

FDPF190N15A

N-Channel PowerTrench® MOSFET

150V, 27.4A, 19mΩ

Features

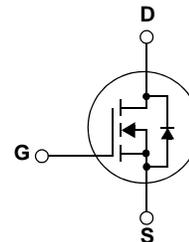
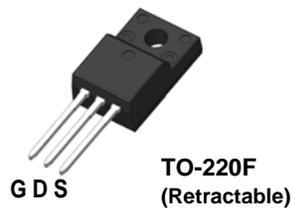
- $R_{DS(on)} = 14.7m\Omega$ (Typ.) @ $V_{GS} = 10V, I_D = 27.4A$
- Low Gate Charge (Typ. 30nC)
- Low C_{rss} (Typ. 56pF)
- Fast Switching
- 100% Avalanche Tested
- Improved dv/dt Capability
- RoHS Compliant

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



MOSFET Maximum Ratings $T_C = 25^\circ C$ 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 ($T_C = 25^\circ C$)	27.4
		- Continuous ($T_C = 100^\circ C$)	17.4
I_{DM}	Drain Current	- Pulsed (Note 1)	110
E_{AS}	Single Pulsed Avalanche Energy	(Note 2)	261
dv/dt	Peak Diode Recovery dv/dt	(Note 3)	6.0
P_D	Power Dissipation	($T_C = 25^\circ C$)	33
		- Derate above $25^\circ C$	0.26
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +150	$^\circ C$
T_L	Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds	300	$^\circ C$

Thermal Characteristics

Symbol	Parameter	Rating	Units
$R_{\theta JC}$	Thermal Resistance, Junction to Case	3.8	$^\circ C/W$
$R_{\theta JA}$	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 $T_C = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
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Off Characteristics

BV_{DSS}	Drain to Source Breakdown Voltage	$I_D = 250\mu\text{A}, V_{GS} = 0\text{V}$	150	-	-	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\mu\text{A}$, Referenced to 25°C	-	0.14	-	$\text{V}/^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 120\text{V}, V_{GS} = 0\text{V}$ $V_{DS} = 120\text{V}, T_C = 150^\circ\text{C}$	-	-	1 500	μA
I_{GSS}	Gate to Body Leakage Current	$V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$	-	-	± 100	nA

On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250\mu\text{A}$	2.0	-	4.0	V
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{V}, I_D = 27.4\text{A}$	-	14.7	19.0	$\text{m}\Omega$
g_{FS}	Forward Transconductance	$V_{DS} = 10\text{V}, I_D = 27.4\text{A}$ (Note 4)	-	64	-	S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 25\text{V}, V_{GS} = 0\text{V}$ $f = 1\text{MHz}$	-	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	$V_{DS} = 75\text{V}, V_{GS} = 0\text{V}$	-	252	-	pF
$Q_{g(tot)}$	Total Gate Charge at 10V	$V_{DS} = 120\text{V}, I_D = 27.4\text{A}$ $V_{GS} = 10\text{V}$	-	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	$V_{DD} = 75\text{V}, I_D = 27.4\text{A}$ $V_{GS} = 10\text{V}, R_{GEN} = 4.7\Omega$ (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)	$f = 1\text{MHz}$	-	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	$V_{GS} = 0\text{V}, I_{SD} = 27.4\text{A}$	-	-	1.3	V
t_{rr}	Reverse Recovery Time	$V_{GS} = 0\text{V}, I_{SD} = 27.4\text{A}$	-	76	-	ns
Q_{rr}	Reverse Recovery Charge	$di_F/dt = 100\text{A}/\mu\text{s}, V_{DD} = 120\text{V}$ (Note 4)	-	0.18	-	μC

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. $L = 3\text{mH}, I_{AS} = 13.2\text{A}, R_G = 25\Omega$, Starting $T_J = 25^\circ\text{C}$
3. $I_{SD} \leq 27.4\text{A}, di/dt \leq 200\text{A}/\mu\text{s}, V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$
4. Pulse Test: Pulse width $\leq 300\mu\text{s}$, Dual Cycle $\leq 2\%$
5. Essentially Independent of Operating Temperature Typical Characteristics

Typical Performance Characteristics

Figure 1. On-Region Characteristics

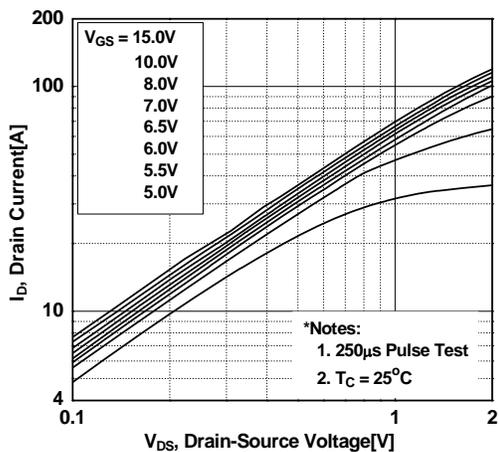


Figure 2. Transfer Characteristics

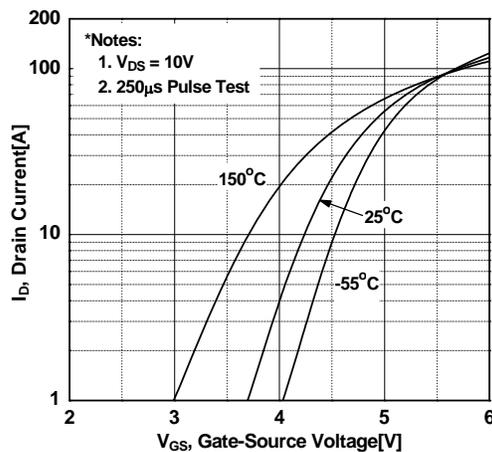


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

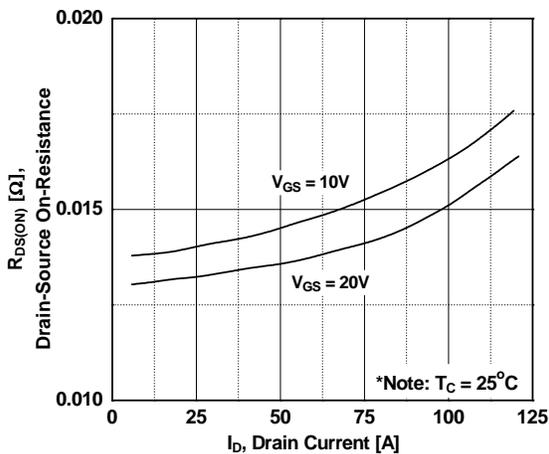


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

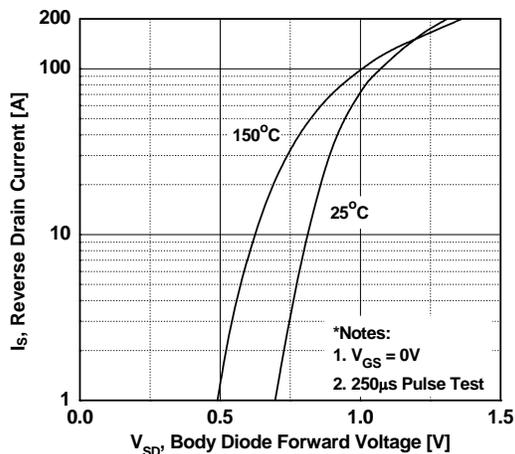


Figure 5. Capacitance Characteristics

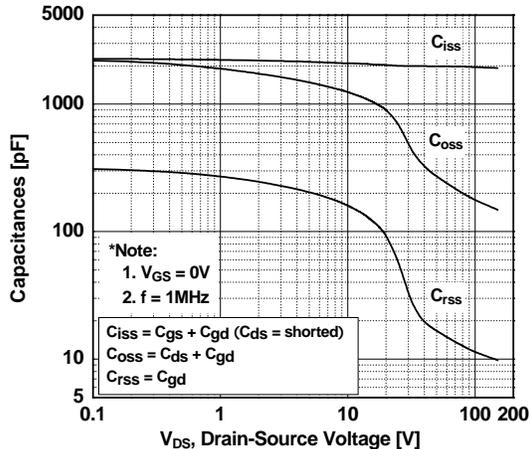
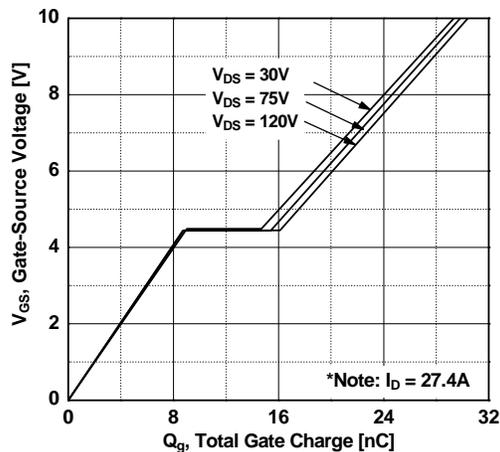


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

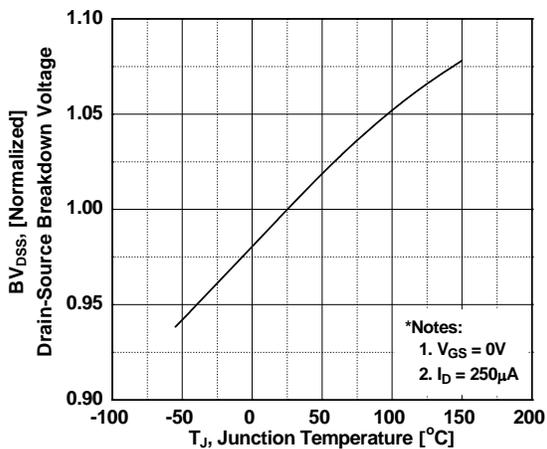


Figure 8. On-Resistance Variation vs. Temperature

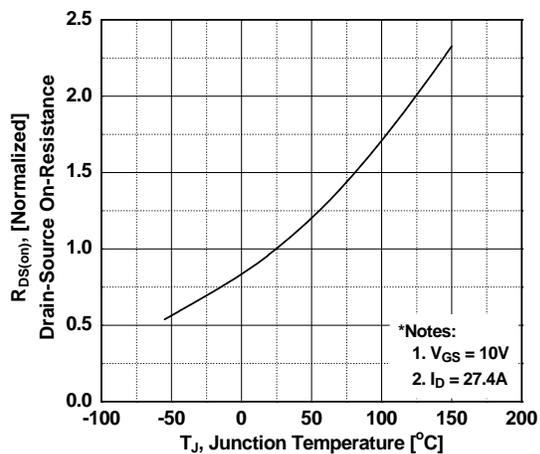


Figure 9. Maximum Safe Operating Area vs. Case Temperature

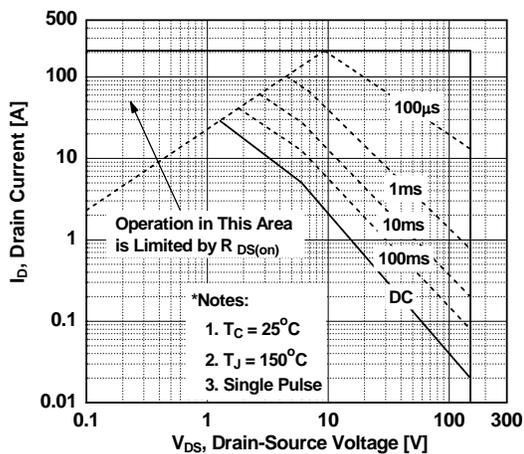


Figure 10. Maximum Drain Current vs. Case Temperature

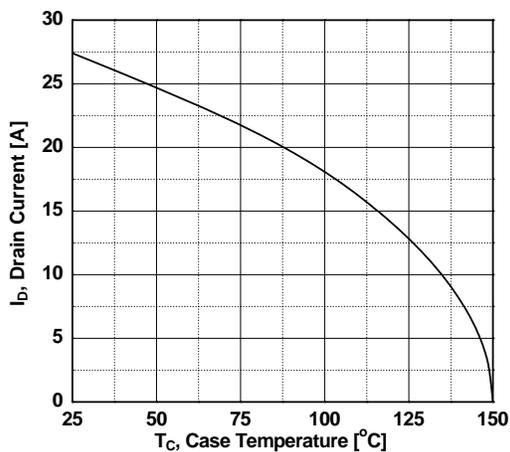
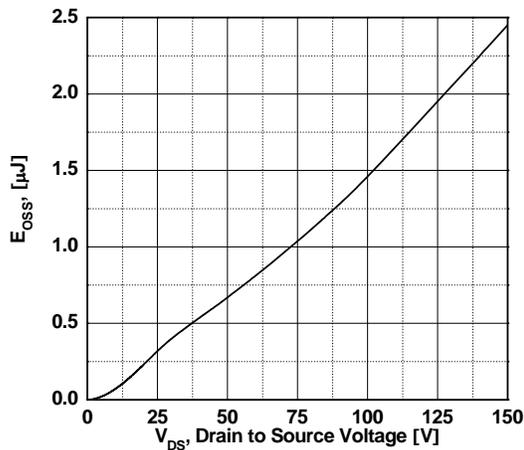
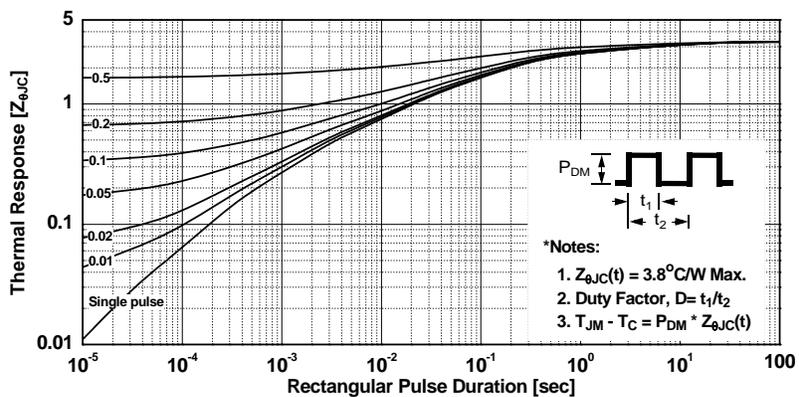


Figure 11. E_oss vs. Drain to Source Voltage

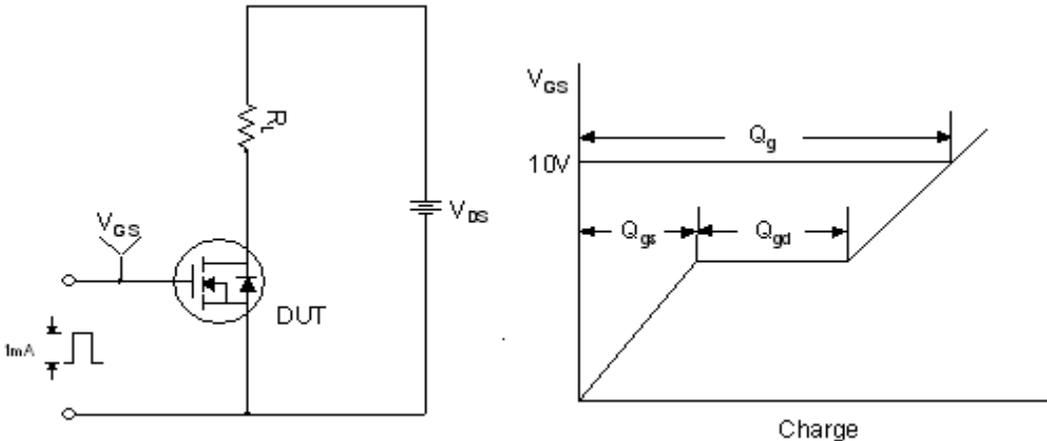


Typical Performance Characteristics (Continued)

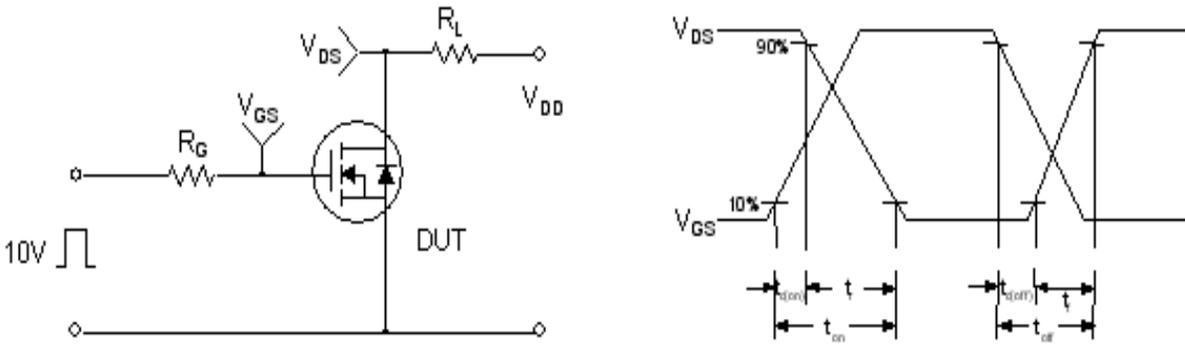
Figure 12. Transient Thermal Response Curve



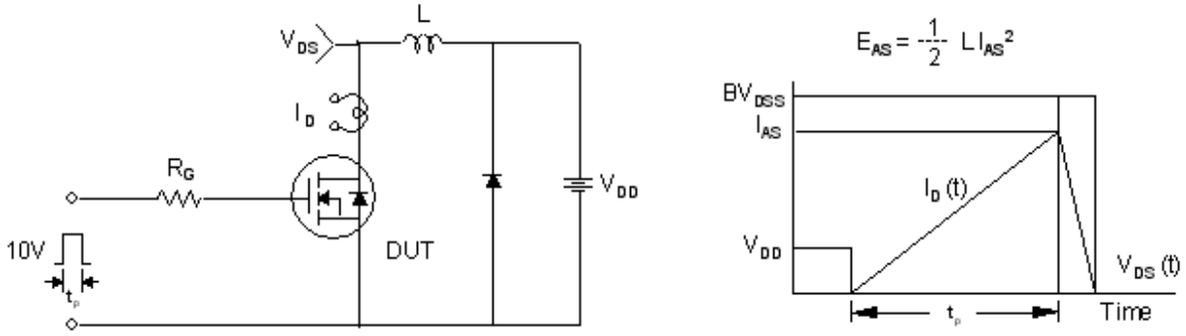
Gate Charge Test Circuit & Waveform



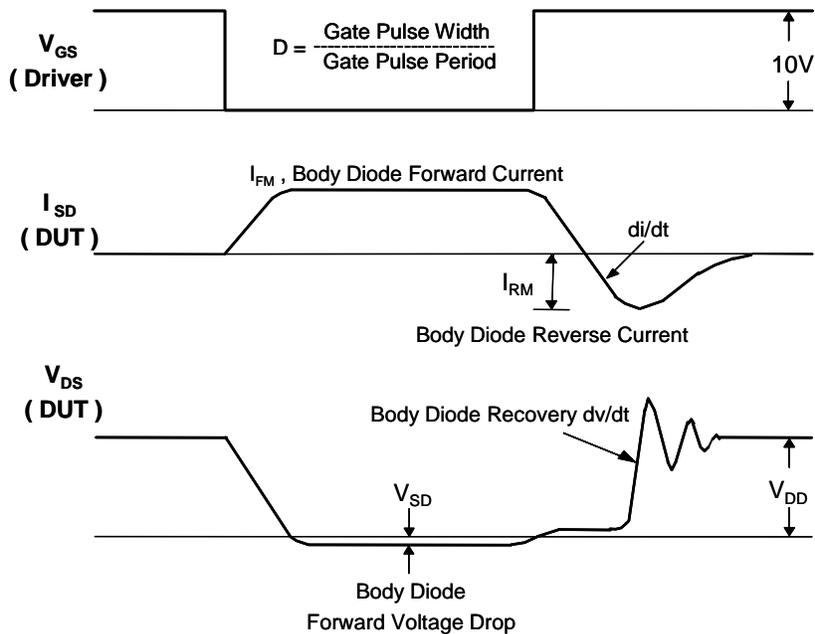
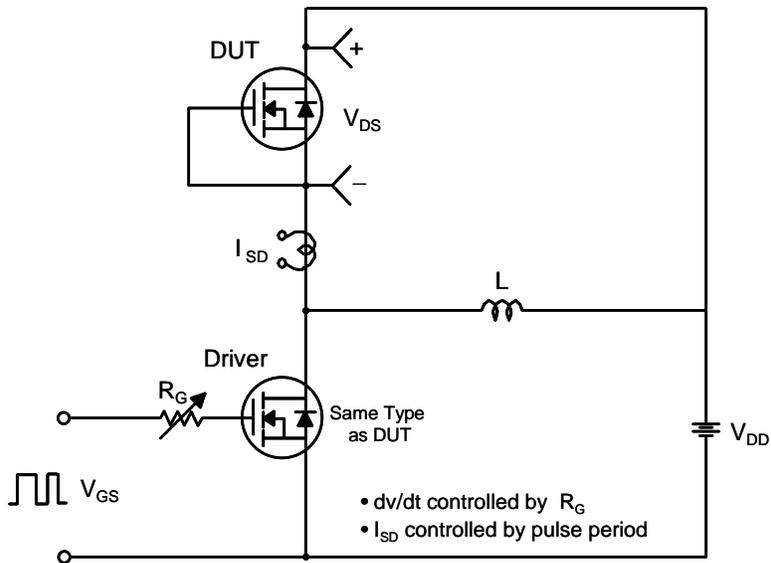
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms

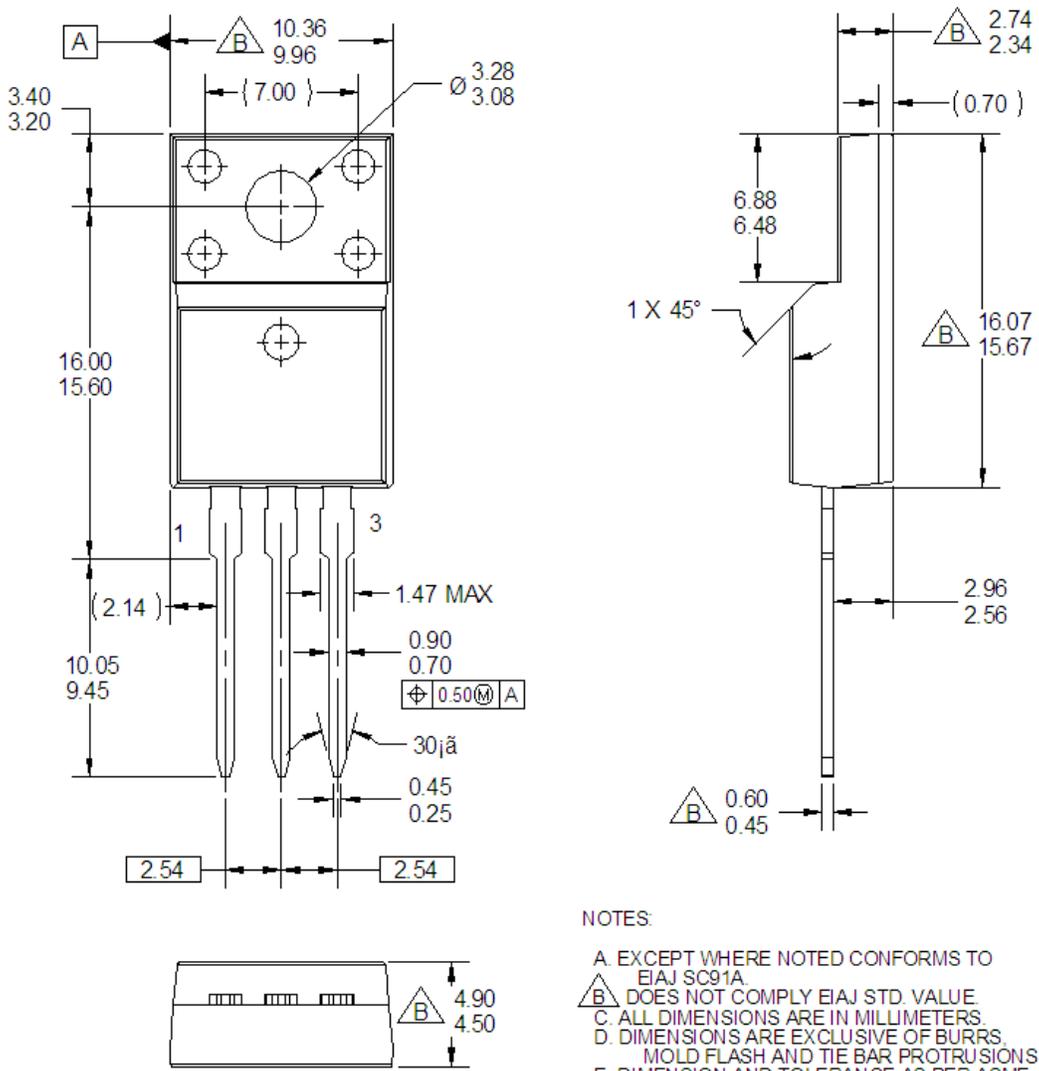


Peak Diode Recovery dv/dt Test Circuit & Waveforms



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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