



**THE DATASHEET OF
FGA25N120ANTDTU**





ON Semiconductor®

FGA25N120ANTDTU

1200 V, 25 A NPT Trench IGBT

Features

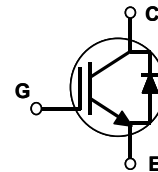
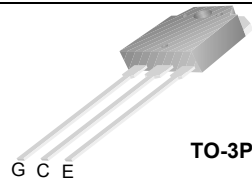
- NPT Trench Technology, Positive Temperature Coefficient
- Low Saturation Voltage: $V_{CE(sat), typ} = 2.0\text{ V}$
@ $I_C = 25\text{ A}$ and $T_C = 25^\circ\text{C}$
- Low Switching Loss: $E_{off, typ} = 0.96\text{ mJ}$
@ $I_C = 25\text{ A}$ and $T_C = 25^\circ\text{C}$
- Extremely Enhanced Avalanche Capability

Description

Using ON Semiconductor's proprietary trench design and advanced NPT technology, the 1200V NPT IGBT offers superior conduction and switching performances, high avalanche ruggedness and easy parallel operation. This device is well suited for the resonant or soft switching application such as induction heating, microwave oven.

Applications

- Induction Heating, Microwave Oven



Absolute Maximum Ratings

| Symbol | Description | | Ratings | Unit |
|-------------|--|-----------------------------|-------------|------------------|
| V_{CES} | Collector-Emitter Voltage | | 1200 | V |
| V_{GES} | Gate-Emitter Voltage | | ± 20 | V |
| I_C | Collector Current | @ $T_C = 25^\circ\text{C}$ | 50 | A |
| | Collector Current | @ $T_C = 100^\circ\text{C}$ | 25 | A |
| $I_{CM(1)}$ | Pulsed Collector Current | | 90 | A |
| I_F | Diode Continuous Forward Current | @ $T_C = 25^\circ\text{C}$ | 50 | A |
| | Diode Continuous Forward Current | @ $T_C = 100^\circ\text{C}$ | 25 | A |
| I_{FM} | Diode Maximum Forward Current | | 150 | A |
| P_D | Maximum Power Dissipation | @ $T_C = 25^\circ\text{C}$ | 312 | W |
| | Maximum Power Dissipation | @ $T_C = 100^\circ\text{C}$ | 125 | W |
| T_J | Operating Junction Temperature | | -55 to +150 | $^\circ\text{C}$ |
| T_{stg} | Storage Temperature Range | | -55 to +150 | $^\circ\text{C}$ |
| 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

Thermal Characteristics

| Symbol | Parameter | Typ. | Max. | Unit |
|-------------------------------|---|------|------|---------------------------|
| $R_{\theta JC}(\text{IGBT})$ | Thermal Resistance, Junction-to-Case | -- | 0.4 | $^\circ\text{C}/\text{W}$ |
| $R_{\theta JC}(\text{DIODE})$ | Thermal Resistance, Junction-to-Case | -- | 2.0 | $^\circ\text{C}/\text{W}$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambient | -- | 40 | $^\circ\text{C}/\text{W}$ |

Package Marking and Ordering Information

| Part Number | Top Mark | Package | Packing Method | Reel Size | Tape Width | Quantity |
|----------------------|-----------------|---------|----------------|-----------|------------|----------|
| FGA25N120ANTDTU-F109 | FGA25N120ANTDTU | TO-3PN | Tube | N/A | N/A | 30 |

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

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|----------------------------------|---|--|------|------|-------|------|
| Off Characteristics | | | | | | |
| I _{CES} | Collector Cut-Off Current | V _{CE} = V _{CES} , V _{GE} = 0 V | -- | -- | 3 | mA |
| I _{GES} | G-E Leakage Current | V _{GE} = V _{GES} , V _{CE} = 0 V | -- | -- | ± 250 | nA |
| On Characteristics | | | | | | |
| V _{GE(th)} | G-E Threshold Voltage | I _C = 25 mA, V _{CE} = V _{GE} | 3.5 | 5.5 | 7.5 | V |
| V _{CE(sat)} | Collector to Emitter Saturation Voltage | I _C = 25 A, V _{GE} = 15 V | -- | 2.0 | -- | V |
| | | I _C = 25 A, V _{GE} = 15 V, T _C = 125°C | -- | 2.15 | -- | V |
| | | I _C = 50 A, V _{GE} = 15 V | -- | 2.65 | -- | V |
| Dynamic Characteristics | | | | | | |
| C _{ies} | Input Capacitance | V _{CE} = 30 V, V _{GE} = 0 V, f = 1 MHz | -- | 3700 | -- | pF |
| C _{oes} | Output Capacitance | | -- | 130 | -- | pF |
| C _{res} | Reverse Transfer Capacitance | | -- | 80 | -- | pF |
| Switching Characteristics | | | | | | |
| t _{d(on)} | Turn-On Delay Time | V _{CC} = 600 V, I _C = 25 A, R _G = 10 Ω, V _{GE} = 15 V, Inductive Load, T _C = 25°C | -- | 50 | -- | ns |
| t _r | Rise Time | | -- | 60 | -- | ns |
| t _{d(off)} | Turn-Off Delay Time | | -- | 190 | -- | ns |
| t _f | Fall Time | | -- | 100 | -- | ns |
| E _{on} | Turn-On Switching Loss | | -- | 4.1 | -- | mJ |
| E _{off} | Turn-Off Switching Loss | | -- | 0.96 | -- | mJ |
| E _{ts} | Total Switching Loss | | -- | 5.06 | -- | mJ |
| t _{d(on)} | Turn-On Delay Time | V _{CC} = 600 V, I _C = 25 A, R _G = 10Ω, V _{GE} = 15 V, Inductive Load, T _C = 125°C | -- | 50 | -- | ns |
| t _r | Rise Time | | -- | 60 | -- | ns |
| t _{d(off)} | Turn-Off Delay Time | | -- | 200 | -- | ns |
| t _f | Fall Time | | -- | 154 | -- | ns |
| E _{on} | Turn-On Switching Loss | | -- | 4.3 | -- | mJ |
| E _{off} | Turn-Off Switching Loss | | -- | 1.5 | -- | mJ |
| E _{ts} | Total Switching Loss | | -- | 5.8 | -- | mJ |
| Q _g | Total Gate Charge | V _{CE} = 600 V, I _C = 25 A, V _{GE} = 15 V | -- | 200 | -- | nC |
| Q _{ge} | Gate-Emitter Charge | | -- | 15 | -- | nC |
| Q _{gc} | Gate-Collector Charge | | -- | 100 | -- | nC |

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

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit | |
|----------|-------------------------------------|---|---------------------------|------|------|------|----|
| V_{FM} | Diode Forward Voltage | $I_F = 25\text{ A}$ | $T_C = 25^\circ\text{C}$ | -- | 2.0 | 3.0 | V |
| | | | $T_C = 125^\circ\text{C}$ | -- | 2.1 | -- | |
| t_{rr} | Diode Reverse Recovery Time | $I_F = 25\text{ A}$ $di_F/dt = 200\text{ A}/\mu\text{s}$ | $T_C = 25^\circ\text{C}$ | -- | 235 | 350 | ns |
| | | | $T_C = 125^\circ\text{C}$ | -- | 300 | -- | |
| I_{rr} | Diode Peak Reverse Recovery Current | $I_F = 25\text{ A}$ $di_F/dt = 200\text{ A}/\mu\text{s}$ | $T_C = 25^\circ\text{C}$ | -- | 27 | 40 | A |
| | | | $T_C = 125^\circ\text{C}$ | -- | 31 | -- | |
| Q_{rr} | Diode Reverse Recovery Charge | $I_F = 25\text{ A}$ $di_F/dt = 200\text{ A}/\mu\text{s}$ | $T_C = 25^\circ\text{C}$ | -- | 3130 | 4700 | nC |
| | | | $T_C = 125^\circ\text{C}$ | -- | 4650 | -- | |

Typical Performance Characteristics

Figure 1. Typical Output Characteristics

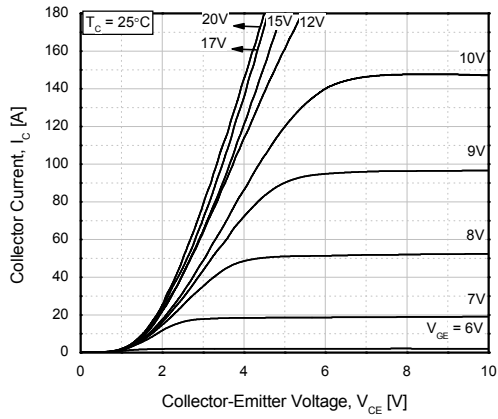


Figure 2. Typical Saturation Voltage Characteristics

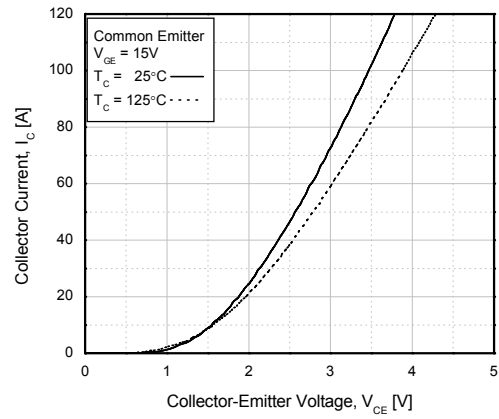


Figure 3. Saturation Voltage vs. Case Temperature at Variant Current Level

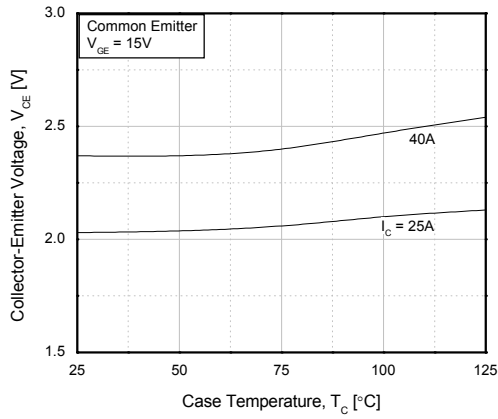


Figure 4. Saturation Voltage vs. V_GE

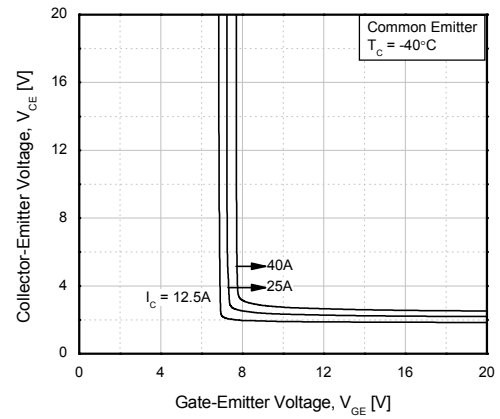


Figure 5. Saturation Voltage vs. V_GE

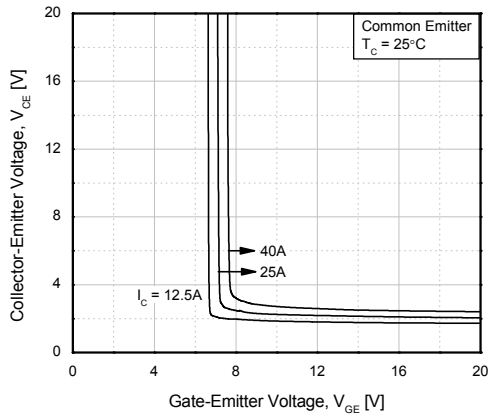
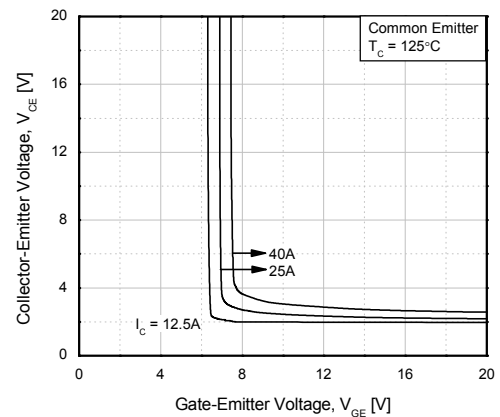


Figure 6. Saturation Voltage vs. V_GE



Typical Performance Characteristics (Continued)

Figure 7. Capacitance Characteristics

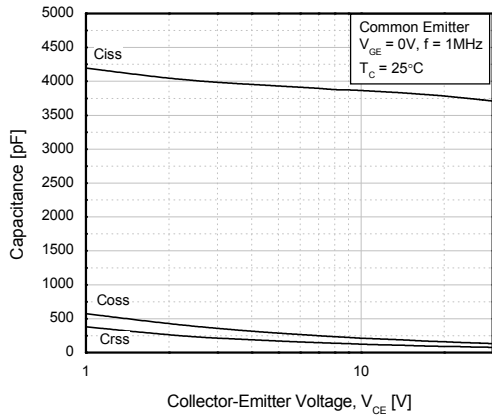


Figure 8. Turn-On Characteristics vs. Gate Resistance

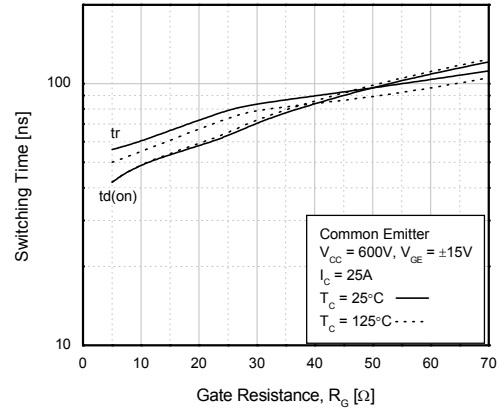


Figure 9. Turn-Off Characteristics vs. Gate Resistance

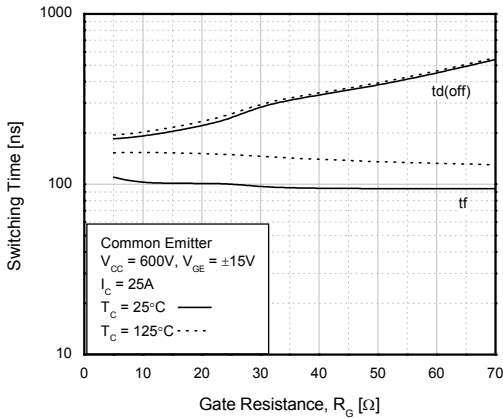


Figure 10. Switching Loss vs. Gate Resistance

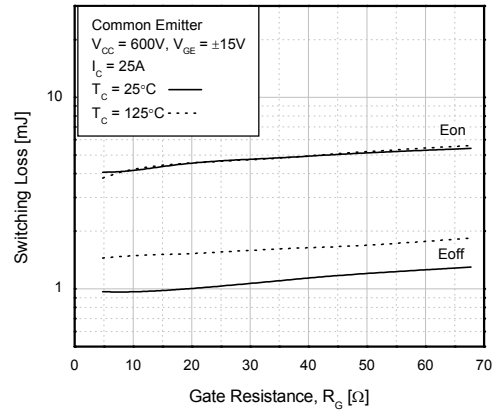


Figure 11. Turn-On Characteristics vs. Collector Current

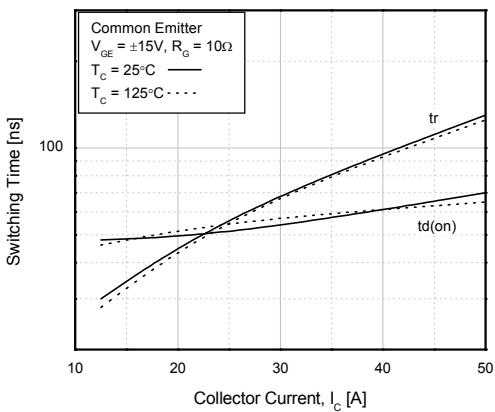
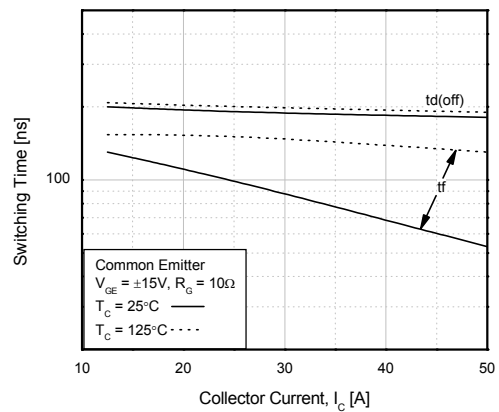


Figure 12. Turn-Off Characteristics vs. Collector Current



Typical Performance Characteristics (Continued)

Figure 13. Switching Loss vs. Collector Current

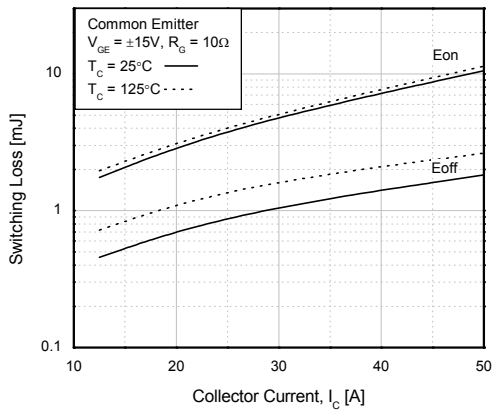


Figure 14. Gate Charge Characteristics

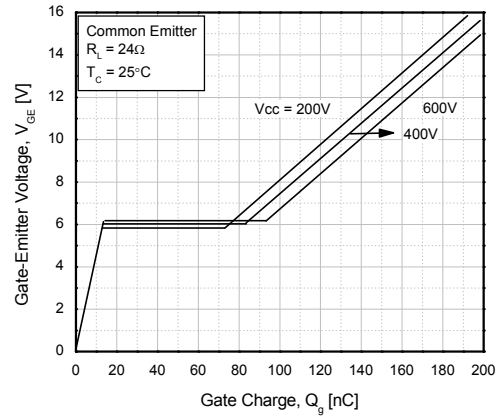


Figure 15. SOA Characteristics

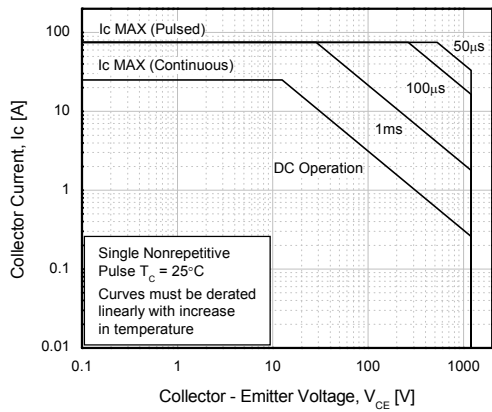


Figure 16. Turn-Off SOA

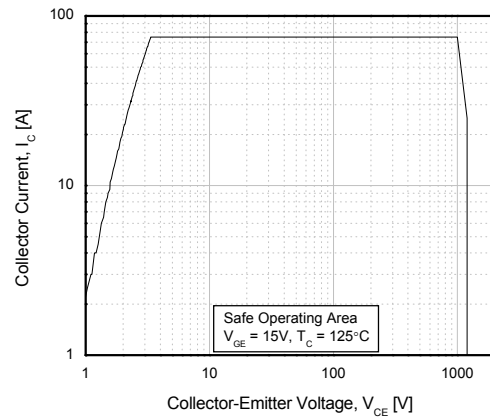
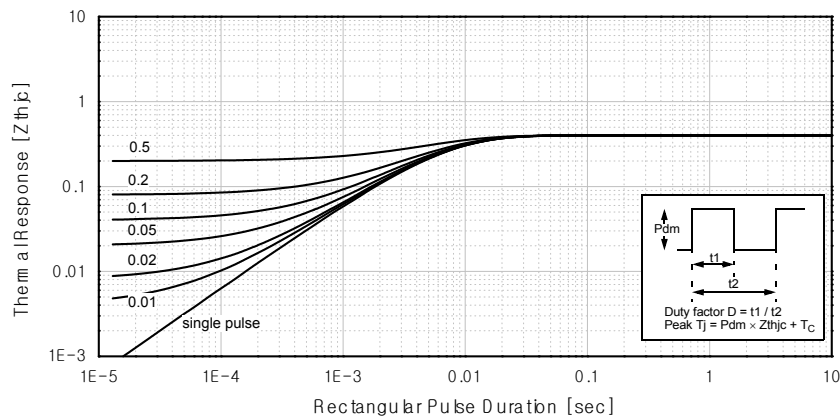


Figure 17. Transient Thermal Impedance of IGBT



Typical Performance Characteristics (Continued)

Figure 18. Forward Characteristics

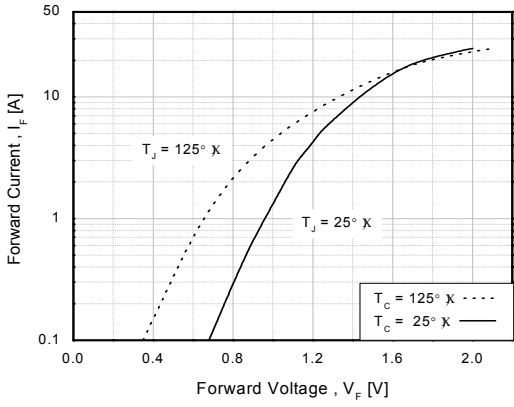


Figure 19. Reverse Recovery Current

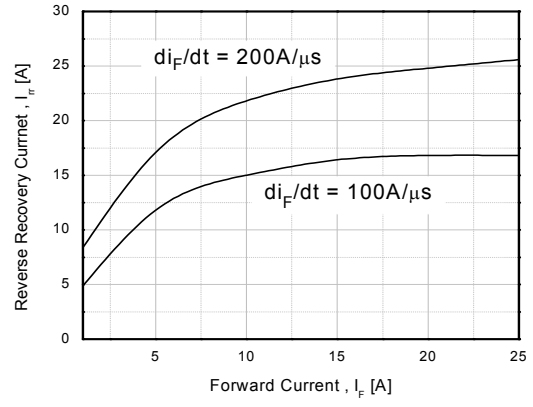


Figure 20. Stored Charge

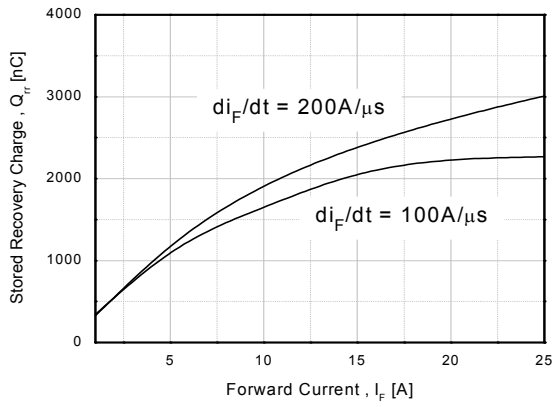
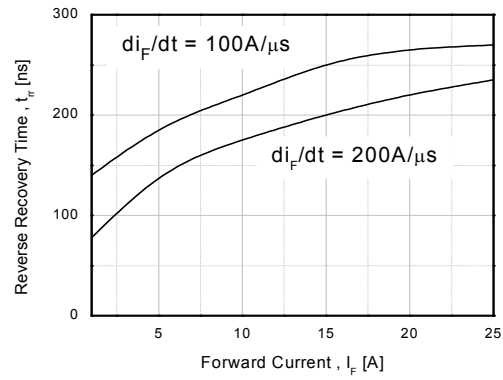
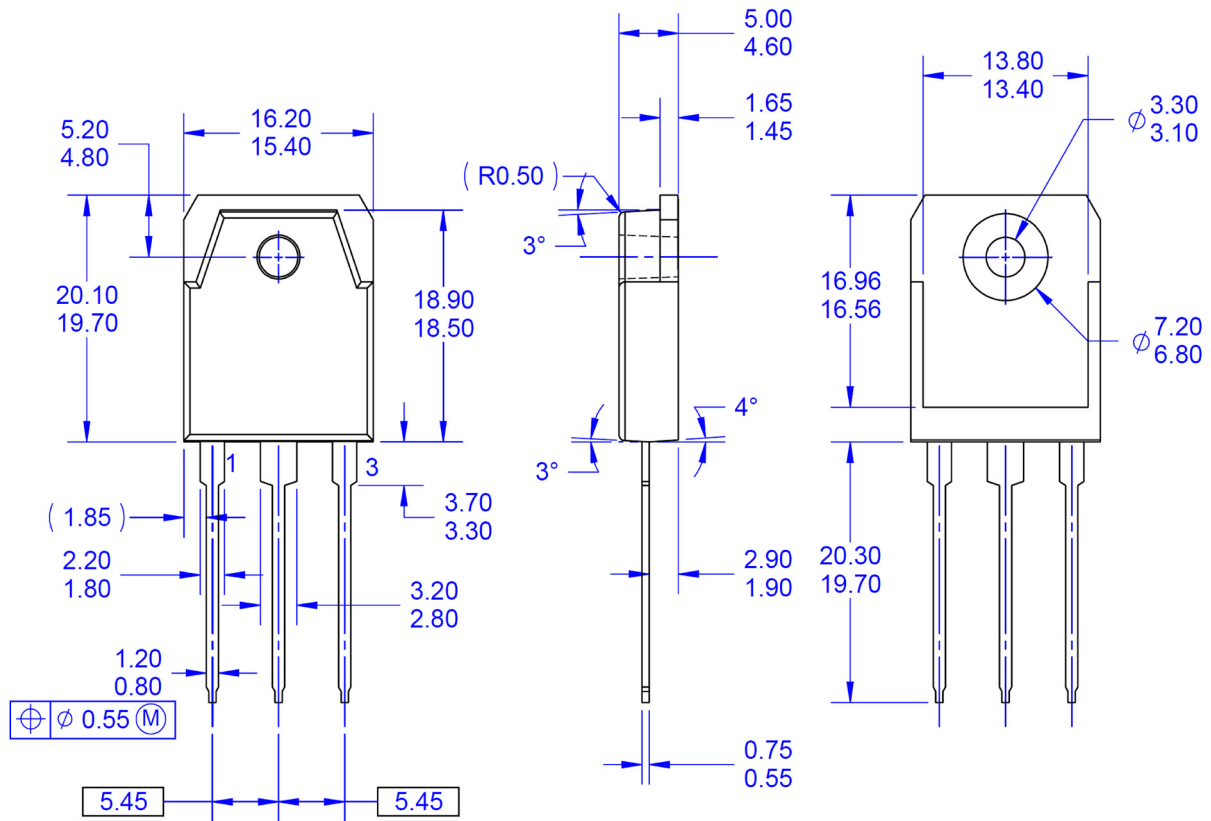


Figure 21. Reverse Recovery Time



Mechanical Dimensions



NOTES: UNLESS OTHERWISE SPECIFIED

- A) THIS PACKAGE CONFORMS TO EIAJ SC-65 PACKAGING STANDARD.
- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DIMENSION AND TOLERANCING PER ASME14.5-2009.
- D) DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.
- E) DRAWING FILE NAME: TO3PN03AREV1.
- F) FAIRCHILD SEMICONDUCTOR.

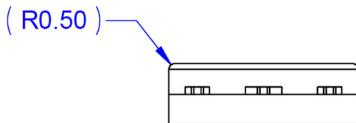


Figure 22. TO3PN, 3-Lead, Plastic, EIAJ SC-65

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