FAIRCHILD
*SEMICONDUCTOR*®

FGPF4536
360 V PDP Trench IGBT

Features

- High Current Capability
- Low Saturation Voltage: $V_{CE\,(sat)}$ =1.59 V @ I_C = 50 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.

G C E   **TO-220F**
(Retractable)
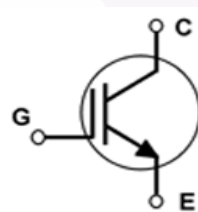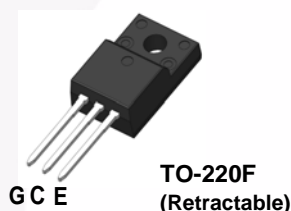
Absolute Maximum Ratings

Symbol	Description		Ratings	Unit
V_{CES}	Collector to Emitter Voltage		360	V
V_{GES}	Gate to Emitter Voltage		± 30	V
$I_{C\,pulse(1)*}$	Pulsed Collector Current	@ T_C = 25°C	220	A
P_D	Maximum Power Dissipation	@ T_C = 25°C	28.4	W
	Maximum Power Dissipation	@ T_C = 100°C	11.4	W
T_J	Operating Junction Temperature		-55 to +150	°C
T_{stg}	Storage Temperature Range		-55 to +150	°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	-	4.4	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	-	62.5	°C/W

Notes:

(1) Half Sine Wave, D < 0.01, pluse width < 1 μsec

* Ic_pluse limited by max Tj

www.fairchildsemi.com
FGPF4536 Rev. C1

Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FGPF4536	FGPF4536	TO-220F	Tube	N/A	N/A	50

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	$V_{GE} = 0V$, $I_C = 250\ \mu A$	360	-	-	V
$\Delta BV_{CES} / \Delta T_J$	Temperature Coefficient of Breakdown Voltage	$V_{GE} = 0V$, $I_C = 250\ \mu A$	-	0.4	-	V/°C
I_{CES}	Collector Cut-Off Current	$V_{CE} = V_{CES}$, $V_{GE} = 0\ V$	-	-	100	μA
I_{GES}	G-E Leakage Current	$V_{GE} = V_{GES}$, $V_{CE} = 0\ V$	-	-	±400	nA
On Characteristics						
$V_{GE(th)}$	G-E Threshold Voltage	$I_C = 250\ \mu A$, $V_{CE} = V_{GE}$	2.4	3.3	4.0	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C = 20\ A$, $V_{GE} = 15\ V$	-	1.19	-	V
		$I_C = 30\ A$, $V_{GE} = 15\ V$	-	1.33	-	V
		$I_C = 50\ A$, $V_{GE} = 15\ V$, $T_C = 25°C$	-	1.59	1.8	V
		$I_C = 50\ A$, $V_{GE} = 15\ V$, $T_C = 125°C$	-	1.66	-	V
Dynamic Characteristics						
C_{ies}	Input Capacitance	$V_{CE} = 30\ V$, $V_{GE} = 0\ V$, $f = 1MHz$	-	1295	-	pF
C_{oes}	Output Capacitance		-	56	-	pF
C_{res}	Reverse Transfer Capacitance		-	43	-	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	$V_{CC} = 200\ V$, $I_C = 20\ A$, $R_G = 5\ \Omega$, $V_{GE} = 15\ V$, Resistive Load, $T_C = 25°C$	-	5	-	ns
t_r	Rise Time		-	20	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	41	-	ns
t_f	Fall Time		-	182	-	ns
$t_{d(on)}$	Turn-On Delay Time	$V_{CC} = 200\ V$, $I_C = 20\ A$, $R_G = 5\ \Omega$, $V_{GE} = 15\ V$, Resistive Load, $T_C = 125°C$	-	4.6	-	ns
t_r	Rise Time		-	21	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	43	-	ns
t_f	Fall Time		-	249	-	ns
Q_g	Total Gate Charge	$V_{CE} = 200\ V$, $I_C = 20\ A$, $V_{GE} = 15\ V$	-	47	-	nC
Q_{ge}	Gate to Emitter Charge		-	5.4	-	nC
Q_{gc}	Gate to Collector Charge		-	15	-	nC

Typical Performance Characteristics

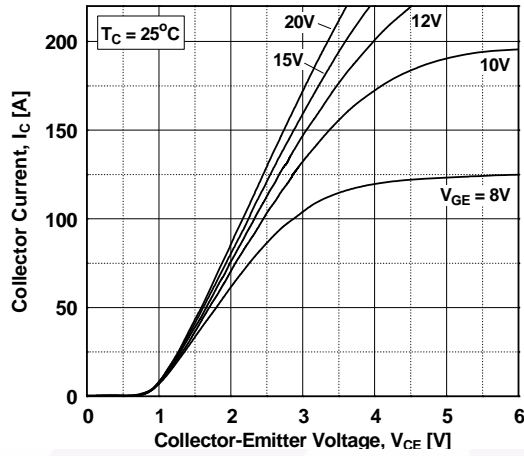### Figure 1. Typical Output Characteristics

Figure 2. Typical Output Characteristics
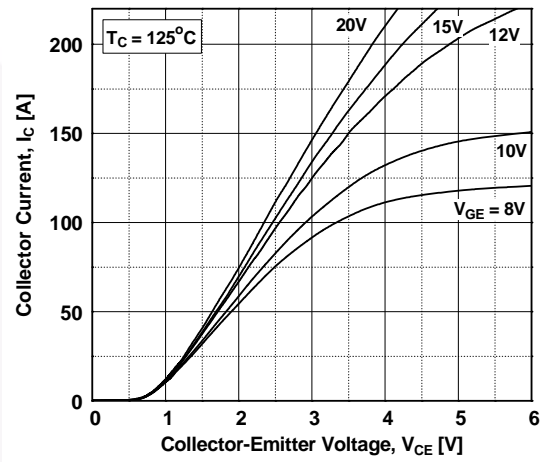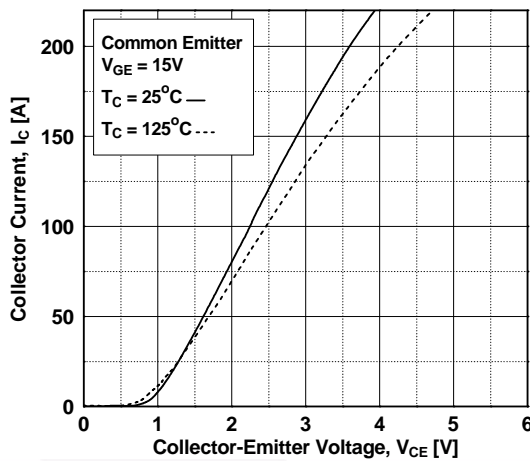

Figure 3. Typical Saturation Voltage Characteristics

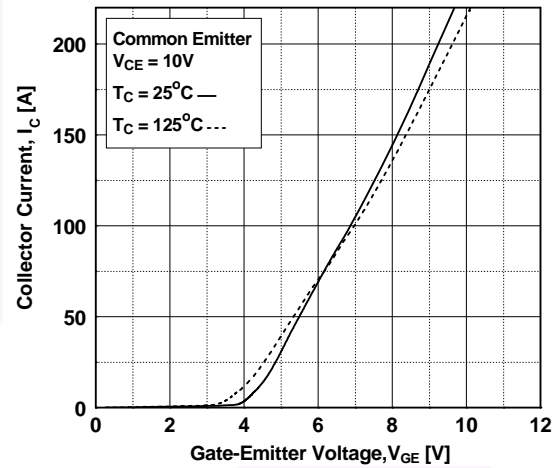### Figure 4. Transfer Characteristics

Figure 5. Saturation Voltage vs. V_{GE}
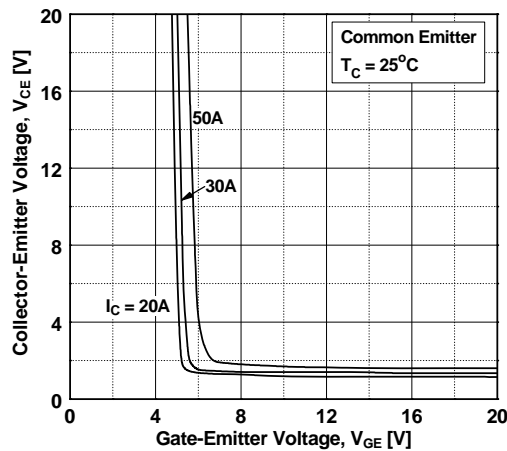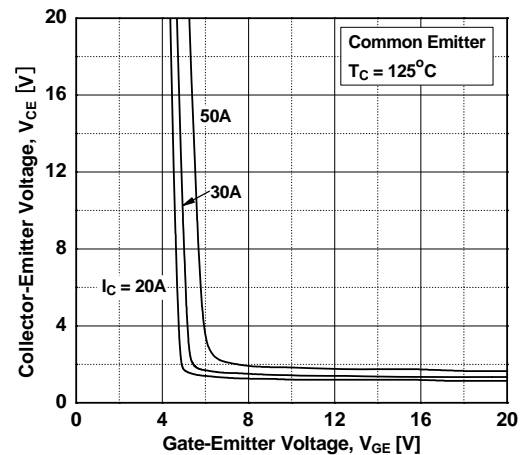

Figure 6. Saturation Voltage vs. V_{GE}

Typical Performance Characteristics

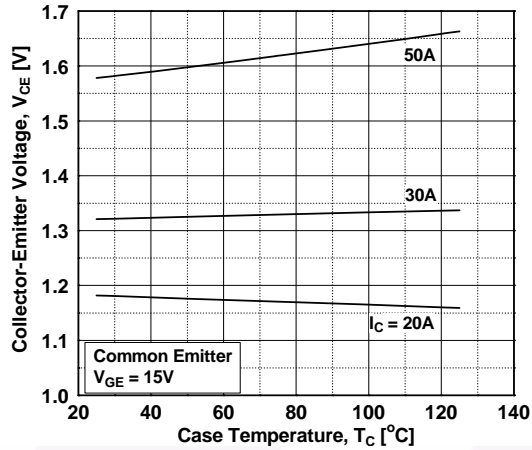### Figure 7. Saturation Voltage vs. Case Temperature at Variant Current Level
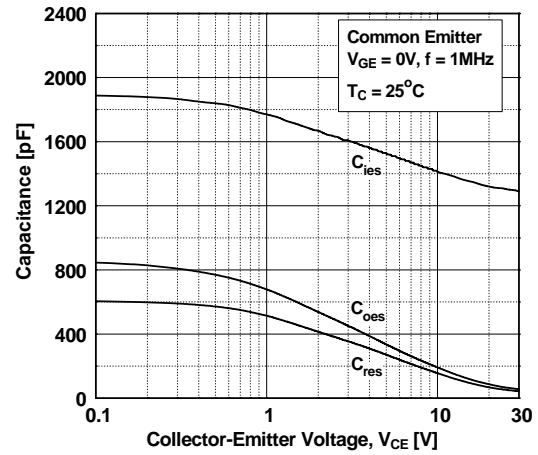

Figure 8. Capacitance Characteristics
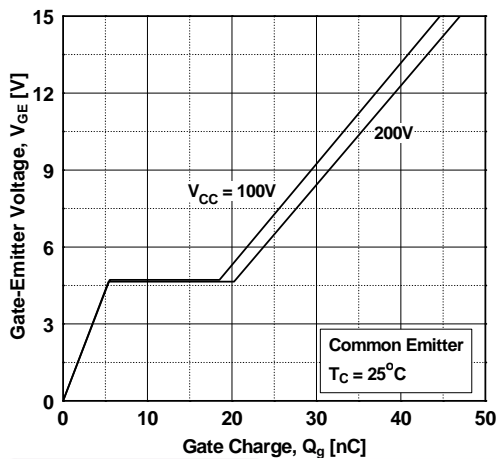

Figure 9. Gate charge Characteristics

Figure 10. SOA Characteristics
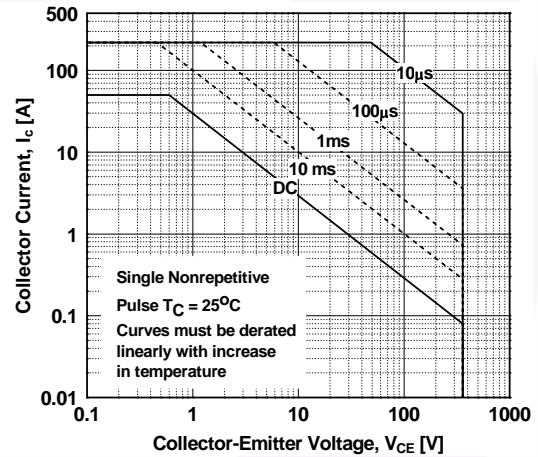
Figure 11. Turn-on Characteristics vs. Gate Resistance
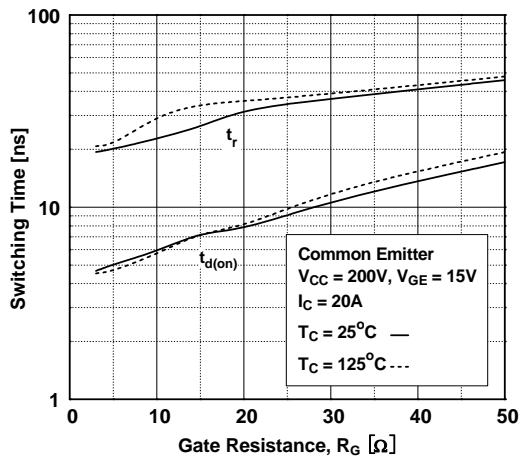
Figure 12. Turn-off Characteristics vs. Gate Resistance
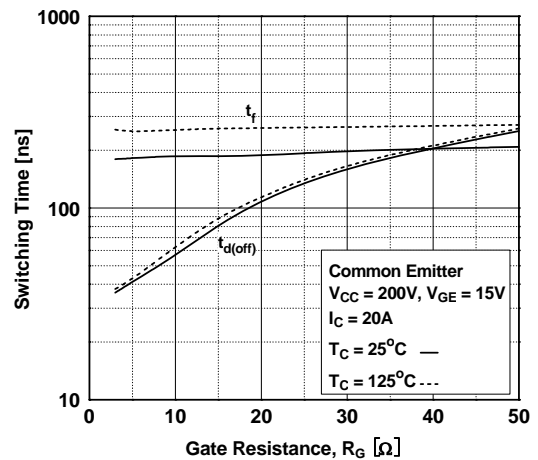
Typical Performance Characteristics

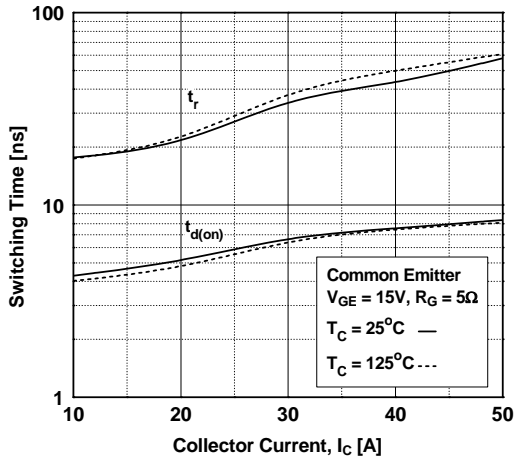### Figure 13. Turn-on Characteristics vs. Collector Current

Figure 14. Turn-off Characteristics vs. Collector Current
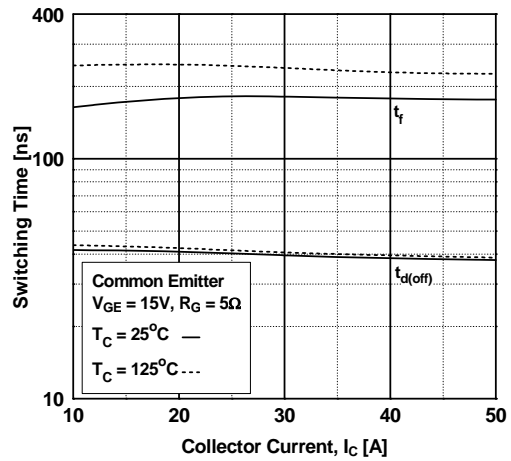

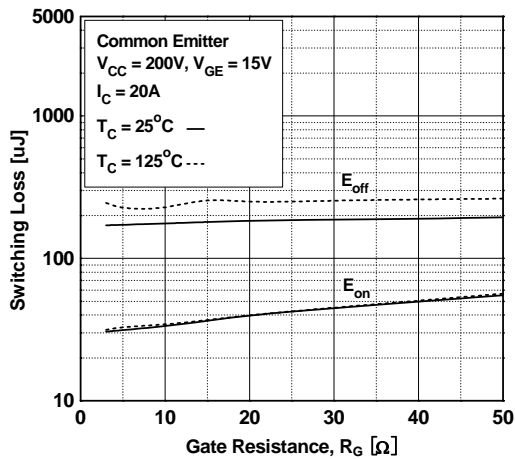### Figure 15. Switching Loss vs. Gate Resistance

Figure 16. Switching Loss vs. Collector Current
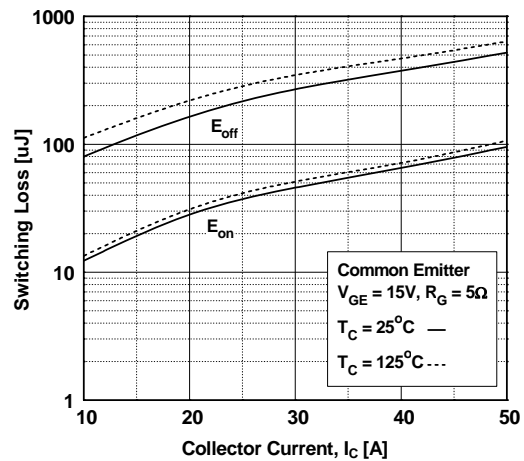
Figure 17. Turn off Switching SOA Characteristics
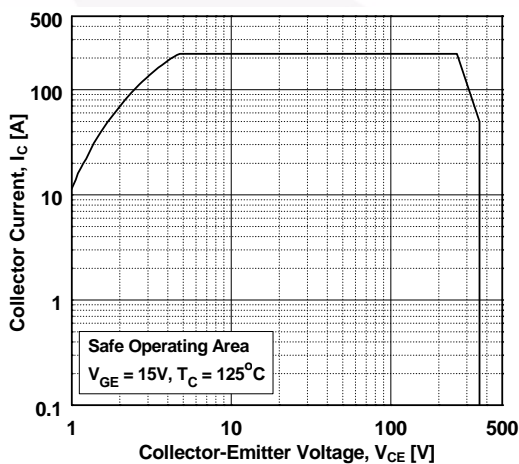
Typical Performance Characteristics

Figure 18. Transient Thermal Impedance of IGBT

Package Dimensions

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

Figure 19. TO-220F 3L - TO220, MOLDED, 3LD, FULL PACK, EIAJ SC91, STRAIGHT LEAD

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http://www.fairchildsemi.com/package/packageDetails.html?id=PN_TF22S-003

Dimensions in Millimeters

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FPS™		SyncFET™	XS™

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2. 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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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.

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