December 2010

FDPF320N06L

N-Channel PowerTrench® MOSFET

60V, 21A, 25mΩ

Features

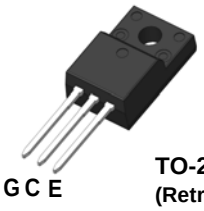
- $R_{DS(on)}$ = 20mΩ (Typ.)@ V_{GS} = 10V, I_D = 21A
- $R_{DS(on)}$ = 23mΩ (Typ.)@ V_{GS} = 5V, I_D = 17A
- Low Gate Charge (Typ. 23.2nC)
- Low C_{rss} (Typ. 64pF)
- Fast Switching
- 100% Avalanche Tested
- Improved dv/dt Capability
- RoHS Compliant

Description

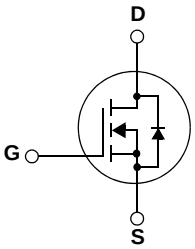
This N-Channel MOSFET is produced using Fairchild Semiconductor's advance PowerTrench process that has been especially tailored to minimize the on-state resistance and yet maintain superior switching performance.

Application

- DC to DC converters / Synchronous Rectification



TO-220F
(Retractable)



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

Symbol	Parameter			FDPF320N06L	Units
V_{DSS}	Drain to Source Voltage			60	V
V_{GSS}	Gate to Source Voltage			±20	V
I_D	Drain Current	- Continuous (T_C = 25°C)		21	A
		- Continuous (T_C = 100°C)		15	
I_{DM}	Drain Current	- Pulsed	(Note 1)	84	A
E_{AS}	Single Pulsed Avalanche Energy		(Note 2)	66	mJ
dv/dt	Peak Diode Recovery dv/dt		(Note 3)	6.0	V/ns
P_D	Power Dissipation	(T_C = 25°C)		26	W
		- Derate above 25°C		0.17	W/°C
T_J, T_{STG}	Operating and Storage Temperature Range			-55 to +175	°C
T_L	Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds			300	°C

*Drain current limited by maximum junction temperature

Thermal Characteristics

Symbol	Parameter	FDPF320N06L	Units
$R_{\theta JC}$	Thermal Resistance, Junction to Case	5.8	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	62.5	

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Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDPF320N06L	FDPF320N06L	TO-220F	-	-	50

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
Off Characteristics						
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 250μA, V_{GS} = 0V	60	-	-	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250μA, Referenced to 25°C	-	0.04	-	V/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 48V, V_{GS} = 0V	-	-	1	μA
		V_{DS} = 48V, T_C = 150°C	-	-	500	
I_{GSS}	Gate to Body Leakage Current	V_{GS} = ±20V, V_{DS} = 0V	-	-	±100	μA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS} = V_{DS}, I_D = 250μA	1.0	-	2.5	V
$R_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10V, I_D = 21A	-	20	25	mΩ
		V_{GS} = 5V, I_D = 17A	-	23	38	mΩ
g_{FS}	Forward Transconductance	V_{DS} = 10V, I_D = 21A (Note 4)	-	34	-	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 25V, V_{GS} = 0V, f = 1MHz	-	1105	1470	pF
C_{oss}	Output Capacitance		-	115	150	pF
C_{rss}	Reverse Transfer Capacitance		-	64	-	pF
$Q_{g(tot)}$	Total Gate Charge at 10V	V_{GS} = 10V, V_{DS} = 48V, I_D = 21A	-	23.2	30.2	nC
$Q_{g(tot)}$	Total Gate Charge at 5V	V_{GS} = 5V, V_{DS} = 48V, I_D = 21A	-	12.7	16.5	nC
Q_{gs}	Gate to Source Gate Charge	V_{DS} = 48V, I_D = 21A	-	3.4	-	nC
Q_{gd}	Gate to Drain “Miller” Charge	V_{DS} = 48V, I_D = 21A	-	6.3	-	nC
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 30V, I_D = 21A, V_{GS} = 5V, R_{GEN} = 4.7Ω (Note 4, 5)	-	16	42	ns
t_r	Turn-On Rise Time		-	34	78	ns
$t_{d(off)}$	Turn-Off Delay Time		-	27	64	ns
t_f	Turn-Off Fall Time		-	8	26	ns
ESR	Equivalent Series Resistance (G-S)		-	2	-	Ω
Drain-Source Diode Characteristics						
I_S	Maximum Continuous Drain to Source Diode Forward Current		-	-	21	A
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	84	A
V_{SD}	Drain to Source Diode Forward Voltage	V_{GS} = 0V, I_{SD} = 21A	-	-	1.3	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0V, I_{SD} = 21A, V_{DD} = 48V, dI_F/dt = 100A/μs (Note 4)	-	27	-	ns
Q_{rr}	Reverse Recovery Charge		-	23	-	nC

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. L = 1mH, I_{AS} = 11.5A, R_G = 25Ω, Starting T_J = 25°C
3. I_{SD} ≤ 21A, di/dt ≤ 200A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J = 25°C
4. Pulse Test: Pulse width ≤ 300μs, Dual Cycle ≤ 2%
5. Essentially Independent of Operating Temperature Typical Characteristics

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Typical Performance Characteristics

Figure 1. On-Region Characteristics

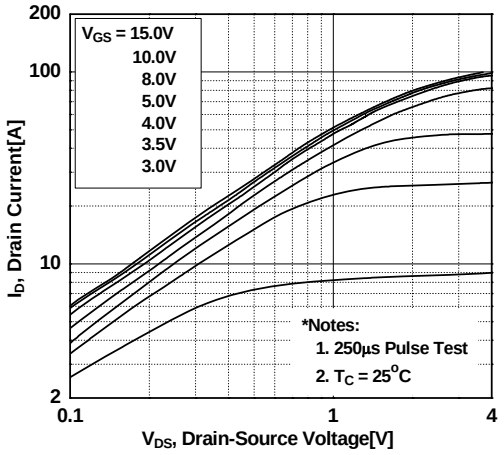


Figure 2. Transfer Characteristics

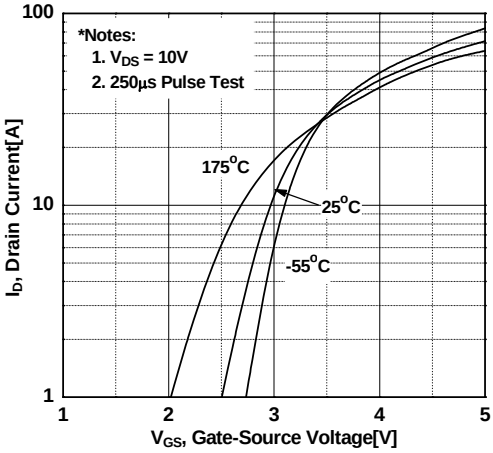


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

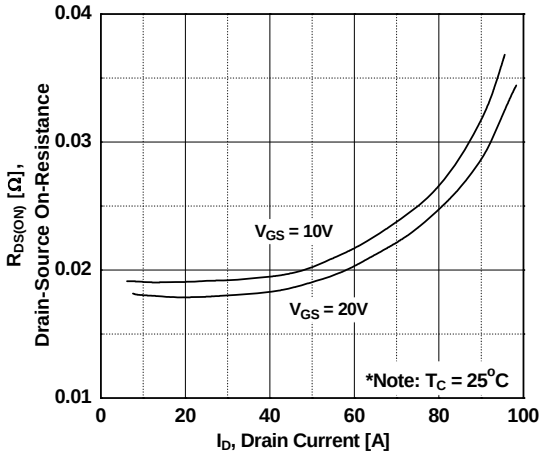


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

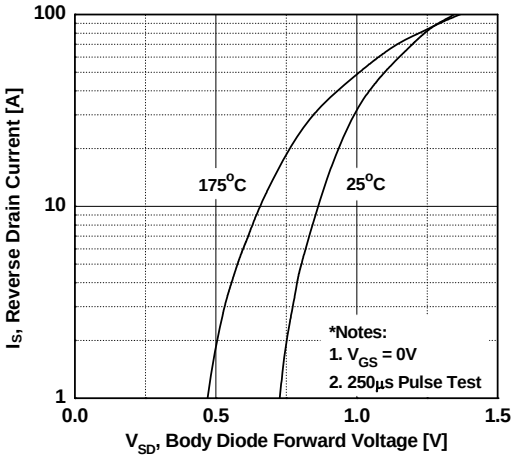


Figure 5. Capacitance Characteristics

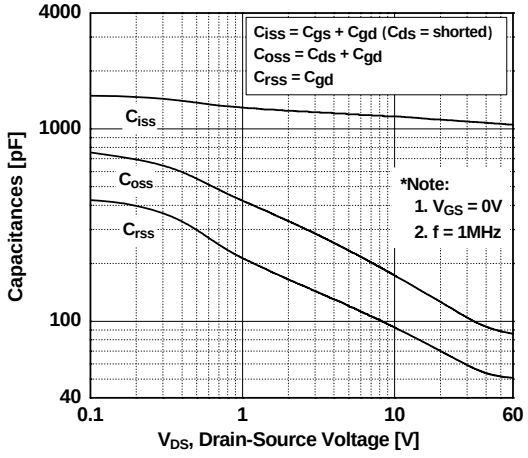
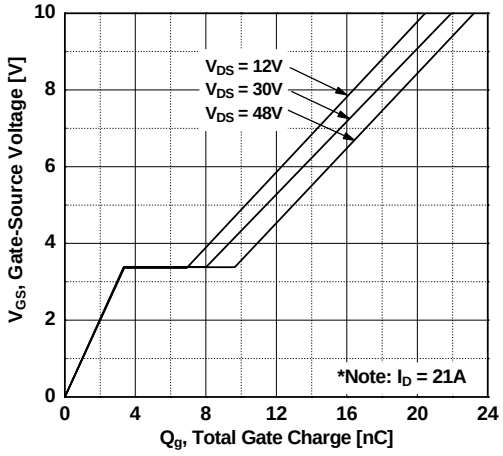


Figure 6. Gate Charge Characteristics



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Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

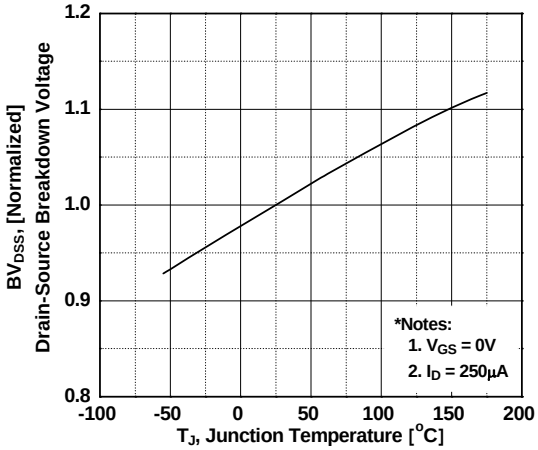


Figure 8. On-Resistance Variation vs. Temperature

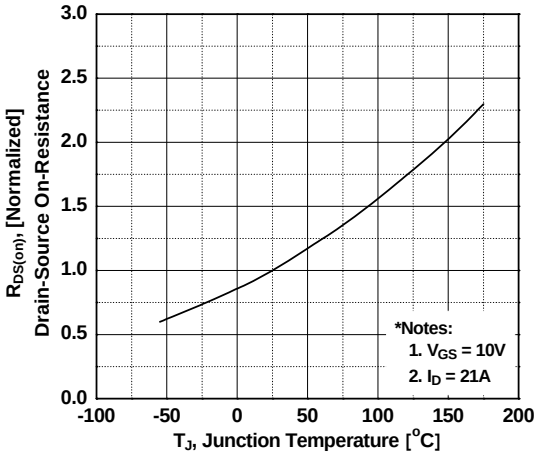


Figure 9. Maximum Safe Operating Area vs. Case Temperature

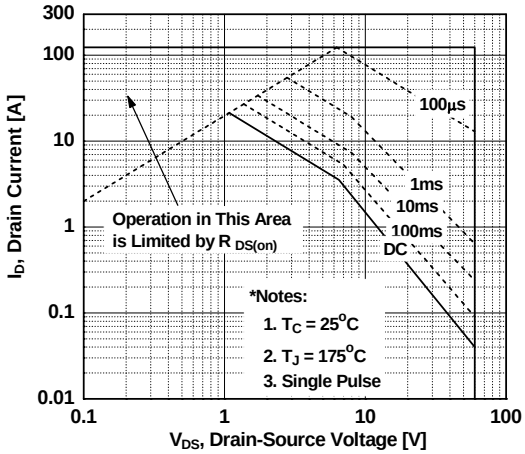


Figure 10. Maximum Drain Current

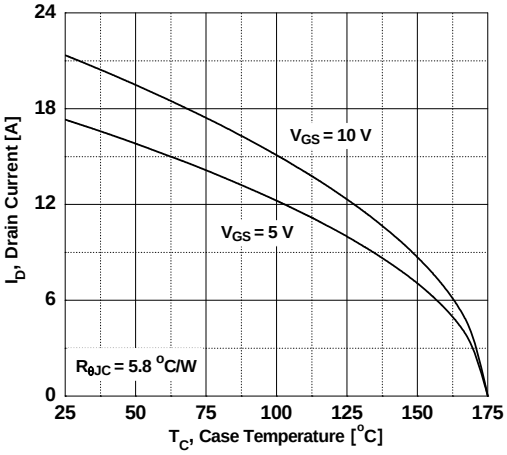
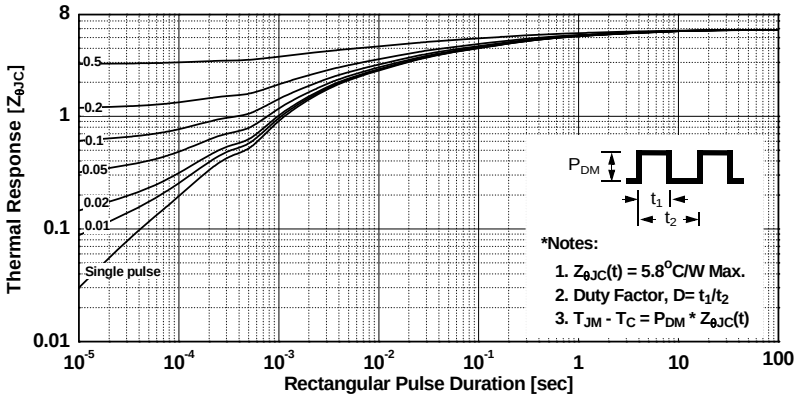


Figure 11. Transient Thermal Response Curve



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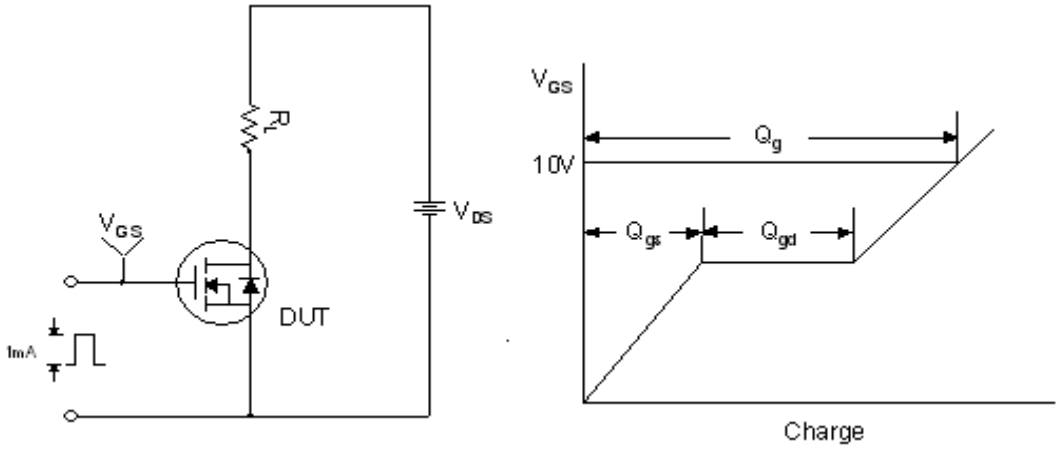
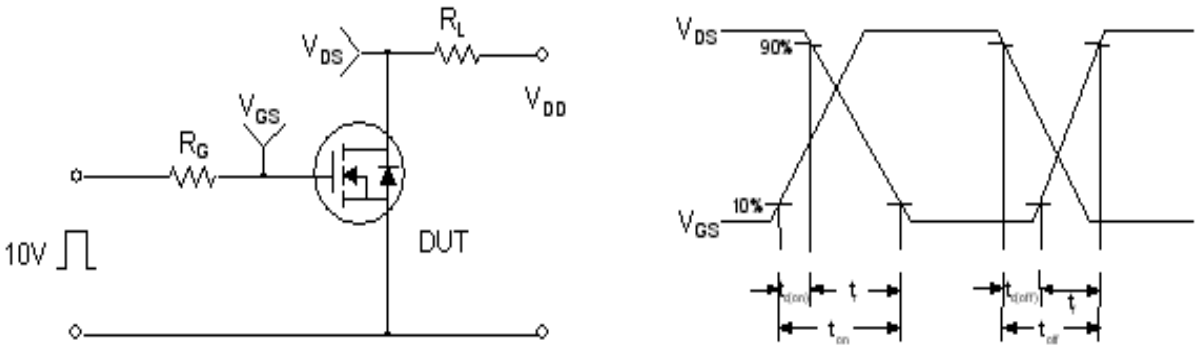
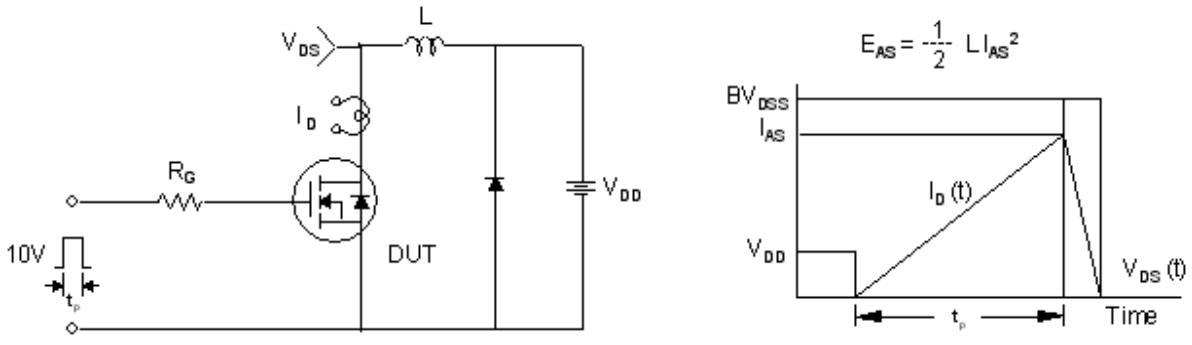
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms



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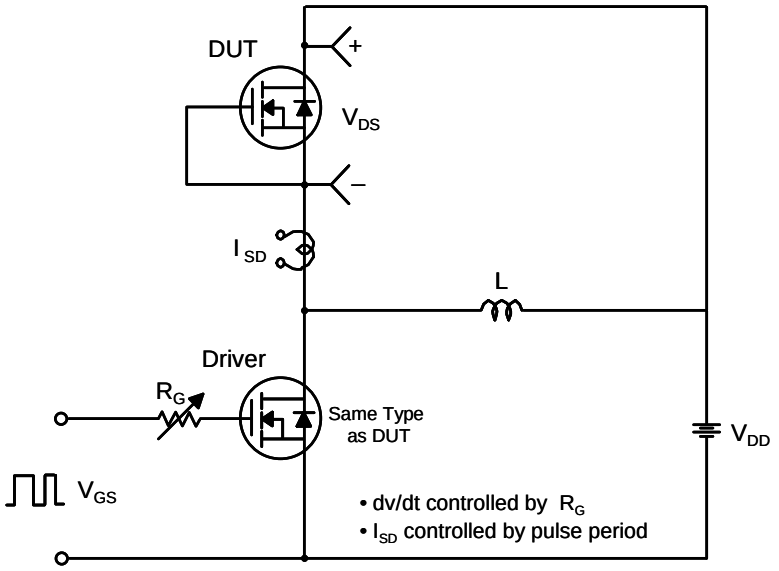
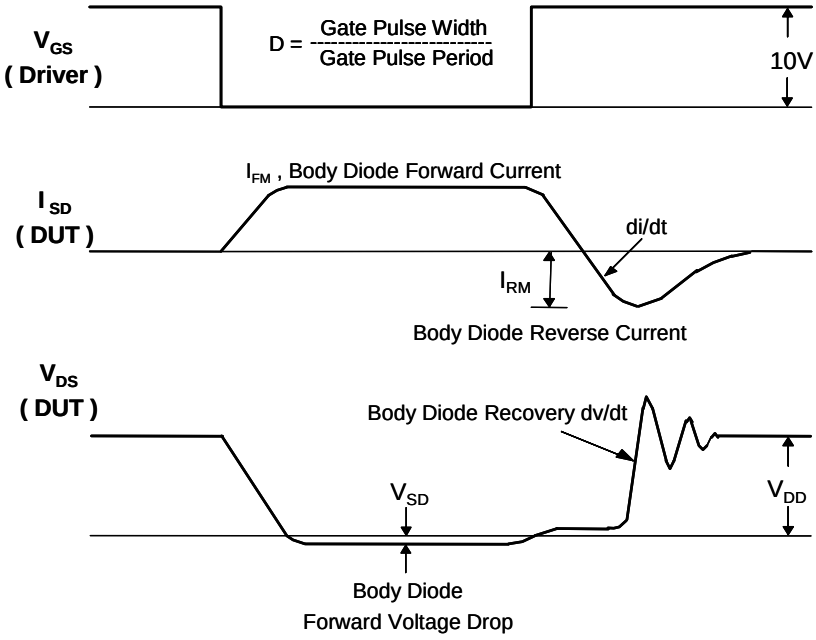
Peak Diode Recovery dv/dt Test Circuit & Waveforms





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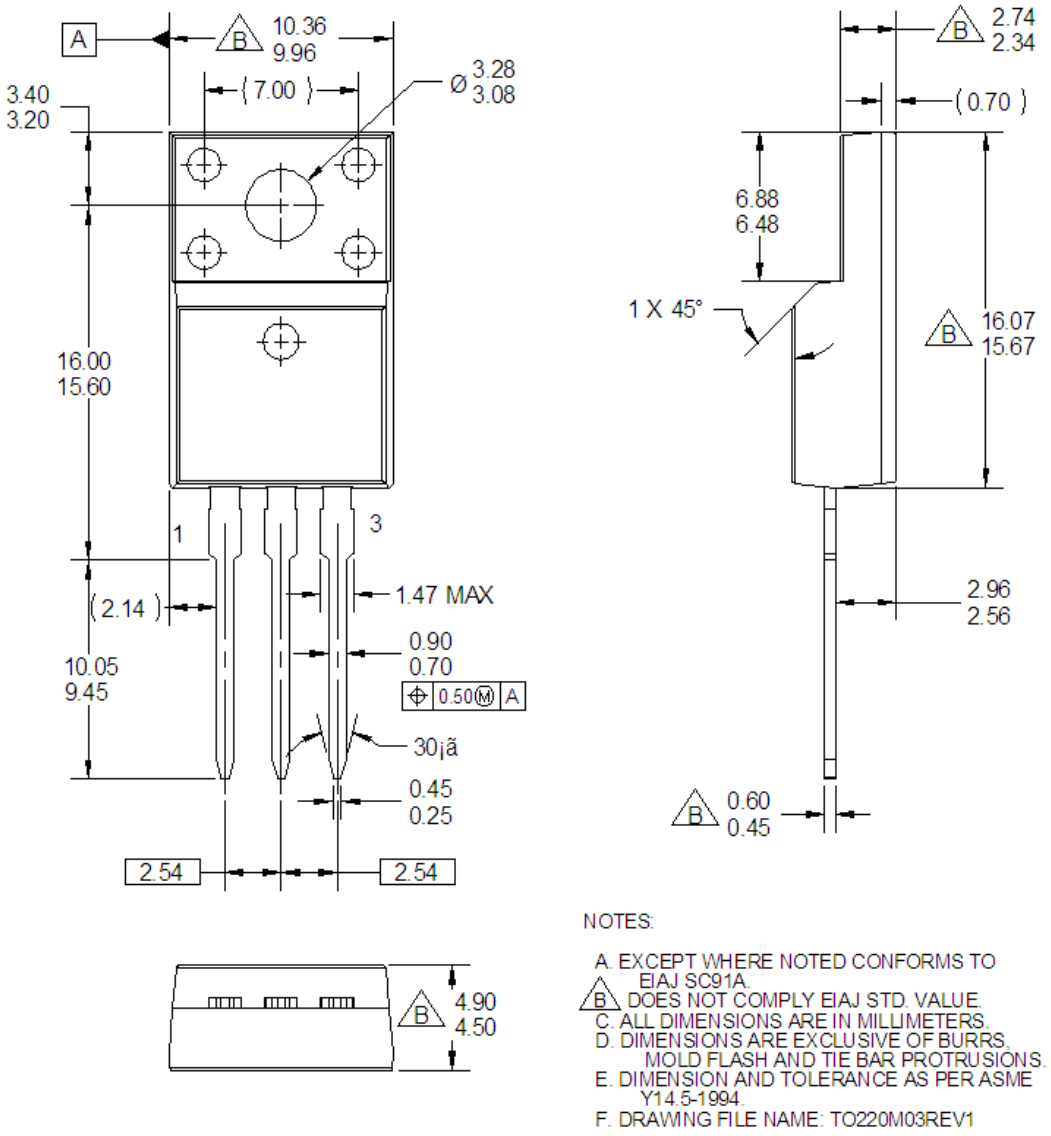
Package Dimensions

TO-220F



NOTES:

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D. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR PROTRUSIONS.
E. DIMENSION AND TOLERANCE AS PER ASME Y14.5-1994.
F. DRAWING FILE NAME: TO220M03REV1

* Front/Back Side Isolation Voltage : AC 2500V

Dimensions in Millimeters

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