

MOSFET – N-Channel, POWER TRENCH®

150 V, 27.4 A, 19 mΩ

FDPF190N15A

Description

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

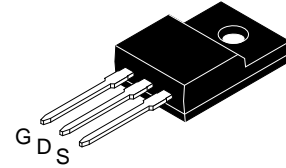
Features

- $R_{DS(on)} = 14.7 \text{ m}\Omega$ (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

Applications

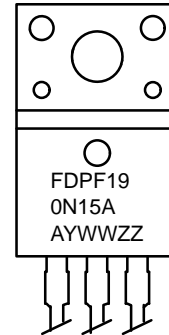
- Consumer Appliances
- LED TV
- Synchronous Rectification for ATX / Server / Telecom PSU
- Uninterruptible Power Supply
- Micro Solar Inverter

V_{DSS}	$R_{DS(on)}$ MAX	I_D MAX
150 V	19 mΩ @ 10 V	27.5 A



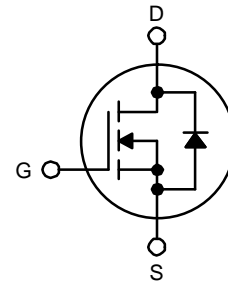
TO-220 Fullpack, 3-Lead / TO-220F-3SG
CASE 221AT

MARKING DIAGRAM



FDPF190N15A = Specific Device Code
A = Assembly Location
YWW = Date Code (Year & Week)
ZZ = Assembly Lot

N-CHANNEL MOSFET



ORDERING INFORMATION

Part Number	Package	Shipping
FDPF190N15A	TO-220F	1000 Units / Tube

FDPF190N15A

MOSFET MAXIMUM RATINGS (T_C = 25°C, unless otherwise noted)

Symbol	Parameter		FDPF190N15A	Unit
V _{DSS}	Drain to Source Voltage		150	V
V _{GSS}	Gate to Source Voltage	– DC	±20	V
		– AC (f > 1 Hz)	±30	
I _D	Drain Current	– Continuous (T _C = 25°C)	27.4	A
		– Continuous (T _C = 100°C)	17.4	
I _{DM}	Drain Current	– Pulsed (Note 1)	110	A
E _{AS}	Single Pulsed Avalanche Energy (Note 2)		261	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)		6.0	V/ns
P _D	Power Dissipation	(T _C = 25°C)	33	W
		– Derate Above 25°C	0.26	W/°C
T _J , T _{STG}	Operating and Storage Temperature Range		–55 to +150	°C
T _L	Maximum Lead Temperature for Soldering, 1/8" from Case for 5 Seconds		300	°C

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Repetitive rating: pulse-width limited by maximum junction temperature.
2. L = 0.33 mH, I_{AS} = 29 A, R_G = 25 Ω, starting T_J = 25°C.
3. I_{SD} ≤ 27.4 A, di/dt ≤ 200 A/μs, V_{DD} ≤ BV_{DSS}, starting T_J = 25°C.

THERMAL CHARACTERISTICS

Symbol	Parameter	FDPF190N15A	Unit
R _{θJC}	Thermal Resistance, Junction to Case, Max.	3.3	°C/W
R _{θJA}	Thermal Resistance, Junction to Ambient, Max.	62.5	

FDPF190N15A

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	–	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	m Ω
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 10 V	$V_{DS} = 120\ \text{V}$, $I_D = 27.4\ \text{A}$, $V_{GS} = 10\ \text{V}$ (Note 4)	–	30	39	nC
Q_{gs}	Gate to Source Gate Charge		–	8.8	–	nC
Q_{gd}	Gate to Drain "Miller" Charge		–	7.3	–	nC
ESR	Equivalent Series Resistance (G–S)	$f = 1\ \text{MHz}$	–	1.5	–	Ω

SWITCHING CHARACTERISTICS

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

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	$V_{GS} = 0\ \text{V}$, $I_{SD} = 27.4\ \text{A}$, $di_F/dt = 100\ \text{A}/\mu\text{s}$, $V_{DD} = 120\ \text{V}$	–	76	–	ns
Q_{rr}	Reverse Recovery Charge		–	0.18	–	μC

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

4. Essentially independent of operating temperature typical characteristics.

TYPICAL PERFORMANCE CHARACTERISTICS

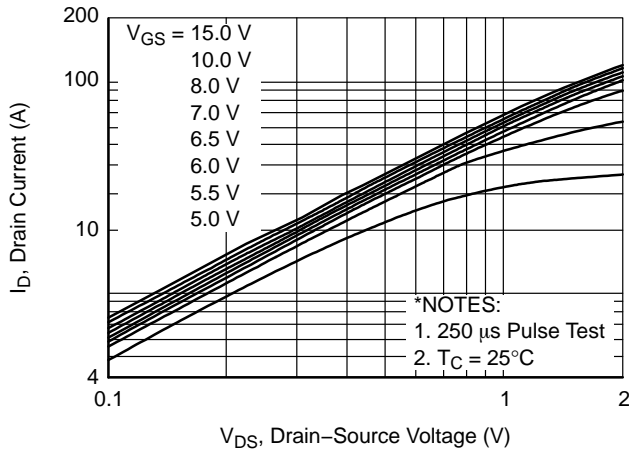


Figure 1. On-Region Characteristics

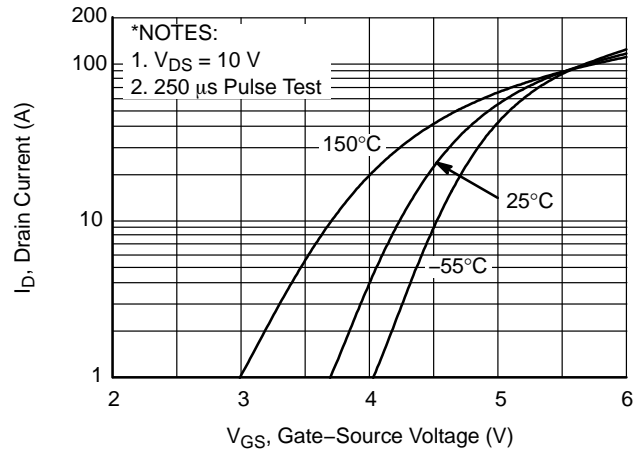


Figure 2. Transfer Characteristics

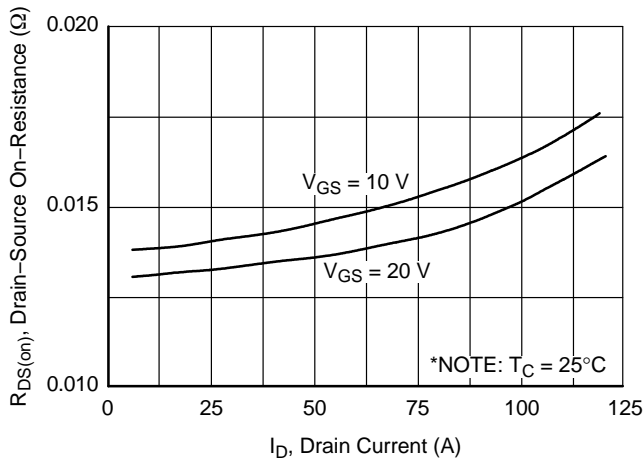


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

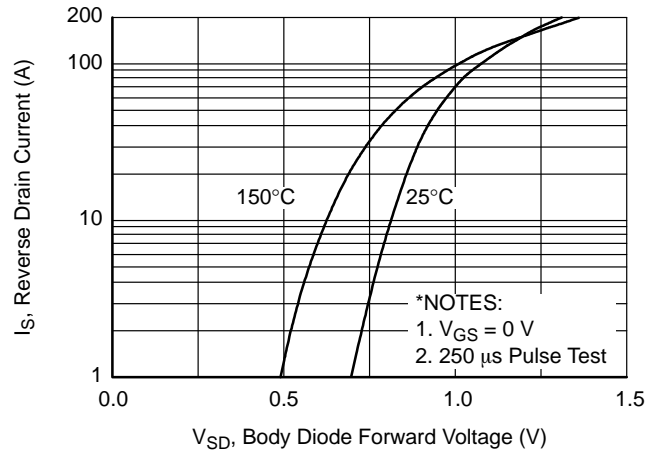


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

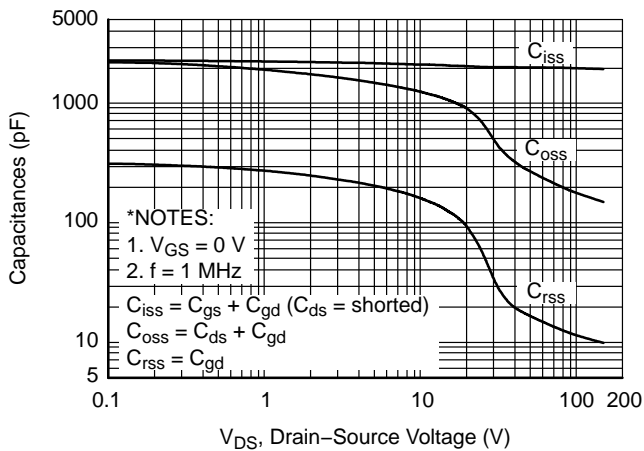


Figure 5. Capacitance Characteristics

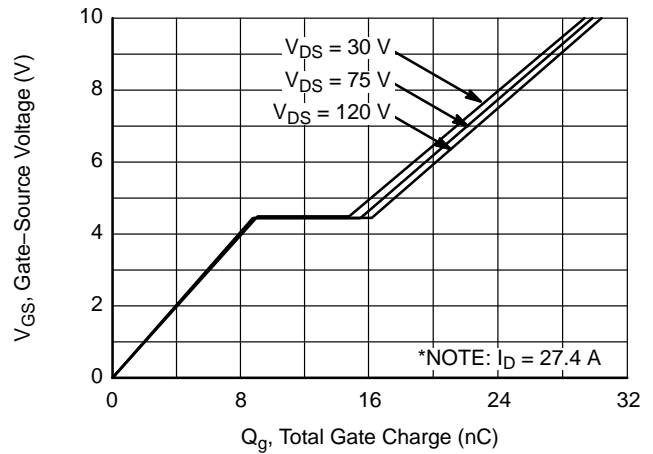


Figure 6. Gate Charge Characteristics

TYPICAL PERFORMANCE CHARACTERISTICS (CONTINUED)

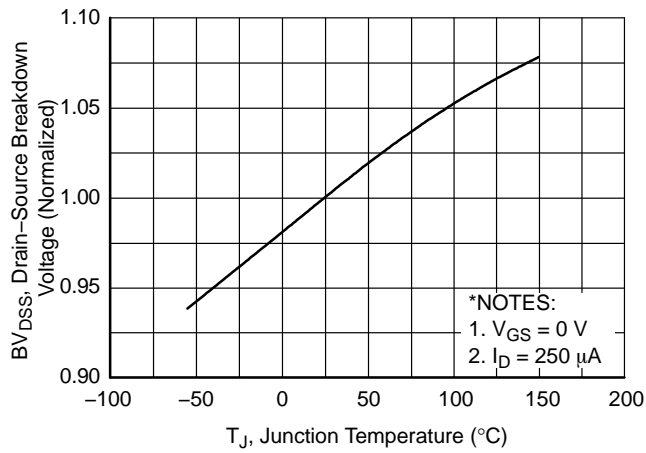


Figure 7. Breakdown Voltage Variation vs. Temperature

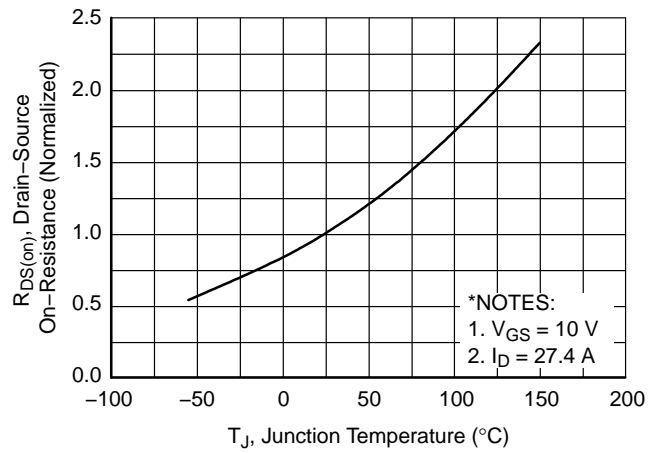


Figure 8. On-Resistance Variation vs. Temperature

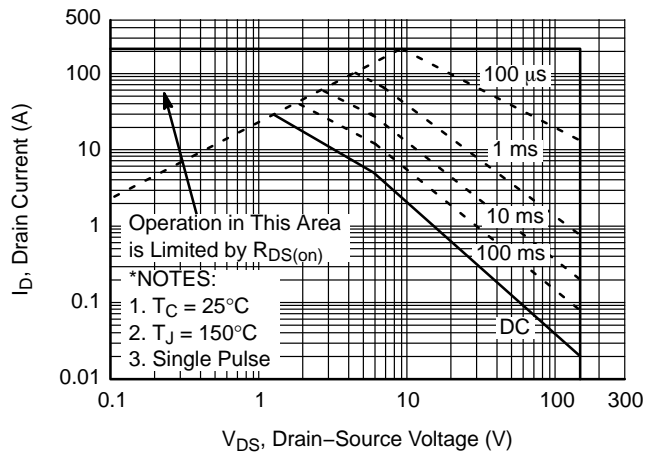


Figure 9. Maximum Safe Operating Area

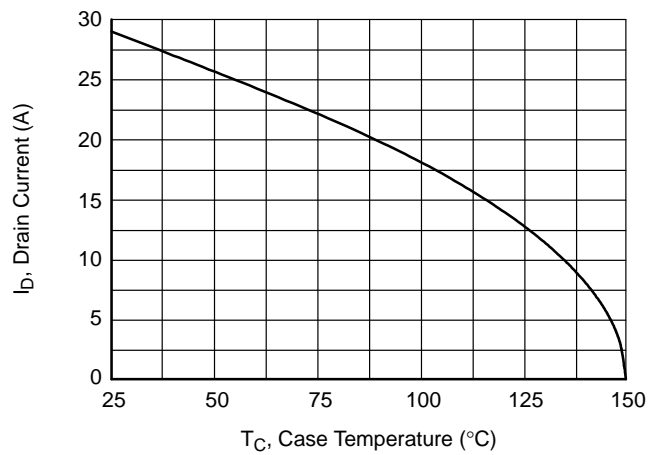


Figure 10. Maximum Drain Current vs. Case Temperature

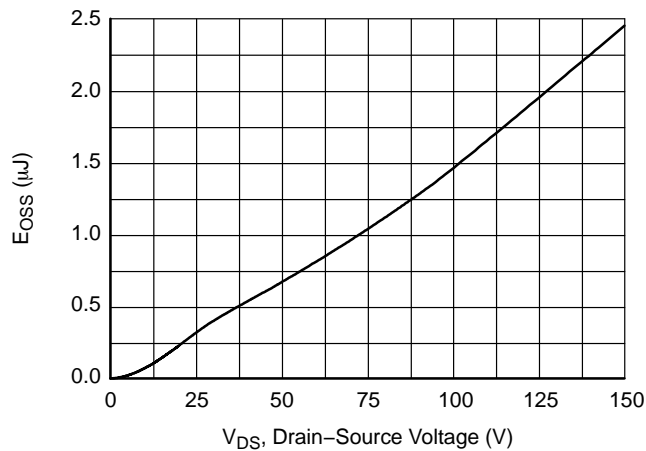


Figure 11. E_{OSS} vs. Drain to Source Voltage

TYPICAL PERFORMANCE CHARACTERISTICS (CONTINUED)

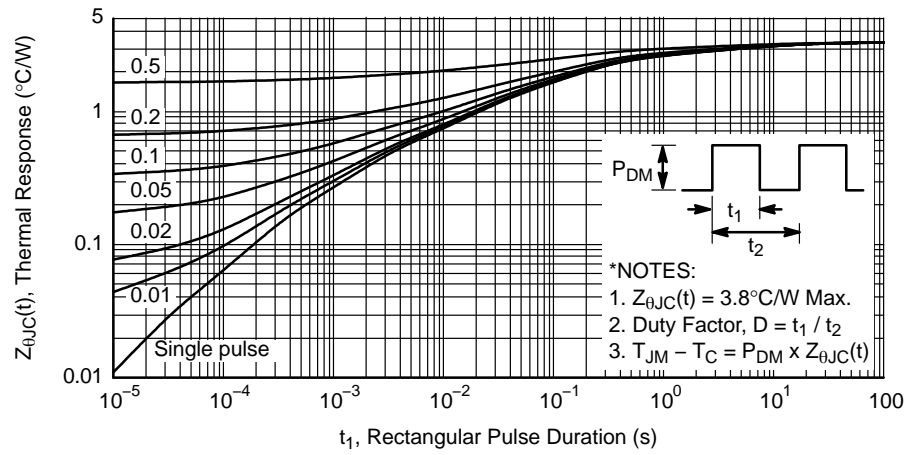


Figure 12. Transient Thermal Response Curve

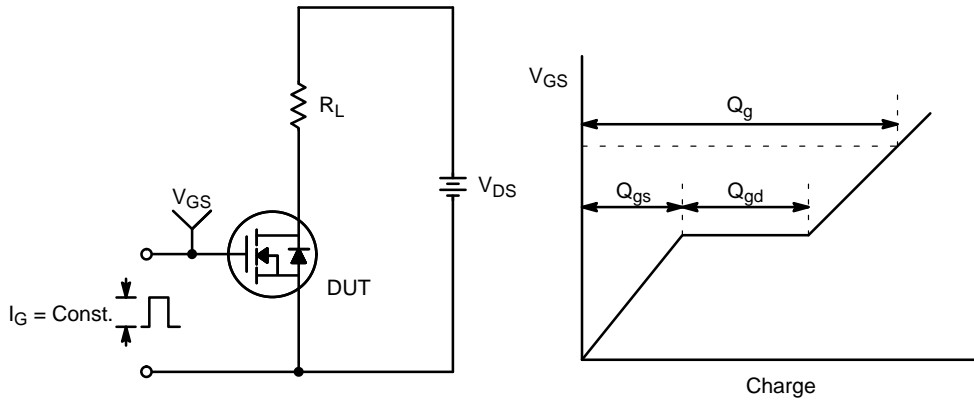


Figure 13. Gate Charge Test Circuit & Waveform

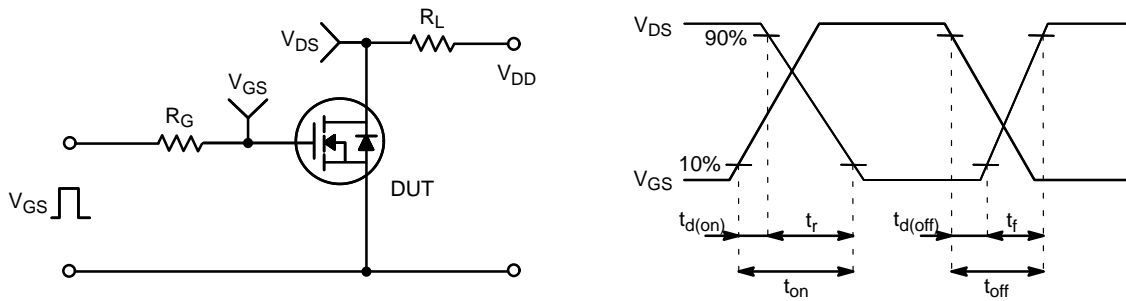


Figure 14. Resistive Switching Test Circuit & Waveforms

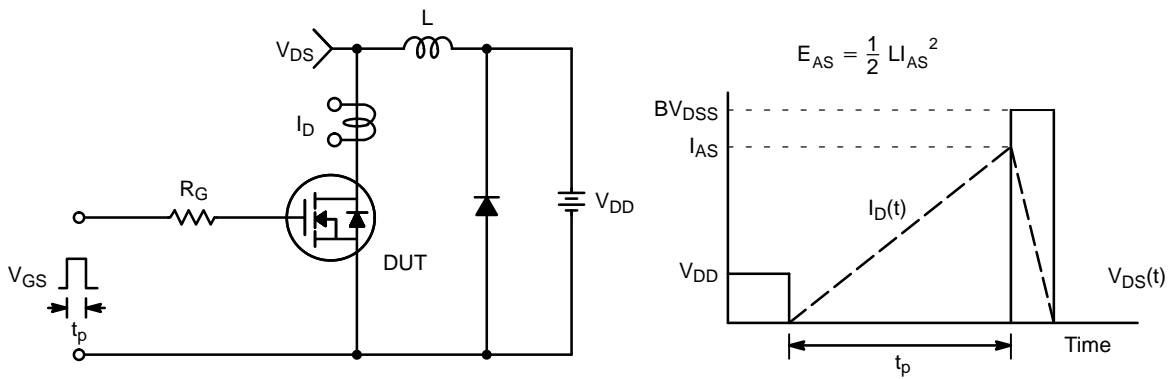


Figure 15. Unclamped Inductive Switching Test Circuit & Waveforms

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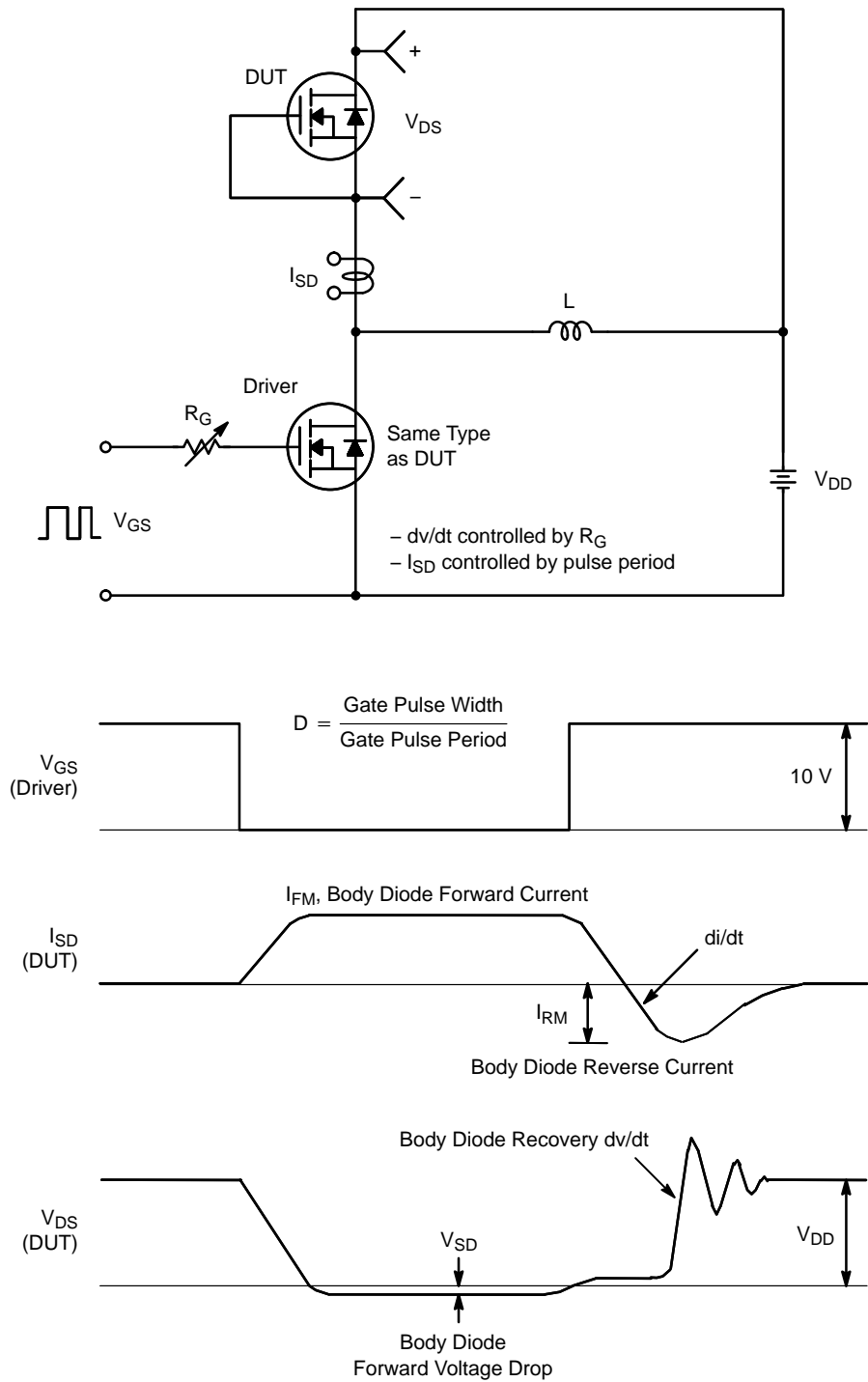


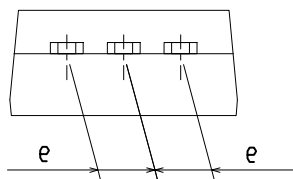
Figure 16. Peak Diode Recovery dv/dt Test Circuit & Waveforms

TO-220 Fullpack, 3-Lead / TO-220F-3SG
CASE 221AT
ISSUE B

DATE 19 JAN 2021



Scale 1:1



OPTION1



DIM	MILLIMETERS		
	MIN	NOM	MAX
A	4.50	4.70	4.90
A1	2.56	2.76	2.96
A2	2.34	2.54	2.74
b	0.70	0.80	0.90
b2	~	~	1.47
c	0.45	0.50	0.60
D	15.67	15.87	16.07
D1	15.60	15.80	16.00
E	9.96	10.16	10.36
e	2.34	2.54	2.74
F	~	0.84	~
H1	6.48	6.68	6.88
L	12.78	12.98	13.18
L1	3.03	3.23	3.43
Ø P	2.98	3.18	3.38
Ø P1	~	1.00	~
Q	3.20	3.30	3.40

NOTES:

A. DIMENSION AND TOLERANCE AS ASME Y14.5-2009

B. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR PROTRUCTIONS.

C. OPTION 1 - WITH SUPPORT PIN HOLE

OPTION 2 - NO SUPPORT PIN HOLE

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DESCRIPTION:	TO-220 FULLPACK, 3-LEAD / TO-220F-3SG	PAGE 1 OF 1

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