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FAIRCHILD SEMICONDUCTOR®

March 2013

FQPF11P06

P-Channel QFET® MOSFET

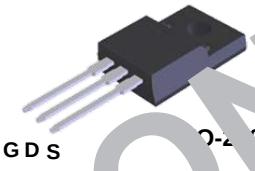
-60 V, -8.6 A, 175 mΩ

Description

This P-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, audio amplifier, DC motor control, and variable switching power applications.

Features

- -8.6 A, -60 V, $R_{DS(on)}$=175 mΩ(Max.) @V[illegible]10 V, I_D=-4.3 A
- Low Gate Charge (Typ. 13 nC)
- Low Crss (Typ. 45 pF)
- 100% Avalanche Tested
- 175°C Maximum Junc[illegible]n Tu[illegible]peratur[illegible] Rating



Absolute Maximum Ratings

T_C = 25°C unless otherwise noted

Symbol	Parameter		FQPF11P06	Unit
V_{DSS}	Drain-Source Voltage		-60	V
I_D	Drain Current - Continuous (T_C = 25°C)		-8.6	A
	- Continuous (T_C = 100°C)		-6.08	A
I_{DM}	Drain Current - Pulsed	(Note 1)	-34.4	A
V_{GSS}	Gate-Source Voltage		± 25	V
E_{AS}	Single Pulsed Avalanche Energy	(Note 2)	160	mJ
I_{AR}	Avalanche Current	(Note 1)	-8.6	A
E_{AR}	Repetitive Avalanche Energy	(Note 1)	3.0	mJ
dv/dt	Peak Diode Recovery dv/dt	(Note 3)	-7.0	V/ns
P_D	Power Dissipation (T_C = 25°C)		30	W
	- Derate above 25°C		0.2	W/°C
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to +175	°C
T_L	Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds		300	°C

Thermal Characteristics

Symbol	Parameter	Typ	Max	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	--	5.0	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	--	62.5	°C/W

Elerical 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	-60	--	--	V
ΔBV_{DSS} / ΔT_J	Breakdown Voltage Temperature Coefficient	I_D = -250 μA, Referenced to 25°C	--	-0.07	--	V/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = -60 V, V_{GS} = 0 V	--	--	-1	μA
		V_{DS} = -48 V, T_C = 150°C	--	--	-10	μA
I_{GSSF}	Gate-Body Leakage Current, Forward	V_{GS} = -25 V, V_{DS} = 0 V	--	--	-100	nA
I_{GSSR}	Gate-Body Leakage Current, Reverse	V_{GS} = 25 V, V_{DS} = 0 V	--	--	100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = -250 μA	[illegible]	--	-4 [illegible]	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	V_{GS} = -10 V, I_D = -4.3 A		0.14	0.175	Ω
g_{FS}	Forward Transconductance	V_{DS} = -30 V, I_D = -4.3 A (Note 4)	--	[illegible].75	[illegible]	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = -25 [illegible] V_{GS} = 0 [illegible]	--	420	550	pF
C_{oss}	Output Capacitance	f = [illegible] MHz	--	195	250	pF
C_{rss}	Reverse Transfer Capacitance		--	4[illegible]	60	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	[illegible] = -30 V, I_D = -5.7 A,	--	6.5	25	ns
t_r	Turn-On Rise Time	R_G = 25 Ω	--	40	90	ns
$t_{d(off)}$	Turn-Off Delay Time		--	15	40	ns
t_f	Turn-Off Fall Time	(Note 4, 5)	--	45	100	ns
Q_g	Total Gate Charge	V_{DS} = -48 V, I_D = -11.4 A,	--	13	17	nC
Q_{gs}	Gate-Source Charge	V_{GS} = -10 V	--	2.0	--	nC
Q_{gd}	Gate-Drain Charge	(Note 4, 5)	--	6.3	--	nC
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain-Source Diode Forward Current		--	--	-8.6	A
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current		--	--	-34.4	A
V_{SD}	Drain-Source Diode Forward Voltage	V_{GS} = 0 V, I_S = -8.6 A	--	--	-4.0	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0 V, I_S = -11.4 A,	--	83	--	ns
Q_{rr}	Reverse Recovery Charge	dI_F / dt = 100 A/μs (Note 4)	--	0.26	--	μC

Notes:
1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. L = 2.5mH, I_{AS} = -8.6A, V_{DD} = -25V, R_G = 25 Ω, Starting T_J = 25°C
3. I_{SD} ≤ -11.4A, di/dt ≤ 300A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J = 25°C
4. Pulse Test : Pulse width ≤ 300μs, Duty cycle ≤ 2%
5. Essentially independent of operating temperature

Typical Characteristics

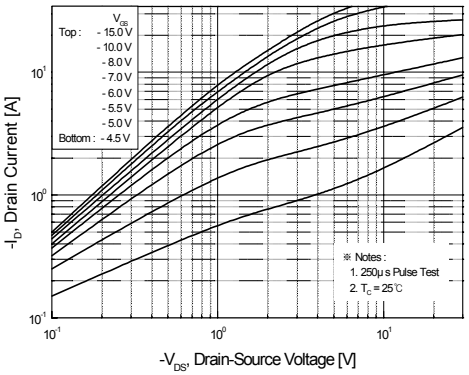


Figure 1. On-Region Characteristics

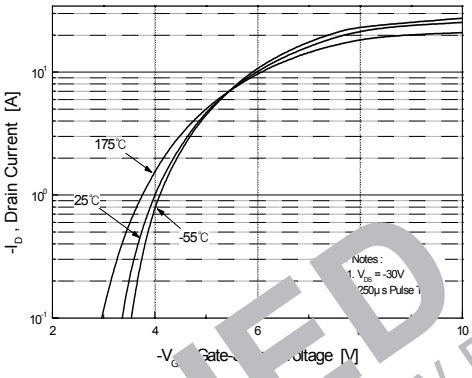


Figure 2. Transfer Characteristics

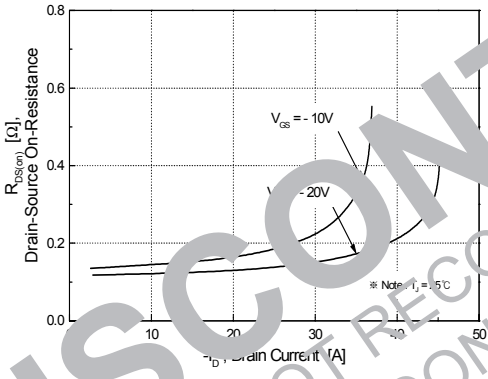


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

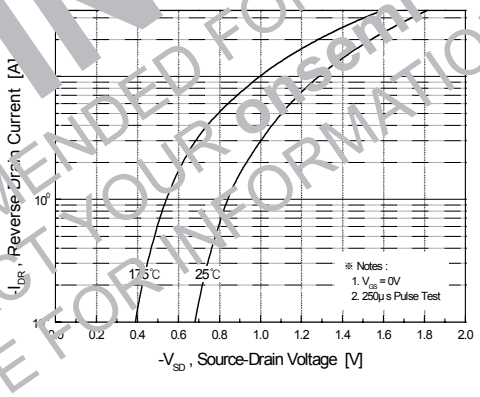


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

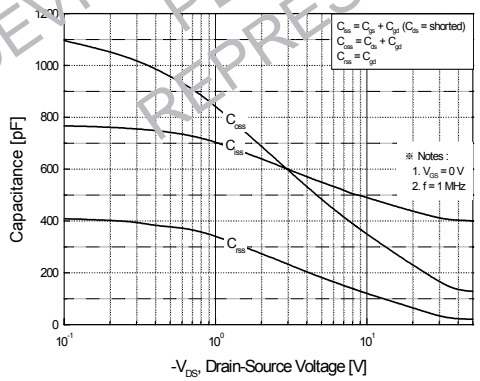


Figure 5. Capacitance Characteristics

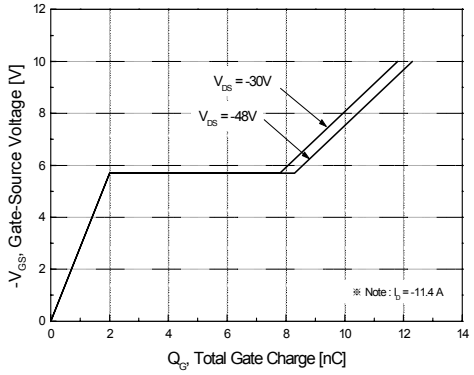


Figure 6. Gate Charge Characteristics

Typical Characteristics (Continued)

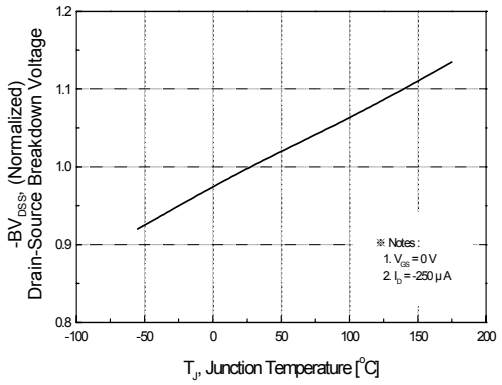


Figure 7. Breakdown Voltage Variation vs. Temperature

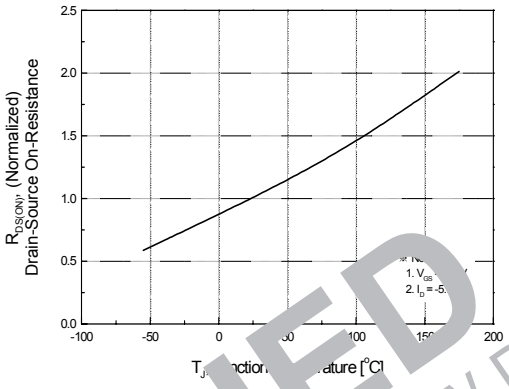


Figure 8. On-Resistance Variation vs. Temperature

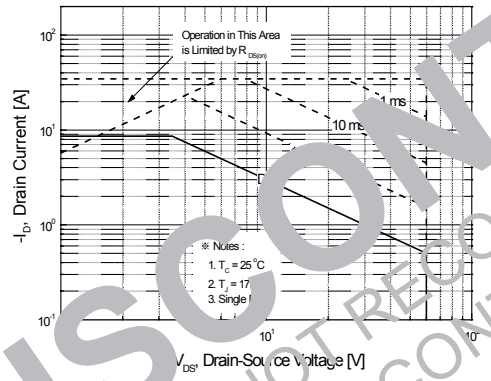


Figure 9. Maximum Safe Operating Area

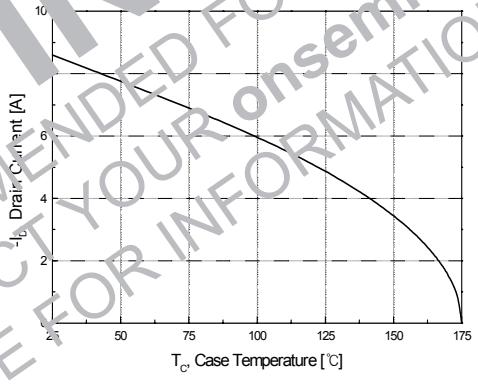


Figure 10. Maximum Drain Current vs. Case Temperature

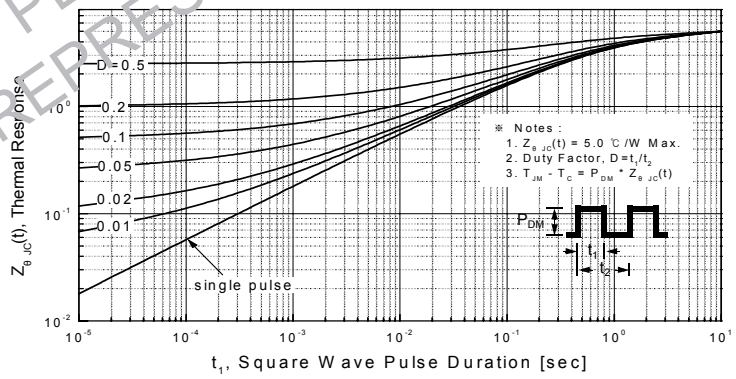
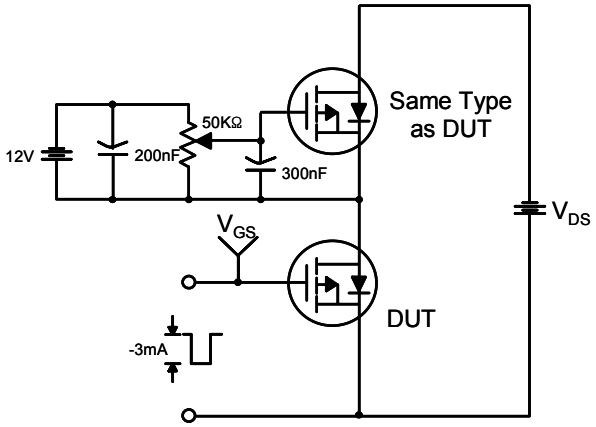
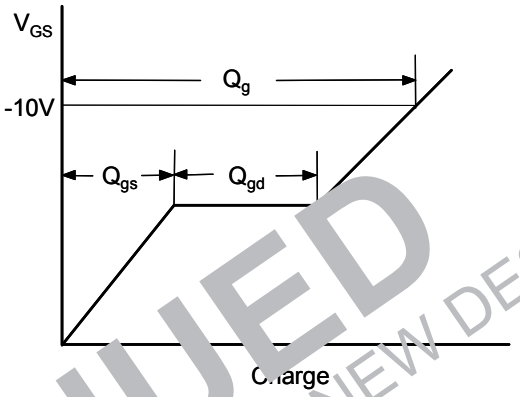


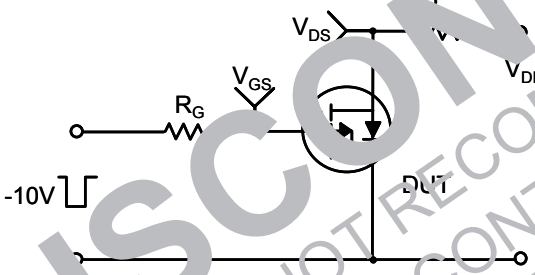
Figure 11. Transient Thermal Response Curve

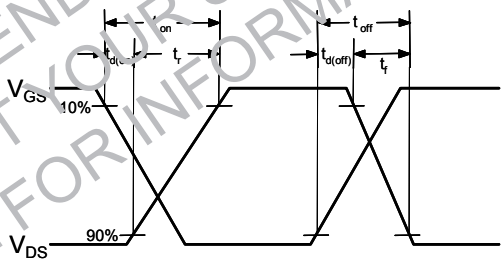
Gate Charge Test Circuit & Waveform



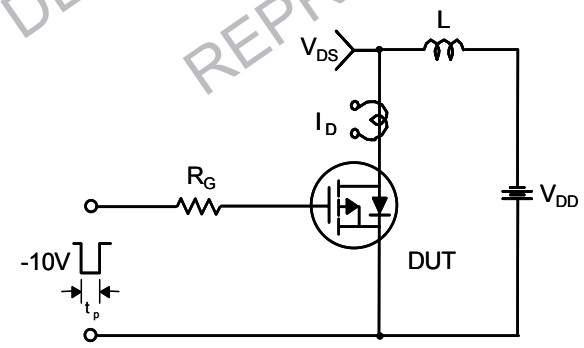


Resistive Switching Test Circuit & Waveforms

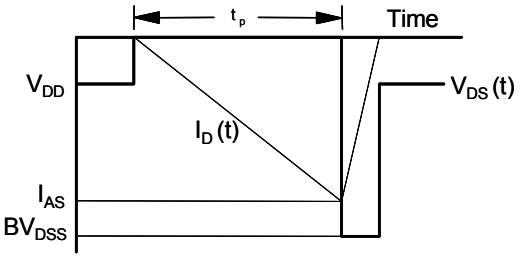




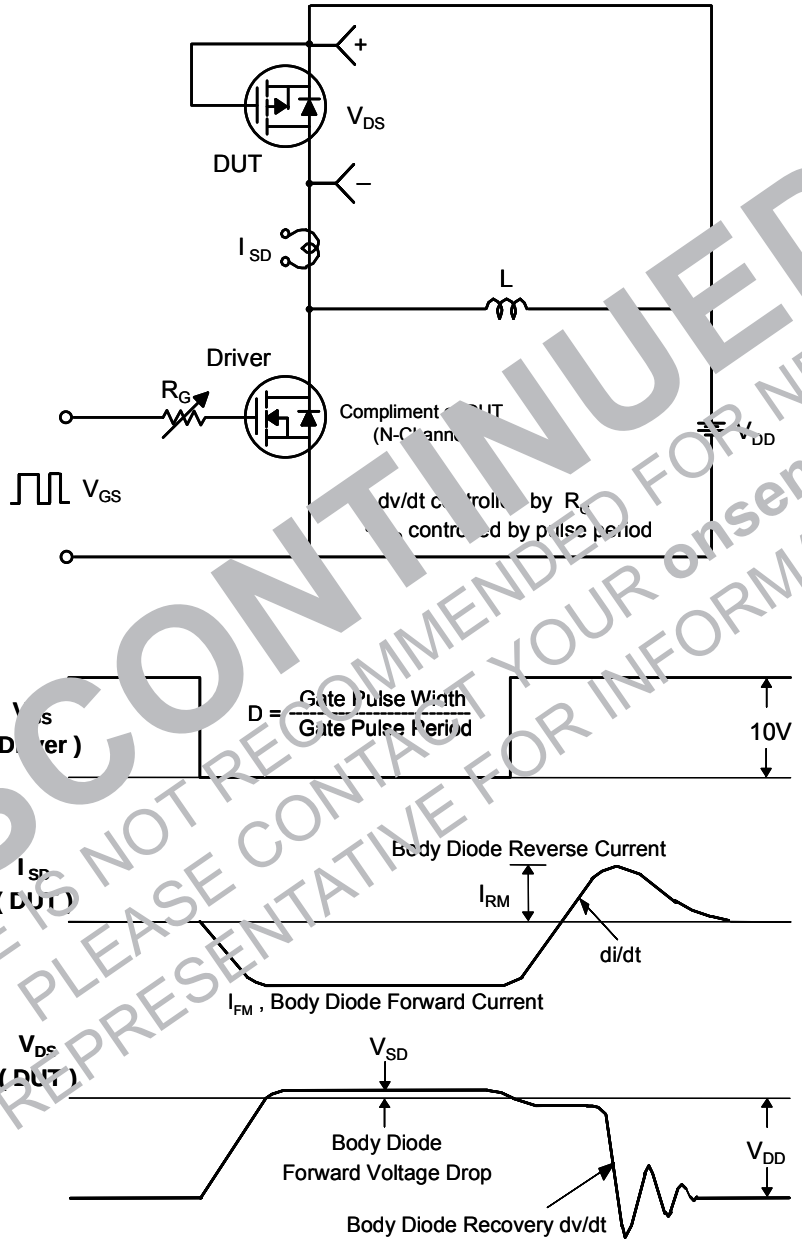
Unclamped Inductive Switching Test Circuit & Waveforms



$$E_{AS} = \frac{1}{2} L I_{AS}^2 \frac{BV_{DSS}}{BV_{DSS} - V_{DD}}$$

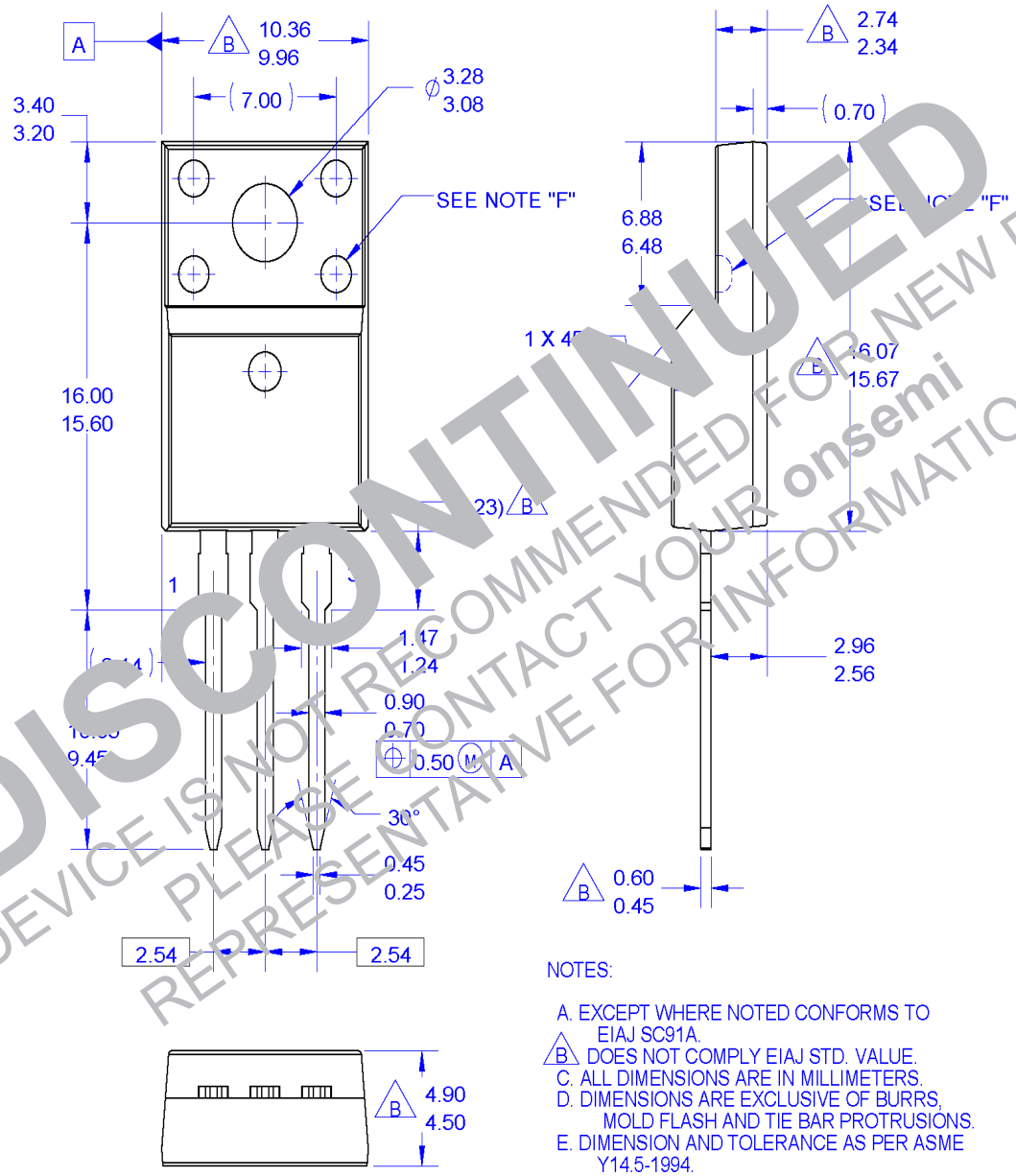


Peak Diode Recovery dv/dt Test Circuit & Waveforms



Mechanical Dimensions

TO-220F



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

Dimensions in Millimeters

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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.

Rev. I64

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