

# FDPF18N20FT\_G

## N-Channel UniFET™ FRFET® MOSFET

200 V, 18 A, 140 m



### Features

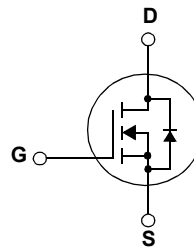
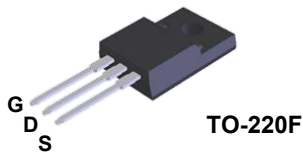
- $R_{DS(on)} = 129 \text{ m}\Omega$  (Typ.) @  $V_{GS} = 10 \text{ V}$ ,  $I_D = 9 \text{ A}$
- Low Gate Charge (Typ. 20 nC)
- Low  $C_{rss}$  (Typ. 24 pF)
- 100% Avalanche Tested
- Improve dv/dt Capability
- RoHS Compliant

### Applications

- LCD/LED TV
- Consumer Appliances
- Lighting
- Uninterruptible Power Supply
- AC-DC Power Supply

### Description

UniFET™ MOSFET is Fairchild Semiconductor®'s high voltage MOSFET family based on planar stripe and DMOS technology. This MOSFET is tailored to reduce on-state resistance, and to provide better switching performance and higher avalanche energy strength. The body diode's reverse recovery performance of UniFET FRFET® has been enhanced by lifetime control. Its  $t_r$  is less than 100nsec and the reverse dv/dt immunity is 15V/ns while normal planar MOSFETs have over 200nsec and 4.5V/nsec respectively. Therefore, it can remove additional component and improve system reliability in certain applications in which the performance of MOSFET's body diode is significant. This device family is suitable for switching power converter applications such as power factor correction (PFC), flat panel display (FPD) TV power, ATX and electronic lamp ballasts.



FDPF18N20FT\_G N-Channel UniFET™ FRFET® MOSFET

### MOSFET Maximum Ratings $T_C = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	FDPF18N20FT_G	Unit
$V_{DSS}$	Drain to Source Voltage	200	V
$V_{GSS}$	Gate to Source Voltage	$\pm 30$	V
$I_D$	Drain Current	-Continuous ( $T_C = 25^\circ\text{C}$ )	18*
		-Continuous ( $T_C = 100^\circ\text{C}$ )	10.8*
$I_{DM}$	Drain Current	- Pulsed (Note 1)	72*
$E_{AS}$	Single Pulsed Avalanche Energy	(Note 2)	324
$I_{AR}$	Avalanche Current	(Note 1)	18
$E_{AR}$	Repetitive Avalanche Energy	(Note 1)	10
dv/dt	Peak Diode Recovery dv/dt	(Note 3)	4.5
$P_D$	Power Dissipation	( $T_C = 25^\circ\text{C}$ )	35
		- Derate above $25^\circ\text{C}$	0.27
$T_J, T_{STG}$	Operating and Storage Temperature Range	-55 to +150	$^\circ\text{C}$
$T_L$	Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds	300	$^\circ\text{C}$


\*Drain current limited by maximum junction temperature

### Thermal Characteristics

Symbol	Parameter	FDPF18N20FT_G	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	3.6	$^\circ\text{C/W}$
$R_{\theta CS}$	Thermal Resistance, Case to Sink, Typ.	0.5	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	62.5	

**Package Marking and Ordering Information**  $T_C = 25^\circ\text{C}$  unless otherwise noted

Device Marking	Device	Package	Eco Status	Reel Size	Tape Width	Quantity
FDPF18N20FT	FDPF18N20F_G	TO-220F	Green/RoHS	-	-	50

 For Fairchild's definition of "green" Eco Status, please visit: [http://www.fairchildsemi.com/company/green/rohs\\_green.html](http://www.fairchildsemi.com/company/green/rohs_green.html)

**Electrical Characteristics**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
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**Off Characteristics**

$BV_{DSS}$	Drain to Source Breakdown Voltage	$I_D = 250\mu\text{A}, V_{GS} = 0\text{V}, T_J = 25^\circ\text{C}$	200	-	-	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\mu\text{A}$ , Referenced to $25^\circ\text{C}$	-	0.2	-	$\text{V}/^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 200\text{V}, V_{GS} = 0\text{V}$ $V_{DS} = 160\text{V}, T_C = 125^\circ\text{C}$	-	-	10 100	$\mu\text{A}$
$I_{GSS}$	Gate to Body Leakage Current	$V_{GS} = \pm 30\text{V}, V_{DS} = 0\text{V}$	-	-	$\pm 100$	nA

**On Characteristics**

$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250\mu\text{A}$	3.0	-	5.0	V
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{V}, I_D = 9\text{A}$	-	0.12	0.14	$\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS} = 20\text{V}, I_D = 9\text{A}$ (Note 4)	-	13.6	-	S

**Dynamic Characteristics**

$C_{iss}$	Input Capacitance	$V_{DS} = 25\text{V}, V_{GS} = 0\text{V}$ $f = 1\text{MHz}$	-	885	1180	pF
$C_{oss}$	Output Capacitance		-	200	270	pF
$C_{rss}$	Reverse Transfer Capacitance		-	24	35	pF
$Q_{g(tot)}$	Total Gate Charge at 10V	$V_{DS} = 160\text{V}, I_D = 18\text{A}$ $V_{GS} = 10\text{V}$ (Note 4, 5)	-	20	26	nC
$Q_{gs}$	Gate to Source Gate Charge		-	5	-	nC
$Q_{gd}$	Gate to Drain "Miller" Charge		-	9	-	nC

**Switching Characteristics**

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 100\text{V}, I_D = 18\text{A}$ $R_G = 25\Omega$ (Note 4, 5)	-	16	40	ns
$t_r$	Turn-On Rise Time		-	50	110	ns
$t_{d(off)}$	Turn-Off Delay Time		-	50	110	ns
$t_f$	Turn-Off Fall Time		-	40	90	ns

**Drain-Source Diode Characteristics**

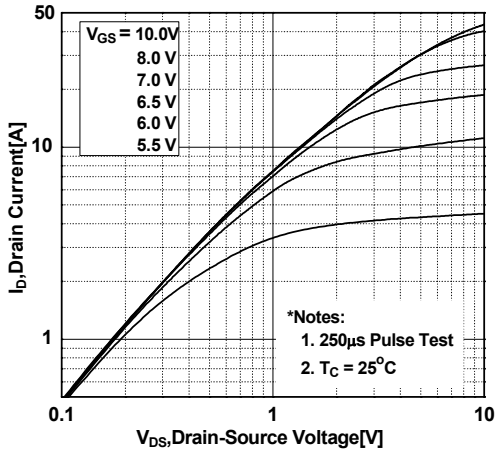
$I_S$	Maximum Continuous Drain to Source Diode Forward Current	-	-	18	A	
$I_{SM}$	Maximum Pulsed Drain to Source Diode Forward Current	-	-	72	A	
$V_{SD}$	Drain to Source Diode Forward Voltage	$V_{GS} = 0\text{V}, I_{SD} = 18\text{A}$	-	-	1.5	V
$t_{rr}$	Reverse Recovery Time	$V_{GS} = 0\text{V}, I_{SD} = 18\text{A}$	-	80	-	ns
$Q_{rr}$	Reverse Recovery Charge	$di/dt = 100\text{A}/\mu\text{s}$ (Note 4)	-	240	-	nC

**Notes:**

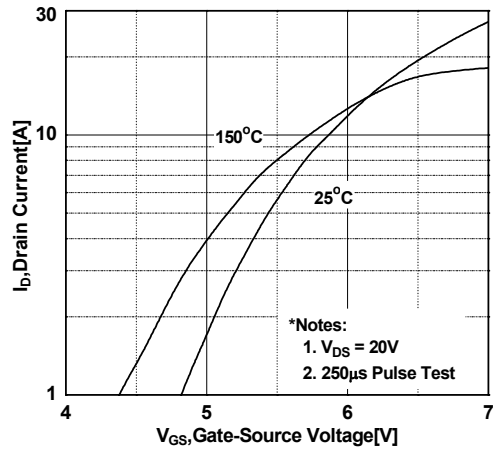
1. Repetitive Rating: Pulse width limited by maximum junction temperature
2.  $L = 2\text{mH}, I_{AS} = 18\text{A}, V_{DD} = 50\text{V}, R_G = 25\Omega$ , Starting  $T_J = 25^\circ\text{C}$
3.  $I_{SD} \leq 18\text{A}, di/dt \leq 200\text{A}/\mu\text{s}, V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$
4. Pulse Test: Pulse width  $\leq 300\mu\text{s}$ , Duty Cycle  $\leq 2\%$
5. Essentially Independent of Operating Temperature Typical Characteristics

## Typical Performance Characteristics

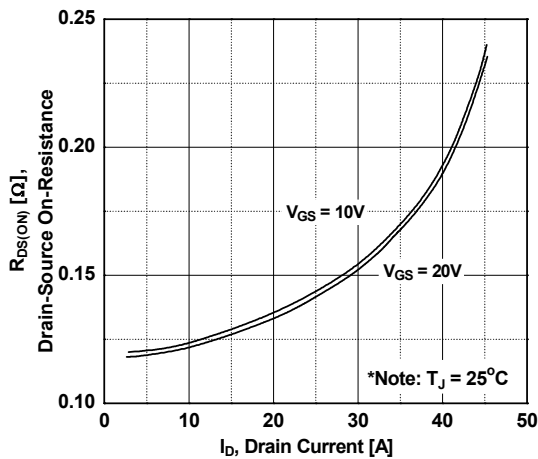
**Figure 1. On-Region Characteristics**



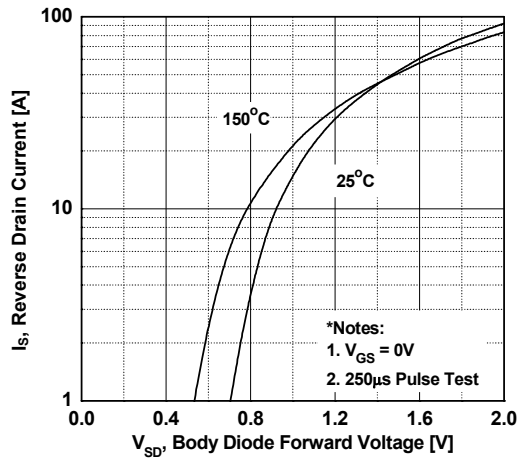
**Figure 2. Transfer Characteristics**



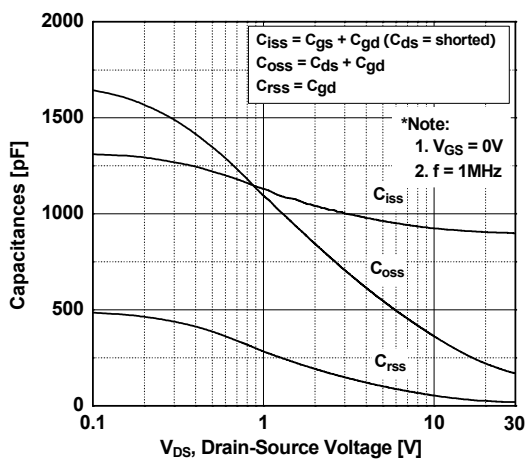
**Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage**



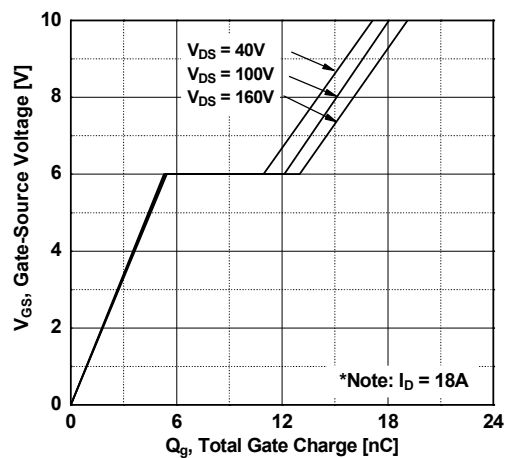
**Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature**



**Figure 5. Capacitance Characteristics**

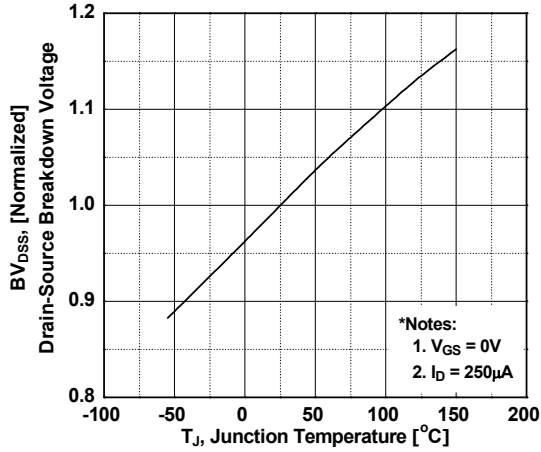


**Figure 6. Gate Charge Characteristics**

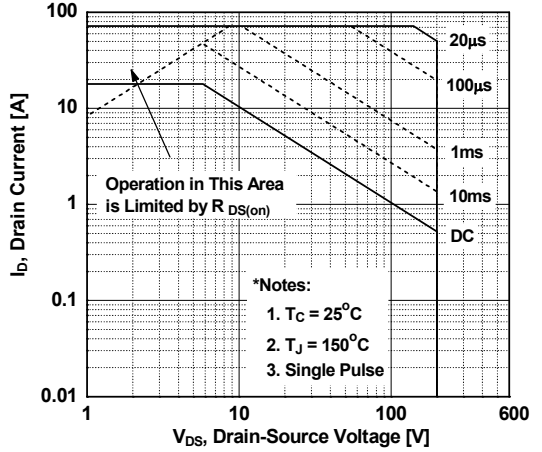


**Typical Performance Characteristics** (Continued)

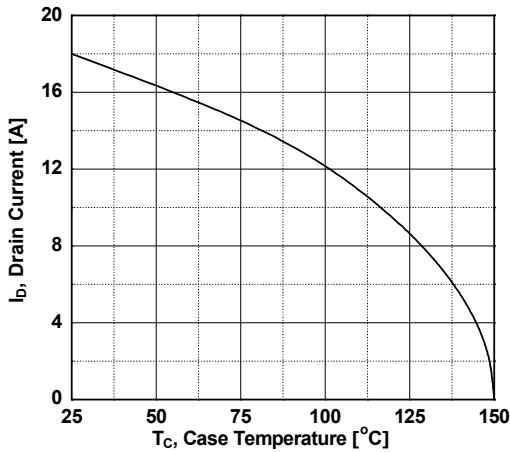
**Figure 7. Breakdown Voltage Variation vs. Temperature**



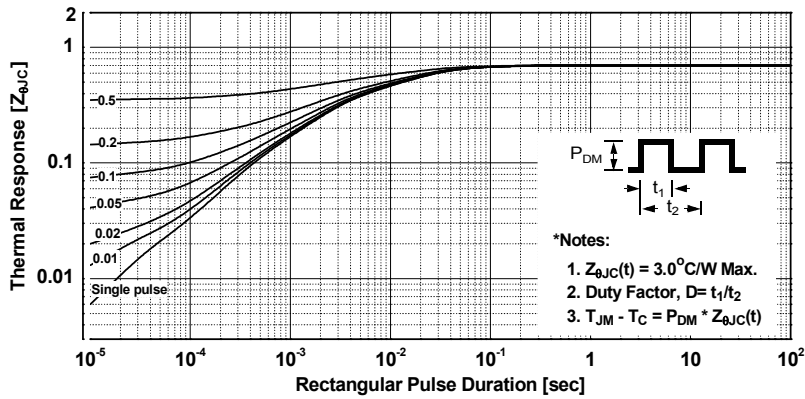
**Figure 8. Maximum Safe Operating Area - FDP18N20F**



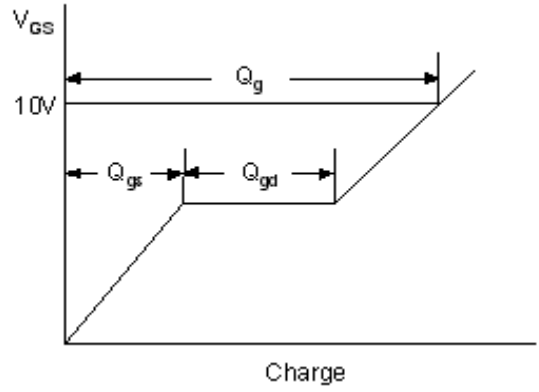
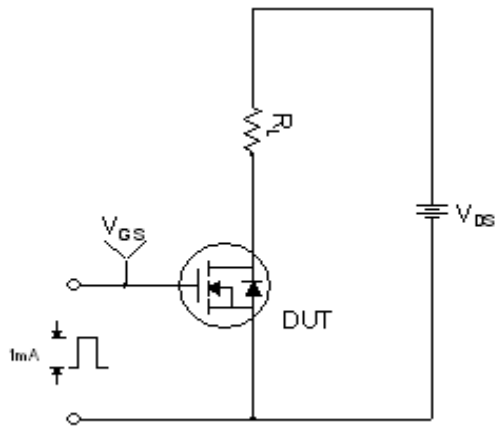
**Figure 9. Maximum Drain Current vs. Case Temperature**



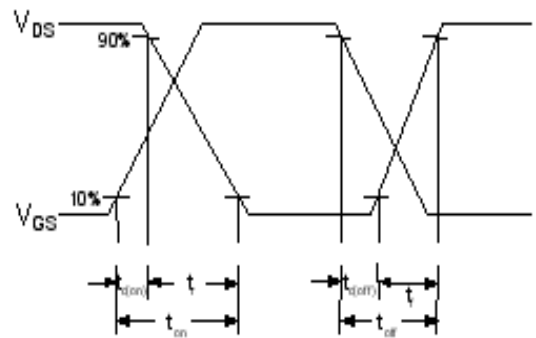
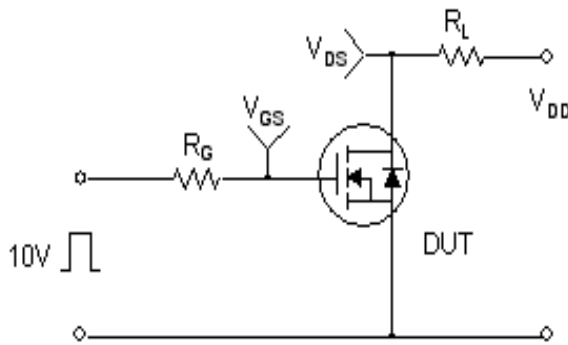
**Figure 10. Transient Thermal Response Curve - FDP18N20F**



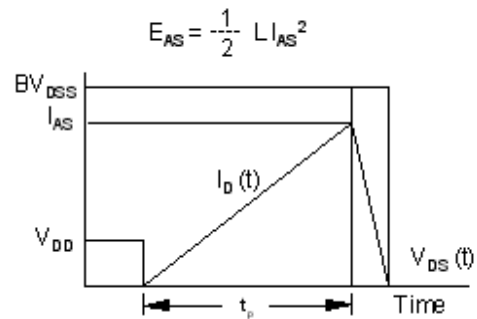
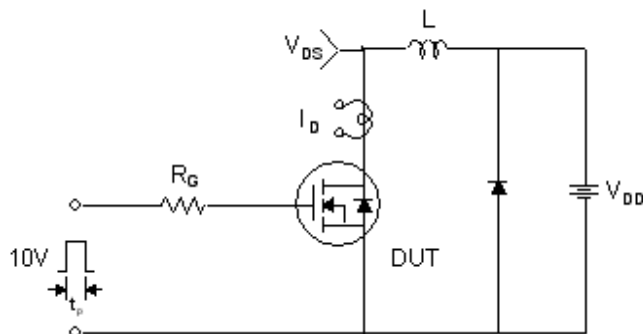
**Gate Charge Test Circuit & Waveform**



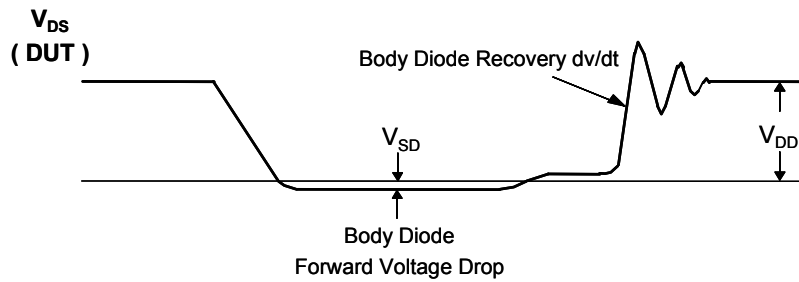
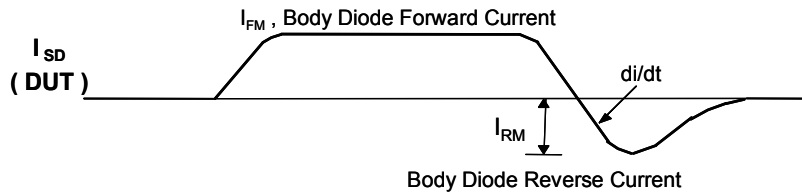
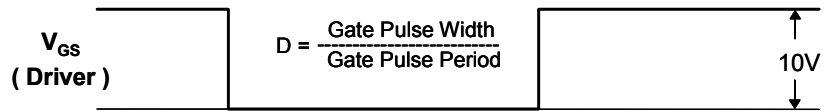
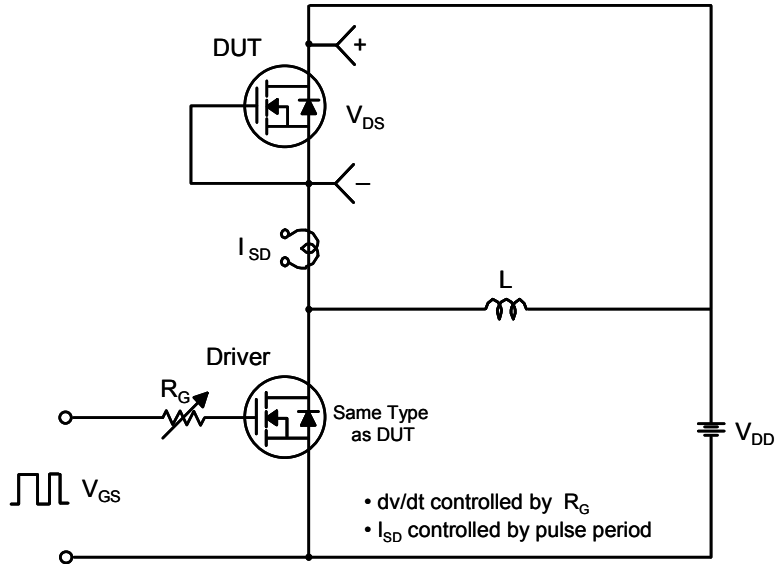
**Resistive Switching Test Circuit & Waveforms**



**Unclamped Inductive Switching Test Circuit & Waveforms**

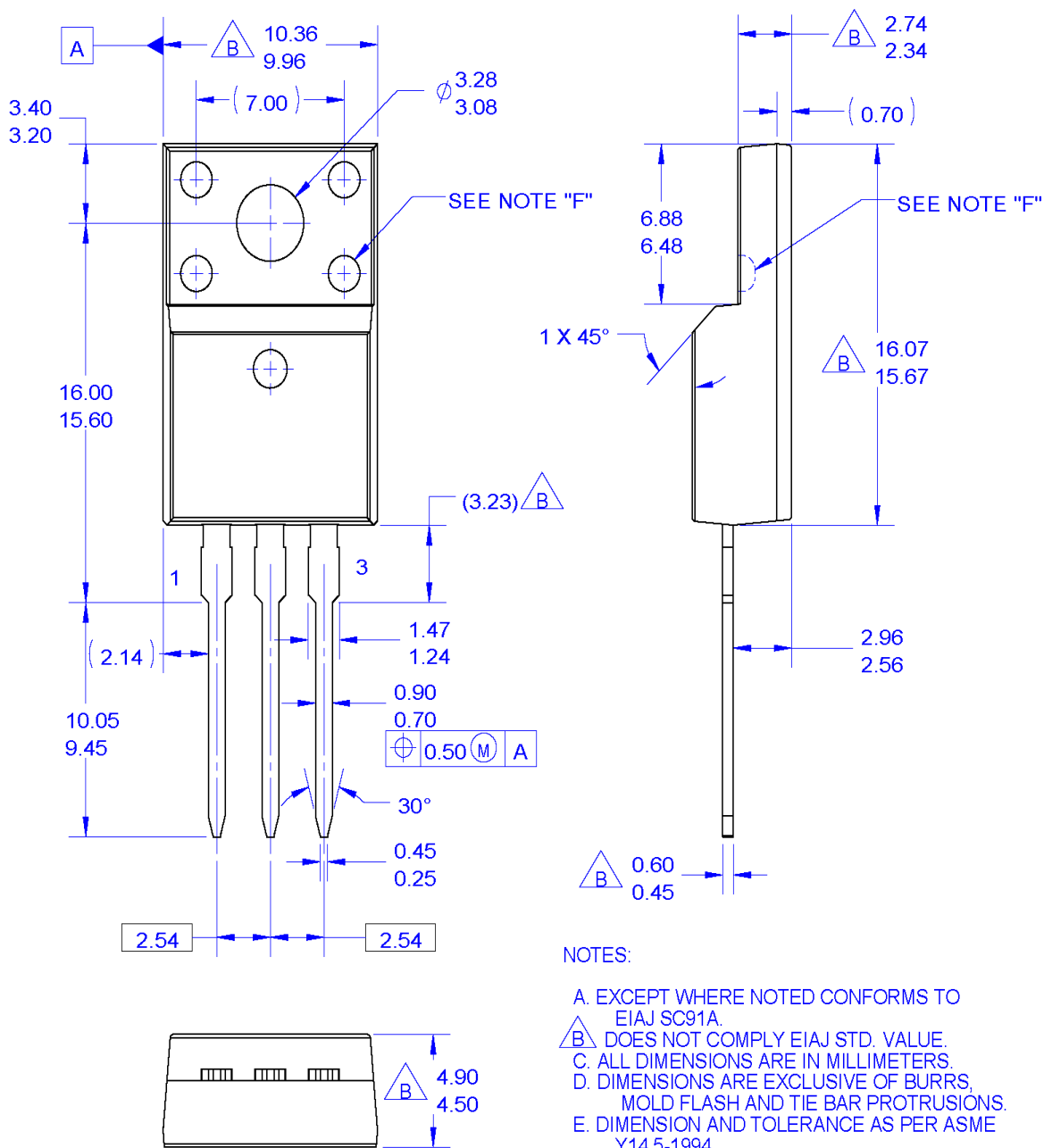


Peak Diode Recovery dv/dt Test Circuit & Waveforms



### Mechanical Dimensions

## TO-220M03



**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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- |   |   |                                       |                  |
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| AccuPower™  | F-PFST™   | PowerXS™                              | SYSTEM GENERAL®* |
| AX-CAP®*  | FRFET®  | Programmable Active Droop™            | TinyBoost™       |
| BitSiC™   | Global Power Resource <sup>SM</sup>             | QFET®                                 | TinyBuck™        |
| Build it Now™   | Green Bridge™                                   | QS™                                   | TinyCalc™        |
| CorePLUSTM  | Green FPS™                                      | Quiet Series™                         | TinyLogic®       |
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|  | MicroPak™                                       | SuperFET®                             | Ultra FRFET™     |
| Fairchild®  | MicroPak2™                                      | SuperSOT™-3                           | UniFET™          |
| Fairchild Semiconductor®  | MillerDrive™                                    | SuperSOT™-6                           | VCX™             |
| FACT Quiet Series™  | MotionMax™                                      | SuperSOT™-8                           | VisualMax™       |
| FACT®   | mWSaver™  | SupreMOS®                             | VoltagePlus™     |
| FAST®   | OptoHit™  | SyncFET™                              | XST™             |
| FastvCore™  | OPTOLOGIC®                                      |                                       |                  |
| FETBench™   | OPTOPLANAR®                                     |                                       |                  |

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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. 164