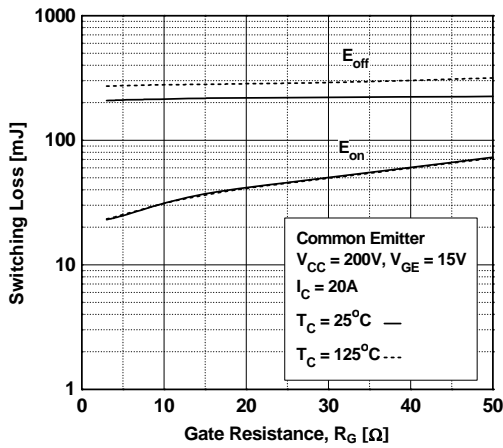


Figure 16. Switching Loss vs. Collector Current

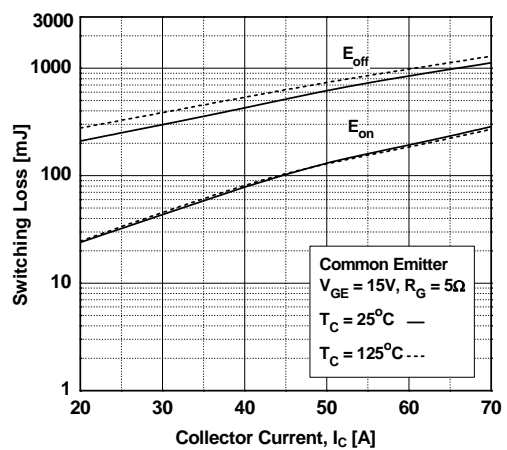
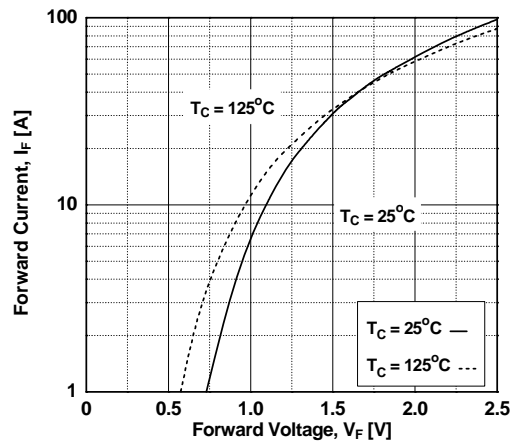
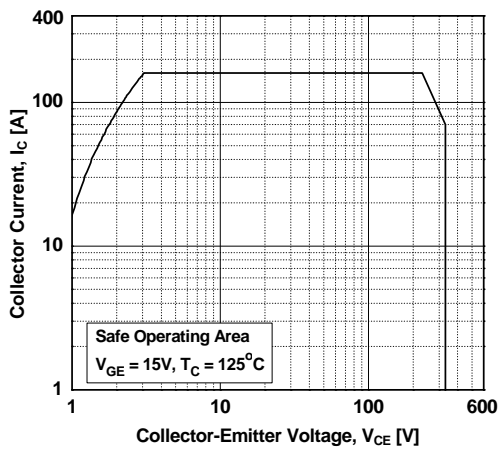


Figure 17. Turn off Switching SOA Characteristics **Figure 18. Forward Characteristics**



Typical Performance Characteristics

Figure 19. Reverse Recovery Current

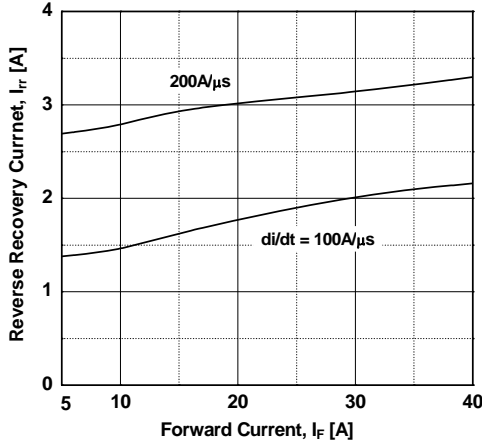


Figure 20. Stored Charge

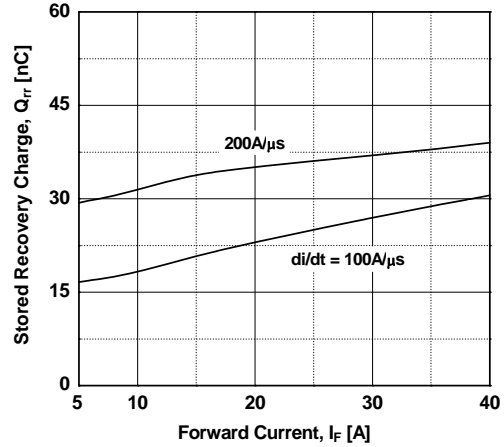


Figure 21. Reverse Recovery Time

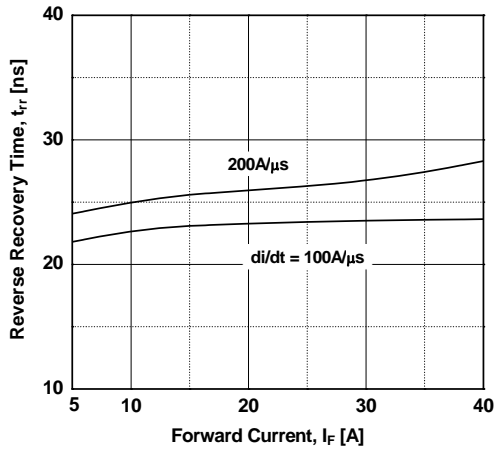
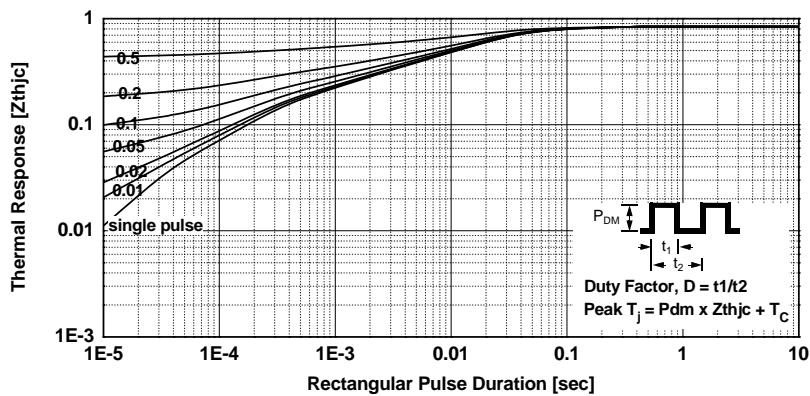
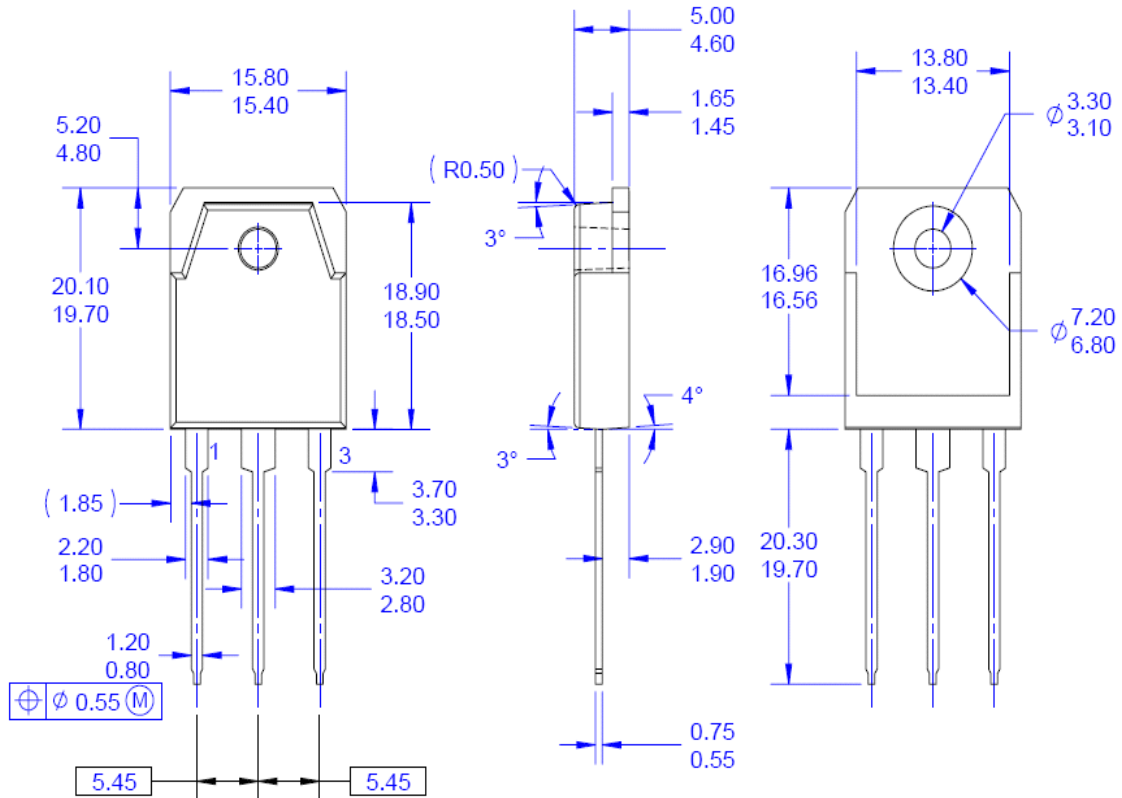


Figure 22. Transient Thermal Impedance of IGBT



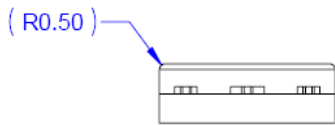
Mechanical Dimensions

TO-3PN



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