

# ON Semiconductor

## Is Now



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ON Semiconductor®

## FDPF18N20FT-G

### N-Channel UniFET™ FRFET® MOSFET

#### 200 V, 18 A, 140 m

#### Features

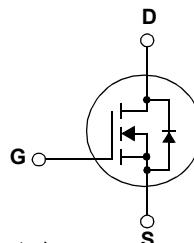
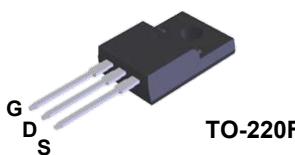
- $R_{DS(on)} = 129 \text{ m}\Omega$  (Typ.) @  $V_{GS} = 10 \text{ V}$ ,  $I_D = 9 \text{ A}$
- Low Gate Charge (Typ. 20 nC)
- Low  $C_{rss}$  (Typ. 24 pF)
- 100% Avalanche Tested
- Improve dv/dt Capability
- RoHS Compliant

#### Applications

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

#### Description

UniFET™ MOSFET is 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.



#### 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*	A
		-Continuous ( $T_C = 100^\circ\text{C}$ )	10.8*	
$I_{DM}$	Drain Current	- Pulsed	(Note 1)	A
$E_{AS}$	Single Pulsed Avalanche Energy		(Note 2)	mJ
$I_{AR}$	Avalanche Current		(Note 1)	A
$E_{AR}$	Repetitive Avalanche Energy		(Note 1)	mJ
dv/dt	Peak Diode Recovery dv/dt		(Note 3)	V/ns
$P_D$	Power Dissipation	( $T_C = 25^\circ\text{C}$ )	35	W
		- 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	$^\circ\text{C}/\text{W}$
$R_{\theta CS}$	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

## Electrical Characteristics

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

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

### On Characteristics

$V_{GS(\text{th})}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250\mu\text{A}$	3.0	-	5.0	V
$R_{DS(\text{on})}$	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
$Q_{g(\text{tot})}$	Total Gate Charge at $10\text{V}$	$V_{DS} = 160\text{V}, I_D = 18\text{A}$ $V_{GS} = 10\text{V}$	-	20	26	nC
$Q_{gs}$	Gate to Source Gate Charge		-	5	-	nC
$Q_{gd}$	Gate to Drain "Miller" Charge		(Note 4, 5)	-	9	nC

### Switching Characteristics

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

### Drain-Source Diode Characteristics

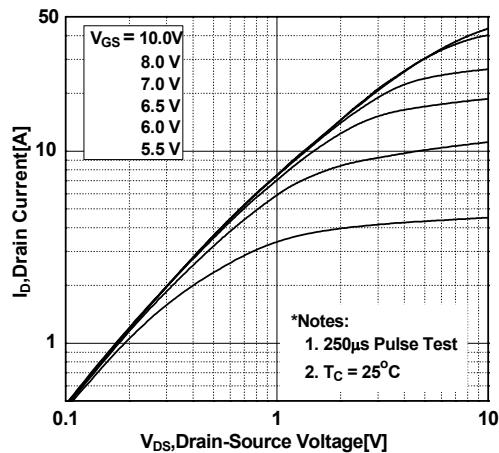
$I_S$	Maximum Continuous Drain to Source Diode Forward Current	-	-	18	A	
$I_{SM}$	Maximum Pulsed Drain to Source Diode Forward Current	-	-	72	A	
$V_{SD}$	Drain to Source Diode Forward Voltage	$V_{GS} = 0\text{V}, I_{SD} = 18\text{A}$	-	-	1.5	V
$t_{rr}$	Reverse Recovery Time	$V_{GS} = 0\text{V}, I_{SD}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

#### Notes:

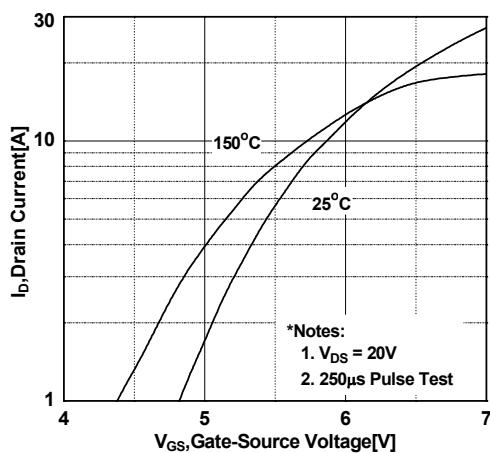
1. Repetitive Rating: Pulse width limited by maximum junction temperature
2.  $L = 2\text{mH}, I_{AS} = 18\text{A}, V_{DD} = 50\text{V}, R_G = 25\Omega$ , Starting  $T_J = 25^\circ\text{C}$
3.  $I_{SD} \leq 18\text{A}, di/dt \leq 200\text{A}/\mu\text{s}, V_{DD} \leq \text{BV}_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$
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

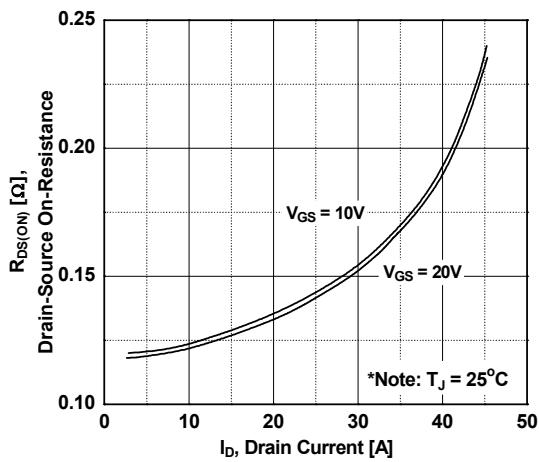
**Figure 1. On-Region Characteristics**



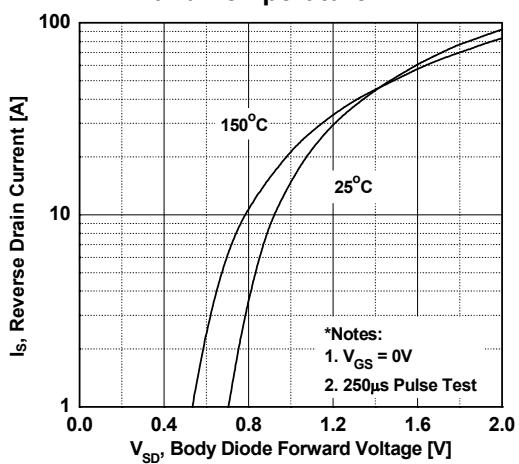
**Figure 2. Transfer Characteristics**



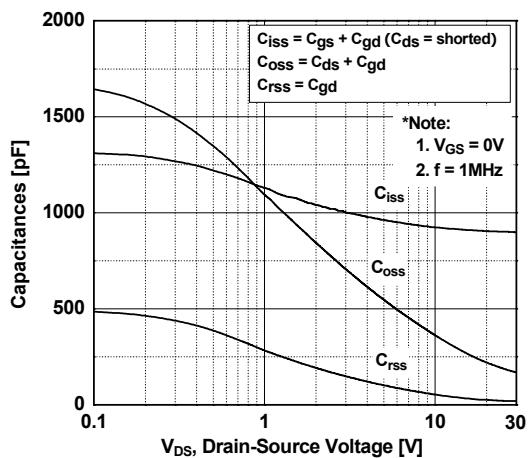
**Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage**



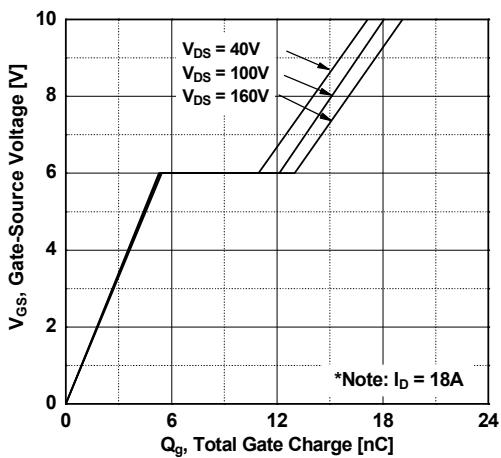
**Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature**



**Figure 5. Capacitance Characteristics**

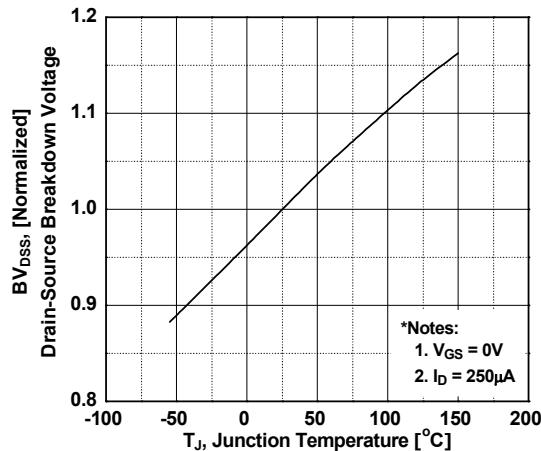


**Figure 6. Gate Charge Characteristics**

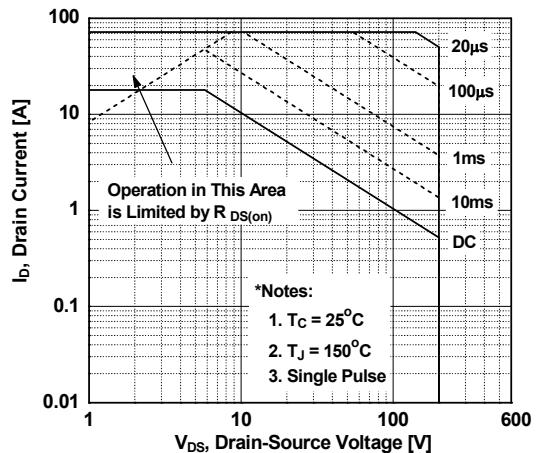


**Typical Performance Characteristics (Continued)**

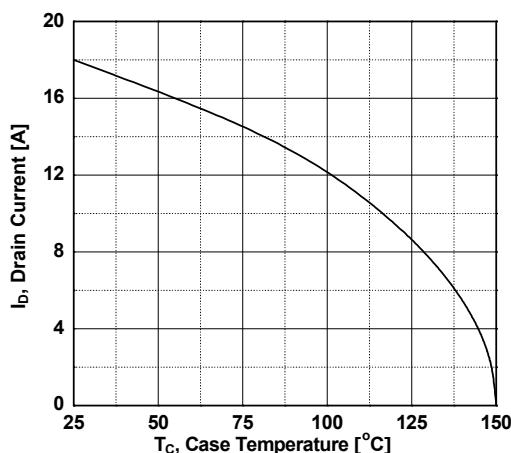
**Figure 7. Breakdown Voltage Variation vs. Temperature**



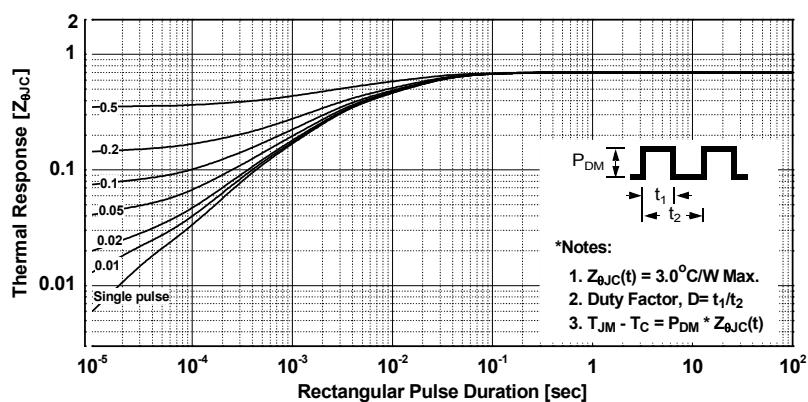
**Figure 8. Maximum Safe Operating Area - FDP18N20F**



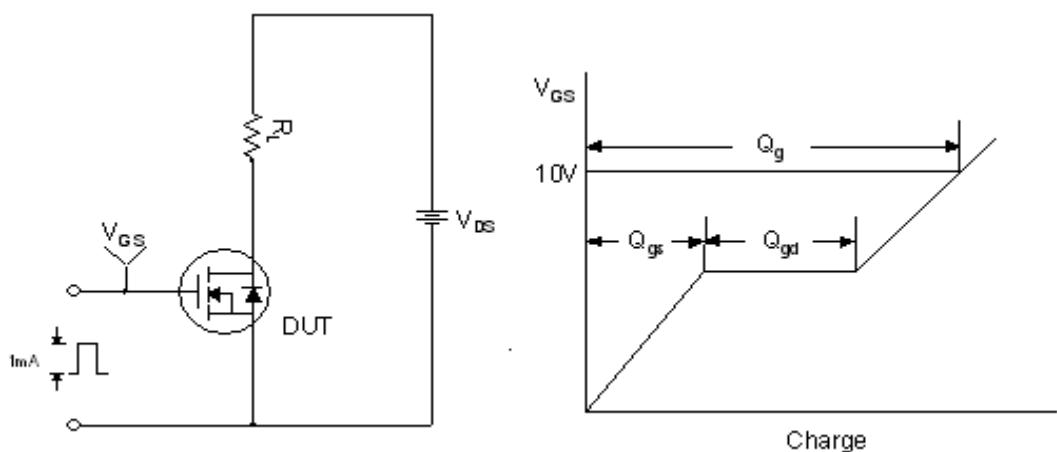
**Figure 9. Maximum Drain Current vs. Case Temperature**



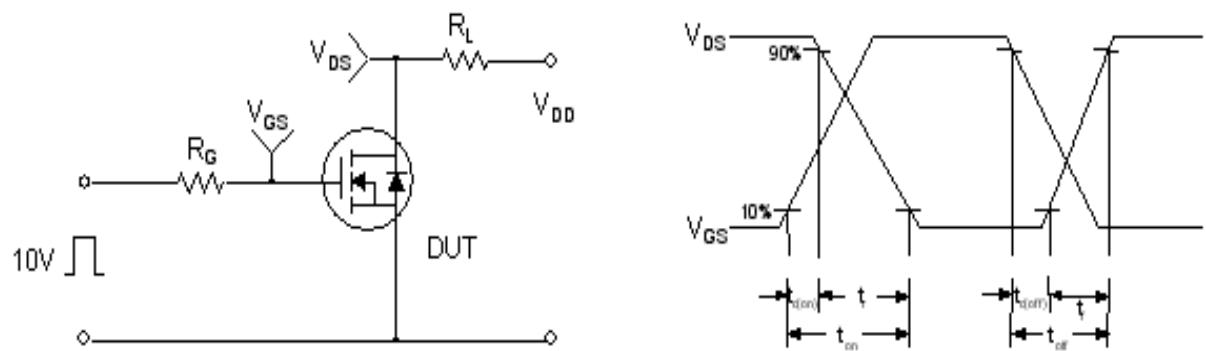
**Figure 10. Transient Thermal Response Curve - FDP18N20F**



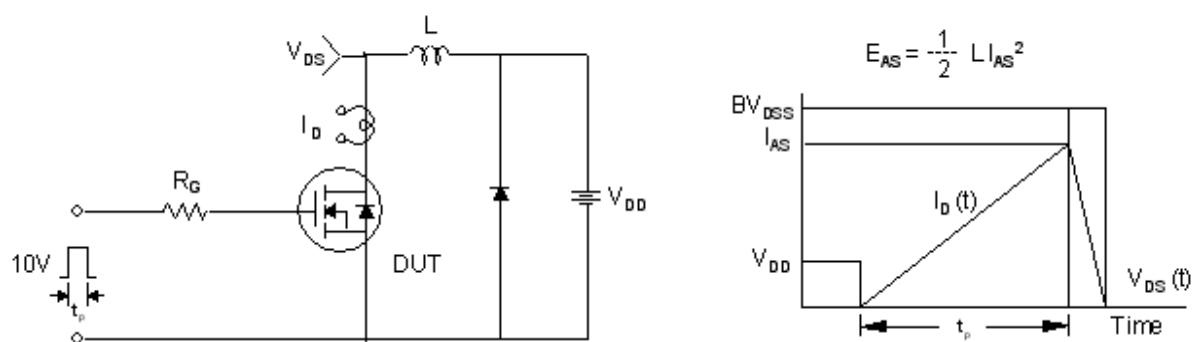
Gate Charge Test Circuit & Waveform



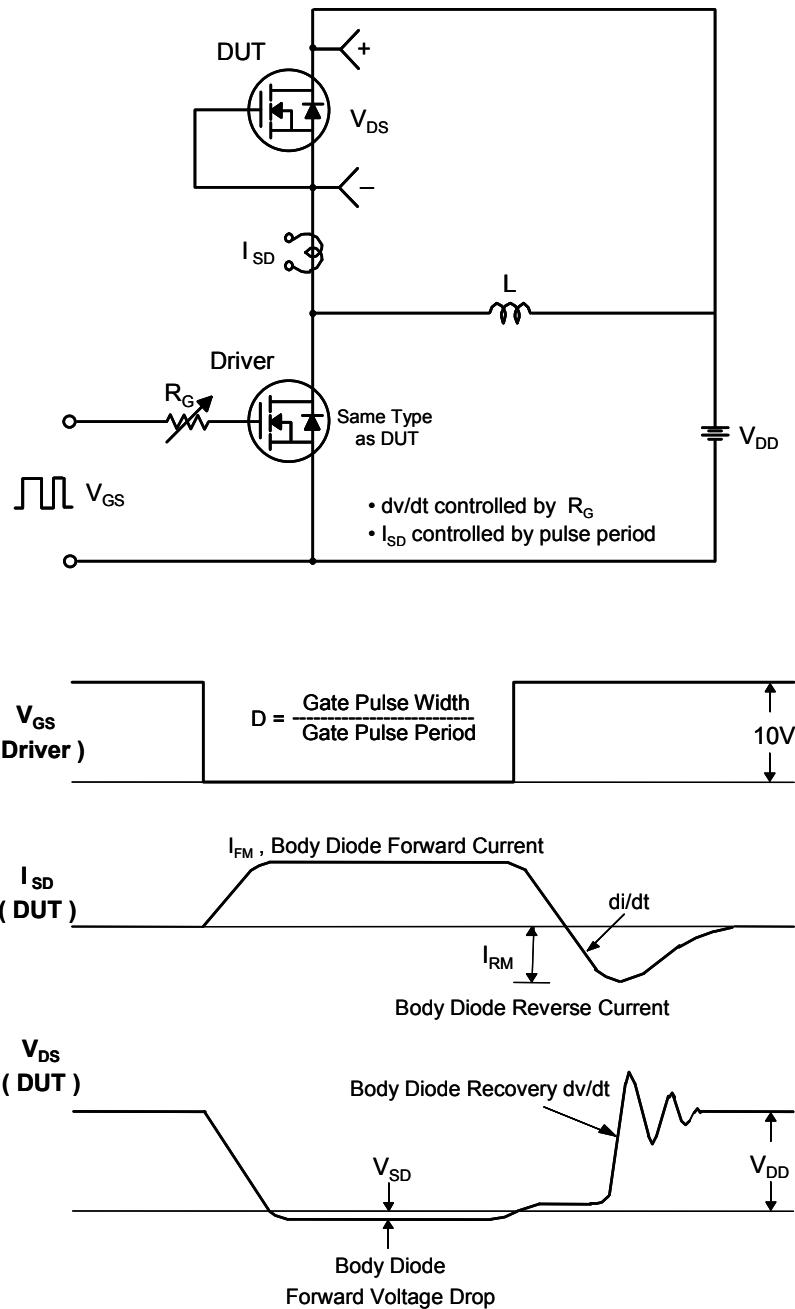
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms

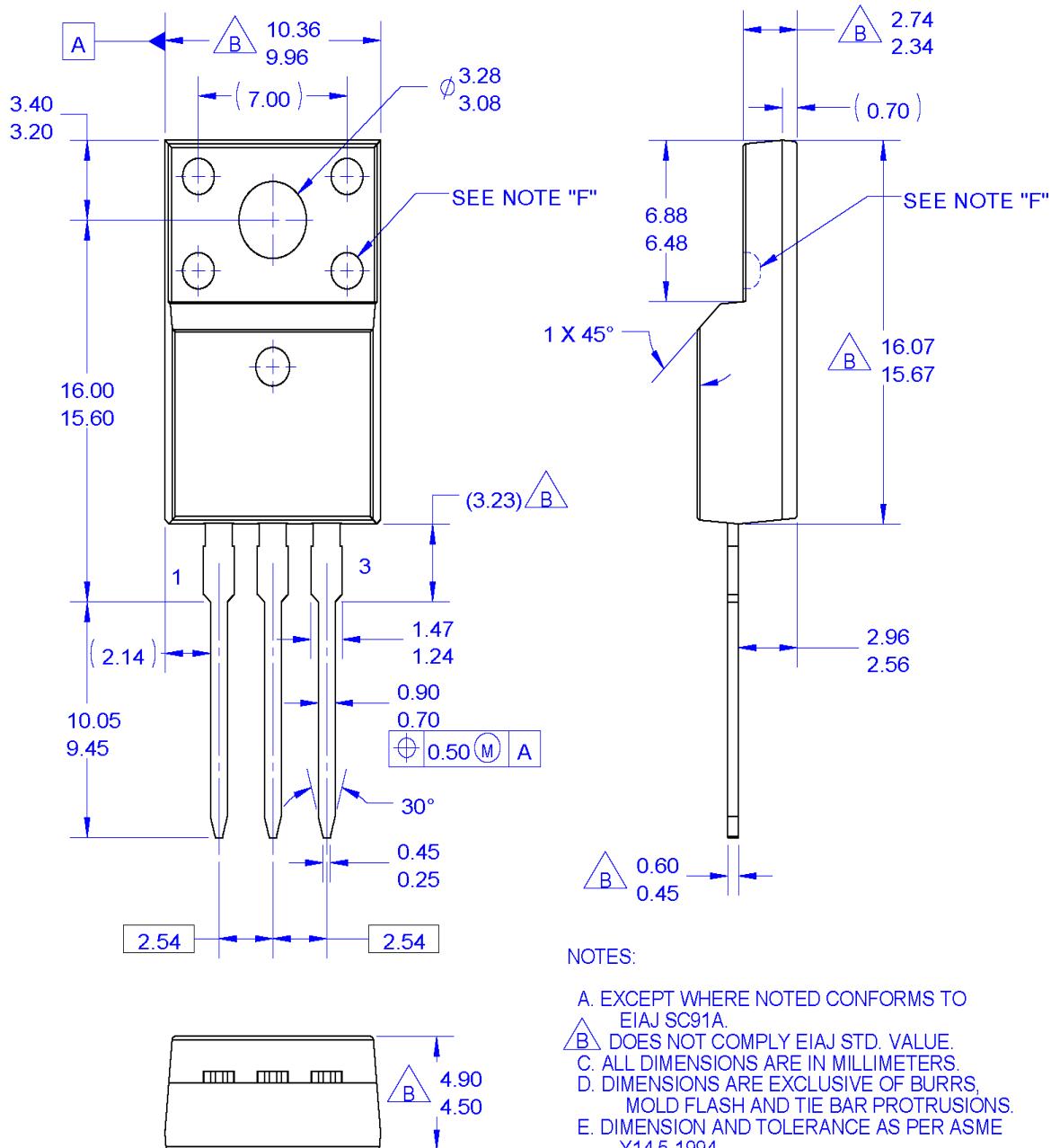


Peak Diode Recovery dv/dt Test Circuit & Waveforms



Mechanical Dimensions

TO-220M03



Dimensions in Millimeters

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