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November 2015

FDPF190N15A N-Channel PowerTrench[®] MOSFET 150 V, 27.4 A, 19 mΩ

Features

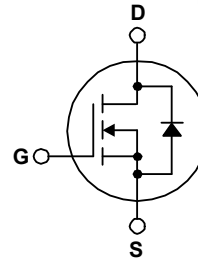
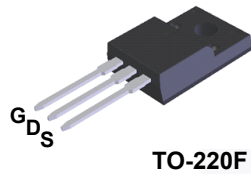
- $R_{DS(on)} = 14.7\text{ m}\Omega$ (Typ.) @ $V_{GS} = 10\text{ V}$, $I_D = 27.4\text{ A}$
- Low Gate Charge, $Q_G = 31\text{ nC}$ (Typ.)
- Low C_{rss} (Typ. 56 pF)
- Fast Switching Speed
- Improved dv/dt Capability
- RoHS Compliant

Description

This N-Channel MOSFET is produced using Fairchild Semiconductor's advanced PowerTrench[®] process that has been tailored to minimize the on-state resistance while maintaining superior switching performance.

Applications

- Consumer Appliances
- LED TV
- Synchronous Rectification for ATX / Server / Telecom PSU
- Uninterruptible Power Supply
- Micro Solar Inverter



Absolute Maximum Ratings $T_C = 25^\circ\text{C}$ unless otherwise noted.

Symbol	Parameter	FDPF190N15A	Unit
V_{DSS}	Drain to Source Voltage	150	V
V_{GSS}	Gate to Source Voltage	- DC	± 20
		- AC (f > 1 Hz)	± 30
I_D	Drain Current	- Continuous ($T_C = 25^\circ\text{C}$)	27.4
		- Continuous ($T_C = 100^\circ\text{C}$)	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	($T_C = 25^\circ\text{C}$)	33
		- Derate Above 25°C	0.26
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +150	$^\circ\text{C}$
T_L	Maximum Lead Temperature for Soldering, 1/8" from Case for 5 Seconds	300	$^\circ\text{C}$

Thermal Characteristics

Symbol	Parameter	FDPF190N15A	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	3.3	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	62.5	

FDPF190N15A — N-Channel PowerTrench[®] MOSFET

Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FDPF190N15A	FDPF190N15A	TO-220F	Tube	N/A	N/A	50 units

Electrical Characteristics $T_C = 25^\circ\text{C}$ unless otherwise noted.

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
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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
$\Delta BV_{DSS} / \Delta T_J$	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	$V_{DS} = 120 \text{ V}, V_{GS} = 0 \text{ V}$	-	-	1	μA
		$V_{DS} = 120 \text{ V}, T_C = 150^\circ\text{C}$	-	-	500	
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	$V_{DS} = 10 \text{ V}, I_D = 27.4 \text{ A}$	-	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		(Note 4)	-	7.3	-
ESR	Equivalent Series Resistance (G-S)	$f = 1 \text{ MHz}$	-	1.5	-	Ω

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 75 \text{ V}, I_D = 27.4 \text{ A},$ $V_{GS} = 10 \text{ V}, R_G = 4.7 \Omega$	-	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		(Note 4)	-	8	26

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	$di/dt = 100 \text{ A}/\mu\text{s}, V_{DD} = 120 \text{ V}$	-	0.18	-	μC

Notes:

1. Repetitive rating: pulse-width limited by maximum junction temperature.
2. $L = 0.33 \text{ mH}, I_{AS} = 29 \text{ A}, R_G = 25 \Omega$, 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. Essentially independent of operating temperature typical characteristics.

Typical Performance Characteristics

Figure 1. On-Region Characteristics

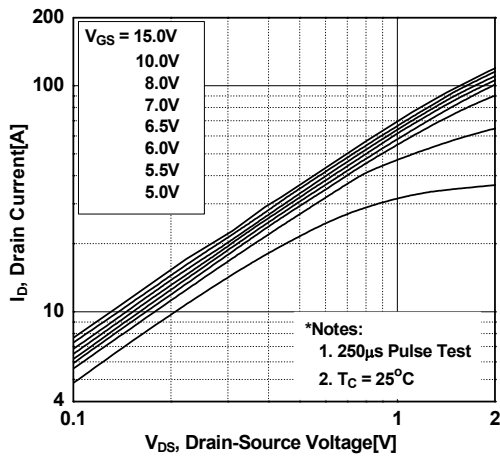


Figure 2. Transfer Characteristics

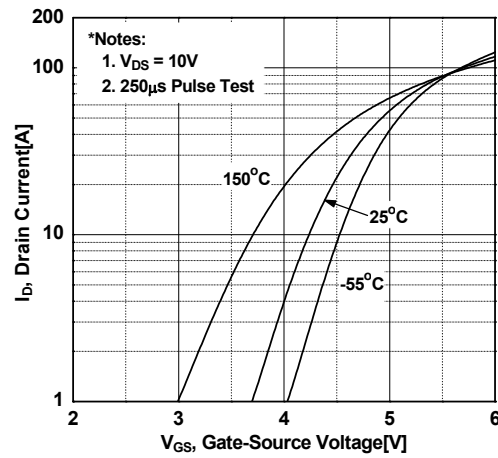


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

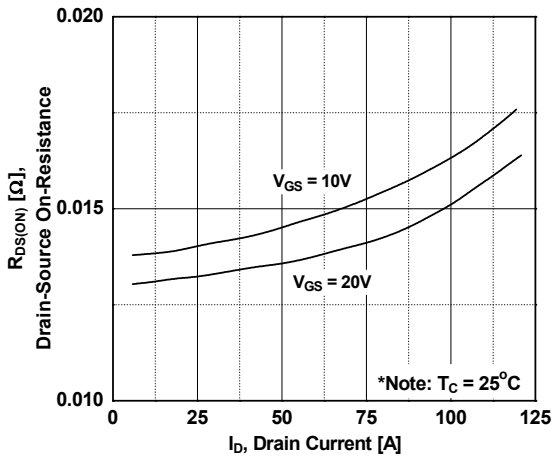


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

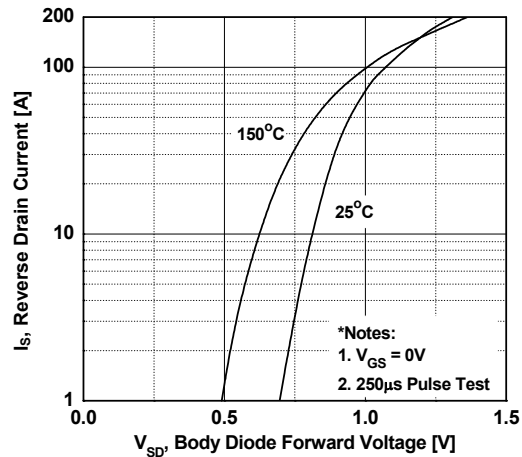


Figure 5. Capacitance Characteristics

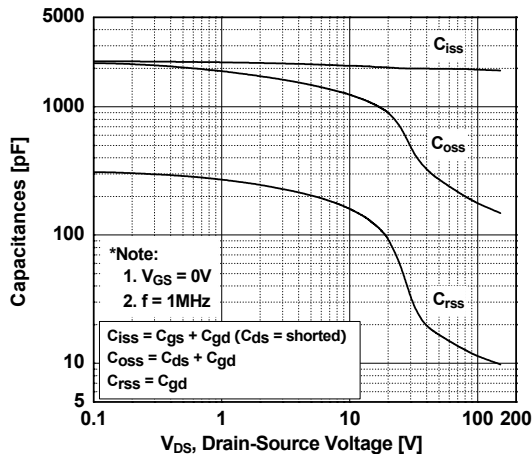
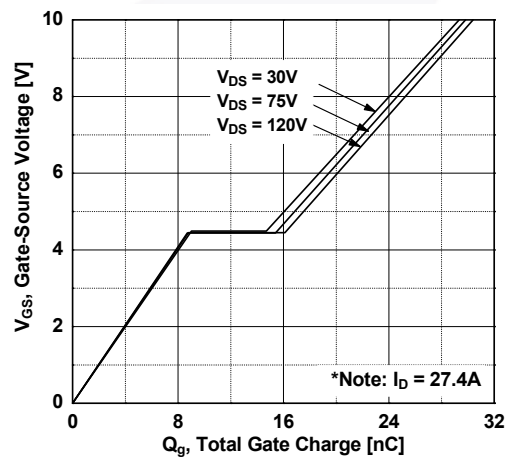


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

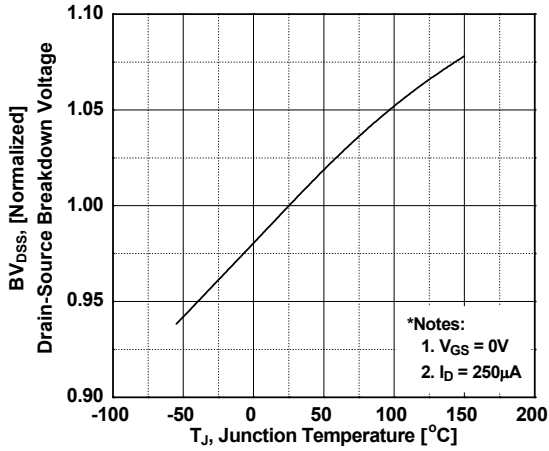


Figure 8. On-Resistance Variation vs. Temperature

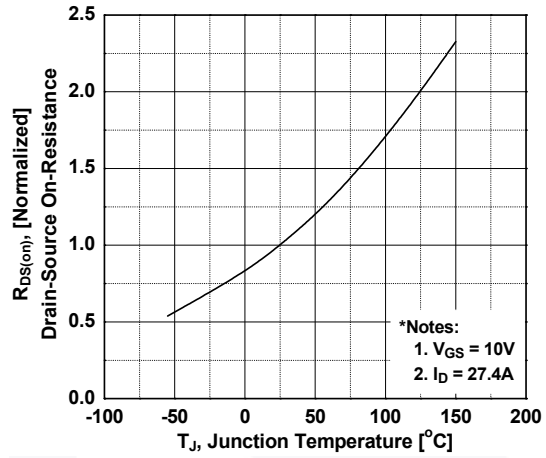


Figure 9. Maximum Safe Operating Area

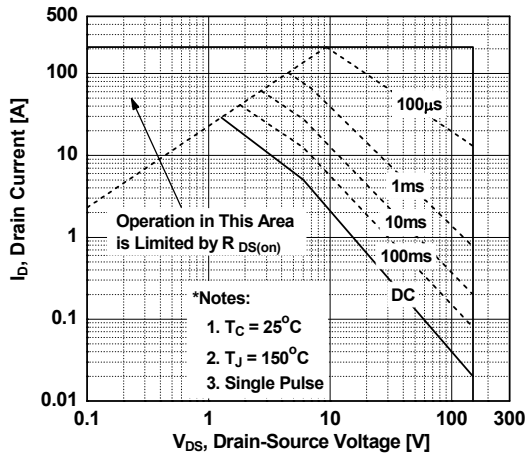


Figure 10. Maximum Drain Current vs. Case Temperature

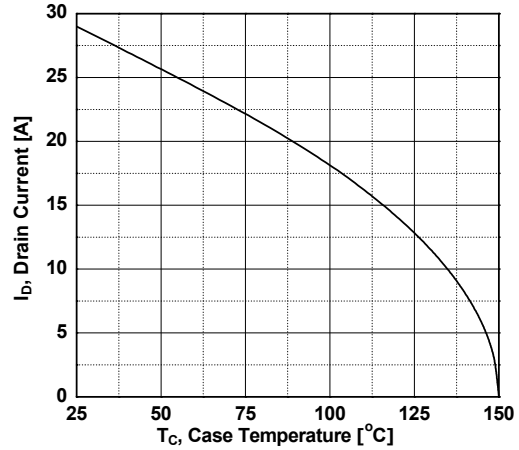
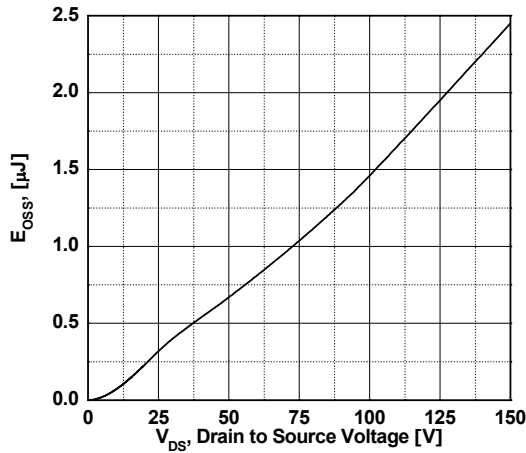
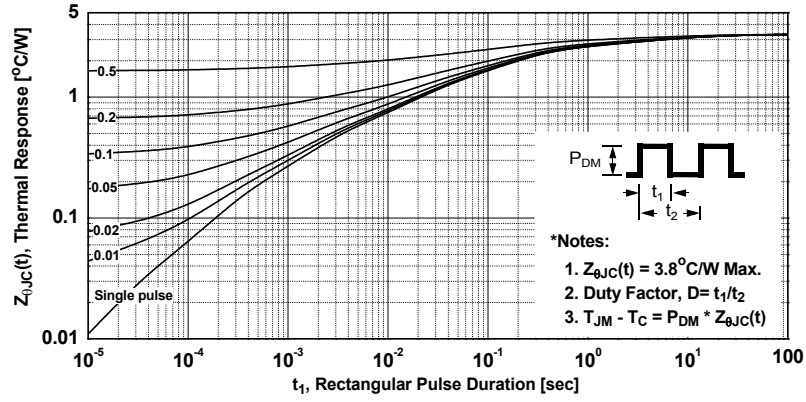


Figure 11. E_{oss} vs. Drain to Source Voltage



Typical Performance Characteristics (Continued)

Figure 12. Transient Thermal Response Curve



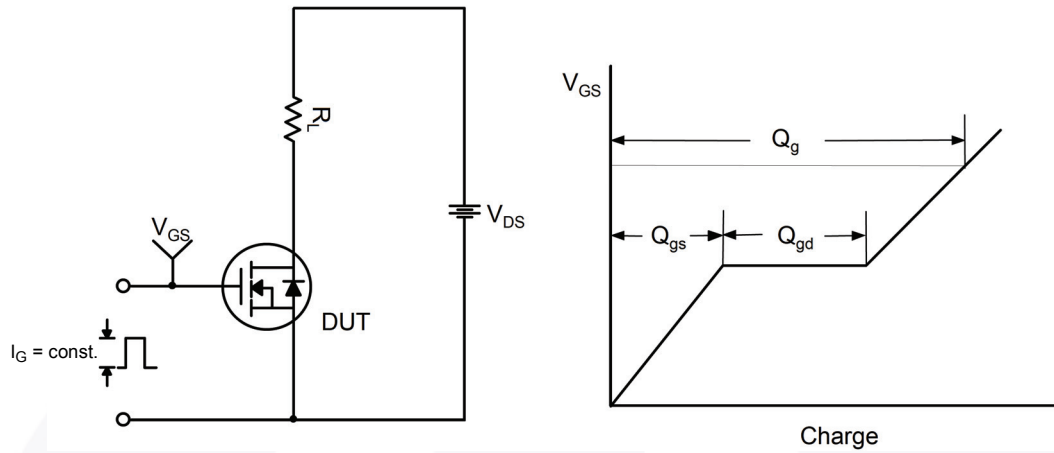


Figure 13. Gate Charge Test Circuit & Waveform



Figure 14. Resistive Switching Test Circuit & Waveforms



Figure 15. Unclamped Inductive Switching Test Circuit & Waveforms

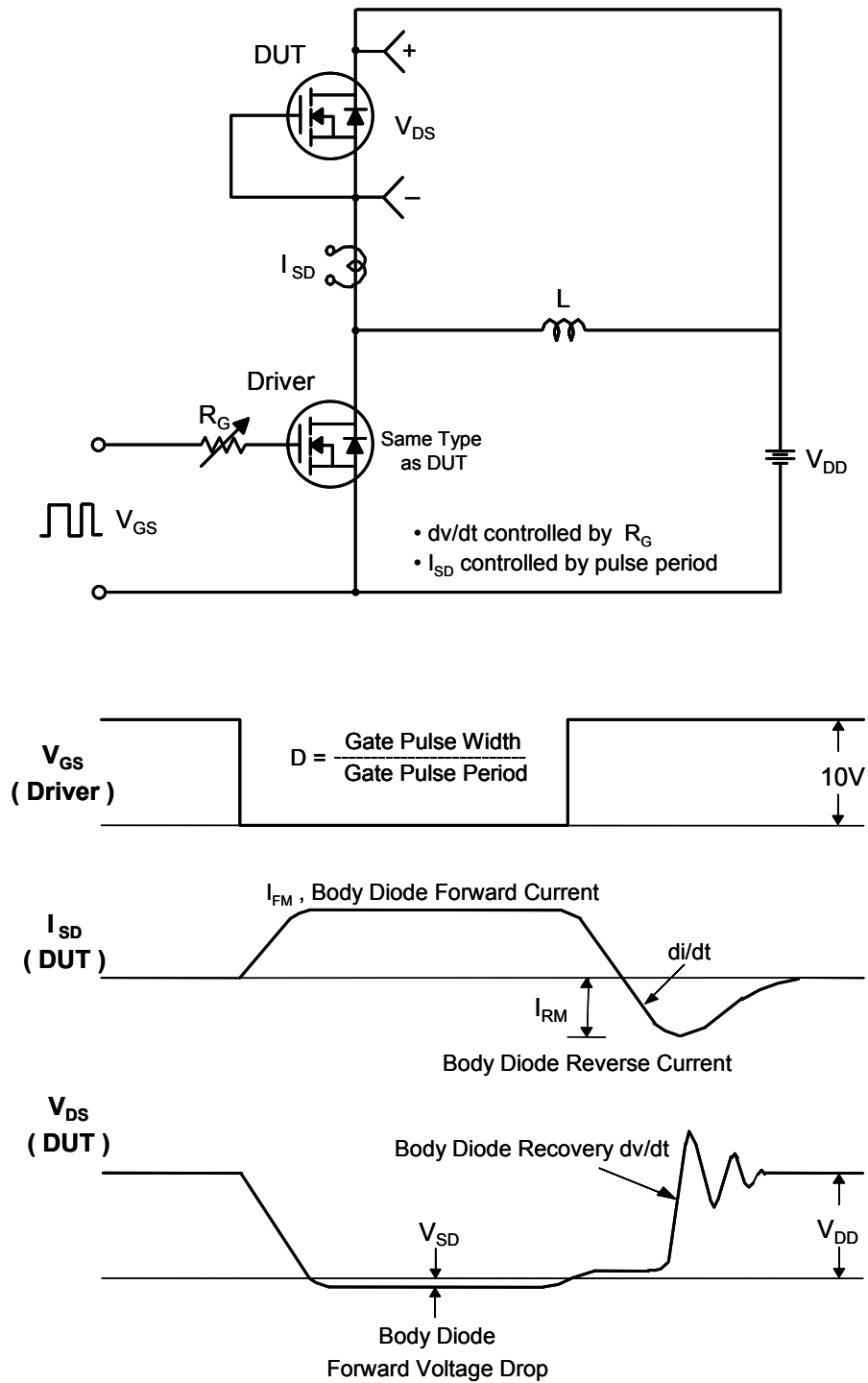
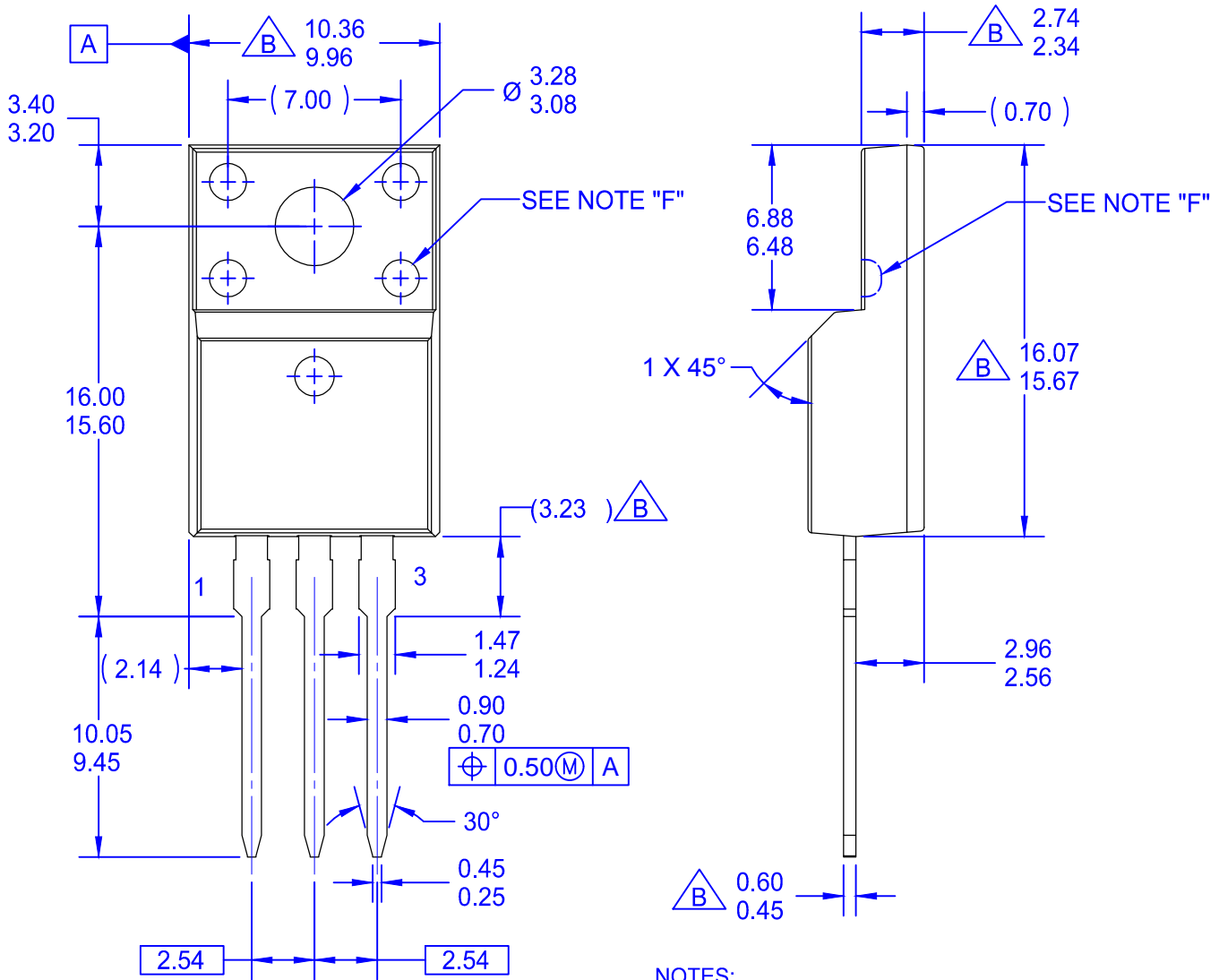


Figure 16. Peak Diode Recovery dv/dt Test Circuit & Waveforms



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