FAIRCHILD SEMICONDUCTOR®

November 2013

FGPF50N33BT
330 V PDP Trench IGBT

Features

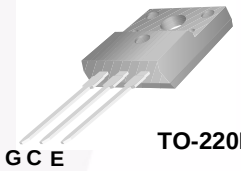
- High Current Capability
- Low Saturation Voltage: $V_{CE(sat)}$ =1.6 V @ I_C = 50 A
- High Input Impedance
- RoHS Compliant

General Description

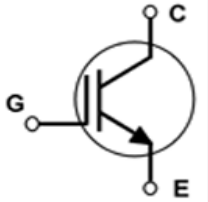
Using novel trench IGBT technology, Fairchild's new series of trench IGBTs offer the optimum performance for PDP TV applications where low conduction and switching losses are essential.

Applications

- PDP TV



TO-220F



Absolute Maximum Ratings

Symbol	Description		Ratings	Unit
V_{CES}	Collector to Emitter Voltage		330	V
V_{GES}	Gate to Emitter Voltage		± 30	V
I_C	Collector Current	@ T_C = 25°C	50	A
$I_{Cpulse\ (1)*}$	Pulsed Collector Current	@ T_C = 25°C	120	A
$I_{Cpulse\ (2)*}$	Pulsed Collector Current	@ T_C = 25°C	160	A
P_D	Maximum Power Dissipation	@ T_C = 25°C	43	W
	Maximum Power Dissipation	@ T_C = 100°C	17.2	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	-	2.9	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	-	62.5	°C/W

Notes:

1: Repetitive test , Pulse width=100usec , Duty=0.1
2: Half Sine Wave, D < 0.01, pluse width < 10usec
*Ic_pluse limited by max Tj

Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FGPF50N33BTTU	FGPF50N33BT	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} = 0 V, I_C = 250 μA, Tc=25°C	330	-	-	V
		V_{GE} = 0 V, I_C = 250 μA, Tc=125°C	340	-	-	V
$\frac{\Delta BV_{CES}}{\Delta T_J}$	Temperature Coefficient of Breakdown Voltage	V_{GE} = 0 V, I_C = 250 μA	-	0.2	-	V/°C
I_{CES}	Collector Cut-Off Current	V_{CE} = V_{CES}, V_{GE} = 0 V, Tc=25°C	-	-	20	μA
		V_{CE} = V_{CES}, V_{GE} = 0 V, Tc=125°C	-	-	200	μA
I_{GES}	G-E Leakage Current	V_{GE} = V_{GES}, V_{CE} = 0 V	-	-	±200	nA
On Characteristics						
$V_{GE(th)}$	G-E Threshold Voltage	I_C = 250 μA, V_{CE} = V_{GE}	2.3	3.3	4.3	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C = 20 A, V_{GE} = 15 V,	-	1.2	1.5	V
		I_C = 30 A, V_{GE} = 15 V,	-	1.3	-	V
		I_C = 50 A, V_{GE} = 15 V, T_C = 25°C	-	1.6	-	V
		I_C = 50 A, V_{GE} = 15 V, T_C = 125°C	-	1.7	-	V
Dynamic Characteristics						
C_{ies}	Input Capacitance	V_{CE} = 30 V, V_{GE} = 0 V, f = 1 MHz	-	980	-	pF
C_{oes}	Output Capacitance		-	70	-	pF
C_{res}	Reverse Transfer Capacitance		-	40	-	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{CC} = 200 V, I_C = 20 A, R_G = 5 Ω, V_{GE} = 15 V, Resistive Load, T_C = 25°C	-	9	-	ns
t_r	Rise Time		-	33	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	32	-	ns
t_f	Fall Time		-	202	-	ns
$t_{d(on)}$	Turn-On Delay Time	V_{CC} = 200 V, I_C = 20 A, R_G = 5 Ω, V_{GE} = 15 V, Resistive Load, T_C = 125°C	-	9	-	ns
t_r	Rise Time		-	37	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	33	-	ns
t_f	Fall Time		-	332	-	ns
Q_g	Total Gate Charge	V_{CE} = 200 V, I_C = 20 A, V_{GE} = 15 V	-	35	-	nC
Q_{ge}	Gate to Emitter Charge		-	6	-	nC
Q_{gc}	Gate to Collector Charge		-	14	-	nC

Typical Performance Characteristics

Figure 1. Typical Output Characteristics

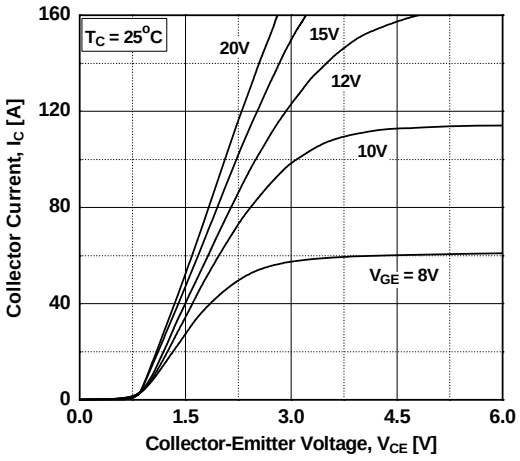


Figure 2. Typical Output Characteristics

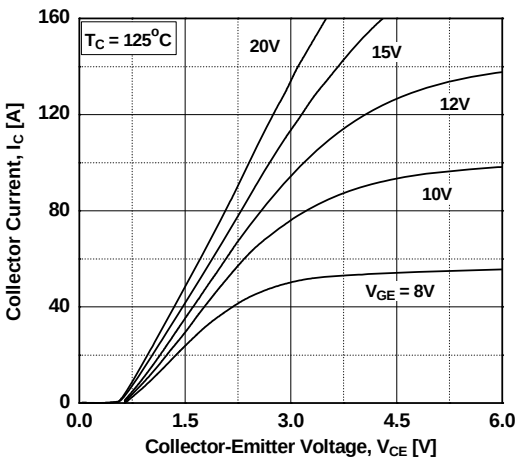


Figure 3. Typical Saturation Voltage Characteristics

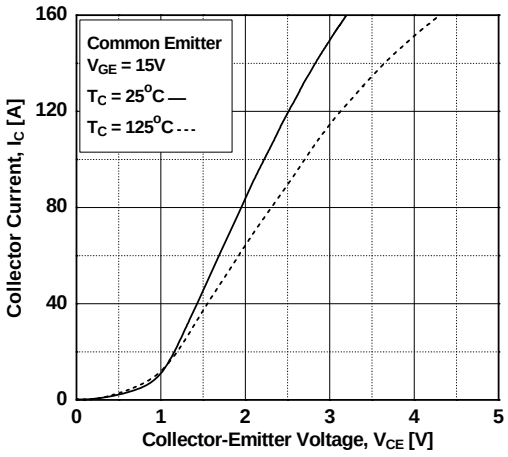


Figure 4. Transfer Characteristics

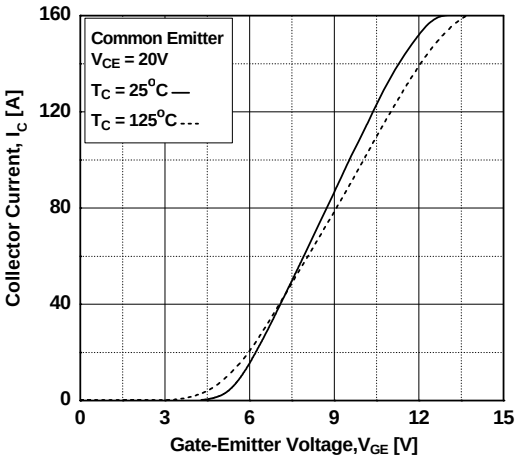


Figure 5. Saturation Voltage vs. Case Temperature at Variant Current Level

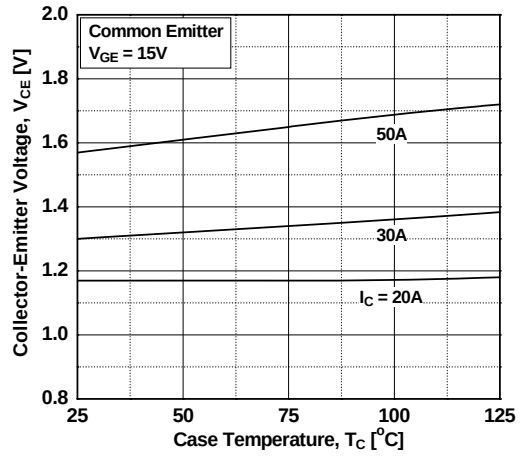
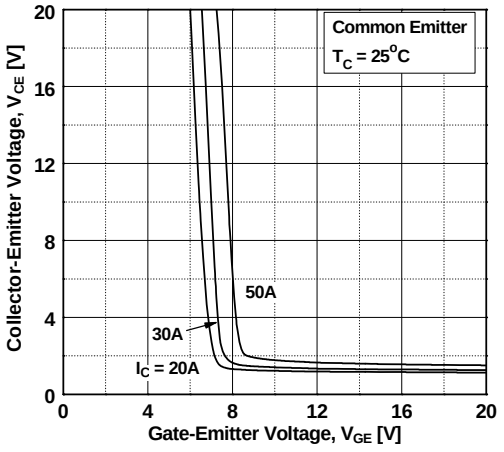


Figure 6. Saturation Voltage vs. V_{GE}



Typical Performance Characteristics

Figure 7. Saturation Voltage vs. V_{GE}

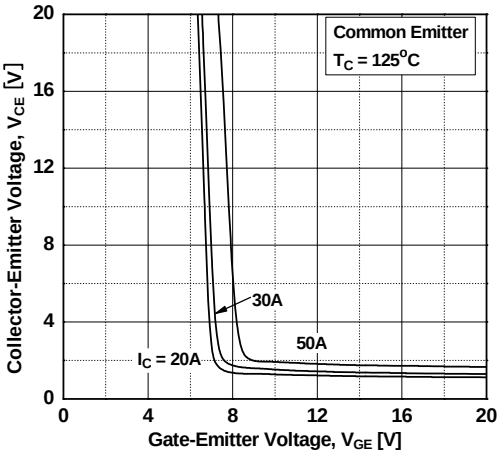


Figure 8. Capacitance Characteristics

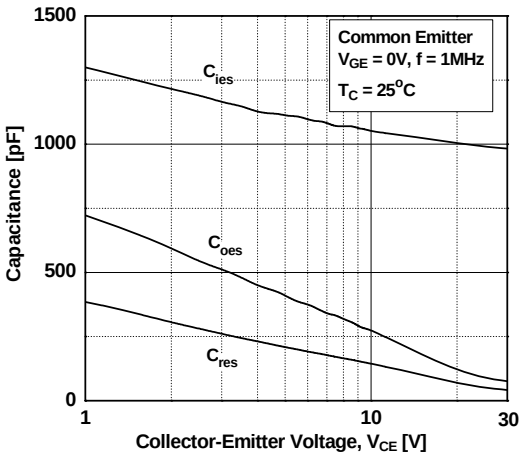


Figure 9. Gate charge Characteristics

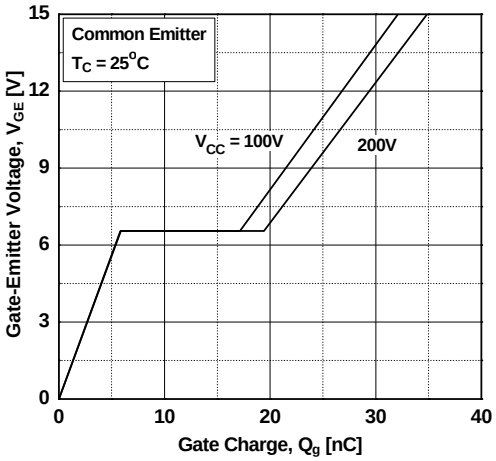


Figure 10. SOA Characteristics

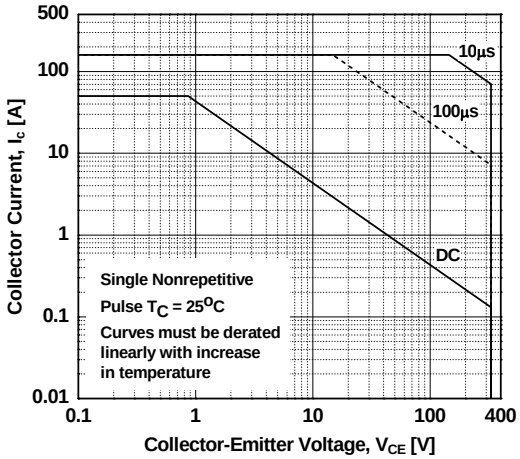


Figure 11. Turn-on Characteristics vs. Gate Resistance

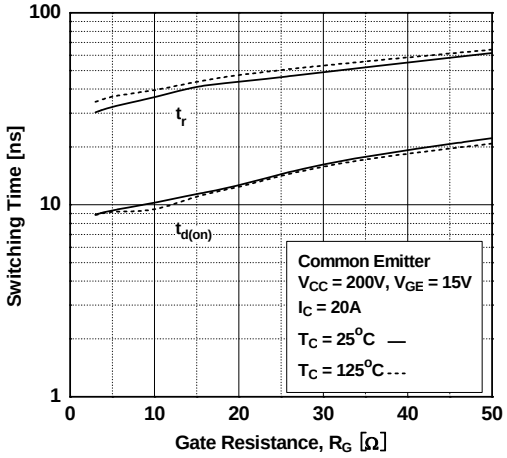
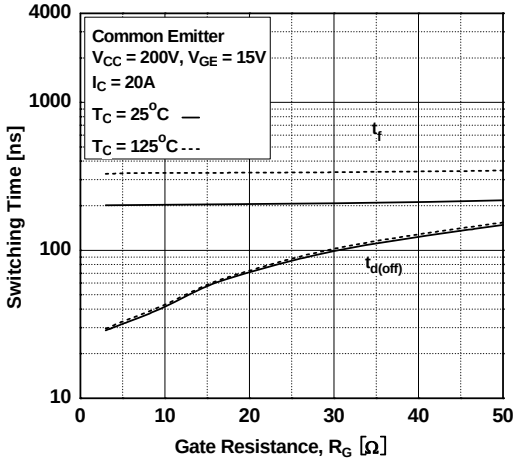


Figure 12. Turn-off Characteristics vs. Gate Resistance



Typical Performance Characteristics

Figure 13. Turn-on Characteristics vs. Collector Current

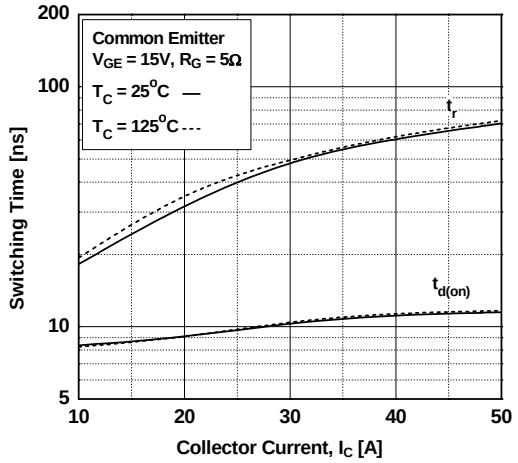


Figure 14. Turn-off Characteristics vs. Collector Current

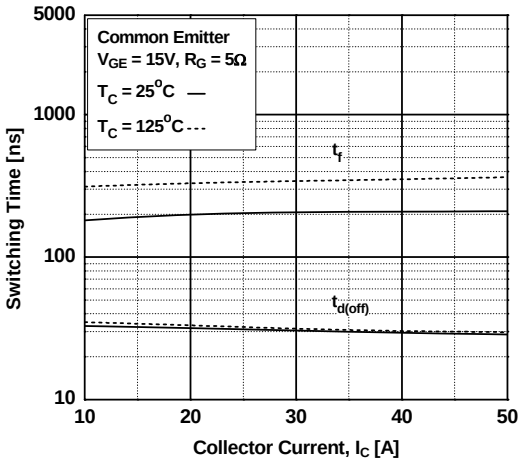


Figure 15. Switching Loss vs. Gate Resistance

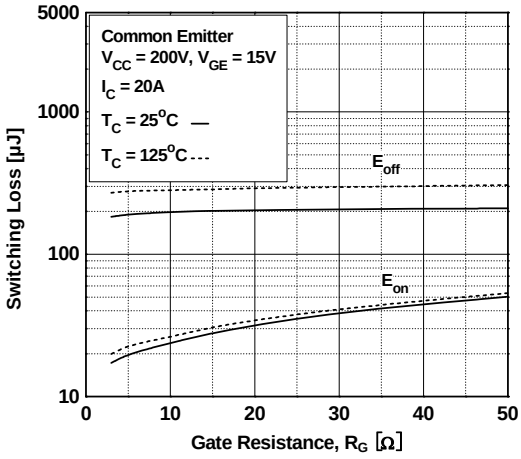


Figure 16. Switching Loss vs. Collector Current

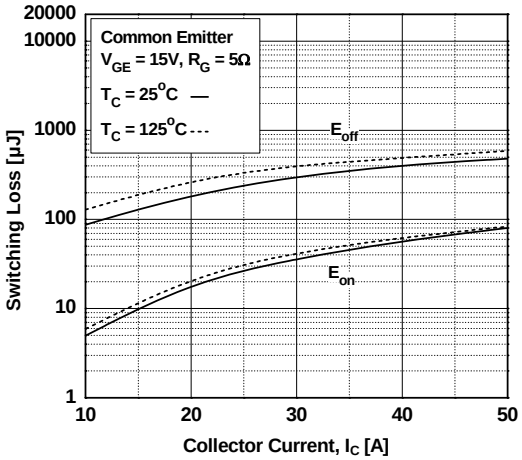
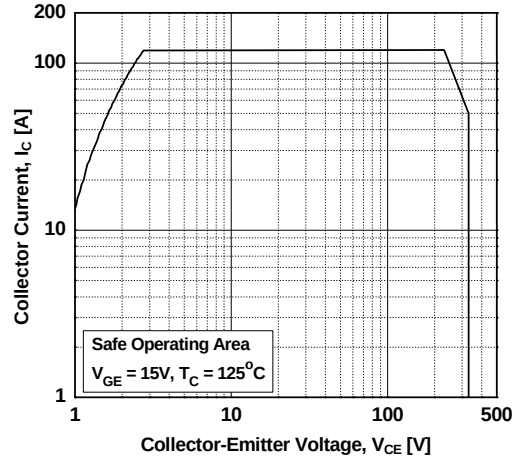
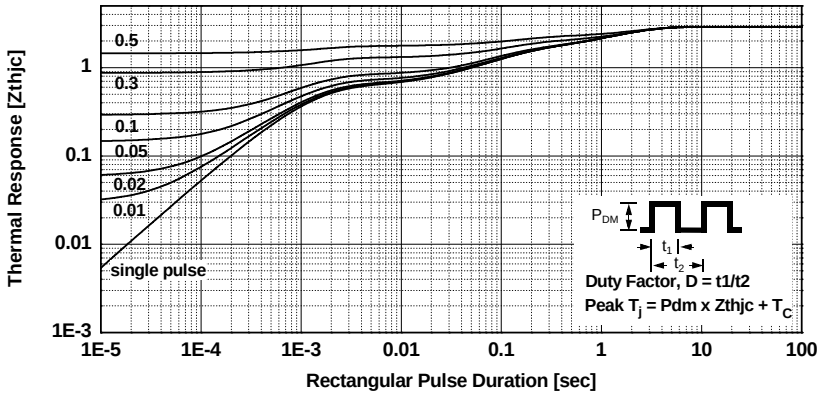


Figure 17. Turn off Switching SOA Characteristics



Typical Performance Characteristics

Figure 18.Transient Thermal Impedance of IGBT



Package Dimensions

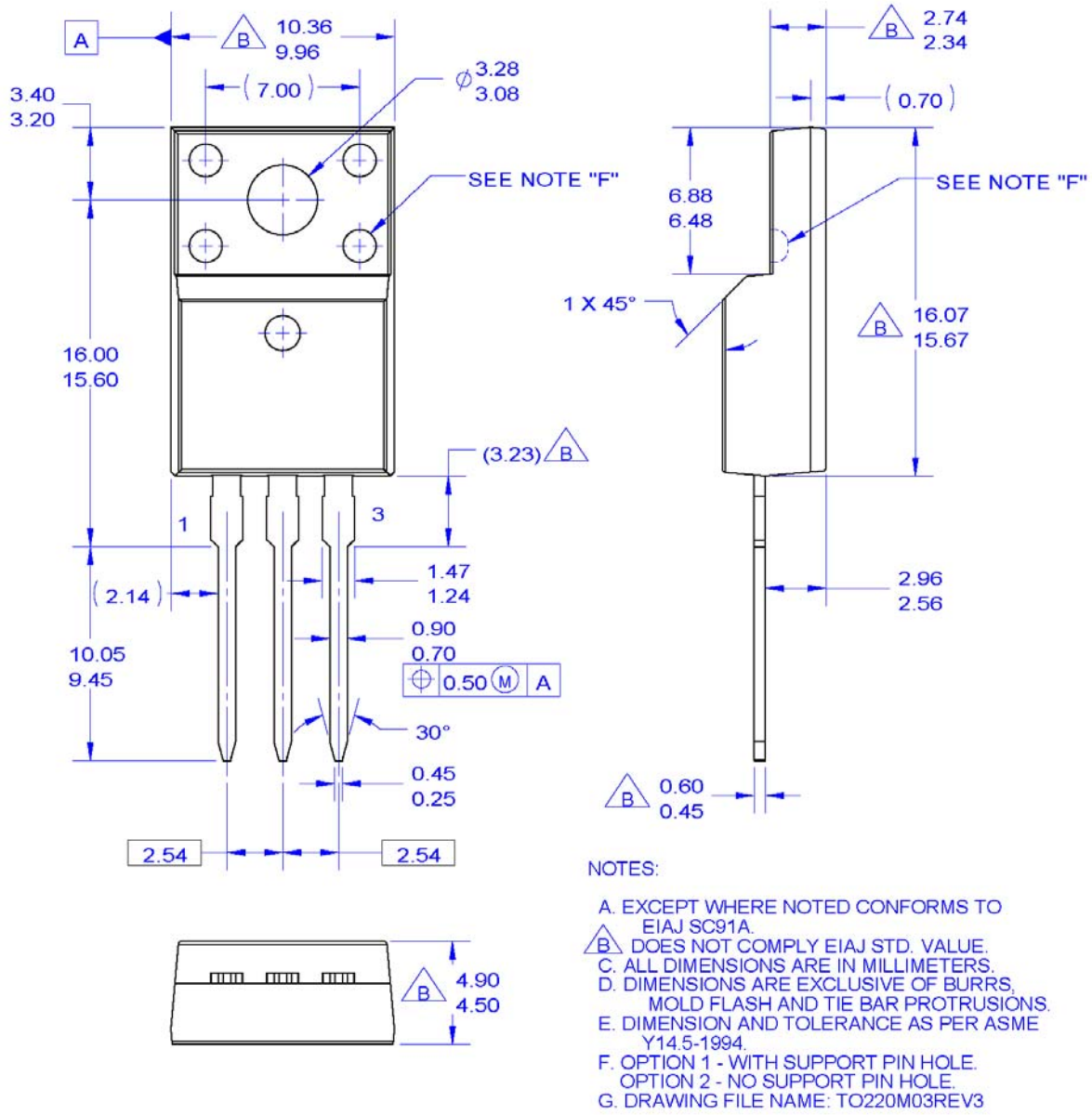


Figure 19. TO-220F 3L - TO220, MOLDED, 3LD, FULL PACK, EIAJ SC91, STRAIGHT LEAD

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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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