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**FAIRCHILD**

SEMICONDUCTOR®

# FGA15S125P
## 1250 V, 15 A Shorted-anode IGBT

## Features

- High Speed Switching
- Low Saturation Voltage: $V_{CE(sat)}$ = 2.25 V @ $I_C$ = 15 A
- High Input Impedance
- RoHS Compliant

## Applications

- Induction Heating, Microwave Oven

## General Description

Using advanced field stop trench and shorted-anode technology, Fairchild's shorted-anode trench IGBTs offer superior conduction and switching performances for switching applications. The device can operate in parallel configuration with exceptional avalanche capability . This device is designed for induction heating and microwave oven.



**TO-3PN**

G C E
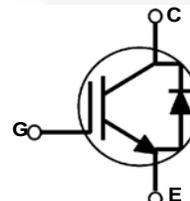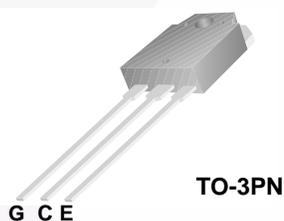


## Absolute Maximum Ratings

| Symbol | Description | | Ratings | Unit |
|---|---|---|---|---|
| $V_{CES}$ | Collector to Emitter Voltage | | 1250 | V |
| $V_{GES}$ | Gate to Emitter Voltage | | ± 25 | V |
| $I_C$ | Collector Current | @ $T_C$ = 25°C | 30 | A |
| | Collector Current | @ $T_C$ = 100°C | 15 | A |
| $I_{CM (1)}$ | Pulsed Collector Current | | 45 | A |
| $I_F$ | Diode Continuous Forward Current | @ $T_C$ = 25°C | 30 | A |
| | Diode Continuous Forward Current | @ $T_C$ = 100°C | 15 | A |
| $P_D$ | Maximum Power Dissipation | @ $T_C$ = 25°C | 136 | W |
| | Maximum Power Dissipation | @ $T_C$ = 100°C | 68 | W |
| $T_J$ | Operating Junction Temperature | | -55 to +175 | °C |
| $T_{stg}$ | Storage Temperature Range | | -55 to +175 | °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 |
|---|---|---|---|---|
| $R_{\theta JC}$(IGBT) | Thermal Resistance, Junction to Case, Max | - | 1.1 | °C/W |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient, Max | - | 40 | °C/W |

**Notes:**

1: Limited by Tjmax

## Package Marking and Ordering Information

| Device Marking | Device | Package | Reel Size | Tape Width | Quantity |
|---|---|---|---|---|---|
| FGA15S125P | FGA15S125P | TO-3PN | - | - | 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 | $V_{CE} = 1250V$, $V_{GE} = 0V$ | - | - | 1 | mA |
| $I_{GES}$ | G-E Leakage Current | $V_{GE} = V_{GES}$, $V_{CE} = 0V$ | - | - | ±500 | nA |
| **On Characteristics** | | | | | | |
| $V_{GE(th)}$ | G-E Threshold Voltage | $I_C = 15mA$, $V_{CE} = V_{GE}$ | 4.5 | 6.0 | 7.5 | V |
| $V_{CE(sat)}$ | Collector to Emitter Saturation Voltage | $I_C = 15A$, $V_{GE} = 15V$ $T_C = 25°C$ | - | 2.25 | 2.72 | V |
| | | $I_C = 15A$, $V_{GE} = 15V$ $T_C = 125°C$ | - | 2.5 | - | V |
| | | $I_C = 15A$, $V_{GE} = 15V$, $T_C = 175°C$ | - | 2.75 | - | V |
| $V_{FM}$ | Diode Forward Voltage | $I_F = 15A$, $T_C = 25°C$ | - | 2 | 2.55 | V |
| | | $I_F = 15A$, $T_C = 175°C$ | - | 2.55 | - | V |
| **Dynamic Characteristics** | | | | | | |
| $C_{ies}$ | Input Capacitance | $V_{CE} = 30V$, $V_{GE} = 0V$, $f = 1MHz$ | - | 1360 | - | pF |
| $C_{oes}$ | Output Capacitance | | - | 40 | - | pF |
| $C_{res}$ | Reverse Transfer Capacitance | | - | 20 | - | pF |
| **Switching Characteristics** | | | | | | |
| $t_{d(on)}$ | Turn-On Delay Time | $V_{CC} = 600V$, $I_C = 15A$, $R_G = 10Ω$, $V_{GE} = 15V$, Resistive Load, $T_C = 25°C$ | - | 10 | - | ns |
| $t_r$ | Rise Time | | - | 260 | - | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | - | 400 | - | ns |
| $t_f$ | Fall Time | | - | 100 | - | ns |
| $E_{on}$ | Turn-On Switching Loss | | - | 0.74 | - | mJ |
| $E_{off}$ | Turn-Off Switching Loss | | - | 0.50 | - | mJ |
| $E_{ts}$ | Total Switching Loss | | - | 1.24 | - | mJ |
| $t_{d(on)}$ | Turn-On Delay Time | $V_{CC} = 600V$, $I_C = 15A$, $R_G = 10Ω$, $V_{GE} = 15V$, Resistive Load,, $T_C = 175°C$ | - | 11 | - | ns |
| $t_r$ | Rise Time | | - | 320 | - | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | - | 420 | - | ns |
| $t_f$ | Fall Time | | - | 250 | - | ns |
| $E_{on}$ | Turn-On Switching Loss | | - | 0.94 | - | mJ |
| $E_{off}$ | Turn-Off Switching Loss | | - | 1.23 | - | mJ |
| $E_{ts}$ | Total Switching Loss | | - | 2.17 | - | mJ |
| $Q_g$ | Total Gate Charge | $V_{CE} = 600V$, $I_C = 15A$, $V_{GE} = 15V$ | - | 129 | - | nC |
| $Q_{ge}$ | Gate to Emitter Charge | | - | 9 | - | nC |
| $Q_{gc}$ | Gate to Collector Charge | | - | 66 | - | nC |

# Typical Performance Characteristics

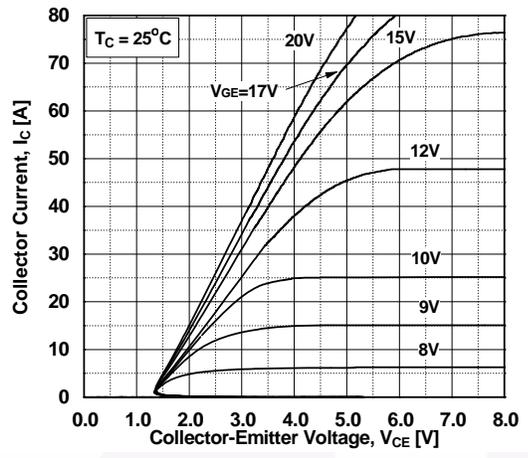### Figure 1. Typical Output Characteristics



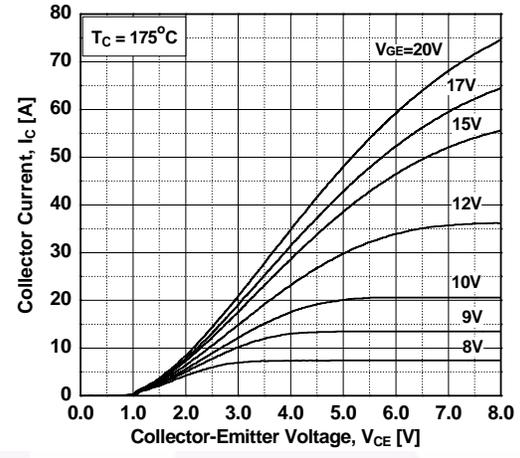### Figure 2. Typical Output Characteristics



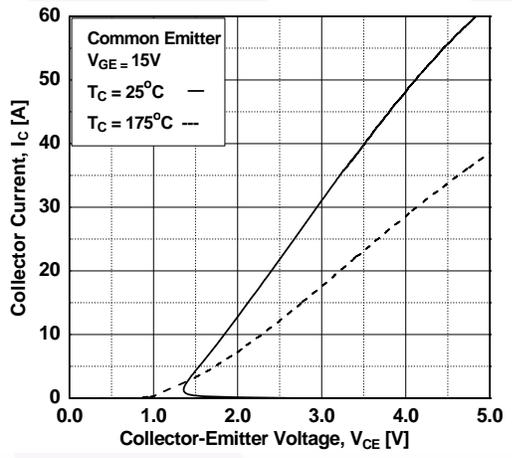### Figure 3. Typical Saturation Voltage Characteristics



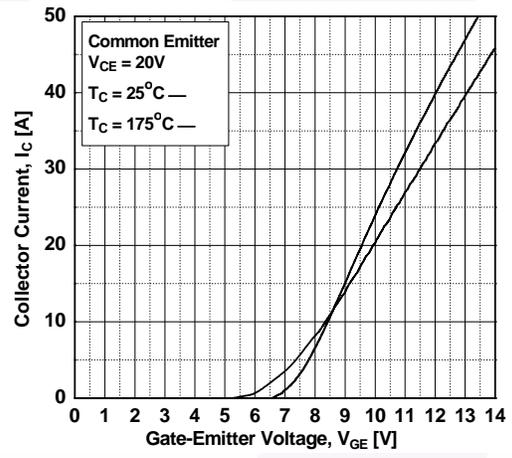### Figure 4. Transfer Characteristics



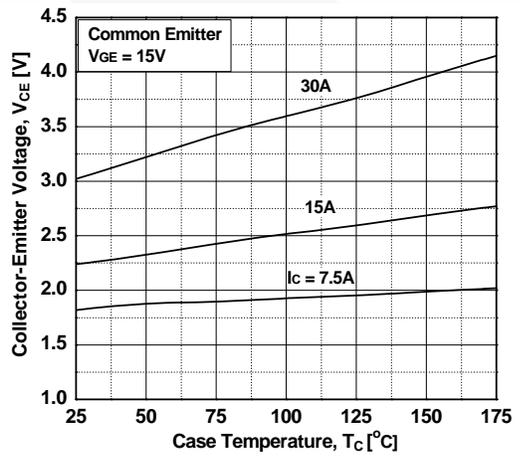### Figure 5. Saturation Voltage vs. Case Temperature at Variant Current Level
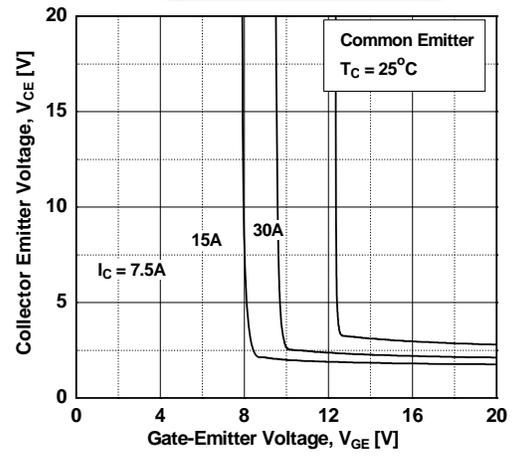


### Figure 6. Saturation Voltage vs. $V_{GE}$

## Typical Performance Characteristics

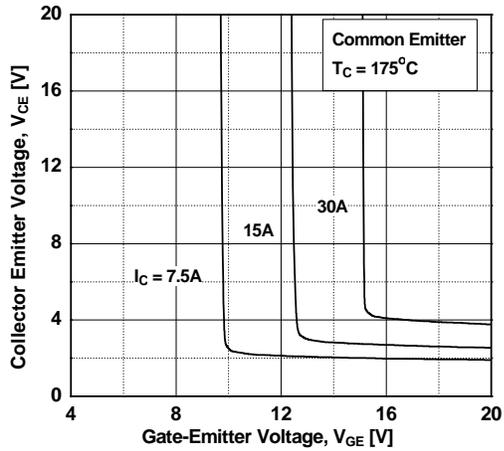### Figure 7. Saturation Voltage vs. V$_{GE}$



### Figure 8. Capacitance Characteristics
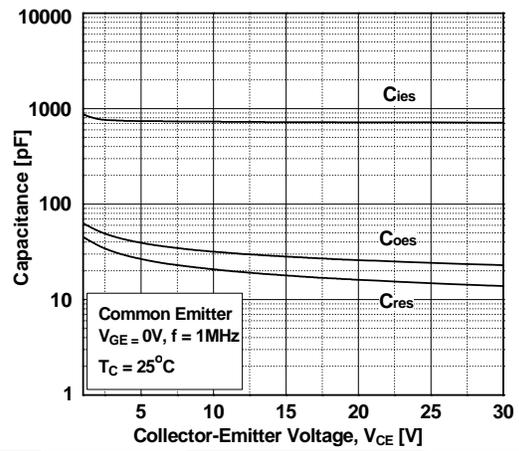


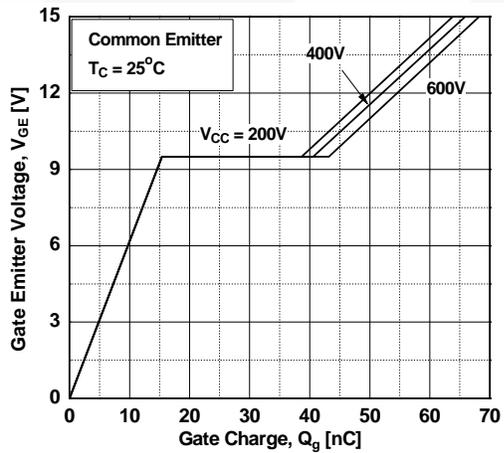### Figure 9. Gate charge Characteristics



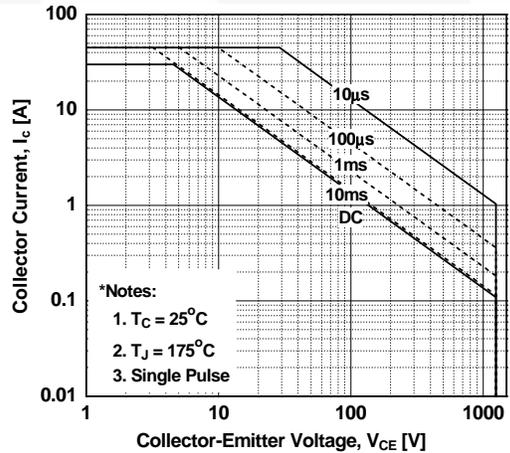### Figure 10. SOA Characteristics



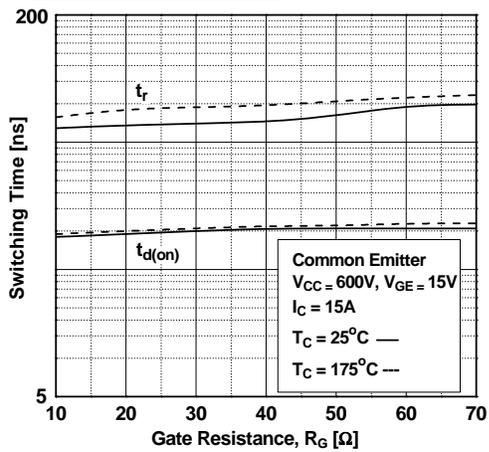### Figure 11. Turn-on Characteristics vs. Gate Resistance



### Figure 12. Turn-off Characteristics vs. Gate Resistance
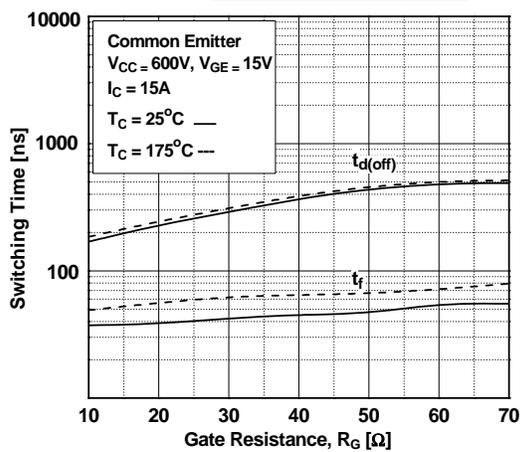
## Typical Performance Characteristics

### Figure 13. Turn-on Characteristics vs. Collector Current
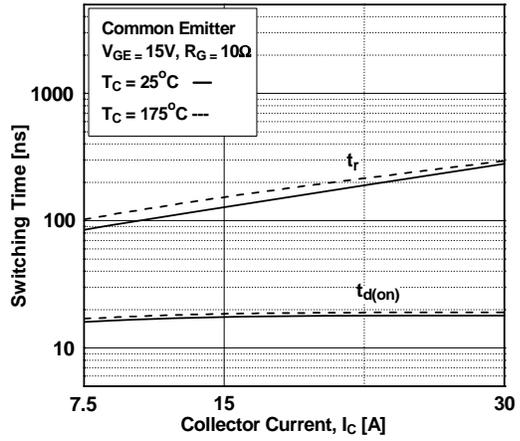


### Figure 14. Turn-off Characteristics vs. Collector Current
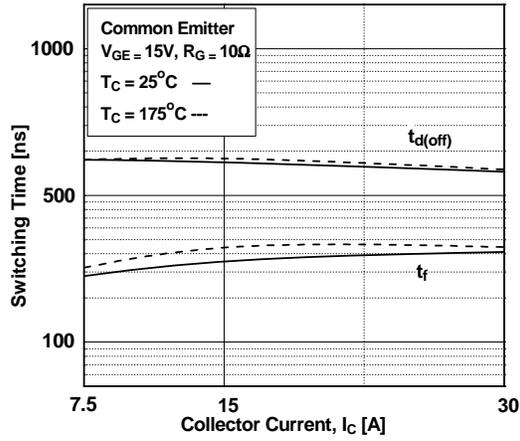


### Figure 15. Switching Loss vs. Gate Resistance



### Figure 16. Switching Loss vs. Collector Current



### Figure 17. Turn off Switching SOA Characteristics



### Figure 18. Forward Characteristics

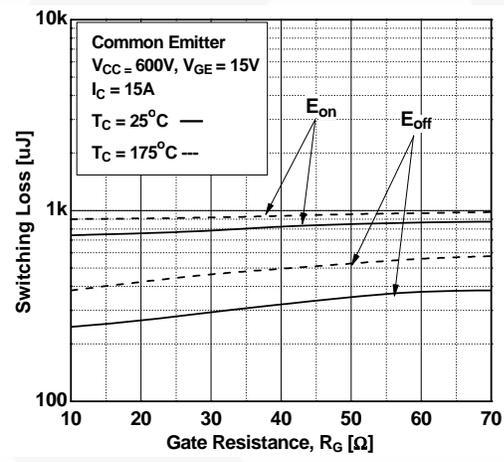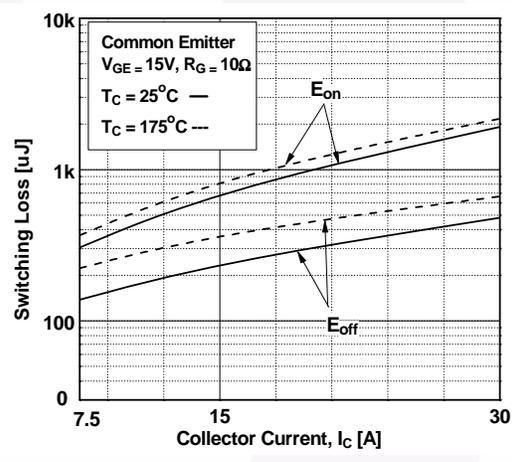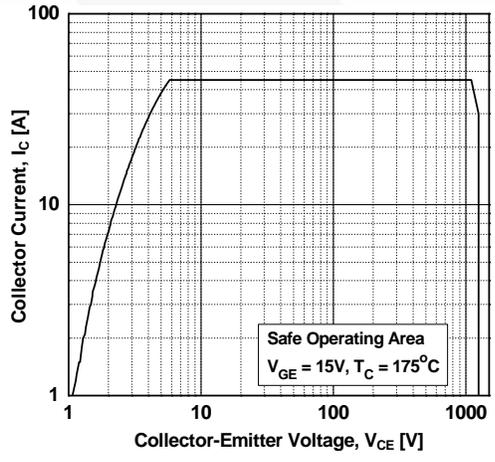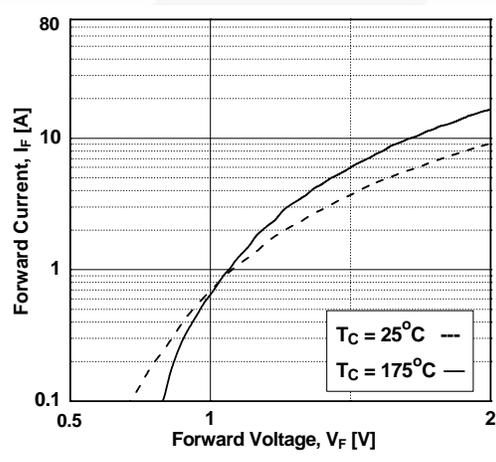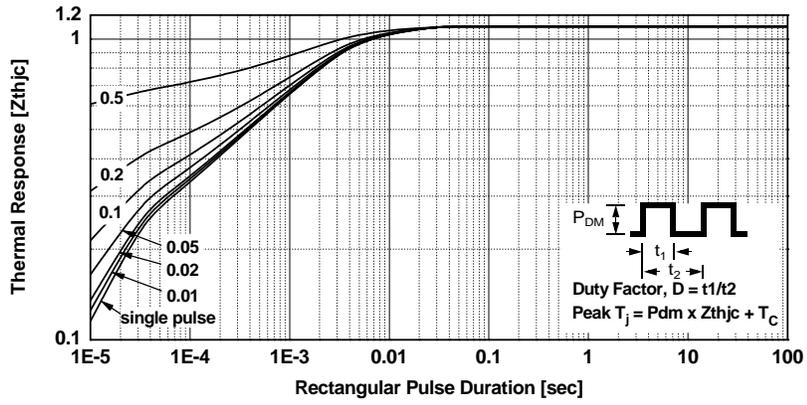## Typical Performance Characteristics

**Figure 19. Transient Thermal Impedance of IGBT**

## Mechanical Dimensions



**Figure 20.  TO-3P 3L - 3LD, T03, PLASTIC, EIAJ SC-65**
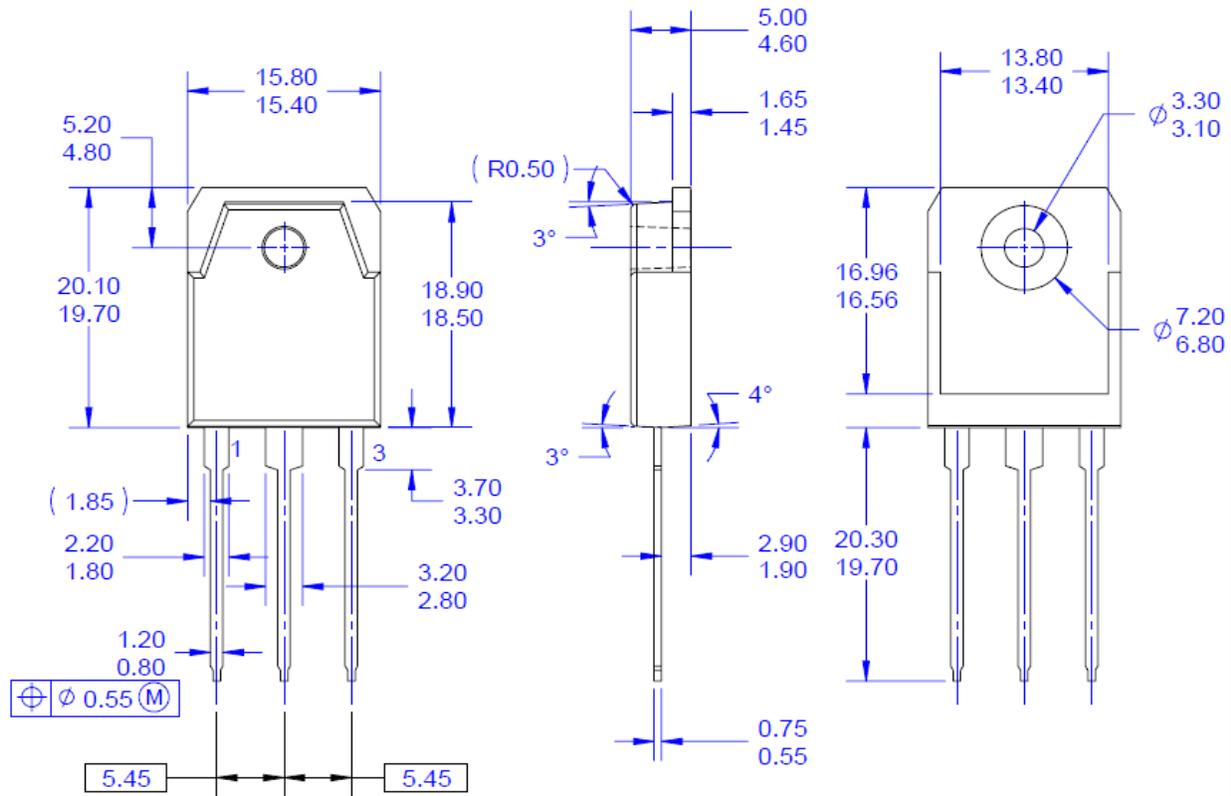
NOTES: UNLESS OTHERWISE SPECIFIED

A) THIS PACKAGE CONFORMS TO EIAJ
   SC-65 PACKAGING STANDARD.
B) ALL DIMENSIONS ARE IN MILLIMETERS.
C) DIMENSION AND TOLERANCING PER
   ASME14.5
D) DIMENSIONS ARE EXCLUSSIVE OF BURRS,
   MOLD FLASH, AND TIE BAR EXTRUSSIONS.
E) THIS PACKAGE IS INTENDED ONLY FOR TO3PN.
F) DRAWING FILE NAME: TO3P03AREV4.

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Dimensions in Millimeters

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| FPS™ | | SyncFET™ | XS™ |

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Rev. I66

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