ON Semiconductor®

FDPF18N20FT-G

N-Channel UniFET^{TM} FRFET® MOSFET

200 V, 18 A, 140 m

Features

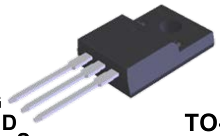
- $R_{DS(on)}$ = 129 mΩ (Typ.) @ V_{GS} = 10 V, I_D = 9 A
- Low Gate Charge (Typ. 20 nC)
- Low C_{rss} (Typ. 24 pF)
- 100% Avalanche Tested
- Improve dv/dt Capability
- RoHS Compliant

Applications

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

Description

UniFET^{TM} MOSFET is ON 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^{rr} 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.



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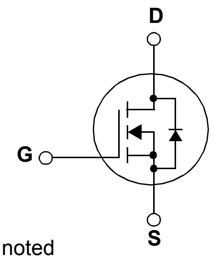

MOSFET Maximum Ratings T_C = 25^{o}C unless otherwise noted

Symbol	Parameter		FDPF18N20FT-G	Unit
V_{DSS}	Drain to Source Voltage		200	V
V_{GSS}	Gate to Source Voltage		±30	V
I_D	Drain Current	-Continuous (T_C = 25^{o}C)	18*	A
		-Continuous (T_C = 100^{o}C)	10.8*	
I_{DM}	Drain Current	- Pulsed (Note 1)	72*	A
E_{AS}	Single Pulsed Avalanche Energy (Note 2)		324	mJ
I_{AR}	Avalanche Current (Note 1)		18	A
E_{AR}	Repetitive Avalanche Energy (Note 1)		10	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)		4.5	V/ns
P_D	Power Dissipation	(T_C = 25^{o}C)	35	W
		- Derate above 25^{o}C	0.27	W/^{o}C
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to +150	^{o}C
T_L	Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds		300	^{o}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	^{o}C/W
$R_{\theta CS}$	Thermal Resistance, Case to Sink, Typ.	0.5	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	62.5	

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Package Marking and Ordering Information T_C = 25°C unless otherwise noted

Device Marking	Device	Package	Eco Status	Reel Size	Tape Width	Quantity
FDPF18N20FT	FDPF18N20F-G	TO-220F	Green/RoHS	-	-	50

Electrical Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Off Characteristics						
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 250μA, V_{GS} = 0V, T_J = 25°C	200	-	-	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250μA, Referenced to 25°C	-	0.2	-	V/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 200V, V_{GS} = 0V	-	-	10	μA
		V_{DS} = 160V, T_C = 125°C	-	-	100	
I_{GSS}	Gate to Body Leakage Current	V_{GS} = ±30V, V_{DS} = 0V	-	-	±100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS} = V_{DS}, I_D = 250μA	3.0	-	5.0	V
$R_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10V, I_D = 9A	-	0.12	0.14	Ω
g_{FS}	Forward Transconductance	V_{DS} = 20V, I_D = 9A (Note 4)	-	13.6	-	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 25V, V_{GS} = 0V f = 1MHz	-	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} = 160V, I_D = 18A V_{GS} = 10V (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} = 100V, I_D = 18A R_G = 25Ω (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} = 0V, I_{SD} = 18A	-	-	1.5	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0V, I_{SD} = 18A dI_F/dt = 100A/μs (Note 4)	-	80	-	ns
Q_{rr}	Reverse Recovery Charge		-	240	-	nC

Notes:
1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. L = 2mH, I_{AS} = 18A, V_{DD} = 50V, R_G = 25Ω, Starting T_J = 25°C
3. I_{SD} ≤ 18A, di/dt ≤ 200A/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

Typical Performance Characteristics

Figure 1. On-Region Characteristics

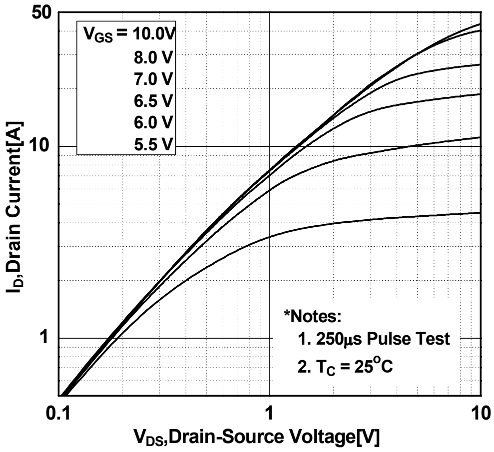


Figure 2. Transfer Characteristics

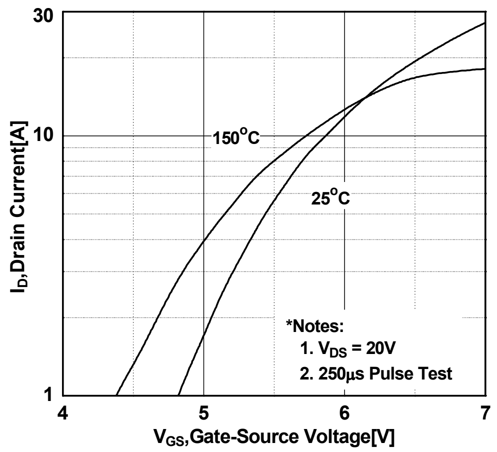


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

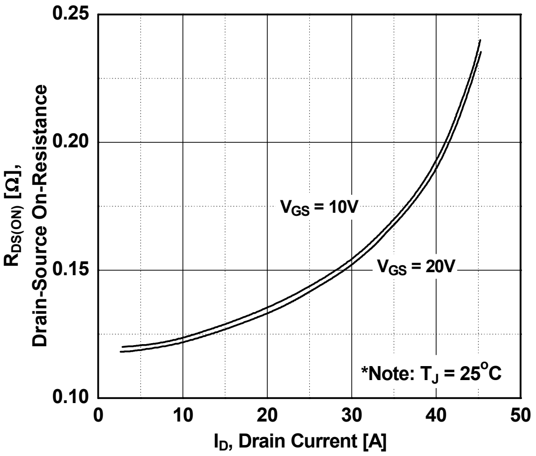


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

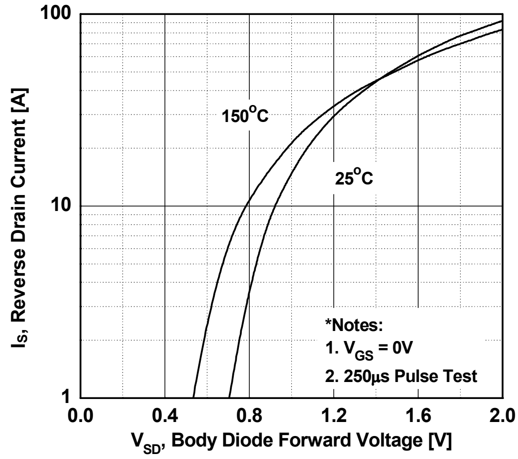


Figure 5. Capacitance Characteristics

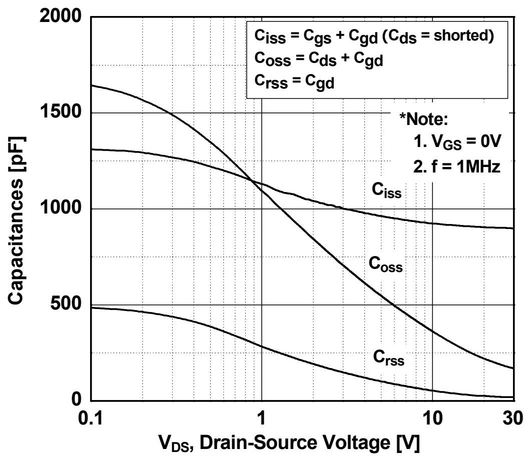
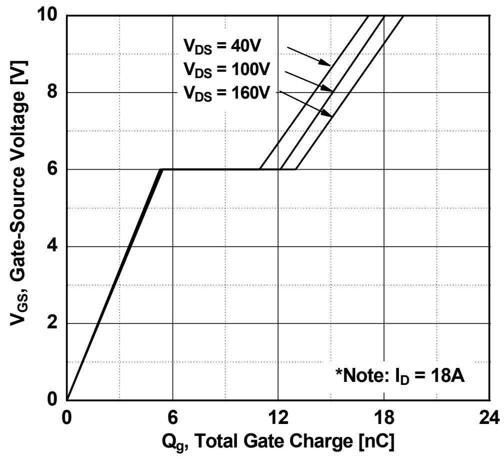


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

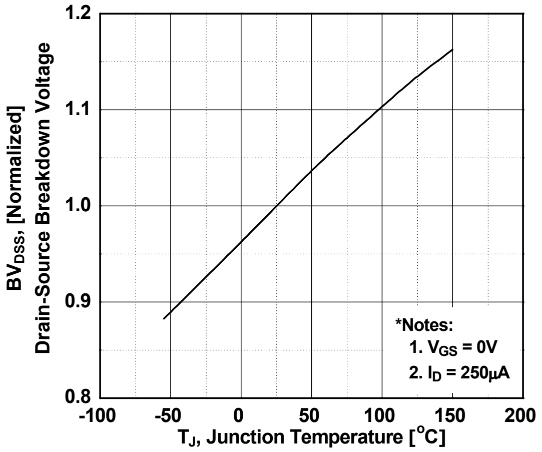


Figure 8. Maximum Safe Operating Area - FDP18N20F

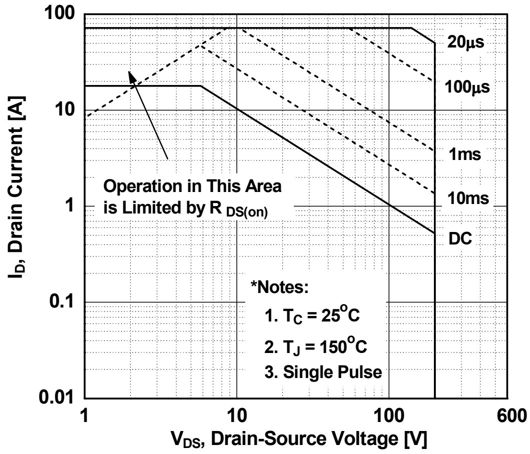


Figure 9. Maximum Drain Current vs. Case Temperature

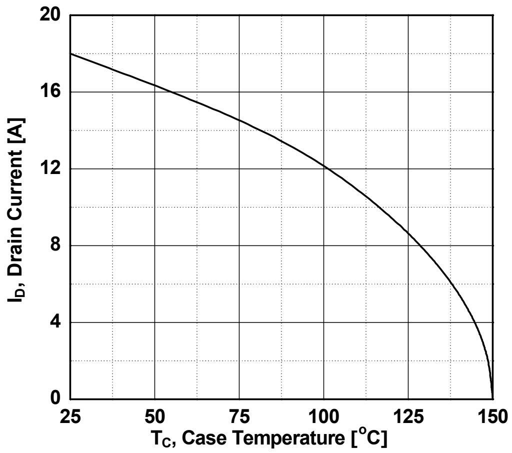
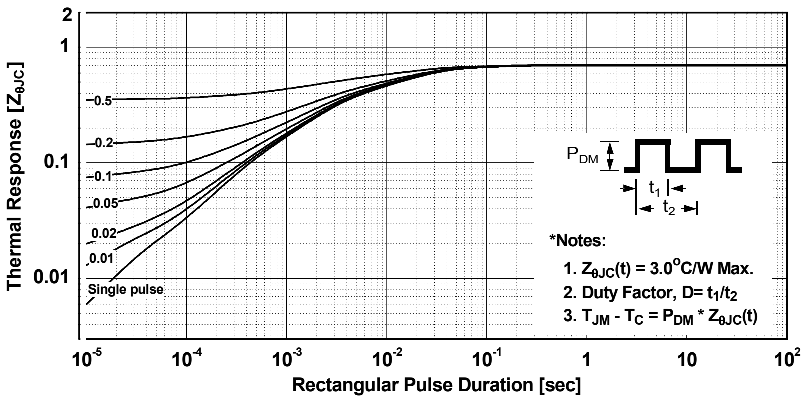
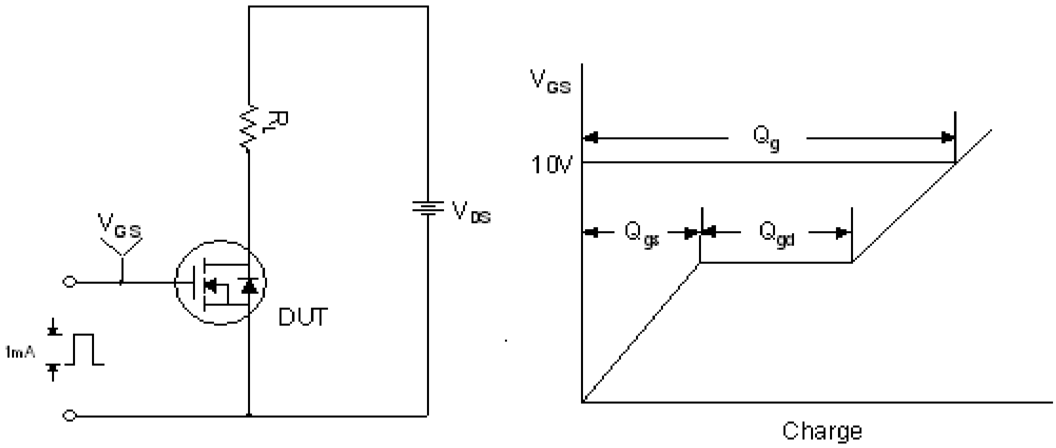


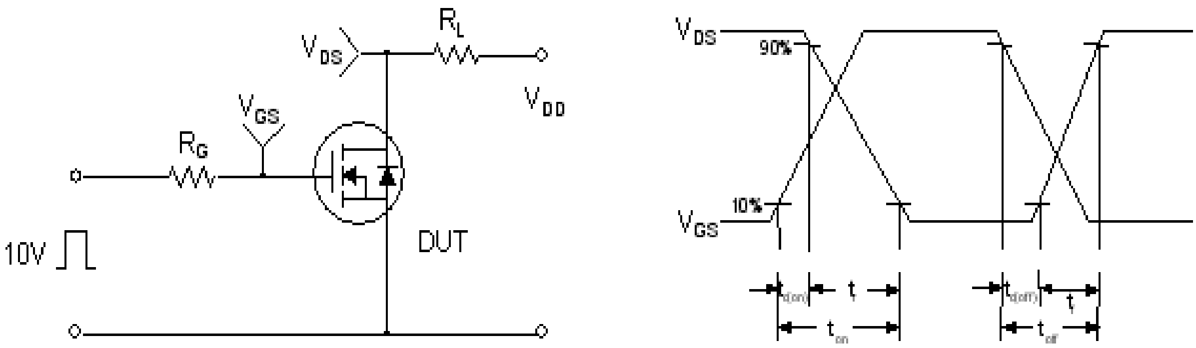
Figure 10. Transient Thermal Response Curve - FDP18N20F



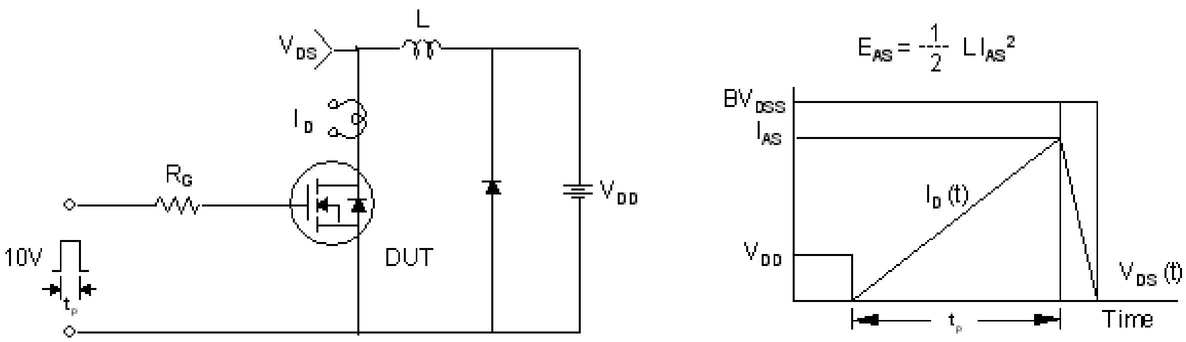
Gate Charge Test Circuit & Waveform



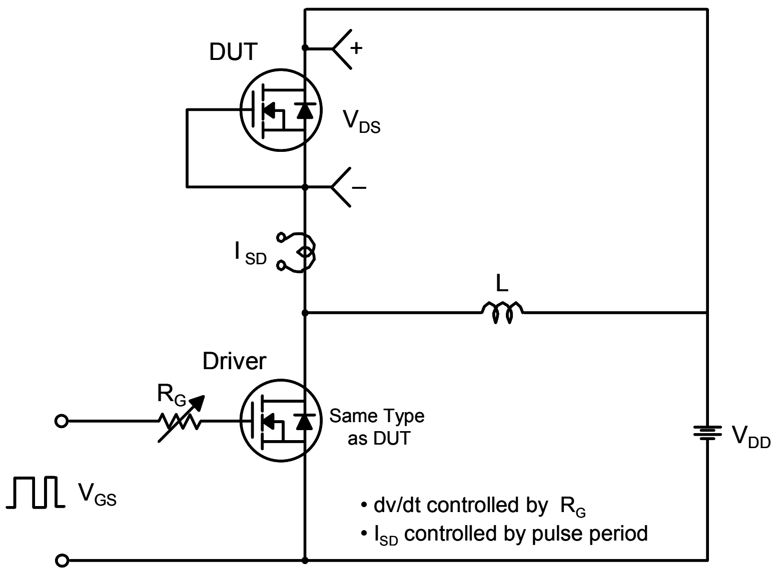
Resistive Switching Test Circuit & Waveforms

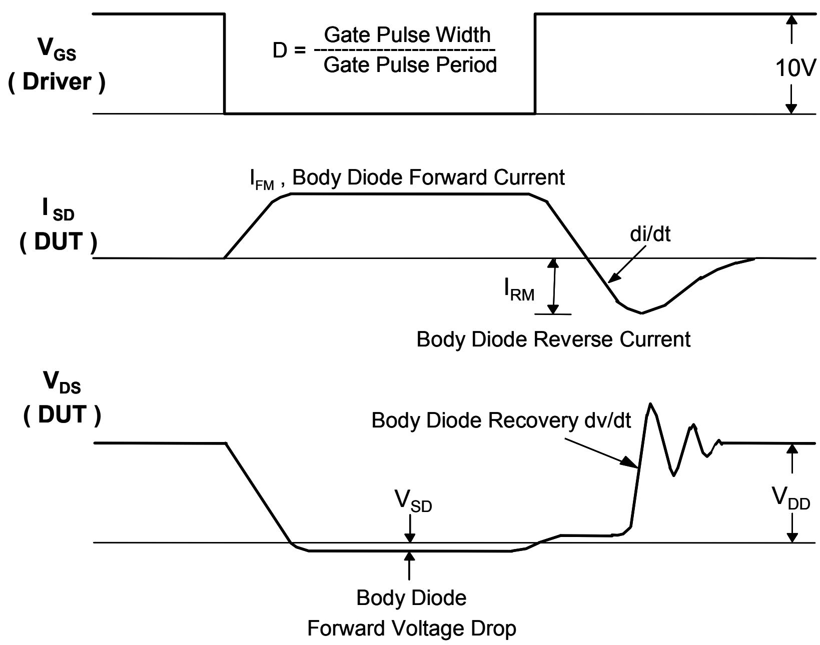


Unclamped Inductive Switching Test Circuit & Waveforms



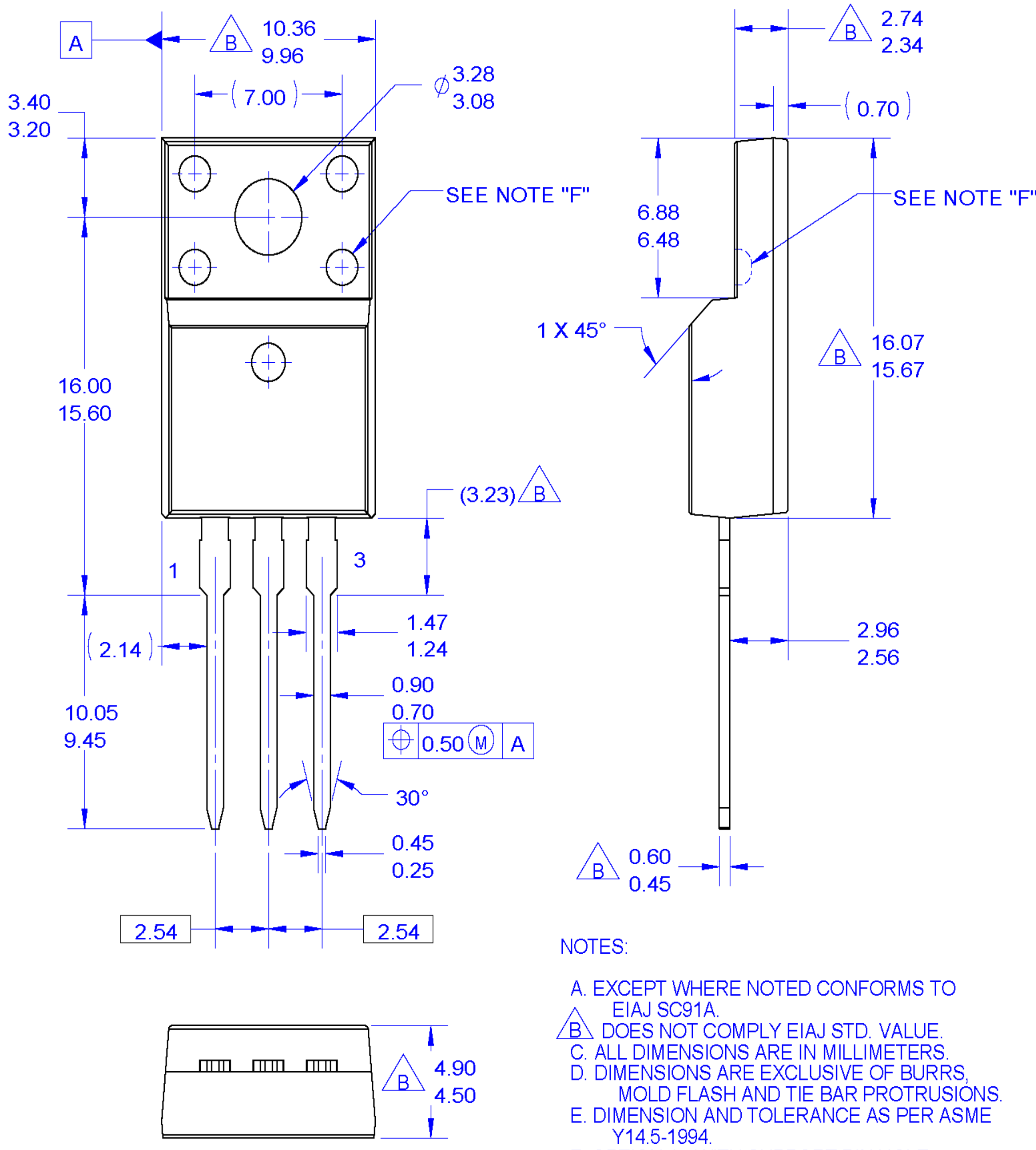
Peak Diode Recovery dv/dt Test Circuit & Waveforms





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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