



November 2014

# FGPF4565 650 V Field Stop Trench IGBT

## Features

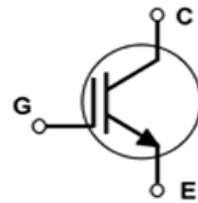
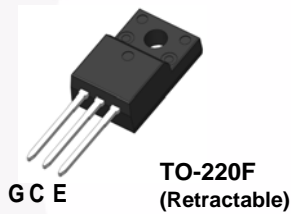
- High Current Capability
- Low Saturation Voltage:  $V_{CE(sat)} = 1.5\text{ V (Typ.) @ } I_C = 30\text{ A}$
- High Input Impedance
- RoHS Compliant

## Applications

- IPL (Intense Pulsed Light)

## General Description

Using innovative field stop IGBT technology, Fairchild's new series of field stop trench IGBTs offer the optimum performance for IPL (Intense Pulsed Light).



## Absolute Maximum Ratings T<sub>C</sub> = 25°C unless otherwise noted

Symbol	Description	Ratings	Unit
$V_{CES}$	Collector to Emitter Voltage	650	V
$V_{GES}$	Gate to Emitter Voltage	$\pm 25$	V
$I_{C\ pulse\ (1)^*}$	Pulsed Collector Current @ $T_C = 25^\circ\text{C}$	170	A
$P_D$	Maximum Power Dissipation @ $T_C = 25^\circ\text{C}$	30	W
	Maximum Power Dissipation @ $T_C = 100^\circ\text{C}$	12	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
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	-	4.1	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	-	62.5	$^\circ\text{C/W}$

### Notes:

1. Half sine wave:  $D < 0.01$ , pulse width  $< 1\text{ usec}$ ,

\*  $I_C$  pulse limit by max  $T_J$

**Package Marking and Ordering Information**

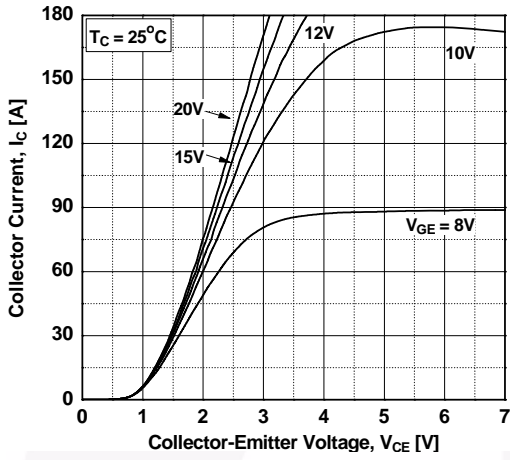
Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FGPF4565	FGPF4565	TO-220F	Tube	N/A	N/A	50

**Electrical Characteristics of the IGBT**  $T_C = 25^\circ\text{C}$  unless otherwise noted

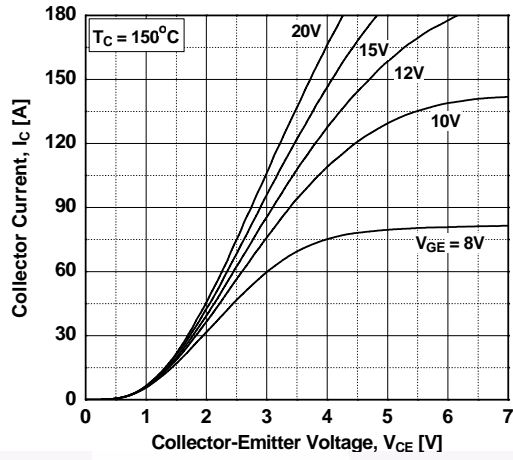
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
<b>Off Characteristics</b>						
$BV_{CES}$	Collector to Emitter Breakdown Voltage	$V_{GE} = 0\text{ V}, I_C = 1\text{ mA}$	650	-	-	V
$\frac{\Delta BV_{CES}}{\Delta T_J}$	Temperature Coefficient of Breakdown Voltage	$V_{GE} = 0\text{ V}, I_C = 1\text{ mA}$	-	0.65	-	V/ $^\circ\text{C}$
$I_{CES}$	Collector Cut-Off Current	$V_{CE} = V_{CES}, V_{GE} = 0\text{ V}$	-	-	250	$\mu\text{A}$
$I_{GES}$	G-E Leakage Current	$V_{GE} = V_{GES}, V_{CE} = 0\text{ V}$	-	-	$\pm 400$	nA
<b>On Characteristics</b>						
$V_{GE(th)}$	G-E Threshold Voltage	$I_C = 250\text{ }\mu\text{A}, V_{CE} = V_{GE}$	3.0	4.0	5.0	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C = 20\text{ A}, V_{GE} = 15\text{ V}$	-	1.35	-	V
		$I_C = 30\text{ A}, V_{GE} = 15\text{ V}$	-	1.50	1.88	V
		$I_C = 30\text{ A}, V_{GE} = 15\text{ V}, T_C = 150^\circ\text{C}$	-	1.75	-	V
<b>Dynamic Characteristics</b>						
$C_{ies}$	Input Capacitance	$V_{CE} = 30\text{ V}, V_{GE} = 0\text{ V}, f = 1\text{ MHz}$	-	1650	-	pF
$C_{oes}$	Output Capacitance		-	34	-	pF
$C_{res}$	Reverse Transfer Capacitance		-	17	-	pF
<b>Switching Characteristics</b>						
$t_{d(on)}$	Turn-On Delay Time	$V_{CC} = 400\text{ V}, I_C = 30\text{ A}, R_G = 5\text{ }\Omega, V_{GE} = 15\text{ V}, \text{Resistive Load}, T_C = 25^\circ\text{C}$	-	11.2	-	ns
$t_r$	Rise Time		-	44.8	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	40.8	-	ns
$t_f$	Fall Time		-	153	-	ns
$t_{d(on)}$	Turn-On Delay Time	$V_{CC} = 400\text{ V}, I_C = 30\text{ A}, R_G = 5\text{ }\Omega, V_{GE} = 15\text{ V}, \text{Resistive Load}, T_C = 150^\circ\text{C}$	-	12.8	-	ns
$t_r$	Rise Time		-	59.2	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	40.8	-	ns
$t_f$	Fall Time		-	202	-	ns
$Q_g$	Total Gate Charge	$V_{CE} = 400\text{ V}, I_C = 30\text{ A}, V_{GE} = 15\text{ V}$	-	40.3	-	nC
$Q_{ge}$	Gate to Emitter Charge		-	8.8	-	nC
$Q_{gc}$	Gate to Collector Charge		-	10.4	-	nC

## Typical Performance Characteristics

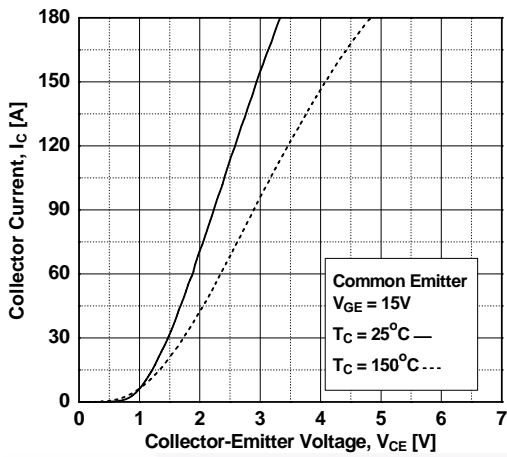
**Figure 1. Typical Output Characteristics**



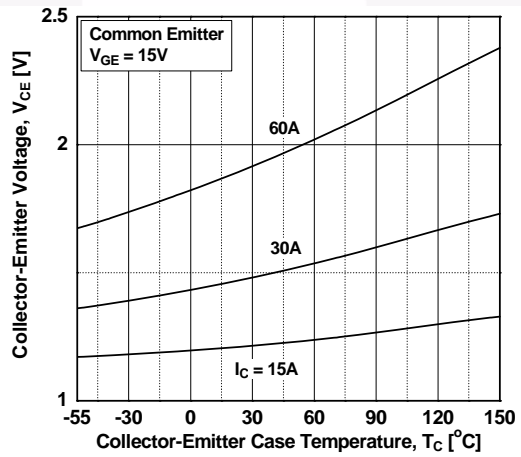
**Figure 2. Typical Output Characteristics**



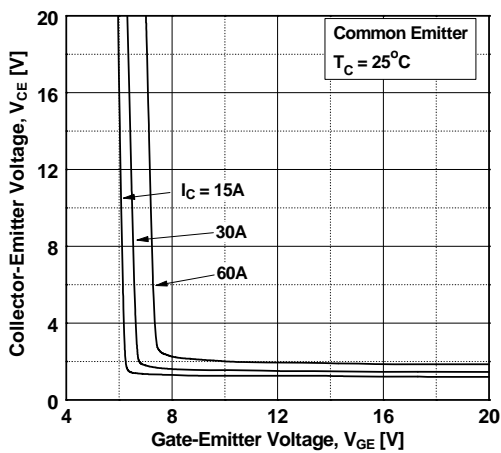
**Figure 3. Typical Saturation Voltage Characteristics**



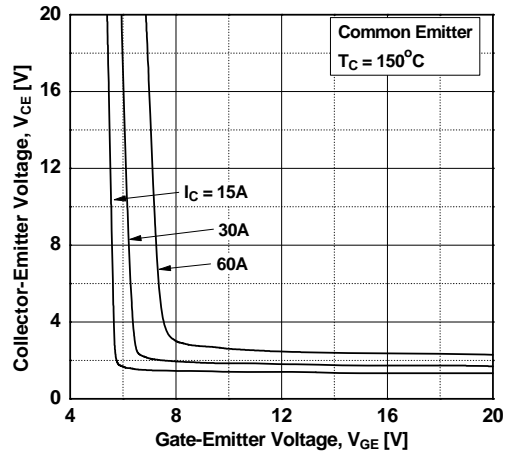
**Figure 4. Saturation Voltage vs. Case Temperature at Variant Current Level**



**Figure 5. Saturation Voltage vs.  $V_{GE}$**

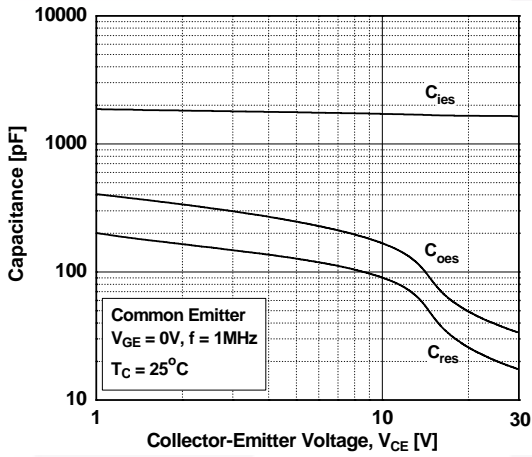


**Figure 6. Saturation Voltage vs.  $V_{GE}$**

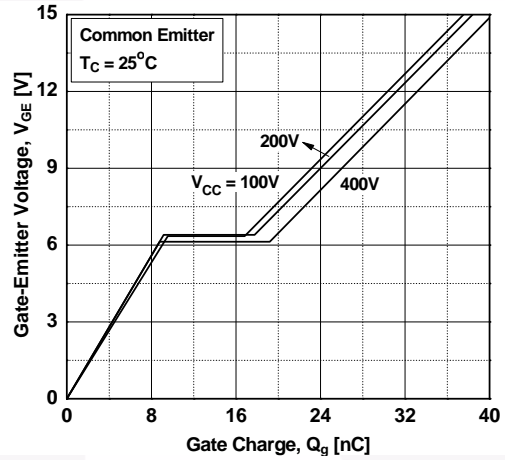


## Typical Performance Characteristics

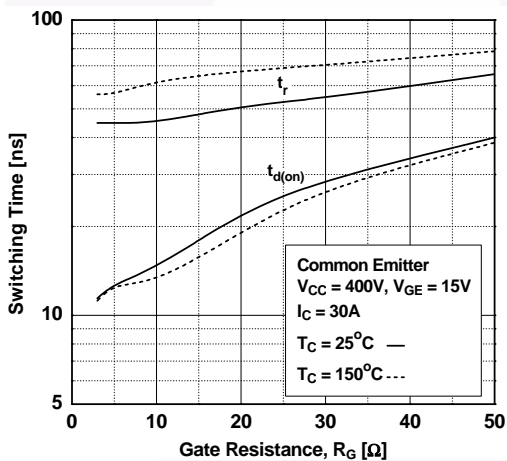
**Figure 7. Capacitance Characteristics**



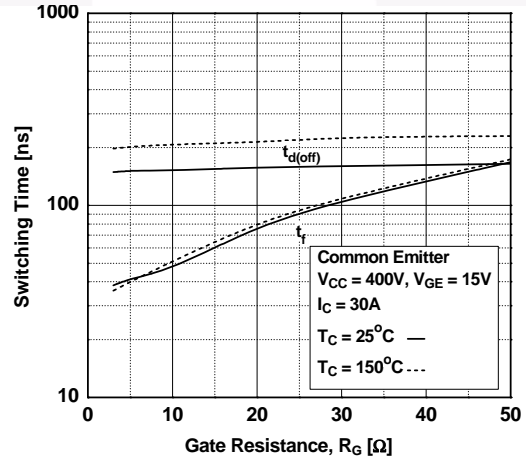
**Figure 8. Gate charge Characteristics**



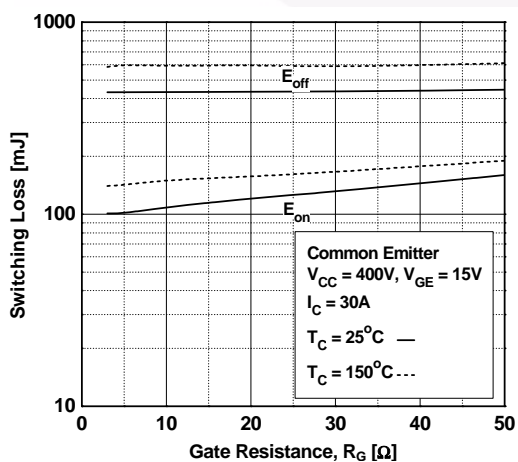
**Figure 9. Turn-on Characteristics vs. Gate Resistance**



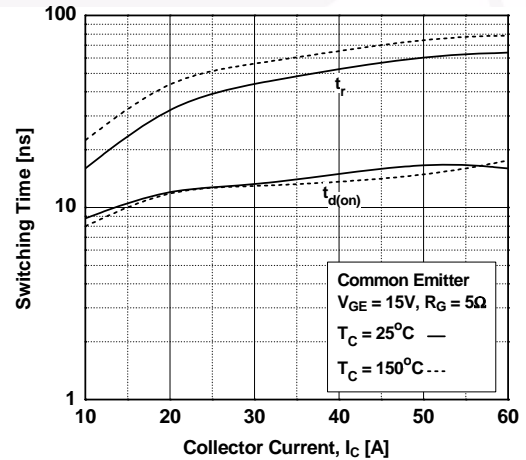
**Figure 10. Turn-off Characteristics vs. Gate Resistance**



**Figure 11. Switching Loss vs. Gate Resistance**



**Figure 12. Turn-on Characteristics vs. Collector Current**



Typical Performance Characteristics

Figure 13. Turn-off Characteristics vs. Collector Current

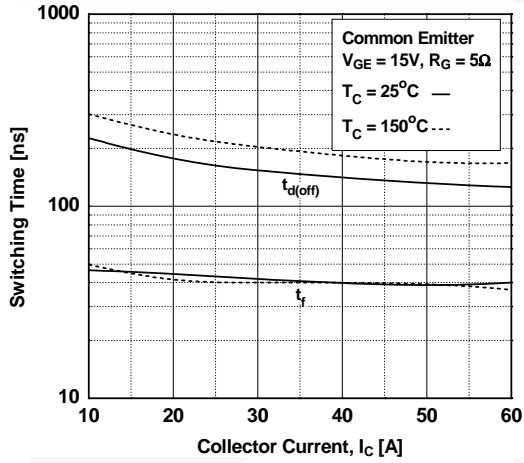


Figure 14. Switching Loss vs. Collector Current

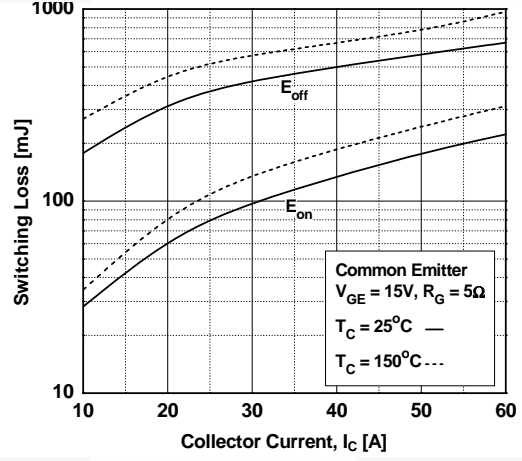
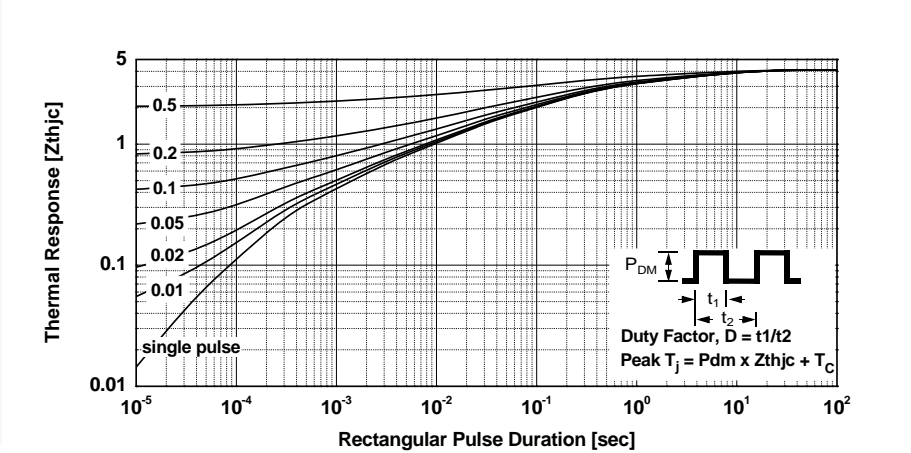
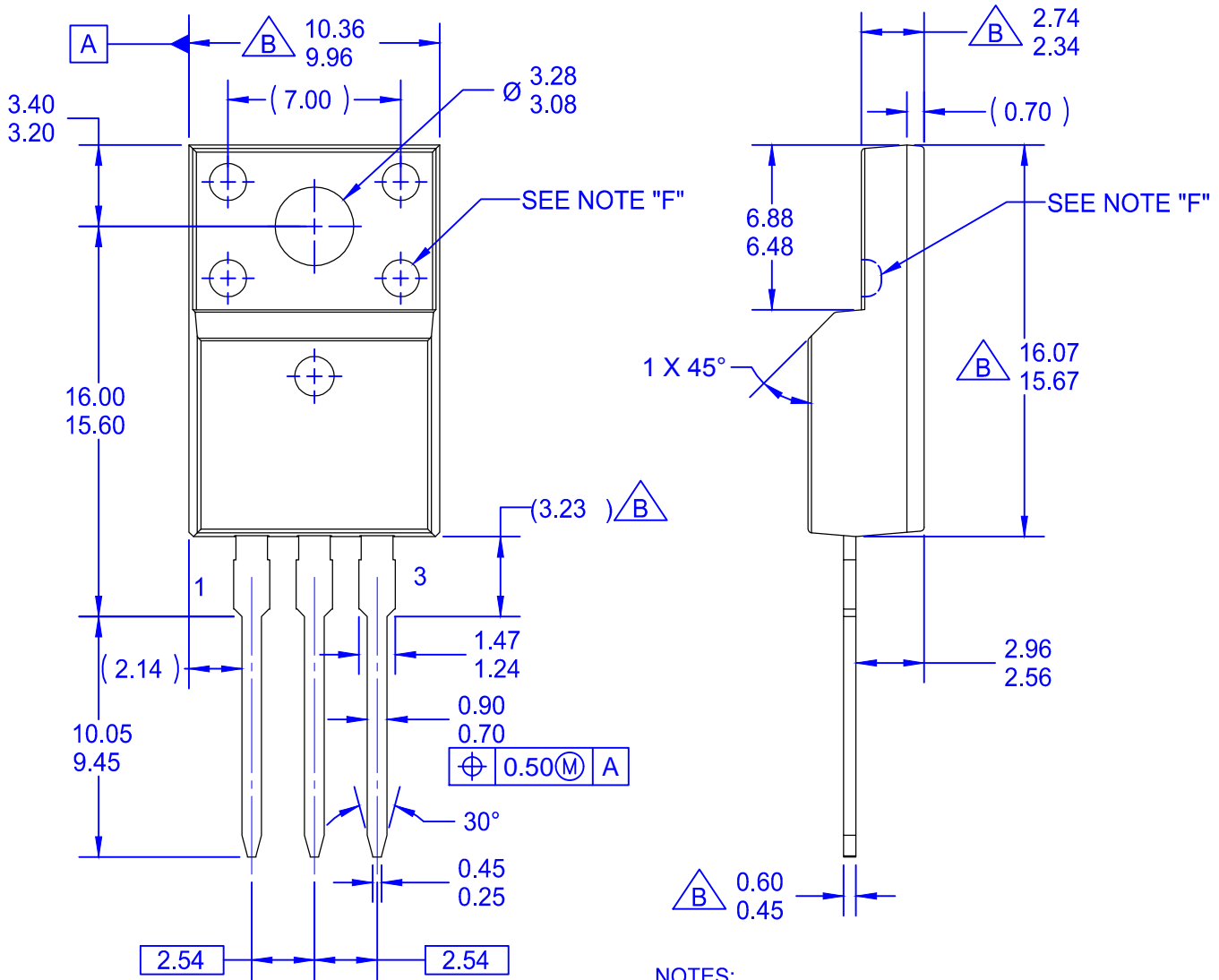


Figure 15. Transient Thermal Impedance of IGBT





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: TO220M03REV4



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