



# FGPF4533

## 330 V PDP Trench IGBT

### Features

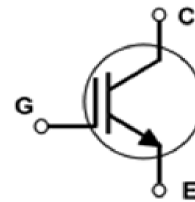
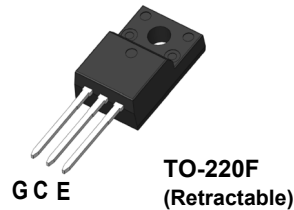
- High Current Capability
- Low Saturation Voltage:  $V_{CE(sat)} = 1.55\text{ V @ } I_C = 50\text{ A}$
- High Input Impedance
- Fast Switching
- RoHS Compliant

### Applications

- PDP TV, Consumer appliances, Lighting

### General Description

Using novel trench IGBT technology, Fairchild®'s new series of trench IGBTs offer the optimum performance for consumer appliances, PDP TV and lighting applications where low conduction and switching losses are essential.



### Absolute Maximum Ratings

Symbol	Description	Ratings	Unit
$V_{CES}$	Collector to Emitter Voltage	330	V
$V_{GES}$	Gate to Emitter Voltage	$\pm 30$	V
$I_C \text{ pulse(1)*}$	Collector Current @ $T_C = 25^\circ\text{C}$	200	A
$P_D$	Maximum Power Dissipation @ $T_C = 25^\circ\text{C}$	28.4	W
	Maximum Power Dissipation @ $T_C = 100^\circ\text{C}$	11.4	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	$^\circ\text{C}$

### Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JC}(\text{IGBT})$	Thermal Resistance, Junction to Case	-	4.4	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	-	62.5	$^\circ\text{C/W}$

**Notes:**

(1) Half Sine Wave,  $D < 0.01$ , pulse width  $< 5\mu\text{sec}$

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

## Package Marking and Ordering Information

Device Marking	Device	Package	Packaging Type	Qty per Tube	Max Qty per Box
FGPF4533	FGPF4533TU	TO-220F	Tube	50ea	-

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
<b>Off Characteristics</b>						
BV <sub>CES</sub>	Collector to Emitter Breakdown Voltage	V <sub>GE</sub> = 0 V, I <sub>C</sub> = 250 μA	330	-	-	V
$\frac{\Delta BV_{CES}}{\Delta T_J}$	Temperature Coefficient of Breakdown Voltage	V <sub>GE</sub> = 0 V, I <sub>C</sub> = 250 μA	-	0.3	-	V/°C
I <sub>CES</sub>	Collector Cut-Off Current	V <sub>CE</sub> = V <sub>CES</sub> , V <sub>GE</sub> = 0 V	-	-	100	μA
I <sub>GES</sub>	G-E Leakage Current	V <sub>GE</sub> = V <sub>GES</sub> , V <sub>CE</sub> = 0 V	-	-	±400	nA
<b>On Characteristics</b>						
V <sub>GE(th)</sub>	G-E Threshold Voltage	I <sub>C</sub> = 250 μA, V <sub>CE</sub> = V <sub>GE</sub>	2.4	3.3	4.0	V
V <sub>CE(sat)</sub>	Collector to Emitter Saturation Voltage	I <sub>C</sub> = 20 A, V <sub>GE</sub> = 15 V	-	1.15	-	V
		I <sub>C</sub> = 50 A, V <sub>GE</sub> = 15 V, T <sub>C</sub> = 25°C	-	1.55	1.8	V
		I <sub>C</sub> = 50 A, V <sub>GE</sub> = 15 V, T <sub>C</sub> = 125°C	-	1.6	-	V
<b>Dynamic Characteristics</b>						
C <sub>ies</sub>	Input Capacitance	V <sub>CE</sub> = 30 V, V <sub>GE</sub> = 0 V, f = 1 MHz	-	1294	-	pF
C <sub>oes</sub>	Output Capacitance		-	57	-	pF
C <sub>res</sub>	Reverse Transfer Capacitance		-	41	-	pF
<b>Switching Characteristics</b>						
t <sub>d(on)</sub>	Turn-On Delay Time	V <sub>CC</sub> = 200 V, I <sub>C</sub> = 20 A, R <sub>G</sub> = 5 Ω, V <sub>GE</sub> = 15 V, Resistive Load, T <sub>C</sub> = 25°C	-	6	-	ns
t <sub>r</sub>	Rise Time		-	22	-	ns
t <sub>d(off)</sub>	Turn-Off Delay Time		-	40	-	ns
t <sub>f</sub>	Fall Time		-	220	-	ns
t <sub>d(on)</sub>	Turn-On Delay Time	V <sub>CC</sub> = 200 V, I <sub>C</sub> = 20 A, R <sub>G</sub> = 5 Ω, V <sub>GE</sub> = 15 V, Resistive Load, T <sub>C</sub> = 125°C	-	6	-	ns
t <sub>r</sub>	Rise Time		-	24	-	ns
t <sub>d(off)</sub>	Turn-Off Delay Time		-	42	-	ns
t <sub>f</sub>	Fall Time		-	277	-	ns
Q <sub>g</sub>	Total Gate Charge	V <sub>CE</sub> = 200 V, I <sub>C</sub> = 20 A, V <sub>GE</sub> = 15 V	-	44	-	nC
Q <sub>ge</sub>	Gate to Emitter Charge		-	6	-	nC
Q <sub>gc</sub>	Gate to Collector Charge		-	14	-	nC

## Typical Performance Characteristics

Figure 1. Typical Output Characteristics

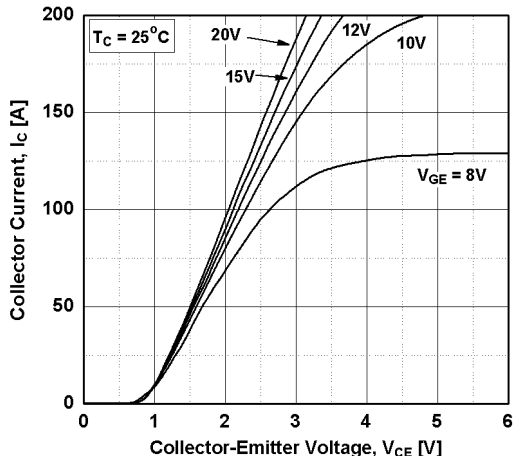


Figure 2. Typical Output Characteristics

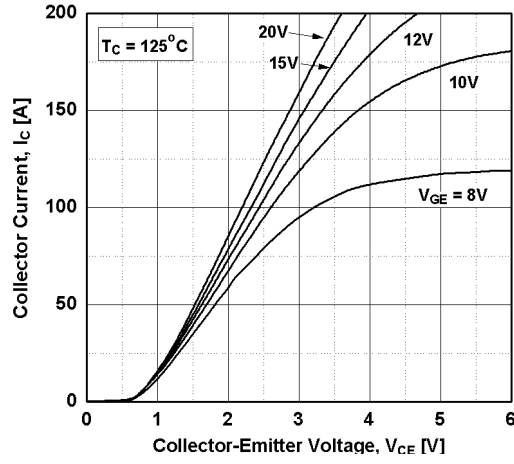


Figure 3. Typical Saturation Voltage Characteristics

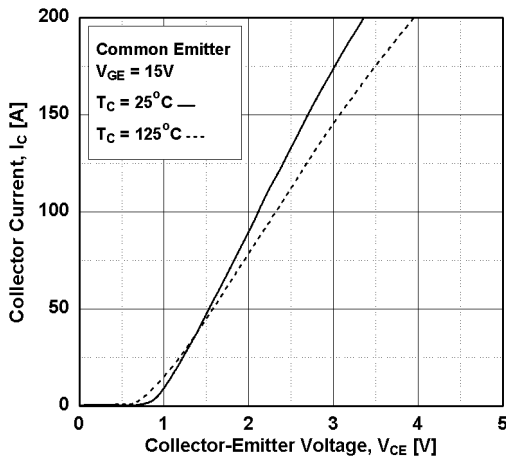


Figure 4. Transfer Characteristics

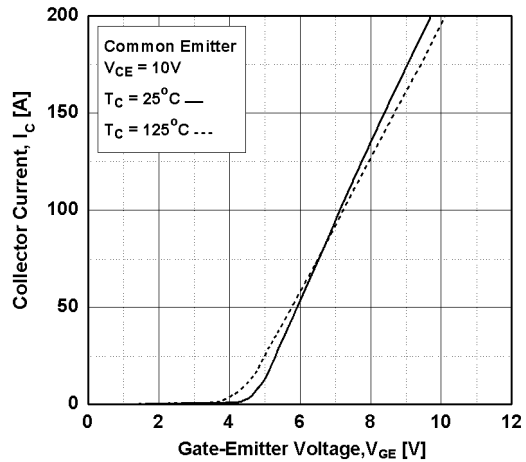


Figure 5. Saturation Voltage vs. Case Temperature at Variant Current Level

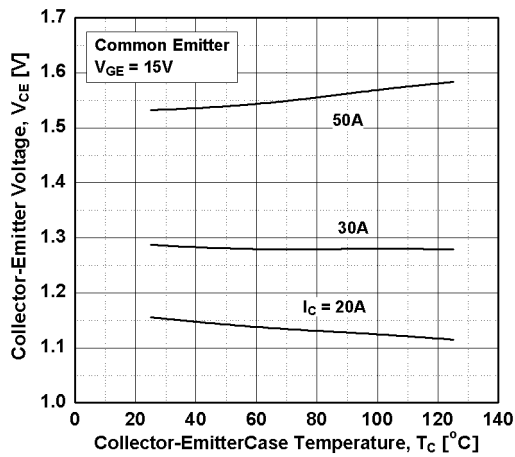
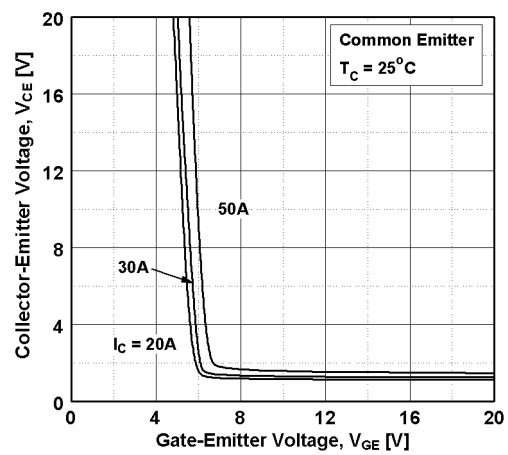


Figure 6. Saturation Voltage vs. Vge



## Typical Performance Characteristics

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

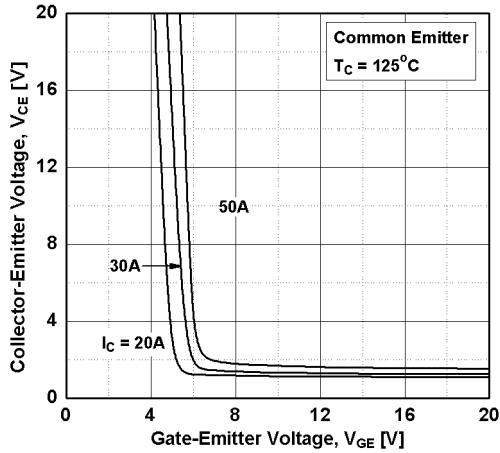


Figure 8. Capacitance Characteristics

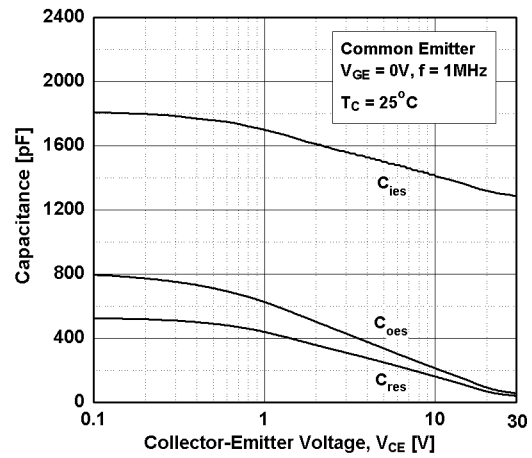


Figure 9. Gate charge Characteristics

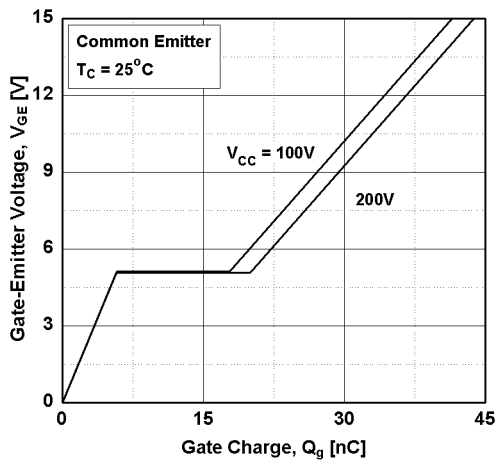


Figure 10. SOA Characteristics

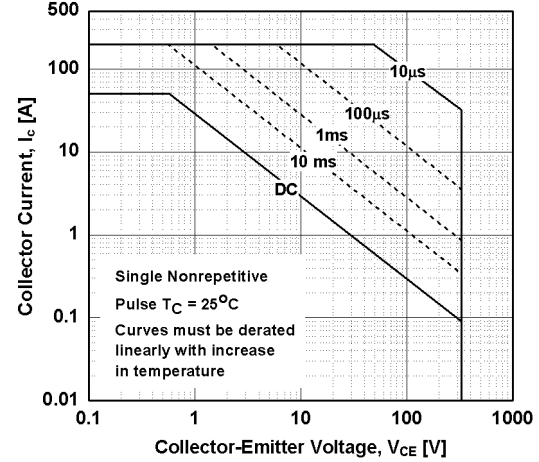


Figure 11. Turn-on Characteristics vs. Gate Resistance

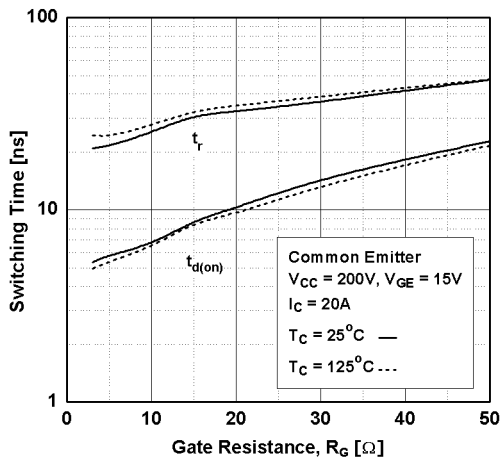
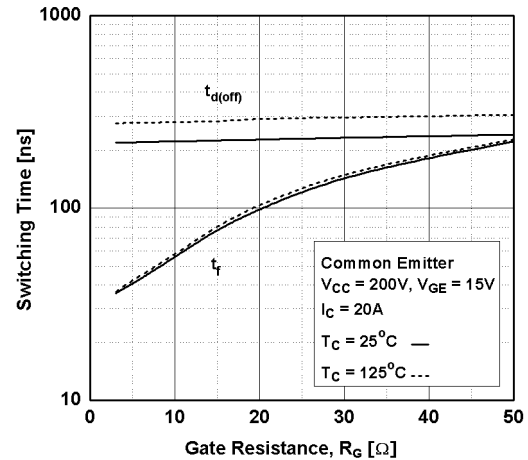
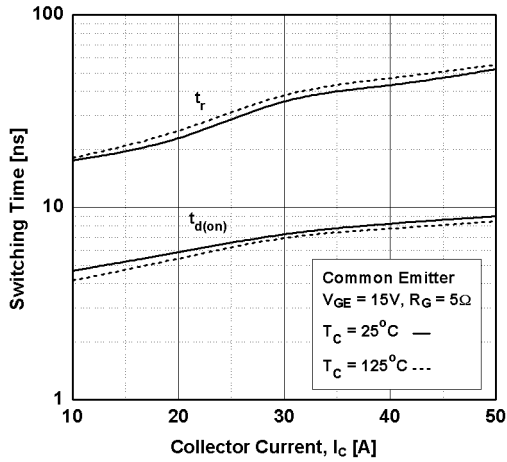


Figure 12. Turn-off Characteristics vs. Gate Resistance

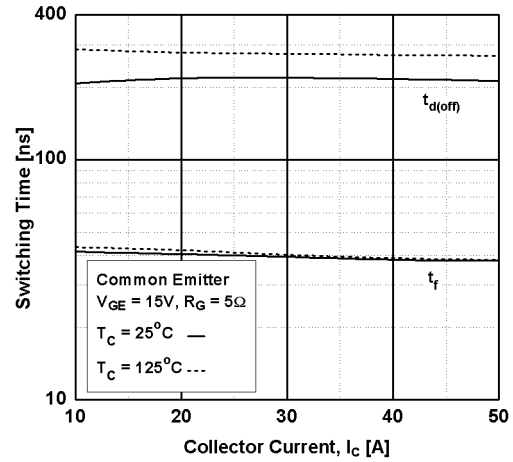


## Typical Performance Characteristics

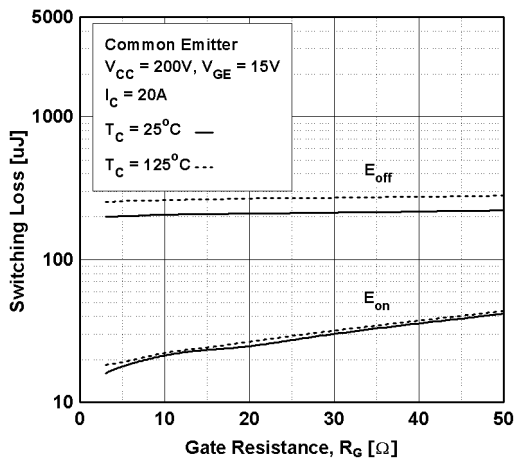
**Figure 13. Turn-on Characteristics vs. Collector Current**



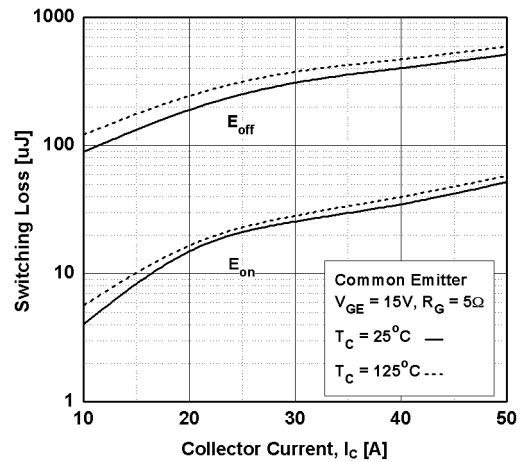
**Figure 14. Turn-off Characteristics vs. Collector Current**



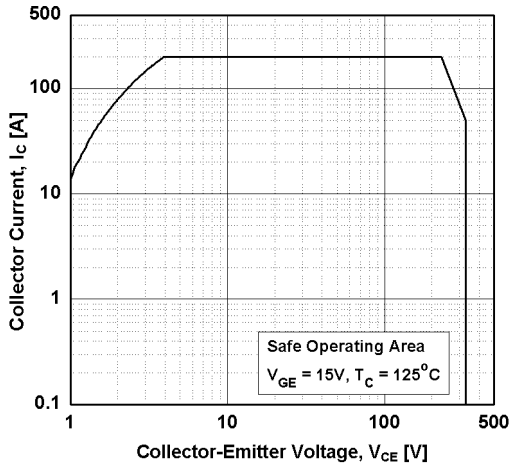
**Figure 15. Switching Loss vs. Gate Resistance**



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

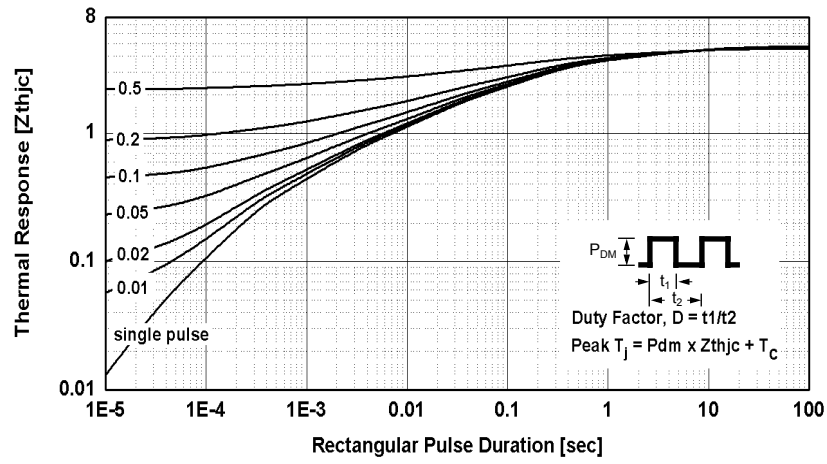


**Figure 17. Turn off Switching SOA Characteristics**



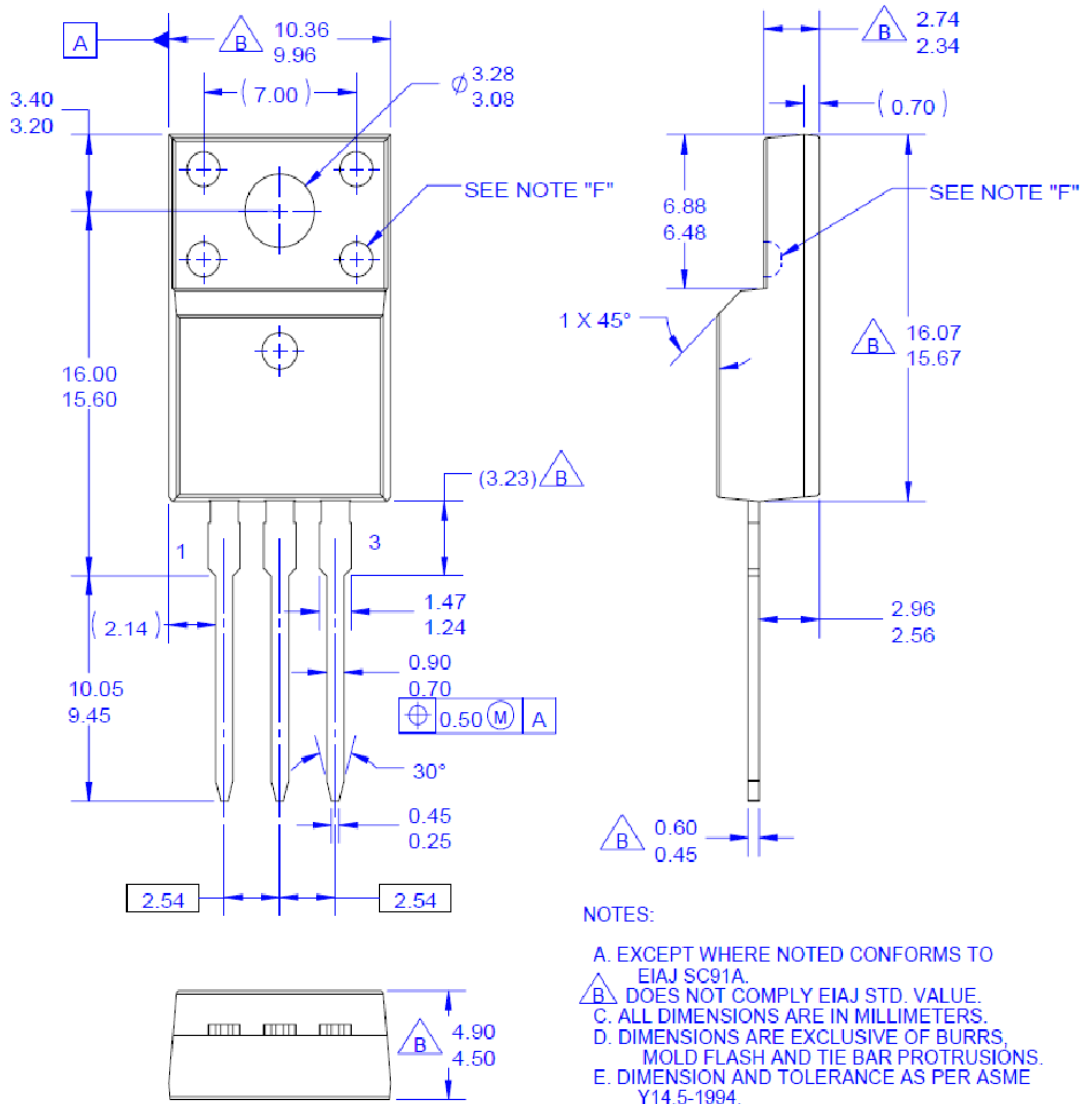
Typical Performance Characteristics

Figure 18. Transient Thermal Impedance of IGBT



**Package Dimensions**

**TO-220F (Retractable)**



**NOTES:**

- A. EXCEPT WHERE NOTED CONFORMS TO EIAJ SC91A.
- B. DOES NOT COMPLY EIAJ STD. VALUE.
- C. ALL DIMENSIONS ARE IN MILLIMETERS.
- D. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR PROTRUSIONS.
- E. DIMENSION AND TOLERANCE AS PER ASME Y14.5-1994.
- F. OPTION 1 - WITH SUPPORT PIN HOLE.  
OPTION 2 - NO SUPPORT PIN HOLE
- G. DRAWING FILE NAME: TO220M03REV3

**\* Front/Back Side Isolation Voltage : AC 2700V**

Dimensions in Millimeters



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| AccuPower™               | F-PFS™  | SYSTEM GENERAL®  |
| AX-CAP®*                 | FRFET®  | TinyBoost™       |
| BitSiC™                  | Global Power Resource <sup>SM</sup>             | TinyBuck™        |
| Build it Now™            | Green Bridge™                                   | TinyCalc™        |
| CorePLUS™                | Green FPS™                                      | TinyLogic®       |
| CorePOWER™               | Green FPS™ e-Series™                            | TINYOPTO™        |
| CROSSVOLT™               | Gmax™   | TinyPower™       |
| CTL™                     | GTO™  | TinyPWM™         |
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|                          | PowerTrench®                                    |                  |
|                          | PowerXS™  |                  |
|                          | Programmable Active Droop™                      |                  |
|                          | QFET®   |                  |
|                          | QS™   |                  |
|                          | Quiet Series™                                   |                  |
|                          | RapidConfigure™                                 |                  |
|                          | Saving our world, 1mW/W/kW at a time™           |                  |
|                          | SignalWise™                                     |                  |
|                          | SmartMax™                                       |                  |
|                          | SMART START™                                    |                  |
|                          | Solutions for Your Success™                     |                  |
|                          | SPM®  |                  |
|                          | STEALTH™  |                  |
|                          | SuperFET®                                       |                  |
|                          | SuperSOT™-3                                     |                  |
|                          | SuperSOT™-6                                     |                  |
|                          | SuperSOT™-8                                     |                  |
|                          | SupreMOS®                                       |                  |
|                          | SyncFET™  |                  |

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- A critical component in any component of a life support, device, or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

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Datasheet Identification	Product Status	Definition
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Preliminary	First Production	Datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
No Identification Needed	Full Production	Datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design.
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