FAIRCHILD SEMICONDUCTOR®

April 2011

FDPF190N15A

N-Channel PowerTrench® MOSFET

150V, 27.4A, 19mΩ

Features

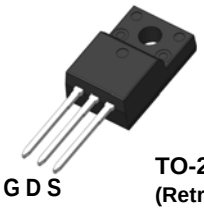
- $R_{DS(on)}$ = 14.7mΩ (Typ.)@ V_{GS} = 10V, I_D = 27.4A
- Low Gate Charge (Typ. 30nC)
- Low C_{rss} (Typ. 56pF)
- Fast Switching
- 100% Avalanche Tested
- Improved dv/dt Capability
- RoHS Compliant

Description

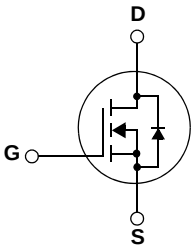
This N-Channel MOSFET is produced using Fairchild Semiconductor's advance PowerTrench process that has been especially tailored to minimize the on-state resistance and yet maintain superior switching performance.

Application

- DC to DC Converters
- Synchronous Rectification for Server/Telecom PSU
- Battery Charger
- AC motor drives and Uninterruptible Power Supplies
- Off-line UPS



TO-220F
(Retractable)



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

Symbol	Parameter			Rating	Units
V_{DSS}	Drain to Source Voltage			150	V
V_{GSS}	Gate to Source Voltage			±20	V
I_D	Drain Current	- Continuous (T_C = 25°C)		27.4	A
		- Continuous (T_C = 100°C)		17.4	
I_{DM}	Drain Current	- Pulsed	(Note 1)	110	A
E_{AS}	Single Pulsed Avalanche Energy		(Note 2)	261	mJ
dv/dt	Peak Diode Recovery dv/dt		(Note 3)	6.0	V/ns
P_D	Power Dissipation	(T_C = 25°C)		33	W
		- Derate above 25°C		0.26	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	Rating	Units
$R_{\theta JC}$	Thermal Resistance, Junction to Case	3.8	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	62.5	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDPF190N15A	FDPF190N15A	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	150	-	-	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250μA, Referenced to 25°C	-	0.14	-	V/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 120V, V_{GS} = 0V	-	-	1	μA
		V_{DS} = 120V, T_C = 150°C	-	-	500	
I_{GSS}	Gate to Body Leakage Current	V_{GS} = ±20V, V_{DS} = 0V	-	-	±100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS} = V_{DS}, I_D = 250μA	2.0	-	4.0	V
$R_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10V, I_D = 27.4A	-	14.7	19.0	mΩ
g_{FS}	Forward Transconductance	V_{DS} = 10V, I_D = 27.4A (Note 4)	-	64	-	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 25V, V_{GS} = 0V, f = 1MHz	-	2020	2685	pF
C_{oss}	Output Capacitance		-	700	930	pF
C_{rss}	Reverse Transfer Capacitance		-	56	85	pF
$C_{oss(er)}$	Energy Related Output Capacitance	V_{DS} = 75V, V_{GS} = 0V	-	252	-	pF
$Q_{g(tot)}$	Total Gate Charge at 10V	V_{DS} = 120V, ID = 27.4A, V_{GS} = 10V	-	30	39	nC
Q_{gs}	Gate to Source Gate Charge		-	8.8	-	nC
Q_{gd}	Gate to Drain “Miller” Charge		-	7.3	-	nC
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 75V, I_D = 27.4A, V_{GS} = 10V, R_{GEN} = 4.7Ω (Note 4, 5)	-	18	46	ns
t_r	Turn-On Rise Time		-	16	42	ns
$t_{d(off)}$	Turn-Off Delay Time		-	32	74	ns
t_f	Turn-Off Fall Time		-	8	26	ns
ESR	Equivalent Series Resistance (G-S)	f = 1MHz	-	1.5	-	Ω
Drain-Source Diode Characteristics						
I_S	Maximum Continuous Drain to Source Diode Forward Current		-	-	27.4	A
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	110	A
V_{SD}	Drain to Source Diode Forward Voltage	V_{GS} = 0V, I_{SD} = 27.4A	-	-	1.3	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0V, I_{SD} = 27.4A, dI_F/dt = 100A/μs, V_{DD} = 120V (Note 4)	-	76	-	ns
Q_{rr}	Reverse Recovery Charge		-	0.18	-	μC

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. L = 3mH, I_{AS} = 13.2A, R_G = 25Ω, Starting T_J = 25°C
3. I_{SD} ≤ 27.4A, 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

Typical Performance Characteristics

Figure 1. On-Region Characteristics

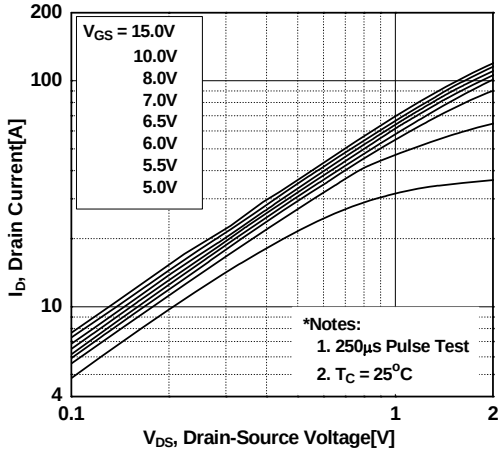


Figure 2. Transfer Characteristics

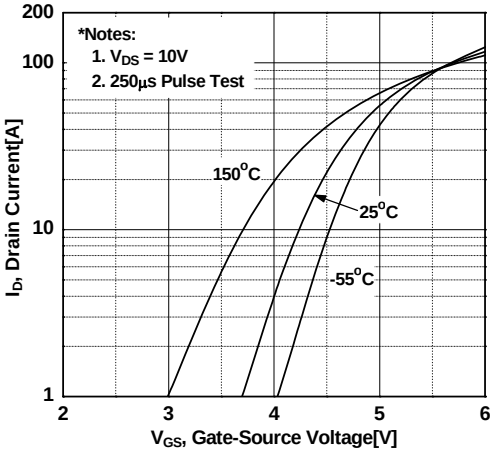


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

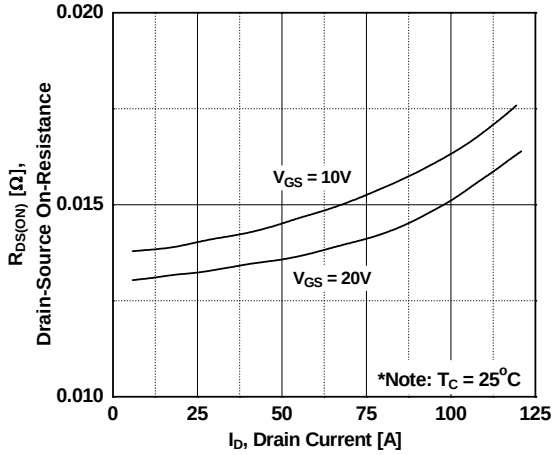


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

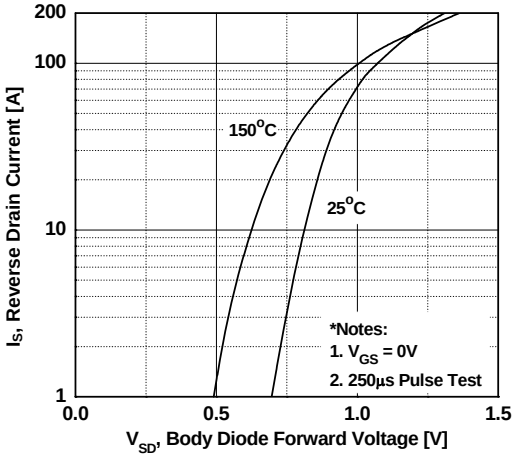


Figure 5. Capacitance Characteristics

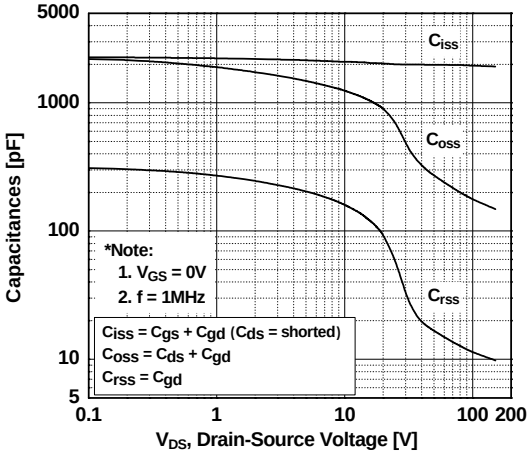
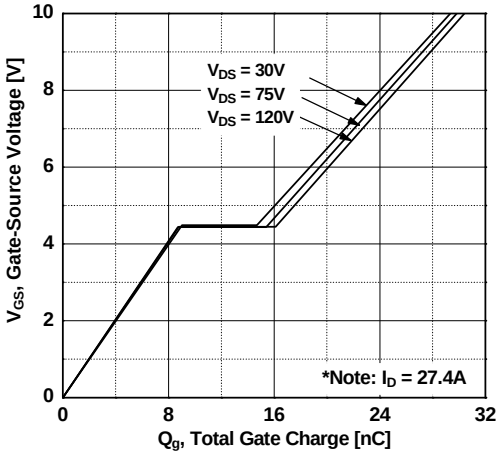


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

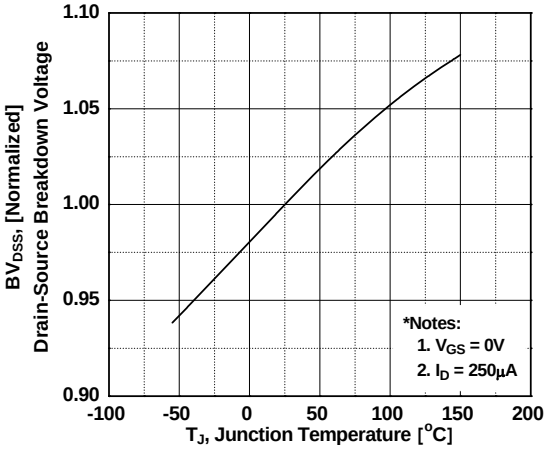


Figure 8. On-Resistance Variation vs. Temperature

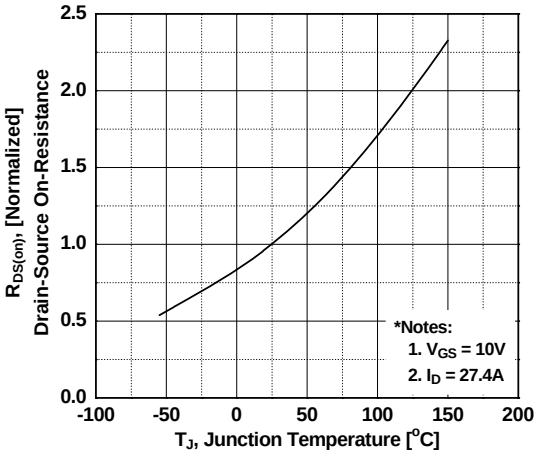


Figure 9. Maximum Safe Operating Area vs. Case Temperature

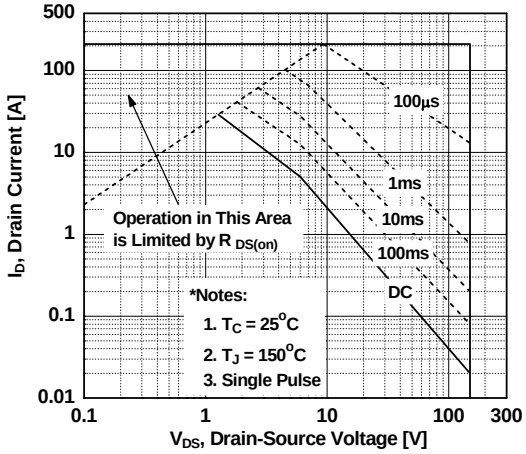


Figure 10. Maximum Drain Current

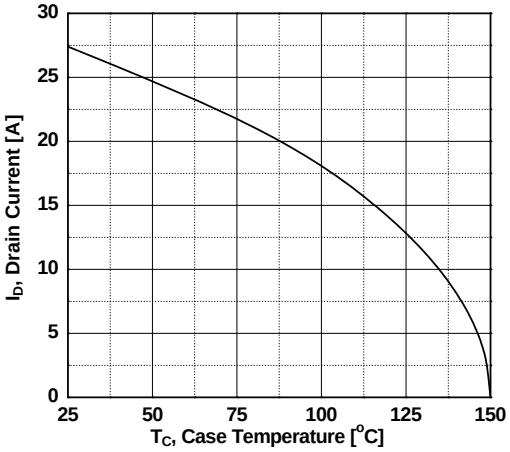
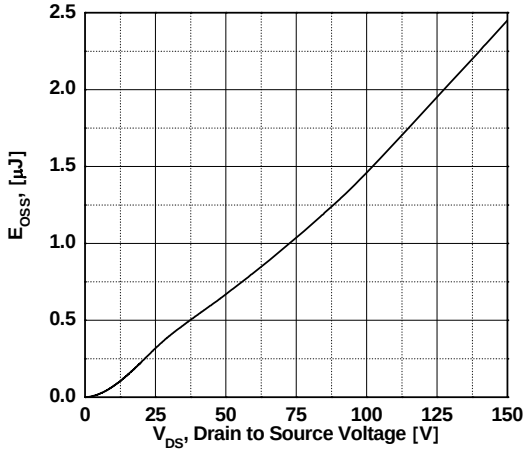
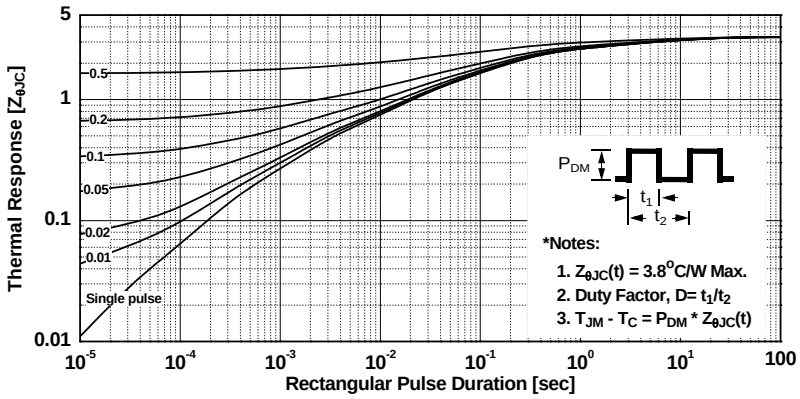


Figure 11. Eoss vs. Drain to Source Voltage

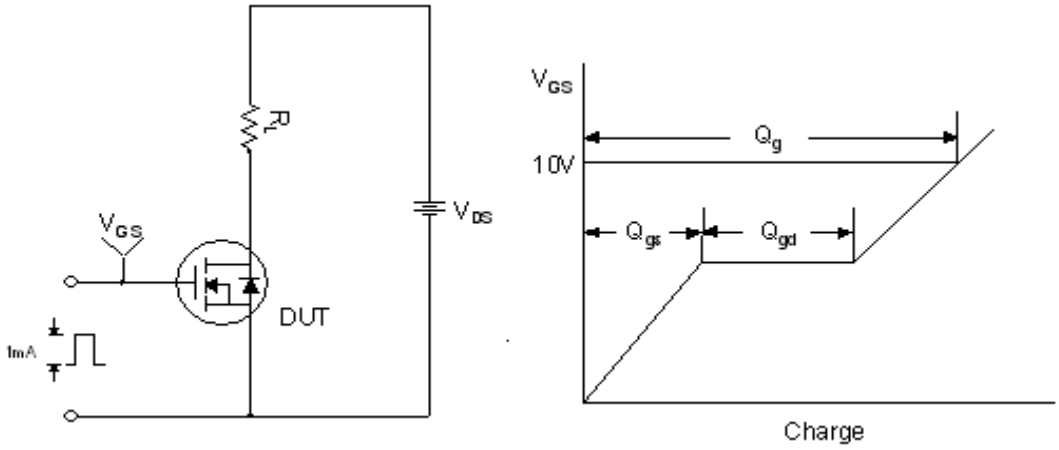


Typical Performance Characteristics (Continued)

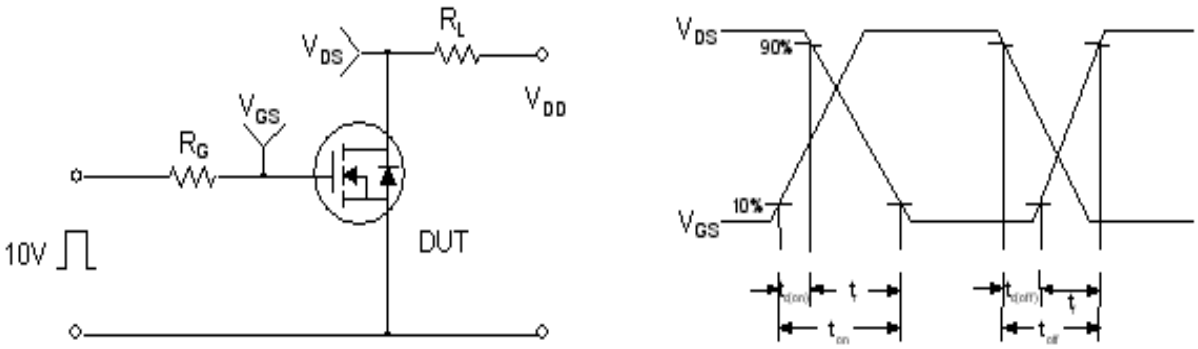
Figure 12. Transient Thermal Response Curve



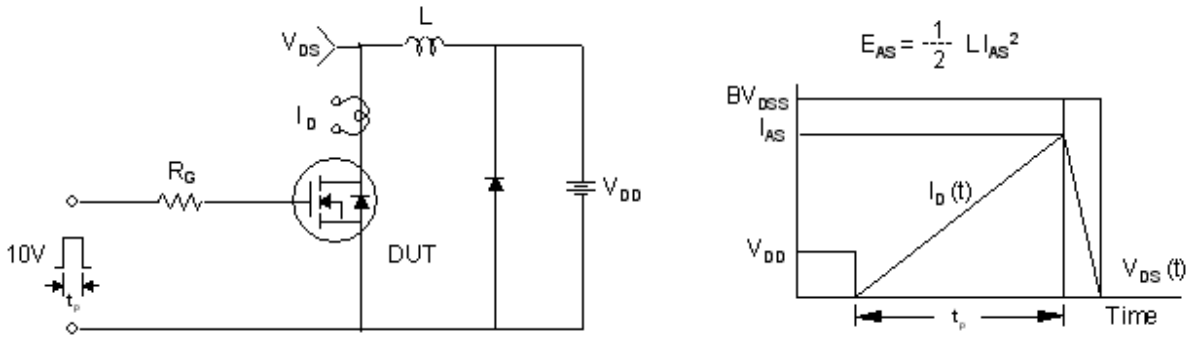
Gate Charge Test Circuit & Waveform



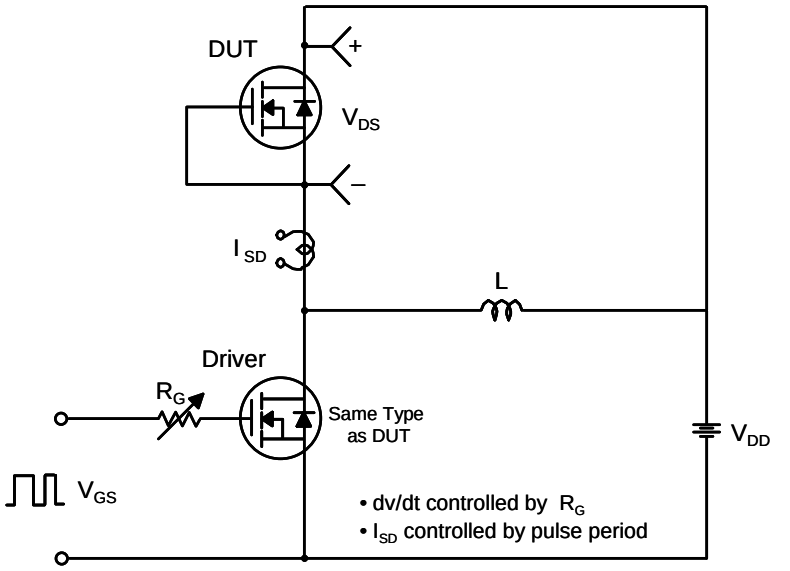
Resistive Switching Test Circuit & Waveforms

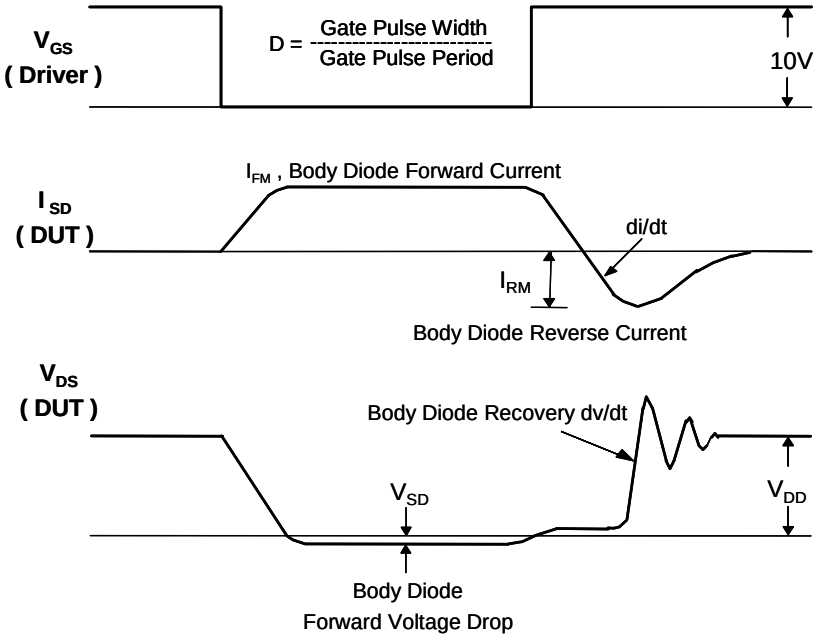


Unclamped Inductive Switching Test Circuit & Waveforms



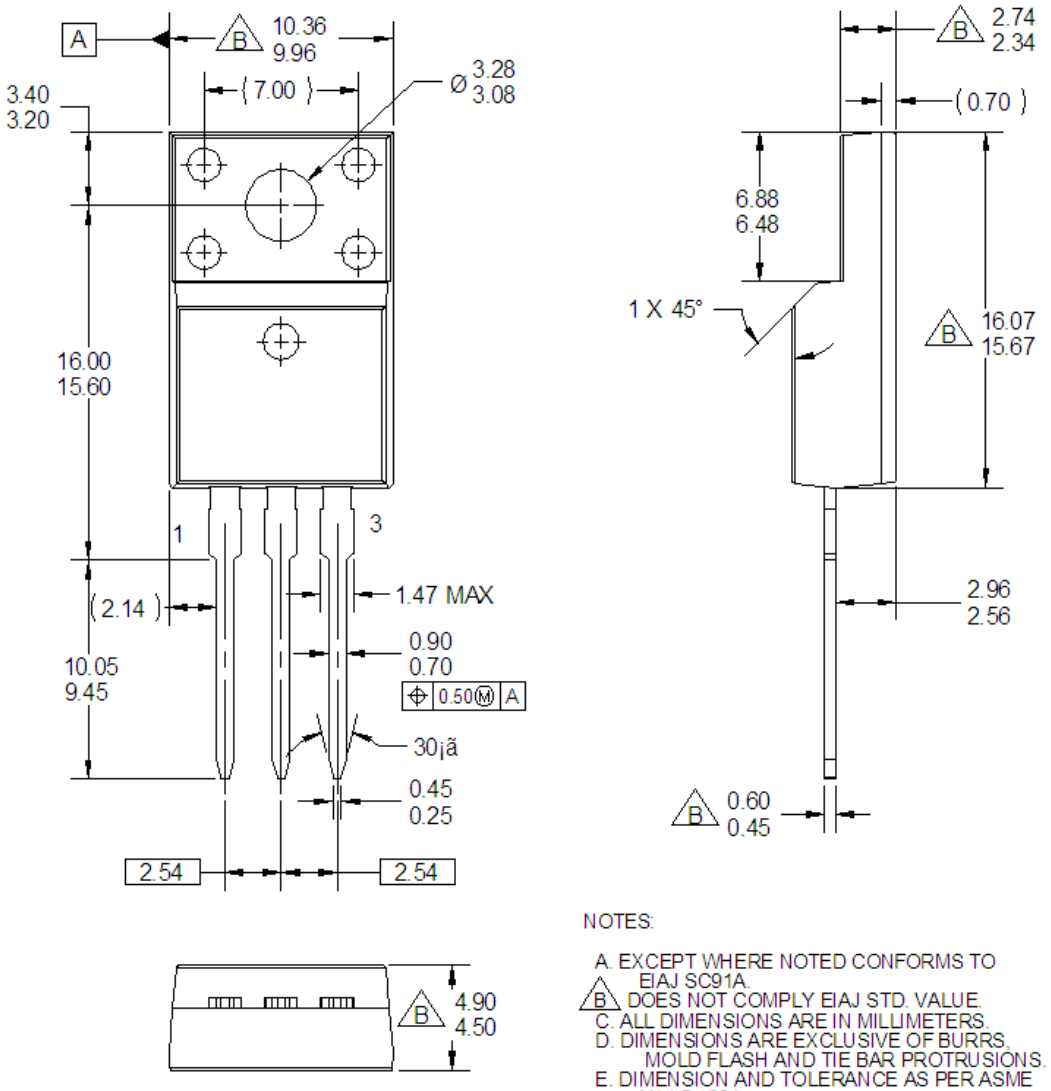
Peak Diode Recovery dv/dt Test Circuit & Waveforms





Package Dimensions

TO-220F (Retractable)



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. DRAWING FILE NAME: TO220M03REV1

* Front/Back Side Isolation Voltage : AC 2500V

Dimensions in Millimeters

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