

# MOSFET – N-Channel, POWERTRENCH®

**250 V, 25 A, 42.5 mΩ**

## FDPF2710T

### Description

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

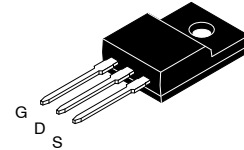
### Features

- $R_{DS(on)} = 36.3 \text{ m}\Omega$  (Typ.) @  $V_{GS} = 10 \text{ V}$ ,  $I_D = 25 \text{ A}$
- Fast Switching Speed
- Low Gate Charge
- High Performance Trench Technology for Extremely Low  $R_{DS(on)}$
- High Power and Current Handling Capability
- This is a Pb-Free Device

### Applications

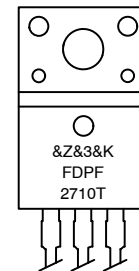
- Consumer Appliances
- Synchronous Rectification

$V_{DS}$	$R_{DS(on)}$ MAX	$I_D$ MAX
250 V	42.5 mΩ @ 10 V	25 A



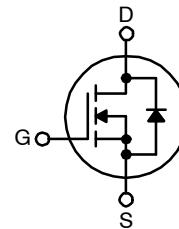
TO-220 Fullpack, 3-Lead /  
 TO-220F-3SG  
 CASE 221AT

### MARKING DIAGRAM



&Z = Assembly Plant Code  
 &3 = 3-Digit Date Code  
 &K = 2-Digits Lot Run Code  
 FDPF2710T = Specific Device Code

### N-CHANNEL MOSFET



### ORDERING INFORMATION

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

# FDPF2710T

## ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter			Unit
$V_{DS}$	Drain-Source Voltage		250	V
$V_{GS}$	Gate-Source Voltage		$\pm 30$	V
$I_D$	Drain Current	Continuous ( $T_C = 25^\circ\text{C}$ )	25	A
		Continuous ( $T_C = 100^\circ\text{C}$ )	18.8	
$I_{DM}$	Drain Current	Pulsed (Note 1)	100	A
$E_{AS}$	Single Pulsed Avalanche Energy (Note 2)		145	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)		4.5	V/ns
$P_D$	Power Dissipation	( $T_C = 25^\circ\text{C}$ )	62.5	W
		Derate above $25^\circ\text{C}$	0.5	W/ $^\circ\text{C}$
$T_J, T_{STG}$	Operating and Storage Temperature Range		-55 to +150	$^\circ\text{C}$
$T_L$	Maximum Lead Temperature for Soldering Purpose, 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.  $L = 1\text{ mH}$ ,  $I_{AS} = 17\text{ A}$ ,  $V_{DD} = 50\text{ V}$ ,  $R_G = 25\ \Omega$ , Starting  $T_J = 25^\circ\text{C}$ .
3.  $I_{SD} \leq 50\text{ A}$ ,  $di/dt \leq 200\text{ A}/\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$ .

## THERMAL CHARACTERISTICS

Symbol	Parameter	FDP20N50	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Max.	2.0	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Max.	62.5	

# FDPF2710T

## ELECTRICAL CHARACTERISTICS (T<sub>C</sub> = 25°C unless otherwise noted)

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

### OFF CHARACTERISTICS

BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA, T <sub>J</sub> = 25°C	250	-	-	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I <sub>D</sub> = 250 μA, Referenced to 25°C	-	0.25	-	V/°C
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> = 250 V, V <sub>GS</sub> = 0 V V <sub>DS</sub> = 250 V, V <sub>GS</sub> = 0 V, T <sub>C</sub> = 125°C	-	-	10 500	μA μA
I <sub>GSSF</sub>	Gate-Body Leakage Current, Forward	V <sub>GS</sub> = 30 V, V <sub>DS</sub> = 0 V	-	-	100	nA
I <sub>GSSR</sub>	Gate-Body Leakage Current, Reverse	V <sub>GS</sub> = -30 V, V <sub>DS</sub> = 0V	-	-	-100	nA

### ON CHARACTERISTICS

V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA	3.0	3.9	5.0	V
R <sub>DS(on)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 25 A	-	36.3	42.5	Ω
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 25 A	-	63	-	S

### DYNAMIC CHARACTERISTICS

C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = 25 V, V <sub>GS</sub> = 0 V, f = 1.0 MHz	-	5470	7280	pF
C <sub>oss</sub>	Output Capacitance		-	426	567	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		-	97	146	pF

### SWITCHING CHARACTERISTICS

t <sub>d(on)</sub>	Turn-On Delay Time	V <sub>DD</sub> = 125 V, I <sub>D</sub> = 50 A, V <sub>GS</sub> = 10 V, R <sub>GEN</sub> = 25 Ω (Note 4)	-	80	170	ns
t <sub>r</sub>	Turn-On Rise Time		-	252	514	ns
t <sub>d(off)</sub>	Turn-Off Delay Time		-	112	234	ns
t <sub>f</sub>	Turn-Off Fall Time		-	154	318	ns
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> = 125 V, I <sub>D</sub> = 50 A, V <sub>GS</sub> = 10 V (Note 4)	-	78	101	nC
Q <sub>gs</sub>	Gate-Source Charge		-	34	-	nC
Q <sub>gd</sub>	Gate-Drain Charge		-	18	-	nC

### DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS

I <sub>S</sub>	Maximum Continuous Drain-Source Diode Forward Current		-	-	25	A
I <sub>SM</sub>	Maximum Pulsed Drain-Source Diode Forward Current		-	-	150	A
V <sub>SD</sub>	Drain-Source Diode Forward Voltage	V <sub>GS</sub> = 0 V, I <sub>S</sub> = 25 A	-	-	1.2	V
t <sub>rr</sub>	Reverse Recovery Time	V <sub>GS</sub> = 0 V, I <sub>S</sub> = 50 A, dI <sub>F</sub> /dt = 130 A/μs	-	163	-	ns
Q <sub>rr</sub>	Reverse Recovery Charge		-	1.3	-	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

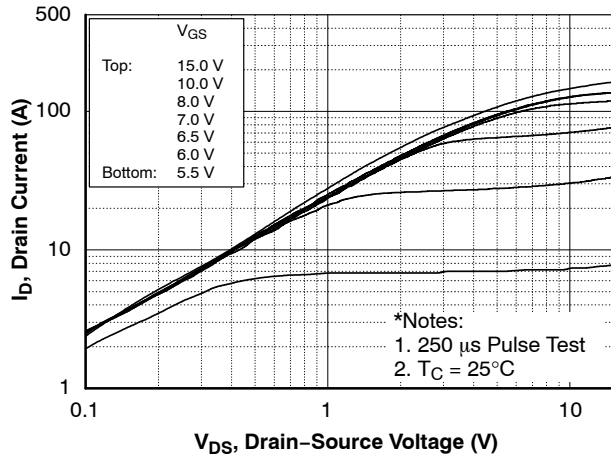


Figure 1. On-Region Characteristics

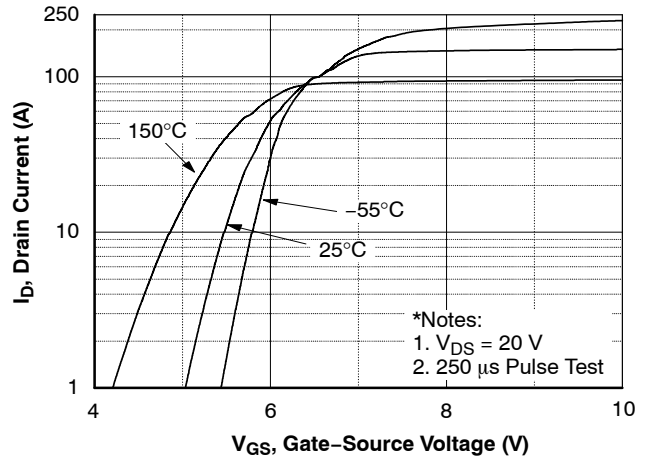


Figure 2. Transfer Characteristics

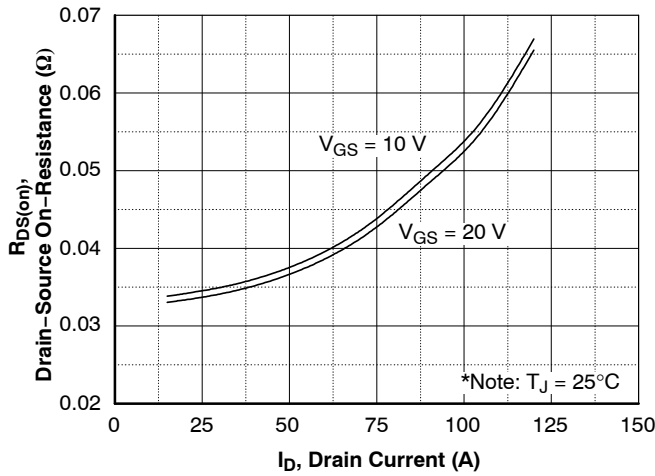


Figure 3. On-Resistance Variation vs. Drain Current and Gate voltage

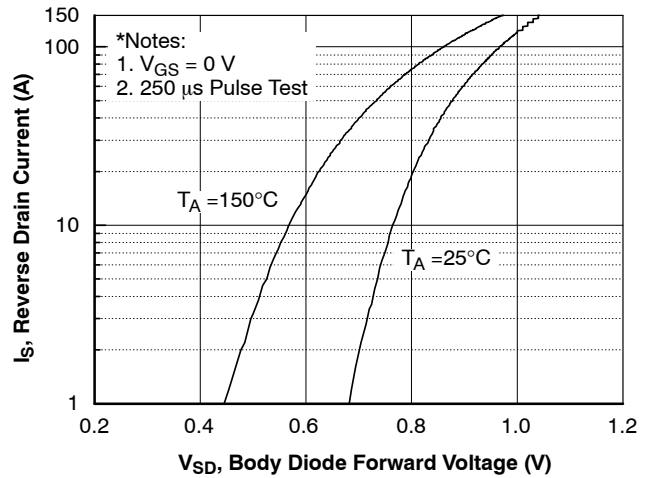


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

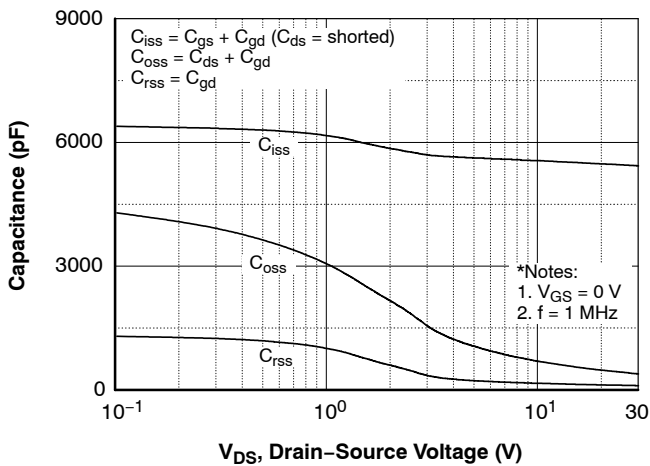


Figure 5. Capacitance Characteristics

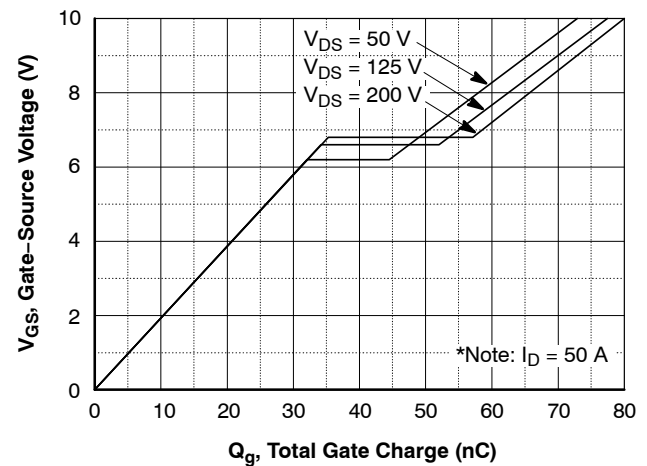


Figure 6. Gate Charge Characteristics

TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

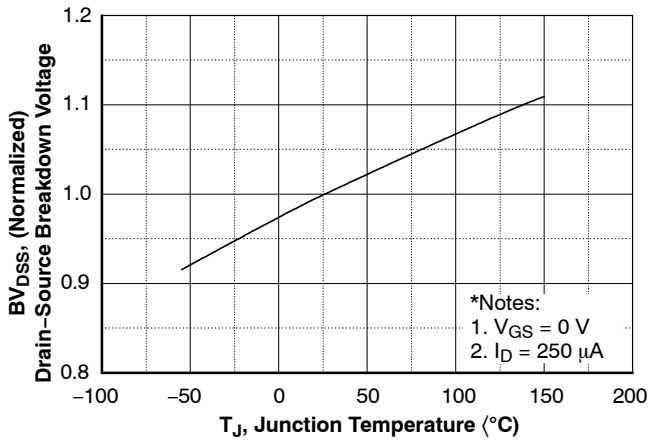


Figure 7. Breakdown Voltage Variation vs. Temperature

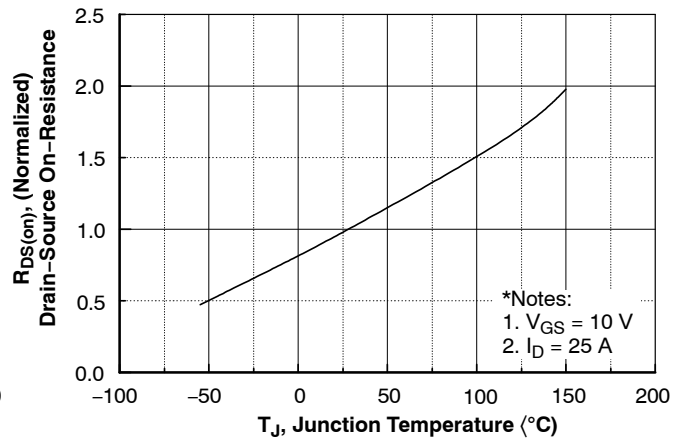


Figure 8. On-Resistance Variation vs. Temperature

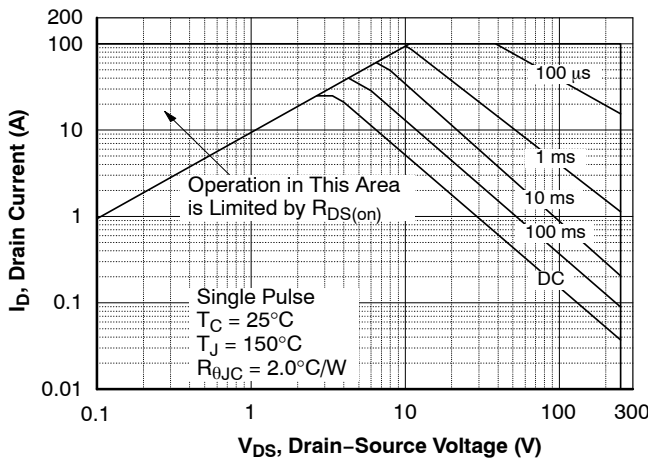


Figure 9. Maximum Safe Operating Area

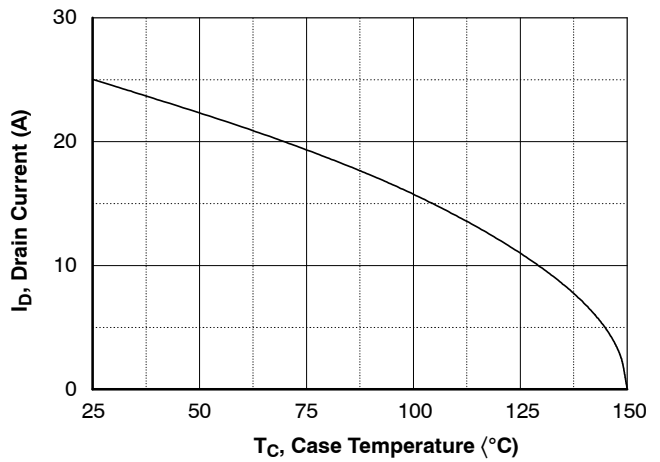


Figure 10. Maximum Drain Current vs. Case Temperature

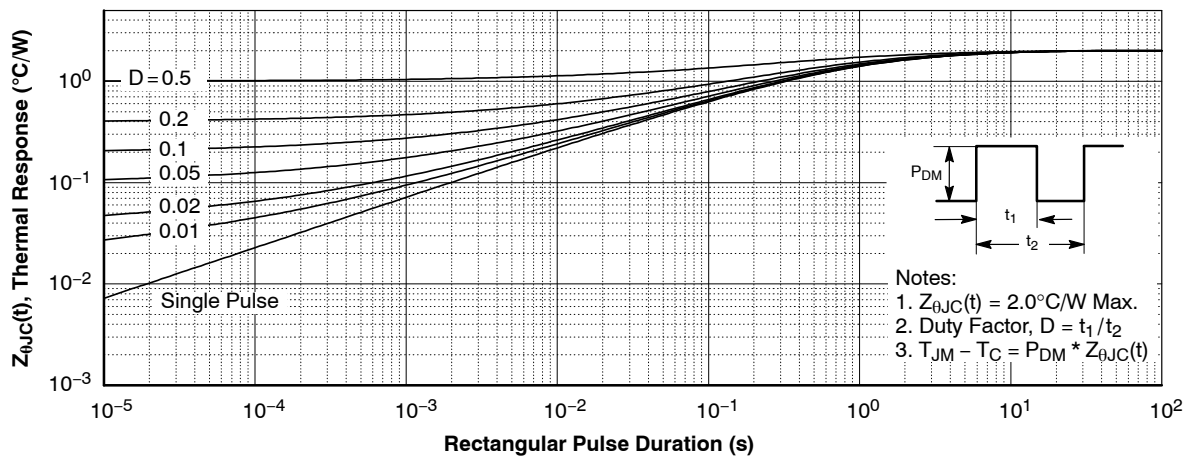


Figure 11. Transient Thermal Response Curve

# FDPF2710T

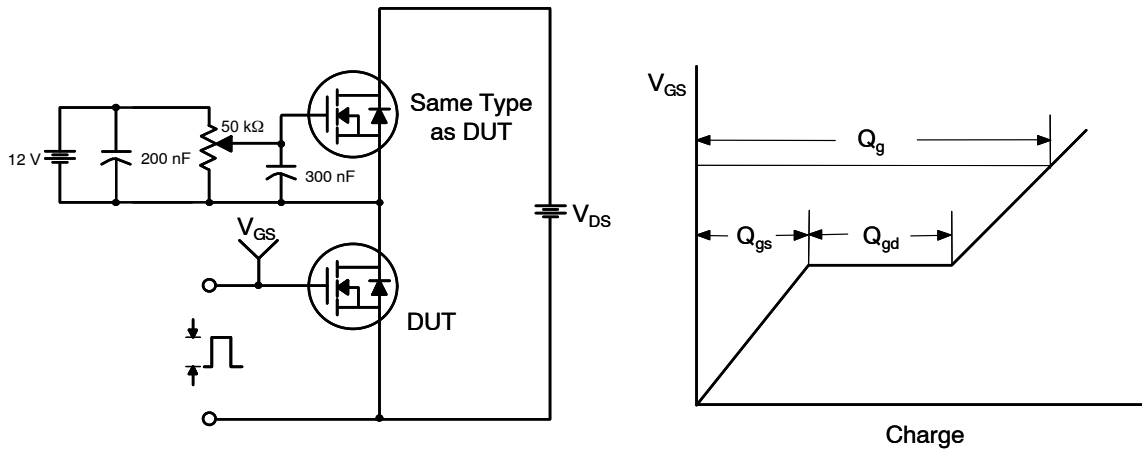


Figure 12. Gate Charge Test Circuit & Waveform

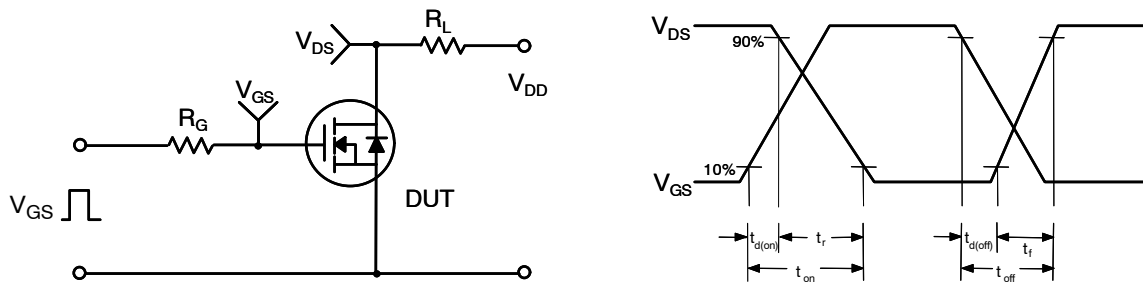


Figure 13. Resistive Switching Test Circuit & Waveforms

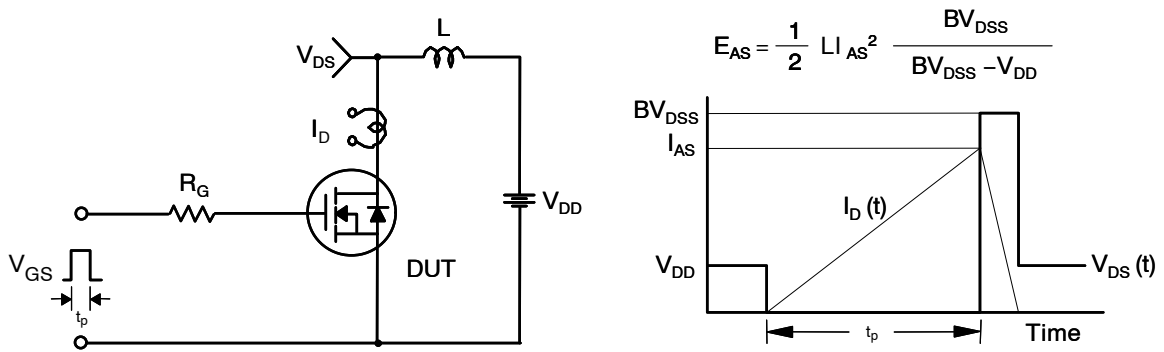


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

# FDPF2710T

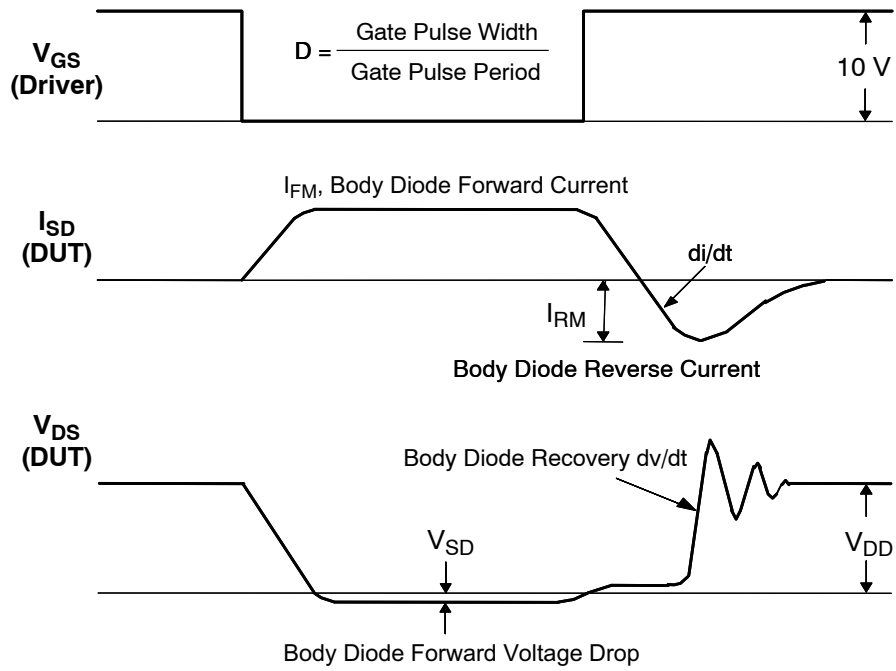
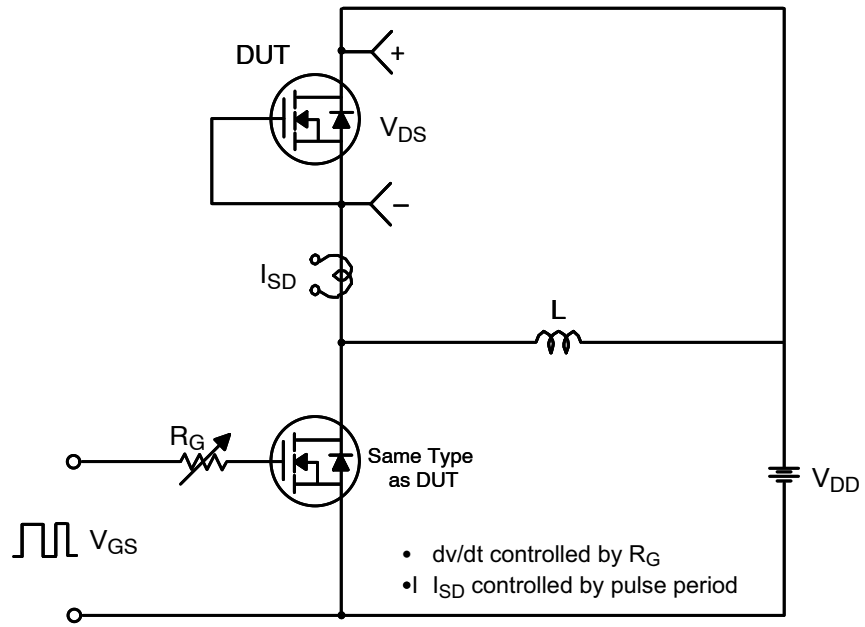


Figure 15. Peak Diode Recovery  $dv/dt$  Test Circuit & Waveforms

# FDPF2710T

## PACKAGE MARKING AND ORDERING INFORMATION

Device	Device Marking	Package	Quantity
FDPF2710T	FDPF2710T	TO-220 Fullpack, 3-Lead / TO-220F-3SG	50 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.



# MECHANICAL CASE OUTLINE

## PACKAGE DIMENSIONS

ON Semiconductor®



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

DATE 19 JAN 2021



Scale 1:1



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
phi P	2.98	3.18	3.38
phi 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

<b>DOCUMENT NUMBER:</b>	<b>98AON67439E</b>	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
<b>DESCRIPTION:</b>	<b>TO-220 FULLPACK, 3-LEAD / TO-220F-3SG</b>	<b>PAGE 1 OF 1</b>

ON Semiconductor and are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor 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. ON Semiconductor 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)