



# FGA90N30

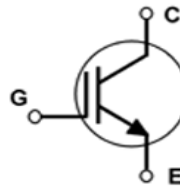
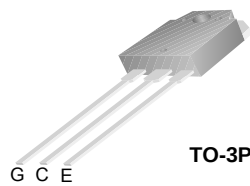
## 300V PDP IGBT

### Features

- High Current Capability
- Low saturation voltage:  $V_{CE(sat)}$ , Typ = 1.1V@  $I_C = 20A$
- High Input Impedance

### Description

Employing Unified IGBT Technology, FGA90N30 provides low conduction and switching loss. FGA90N30 offers the optimum solution for PDP applications where low conduction loss is essential.



### Absolute Maximum Ratings $T_C = 25^\circ\text{C}$ unless otherwise noted

| Symbol    | Description                                                                |                             | FGA90N30    | Units            |
|-----------|----------------------------------------------------------------------------|-----------------------------|-------------|------------------|
| $V_{CES}$ | Collector-Emitter Voltage                                                  |                             | 300         | V                |
| $V_{GES}$ | Gate-Emitter Voltage                                                       |                             | $\pm 30$    | V                |
| $I_C$     | Collector Current                                                          | @ $T_C = 25^\circ\text{C}$  | 90          | A                |
| $I_{CM}$  | Pulsed Collector Current (Note 1)                                          | @ $T_C = 25^\circ\text{C}$  | 220         | A                |
| $P_D$     | Maximum Power Dissipation                                                  | @ $T_C = 25^\circ\text{C}$  | 219         | W                |
|           | Maximum Power Dissipation                                                  | @ $T_C = 100^\circ\text{C}$ | 87          | 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<br>Purposes, 1/8" from case for 5 seconds |                             | 300         | $^\circ\text{C}$ |

#### Notes:

(1) Repetitive test, pulse width = 100usec, Duty = 0.2

\*  $I_{C\_pulse}$  limited by max  $T_J$

### Thermal Characteristics

| Symbol                | Parameter                                     | Typ. | Max. | Units              |
|-----------------------|-----------------------------------------------|------|------|--------------------|
| $R_{\theta JC}(IGBT)$ | Thermal Resistance, Junction-to-Case for IGBT | --   | 0.57 | $^\circ\text{C/W}$ |
| $R_{\theta JA}$       | Thermal Resistance, Junction-to-Ambient       | --   | 40   | $^\circ\text{C/W}$ |

## Package Marking and Ordering Information

| Device Marking | Device   | Package | Reel Size | Tape Width | Quantity |
|----------------|----------|---------|-----------|------------|----------|
| FGA90N30       | FGA90N30 | TO-3P   | --        | --         | 30       |

## Electrical Characteristics of the IGBT T<sub>C</sub> = 25°C unless otherwise noted

| Symbol                                  | Parameter                                    | Test Conditions                                                                                                                  | Min. | Typ. | Max.  | Units |
|-----------------------------------------|----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|------|------|-------|-------|
| Off Characteristics                     |                                              |                                                                                                                                  |      |      |       |       |
| BV <sub>CES</sub>                       | Collector-Emitter Breakdown Voltage          | V <sub>GE</sub> = 0V, I <sub>C</sub> = 250μA                                                                                     | 300  | --   | --    | V     |
| ΔB <sub>VCES</sub> /<br>ΔT <sub>J</sub> | Temperature Coefficient of Breakdown Voltage | V <sub>GE</sub> = 0V, I <sub>C</sub> = 250μA                                                                                     | --   | 0.6  | --    | V/°C  |
| I <sub>CES</sub>                        | Collector Cut-Off Current                    | V <sub>CE</sub> = V <sub>CES</sub> , V <sub>GE</sub> = 0V                                                                        | --   | --   | 100   | μA    |
| I <sub>GES</sub>                        | G-E Leakage Current                          | V <sub>GE</sub> = V <sub>GES</sub> , V <sub>CE</sub> = 0V                                                                        | --   | --   | ± 250 | nA    |
| On Characteristics                      |                                              |                                                                                                                                  |      |      |       |       |
| V <sub>GE(th)</sub>                     | G-E Threshold Voltage                        | I <sub>C</sub> = 250uA, V <sub>CE</sub> = V <sub>GE</sub>                                                                        | 2.5  | 4.0  | 5.0   | V     |
| V <sub>CE(sat)</sub>                    | Collector to Emitter Saturation Voltage      | I <sub>C</sub> = 20A, V <sub>GE</sub> = 15V                                                                                      | --   | 1.1  | 1.4   | V     |
|                                         |                                              | I <sub>C</sub> = 90A, V <sub>GE</sub> = 15V                                                                                      | --   | 1.9  | --    | V     |
|                                         |                                              | I <sub>C</sub> = 90A, V <sub>GE</sub> = 15V, T <sub>C</sub> = 125°C                                                              | --   | 2.0  | --    | V     |
|                                         |                                              |                                                                                                                                  |      |      |       |       |
| Dynamic Characteristics                 |                                              |                                                                                                                                  |      |      |       |       |
| C <sub>ies</sub>                        | Input Capacitance                            | V <sub>CE</sub> = 30V, V <sub>GE</sub> = 0V, f = 1MHz                                                                            | --   | 1700 | -     | pF    |
| C <sub>oes</sub>                        | Output Capacitance                           |                                                                                                                                  | --   | 290  | -     | pF    |
| C <sub>res</sub>                        | Reverse Transfer Capacitance                 |                                                                                                                                  | --   | 80   | -     | pF    |
| Switching Characteristics               |                                              |                                                                                                                                  |      |      |       |       |
| t <sub>d(on)</sub>                      | Turn-On Delay Time                           | V <sub>CC</sub> = 200V, I <sub>C</sub> = 20A, R <sub>G</sub> = 10Ω, V <sub>GE</sub> = 15V, Resistive Load, T <sub>C</sub> = 25°C | --   | 30   | --    | ns    |
| t <sub>r</sub>                          | Rise Time                                    |                                                                                                                                  | --   | 200  | --    | ns    |
| t <sub>d(off)</sub>                     | Turn-Off Delay Time                          |                                                                                                                                  | --   | 110  | --    | ns    |
| t <sub>f</sub>                          | Fall Time                                    |                                                                                                                                  | --   | 140  | 300   | ns    |
| E <sub>on</sub>                         | Turn-On Switching Loss                       |                                                                                                                                  | --   | 0.15 | --    | mJ    |
| E <sub>off</sub>                        | Turn-Off Switching Loss                      |                                                                                                                                  | --   | 0.45 | --    | mJ    |
| E <sub>ts</sub>                         | Total Switching Loss                         |                                                                                                                                  | --   | 0.6  | --    | mJ    |
| t <sub>d(on)</sub>                      | Turn-On Delay Time                           | V <sub>CC</sub> =200V, I <sub>C</sub> = 20A, R <sub>G</sub> = 10Ω, V <sub>GE</sub> = 15V, Resistive Load, T <sub>C</sub> = 125°C | --   | 30   | --    | ns    |
| t <sub>r</sub>                          | Rise Time                                    |                                                                                                                                  | --   | 210  | --    | ns    |
| t <sub>d(off)</sub>                     | Turn-Off Delay Time                          |                                                                                                                                  | --   | 110  | --    | ns    |
| t <sub>f</sub>                          | Fall Time                                    |                                                                                                                                  | --   | 200  | --    | ns    |
| E <sub>on</sub>                         | Turn-On Switching Loss                       |                                                                                                                                  | --   | 0.16 | --    | mJ    |
| E <sub>off</sub>                        | Turn-Off Switching Loss                      |                                                                                                                                  | --   | 0.72 | --    | mJ    |
| E <sub>ts</sub>                         | Total Switching Loss                         |                                                                                                                                  | --   | 0.88 | --    | mJ    |
| Q <sub>g</sub>                          | Total Gate Charge                            | V <sub>CE</sub> = 200V, I <sub>C</sub> = 20A, V <sub>GE</sub> = 15V                                                              | --   | 87   | 130   | nC    |
| Q <sub>ge</sub>                         | Gate-Emitter Charge                          |                                                                                                                                  | --   | 12   | 18    | nC    |
| Q <sub>gc</sub>                         | Gate-Collector Charge                        |                                                                                                                                  | --   | 38   | 57    | nC    |

## Typical Performance Characteristics

Figure 1. Typical Output Characteristics

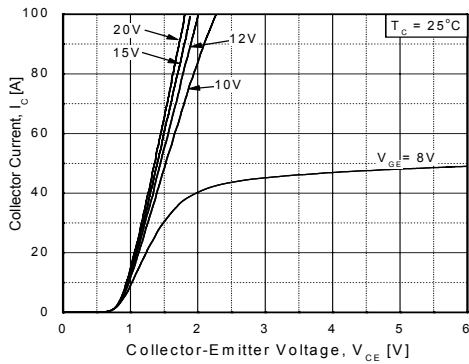


Figure 2. Typical Output Characteristics

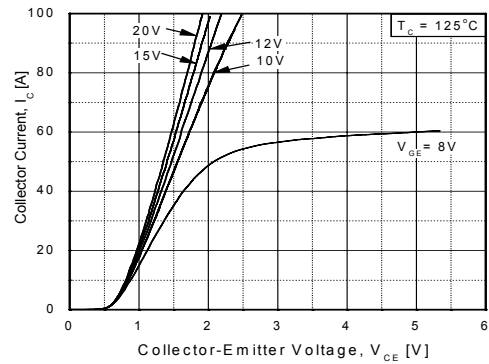


Figure 3. Typical Saturation Voltage Characteristics

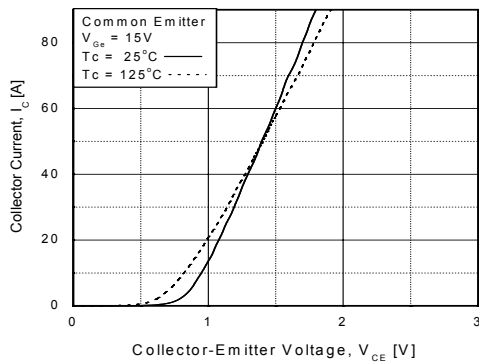


Figure 4. Transfer characteristics

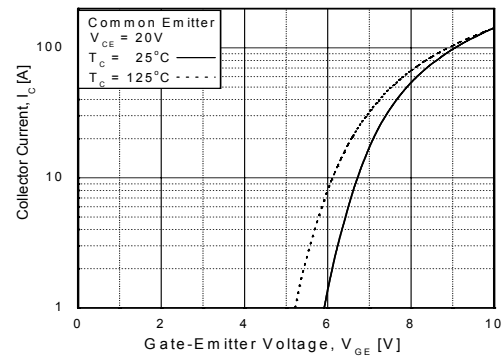


Figure 5. Saturation Voltage vs. Case Temperature at Variant Current Level

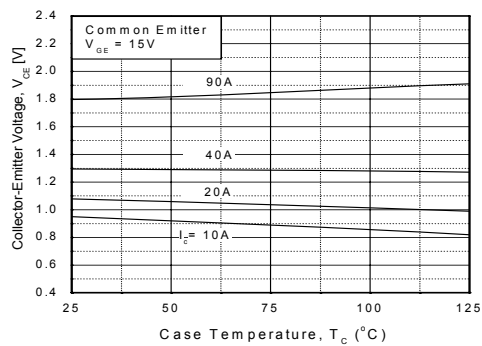
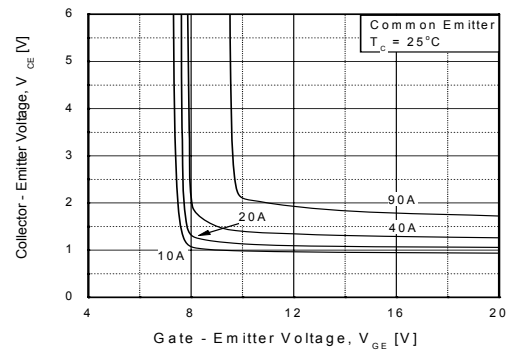


Figure 6. Saturation Voltage vs. Vge



## Typical Performance Characteristics (Continued)

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

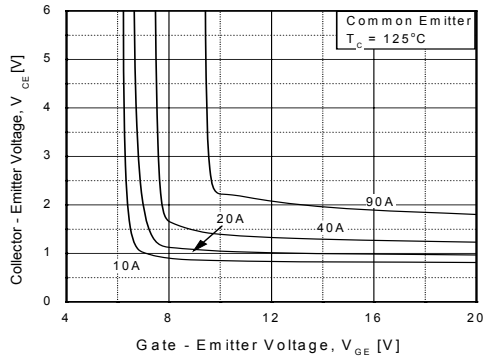


Figure 8. Capacitance Characteristics

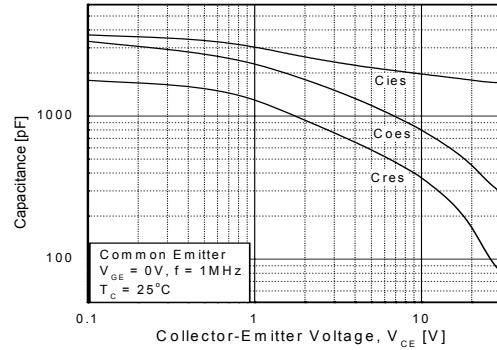


Figure 9. Gate Charge Characteristics

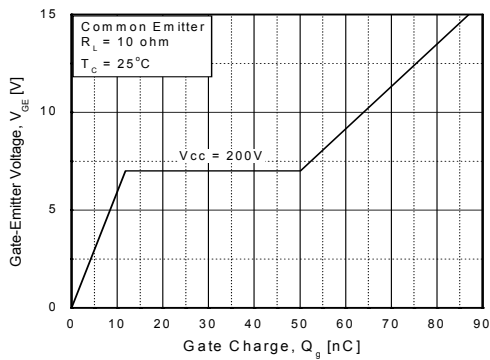


Figure 10. SOA Characteristics

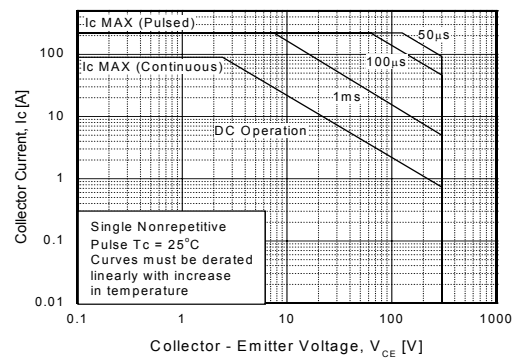


Figure 11. Turn-On Characteristics vs. Gate Resistance

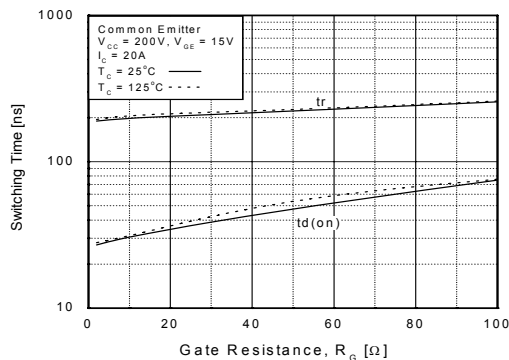
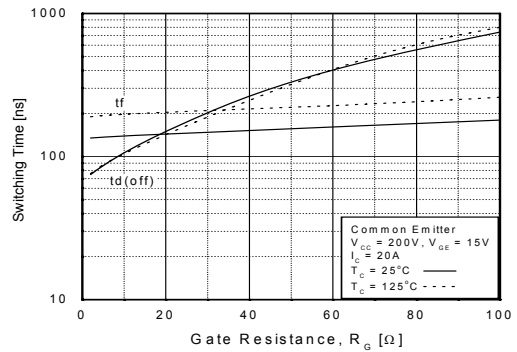


Figure 12. Turn-Off Characteristics vs. Gate Resistance



## Typical Performance Characteristics (Continued)

Figure 13. Turn-On Characteristics vs. Collector Current

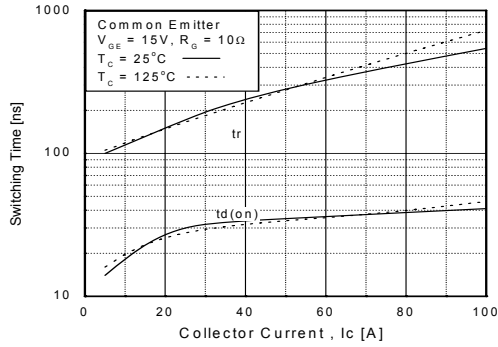


Figure 14. Turn-Off Characteristics vs. Collector Current

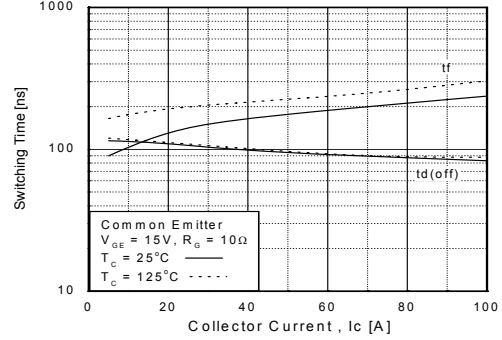


Figure 15. Switching Loss vs. Gate Resistance

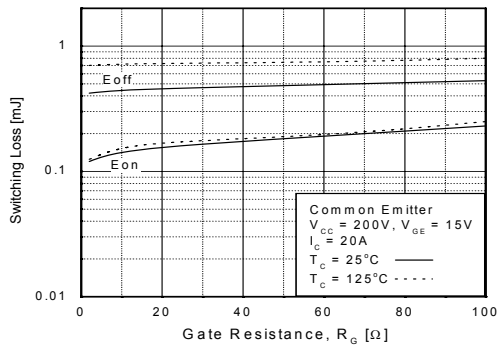


Figure 16. Switching Loss vs. Collector Current

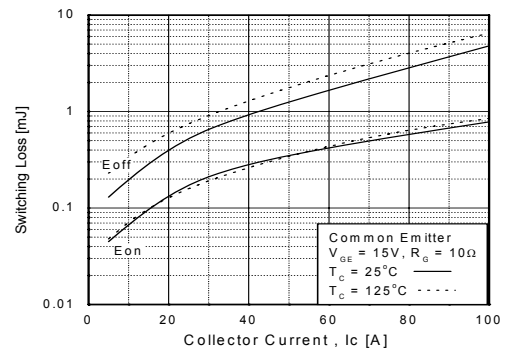
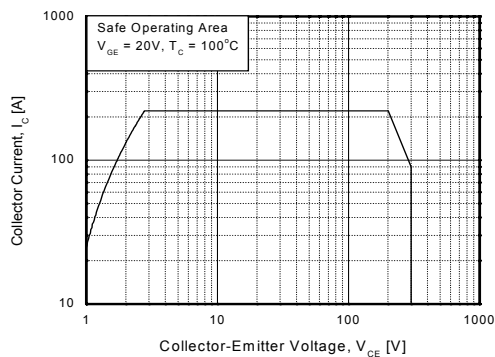
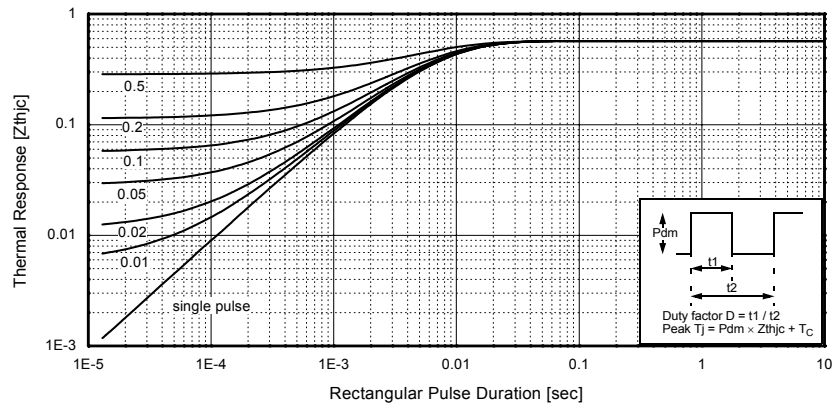


Figure 17. Turn-Off SOA Figure



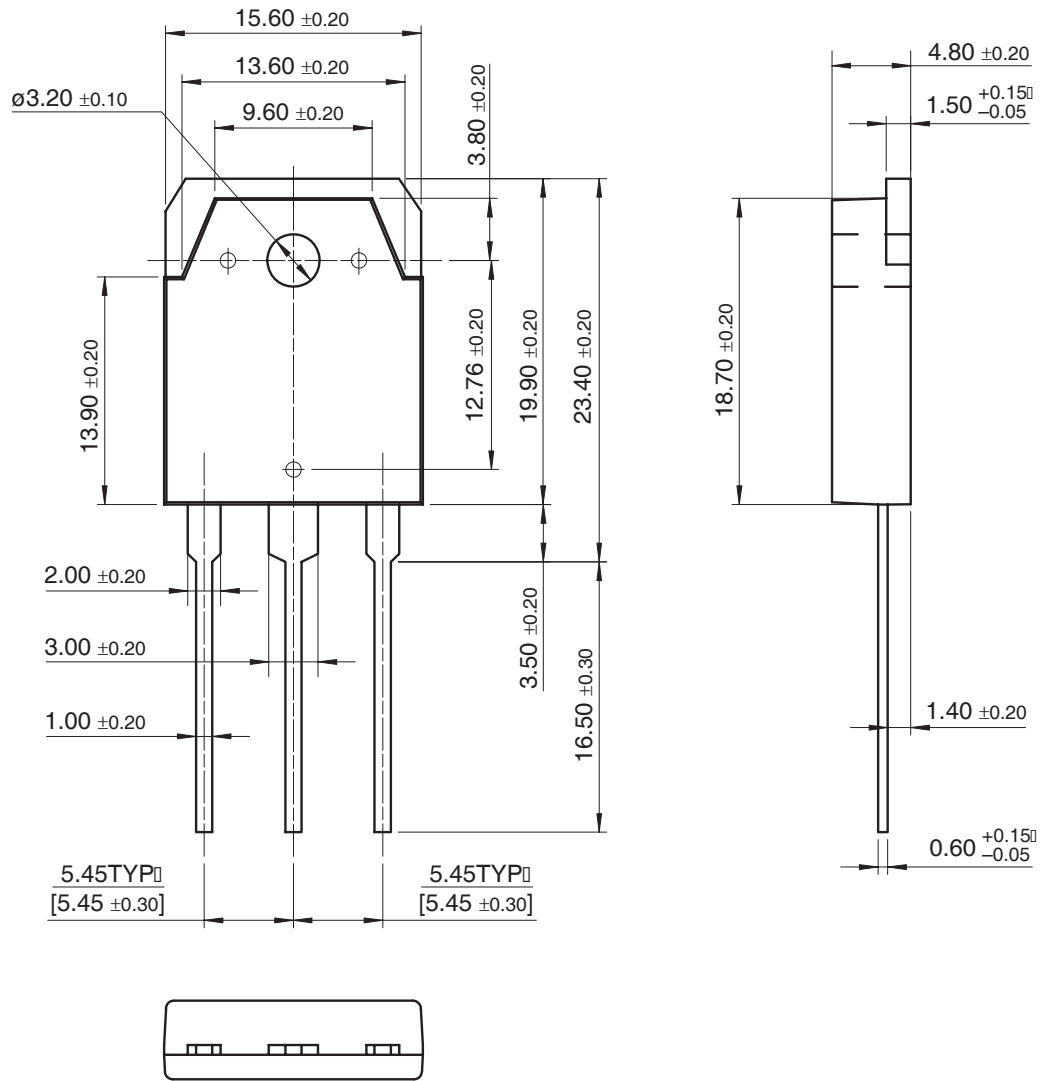
# Typical Performance Characteristics (Continued)

Figure 18. Transient Thermal Impedance of IGBT



# Mechanical Dimensions

## TO-3P



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| FRFET™                               | MSX™                | RapidConfigure™     | TinyLogic®       |           |
|                                      | MSXPro™             | RapidConnect™       | TINYOPTO™        |           |
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|                                      |                     | ScalarPump™         | UHC™             |           |
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