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February 2016

# FGA25S125P

## 1250 V, 25 A Shorted-anode IGBT

### Features

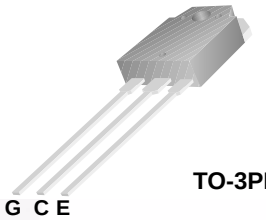
- High Speed Switching
- Low Saturation Voltage: $V_{CE(sat)}$ = 1.8 V @ $I_C$ = 25 A
- High Input Impedance
- RoHS Compliant

### Applications

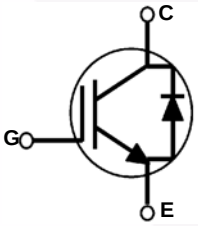
- Induction Heating, Microwave Oven

### General Description

Using advanced field stop trench and shorted-anode technology, Fairchild's shorted-anode trench IGBTs offer superior conduction and switching performances for soft 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




### Absolute Maximum Ratings

| Symbol | Description | | FGA25S125P_SN00337 | 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 | 50 | A |
| | Collector Current | @ $T_C$ = 100°C | 25 | A |
| $I_{CM\ (1)}$ | Pulsed Collector Current | | 75 | A |
| $I_F$ | Diode Continuous Forward Current | @ $T_C$ = 25°C | 50 | A |
| | Diode Continuous Forward Current | @ $T_C$ = 100°C | 25 | A |
| $P_D$ | Maximum Power Dissipation | @ $T_C$ = 25°C | 250 | W |
| | Maximum Power Dissipation | @ $T_C$ = 100°C | 125 | 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 | - | 0.6 | °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 |
|---|---|---|---|---|---|
| FGA25S125P | FGA25S125P _SN00337 | 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** | | | | | | |
| $BV_{CES}$ | Collector to Emitter Breakdown Voltage | $V_{GE}$ = 0 V, $I_C$ = 1 mA | 1250 | - | - | V |
| $\frac{\Delta BV_{CES}}{\Delta T_J}$ | Temperature Coefficient of Breakdown Voltage | $V_{GE}$ = 0 V, $I_C$ = 1 mA | - | 1.2 | - | V/°C |
| $I_{CES}$ | 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 | $I_C$ = 25mA, $V_{CE}$ = $V_{GE}$ | 4.5 | 6.0 | 7.5 | V |
| $V_{CE(sat)}$ | Collector to Emitter Saturation Voltage | $I_C$ = 25A, $V_{GE}$ = 15V<br>$T_C$ = 25°C | - | 1.8 | 2.35 | V |
| | | $I_C$ = 25A, $V_{GE}$ = 15V<br>$T_C$ = 125°C | - | 2.05 | - | V |
| | | $I_C$ = 25A, $V_{GE}$ = 15V,<br>$T_C$ = 175°C | - | 2.16 | - | V |
| $V_{FM}$ | Diode Forward Voltage | $I_F$ = 25A, $T_C$ = 25°C | - | 1.7 | 2.4 | V |
| | | $I_F$ = 25A, $T_C$ = 175°C | - | 2.1 | - | V |
| **Dynamic Characteristics** | | | | | | |
| $C_{ies}$ | Input Capacitance | $V_{CE}$ = 30V, $V_{GE}$ = 0V,<br>f = 1MHz | - | 2150 | - | pF |
| $C_{oes}$ | Output Capacitance | | - | 48 | - | pF |
| $C_{res}$ | Reverse Transfer Capacitance | | - | 36 | - | pF |
| **Switching Characteristics** | | | | | | |
| $t_{d(on)}$ | Turn-On Delay Time | $V_{CC}$ = 600V, $I_C$ = 25A,<br>$R_G$ = 10Ω, $V_{GE}$ = 15V,<br>Resistive Load, $T_C$ = 25°C | - | 24 | - | ns |
| $t_r$ | Rise Time | | - | 250 | - | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | - | 502 | - | ns |
| $t_f$ | Fall Time | | - | 138 | - | ns |
| $E_{on}$ | Turn-On Switching Loss | | - | 1085 | - | uJ |
| $E_{off}$ | Turn-Off Switching Loss | | - | 580 | - | uJ |
| $E_{ts}$ | Total Switching Loss | | - | 1665 | - | uJ |
| $t_{d(on)}$ | Turn-On Delay Time | $V_{CC}$ = 600V, $I_C$ = 25A,<br>$R_G$ = 10Ω, $V_{GE}$ = 15V,<br>Resistive Load,, $T_C$ = 175°C | - | 21.2 | - | ns |
| $t_r$ | Rise Time | | - | 304 | - | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | - | 490 | - | ns |
| $t_f$ | Fall Time | | - | 232 | - | ns |
| $E_{on}$ | Turn-On Switching Loss | | - | 1310 | - | uJ |
| $E_{off}$ | Turn-Off Switching Loss | | - | 952 | - | uJ |
| $E_{ts}$ | Total Switching Loss | | - | 2262 | - | uJ |
| $Q_g$ | Total Gate Charge | $V_{CE}$ = 600V, $I_C$ = 25A,<br>$V_{GE}$ = 15V | - | 204 | - | nC |
| $Q_{ge}$ | Gate to Emitter Charge | | - | 15 | - | nC |
| $Q_{gc}$ | Gate to Collector Charge | | - | 103 | - | nC |

## Typical Performance Characteristics

**Figure 1. Typical Output Characteristics**

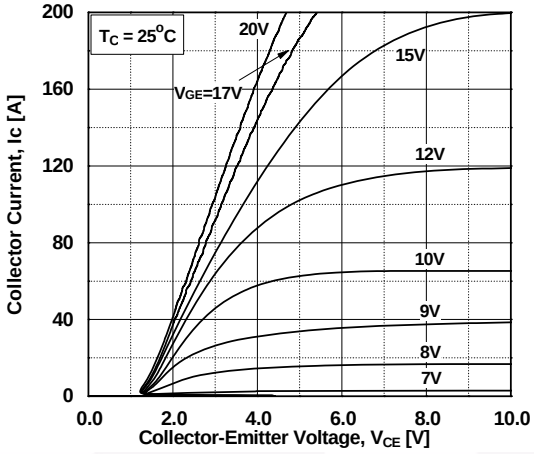



**Figure 2. Typical Output Characteristics**

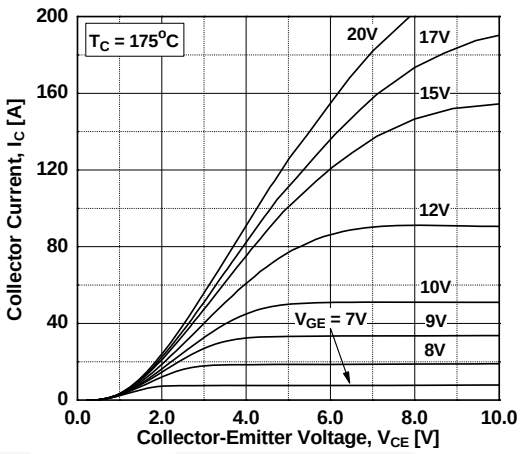



**Figure 3. Typical Saturation Voltage Characteristics**

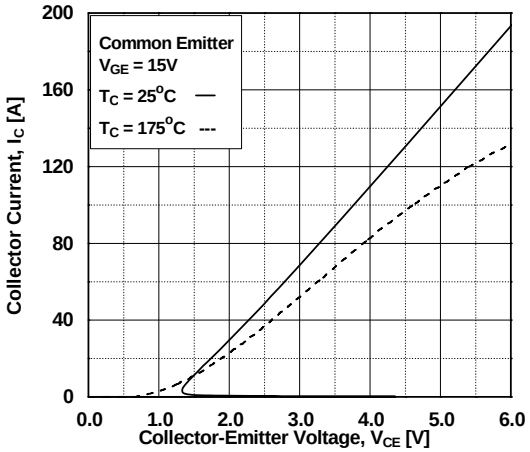



**Figure 4. Transfer Characteristics**

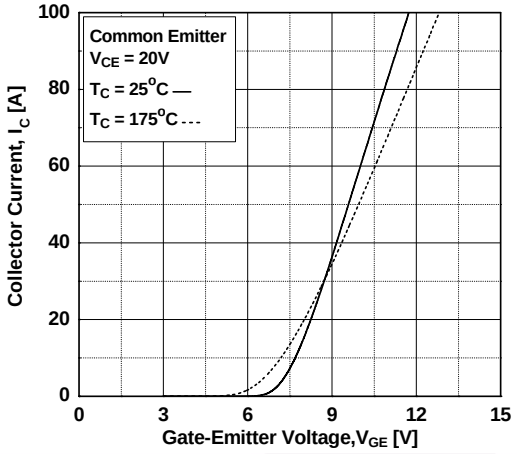



**Figure 5. Saturation Voltage vs. Case Temperature at Variant Current Level**

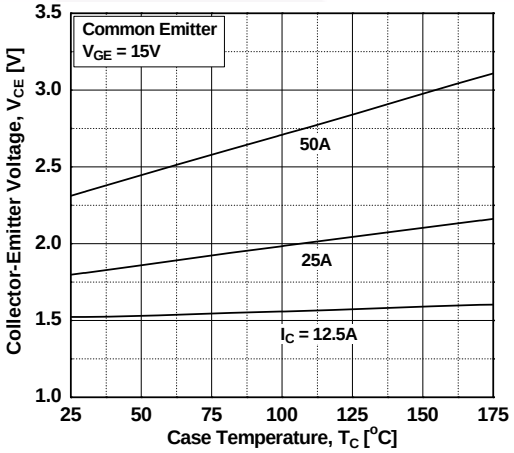
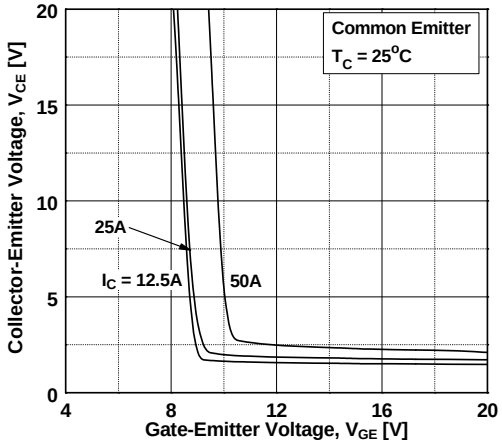



**Figure 6. Saturation Voltage vs. $V_{GE}$**



## Typical Performance Characteristics

**Figure 7. Saturation Voltage vs. $V_{GE}$**

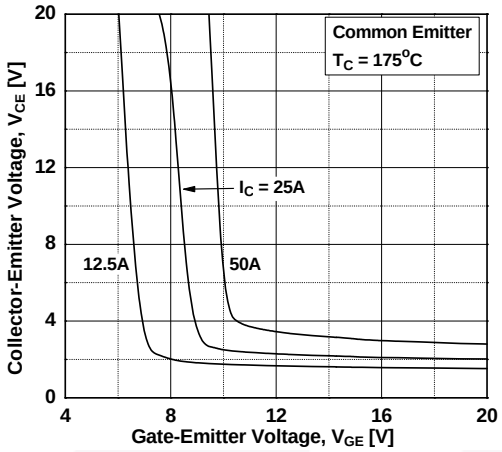



**Figure 8. Capacitance Characteristics**

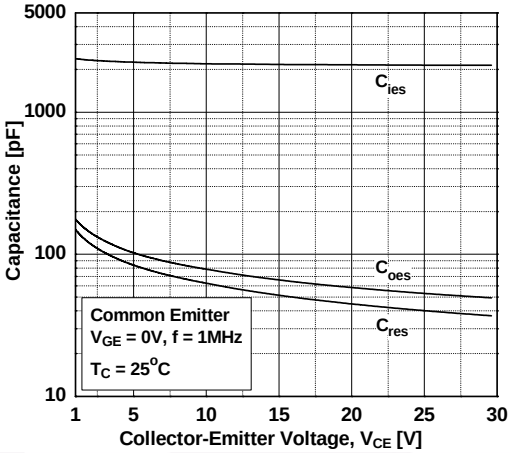



**Figure 9. Gate charge Characteristics**

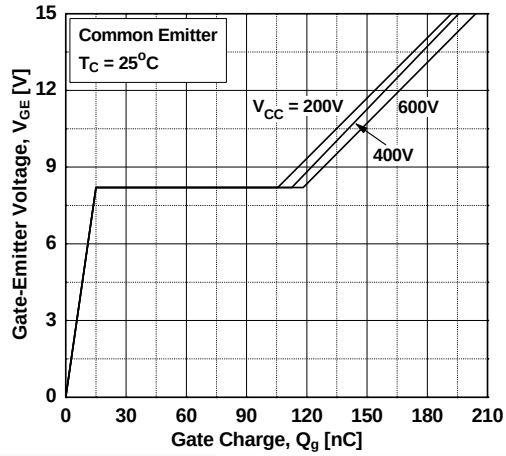



**Figure 10. SOA Characteristics**

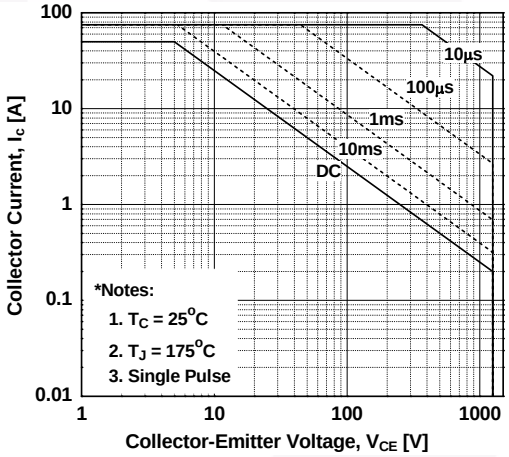



**Figure 11. Turn-on Characteristics vs. Gate Resistance**

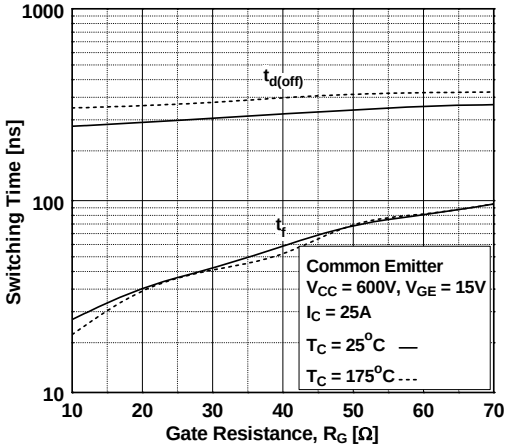
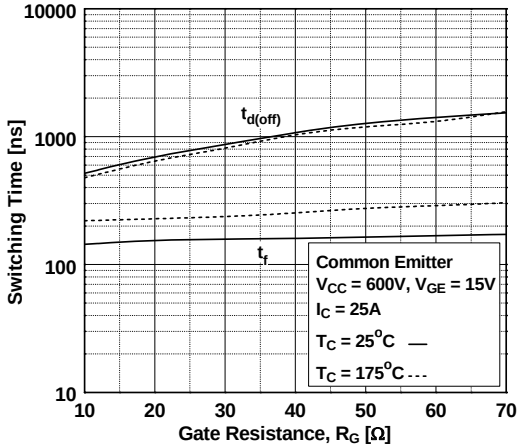



**Figure 12. Turn-off Characteristics vs. Gate Resistance**



## Typical Performance Characteristics

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

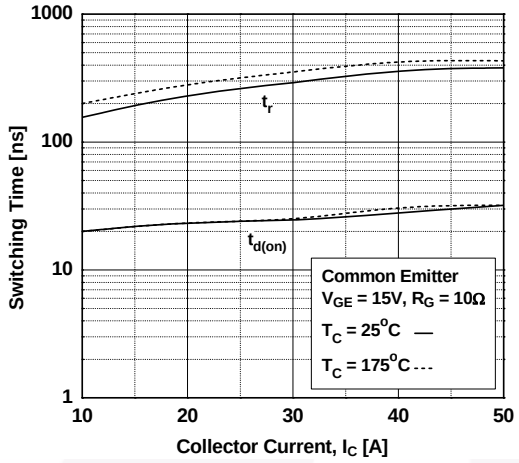



**Figure 14. Turn-off Characteristics vs. Collector Current**

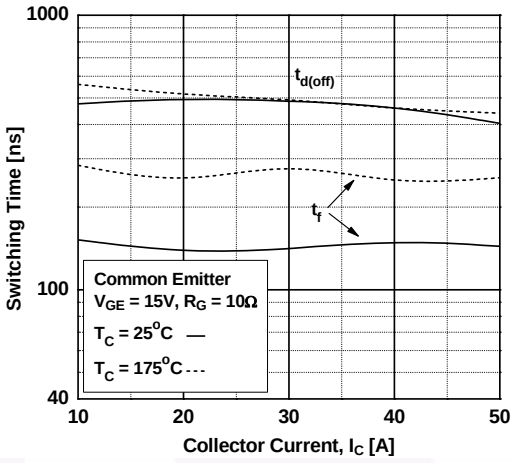



**Figure 15. Switching Loss vs. Gate Resistance**

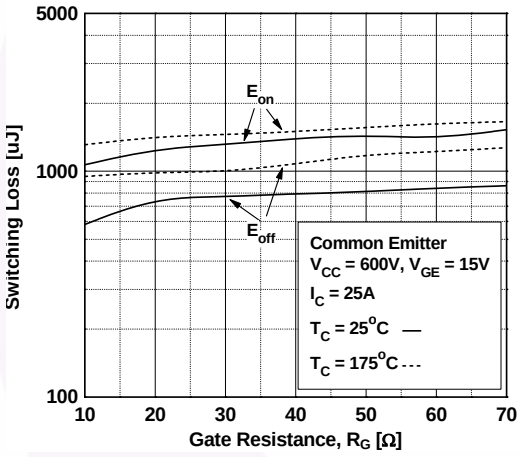



**Figure 16. Switching Loss vs. Collector Current**

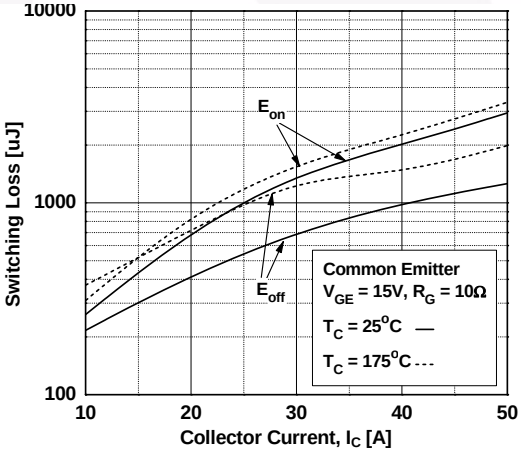



**Figure 17. Turn off Switching SOA Characteristics**

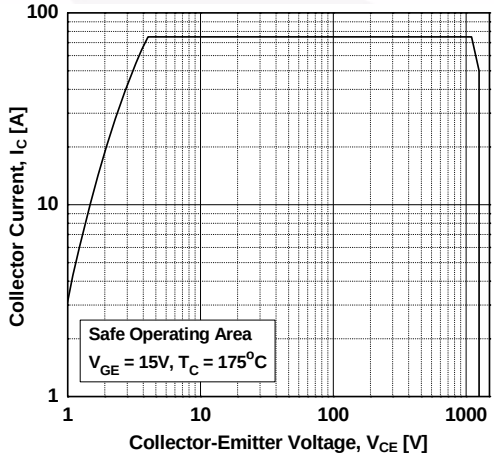
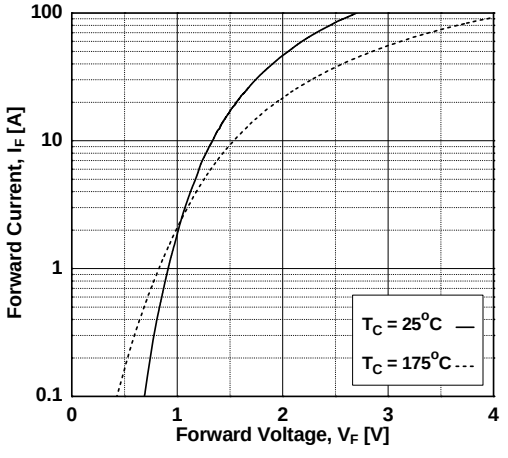
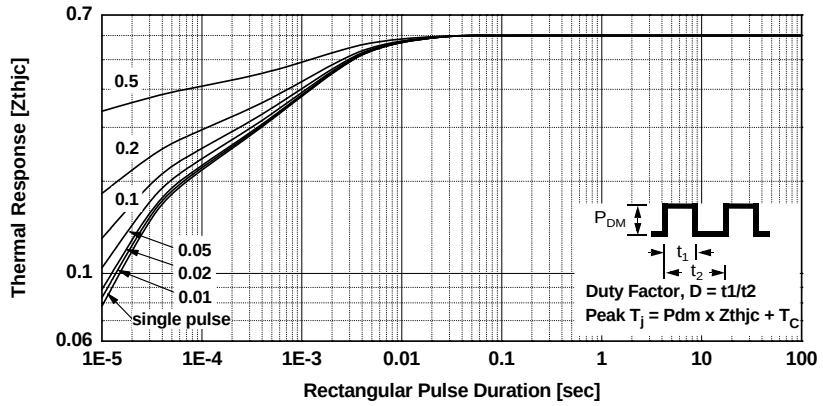


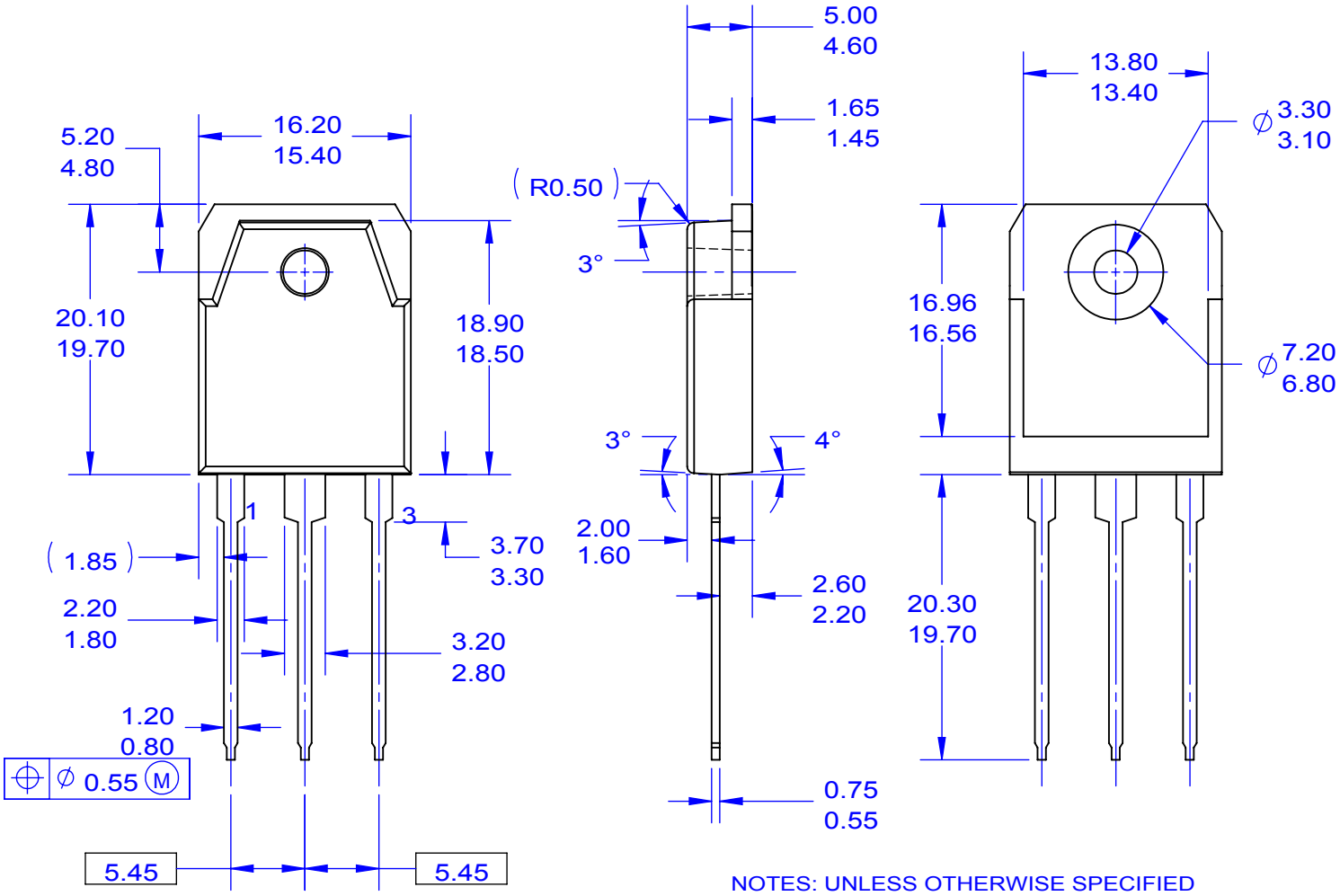

**Figure 18. Forward Characteristics**

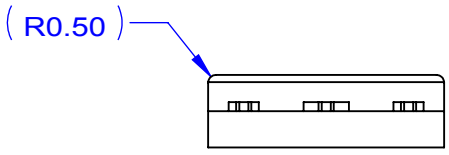


## Typical Performance Characteristics

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






NOTES: UNLESS OTHERWISE SPECIFIED

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C) DIMENSION AND TOLERANCING PER ASME14.5-2009.
D) DIMENSIONS ARE EXCLUSSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSSIONS.
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