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August 2014

FDPF045N10A

N-Channel PowerTrench[®] MOSFET

100 V, 67 A, 4.5 mΩ

Features

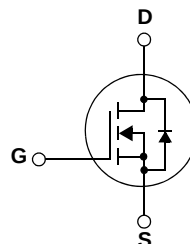
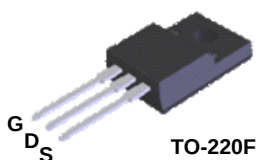
- $R_{DS(on)} = 3.7 \text{ m}\Omega$ (Typ.) @ $V_{GS} = 10 \text{ V}$, $I_D = 67 \text{ A}$
- Fast Switching Speed
- Low Gate Charge, $Q_G = 57 \text{ nC}$ (Typ.)
- High Performance Trench Technology for Extremely Low $R_{DS(on)}$
- High Power and Current Handling Capability
- RoHS Compliant

Description

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

Applications

- Synchronous Rectification for ATX / Server / Telecom PSU
- Motor drives and Uninterruptible Power Supplies
- Micro Solar Inverter



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

Symbol	Parameter		FDPF045N10A	Unit
V_{DSS}	Drain to Source Voltage		100	V
V_{GSS}	Gate to Source Voltage		± 20	V
I_D	Drain Current	- Continuous ($T_C = 25^\circ\text{C}$)	67	A
		- Continuous ($T_C = 100^\circ\text{C}$)	47	
I_{DM}	Drain Current	- Pulsed (Note 1)	268	A
E_{AS}	Single Pulsed Avalanche Energy (Note 2)		637	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)		6.0	V/ns
P_D	Power Dissipation	($T_C = 25^\circ\text{C}$)	43	W
		- Derate above 25°C	0.29	W/ $^\circ\text{C}$
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	FDPF045N10A	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	3.5	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	62.5	

Package Marking and Ordering Information

Device Marking	Device	Package	Packing Method	Reel Size	Tape Width	Quantity
FDPF045N10A	FDPF045N10A	TO-220F	Tube	-	-	50

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
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\mu\text{A}$, Referenced to 25°C	-	0.06	-	$\text{V}/^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 80\text{V}$, $V_{GS} = 0\text{V}$	-	-	1	μA
		$V_{DS} = 80\text{V}$, $T_C = 150^\circ\text{C}$	-	-	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	$V_{GS} = 10\text{V}$, $I_D = 67\text{A}$	-	3.7	4.5	$\text{m}\Omega$
g_{FS}	Forward Transconductance	$V_{DS} = 10\text{V}$, $I_D = 67\text{A}$	-	127	-	S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 50\text{V}$, $V_{GS} = 0\text{V}$ $f = 1\text{MHz}$	-	3961	5270	pF
C_{oss}	Output Capacitance		-	925	1230	pF
C_{rss}	Reverse Transfer Capacitance		-	34	-	pF
$C_{oss(er)}$	Energy Related Output Capacitance	$V_{DS} = 50\text{V}$, $V_{GS} = 0\text{V}$	-	1521	-	pF
$Q_{g(tot)}$	Total Gate Charge at 10V	$V_{GS} = 10\text{V}$, $V_{DS} = 50\text{V}$ $I_D = 100\text{A}$	-	57	74	nC
Q_{gs}	Gate to Source Gate Charge		-	17	-	nC
Q_{gs2}	Gate Charge Threshold to Plateau		-	8	-	nC
Q_{gd}	Gate to Drain "Miller" Charge		-	13	-	nC
ESR	Equivalent Series Resistance (G-S)	$f = 1\text{MHz}$	-	1.9	-	Ω

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 50\text{V}$, $I_D = 100\text{A}$ $V_{GS} = 10\text{V}$, $R_{GEN} = 4.7\Omega$ (Note 4)	-	23	56	ns
t_r	Turn-On Rise Time		-	26	62	ns
$t_{d(off)}$	Turn-Off Delay Time		-	50	110	ns
t_f	Turn-Off Fall Time		-	15	40	ns

Drain-Source Diode Characteristics

I _S	Maximum Continuous Drain to Source Diode Forward Current	-	-	67	A	
I _{SM}	Maximum Pulsed Drain to Source Diode Forward Current	-	-	268	A	
V _{SD}	Drain to Source Diode Forward Voltage	V _{GS} = 0V, I _{SD} = 67A	-	-	1.3	V
t _{rr}	Reverse Recovery Time	V _{GS} = 0V, V _{DD} = 50V, I _{SD} = 100A	-	75	-	ns
Q _{rr}	Reverse Recovery Charge	dI _F /dt = 100A/μs	-	120	-	nC

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. $L = 3\text{mH}$, $I_{AS} = 20.6\text{A}$, $R_G = 25\Omega$, Starting $T_J = 25^\circ\text{C}$
3. $I_{SD} \leq 100\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$
4. Essentially Independent of Operating Temperature Typical Characteristics

Typical Performance Characteristics

Figure 1. On-Region Characteristics

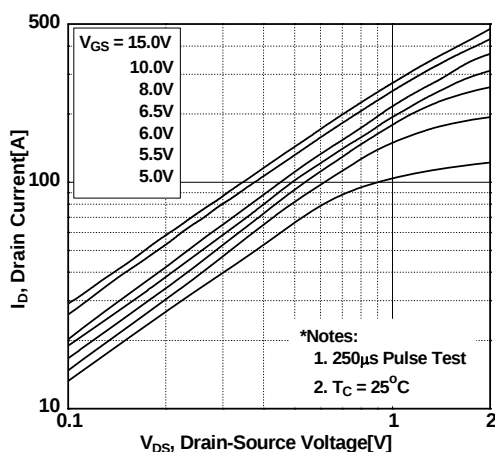


Figure 2. Transfer Characteristics

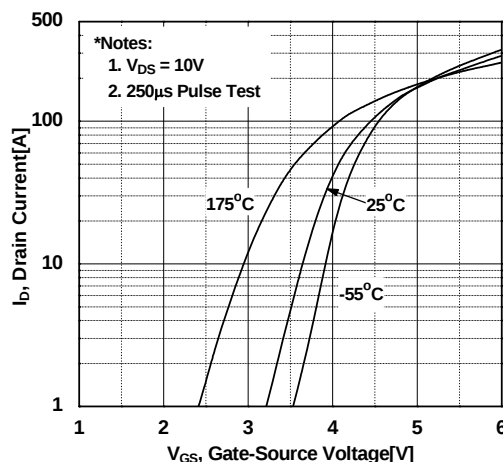


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

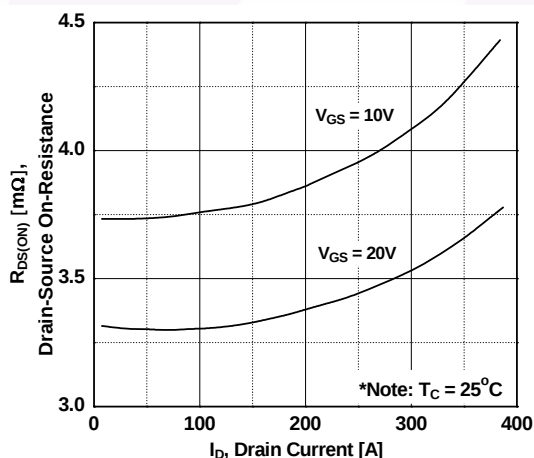


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

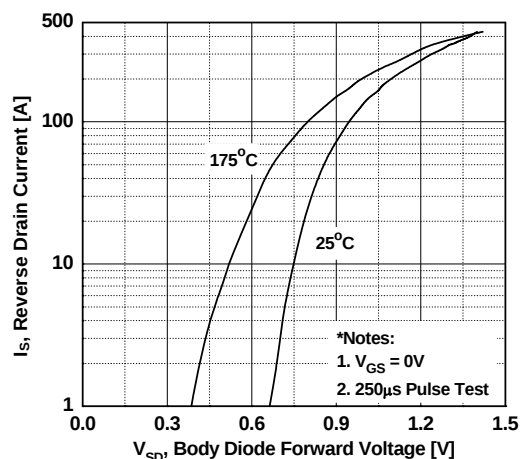


Figure 5. Capacitance Characteristics

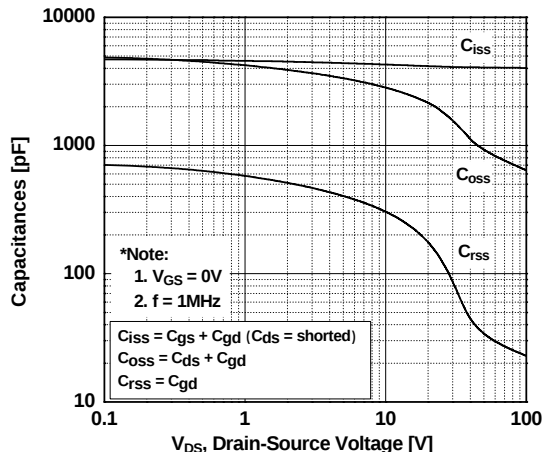
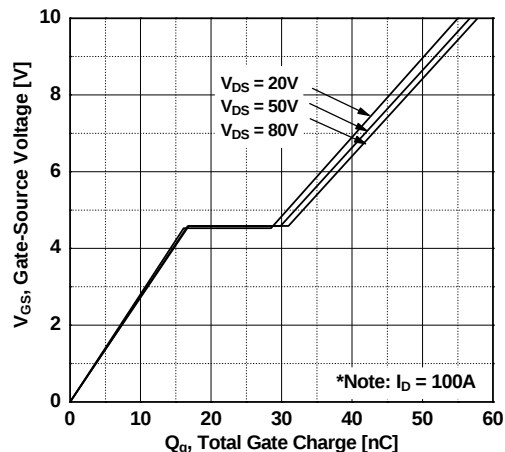


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

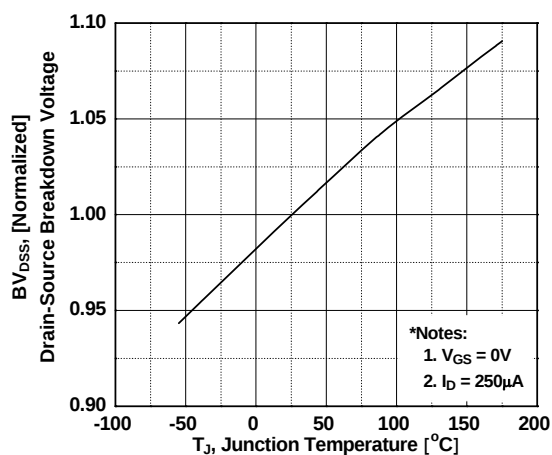


Figure 8. On-Resistance Variation vs. Temperature

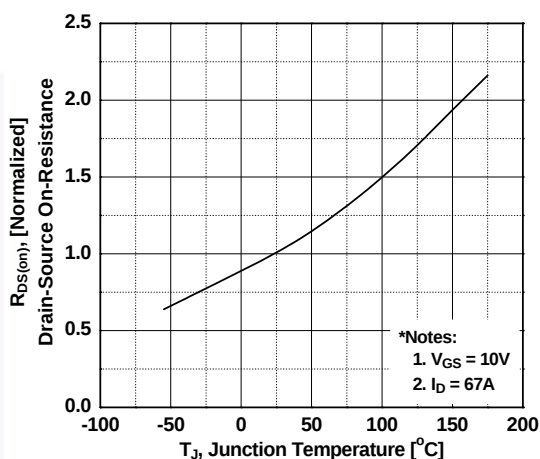


Figure 9. Maximum Safe Operating Area vs. Case Temperature

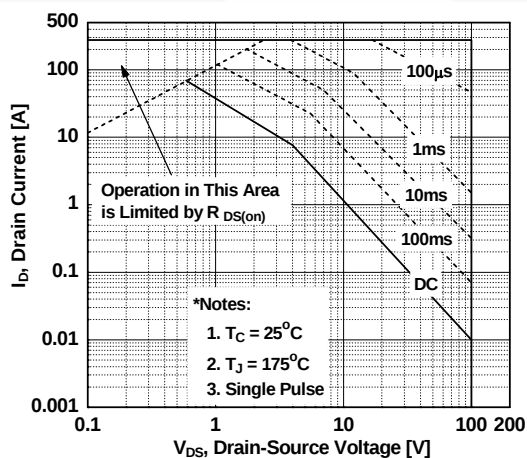


Figure 10. Maximum Drain Current

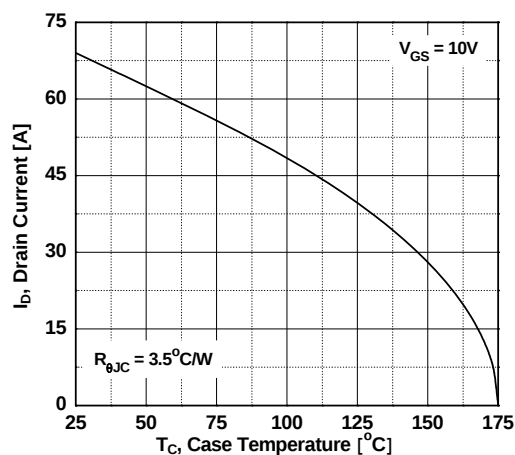
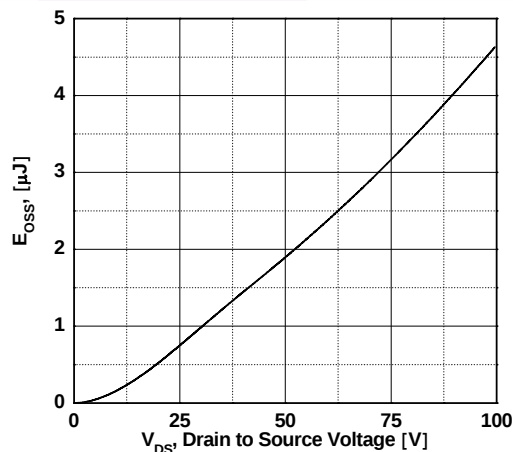
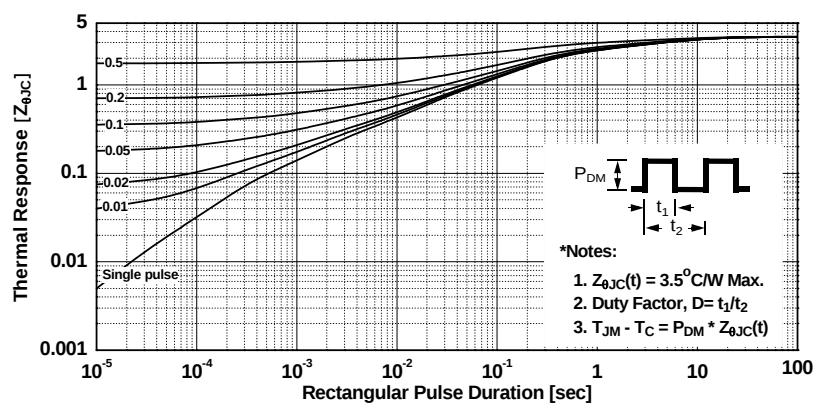


Figure 11. Eoss vs. Drain to Source Voltage



Typical Performance Characteristics (Continued)

Figure 12. Transient Thermal Response Curve



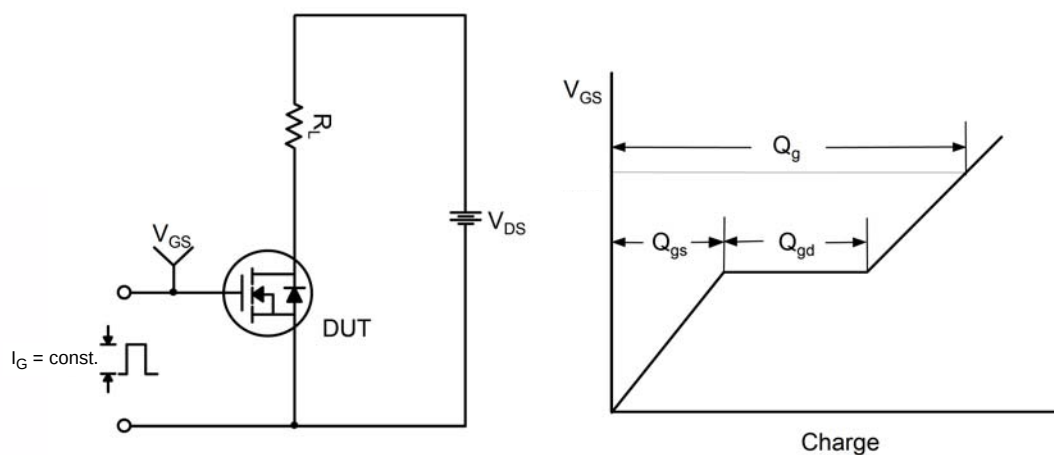


Figure 13. Gate Charge Test Circuit & Waveform

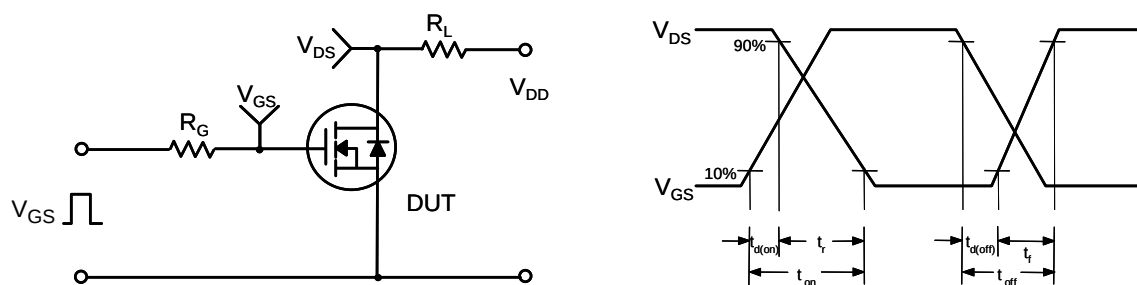


Figure 14. Resistive Switching Test Circuit & Waveforms

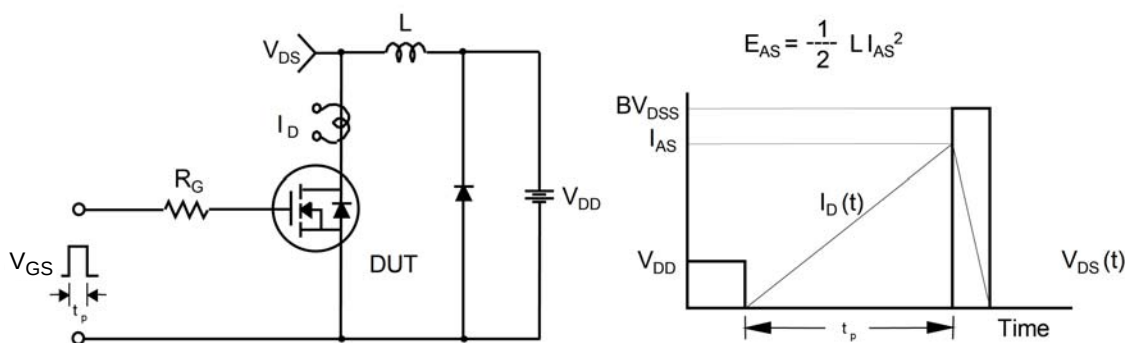


Figure 15. Unclamped Inductive Switching Test Circuit & Waveforms

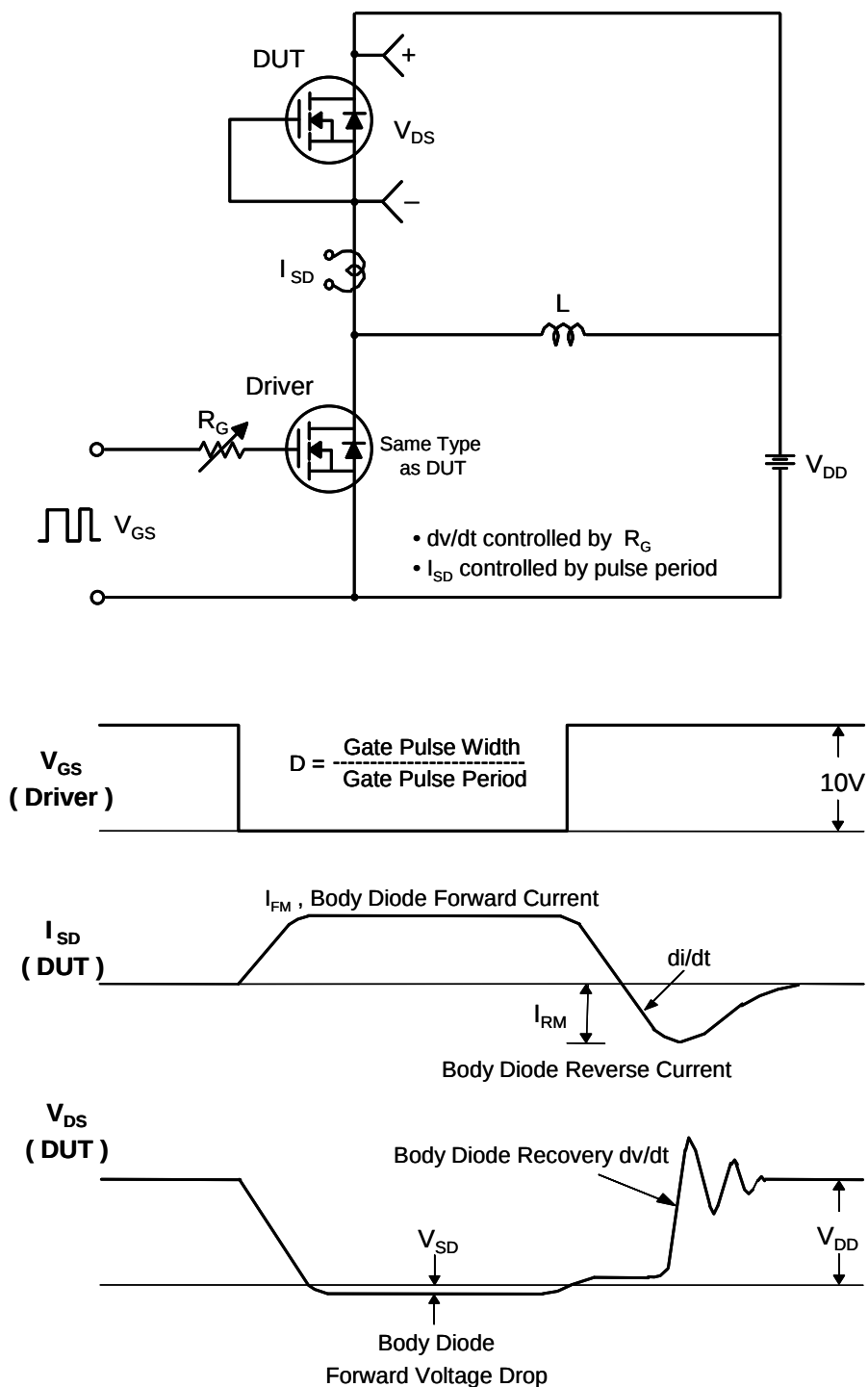


Figure 16. Unclamped Inductive Switching Test Circuit & Waveforms

Mechanical Dimensions

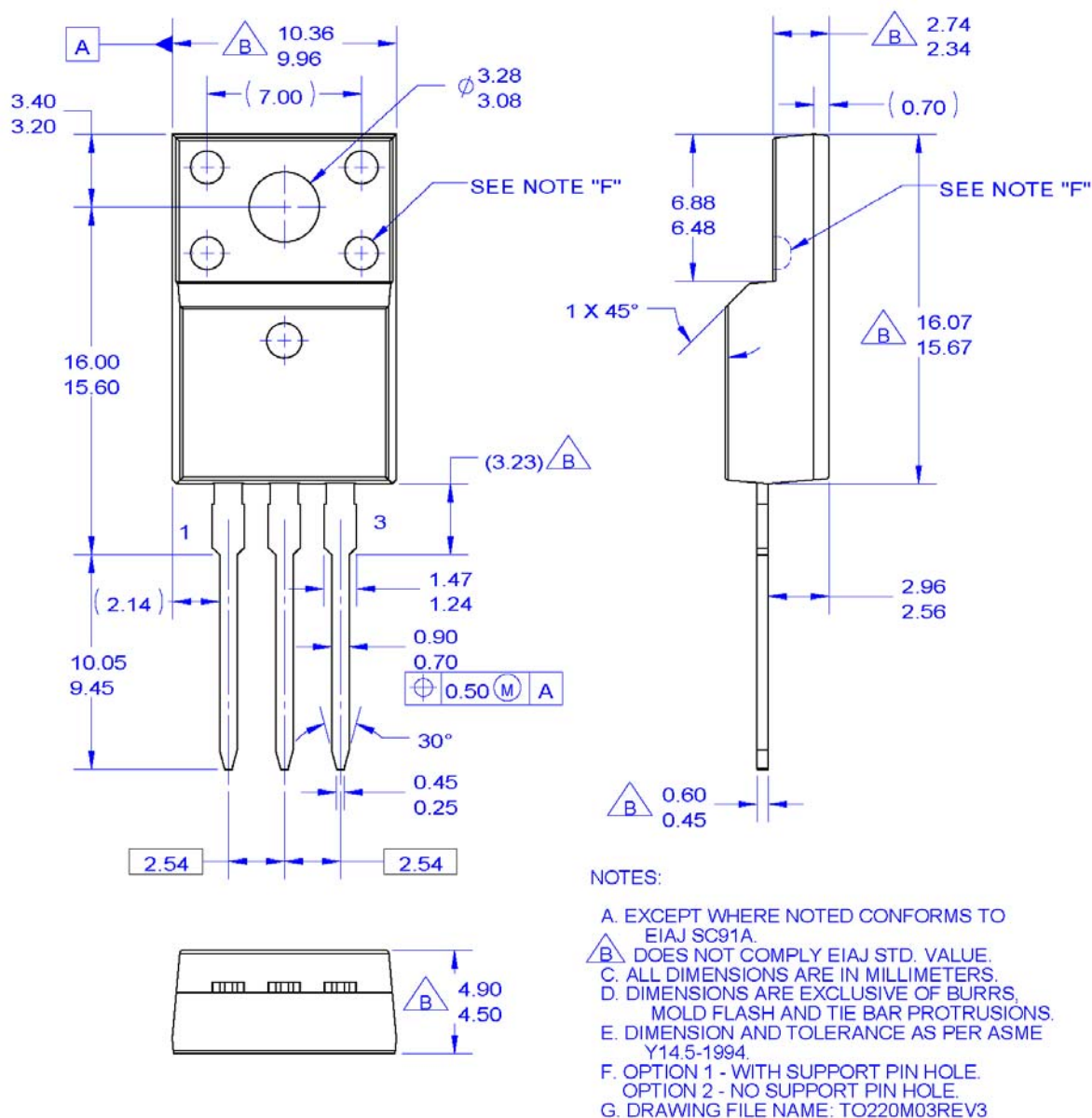


Figure 17. TO220, Molded, 3-Lead, Full Pack, EIAJ SC91, Straight Lead

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