

# FGPF4633

## 330 V PDP Trench IGBT

### Features

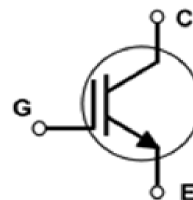
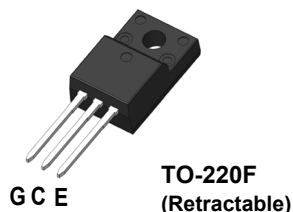
- High Current Capability
- Low Saturation Voltage:  $V_{CE(sat)} = 1.55 \text{ V @ } I_C = 70 \text{ A}$
- High Input Impedance
- Fast Switching
- RoHS Compliant

### 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 @ $T_C = 25^\circ\text{C}$	300	A
$P_D$	Maximum Power Dissipation @ $T_C = 25^\circ\text{C}$	30.5	W
	Maximum Power Dissipation @ $T_C = 100^\circ\text{C}$	12.2	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.	Units
$R_{\theta JC}(\text{IGBT})$	Thermal Resistance, Junction to Case	-	4.1	$^\circ\text{C/W}$
$R_{\theta JA}$	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
FGPF4633	FGPF4633TU	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
Off Characteristics						
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
On Characteristics						
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	-	1.1	-	V
		I <sub>C</sub> = 40 A, V <sub>GE</sub> = 15 V	-	1.35	-	
		I <sub>C</sub> = 70 A, V <sub>GE</sub> = 15 V, T <sub>C</sub> = 25°C	-	1.55	1.8	V
		I <sub>C</sub> = 70 A, V <sub>GE</sub> = 15 V, T <sub>C</sub> = 125°C	-	1.61	-	V
Dynamic Characteristics						
C <sub>ies</sub>	Input Capacitance	V <sub>CE</sub> = 30 V, V <sub>GE</sub> = 0 V, f = 1 MHz	-	1715	-	pF
C <sub>oes</sub>	Output Capacitance		-	75	-	pF
C <sub>res</sub>	Reverse Transfer Capacitance		-	55	-	pF
Switching Characteristics						
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	-	8	-	ns
t <sub>r</sub>	Rise Time		-	30	-	ns
t <sub>d(off)</sub>	Turn-Off Delay Time		-	52	-	ns
t <sub>f</sub>	Fall Time		-	260	-	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	-	8	-	ns
t <sub>r</sub>	Rise Time		-	32	-	ns
t <sub>d(off)</sub>	Turn-Off Delay Time		-	53	-	ns
t <sub>f</sub>	Fall Time		-	341	-	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	-	60	-	nC
Q <sub>ge</sub>	Gate to Emitter Charge		-	8	-	nC
Q <sub>gc</sub>	Gate to Collector Charge		-	20	-	nC

## Typical Performance Characteristics

Figure 1. Typical Output Characteristics

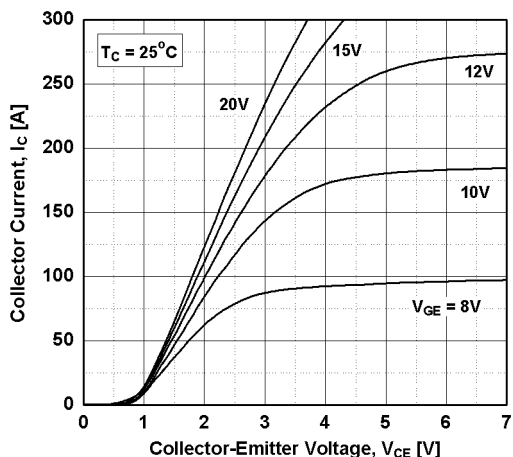


Figure 2. Typical Output Characteristics

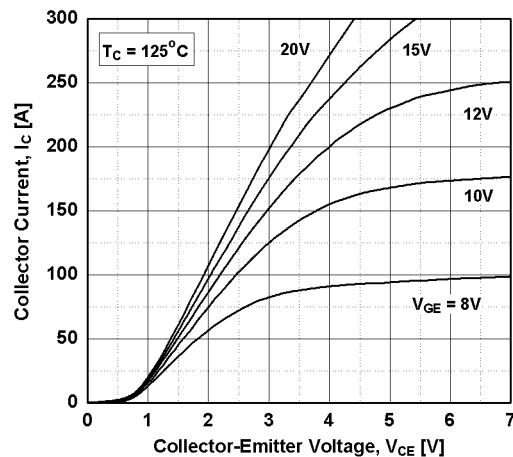


Figure 3. Typical Saturation Voltage Characteristics

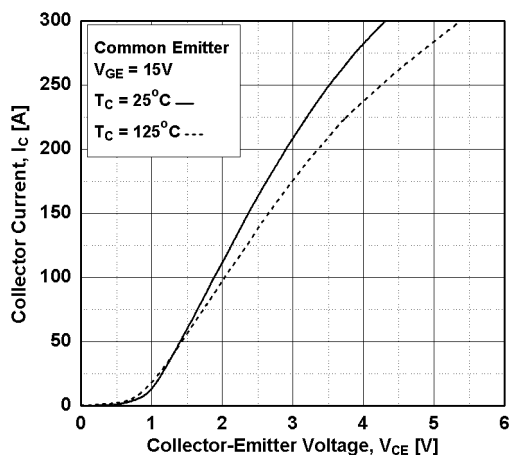


Figure 4. Transfer Characteristics

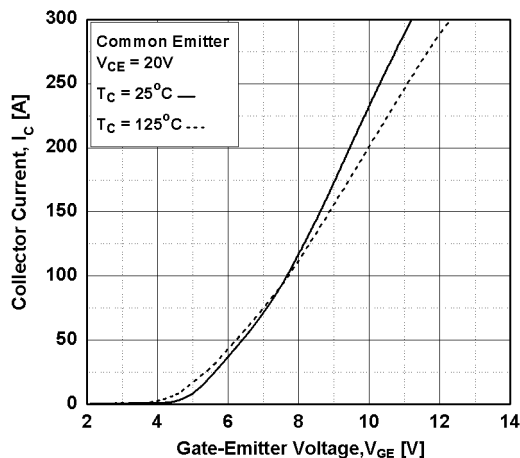


Figure 5. Saturation Voltage vs. Case Temperature at Variant Current Level

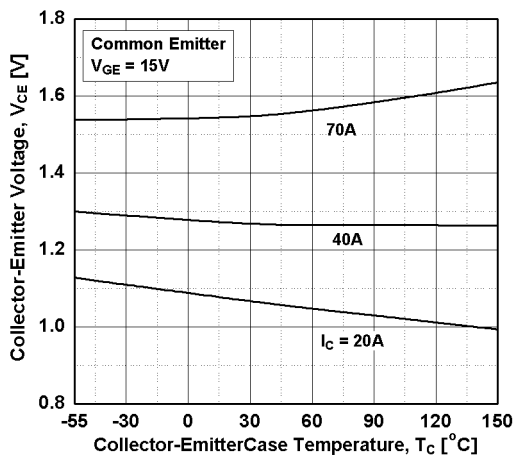
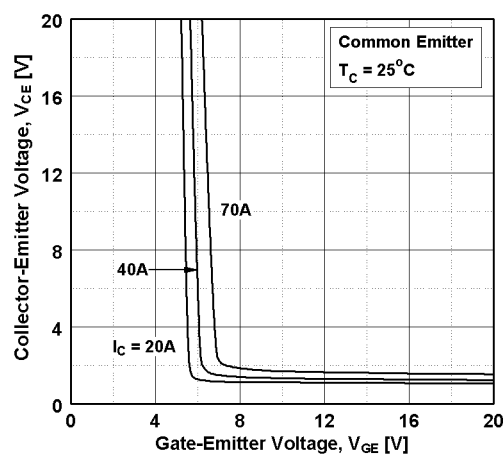


Figure 6. Saturation Voltage vs.  $V_{GE}$



## Typical Performance Characteristics

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

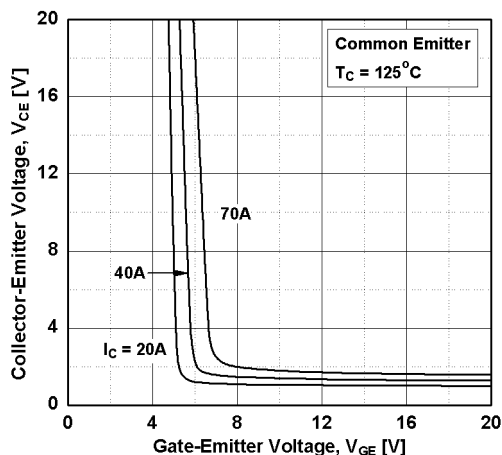


Figure 8. Capacitance Characteristics

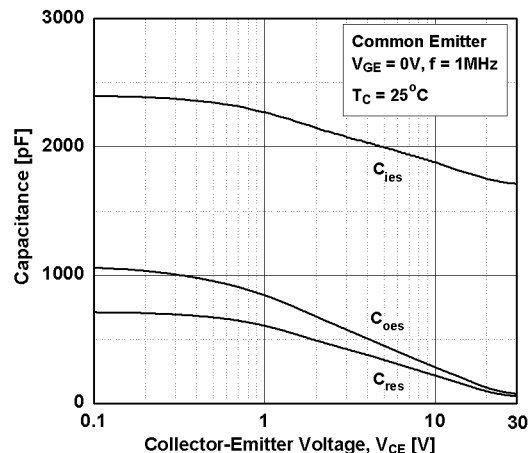


Figure 9. Gate charge Characteristics

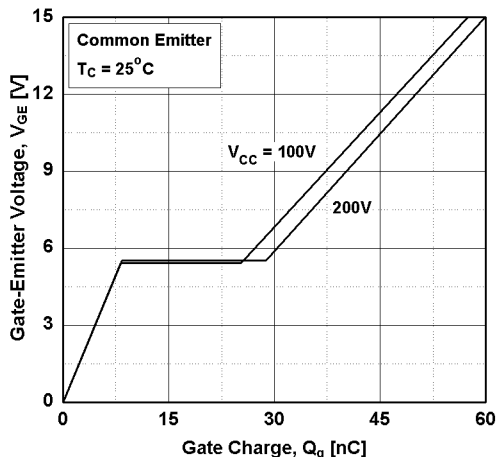


Figure 10. SOA Characteristics

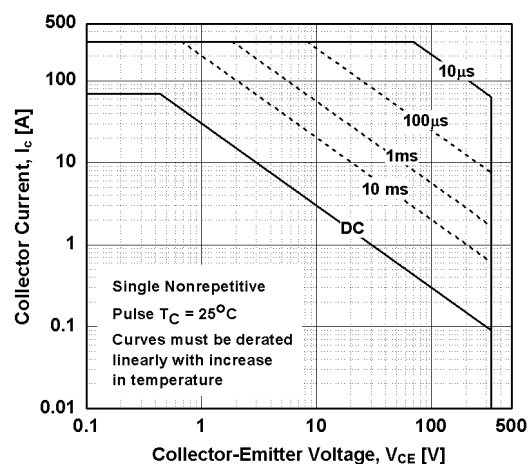


Figure 11. Turn-on Characteristics vs. Gate Resistance

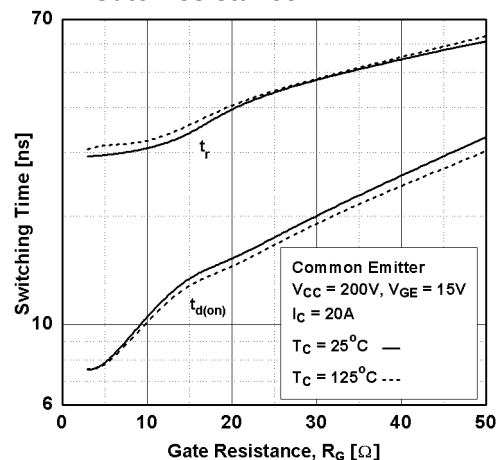
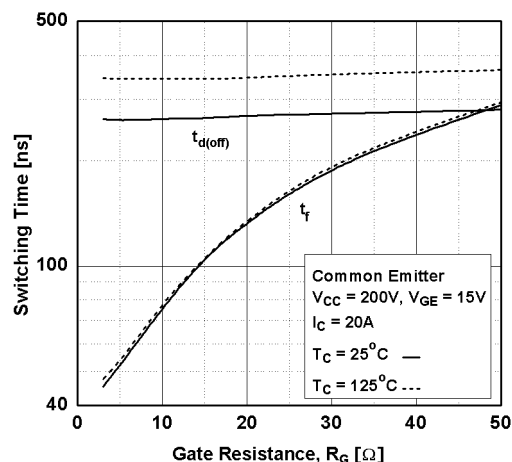


Figure 12. Turn-off Characteristics vs. Gate Resistance



## Typical Performance Characteristics

Figure 13. Turn-on Characteristics vs. Collector Current

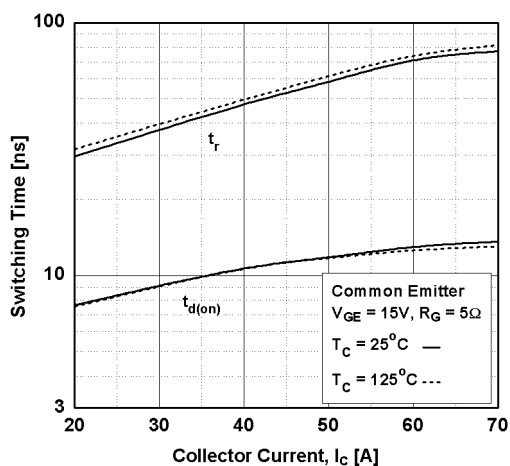


Figure 14. Turn-off Characteristics vs. Collector Current

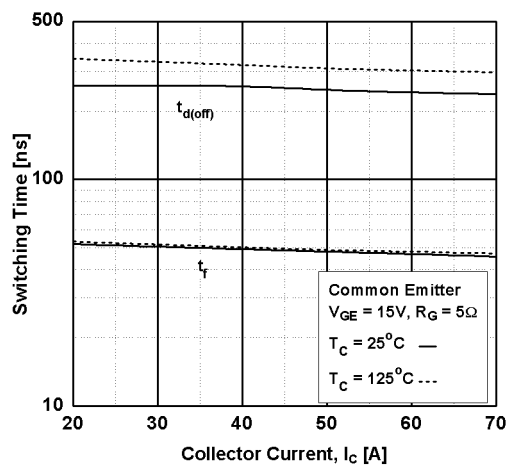


Figure 15. Switching Loss vs. Gate Resistance

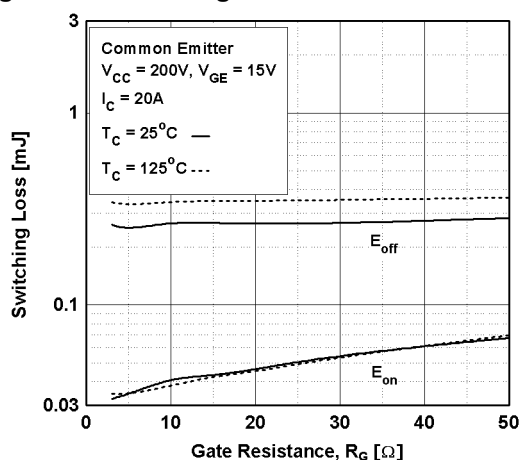


Figure 16. Switching Loss vs. Collector Current

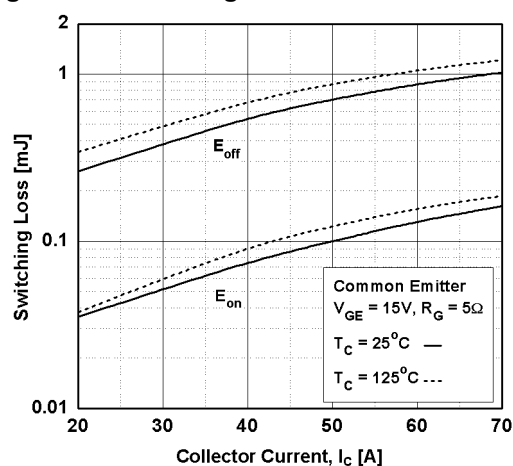
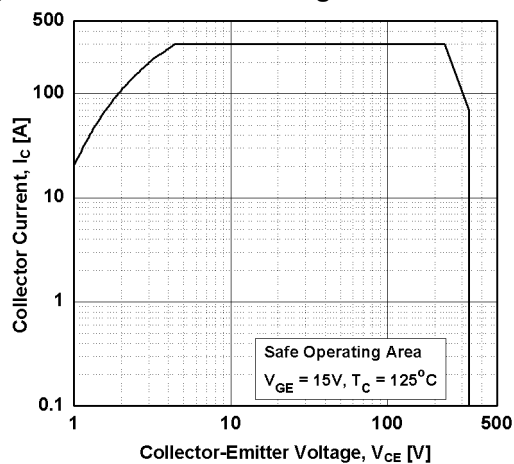
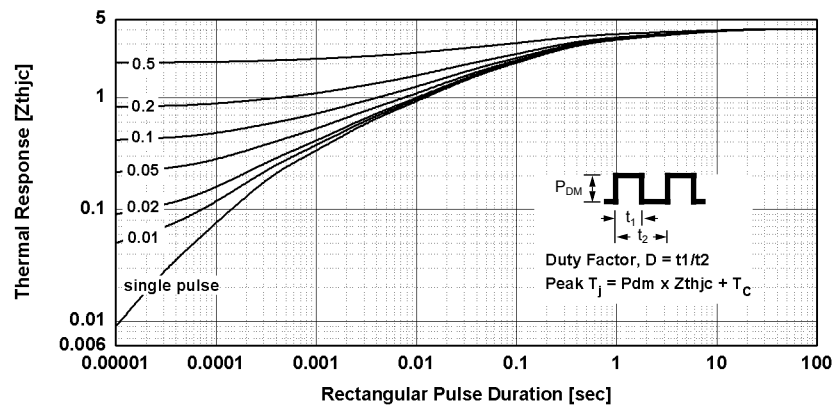


Figure 17. Turn off Switching SOA Characteristics



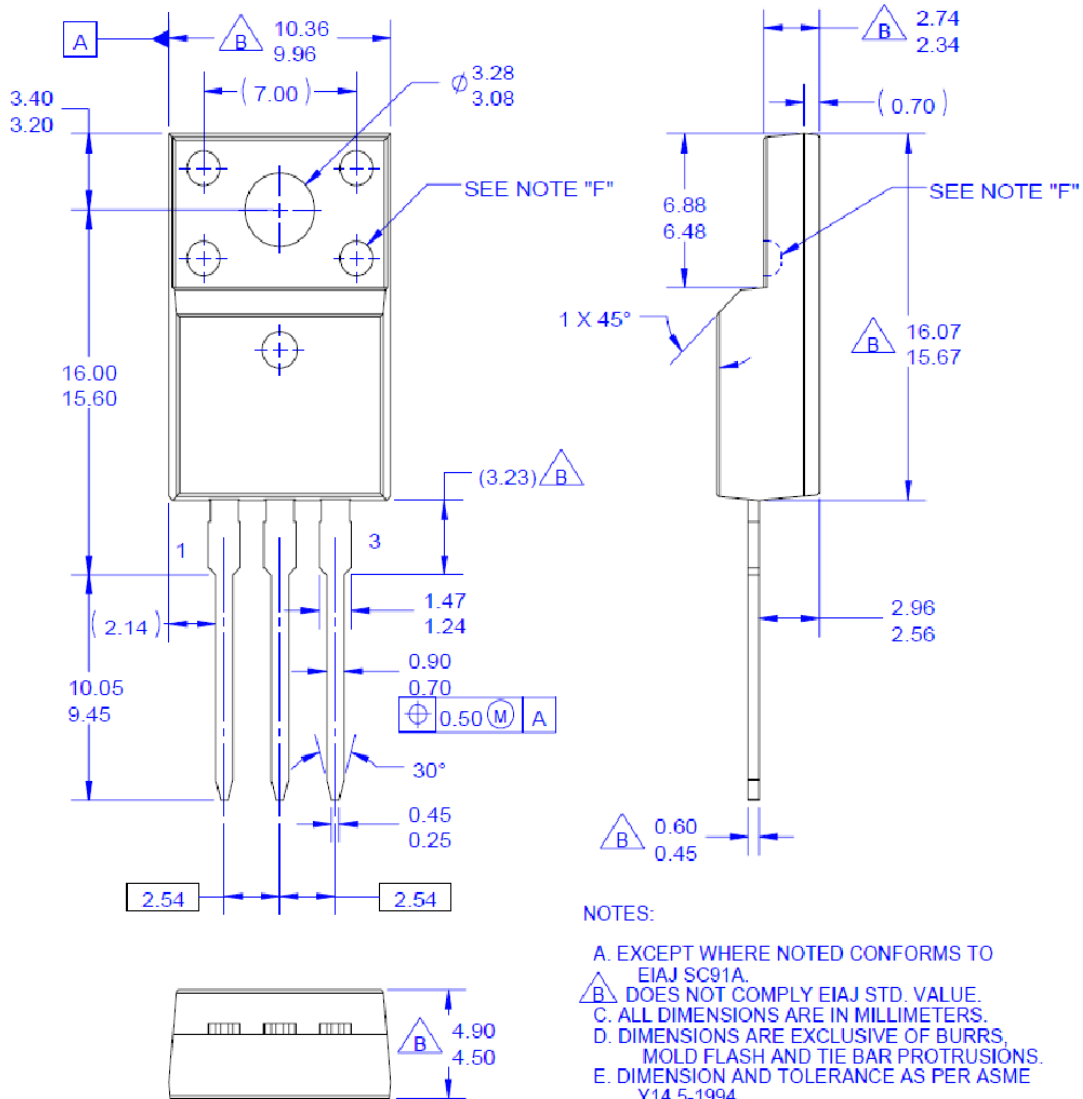
## Typical Performance Characteristics

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

2Cool™  
AccuPower™  
AX-CAP®  
BitSiC™  
Build it Now™  
CorePLUS™  
CorePOWER™  
CROSSVOL™  
CTL™  
Current Transfer Logic™  
DEUXPEED®  
Dual Cool™  
EcoSPARK®  
EfficientMax™  
ESBC™  
  
Fairchild®  
Fairchild Semiconductor®  
FACT Quiet Series™  
FACT®  
FAST®  
FastvCore™  
FETBench™  
FPS™  
F-PFS™  
FRFET®  
Global Power ResourceSM  
Green Bridge™  
Green FPS™  
Green FPS™ e-Series™  
Gmax™  
GTO™  
IntelliMAX™  
ISOPLANAR™  
Marking Small Speakers Sound Louder  
and Better™  
MegaBuck™  
MICROCOUPLER™  
MicroFET™  
MicroPak™  
MicroPak2™  
MillerDrive™  
MotionMax™  
mWSaver™  
OptoHiT™  
OPTOLOGIC®  
OPTOPLANAR®

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®  
SvncFET™

Sync-Lock™  
 SYSTEM GENERAL®  
 TinyBoost™  
 TinyBuck™  
 TinyCalc™  
 TinyLogic®  
 TinyOPTO™  
 TinyPower™  
 TinyPWM™  
 TinyWire™  
 TranSiC®  
 TriFault Detect™  
 TRUECURRENT®  
 µSerDes™  
 SerDes™  
 UHC®  
 Ultra FRFET™  
 UniFET™  
 VCX™  
 VisualMax™  
 VoltagePlus™  
 XS™

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Datasheet Identification	Product Status	Definition
Advance Information	Formative / In Design	Datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
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.
Obsolete	Not In Production	Datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only.

Rev. 164



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