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ON Semiconductor®

# FGA15N120ANTDTU

## 1200 V, 15 A NPT Trench IGBT

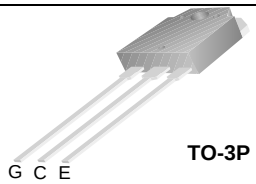
### Features

- NPT Trench Technology, Positive temperature coefficient
- Low Saturation Voltage: $V_{CE(sat),\ typ}$ = 1.9 V @ $I_C$ = 15 A and $T_C$ = 25°C
- Low Switching Loss: $E_{off,\ typ}$ = 0.6 mJ @ $I_C$ = 15 A and $T_C$ = 25°C
- Extremely Enhanced Avalanche Capability

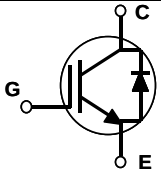
### Description

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.




TO-3P




### 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°C | 30 | A |
| | Collector Current | @ $T_C$ = 100°C | 15 | A |
| $I_{CM}$ | Pulsed Collector Current (Note 1) | | 45 | A |
| $I_F$ | Diode Continuous Forward Current | @ $T_C$ = 25°C | 30 | A |
| | Diode Continuous Forward Current | @ $T_C$ = 100°C | 15 | A |
| $I_{FM}$ | Diode Maximum Forward Current | | 45 | A |
| $P_D$ | Maximum Power Dissipation | @ $T_C$ = 25°C | 186 | W |
| | Maximum Power Dissipation | @ $T_C$ = 100°C | 74 | W |
| $T_J$ | Operating Junction Temperature | | -55 to +150 | °C |
| $T_{stg}$ | Storage Temperature Range | | -55 to +150 | °C |
| $T_L$ | Maximum Lead Temp. for soldering Purposes, 1/8" from case for 5 seconds | | 300 | °C |

### Thermal Characteristics

| Symbol | Parameter | Typ. | Max. | Unit |
|---|---|---|---|---|
| $R_{\theta JC}$ | Thermal Resistance, Junction-to-Case for IGBT | -- | 0.67 | °C/W |
| $R_{\theta JC}$ | Thermal Resistance, Junction-to-Case for Diode | -- | 2.88 | °C/W |
| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambient | -- | 40 | °C/W |

**Notes:**

(1) Repetitive rating: Pulse width limited by max. junction temperature

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October-2017,Rev.3

Publication Order Number:
FGA15N120ANTDTU/D

## Package Marking and Ordering Information

| Part Number | Top Mark | Package | Packing Method | Reel Size | Tape Width | Quantity |
|---|---|---|---|---|---|---|
| FGA15N120ANTDTU-F109 | FGA15N120ANTDTU | TO-3P | Tube | N/A | N/A | 30 |

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

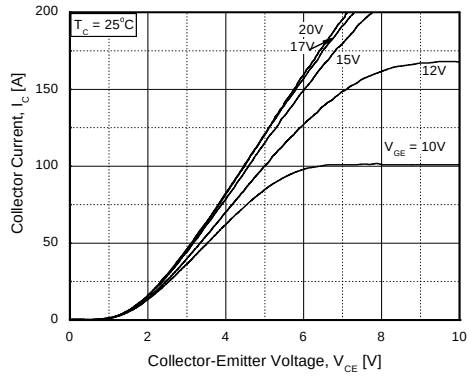
| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| **Off Characteristics** | | | | | | |
| $I_{CES}$ | Collector Cut-Off Current | $V_{CE}$ = $V_{CES}$, $V_{GE}$ = 0 V | -- | -- | 3 | mA |
| $I_{GES}$ | G-E Leakage Current | $V_{GE}$ = $V_{GES}$, $V_{CE}$ = 0 V | -- | -- | ± 250 | nA |
| **On Characteristics** | | | | | | |
| $V_{GE(th)}$ | G-E Threshold Voltage | $I_C$ = 15 mA, $V_{CE}$ = $V_{GE}$ | 4.5 | 6.5 | 8.5 | V |
| $V_{CE(sat)}$ | Collector to Emitter Saturation Voltage | $I_C$ = 15 A, $V_{GE}$ = 15 V | -- | 1.9 | 2.4 | V |
| | | $I_C$ = 15 A, $V_{GE}$ = 15 V, $T_C$ = 125°C | -- | 2.2 | -- | V |
| | | $I_C$ = 30 A, $V_{GE}$ = 15 V | -- | 2.3 | -- | V |
| **Dynamic Characteristics** | | | | | | |
| $C_{ies}$ | Input Capacitance | $V_{CE}$ = 30 V, $V_{GE}$ = 0 V, f = 1 MHz | -- | 2650 | -- | pF |
| $C_{oes}$ | Output Capacitance | | -- | 143 | -- | pF |
| $C_{res}$ | Reverse Transfer Capacitance | | -- | 96 | -- | pF |
| **Switching Characteristics** | | | | | | |
| $t_{d(on)}$ | Turn-On Delay Time | $V_{CC}$ = 600 V, $I_C$ = 15 A, $R_G$ = 10 Ω, $V_{GE}$ = 15 V, Inductive Load, $T_C$ = 25°C | -- | 15 | -- | ns |
| $t_r$ | Rise Time | | -- | 20 | -- | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | -- | 160 | -- | ns |
| $t_f$ | Fall Time | | -- | 100 | 180 | ns |
| $E_{on}$ | Turn-On Switching Loss | | -- | 3 | 4.5 | mJ |
| $E_{off}$ | Turn-Off Switching Loss | | -- | 0.6 | 0.9 | mJ |
| $E_{ts}$ | Total Switching Loss | | -- | 3.6 | 5.4 | mJ |
| $t_{d(on)}$ | Turn-On Delay Time | $V_{CC}$ = 600 V, $I_C$ = 15 A, $R_G$ = 10 Ω, $V_{GE}$ = 15 V, Inductive Load, $T_C$ = 125°C | -- | 15 | -- | ns |
| $t_r$ | Rise Time | | -- | 20 | -- | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | -- | 170 | -- | ns |
| $t_f$ | Fall Time | | -- | 150 | -- | ns |
| $E_{on}$ | Turn-On Switching Loss | | -- | 3.2 | 4.8 | mJ |
| $E_{off}$ | Turn-Off Switching Loss | | -- | 0.8 | 1.2 | mJ |
| $E_{ts}$ | Total Switching Loss | | -- | 4.0 | 6.0 | mJ |
| $Q_g$ | Total Gate Charge | $V_{CE}$ = 600 V, $I_C$ = 15 A, $V_{GE}$ = 15 V | -- | 120 | 180 | nC |
| $Q_{ge}$ | Gate-Emitter Charge | | -- | 16 | 22 | nC |
| $Q_{gc}$ | Gate-Collector Charge | | -- | 50 | 65 | nC |

## Electrical Characteristics of DIODE $T_C$ = 25°C unless otherwise noted

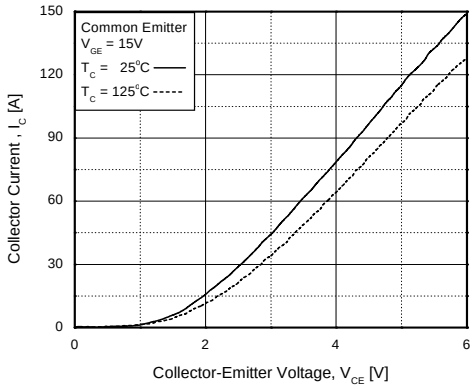
| Symbol | Parameter | Test Conditions | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| $V_{FM}$ | Diode Forward Voltage | $I_F$ = 15 A | $T_C$ = 25°C | -- | 1.7 | 2.7 | V |
| | | | $T_C$ = 125°C | -- | 1.8 | -- | |
| $t_{rr}$ | Diode Reverse Recovery Time | $I_F$ = 15 A<br>$di_F/dt$ = 200 A/μs | $T_C$ = 25°C | -- | 210 | 330 | ns |
| | | | $T_C$ = 125°C | -- | 280 | -- | |
| $I_{rr}$ | Diode Peak Reverse Recovery Current | | $T_C$ = 25°C | -- | 27 | 40 | A |
| | | | $T_C$ = 125°C | -- | 31 | -- | |
| $Q_{rr}$ | Diode Reverse Recovery Charge | | $T_C$ = 25°C | -- | 2835 | 6600 | nC |
| | | | $T_C$ = 125°C | -- | 4340 | -- | |

## Typical Performance Characteristics

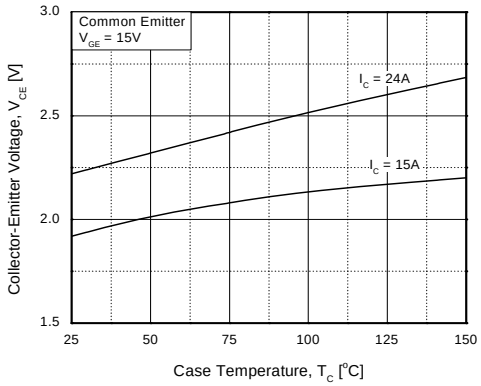
### Figure 1. Typical Output Characteristics



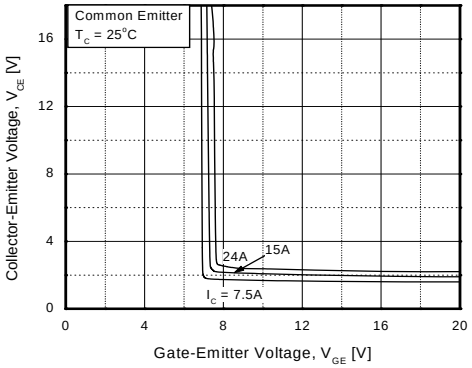

### Figure 2. Typical Saturation Voltage Characteristics



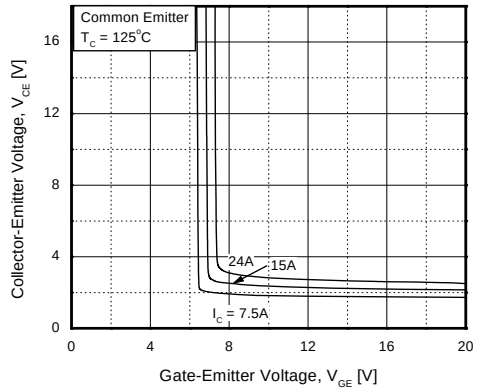

### Figure 3. Saturation Voltage vs. Case Temperature at Variant Current Level



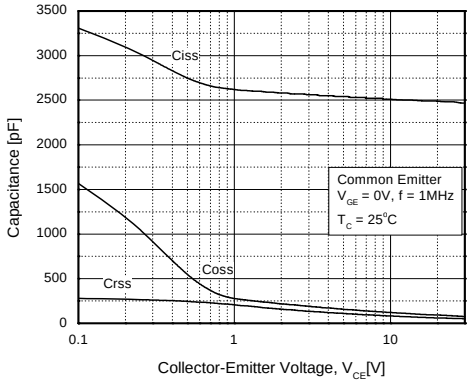

### Figure 4. Saturation Voltage vs. $V_{GE}$




### Figure 5. Saturation Voltage vs. $V_{GE}$

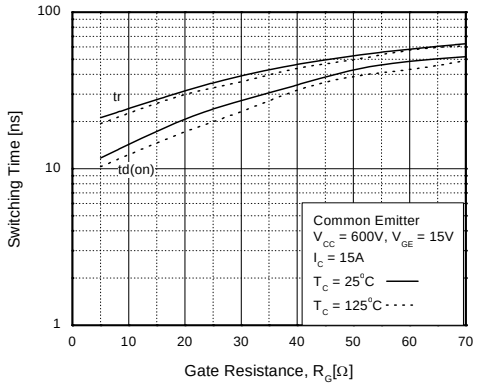



### Figure 6. Capacitance Characteristics

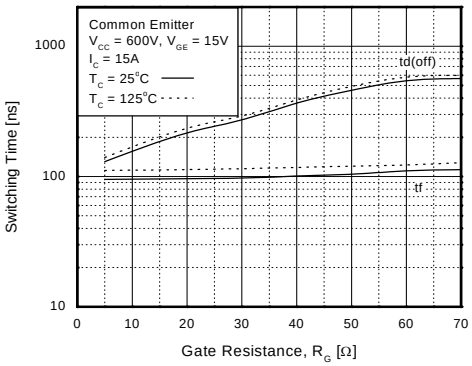


## Typical Performance Characteristics (Continued)

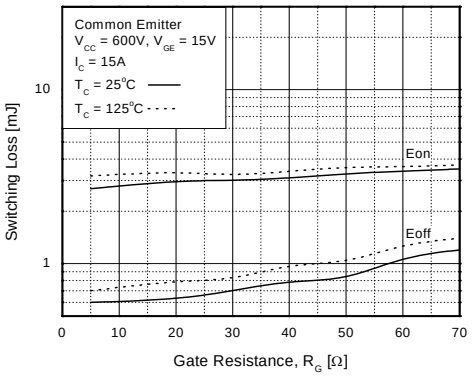
### Figure 7. Turn-On Characteristics vs. Gate Resistance



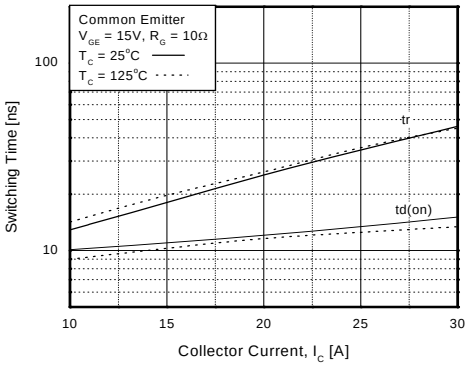

### Figure 8. Turn-Off Characteristics vs. Gate Resistance



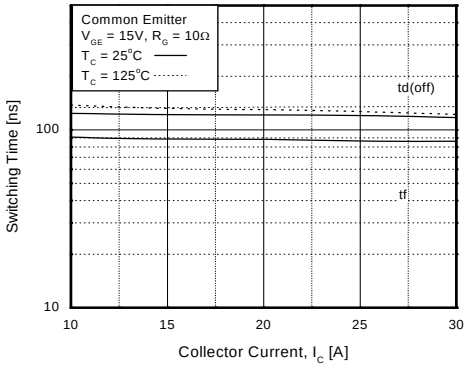

### Figure 9. Switching Loss vs. Gate Resistance



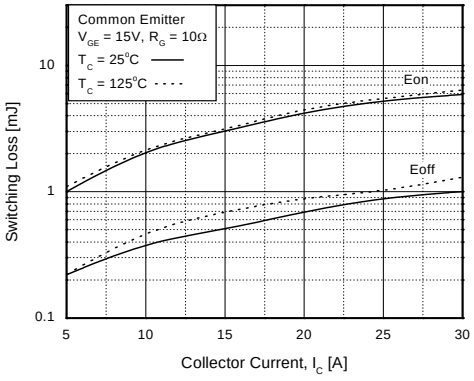

### Figure 10. Turn-On Characteristics vs. Collector Current




### Figure 11. Turn-Off Characteristics vs. Collector Current

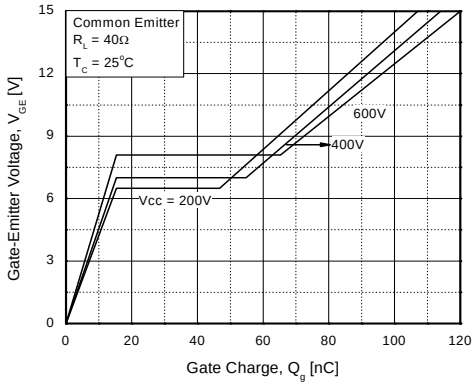



### Figure 12. Switching Loss vs. Collector Current

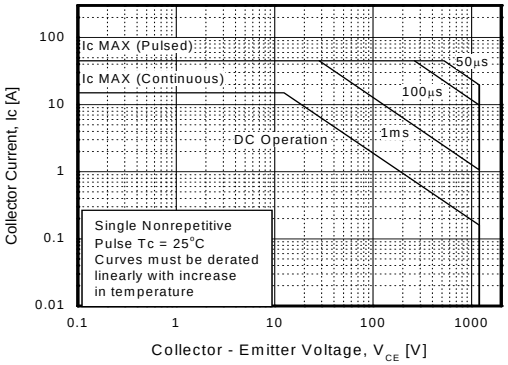


## Typical Performance Characteristics (Continued)

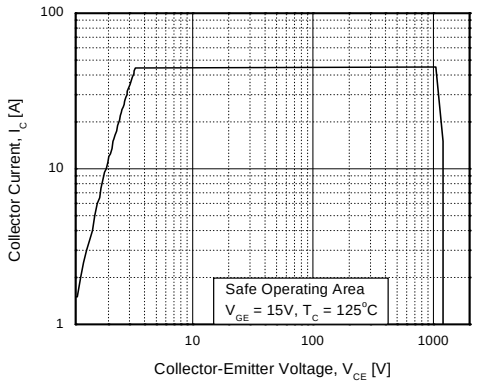
### Figure 13. Gate Charge Characteristics



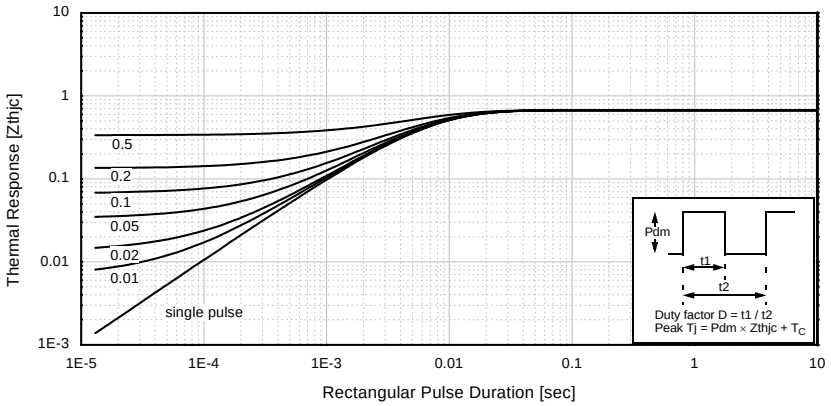

### Figure 14. SOA Characteristics




### Figure 15. Turn-Off SOA

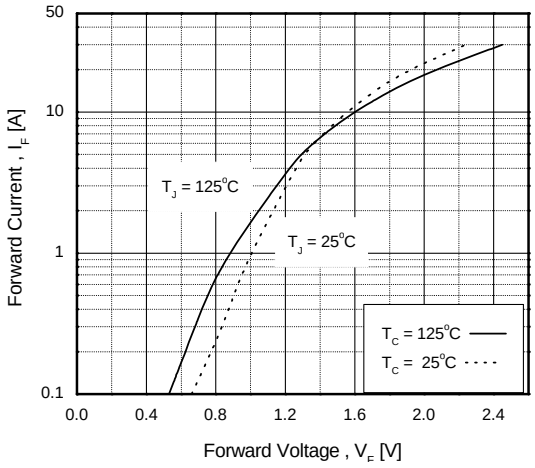



### Figure 16. Transient Thermal Impedance of IGBT

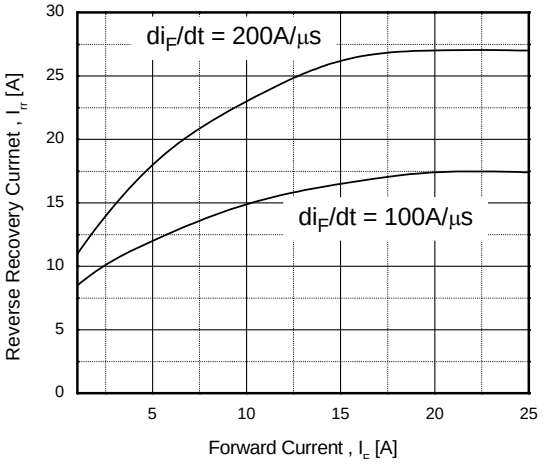


## Typical Performance Characteristics (Continued)

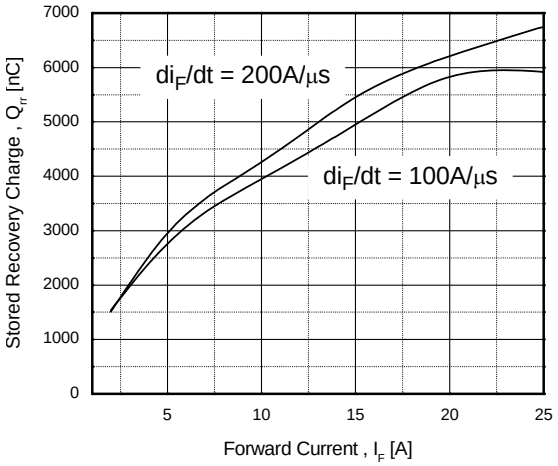
### Figure 17. Forward Characteristics



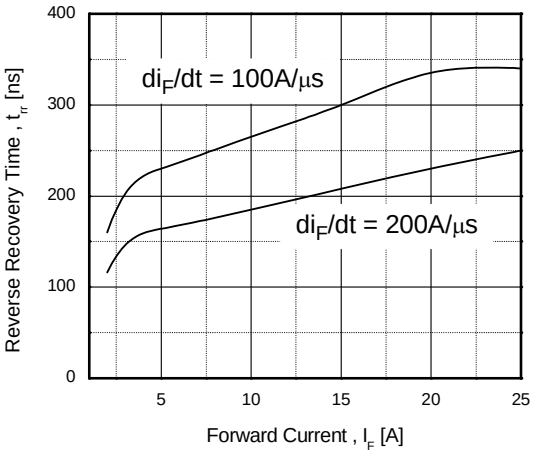

### Figure 18. Reverse Recovery Current




### Figure 19. Stored Charge




### Figure 20. Reverse Recovery Time



## Mechanical Dimensions

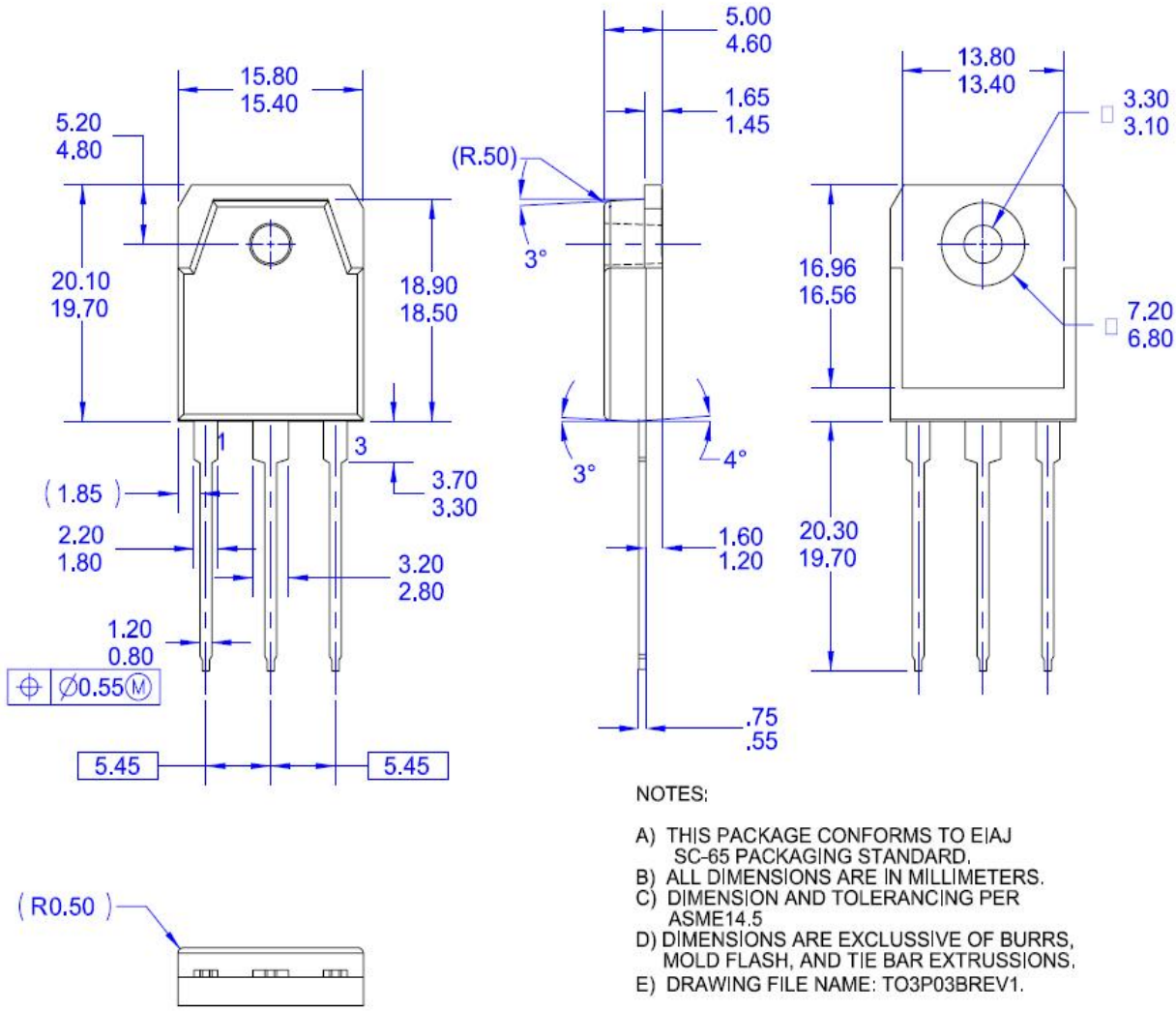



**Figure 21. TO-3P 3L - 3LD, T03, PLASTIC, EIAJ SC-65**

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