FAIRCHILD SEMICONDUCTOR®

November 2013

FDPF085N10A

N-Channel PowerTrench® MOSFET

100 V, 40 A, 8.5 mΩ

Features

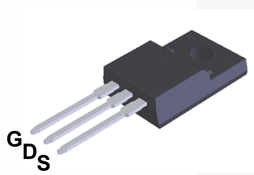
- $R_{DS(on)}$ = 6.5 mΩ (Typ.) @ V_{GS} = 10 V, I_D = 40 A
- Fast Switching Speed
- Low Gate Charge, Q_G = 31 nC (Typ.)
- High Performance Trench Technology for Extremely Low $R_{DS(on)}$
- High Power and Current Handling Capability
- RoHS Compliant

Description

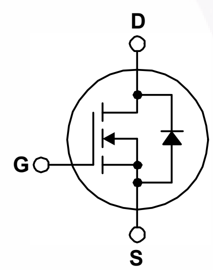
This N-Channel MOSFET is produced using Fairchild Semiconductor's advanced PowerTrench® process that has been tailored to minimize the on-state resistance while maintaining superior switching performance.

Applications

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



TO-220F



Absolute Maximum Ratings T_C = 25°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°C)	40	A
		- Continuous (T_C = 100°C)	28	
I_{DM}	Drain Current	- Pulsed (Note 1)	160	A
E_{AS}	Single Pulsed Avalanche Energy (Note 2)		269	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)		6.0	V/ns
P_D	Power Dissipation	(T_C = 25°C)	33.3	W
		- Derate Above 25°C	0.22	W/°C
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to +175	°C
T_L	Maximum Lead Temperature for Soldering, 1/8" from Case for 5 Seconds		300	°C

Thermal Characteristics

Symbol	Parameter	FDPF085N10A	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	4.5	°C/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°C unless otherwise noted.

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Off Characteristics						
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 250 μA, V_{GS} = 0 V	100	-	-	V
ΔBV_{DSS} / ΔT_J	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, Referenced to 25°C	-	0.07	-	V/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 80 V, V_{GS} = 0 V	-	-	1	μA
		V_{DS} = 80 V, T_C = 150°C	-	-	500	
I_{GSS}	Gate to Body Leakage Current	V_{GS} = ±20 V, V_{DS} = 0 V	-	-	±100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS} = V_{DS}, I_D = 250 μA	2.0	-	4.0	V
$R_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10 V, I_D = 96 A	-	6.5	8.5	mΩ
g_{FS}	Forward Transconductance	V_{DS} = 10 V, I_D = 96 A	-	76	-	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 50 V, V_{GS} = 0 V, f = 1 MHz	-	2025	2695	pF
C_{oss}	Output Capacitance		-	468	620	pF
C_{rss}	Reverse Transfer Capacitance		-	20	-	pF
C_{oss}(er)	Engry Related Output Capacitance	V_{DS} = 50 V, V_{GS} = 0 V	-	752	-	pF
$Q_{g(tot)}$	Total Gate Charge at 10V	V_{GS} = 10 V, V_{DS} = 50 V, I_D = 96 A (Note 4)	-	31	40	nC
Q_{gs}	Gate to Source Gate Charge		-	9.7	-	nC
Q_{gs2}	Gate Charge Threshoid to Plateau		-	5.0	-	nC
Q_{gd}	Gate to Drain "Miller" Charge		-	7.5	-	nC
ESR	Equivalent Series Resistance (G-S)	f = 1 MHz	-	0.97	-	Ω
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 50 V, I_D = 96 A, V_{GS} = 10 V, R_G = 4.7 Ω (Note 4)	-	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		-	8	26	ns
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 V, I_{SD} = 96 A	-	-	1.3	V
t_{rr}	Reverse Recovery Time	V_{DD} = 50 V, V_{GS} = 0 V, I_{SD} = 96 A, dI_F/dt = 100 A/μs	-	59	-	ns
Q_{rr}	Reverse Recovery Charge		-	80	-	nC

Notes:
1. Repetitive rating: pulse-width limited by maximum junction temperature.
2. L = 3 mH, I_{AS} = 13.4 A, R_G = 25 Ω, starting T_J = 25°C.
3. I_{SD} ≤ 40 A, di/dt ≤ 200 A/μs, V_{DD} ≤ BV_{DSS}, starting T_J = 25°C.
4. Essentially independent of operating temperature typical characteristics.

Typical Performance Characteristics

Figure 1. On-Region Characteristics

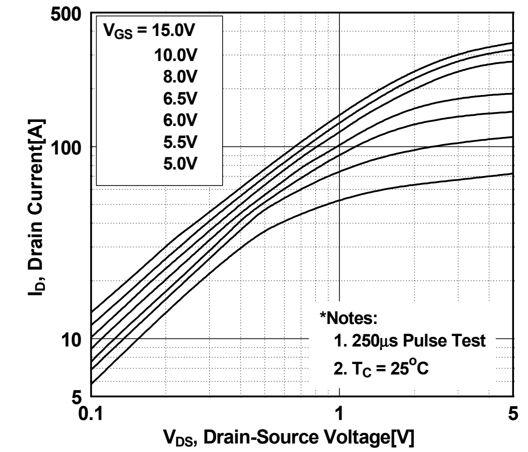


Figure 2. Transfer Characteristics

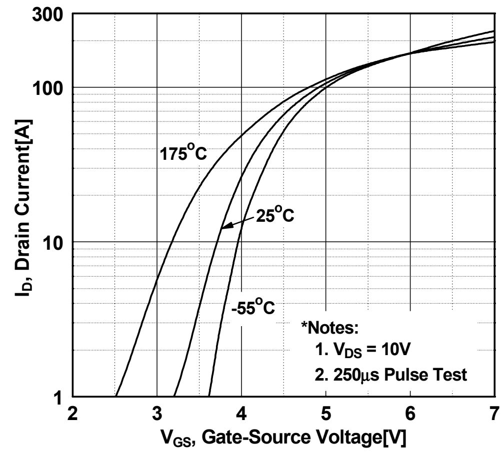


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

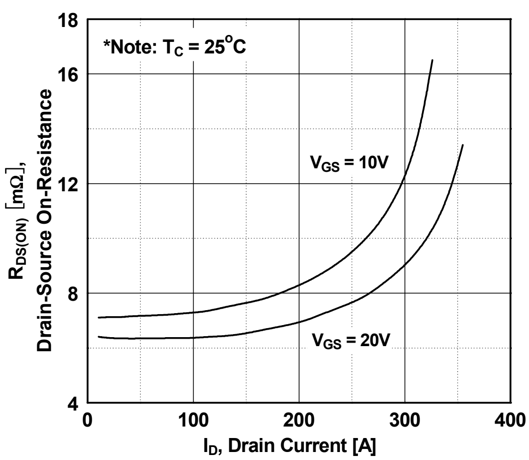


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

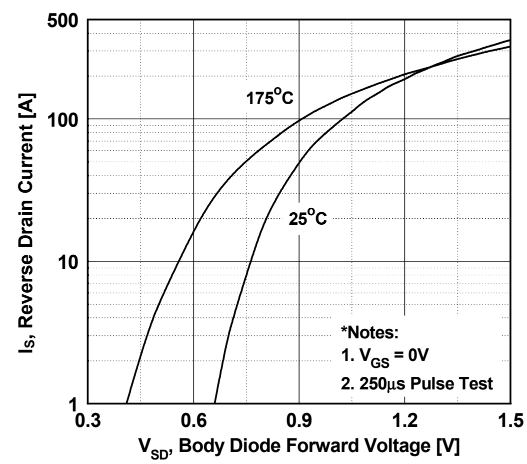


Figure 5. Capacitance Characteristics

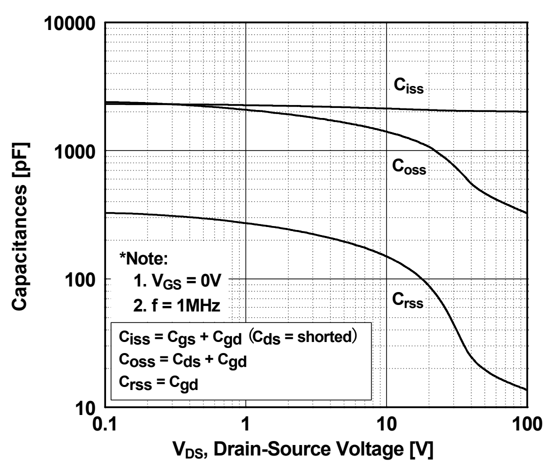
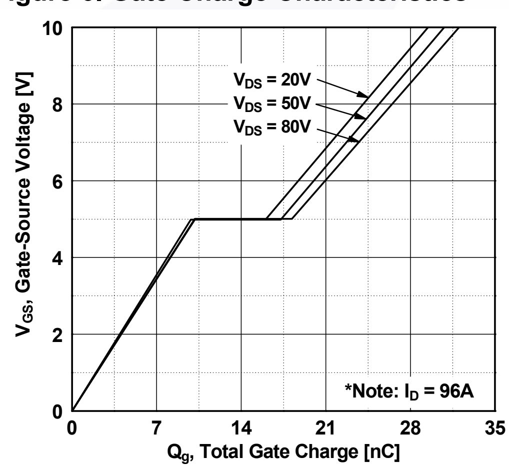


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

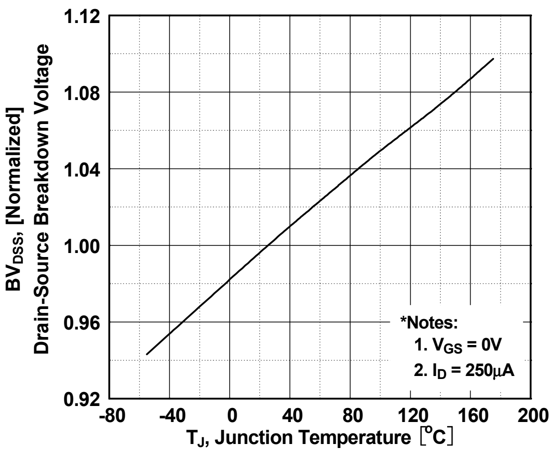


Figure 8. On-Resistance Variation vs. Temperature

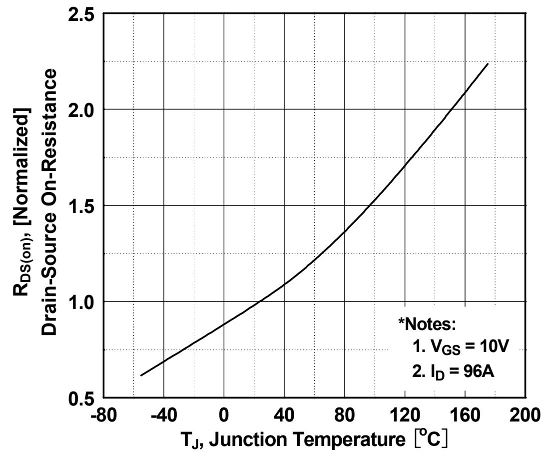


Figure 9. Maximum Safe Operating Area

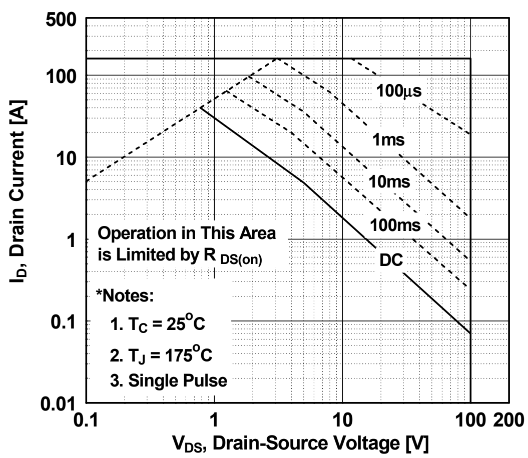


Figure 10. Maximum Drain Current vs. Case Temperature

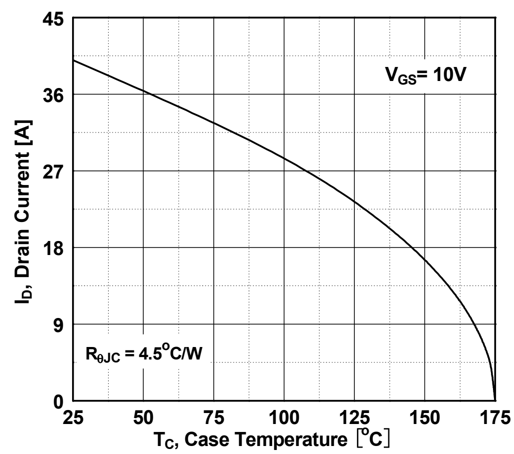


Figure 11. Eoss vs. Drain to Source Voltage

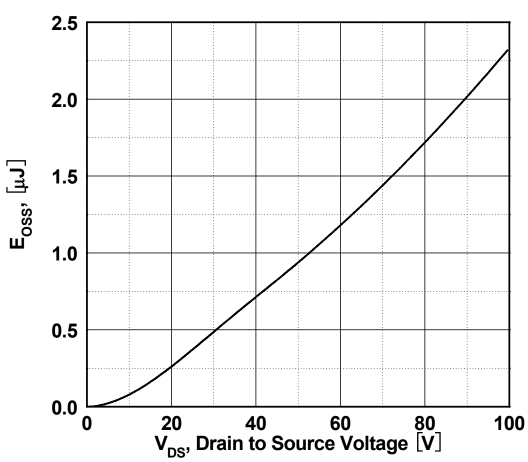
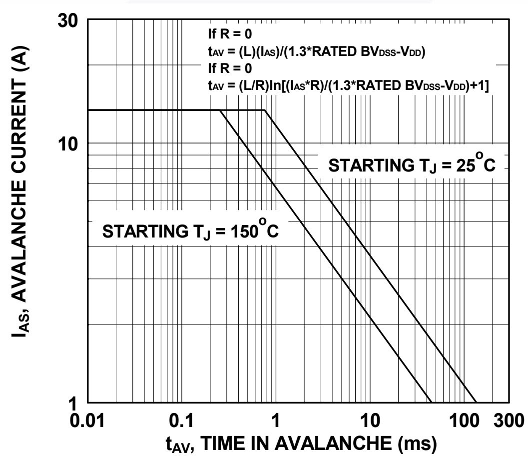
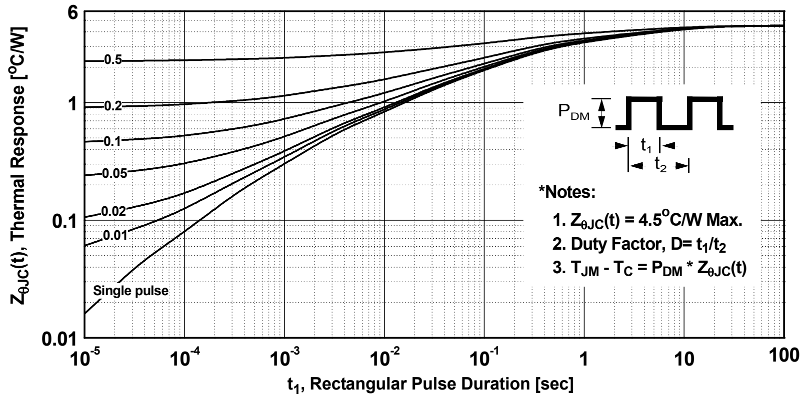


Figure 12. Unclamped Inductive Switching Capability



Typical Performance Characteristics (Continued)

Figure 13. Transient Thermal Response Curve



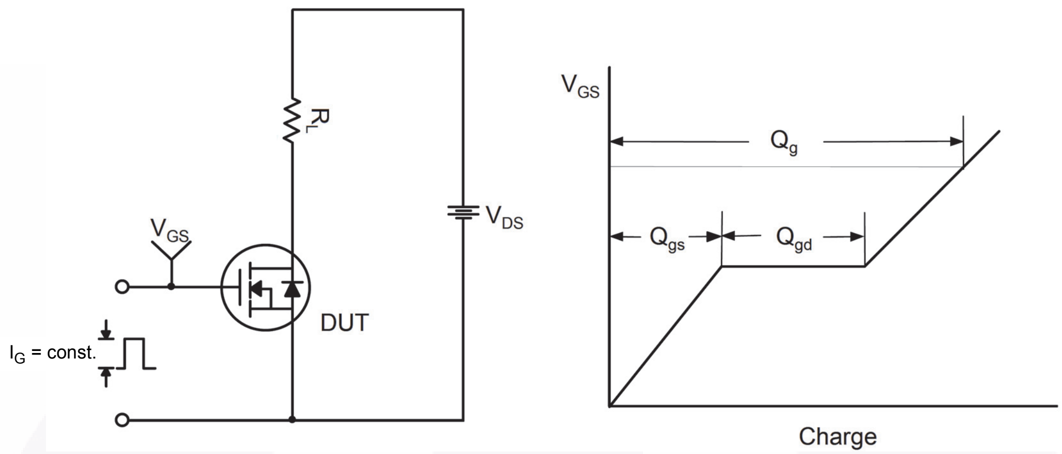


Figure 14. Gate Charge Test Circuit & Waveform

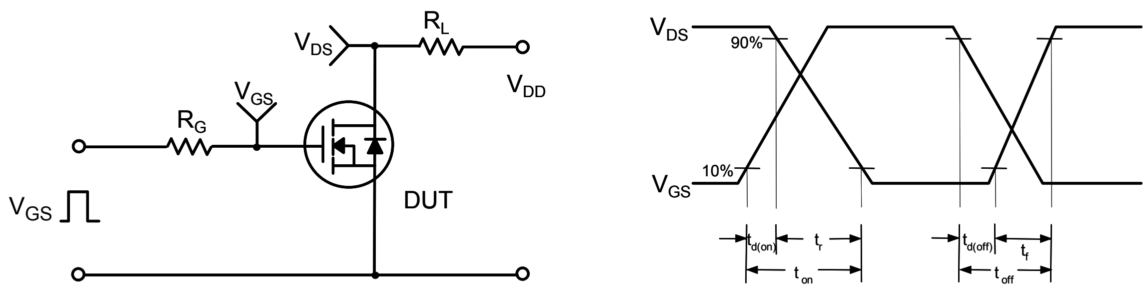


Figure 15. Resistive Switching Test Circuit & Waveforms

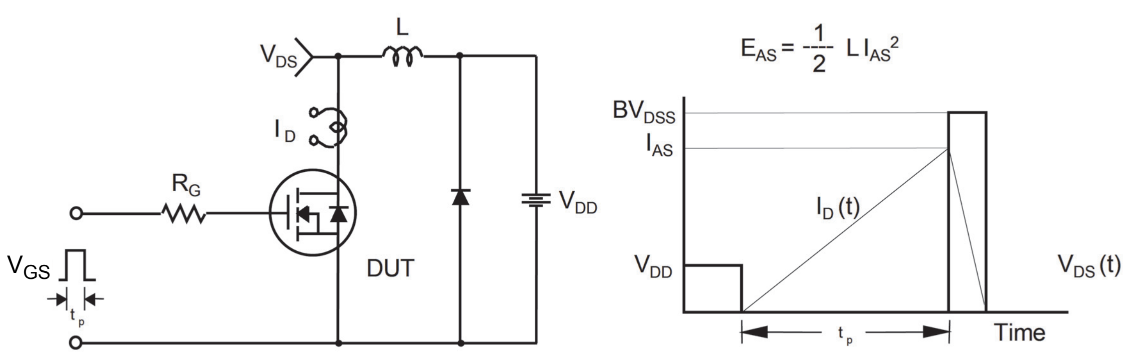


Figure 16. Unclamped Inductive Switching Test Circuit & Waveforms

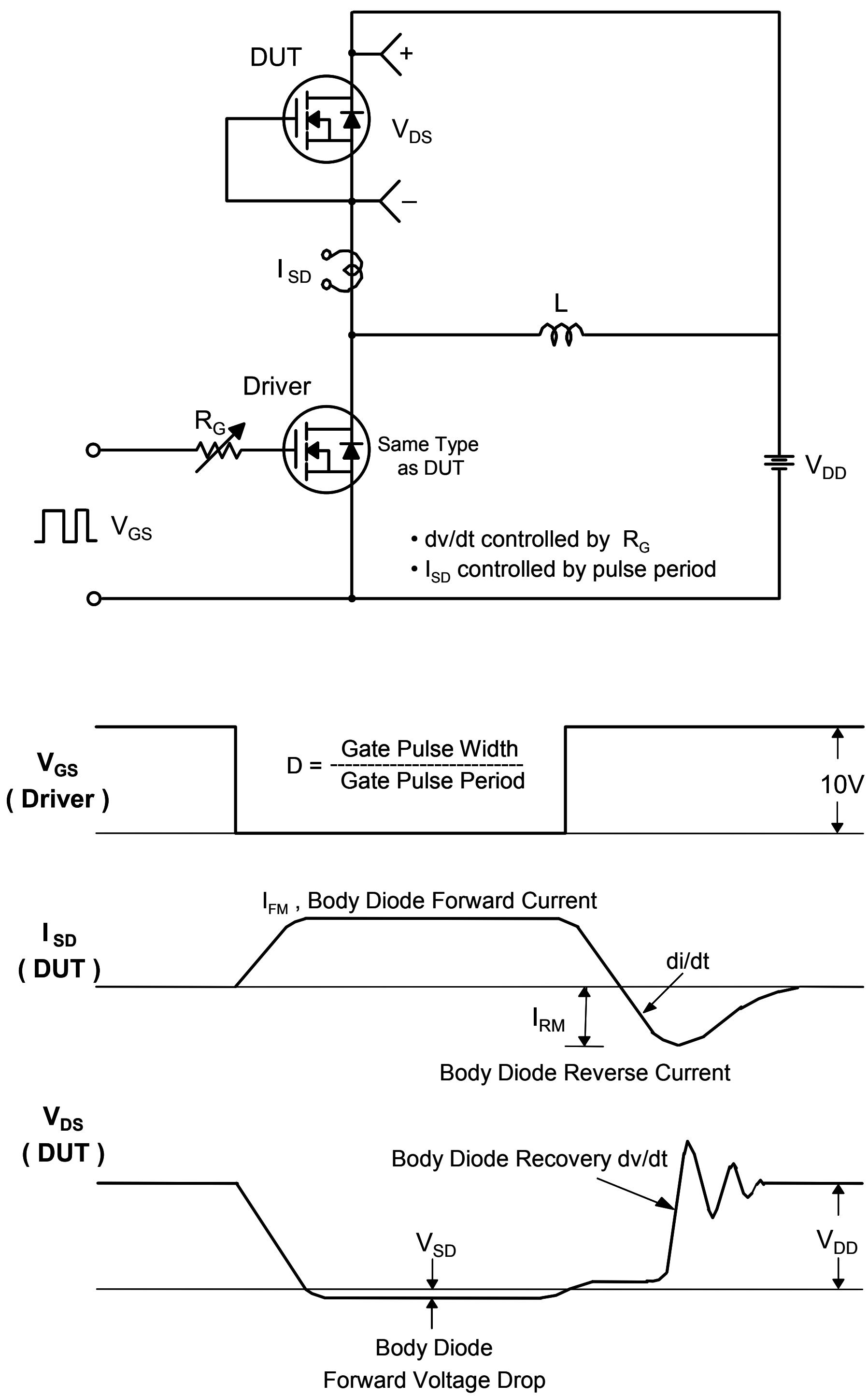


Figure 17. Peak Diode Recovery dv/dt Test Circuit & Waveforms

Mechanical Dimensions

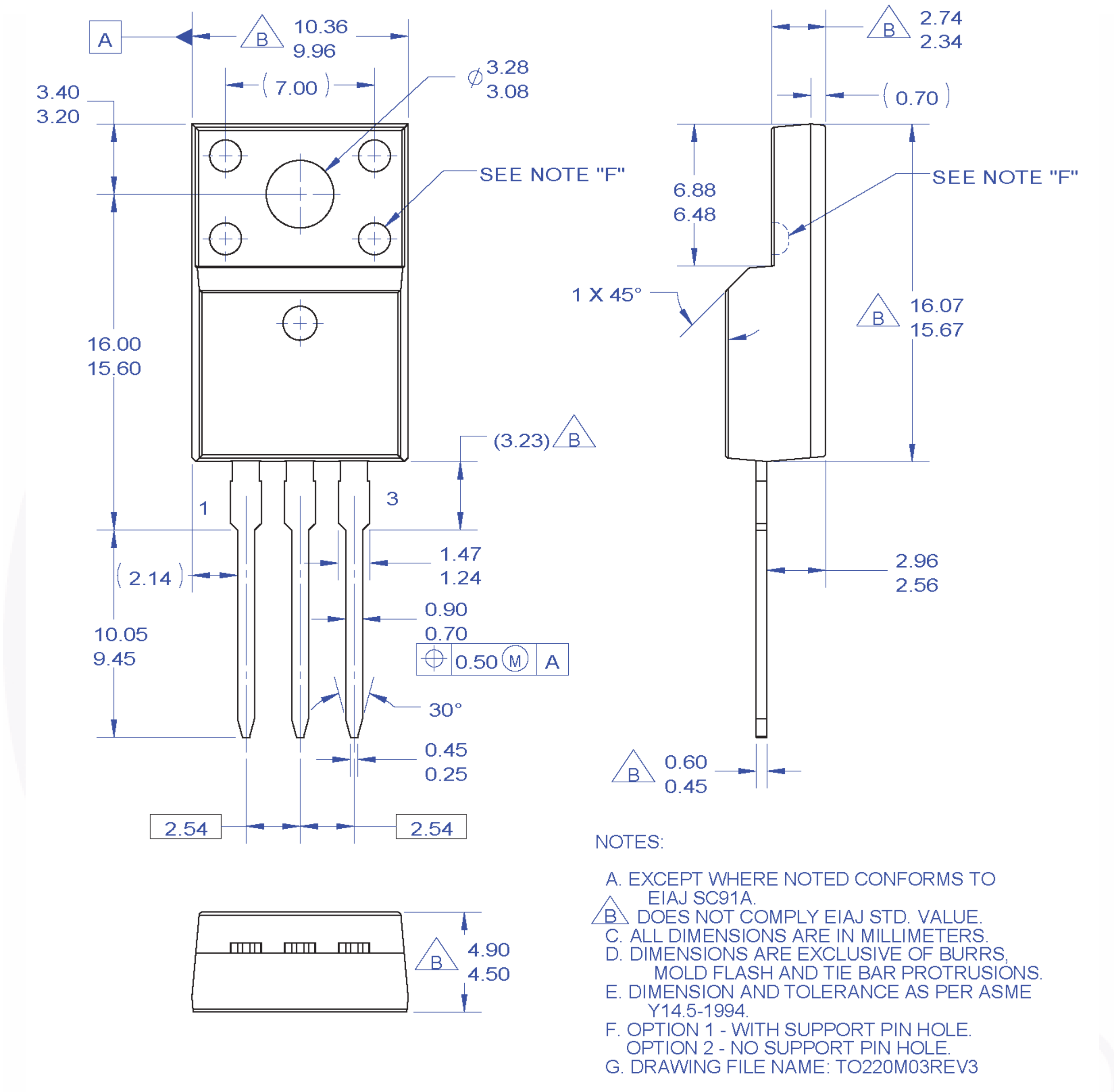


Figure 18. TO220, Molded, 3-Lead, Full Pack, EIAJ SC91, Straight Lead

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