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November 2013

FDPF085N10A

N-Channel PowerTrench[®] MOSFET

100 V, 40 A, 8.5 mΩ

Features

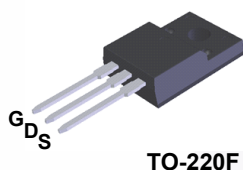
- $R_{DS(on)} = 6.5 \text{ m}\Omega$ (Typ.) @ $V_{GS} = 10 \text{ V}$, $I_D = 40 \text{ A}$
- Fast Switching Speed
- Low Gate Charge, $Q_G = 31 \text{ nC}$ (Typ.)
- High Performance Trench Technology for Extremely Low $R_{DS(on)}$
- High Power and Current Handling Capability
- RoHS Compliant

Description

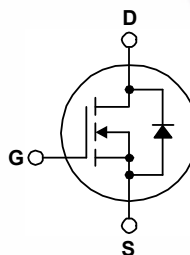
This N-Channel MOSFET is produced using Fairchild Semiconductor's advanced PowerTrench[®] process that has been tailored to minimize the on-state resistance while maintaining superior switching performance.

Applications

- Consumer Appliances
- LED TV
- Synchronous Rectification for ATX / Server / Telecom PSU
- Motor Drives and Uninterruptible Power Supplies
- Micro Solar Inverter



TO-220F



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

Symbol	Parameter	FDPF085N10A	Unit
V_{DSS}	Drain to Source Voltage	100	V
V_{GSS}	Gate to Source Voltage	± 20	V
I_D	Drain Current	- Continuous ($T_C = 25^\circ\text{C}$)	40
		- Continuous ($T_C = 100^\circ\text{C}$)	28
I_{DM}	Drain Current	- Pulsed (Note 1)	160
E_{AS}	Single Pulsed Avalanche Energy	(Note 2)	269
dv/dt	Peak Diode Recovery dv/dt	(Note 3)	6.0
P_D	Power Dissipation	($T_C = 25^\circ\text{C}$)	33.3
		- Derate Above 25°C	0.22
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +175	$^\circ\text{C}$
T_L	Maximum Lead Temperature for Soldering, 1/8" from Case for 5 Seconds	300	$^\circ\text{C}$

Thermal Characteristics

Symbol	Parameter	FDPF085N10A	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	4.5	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	62.5	

Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FDPF085N10A	FDPF085N10A	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	$I_D = 250 \mu\text{A}, V_{GS} = 0 \text{ V}$	100	-	-	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250 \mu\text{A}$, Referenced to 25°C	-	0.07	-	V/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 80 \text{ V}, V_{GS} = 0 \text{ V}$ $V_{DS} = 80 \text{ V}, T_C = 150^\circ\text{C}$	-	-	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	$V_{GS} = 10 \text{ V}, I_D = 96 \text{ A}$	-	6.5	8.5	m Ω
g_{FS}	Forward Transconductance	$V_{DS} = 10 \text{ V}, I_D = 96 \text{ A}$	-	76	-	S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 50 \text{ V}, V_{GS} = 0 \text{ V},$ $f = 1 \text{ MHz}$	-	2025	2695	pF
C_{oss}	Output Capacitance		-	468	620	pF
C_{rss}	Reverse Transfer Capacitance		-	20	-	pF
$C_{oss(er)}$	Energy Related Output Capacitance	$V_{DS} = 50 \text{ V}, V_{GS} = 0 \text{ V}$	-	752	-	pF
$Q_{g(tot)}$	Total Gate Charge at 10V	$V_{GS} = 10 \text{ V}, V_{DS} = 50 \text{ V},$ $I_D = 96 \text{ A}$	-	31	40	nC
Q_{gs}	Gate to Source Gate Charge		-	9.7	-	nC
Q_{gs2}	Gate Charge Threshold to Plateau		-	5.0	-	nC
Q_{gd}	Gate to Drain "Miller" Charge		(Note 4)	-	7.5	-
ESR	Equivalent Series Resistance (G-S)	$f = 1 \text{ MHz}$	-	0.97	-	Ω

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 50 \text{ V}, I_D = 96 \text{ A},$ $V_{GS} = 10 \text{ V}, R_G = 4.7 \Omega$	-	18	46	ns
t_r	Turn-On Rise Time		-	22	54	ns
$t_{d(off)}$	Turn-Off Delay Time		-	29	68	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	-	-	40	A	
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current	-	-	160	A	
V_{SD}	Drain to Source Diode Forward Voltage	$V_{GS} = 0 \text{ V}, I_{SD} = 96 \text{ A}$	-	-	1.3	V
t_{rr}	Reverse Recovery Time	$V_{DD} = 50 \text{ V}, V_{GS} = 0 \text{ V}, I_{SD} = 96 \text{ A},$ $di_F/dt = 100 \text{ A}/\mu\text{s}$	-	59	-	ns
Q_{rr}	Reverse Recovery Charge		-	80	-	nC

Notes:

1. Repetitive rating; pulse-width limited by maximum junction temperature.
2. $L = 3 \text{ mH}, I_{AS} = 13.4 \text{ A}, R_G = 25 \Omega$, starting $T_J = 25^\circ\text{C}$.
3. $I_{SD} \leq 40 \text{ A}, di/dt \leq 200 \text{ A}/\mu\text{s}, V_{DD} \leq BV_{DSS}$, starting $T_J = 25^\circ\text{C}$.
4. Essentially independent of operating temperature typical characteristics.

Typical Performance Characteristics

Figure 1. On-Region Characteristics

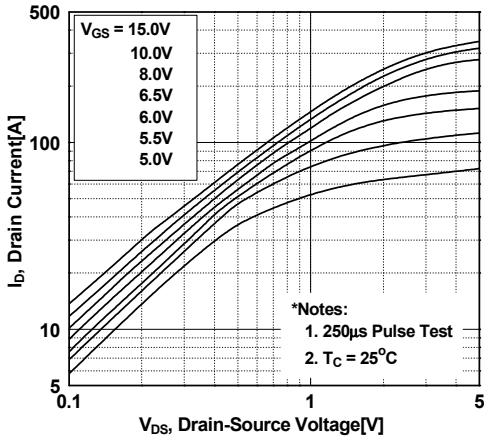


Figure 2. Transfer Characteristics

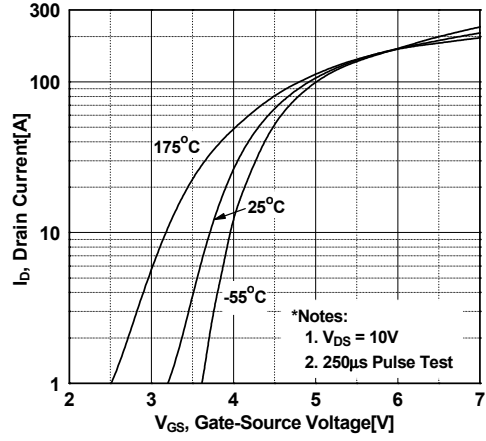


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

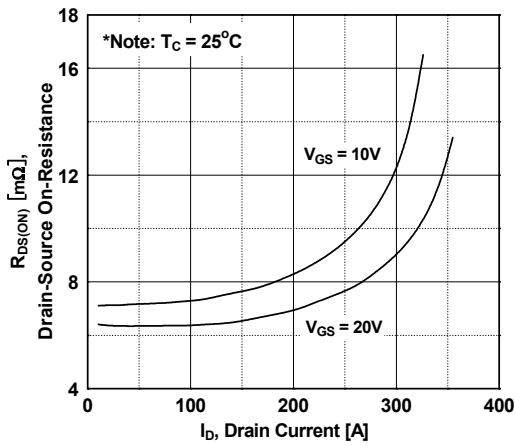


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

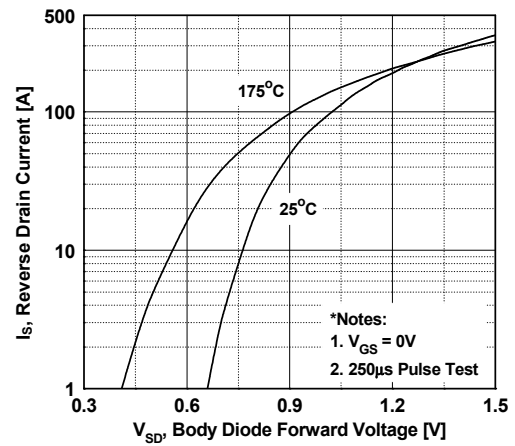


Figure 5. Capacitance Characteristics

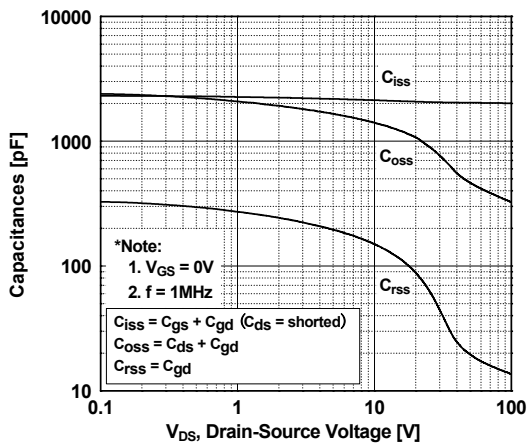
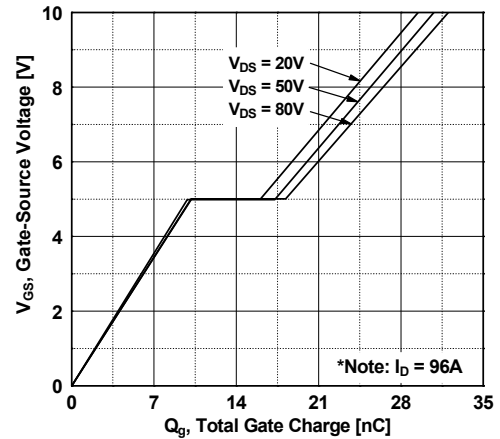


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

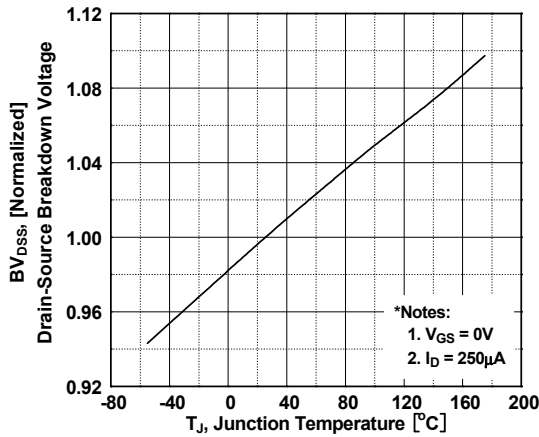


Figure 8. On-Resistance Variation vs. Temperature

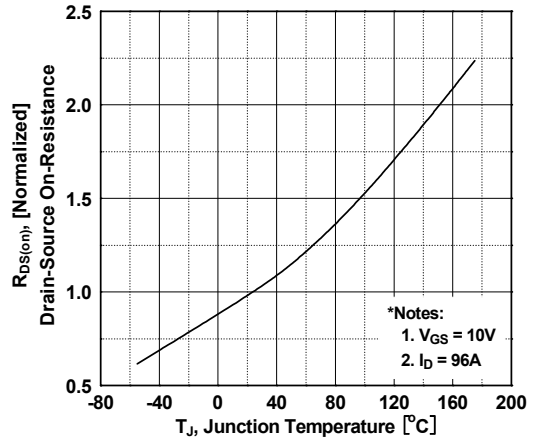


Figure 9. Maximum Safe Operating Area

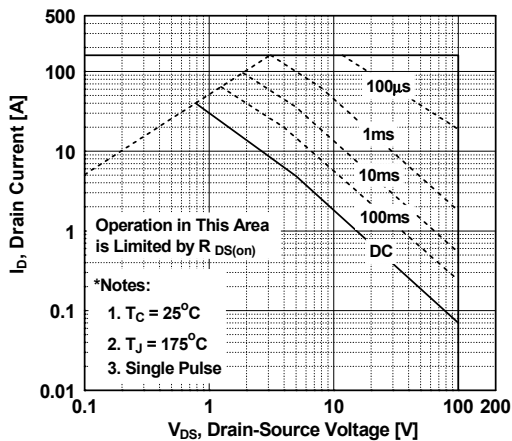


Figure 10. Maximum Drain Current vs. Case Temperature

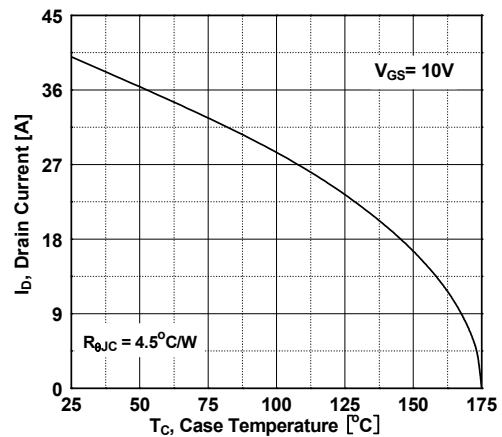


Figure 11. E_oss vs. Drain to Source Voltage

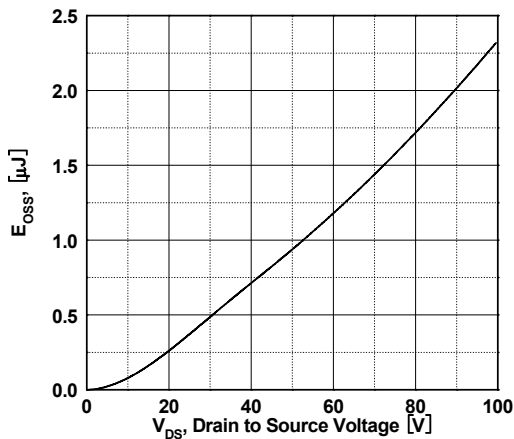
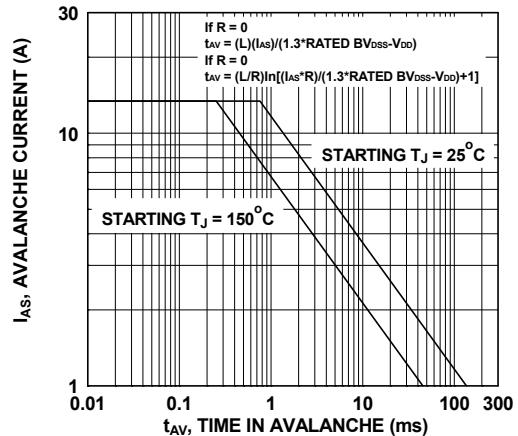
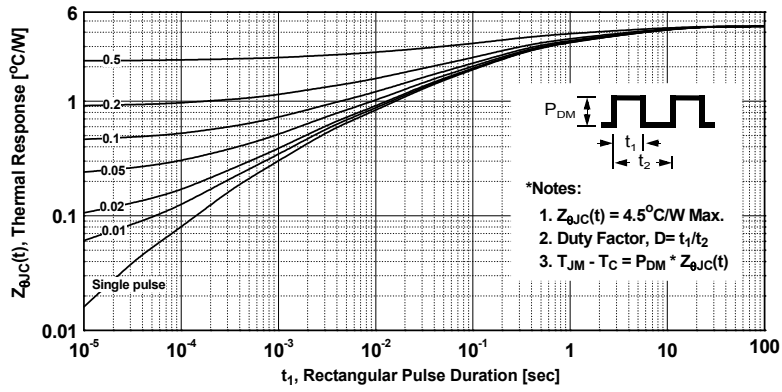


Figure 12. Unclamped Inductive Switching Capability



Typical Performance Characteristics (Continued)

Figure 13. Transient Thermal Response Curve



FDPF085N10A — N-Channel PowerTrench[®] MOSFET

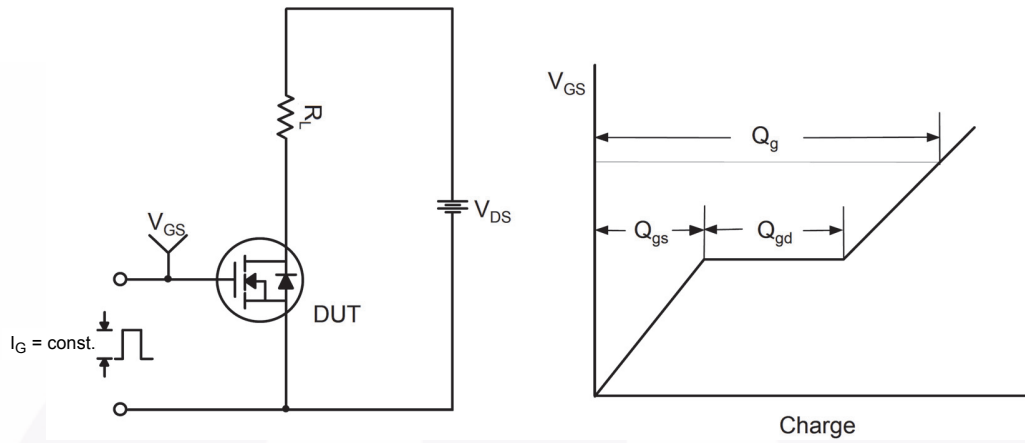


Figure 14. Gate Charge Test Circuit & Waveform

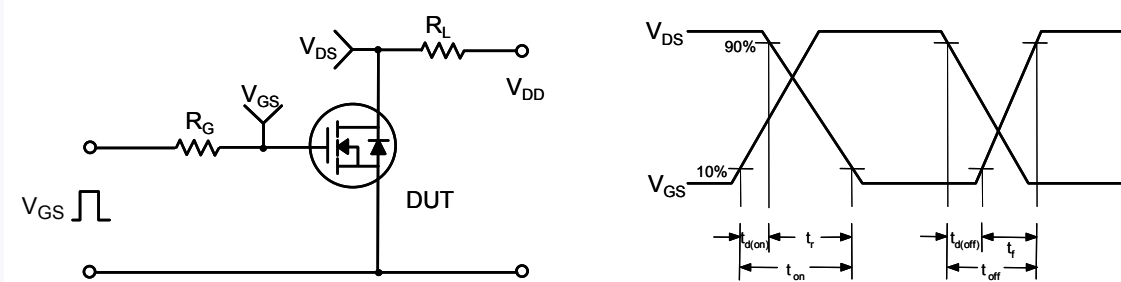


Figure 15. Resistive Switching Test Circuit & Waveforms

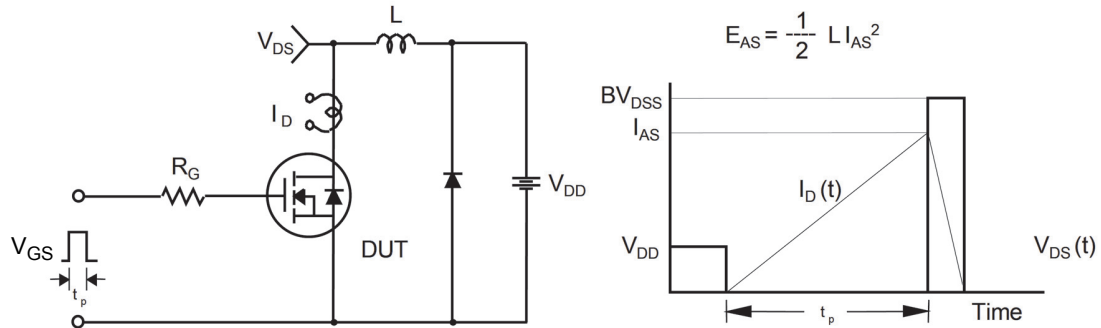


Figure 16. Unclamped Inductive Switching Test Circuit & Waveforms

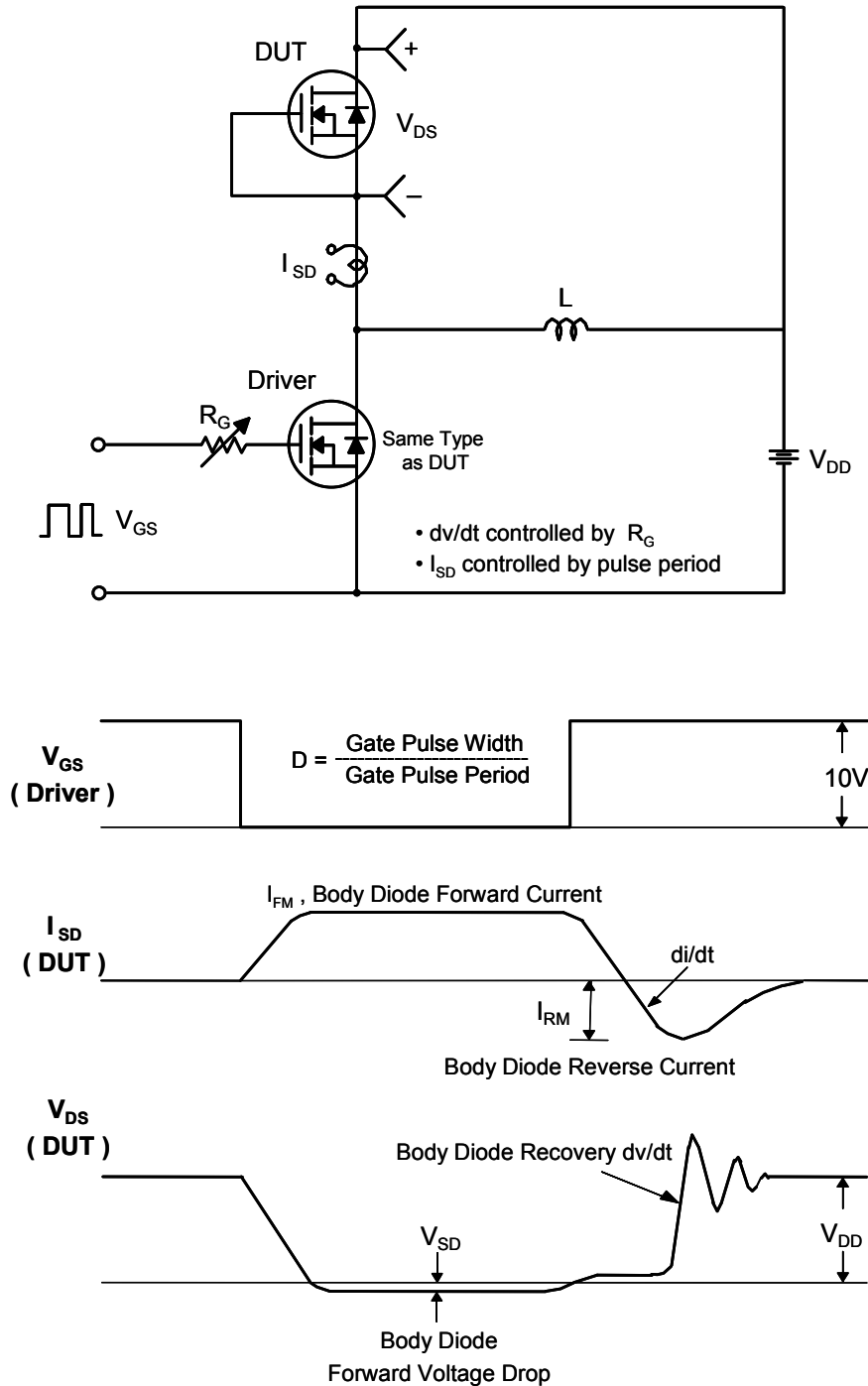
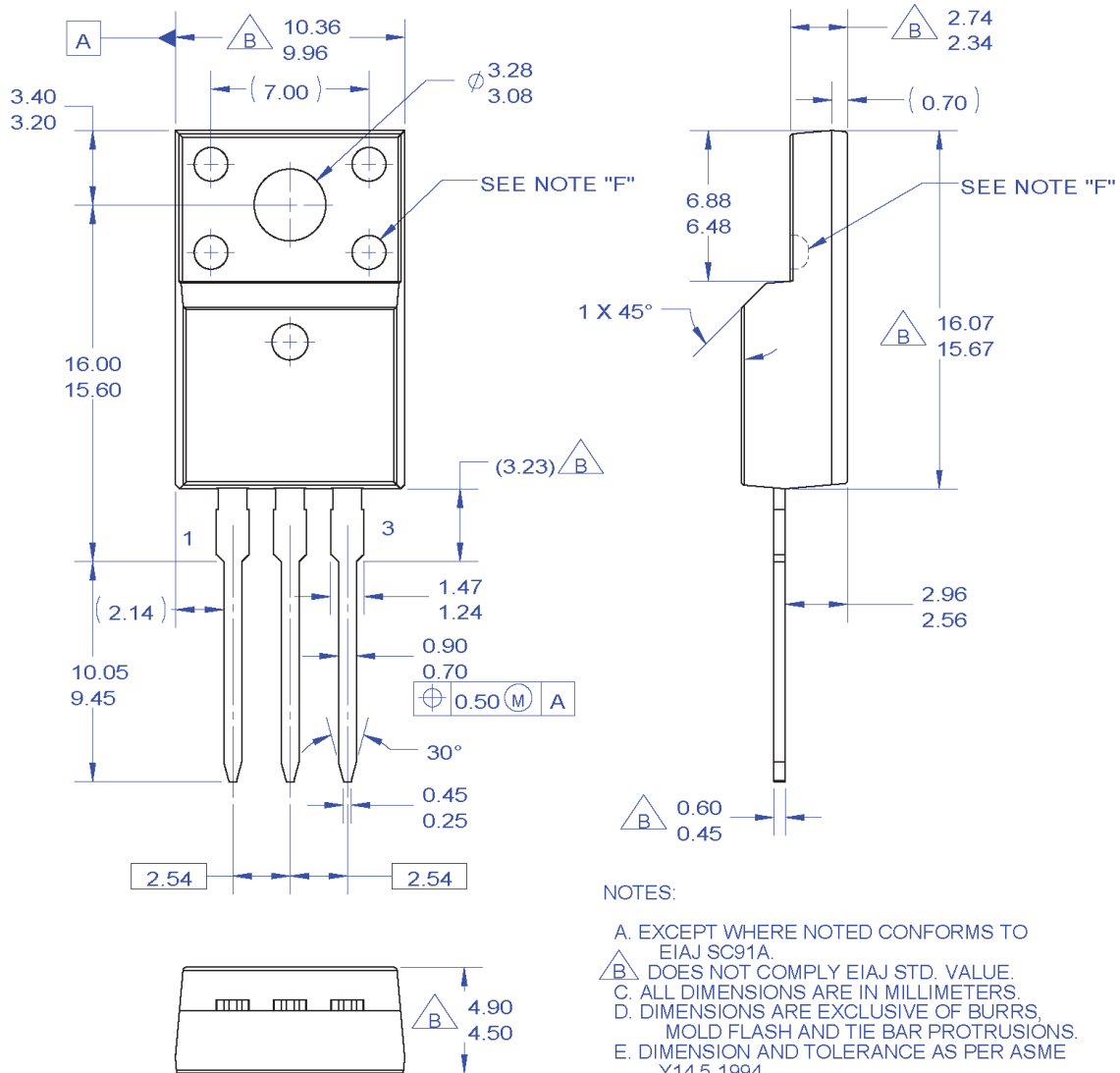


Figure 17. Peak Diode Recovery dv/dt Test Circuit & Waveforms

Mechanical Dimensions



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

Figure 18. TO220, Molded, 3-Lead, Full Pack, EIAJ SC91, Straight Lead

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Preliminary	First Production	Datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
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