FAIRCHILD SEMICONDUCTOR®

April 2013

FDPF680N10T

N-Channel PowerTrench® MOSFET

100 V, 12 A, 68 mΩ

Features

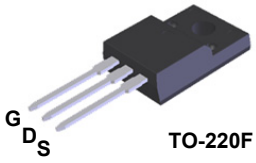
- $R_{DS(on)}$ = 54 mΩ (Typ.)@ V_{GS} = 10 V, I_D = 6 A
- Fast Switching Speed
- Low Gate Charge
- High Performance Trench Technology for Extremely Low $R_{DS(on)}$
- High Power and Current Handling Capability
- RoHS Compliant

Description

This N-Channel MOSFET is produced using Fairchild Semiconductor®'s advance PowerTrench® process that has been tailored to minimize the on-state resistance while maintaining superior switching performance.

Applications

- Consumer Appliances
- LCD/LED/PDP TV
- Synchronous Rectification
- Uninterruptible Power Supply
- Micro Solar Inverter



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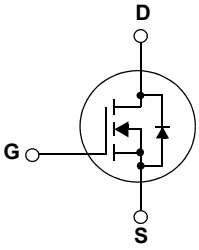


MOSFET Maximum Ratings T_C = 25°C unless otherwise noted*

Symbol	Parameter			FDPF680N10T	Unit
V_{DSS}	Drain to Source Voltage			100	V
V_{GSS}	Gate to Source Voltage			±20	V
I_D	Drain Current	-Continuous (T_C = 25°C)		12	A
		-Continuous (T_C = 100°C)		7.6	
I_{DM}	Drain Current	- Pulsed	(Note 1)	48	A
E_{AS}	Single Pulsed Avalanche Energy		(Note 2)	50.4	mJ
dv/dt	Peak Diode Recovery dv/dt		(Note 3)	13.0	V/ns
P_D	Power Dissipation	(T_C = 25°C)		24	W
		- Derate above 25°C		0.19	W/°C
T_J, T_{STG}	Operating and Storage Temperature Range			-55 to +150	°C
T_L	Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds			300	°C

Thermal Characteristics

Symbol	Parameter	FDPF680N10T	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	5.2	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	62.5	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDPF680N10T	FDPF680N10T	TO-220F	-	-	50

Electrical Characteristics $T_C = 25^oC$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Off Characteristics						
BV_{DSS}	Drain to Source Breakdown Voltage	$I_D = 250\mu A$, $V_{GS} = 0V$, $T_C = 25^oC$	100	-	-	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\mu A$, Referenced to 25^oC	-	0.1	-	$V/^oC$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 100V$, $V_{GS} = 0V$	-	-	1	μA
		$V_{DS} = 100V$, $V_{GS} = 0V$, $T_C = 150^oC$	-	-	500	
I_{GSS}	Gate to Body Leakage Current	$V_{GS} = \pm 20V$, $V_{DS} = 0V$	-	-	±100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}$, $I_D = 250\mu A$	2.5	3.5	4.5	V
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10V$, $I_D = 6A$	-	54	68	mΩ
g_{FS}	Forward Transconductance	$V_{DS} = 10V$, $I_D = 12A$	-	26	-	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	$V_{DS} = 50V$, $V_{GS} = 0V$, f = 1MHz	-	750	1000	pF
C_{oss}	Output Capacitance		-	60	80	pF
C_{rss}	Reverse Transfer Capacitance		-	25	40	pF
$Q_{g(tot)}$	Total Gate Charge	$V_{DS} = 80V$, $I_D = 12A$, $V_{GS} = 10V$ (Note 4)	-	13	17	nC
Q_{gs}	Gate to Source Gate Charge		-	4	-	nC
Q_{gd}	Gate to Drain “Miller” Charge		-	4	-	nC
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 50V$, $I_D = 12A$, $V_{GS} = 10V$, $R_{GEN} = 10\Omega$ (Note 4)	-	13	36	ns
t_r	Turn-On Rise Time		-	19	48	ns
$t_{d(off)}$	Turn-Off Delay Time		-	18	46	ns
t_f	Turn-Off Fall Time		-	6	22	ns
Drain-Source Diode Characteristics						
I_S	Maximum Continuous Drain to Source Diode Forward Current		-	-	12	A
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	48	A
V_{SD}	Drain to Source Diode Forward Voltage	$V_{GS} = 0V$, $I_{SD} = 12A$	-	-	1.3	V
t_{rr}	Reverse Recovery Time	$V_{GS} = 0V$, $I_{SD} = 12A$, $dI_F/dt = 100A/\mu s$	-	29	-	ns
Q_{rr}	Reverse Recovery Charge		-	35	-	nC

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. L = 0.7mH, $I_{AS} = 12A$, $V_{DD} = 50V$, $R_G = 25\Omega$, Starting $T_J = 25°C$
3. $I_{SD} \le 12A$, $di/dt \le 200A/\mu s$, $V_{DD} \le BV_{DSS}$, Starting $T_J = 25°C$
4. Essentially Independent of Operating Temperature Typical Characteristics

Typical Performance Characteristics

Figure 1. On-Region Characteristics

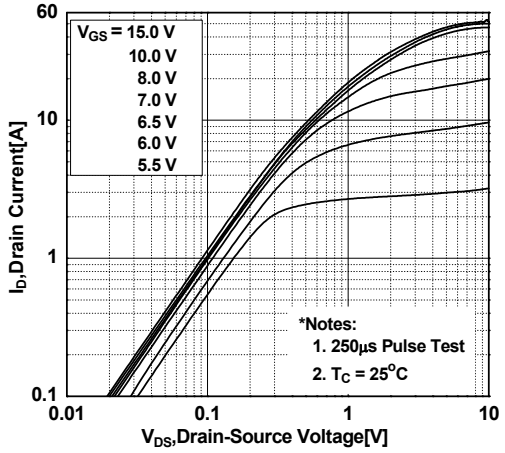


Figure 2. Transfer Characteristics

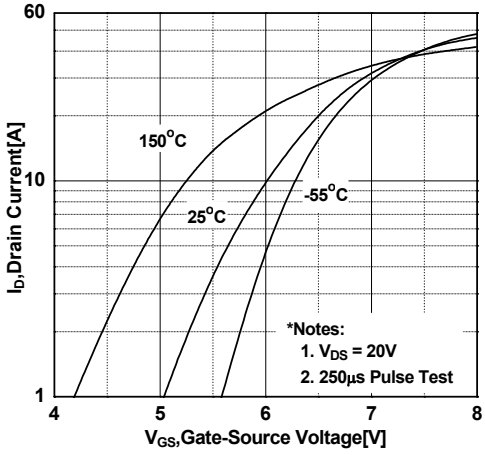


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

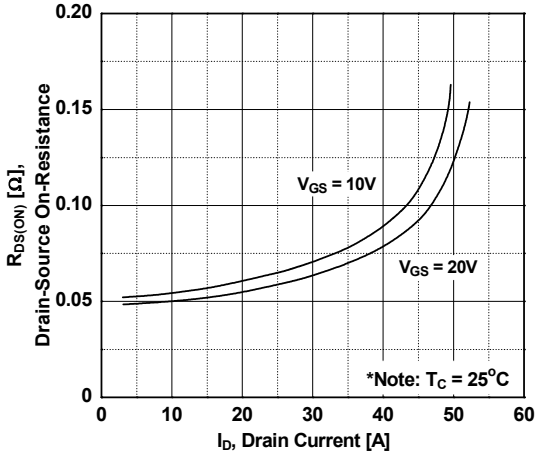


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

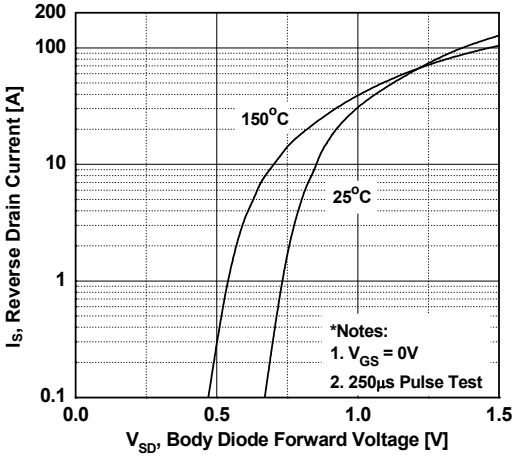


Figure 5. Capacitance Characteristics

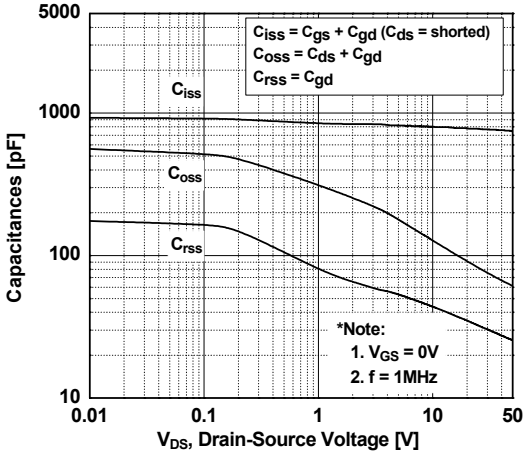
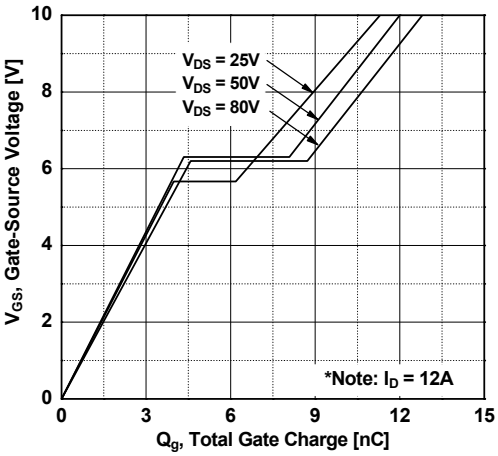


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

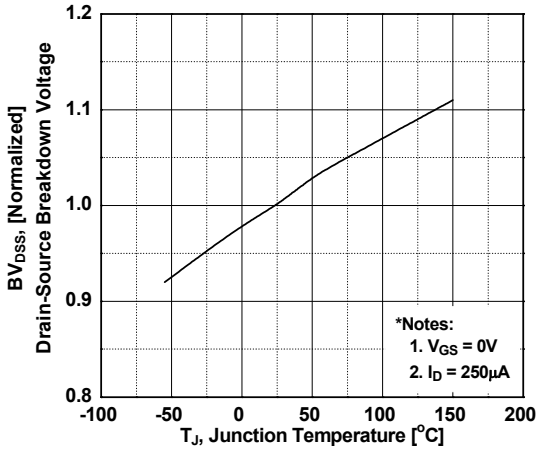


Figure 8. On-Resistance Variation vs. Temperature

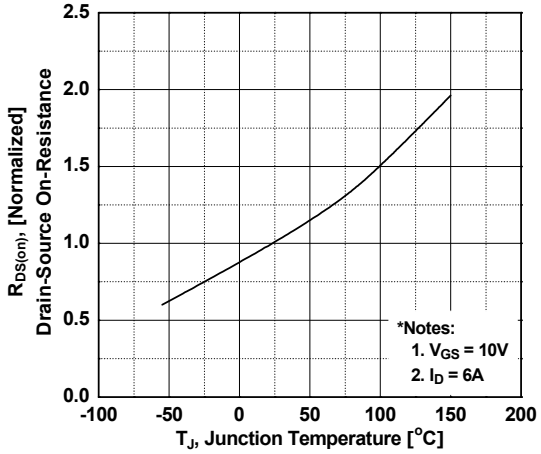


Figure 9. Maximum Safe Operating Area

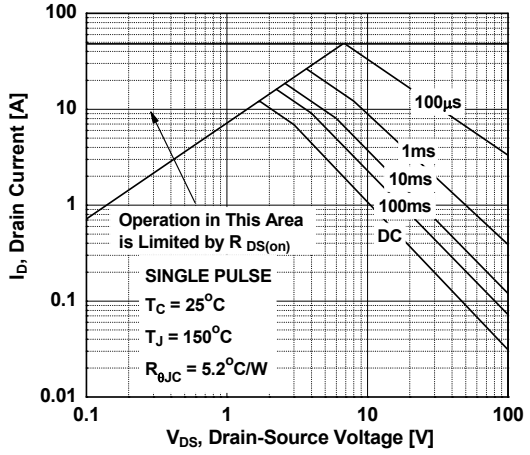


Figure 10. Maximum Drain Current vs. Case Temperature

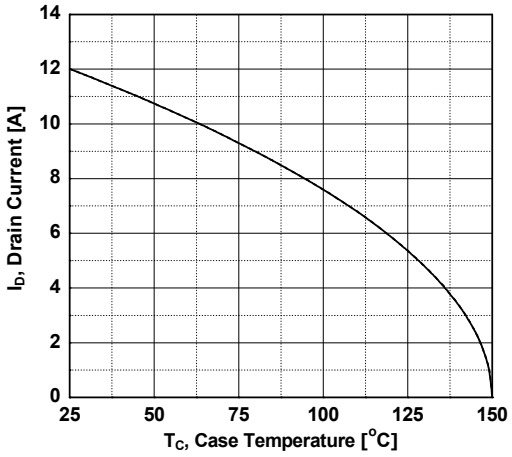
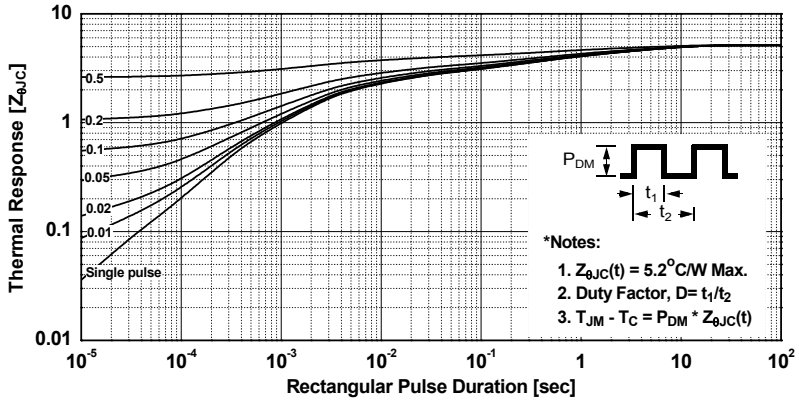
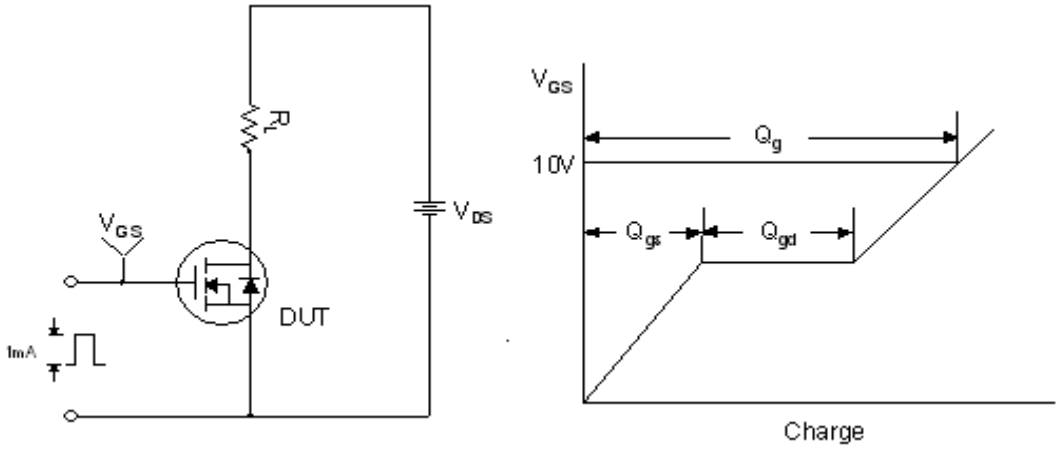


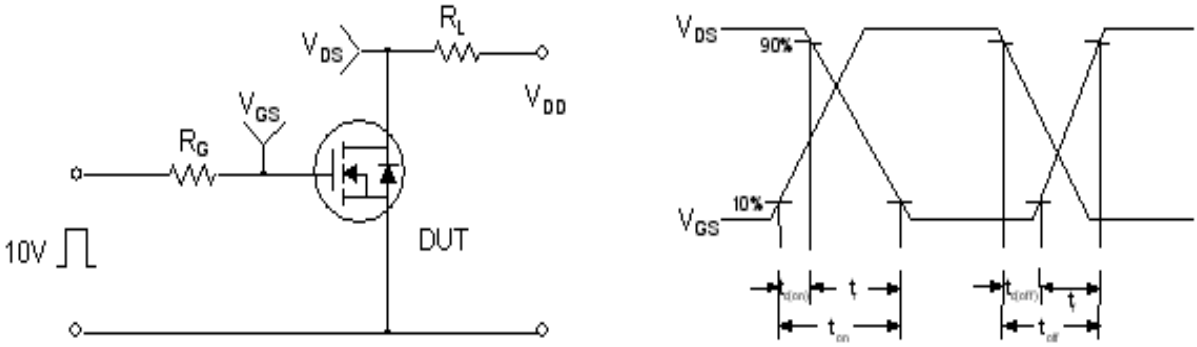
Figure 11. Transient Thermal Response Curve



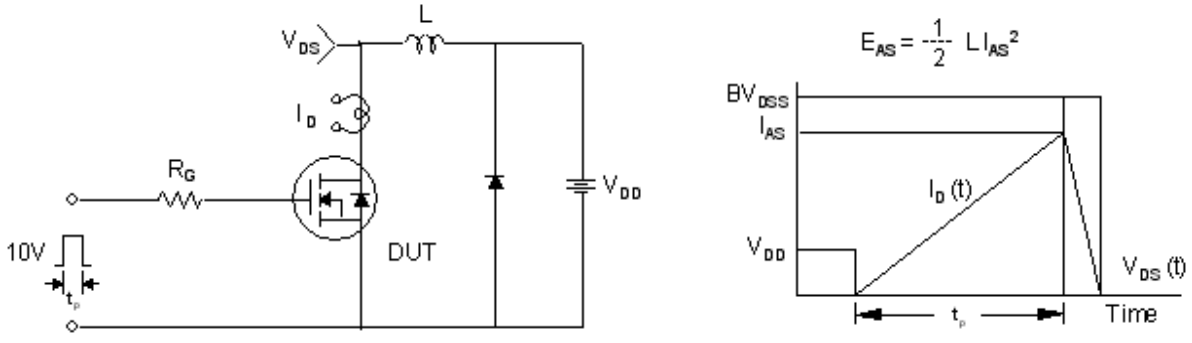
Gate Charge Test Circuit & Waveform



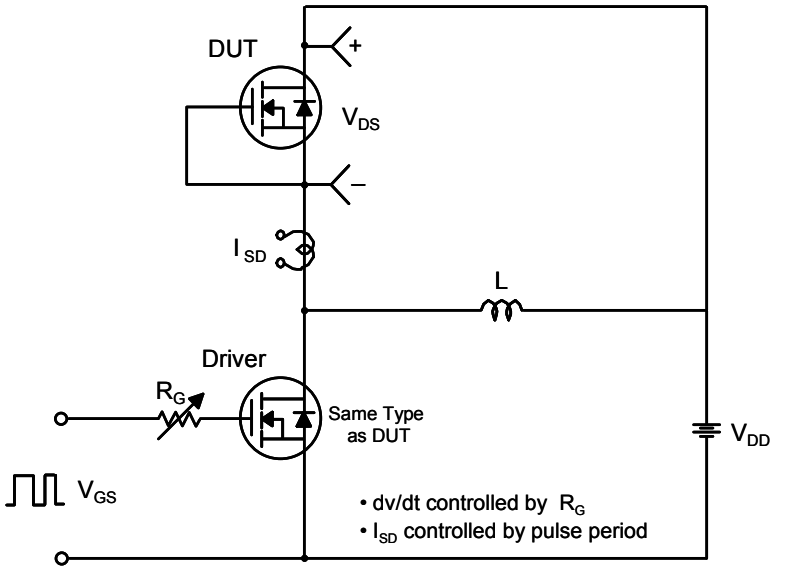
Resistive Switching Test Circuit & Waveforms

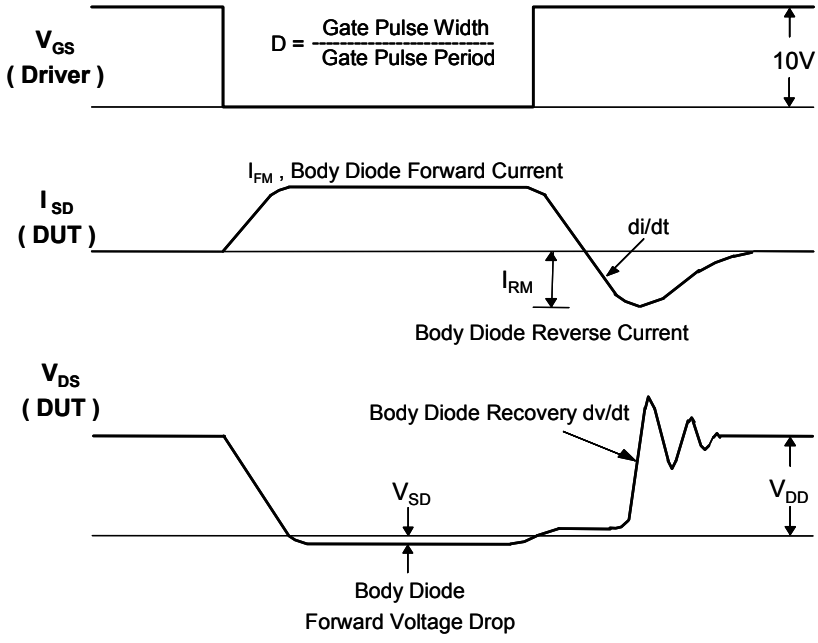


Unclamped Inductive Switching Test Circuit & Waveforms



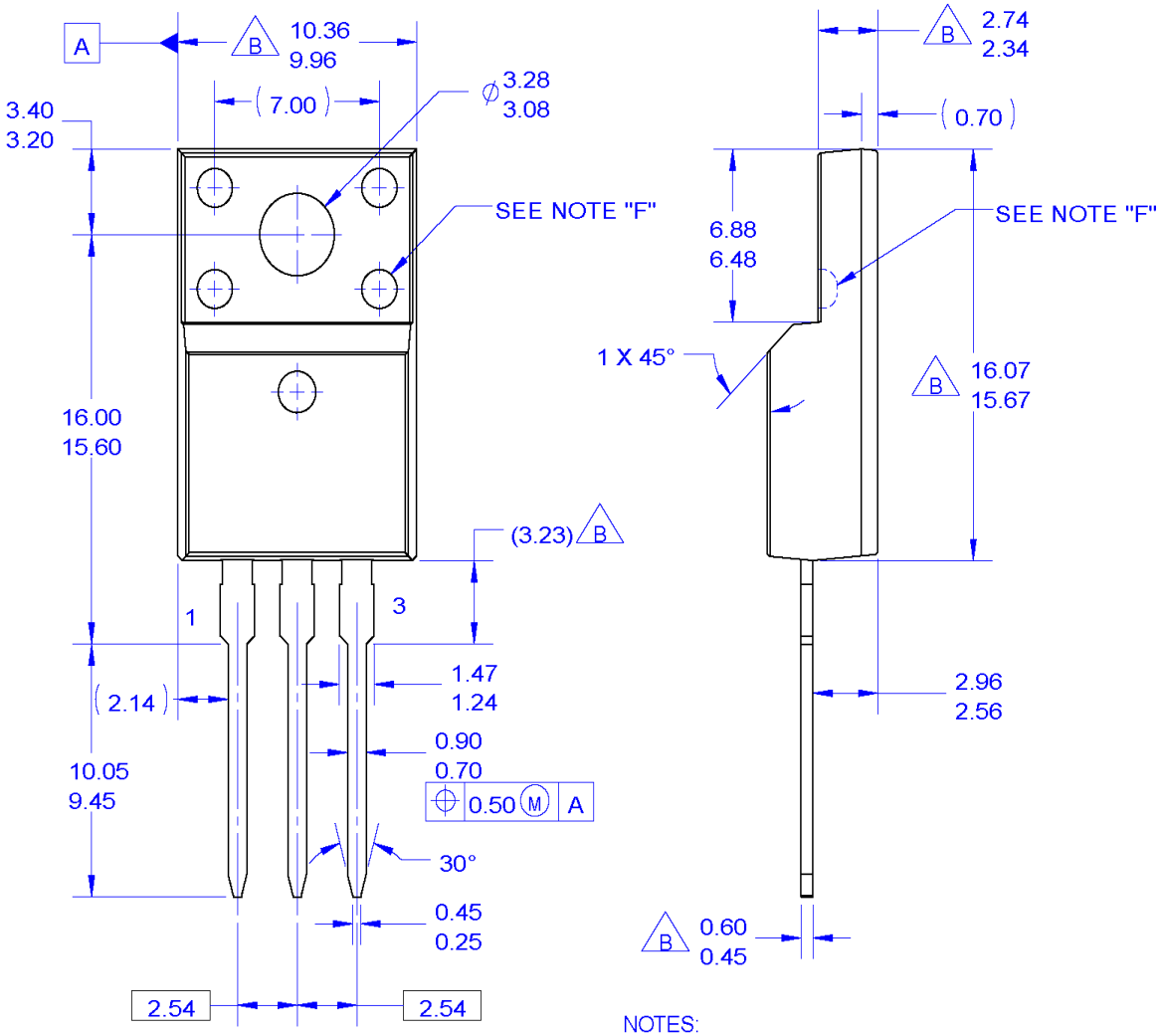
Peak Diode Recovery dv/dt Test Circuit & Waveforms





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

FAIRCHILD SEMICONDUCTOR®

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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.
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Rev. I64