

# FDP18N50 / FDPF18N50 / FDPF18N50T

## N-Channel UniFET™ MOSFET

500 V, 18 A, 265 mΩ

### Features

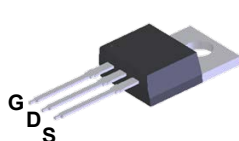
- $R_{DS(on)} = 265 \text{ m}\Omega$  (Max.) @  $V_{GS} = 10 \text{ V}$ ,  $I_D = 9 \text{ A}$
- Low Gate Charge (Typ. 45 nC)
- Low  $C_{rss}$  (Typ. 25 pF)
- 100% Avalanche Tested

### Applications

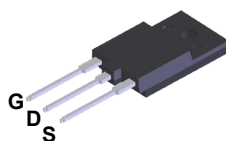
- LCD/LED/PDP TV
- Lighting
- Uninterruptible Power Supply

### Description

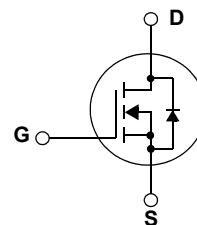
UniFET™ MOSFET is Fairchild Semiconductor®'s high voltage MOSFET family based on planar stripe and DMOS technology. This MOSFET is tailored to reduce on-state resistance, and to provide better switching performance and higher avalanche energy strength. This device family is suitable for switching power converter applications such as power factor correction (PFC), flat panel display (FPD) TV power, ATX and electronic lamp ballasts.



TO-220



TO-220F



### Absolute Maximum Ratings

Symbol	Parameter	FDP18N50	FDPF18N50 / FDPF18N50T	Unit
$V_{DSS}$	Drain-Source Voltage	500		V
$I_D$	Drain Current - Continuous ( $T_C = 25^\circ\text{C}$ ) - Continuous ( $T_C = 100^\circ\text{C}$ )	18	18 *	A
		10.8	10.8 *	A
$I_{DM}$	Drain Current - Pulsed (Note 1)	72	72 *	A
$V_{GSS}$	Gate-Source voltage	$\pm 30$		V
$E_{AS}$	Single Pulsed Avalanche Energy (Note 2)	945		mJ
$I_{AR}$	Avalanche Current (Note 1)	18		A
$E_{AR}$	Repetitive Avalanche Energy (Note 1)	23.5		mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	4.5		V/ns
$P_D$	Power Dissipation ( $T_C = 25^\circ\text{C}$ ) - Derate above $25^\circ\text{C}$	235	38.5	W
		1.88	0.3	W/ $^\circ\text{C}$
$T_J, T_{STG}$	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	FDP18N50	FDPF18N50 / FDPF18N50T	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Max.	0.53	3.3	$^\circ\text{C}/\text{W}$
$R_{\theta CS}$	Thermal Resistance, Case-to-Sink, Typ.	0.5	--	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Max.	62.5	62.5	$^\circ\text{C}/\text{W}$

## Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDP18N50	FDP18N50	TO-220	-	-	50
FDPF18N50	FDPF18N50	TO-220F	-	-	50
FDPF18N50T	FDPF18N50T	TO-220F	-	-	50

## Electrical Characteristics T<sub>C</sub> = 25°C unless otherwise noted

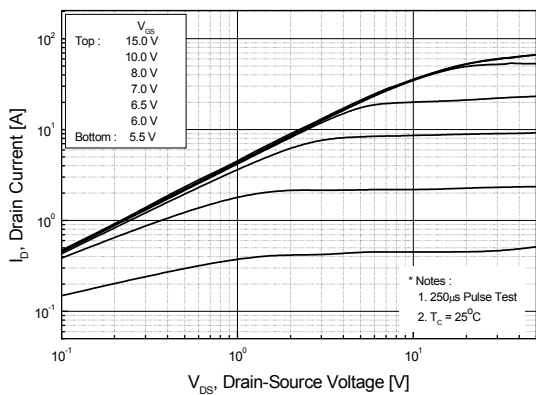
Symbol	Parameter	Conditions	Min.	Typ.	Max	Unit
<b>Off Characteristics</b>						
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA	500	--	--	V
ΔBV <sub>DSS</sub> / ΔT <sub>J</sub>	Breakdown Voltage Temperature Coefficient	I <sub>D</sub> = 250μA, Referenced to 25°C	--	0.5	--	V/°C
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> = 500V, V <sub>GS</sub> = 0V V <sub>DS</sub> = 400V, T <sub>C</sub> = 125°C	--	--	1 10	μA μA
I <sub>GSSF</sub>	Gate-Body Leakage Current, Forward	V <sub>GS</sub> = 30V, V <sub>DS</sub> = 0V	--	--	100	nA
I <sub>GSSR</sub>	Gate-Body Leakage Current, Reverse	V <sub>GS</sub> = -30V, V <sub>DS</sub> = 0V	--	--	-100	nA
<b>On Characteristics</b>						
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA	3.0	--	5.0	V
R <sub>DS(on)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> = 10V, I <sub>D</sub> = 9A	--	0.220	0.265	Ω
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> = 40V, I <sub>D</sub> = 9A (Note 4)	--	25	--	S
<b>Dynamic Characteristics</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = 25V, V <sub>GS</sub> = 0V, f = 1.0MHz	--	2200	2860	pF
C <sub>oss</sub>	Output Capacitance		--	330	430	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		--	25	40	pF
<b>Switching Characteristics</b>						
t <sub>d(on)</sub>	Turn-On Delay Time	V <sub>DD</sub> = 250V, I <sub>D</sub> = 18A R <sub>G</sub> = 25Ω	--	55	120	ns
t <sub>r</sub>	Turn-On Rise Time		--	165	340	ns
t <sub>d(off)</sub>	Turn-Off Delay Time		--	95	200	ns
t <sub>f</sub>	Turn-Off Fall Time		(Note 4, 5)	--	90	190
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> = 400V, I <sub>D</sub> = 18A V <sub>GS</sub> = 10V	--	45	60	nC
Q <sub>gs</sub>	Gate-Source Charge		--	12.5	--	nC
Q <sub>gd</sub>	Gate-Drain Charge		(Note 4, 5)	--	19	--
<b>Drain-Source Diode Characteristics and Maximum Ratings</b>						
I <sub>S</sub>	Maximum Continuous Drain-Source Diode Forward Current		--	--	18	A
I <sub>SM</sub>	Maximum Pulsed Drain-Source Diode Forward Current		--	--	72	A
V <sub>SD</sub>	Drain-Source Diode Forward Voltage	V <sub>GS</sub> = 0V, I <sub>S</sub> = 18A	--	--	1.4	V
t <sub>rr</sub>	Reverse Recovery Time	V <sub>GS</sub> = 0V, I <sub>S</sub> = 18A di/dt = 100A/μs (Note 4)	--	500	--	ns
Q <sub>rr</sub>	Reverse Recovery Charge		--	5.4	--	μC

### NOTES:

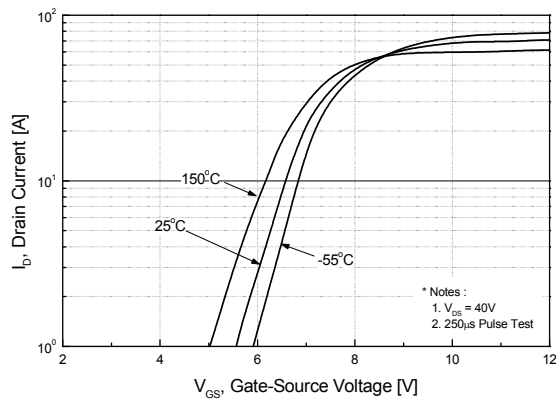
1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. L = 5.2mH, I<sub>AS</sub> = 18A, V<sub>DD</sub> = 50V, R<sub>G</sub> = 25Ω, Starting T<sub>J</sub> = 25°C
3. I<sub>SD</sub> ≤ 18A, di/dt ≤ 200A/μs, V<sub>DD</sub> ≤ BV<sub>DSS</sub>, Starting T<sub>J</sub> = 25°C
4. Pulse Test: Pulse width ≤ 300μs, Duty Cycle ≤ 2%
5. Essentially Independent of Operating Temperature Typical Characteristics

## Typical Performance Characteristics

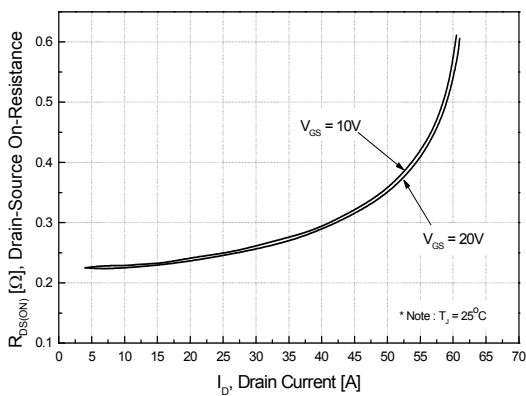
**Figure 1. On-Region Characteristics**



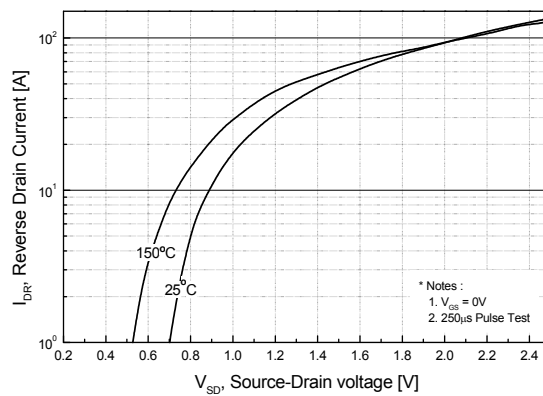
**Figure 2. Transfer Characteristics**



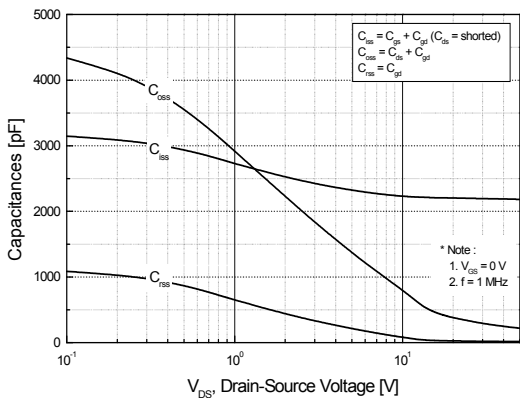
**Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage**



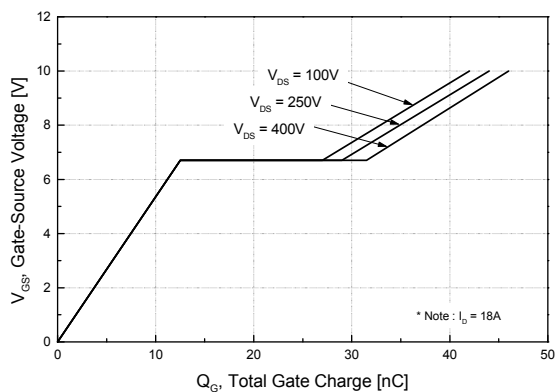
**Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature**



**Figure 5. Capacitance Characteristics**

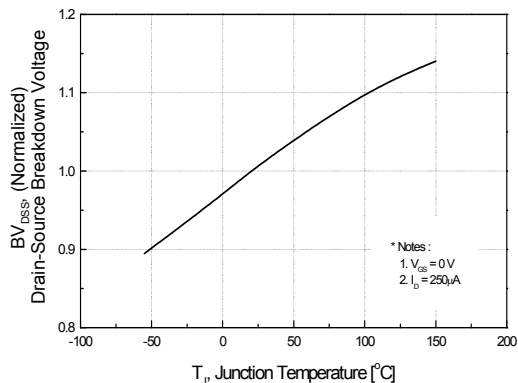


**Figure 6. Gate Charge Characteristics**

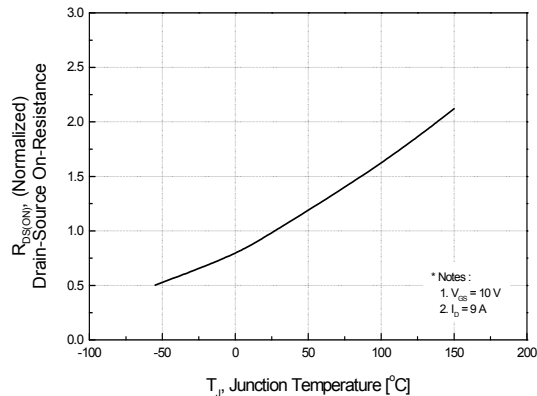


## Typical Performance Characteristics (Continued)

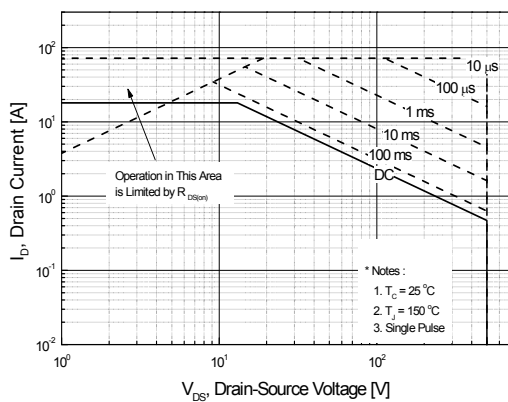
**Figure 7. Breakdown Voltage Variation vs. Temperature**



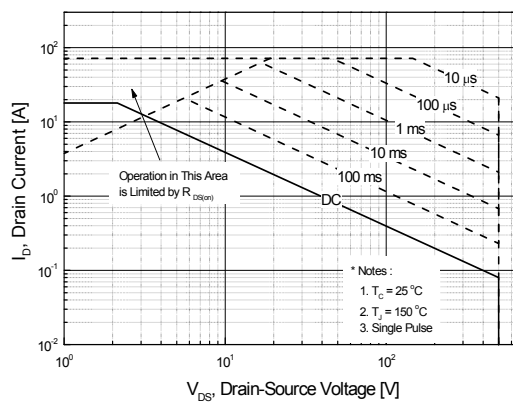
**Figure 8. On-Resistance Variation vs. Temperature**



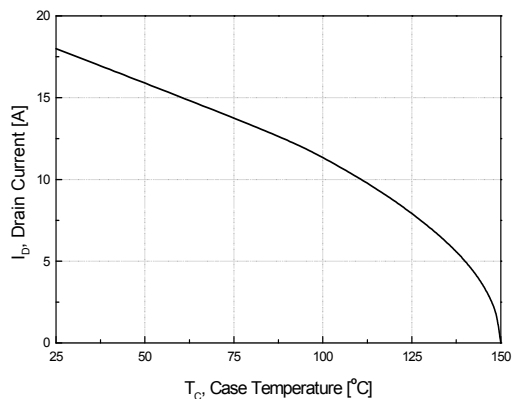
**Figure 9-1. Maximum Safe Operating Area - FDP18N50**



**Figure 9-2. Maximum Safe Operating Area - FDPF18N50 / FDPF18N50T**



**Figure 10. Maximum Drain Current vs. Case Temperature**



Typical Performance Characteristics (Continued)

Figure 11-1. Transient Thermal Response Curve - FDP18N50

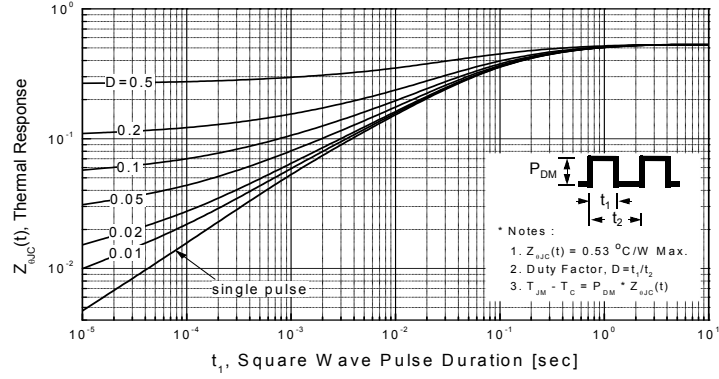
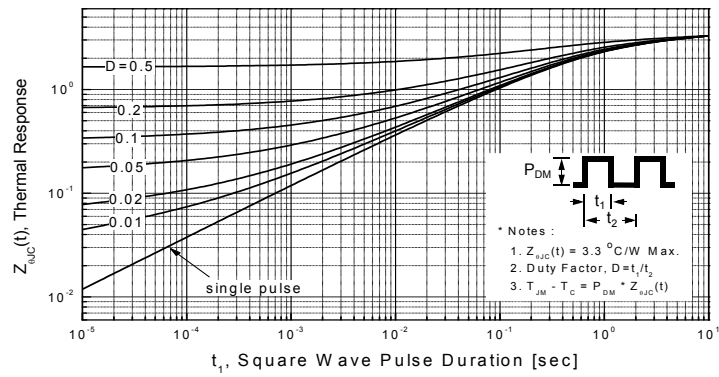
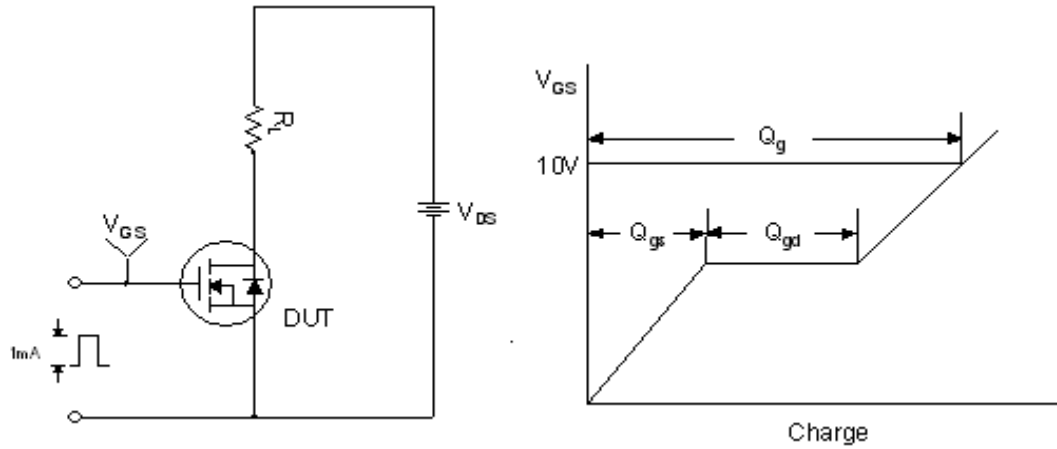


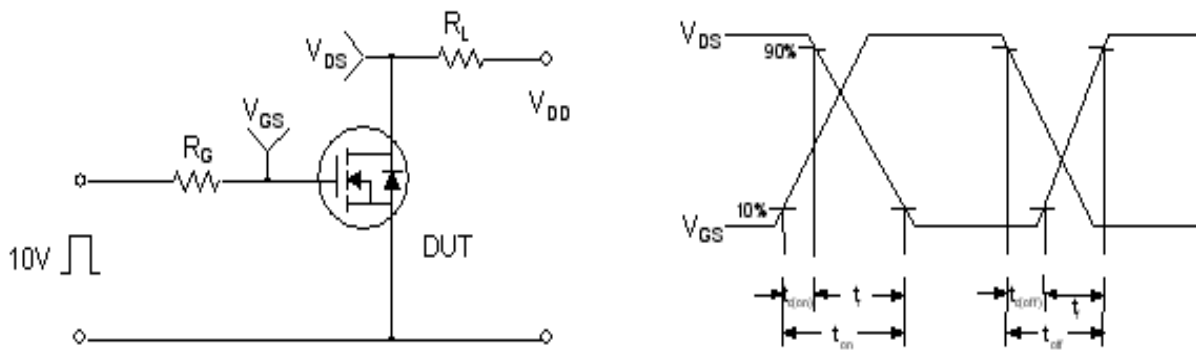
Figure 11-2. Transient Thermal Response Curve - FDPF18N50 / FDPF18N50T



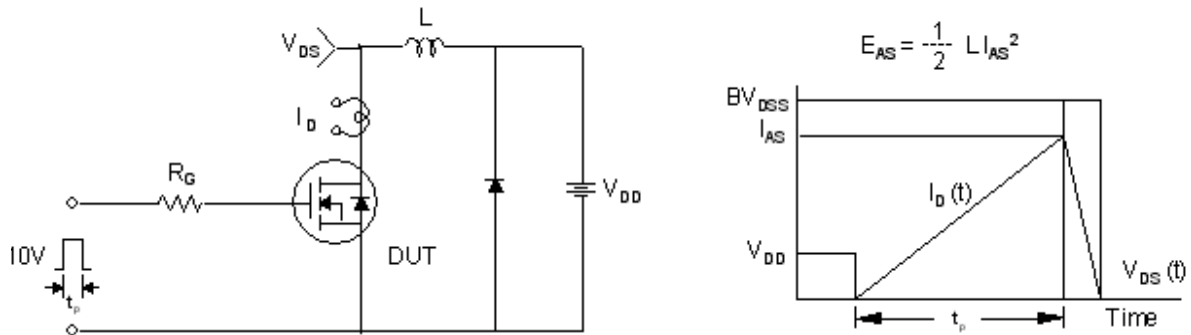
**Gate Charge Test Circuit & Waveform**



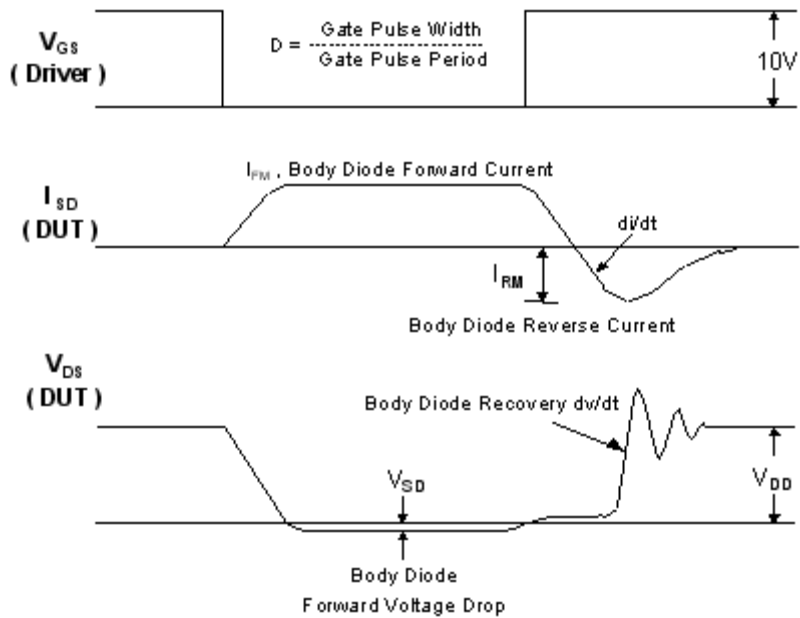
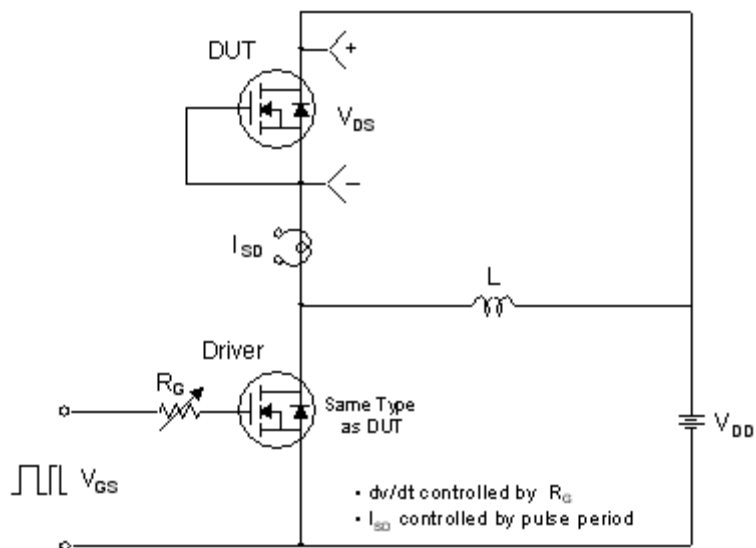
**Resistive Switching Test Circuit & Waveforms**



**Unclamped Inductive Switching Test Circuit & Waveforms**

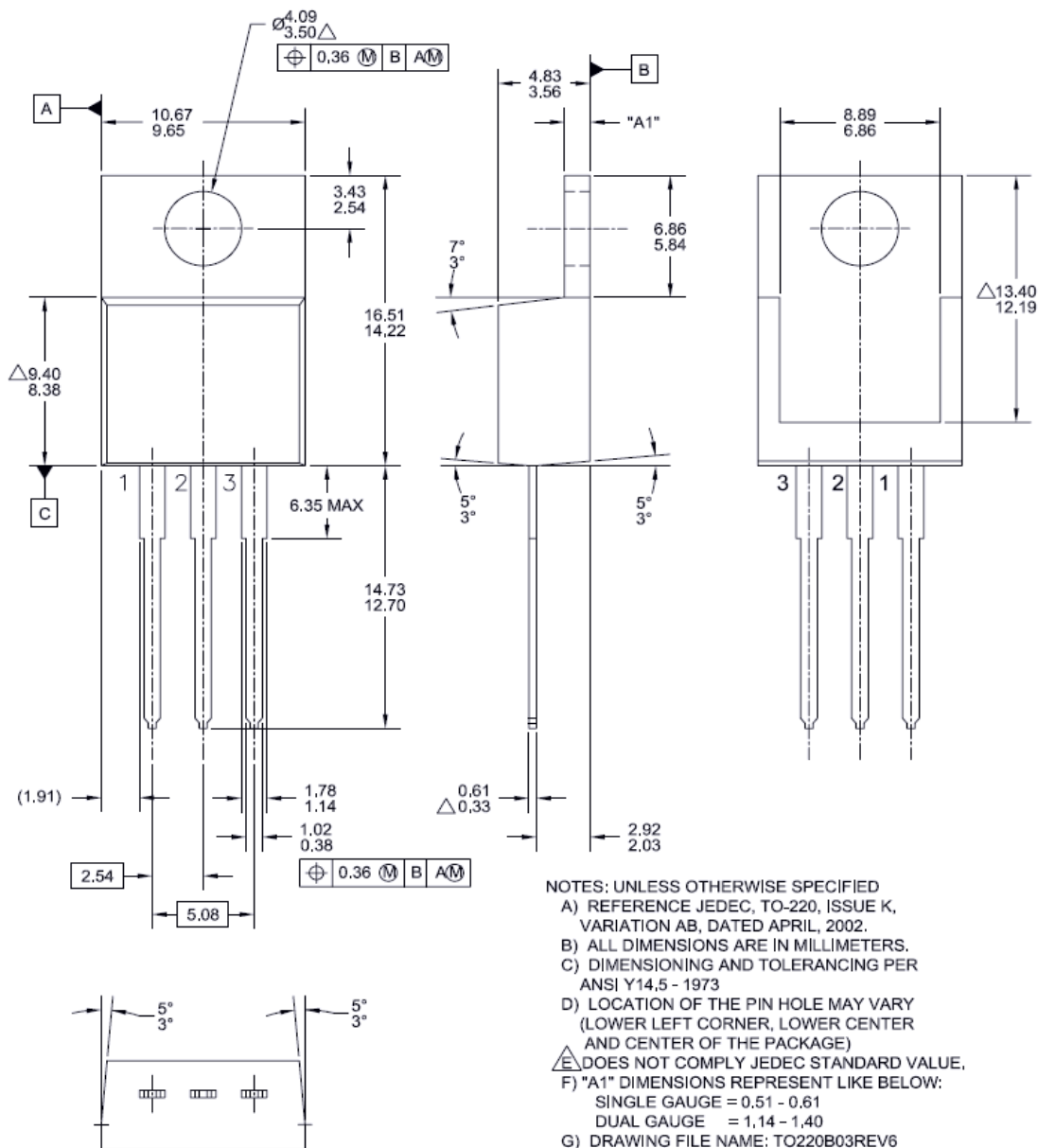


Peak Diode Recovery dv/dt Test Circuit & Waveforms



## Mechanical Dimensions

### TO-220B03

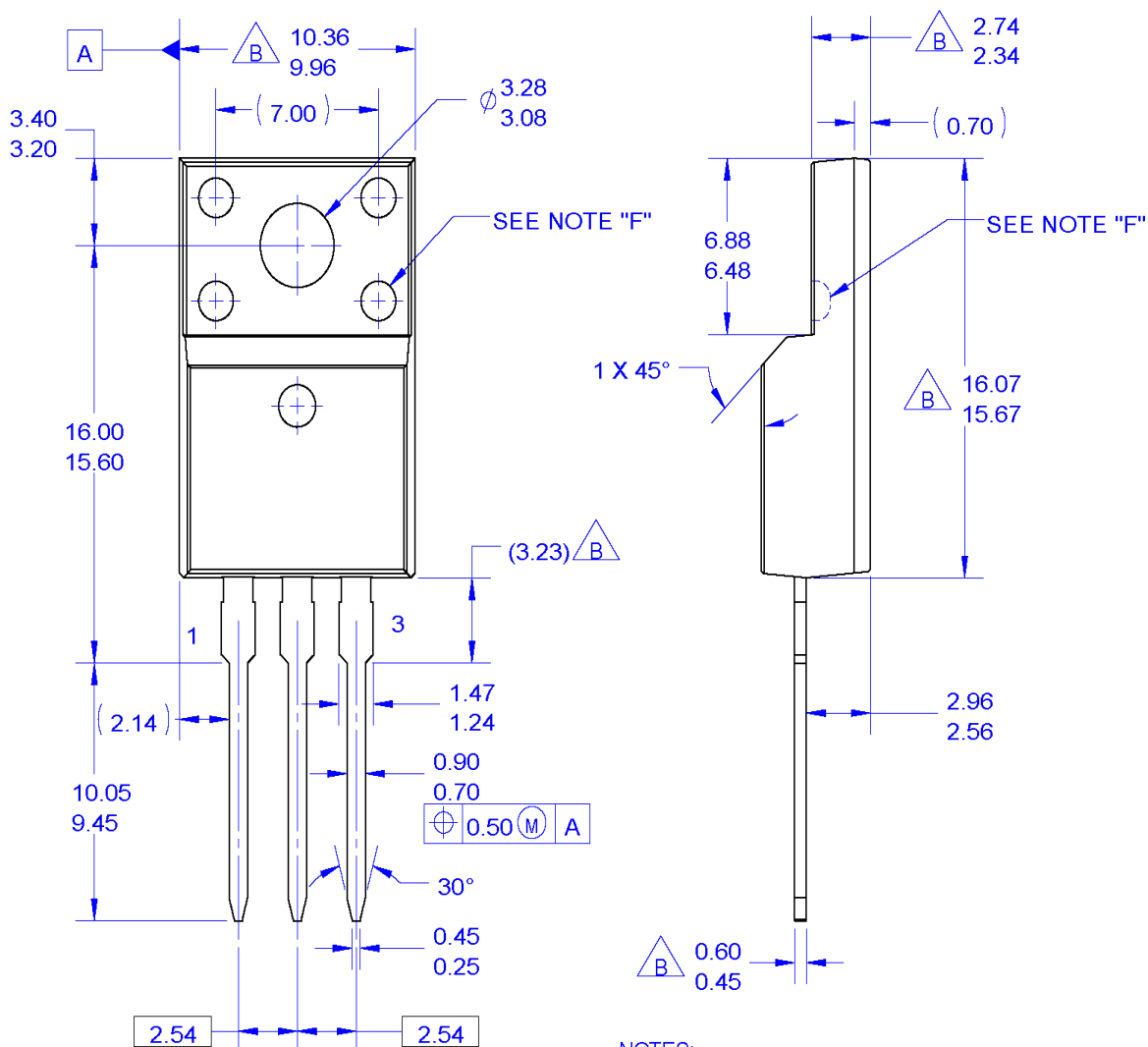


Dimensions in Millimeters



### 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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| BitSiC™   | Global Power Resource <sup>SM</sup>             | QFET®                                 | TinyBuck™        |
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| FAST®   | OptoHit™  | SyncFET™                              | XST™             |
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| FETBench™   | OPTOPLANAR®                                     |                                       |                  |

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