

# MOSFET – N-Channel, POWERTRENCH®

100 V, 50 A, 15 mΩ

## FDP150N10A

### Description

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

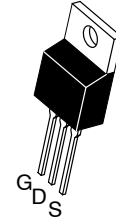
### Features

- $R_{DS(on)} = 12.5 \text{ m}\Omega$  (Typ.) @  $V_{GS} = 10 \text{ V}$ ,  $I_D = 50 \text{ A}$
- Fast Switching Speed
- Low Gate Charge,  $Q_G = 16.2 \text{ nC}$  (Typ.)
- High Performance Trench Technology for Extremely Low  $R_{DS(on)}$
- High Power and Current Handling Capability
- RoHS Compliant

### Applications

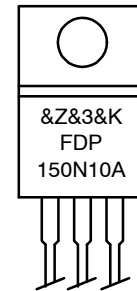
- Synchronous Rectification for ATX / Server / Telecom PSU
- Motor Drives and Uninterruptible Power Supplies
- Micro Solar Inverter

$V_{DSS}$	$R_{DS(on)}$ MAX	$I_D$ MAX
100 V	15.0 mΩ @ 10 V	50 A

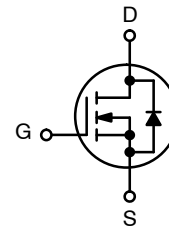


TO-220  
CASE 221A

### MARKING DIAGRAM



&Z = Assembly Plant Code  
&3 = 3-Digit Date Code Format  
&K = 2-Digits Lot Run Traceability Code  
FDP150N10A = Device Code



N-Channel MOSFET

### ORDERING INFORMATION

See detailed ordering and shipping information on page 8 of this data sheet.

**ABSOLUTE MAXIMUM RATINGS** ( $T_C = 25^\circ\text{C}$  unless otherwise noted)

Symbol	Parameter	FDP150N10A_F102	Unit
$V_{DSS}$	Drain to Source Voltage	100	V
$V_{GSS}$	Gate to Source Voltage	$\pm 20$	V
$I_D$	Drain Current	- Continuous ( $T_C = 25^\circ\text{C}$ )	50
		- Continuous ( $T_C = 100^\circ\text{C}$ )	36
$I_{DM}$	Drain Current	- Pulsed (Note 1)	200
$E_{AS}$	Single Pulsed Avalanche Energy (Note 2)	84.6	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	6.0	V/ns
$P_D$	Power Dissipation	( $T_C = 25^\circ\text{C}$ )	91
		- Derate Above $25^\circ\text{C}$	0.61
$T_J, T_{STG}$	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	$^\circ\text{C}$

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.  $L = 2\text{ mH}$ ,  $I_{AS} = 9.2\text{ A}$ ,  $R_G = 25\ \Omega$ , 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  $T_J = 25^\circ\text{C}$ .

**THERMAL CHARACTERISTICS**

Symbol	Parameter	FDP150N10A_F102	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	1.6	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	62.5	

**ELECTRICAL CHARACTERISTICS** ( $T_C = 25^\circ\text{C}$  unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
--------	-----------	-----------------	-----	-----	-----	------

**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 $25^\circ\text{C}$	–	0.08	–	$\text{V}/^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 80 \text{ V}, V_{GS} = 0 \text{ V}$	–	–	1	$\mu\text{A}$
		$V_{DS} = 80 \text{ V}, T_C = 150^\circ\text{C}$	–	–	500	
$I_{GSS}$	Gate to Body Leakage Current	$V_{GS} = \pm 20 \text{ V}, V_{DS} = 0 \text{ V}$	–	–	$\pm 100$	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	$V_{GS} = 10 \text{ V}, I_D = 50 \text{ A}$	–	12.5	15.0	$\text{m}\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS} = 10 \text{ V}, I_D = 50 \text{ A}$	–	40	–	S

**DYNAMIC CHARACTERISTICS**

$C_{iss}$	Input Capacitance	$V_{DS} = 50 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$	–	1080	1440	pF
$C_{oss}$	Output Capacitance		–	267	355	pF
$C_{rss}$	Reverse Transfer Capacitance		–	11	–	pF
$C_{oss(er)}$	Energy Related Output Capacitance	$V_{DS} = 50 \text{ V}, V_{GS} = 0 \text{ V}$	–	436	–	pF
$Q_{g(tot)}$	Total Gate Charge at 10 V	$V_{DS} = 50 \text{ V}, V_{GS} = 10 \text{ V}, I_D = 50 \text{ A}$ , (Note 4)	–	16.2	21.0	nC
$Q_{gs}$	Gate to Source Gate Charge		–	5.3	–	nC
$Q_{gs2}$	Gate Charge Threshold to Plateau		–	2.6	–	nC
$Q_{gd}$	Gate to Drain “Miller” Charge		–	3.7	–	nC
ESR	Equivalent Series Resistance (G–S)	$f = 1 \text{ MHz}$	–	1.3	–	$\Omega$

**SWITCHING CHARACTERISTICS**

$t_{d(on)}$	Turn–On Delay Time	$V_{DD} = 50 \text{ V}, I_D = 50 \text{ A}, V_{GS} = 10 \text{ V}$ , $R_G = 4.7 \Omega$ (Note 4)	–	13	36	ns
$t_r$	Turn–On Rise Time		–	16	42	ns
$t_{d(off)}$	Turn–Off Delay Time		–	21	52	ns
$t_f$	Turn–Off Fall Time		–	5	20	ns

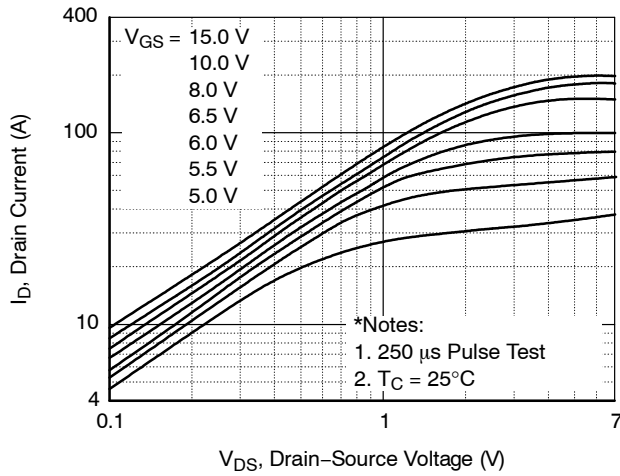
**DRAIN–SOURCE DIODE CHARACTERISTICS**

$I_S$	Maximum Continuous Drain to Source Diode Forward Current	–	–	50	A	
$I_{SM}$	Maximum Pulsed Drain to Source Diode Forward Current	–	–	200	A	
$V_{SD}$	Drain to Source Diode Forward Voltage	$V_{GS} = 0 \text{ V}, I_{SD} = 50 \text{ A}$	–	–	1.3	V
$t_{rr}$	Reverse Recovery Time	$V_{GS} = 0 \text{ V}, V_{DD} = 50 \text{ V}, I_{SD} = 50 \text{ A}$ , $di_F/dt = 100 \text{ A}/\mu\text{s}$	–	50	–	ns
$Q_{rr}$	Reverse Recovery Charge		–	55	–	nC

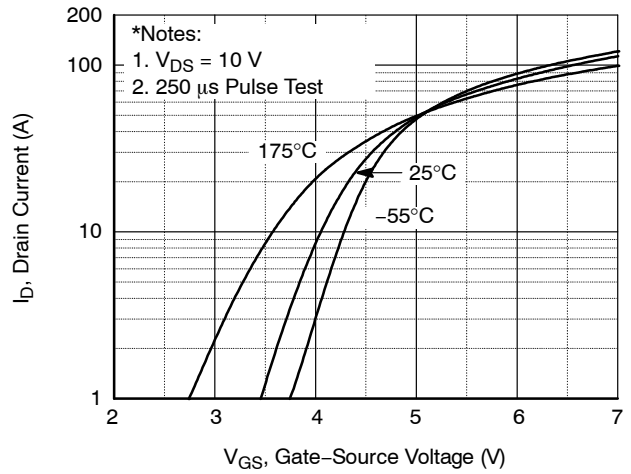
Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

4. Essentially independent of operating temperature typical characteristics.

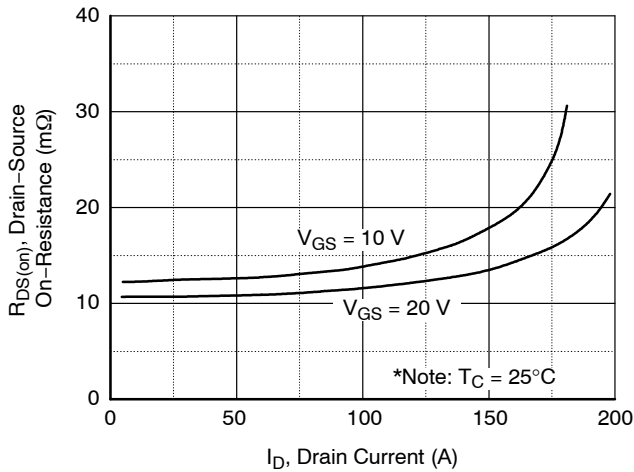
## TYPICAL PERFORMANCE CHARACTERISTICS



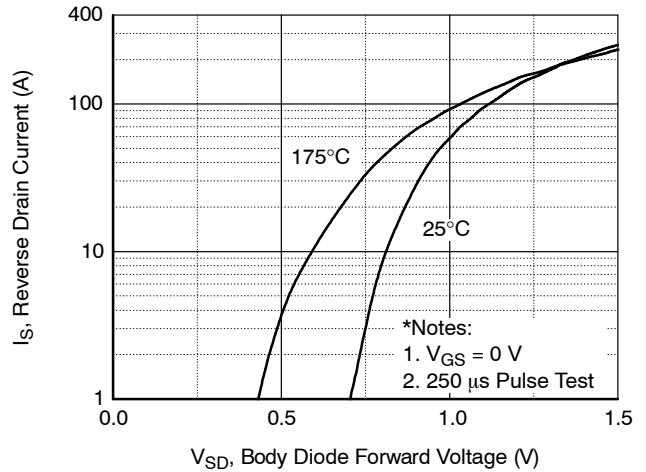
**Figure 1. On-Region Characteristics**



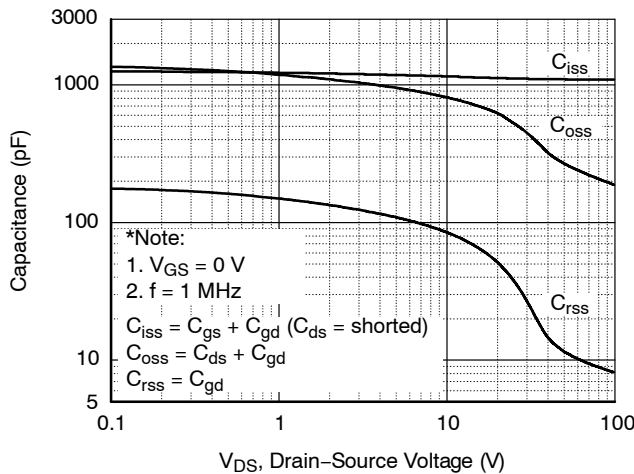
**Figure 2. Transfer Characteristics**



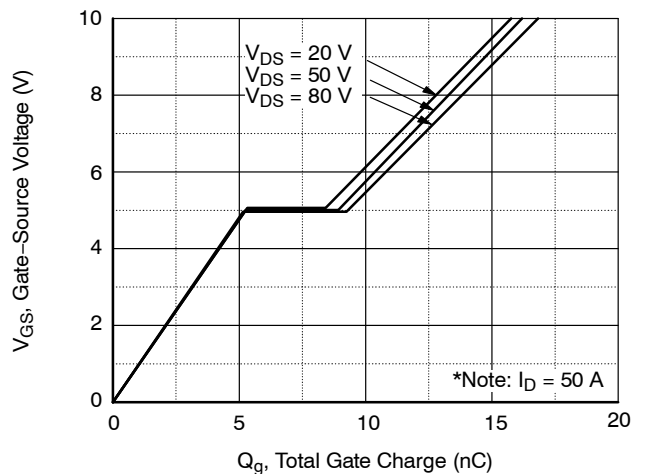
**Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage**



**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)

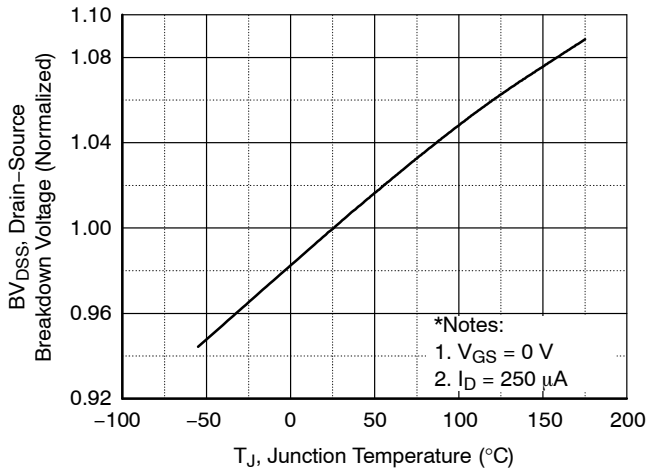


Figure 7. Breakdown Voltage Variation vs. Temperature

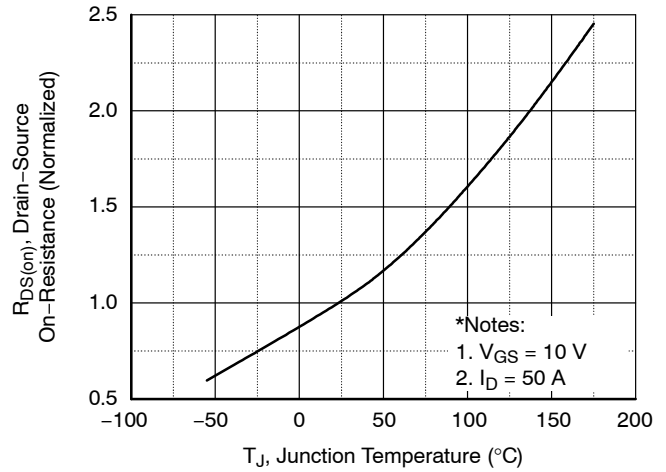


Figure 8. On-Resistance Variation vs. Temperature

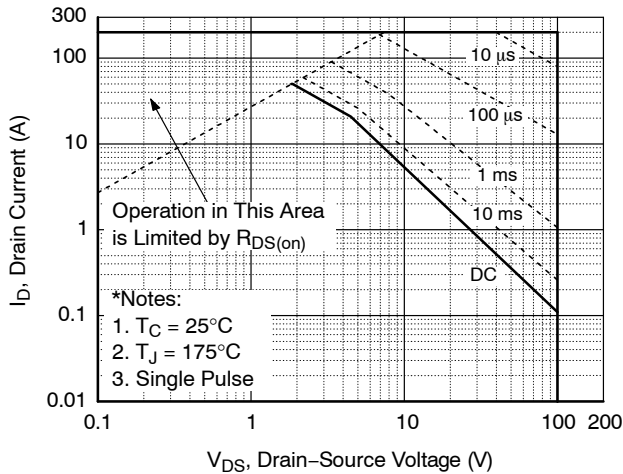


Figure 9. Maximum Safe Operating Area

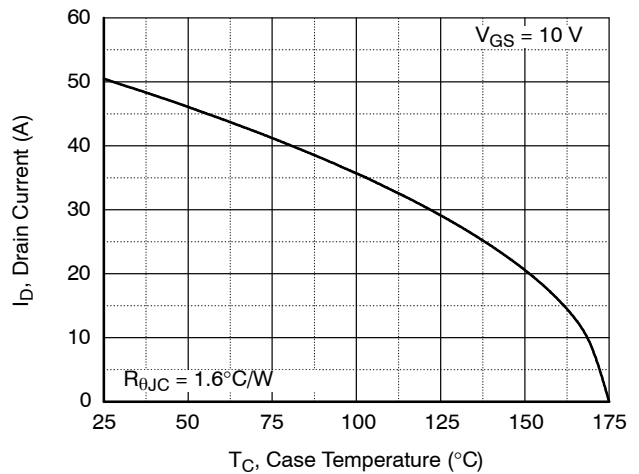


Figure 10. Maximum Drain Current vs. Case Temperature

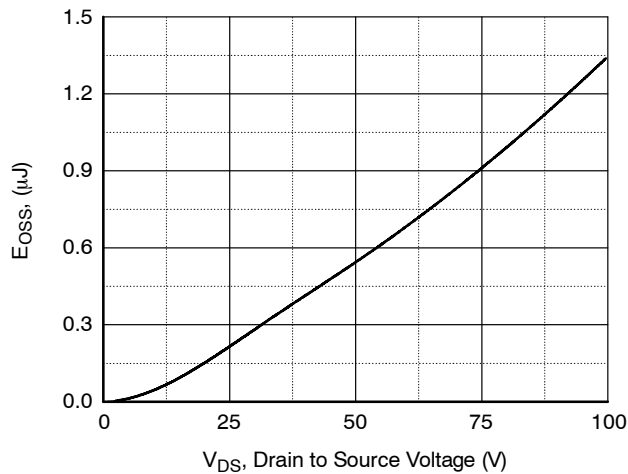


Figure 11. E<sub>oss</sub> vs. Drain to Source Voltage

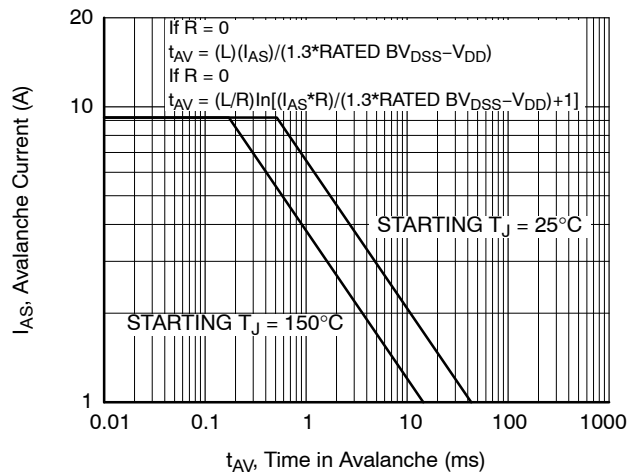


Figure 12. Unclamped Inductive Switching Capability

TYPICAL PERFORMANCE CHARACTERISTICS (continued)

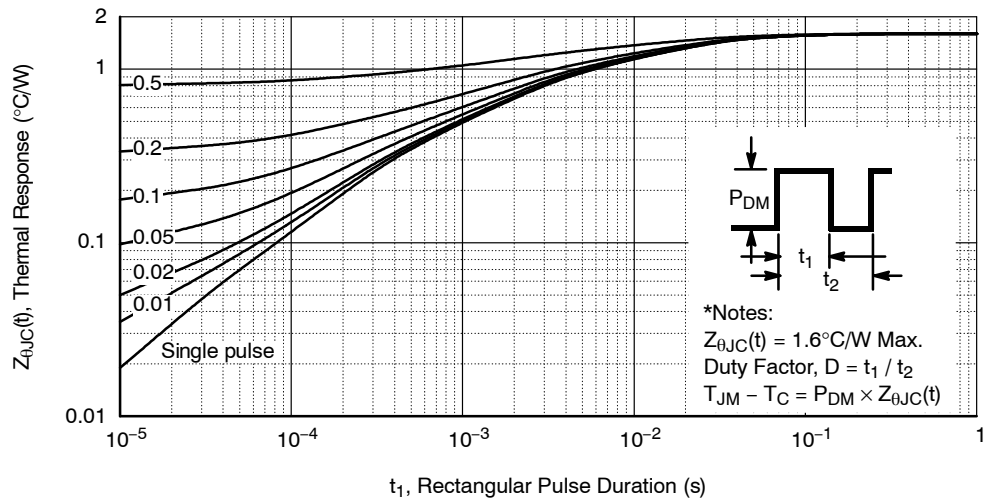


Figure 13. Transient Thermal Response Curve

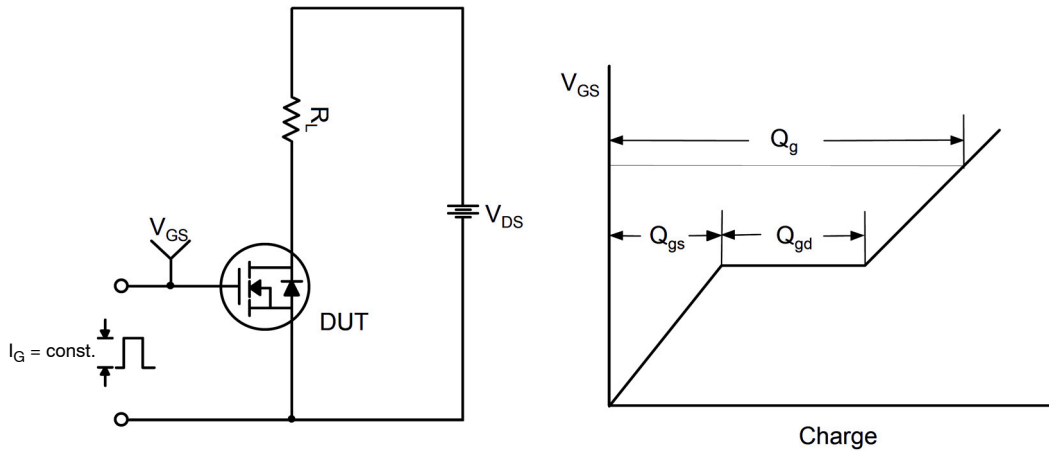


Figure 14. Gate Charge Test Circuit & Waveform

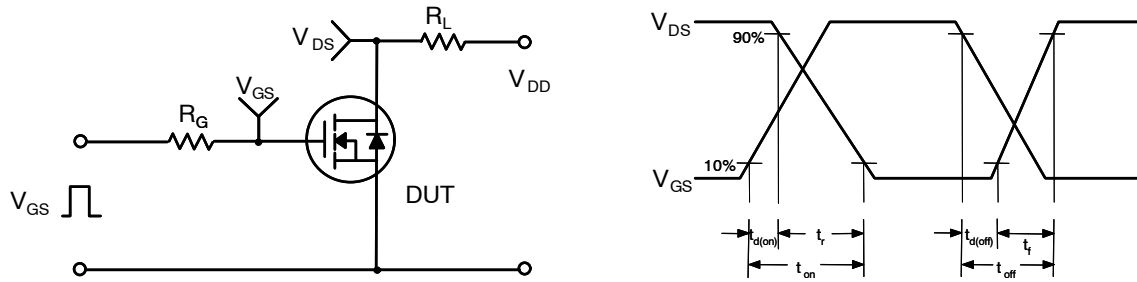


Figure 15. Resistive Switching Test Circuit & Waveforms

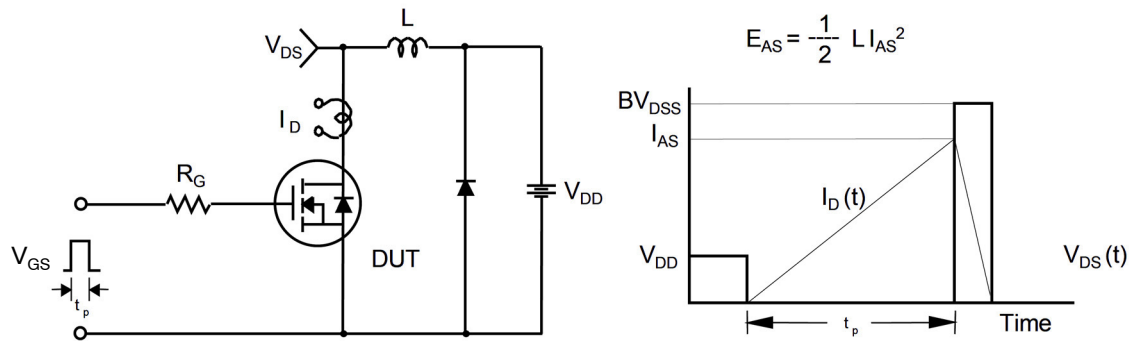


Figure 16. Unclamped Inductive Switching Test Circuit & Waveforms

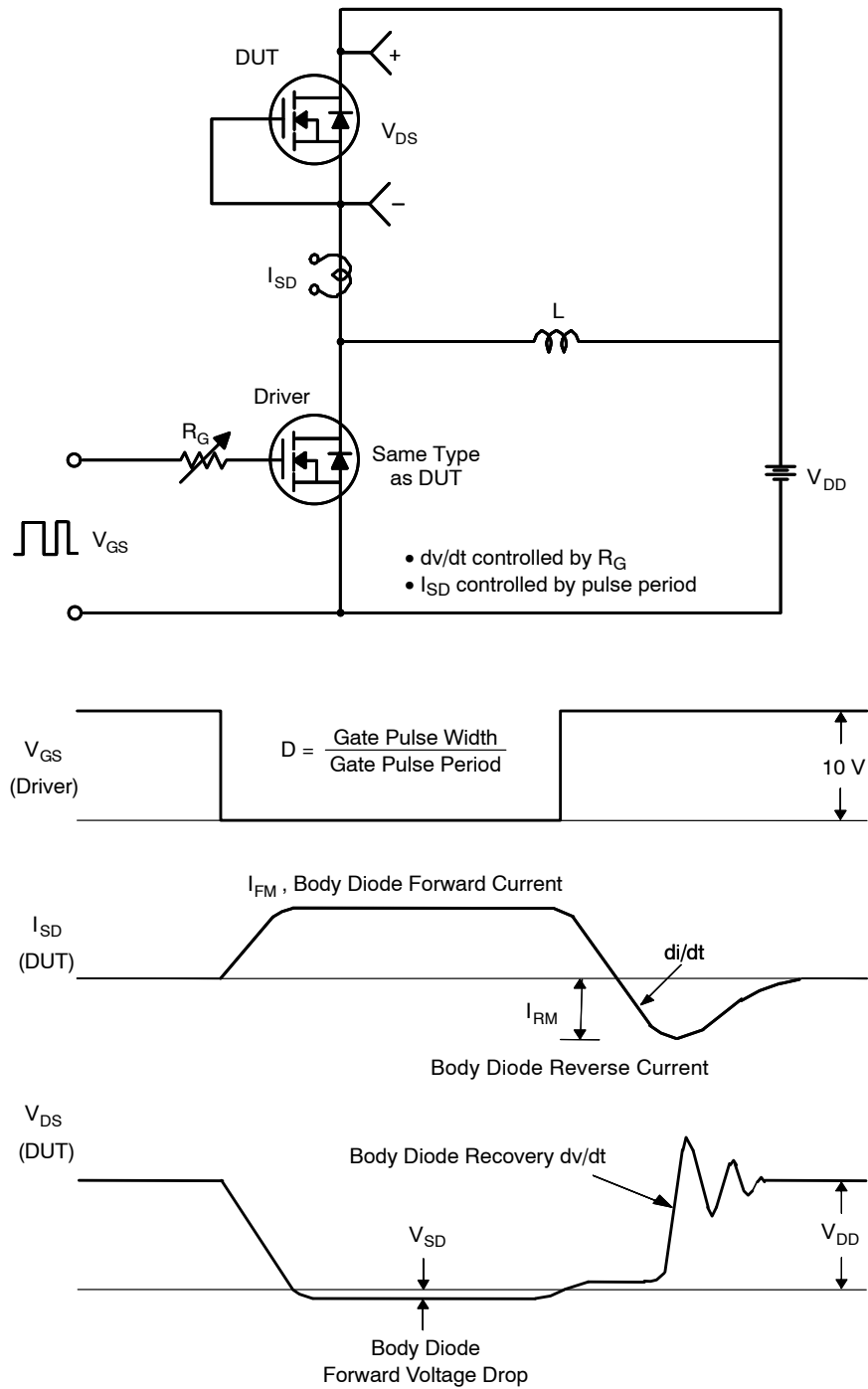


Figure 17. Peak Diode Recovery  $dv/dt$  Test Circuit & Waveforms

#### ORDERING INFORMATION

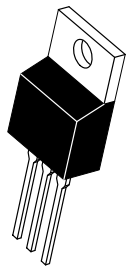
Part Number	Device Marking	Package	Reel Size	Tape Width	Shipping
FDP150N10A-F102	FDP150N10A	TO-220	N/A	N/A	800 Units / Tube

POWERTRENCH is a registered trademark of Semiconductor Components Industries, LLC dba "onsemi" or its affiliates and/or subsidiaries in the United States and/or other countries.

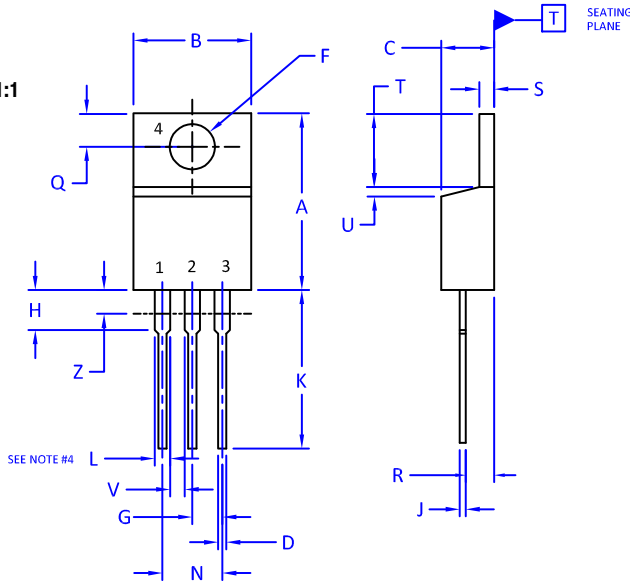


TO-220  
CASE 221A  
ISSUE AK

DATE 13 JAN 2022



SCALE 1:1



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 2009.
2. CONTROLLING DIMENSION: INCHES
3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.
4. MAX WIDTH FOR F102 DEVICE = 1.35MM

DIM	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
A	0.570	0.620	14.48	15.75
B	0.380	0.415	9.66	10.53
C	0.160	0.190	4.07	4.83
D	0.025	0.038	0.64	0.96
F	0.142	0.161	3.60	4.09
G	0.095	0.105	2.42	2.66
H	0.110	0.161	2.80	4.10
J	0.014	0.024	0.36	0.61
K	0.500	0.562	12.70	14.27
L	0.045	0.060	1.15	1.52
N	0.190	0.210	4.83	5.33
Q	0.100	0.120	2.54	3.04
R	0.080	0.110	2.04	2.79
S	0.045	0.055	1.15	1.41
T	0.235	0.255	5.97	6.47
U	0.000	0.050	0.00	1.27
V	0.045	----	1.15	---
Z	----	0.080	---	2.04

STYLE 1:

- PIN 1. BASE
- 2. COLLECTOR
- 3. EMITTER
- 4. COLLECTOR

STYLE 2:

- PIN 1. BASE
- 2. EMITTER
- 3. COLLECTOR
- 4. EMITTER

STYLE 3:

- PIN 1. CATHODE
- 2. ANODE
- 3. GATE
- 4. ANODE

STYLE 4:

- PIN 1. MAIN TERMINAL 1
- 2. MAIN TERMINAL 2
- 3. GATE
- 4. MAIN TERMINAL 2

STYLE 5:

- PIN 1. GATE
- 2. DRAIN
- 3. SOURCE
- 4. DRAIN

STYLE 6:

- PIN 1. ANODE
- 2. CATHODE
- 3. ANODE
- 4. CATHODE

STYLE 7:

- PIN 1. CATHODE
- 2. ANODE
- 3. CATHODE
- 4. ANODE

STYLE 8:

- PIN 1. CATHODE
- 2. ANODE
- 3. EXTERNAL TRIP/DELAY
- 4. ANODE

STYLE 9:

- PIN 1. GATE
- 2. COLLECTOR
- 3. EMITTER
- 4. COLLECTOR

STYLE 10:

- PIN 1. GATE
- 2. SOURCE
- 3. DRAIN
- 4. SOURCE

STYLE 11:

- PIN 1. DRAIN
- 2. SOURCE
- 3. GATE
- 4. SOURCE

STYLE 12:

- PIN 1. MAIN TERMINAL 1
- 2. MAIN TERMINAL 2
- 3. GATE
- 4. NOT CONNECTED

DOCUMENT NUMBER:	98ASB42148B	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
DESCRIPTION:	TO-220	PAGE 1 OF 1

onsemi and ONSEMI are trademarks of Semiconductor Components Industries, LLC dba onsemi or its subsidiaries in the United States and/or other countries. onsemi reserves the right to make changes without further notice to any products herein. onsemi makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does onsemi assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. onsemi does not convey any license under its patent rights nor the rights of others.

**onsemi**, **Onsemi**, and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "**onsemi**" or its affiliates and/or subsidiaries in the United States and/or other countries. **onsemi** owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of **onsemi**'s product/patent coverage may be accessed at [www.onsemi.com/site/pdf/Patent-Marking.pdf](http://www.onsemi.com/site/pdf/Patent-Marking.pdf). **onsemi** reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as-is" and **onsemi** makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does **onsemi** assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using **onsemi** products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by **onsemi**. "Typical" parameters which may be provided in **onsemi** data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. **onsemi** does not convey any license under any of its intellectual property rights nor the rights of others. **onsemi** products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use **onsemi** products for any such unintended or unauthorized application, Buyer shall indemnify and hold **onsemi** and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that **onsemi** was negligent regarding the design or manufacture of the part. **onsemi** is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

## ADDITIONAL INFORMATION

### TECHNICAL PUBLICATIONS:

Technical Library: [www.onsemi.com/design/resources/technical-documentation](http://www.onsemi.com/design/resources/technical-documentation)  
onsemi Website: [www.onsemi.com](http://www.onsemi.com)

### ONLINE SUPPORT: [www.onsemi.com/support](http://www.onsemi.com/support)

For additional information, please contact your local Sales Representative at [www.onsemi.com/support/sales](http://www.onsemi.com/support/sales)

