**FAIRCHILD**
SEMICONDUCTOR®

FQPF19N20

N-Channel QFET® MOSFET

200 V, 11.8 A, 150 mΩ

Description

This N-Channel enhancement mode power MOSFET is produced using Fairchild Semiconductor's proprietary planar stripe and DMOS technology. This advanced MOSFET technology has been especially tailored to reduce on-state resistance, and to provide superior switching performance and high avalanche energy strength. These devices are suitable for switched mode power supplies, active power factor correction (PFC), and electronic lamp ballasts.

Features

- 11.8 A, 200 V, $R_{DS(on)}$ = 150 mΩ (Max.) @ V_{GS} = 10 V, I_D = 5.9 A
- Low Gate Charge (Typ. 31 nC)
- Low Crss (Typ. 30 pF)
- 100% Avalanche Tested

TO-220F
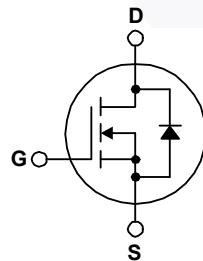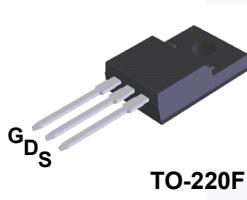
Absolute Maximum Ratings T_C = 25°C unless otherwise noted.

Symbol	Parameter			FQPF19N20	Unit
V_{DSS}	Drain-Source Voltage			200	V
I_D	Drain Current	- Continuous (T_C = 25°C)		11.8	A
		- Continuous (T_C = 100°C)		7.5	A
I_{DM}	Drain Current	- Pulsed	(Note 1)	48	A
V_{GSS}	Gate-Source Voltage			± 30	V
E_{AS}	Single Pulsed Avalanche Energy		(Note 2)	250	mJ
I_{AR}	Avalanche Current		(Note 1)	11.8	A
E_{AR}	Repetitive Avalanche Energy		(Note 1)	5.0	mJ
dv/dt	Peak Diode Recovery dv/dt		(Note 3)	5.5	V/ns
P_D	Power Dissipation (T_C = 25°C)			50	W
	- Derate above 25°C			0.4	W/°C
T_J, T_{STG}	Operating and Storage Temperature Range			-55 to +150	°C
T_L	Maximum Lead Temperature for Soldering, 1/8" from Case for 5 seconds			300	°C

Thermal Characteristics

Symbol	Parameter	FQPF19N20	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Max.	2.5	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Max.	62.5	°C/W

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Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FQPF19N20	FQPF19N20	TO-220F	Tube	N/A	N/A	50 units

Electrical Characteristics T_C = 25°C unless otherwise noted.

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = 0 V, I_D = 250 µA	200	--	--	V
ΔBV_{DSS} / ΔT_J	Breakdown Voltage Temperature Coefficient	I_D = 250 µA, Referenced to 25°C	--	0.18	--	V/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 200 V, V_{GS} = 0 V	--	--	1	µA
		V_{DS} = 160 V, T_C = 125°C	--	--	10	µA
I_{GSSF}	Gate-Body Leakage Current, Forward	V_{GS} = 30 V, V_{DS} = 0 V	--	--	100	nA
I_{GSSR}	Gate-Body Leakage Current, Reverse	V_{GS} = -30 V, V_{DS} = 0 V	--	--	-100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250 µA	3.0	--	5.0	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	V_{GS} = 10 V, I_D = 5.9 A	--	0.12	0.15	Ω
g_{FS}	Forward Transconductance	V_{DS} = 40 V, I_D = 5.9 A	--	8.7	--	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 25 V, V_{GS} = 0 V, f = 1.0 MHz	--	1220	1600	pF
C_{oss}	Output Capacitance		--	220	290	pF
C_{rss}	Reverse Transfer Capacitance		--	30	40	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 100 V, I_D = 19.4 A, R_G = 25 Ω	--	20	50	ns
t_r	Turn-On Rise Time		--	190	390	ns
$t_{d(off)}$	Turn-Off Delay Time		--	55	120	ns
t_f	Turn-Off Fall Time	(Note 4)	--	80	170	ns
Q_g	Total Gate Charge	V_{DS} = 160 V, I_D = 19.4 A, V_{GS} = 10 V	--	31	40	nC
Q_{gs}	Gate-Source Charge		--	8.6	--	nC
Q_{gd}	Gate-Drain Charge	(Note 4)	--	13.5	--	nC
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain-Source Diode Forward Current		--	--	11.8	A
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current		--	--	48	A
V_{SD}	Drain-Source Diode Forward Voltage	V_{GS} = 0 V, I_S = 11.8 A	--	--	1.5	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0 V, I_S = 19.4 A, dI_F / dt = 100 A/µs	--	140	--	ns
Q_{rr}	Reverse Recovery Charge		--	0.69	--	µC

Notes:
1. Repetitive Rating : Pulse width limited by maximum junction temperature.
2. L = 2.7 mH, I_{AS} = 11.8 A, V_{DD} = 50 V, R_G = 25 Ω, starting T_J = 25°C.
3. $I_{SD} \leq$ 19.4 A, di/dt $\leq$ 300 A/µs, $V_{DD} \leq$ $BV_{DSS,}$ starting T_J = 25°C.
4. Essentially independent of operating temperature.

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Typical Characteristics
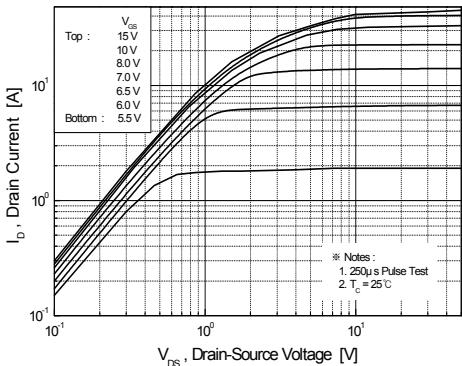
Figure 1. On-Region Characteristics
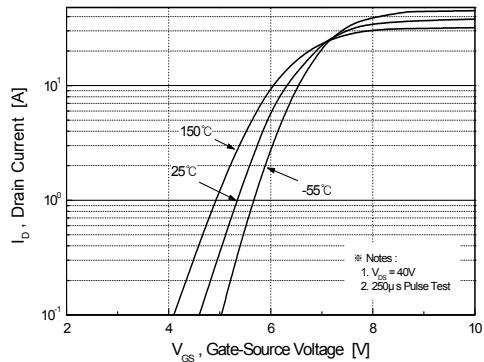
Figure 2. Transfer Characteristics
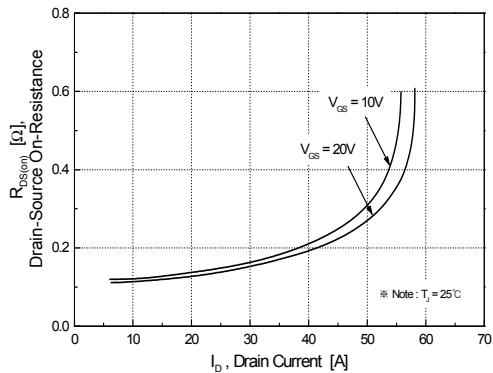
Figure 3. On-Resistance Variation vs.
Drain Current and Gate Voltage
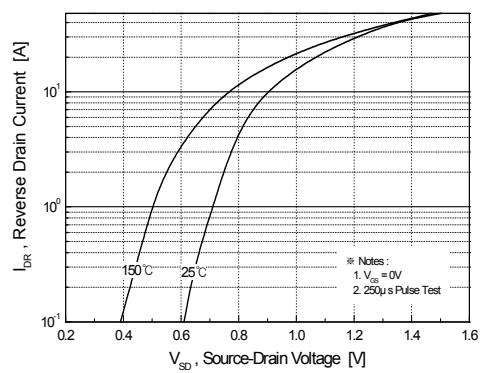
Figure 4. Body Diode Forward Voltage
Variation vs. Source Current
and Temperature
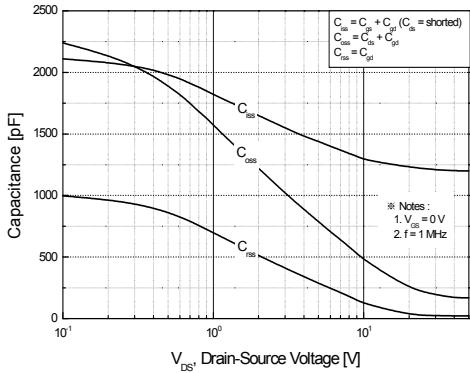
Figure 5. Capacitance Characteristics
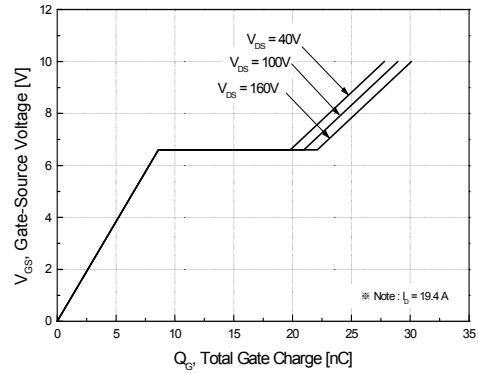
Figure 6. Gate Charge Characteristics

Typical Characteristics (continued)
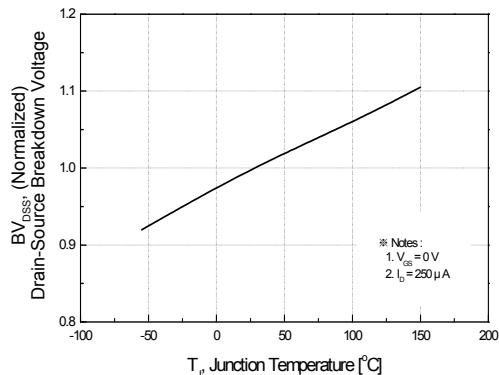
**Figure 7. Breakdown Voltage Variation vs. Temperature**
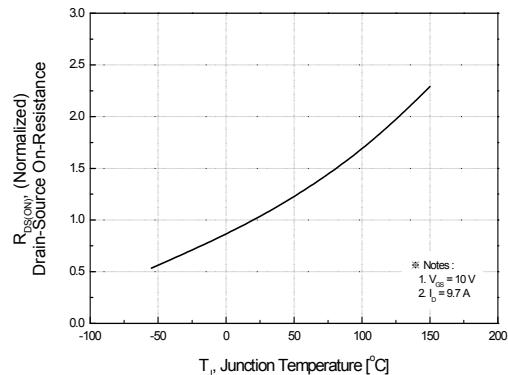
Figure 8. On-Resistance Variation vs. Temperature
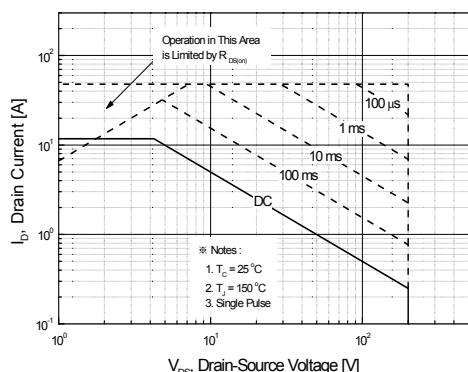
**Figure 9. Maximum Safe Operating Area**
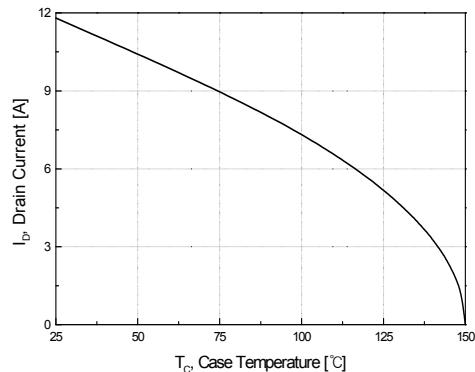
Figure 10. Maximum Drain Current vs. Case Temperature
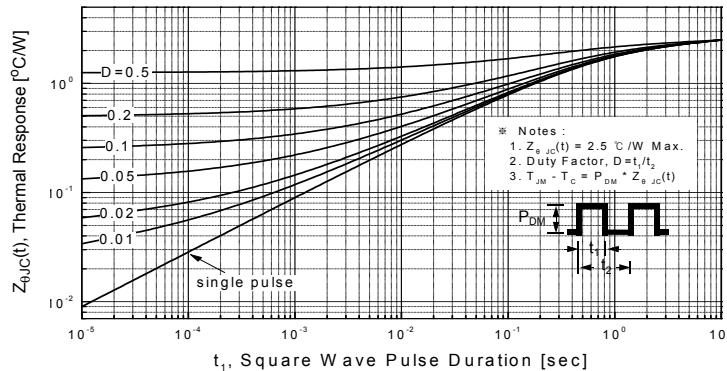

Figure 11. Transient Thermal Response Curve
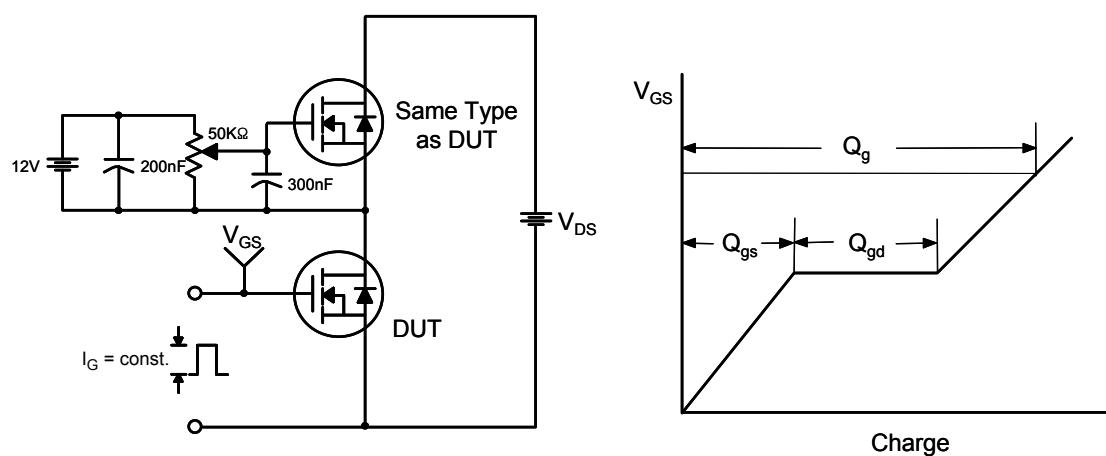
Figure 12. Gate Charge Test Circuit & Waveform
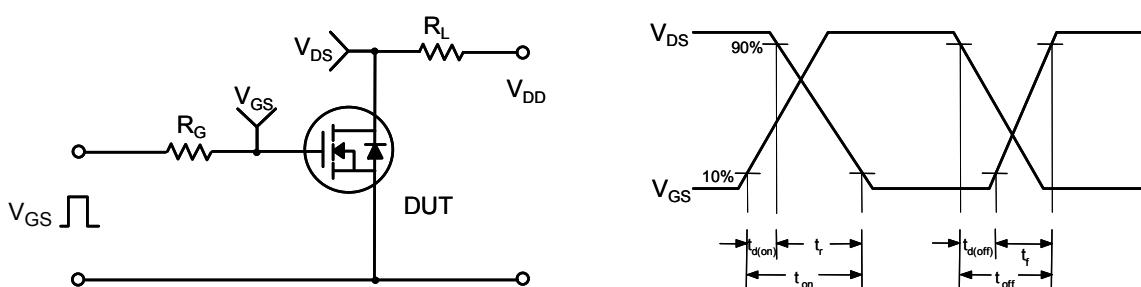
Figure 13. Resistive Switching Test Circuit & Waveforms

$$E_{AS} = \frac{1}{2} L I_{AS}^2 \; \frac{BV_{DSS}}{BV_{DSS} - V_{DD}}$$
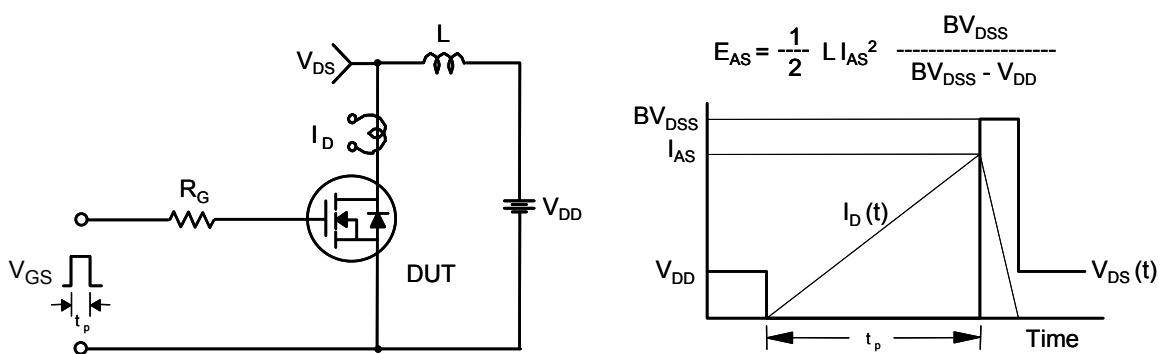
Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

DUT

V_{DS}

I_{SD}

L

Driver

R_G

Same Type
as DUT

V_{DD}

V_{GS}

• dv/dt controlled by R_G
• I_{SD} controlled by pulse period

V_{GS}
(Driver)

$D = \dfrac{\text{Gate Pulse Width}}{\text{Gate Pulse Period}}$

10V

I_{SD}
(DUT)

I_{FM} , Body Diode Forward Current

di/dt

I_{RM}

Body Diode Reverse Current

V_{DS}
(DUT)

Body Diode Recovery dv/dt

V_{SD}

V_{DD}

Body Diode
Forward Voltage Drop
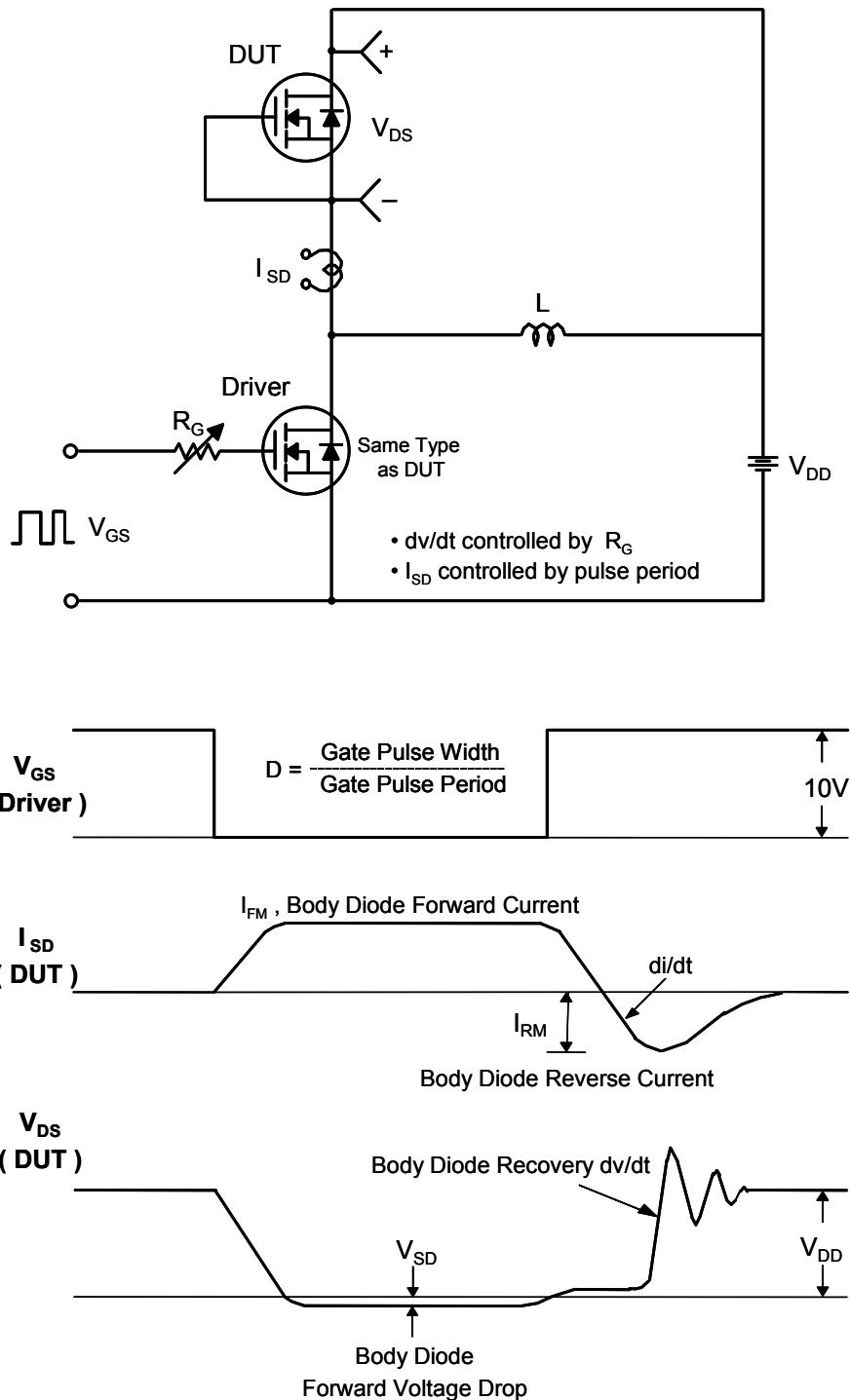
Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms

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Mechanical Dimensions

A

B 10.36 / 9.96

(7.00)

Ø 3.28 / 3.08

3.40 / 3.20

SEE NOTE "F"

16.00 / 15.60

1   3

(3.23) **B**

1.47 / 1.24

(2.14)

0.90 / 0.70

10.05 / 9.45

⊕ 0.50 Ⓜ A

30°

0.45 / 0.25

2.54   2.54

B 2.74 / 2.34

(0.70)

6.88 / 6.48

SEE NOTE "F"

1 X 45°

B 16.07 / 15.67

2.96 / 2.56

B 0.60 / 0.45

B 4.90 / 4.50
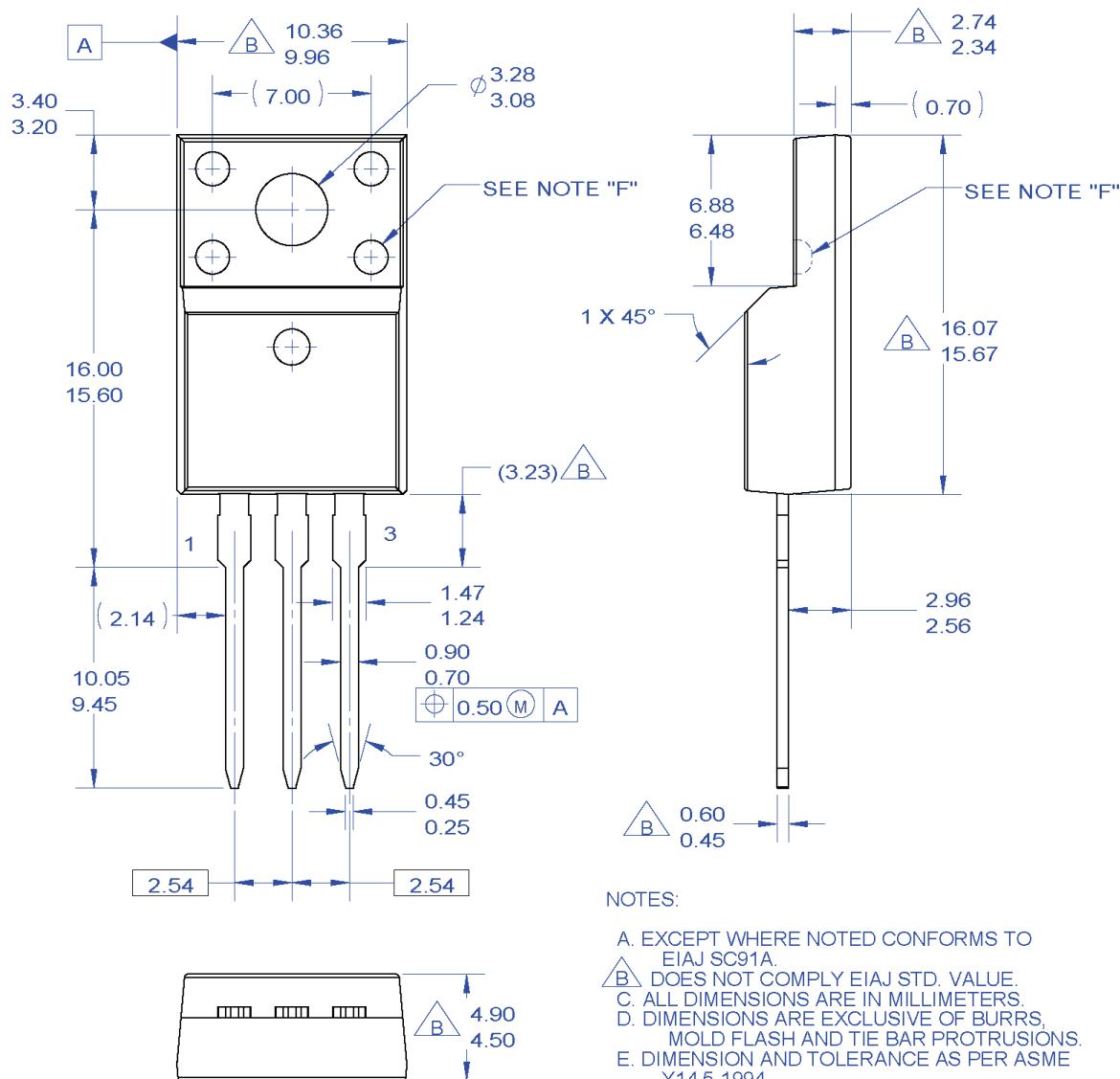
NOTES:

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 16. TO220, Molded, 3-Lead, Full Pack, EIAJ SC91, Straight Lead

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Dual Cool™	Marking Small Speakers Sound Louder		TranSiC™
EcoSPARK®	and Better™	Saving our world, 1mW/W/kW at a time™	TriFault Detect™
EfficentMax™	MegaBuck™	SignalWise™	TRUECURRENT®*
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	MicroFET™	SMART START™	
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FastvCore™	OPTOLOGIC®	SuperSOT™-8	VisualMax™
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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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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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