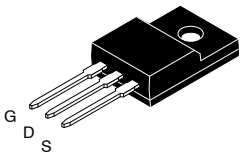
MOSFET – N-Channel, POWERTRENCH®

250 V, 25 A, 42.5 mΩ

FDPF2710T

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

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.

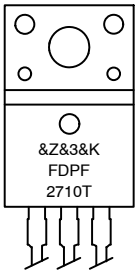
Features

- $R_{DS(on)}$ = 36.3 mΩ (Typ.) @ V_{GS} = 10 V, I_D = 25 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

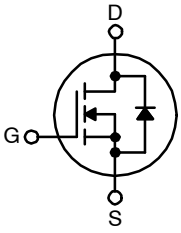
- Consumer Appliances
- Synchronous Rectification

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.

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter			Unit
V_{DS}	Drain−Source Voltage		250	V
V_{GS}	Gate−Source Voltage		±30	V
I_D	Drain Current	Continuous (T_C = 25°C)	25	A
		Continuous (T_C = 100°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°C)	62.5	W
		Derate above 25°C	0.5	W/°C
T_J, T_{STG}	Operating and Storage Temperature Range		−55 to +150	°C
T_L	Maximum Lead Temperature for Soldering Purpose, 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 = 1 mH, I_{AS} = 17 A, V_{DD} = 50 V, R_G = 25 Ω, Starting T_J = 25°C.
3. I_{SD} ≤ 50 A, di/dt ≤ 200 A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J = 25°C.

THERMAL CHARACTERISTICS

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

ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
BV_{DSS}	Drain−Source Breakdown Voltage	V_{GS} = 0 V, I_D = 250 μA, T_J = 25°C	250	–	–	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, Referenced to 25°C	–	0.25	–	V/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 250 V, V_{GS} = 0 V V_{DS} = 250 V, V_{GS} = 0 V, T_C = 125°C	– –	– –	10 500	μA μA
I_{GSSF}	Gate−Body Leakage Current, Forward	V_{GS} = 30 V, V_{DS} = 0 V	–	–	100	nA
I_{GSSR}	Gate−Body Leakage Current, Reverse	V_{GS} = −30 V, V_{DS} = 0V	–	–	−100	nA
ON CHARACTERISTICS						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250 μA	3.0	3.9	5.0	V
$R_{DS(on)}$	Static Drain−Source On−Resistance	V_{GS} = 10 V, I_D = 25 A	–	36.3	42.5	Ω
g_{FS}	Forward Transconductance	V_{DS} = 10 V, I_D = 25 A	–	63	–	S
DYNAMIC CHARACTERISTICS						
C_{iss}	Input Capacitance	V_{DS} = 25 V, V_{GS} = 0 V, f = 1.0 MHz	–	5470	7280	pF
C_{oss}	Output Capacitance		–	426	567	pF
C_{rss}	Reverse Transfer Capacitance		–	97	146	pF
SWITCHING CHARACTERISTICS						
$t_{d(on)}$	Turn−On Delay Time	V_{DD} = 125 V, I_D = 50 A, V_{GS} = 10 V, R_{GEN} = 25 Ω (Note 4)	–	80	170	ns
t_r	Turn−On Rise Time		–	252	514	ns
$t_{d(off)}$	Turn−Off Delay Time		–	112	234	ns
t_f	Turn−Off Fall Time		–	154	318	ns
Q_g	Total Gate Charge	V_{DS} = 125 V, I_D = 50 A, V_{GS} = 10 V (Note 4)	–	78	101	nC
Q_{gs}	Gate−Source Charge		–	34	–	nC
Q_{gd}	Gate−Drain Charge		–	18	–	nC
DRAIN−SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
I_S	Maximum Continuous Drain−Source Diode Forward Current		–	–	25	A
I_{SM}	Maximum Pulsed Drain−Source Diode Forward Current		–	–	150	A
V_{SD}	Drain−Source Diode Forward Voltage	V_{GS} = 0 V, I_S = 25 A	–	–	1.2	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0 V, I_S = 50 A, dI_F/dt = 130 A/μs	–	163	–	ns
Q_{rr}	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

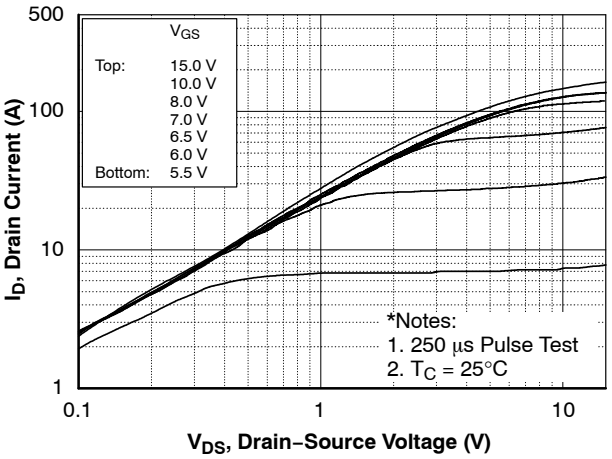


Figure 1. On−Region Characteristics

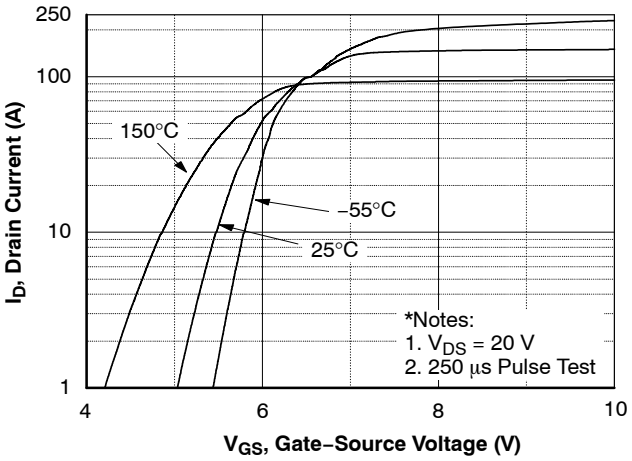


Figure 2. Transfer Characteristics

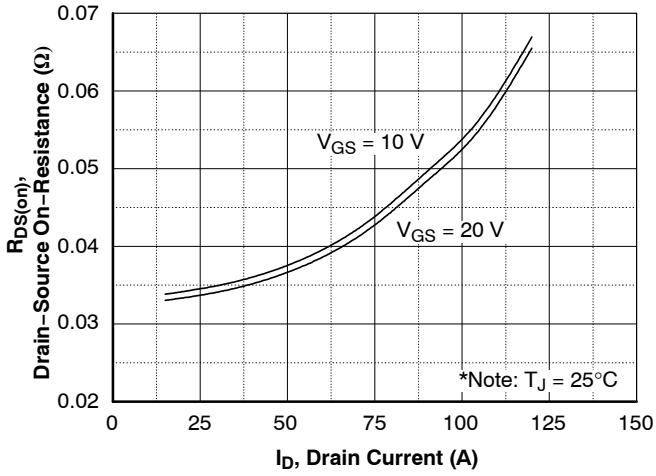


Figure 3. On−Resistance Variation vs. Drain Current and Gate voltage

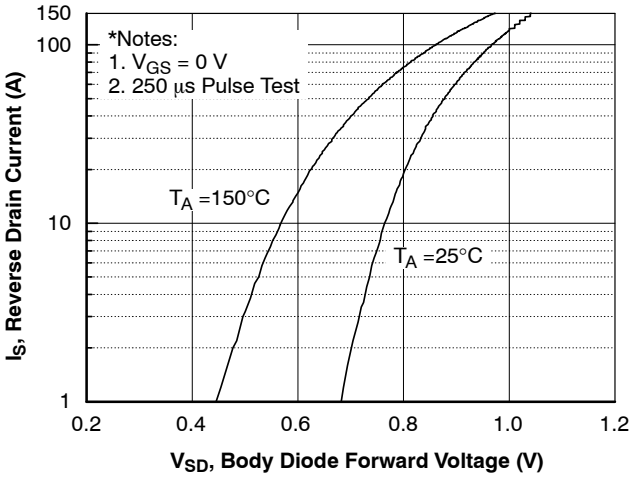


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

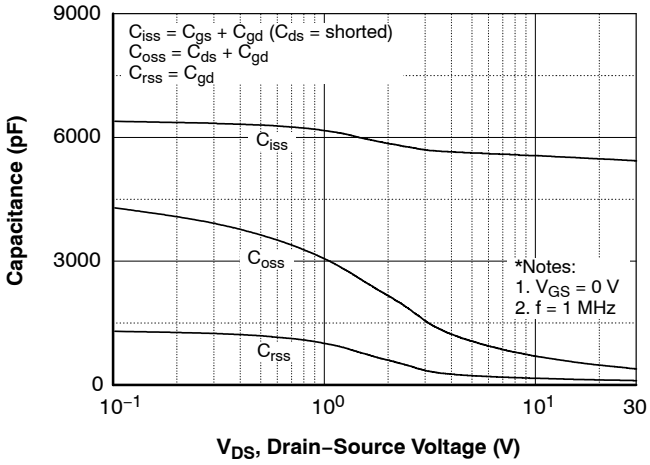


Figure 5. Capacitance Characteristics

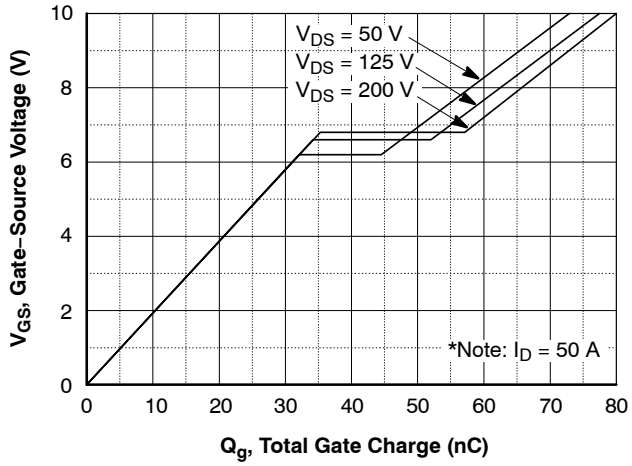


Figure 6. Gate Charge Characteristics

TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

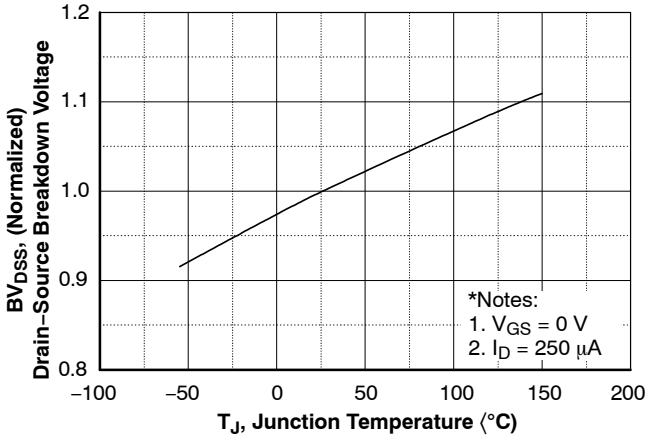


Figure 7. Breakdown Voltage Variation vs. Temperature

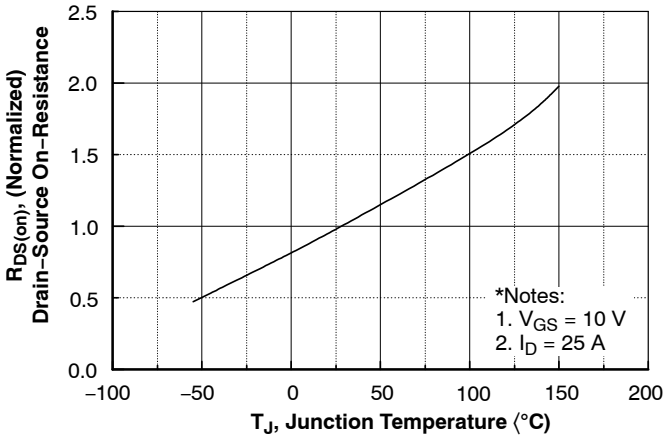


Figure 8. On–Resistance Variation vs. Temperature

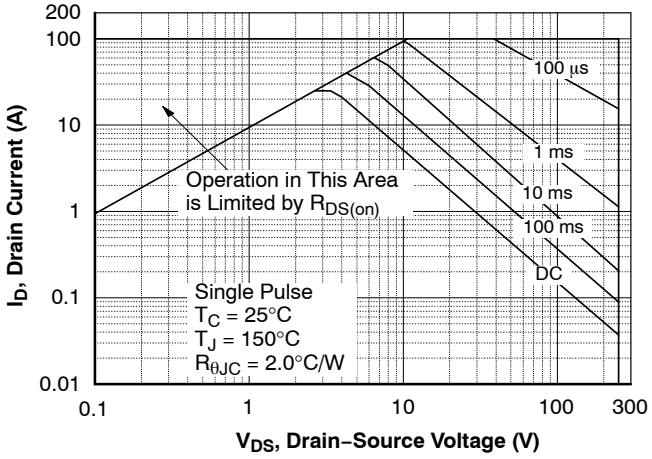


Figure 9. Maximum Safe Operating Area

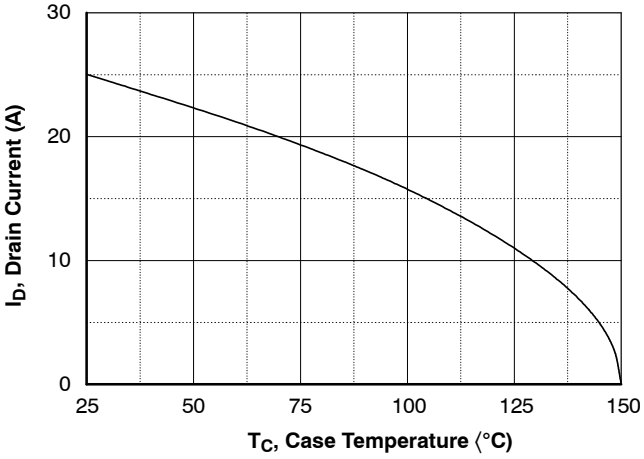


Figure 10. Maximum Drain Current vs. Case Temperature

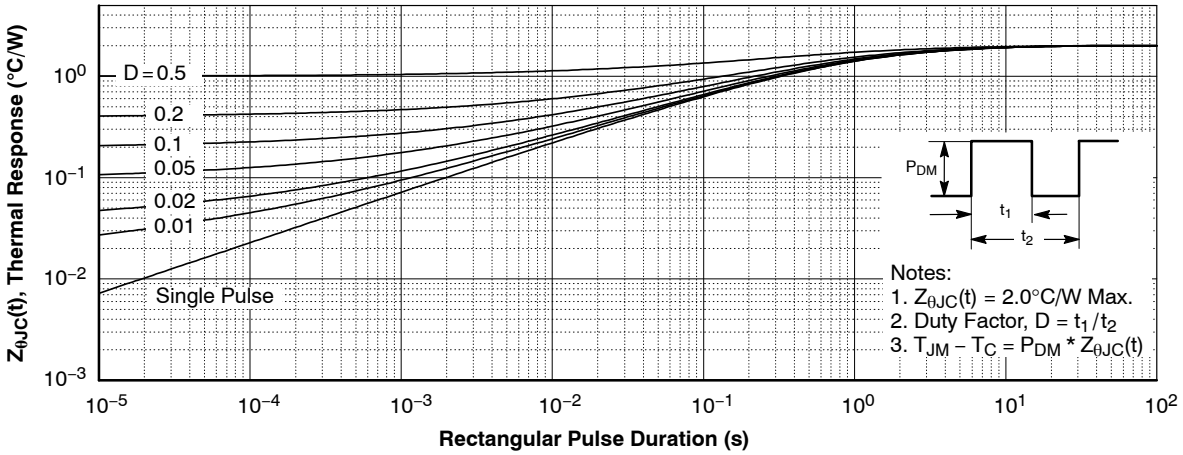


Figure 11. Transient Thermal Response Curve

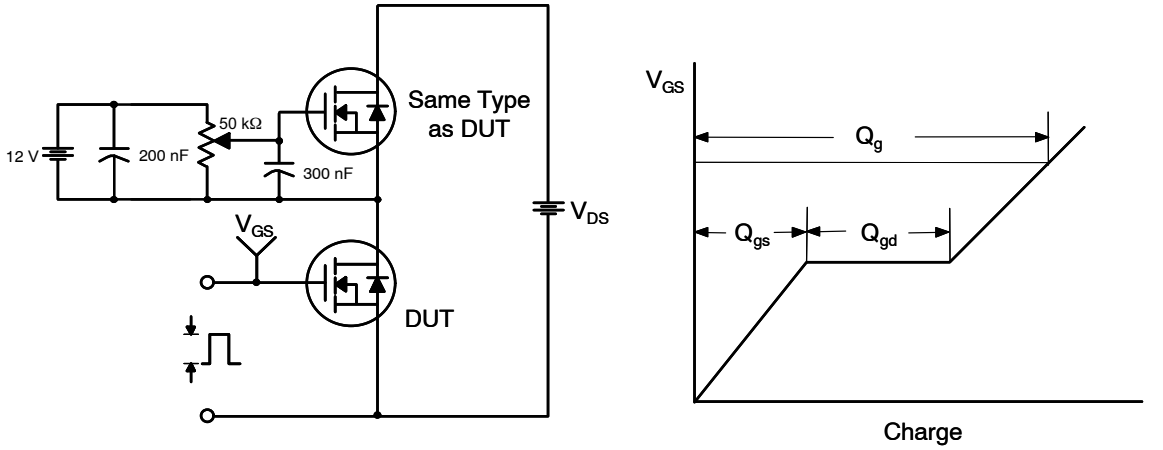


Figure 12. Gate Charge Test Circuit & Waveform

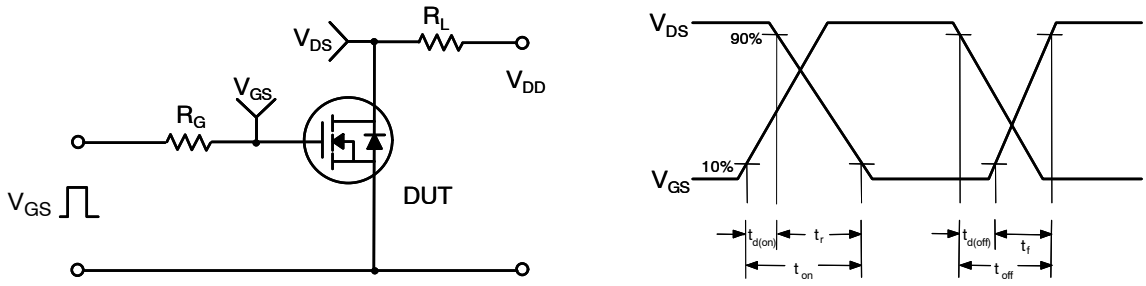


Figure 13. Resistive Switching Test Circuit & Waveforms

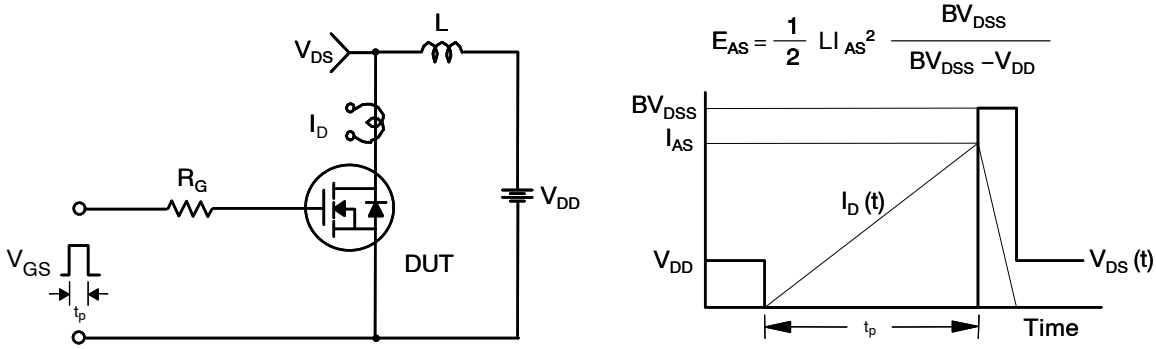


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

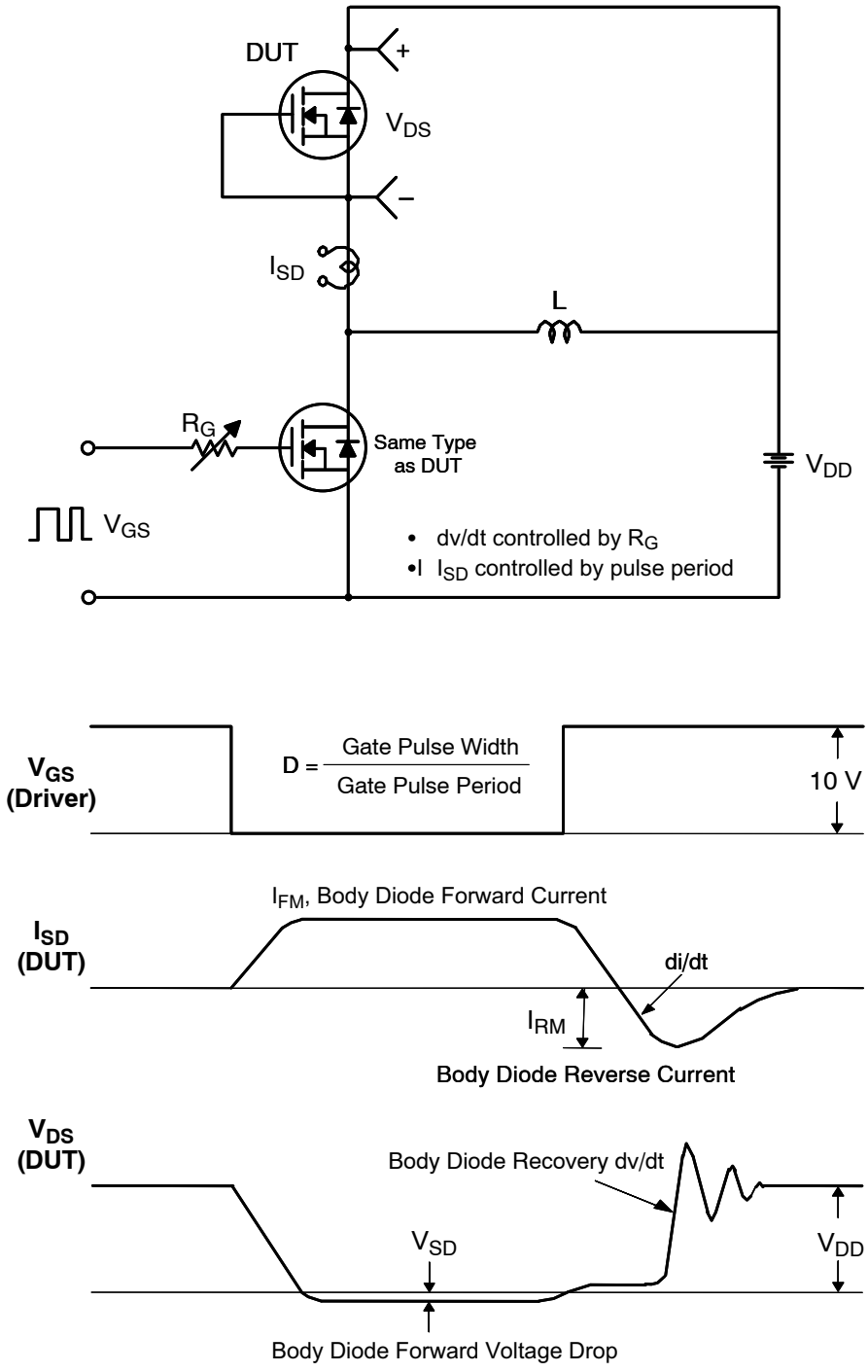


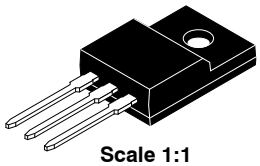
Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms

PACKAGE MARKING AND ORDERING INFORMATION

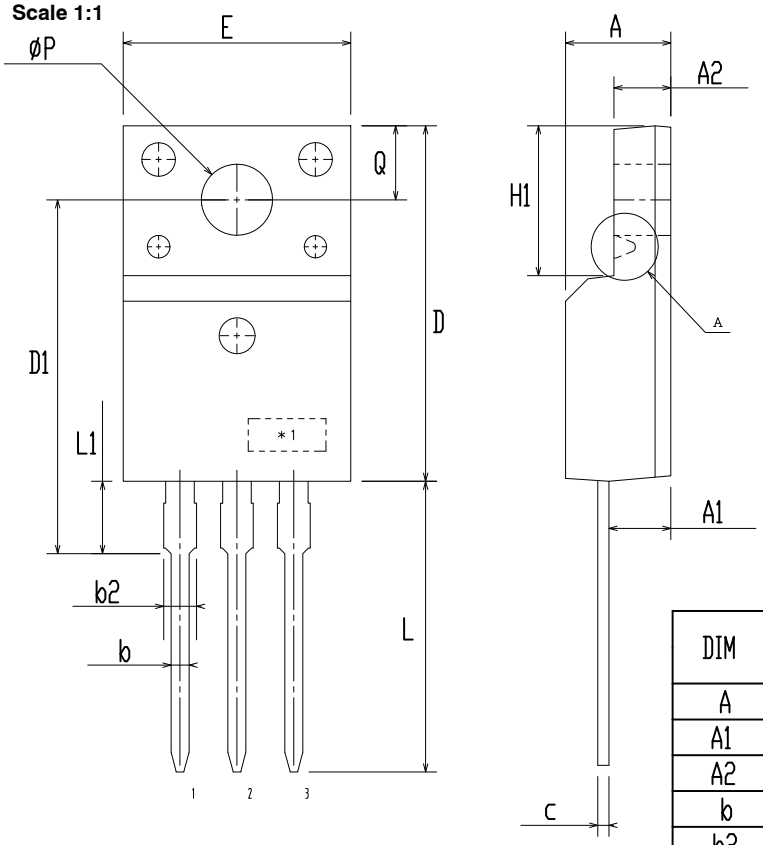
Device	Device Marking	Package	Quantity
FDPF2710T	FDPF2710T	TO−220 Fullpack, 3−Lead / TO−220F−3SG	50 Units / Tube

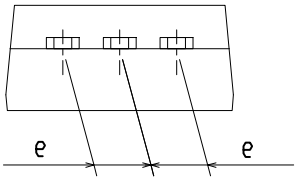
TO−220 Fullpack, 3−Lead / TO−220F−3SG
CASE 221AT
ISSUE B

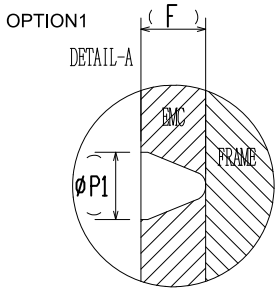
DATE 19 JAN 2021



Scale 1:1







DIM	MILLIMITERS		
	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 PROTRUCSIONS.
C. OPTION 1 - WITH SUPPORT PIN HOLE
OPTION 2 - NO SUPPORT PIN HOLE

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