

FQPF11P06

P-Channel QFET® MOSFET

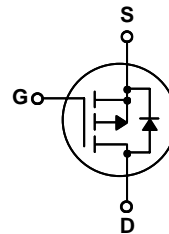
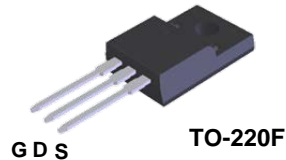
-60 V, -8.6 A, 175 mΩ

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_{GS} =-10 V, I_D =-4.3 A
- Low Gate Charge (Typ. 13 nC)
- Low C_{rss} (Typ. 45 pF)
- 100% Avalanche Tested
- 175°C Maximum Junction Temperature Rating



Absolute Maximum Ratings

$T_C = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	FQPF11P06	Unit
V_{DSS}	Drain-Source Voltage	-60	V
I_D	Drain Current - Continuous ($T_C = 25^\circ\text{C}$) - Continuous ($T_C = 100^\circ\text{C}$)	-8.6	A
		-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 ($T_C = 25^\circ\text{C}$) - Derate above 25°C	30	W
		0.2	W/ $^\circ\text{C}$
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +175	$^\circ\text{C}$
T_L	Maximum lead temperature 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	--	5.0	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	--	62.5	$^\circ\text{C/W}$

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
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Off Characteristics

BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = -250\text{ }\mu\text{A}$	-60	--	--	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = -250\text{ }\mu\text{A}$, Referenced to 25°C	--	-0.07	--	V/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = -60\text{ V}, V_{GS} = 0\text{ V}$	--	--	-1	μA
		$V_{DS} = -48\text{ V}, T_C = 150^\circ\text{C}$	--	--	-10	μA
I_{GSSF}	Gate-Body Leakage Current, Forward	$V_{GS} = -25\text{ V}, V_{DS} = 0\text{ V}$	--	--	-100	nA
I_{GSSR}	Gate-Body Leakage Current, Reverse	$V_{GS} = 25\text{ V}, V_{DS} = 0\text{ V}$	--	--	100	nA

On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = -250\text{ }\mu\text{A}$	-2.0	--	-4.0	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = -10\text{ V}, I_D = -4.3\text{ A}$	--	0.14	0.175	Ω
g_{FS}	Forward Transconductance	$V_{DS} = -30\text{ V}, I_D = -4.3\text{ A}$ (Note 4)	--	4.75	--	S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = -25\text{ V}, V_{GS} = 0\text{ V},$ $f = 1.0\text{ MHz}$	--	420	550	pF
C_{oss}	Output Capacitance		--	195	250	pF
C_{rss}	Reverse Transfer Capacitance		--	45	60	pF

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = -30\text{ V}, I_D = -5.7\text{ A},$ $R_G = 25\text{ }\Omega$ (Note 4, 5)	--	6.5	25	ns
t_r	Turn-On Rise Time		--	40	90	ns
$t_{d(off)}$	Turn-Off Delay Time		--	15	40	ns
t_f	Turn-Off Fall Time		--	45	100	ns
Q_g	Total Gate Charge	$V_{DS} = -48\text{ V}, I_D = -11.4\text{ A},$ $V_{GS} = -10\text{ V}$ (Note 4, 5)	--	13	17	nC
Q_{gs}	Gate-Source Charge		--	2.0	--	nC
Q_{gd}	Gate-Drain Charge		--	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. $L = 2.5\text{ mH}, I_{AS} = -8.6\text{ A}, V_{DD} = -25\text{ V}, R_G = 25\text{ }\Omega$, Starting $T_J = 25^\circ\text{C}$
3. $I_{SD} \leq -11.4\text{ A}, dI/dt \leq 300\text{ A}/\mu\text{s}, V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$
4. Pulse Test : Pulse width $\leq 300\text{ }\mu\text{s}$, Duty cycle $\leq 2\%$
5. Essentially independent of operating temperature

Typical Characteristics

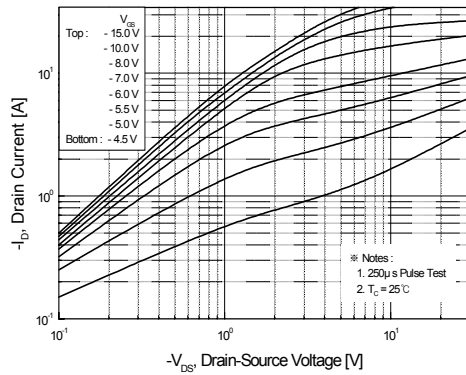


Figure 1. On-Region Characteristics

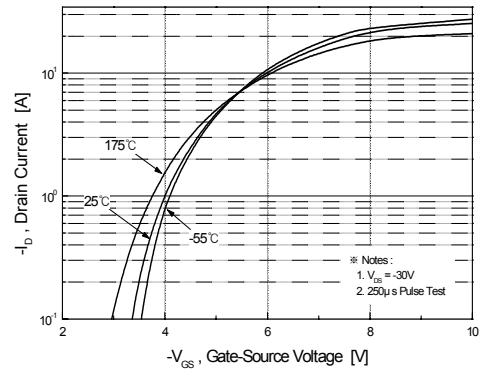


Figure 2. Transfer Characteristics

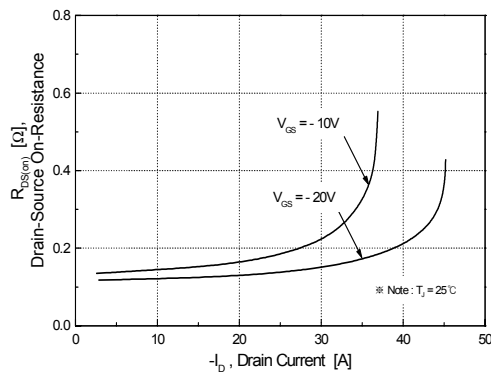


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

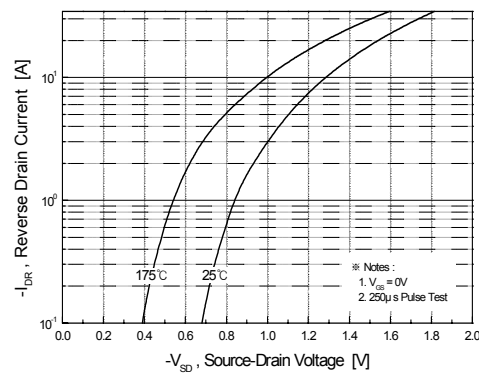


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

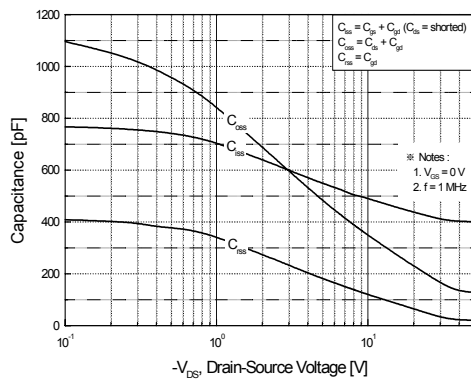


Figure 5. Capacitance Characteristics

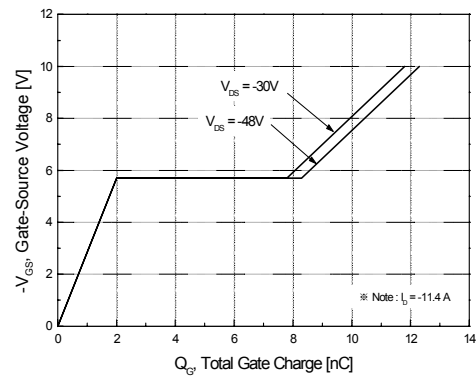


Figure 6. Gate Charge Characteristics

Typical Characteristics (Continued)

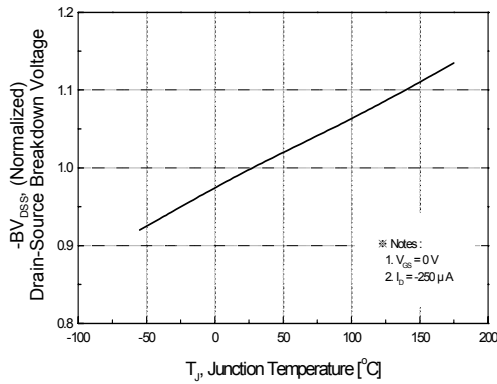


Figure 7. Breakdown Voltage Variation vs. Temperature

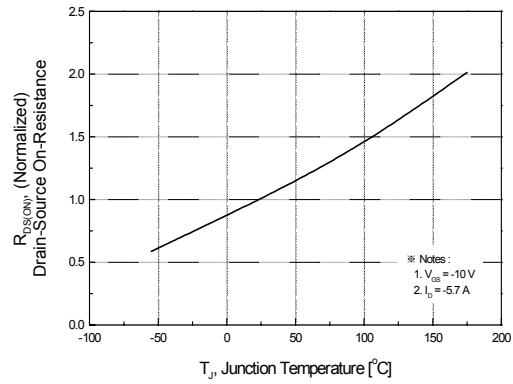


Figure 8. On-Resistance Variation vs. Temperature

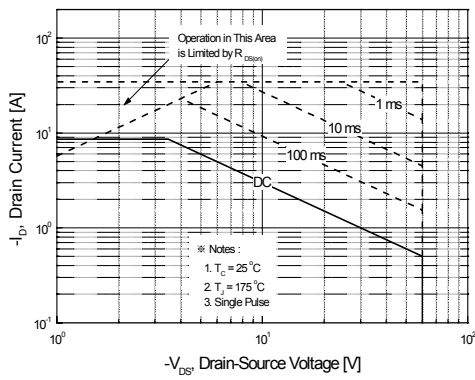


Figure 9. Maximum Safe Operating Area

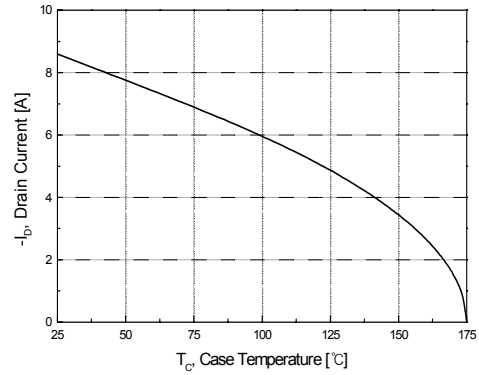


Figure 10. Maximum Drain Current vs. Case Temperature

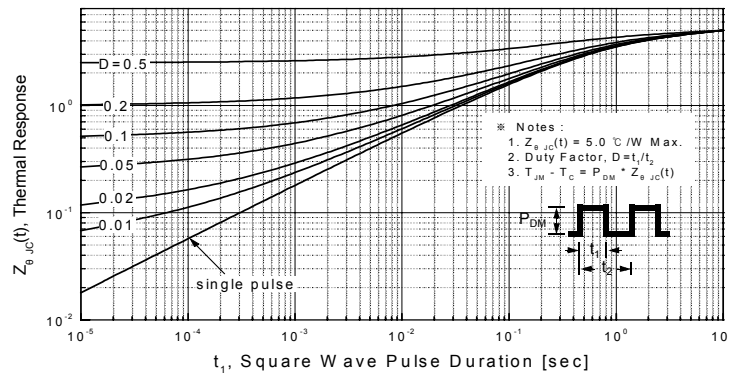
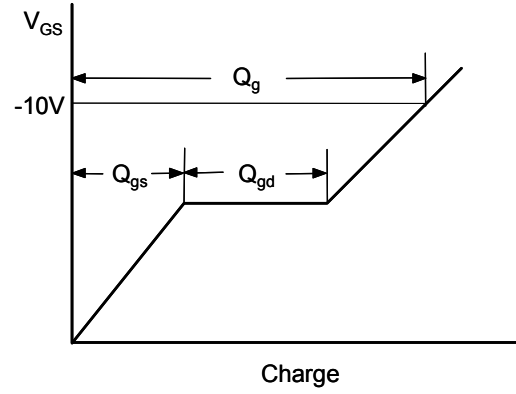
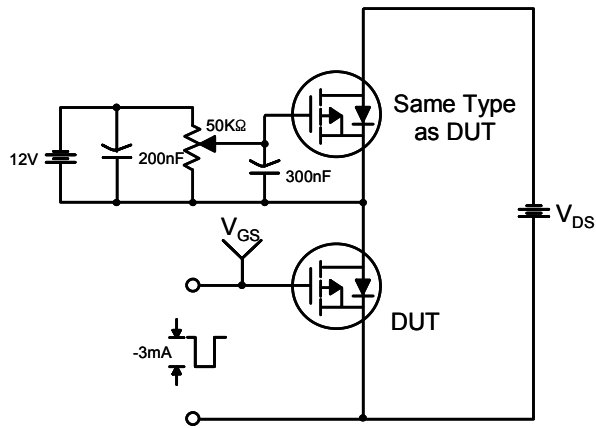
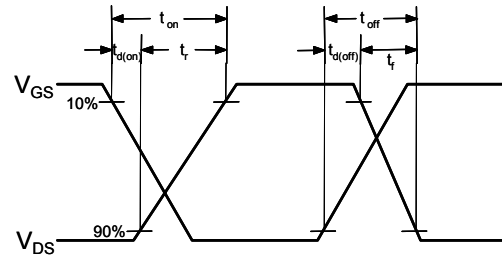
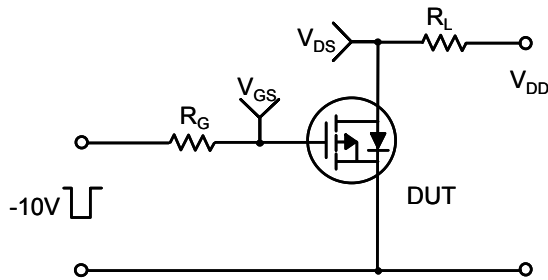


Figure 11. Transient Thermal Response Curve

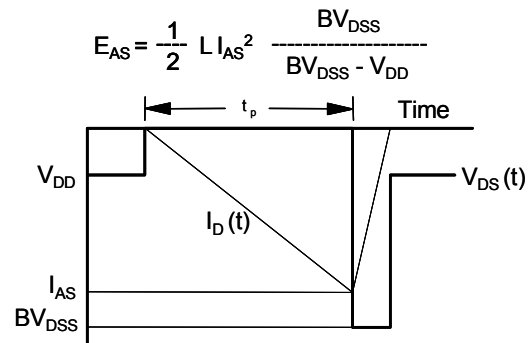
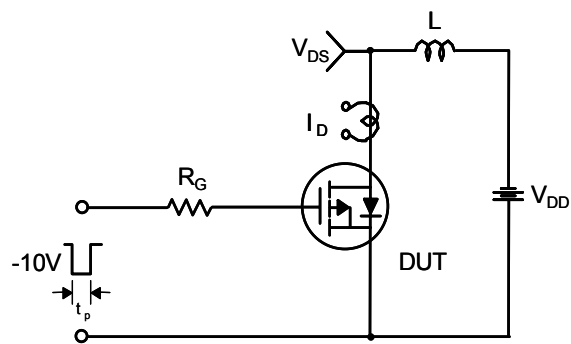
Gate Charge Test Circuit & Waveform



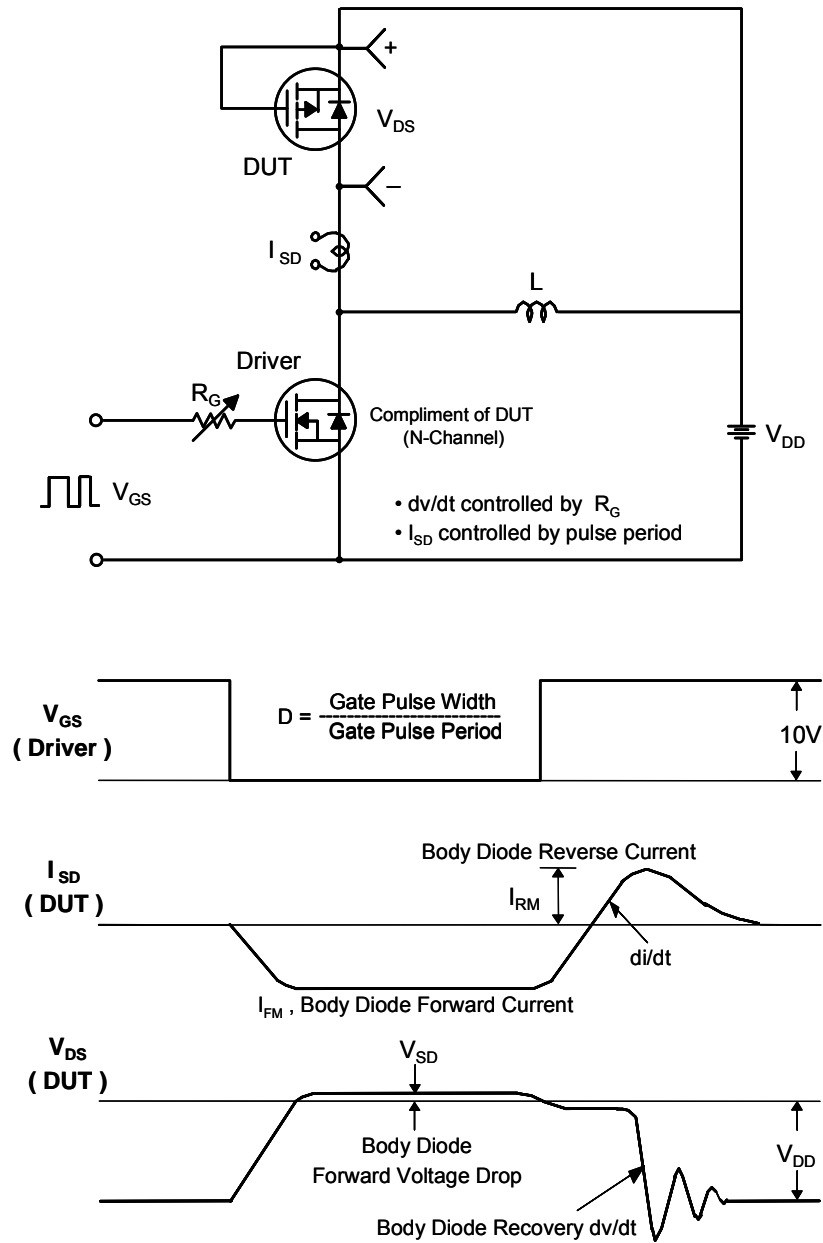
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms

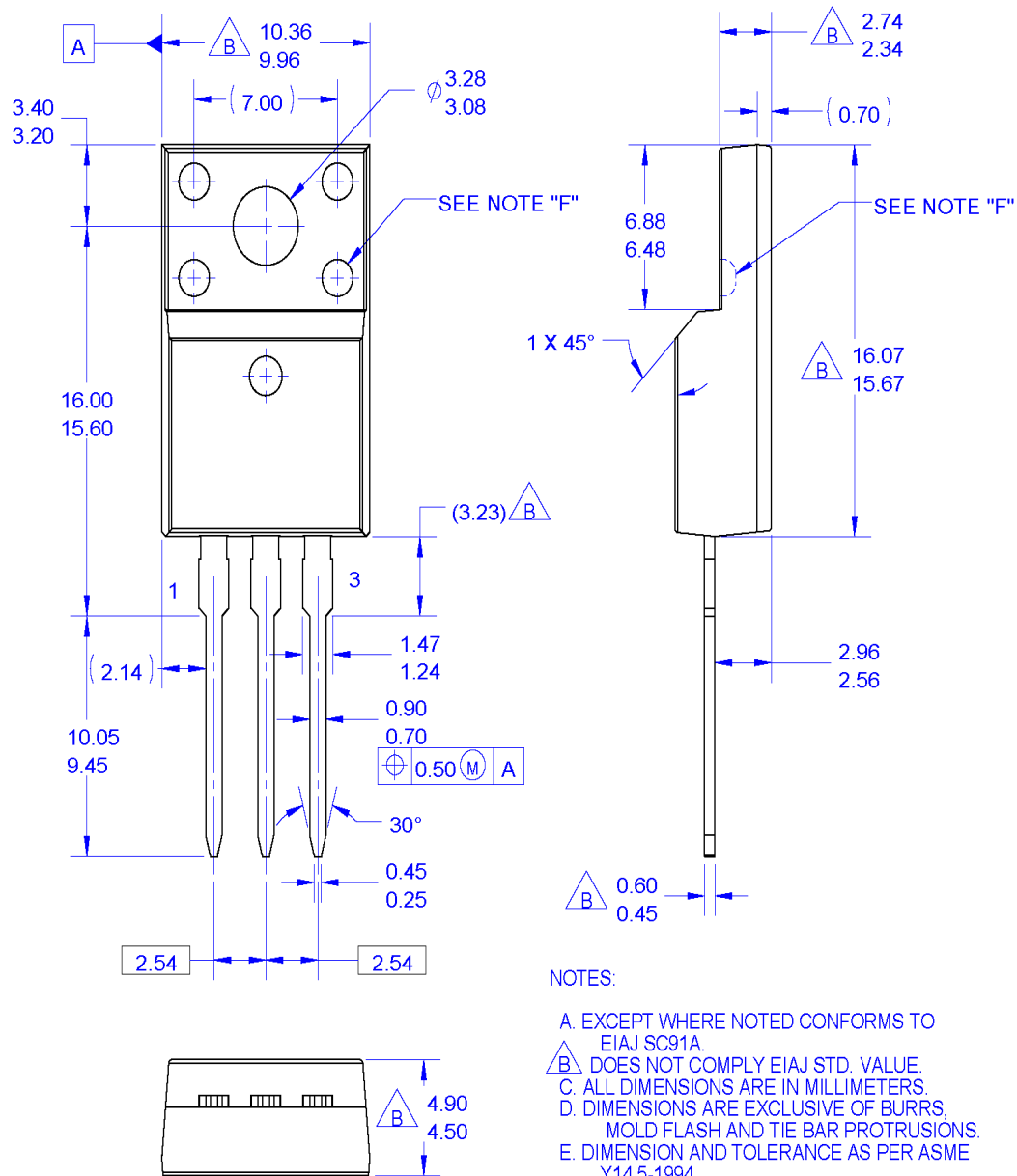


Peak Diode Recovery dv/dt Test Circuit & Waveforms



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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Definition of Terms

Datasheet Identification	Product Status	Definition
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.

Rev. I64

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