

# MOSFET – N-Channel, QFET

250 V, 14 A, 110 mΩ

## FQPF27N25

### Description

This N-Channel enhancement mode power MOSFET is produced using onsemi's proprietary planar stripe and DMOS technology. This advanced MOSFET technology has been especially tailored to reduce on-state resistance, and to provide superior switching performance and high avalanche energy strength. These devices are suitable for switched mode power supplies, active power factor correction (PFC), and electronic lamp ballasts.

### Features

- 14 A, 250 V,  $R_{DS(on)} = 110 \text{ m}\Omega$  (Max.) @  $V_{GS} = 10 \text{ V}$ ,  $I_D = 7 \text{ A}$
- Low Gate Charge (Typ. 50 nC)
- Low  $C_{rss}$  (Typ. 45 pF)
- 100% Avalanche Tested
- This is a Pb-Free Device

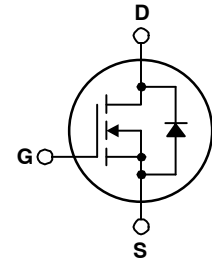
### ABSOLUTE MAXIMUM RATINGS ( $T_C = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Value	Unit
$V_{DSS}$	Drain to Source Voltage	250	V
$I_D$	Drain Current	-Continuous ( $T_C = 25^\circ\text{C}$ )	14 A
		-Continuous ( $T_C = 100^\circ\text{C}$ )	8.9 A
$I_{DM}$	Drain Current -Pulsed (Note 1)	56	A
$V_{GSS}$	Gate-Source Voltage	$\pm 30$	V
$E_{AS}$	Single Pulsed Avalanche Energy (Note 2)	600	mJ
$I_{AR}$	Avalanche Current (Note 1)	14	A
$E_{AR}$	Repetitive Avalanche Energy (Note 1)	5.5	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	5.5	V/ns
$P_D$	Power Dissipation ( $T_C = 25^\circ\text{C}$ )		55 W
		-Derate Above $25^\circ\text{C}$	0.44 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 Purposes, 1/8" from Case for 5 seconds	300	$^\circ\text{C}$

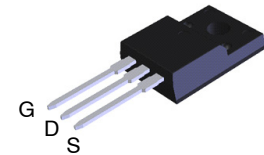
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2.  $L = 4.9 \text{ mH}$ ,  $I_{AS} = 14 \text{ A}$ ,  $V_{DD} = 50 \text{ V}$ ,  $R_G = 25 \Omega$ , Starting  $T_J = 25^\circ\text{C}$ .
3.  $I_{SD} \leq 27 \text{ A}$ ,  $di/dt \leq 300 \text{ A}/\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$ .

$V_{DSS}$	$R_{DS(on)} \text{ MAX}$	$I_D \text{ MAX}$
250 V	110 mΩ @ 10 V	14 A

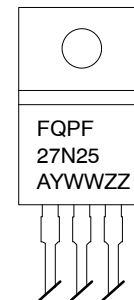


N-CHANNEL MOSFET



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

### MARKING DIAGRAM



- FQPF27N25 = Specific Device Code  
A = Assembly Location  
YWW = Date Code (Year & Week)  
ZZ = Assembly Lot

### ORDERING INFORMATION

Device	Package	Shipping
FQPF27N25	TO-220F (Pb-Free)	1000 / Tube

# FQPF27N25

## THERMAL CHARACTERISTICS

Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Max.	2.27	$^{\circ}\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Max.	62.5	$^{\circ}\text{C}/\text{W}$

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

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

$BV_{DSS}$	Drain-Source Breakdown Voltage	$I_D = 250 \mu\text{A}, V_{GS} = 0 \text{V}$	250	-	-	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250 \mu\text{A}$ , Referenced to $25^{\circ}\text{C}$	-	0.29	-	$\text{V}/^{\circ}\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 250 \text{V}, V_{GS} = 0 \text{V}$	-	-	1	$\mu\text{A}$
		$V_{DS} = 200 \text{V}, T_C = 125^{\circ}\text{C}$	-	-	10	$\mu\text{A}$
$I_{GSSF}$	Gate-Body Leakage Current, Forward	$V_{GS} = 30 \text{V}, V_{DS} = 0 \text{V}$	-	-	100	nA
$I_{GSSR}$	Gate-Body Leakage Current, Reverse	$V_{GS} = -30 \text{V}, V_{DS} = 0 \text{V}$	-	-	-100	nA

### ON CHARACTERISTICS

$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250 \mu\text{A}$	3.0	-	5.0	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = 10 \text{V}, I_D = 7.0 \text{A}$	-	0.083	0.11	$\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS} = 50 \text{V}, I_D = 7.0 \text{A}$	-	15	-	S

### DYNAMIC CHARACTERISTICS

$C_{iss}$	Input Capacitance	$V_{DS} = 25 \text{V}, V_{GS} = 0 \text{V}, f = 1.0 \text{MHz}$	-	1900	2450	pF
$C_{oss}$	Output Capacitance		-	360	470	pF
$C_{rss}$	Reverse Transfer Capacitance		-	45	60	pF

### SWITCHING CHARACTERISTICS

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 125 \text{V}, I_D = 27 \text{A}, R_G = 25 \Omega$ (Note 4)	-	32	75	ns
$t_r$	Turn-On Rise Time		-	270	550	ns
$t_{d(off)}$	Turn-Off Delay Time		-	80	170	ns
$t_f$	Turn-Off Fall Time		-	120	250	ns
$Q_g$	Total Gate Charge	$V_{DS} = 200 \text{V}, I_D = 27 \text{A}, V_{GS} = 10 \text{V}$ (Note 4)	-	50	65	nC
$Q_{gs}$	Gate-Source Charge		-	12.5	-	nC
$Q_{gd}$	Gate-Drain Charge		-	26	-	nC

### DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS

$I_S$	Maximum Continuous Drain-Source Diode Forward Current	-	-	14	A	
$I_{SM}$	Maximum Pulsed Drain-Source Diode Forward Current	-	-	56	A	
$V_{SD}$	Drain-Source Diode Forward Voltage	$V_{GS} = 0 \text{V}, I_S = 14 \text{A}$	-	-	1.5	V
$t_{rr}$	Reverse Recovery Time	$V_{GS} = 0 \text{V}, I_S = 27 \text{A}, dI_F/dt = 100 \text{A}/\mu\text{s}$	-	220	-	ns
$Q_{rr}$	Reverse Recovery Charge		-	1.8	-	$\mu\text{C}$

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

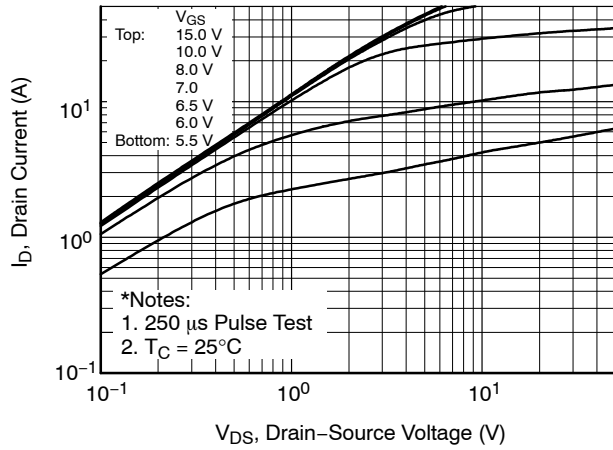


Figure 1. On-Region Characteristics

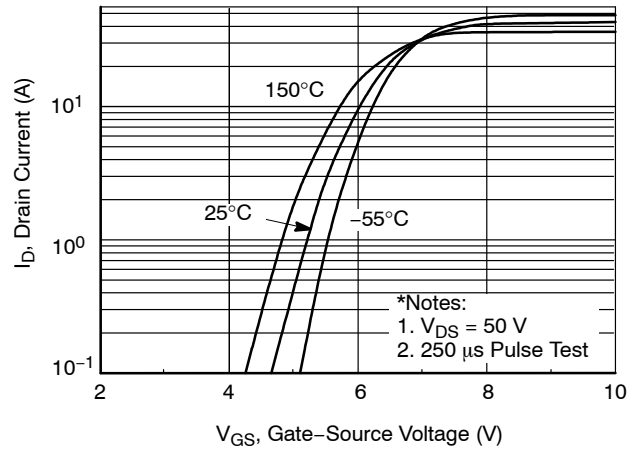


Figure 2. Transfer Characteristics

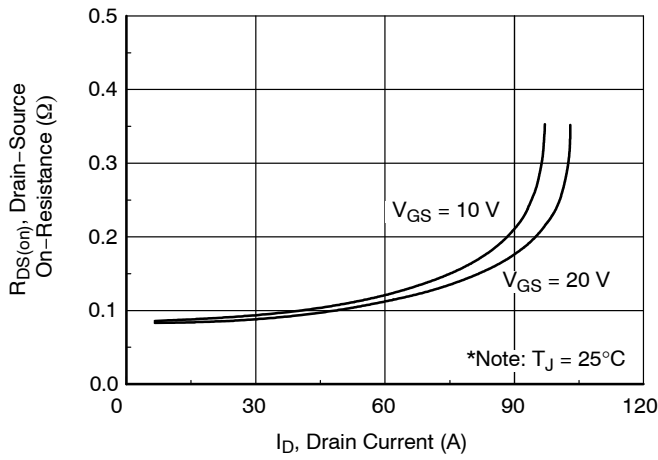


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

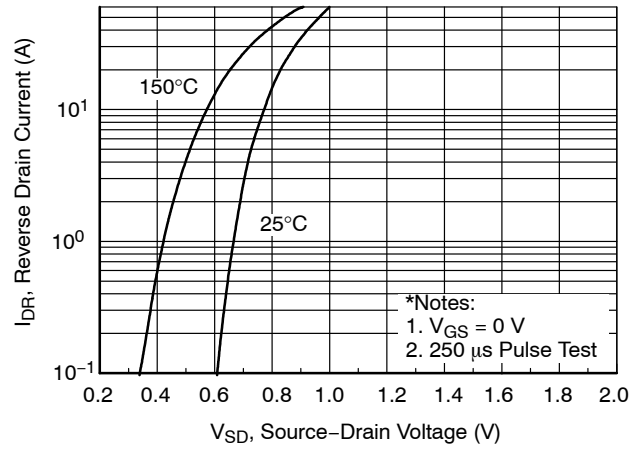


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

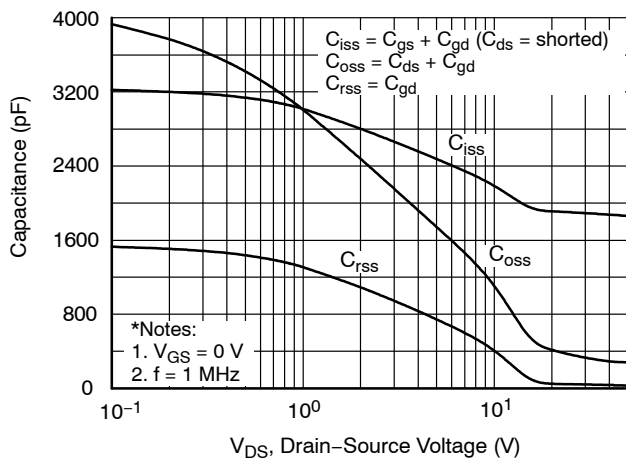


Figure 5. Capacitance Characteristics

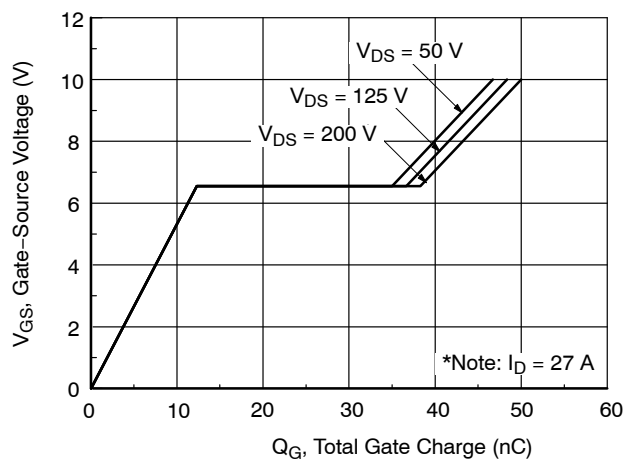


Figure 6. Gate Charge Characteristics

TYPICAL CHARACTERISTICS (continued)

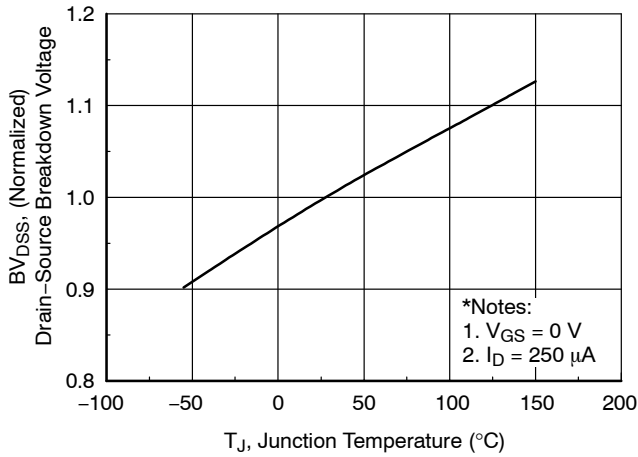


Figure 7. Breakdown Voltage Variation vs. Temperature

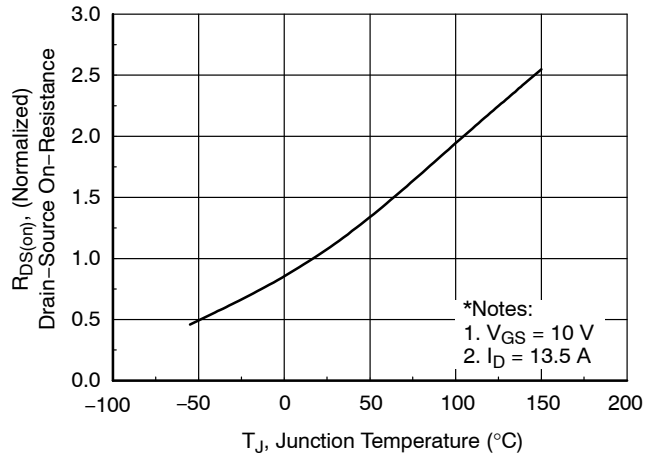


Figure 8. On-Resistance Variation vs. Temperature

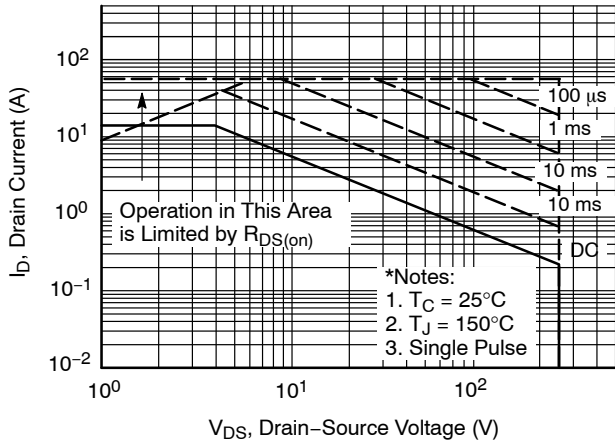


Figure 9. Maximum Safe Operating Area

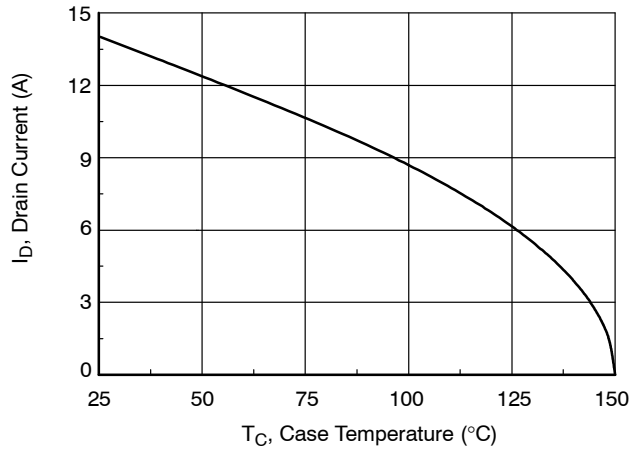


Figure 10. Maximum Drain Current vs. Case Temperature

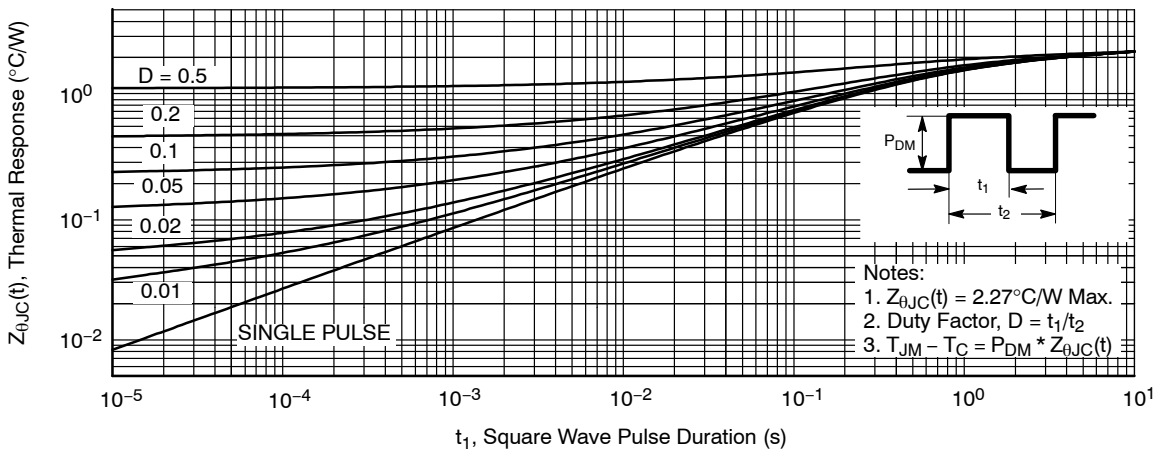


Figure 11. Transient Thermal Response Curve

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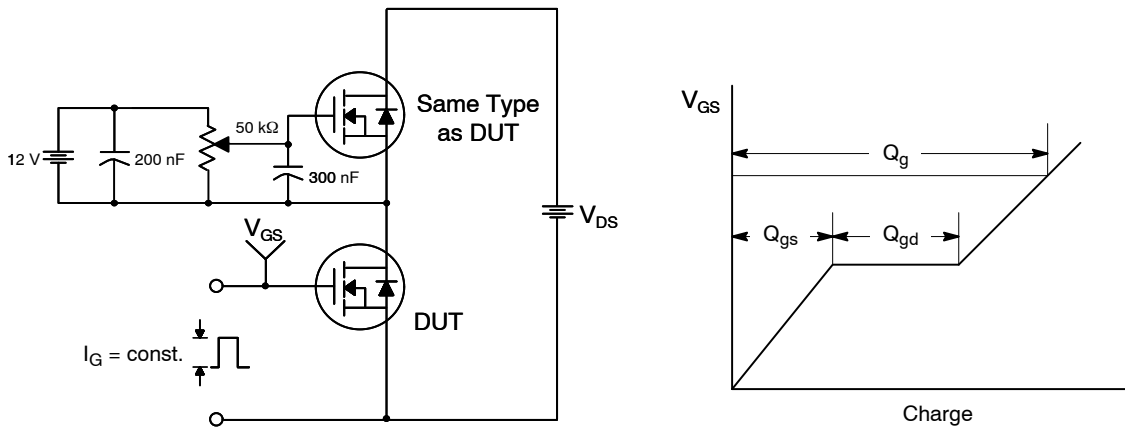


Figure 12. Gate Charge Test Circuit & Waveform

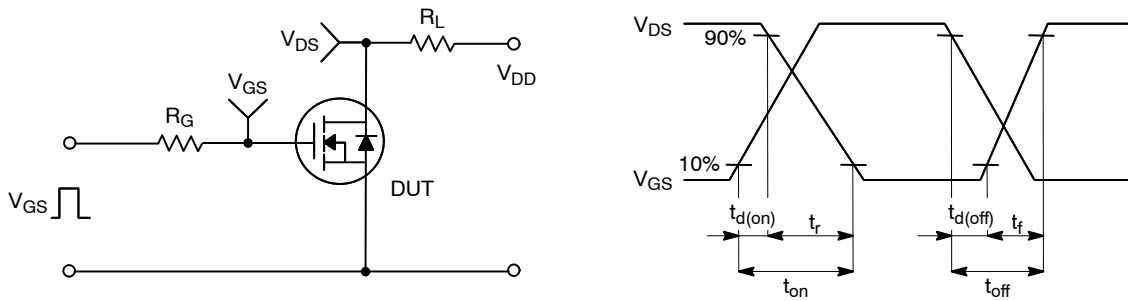


Figure 13. Resistive Switching Test Circuit & Waveforms

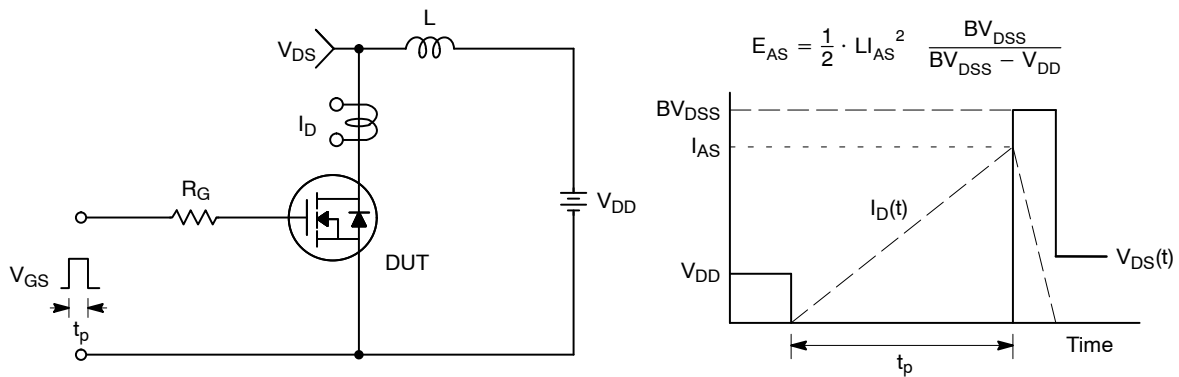
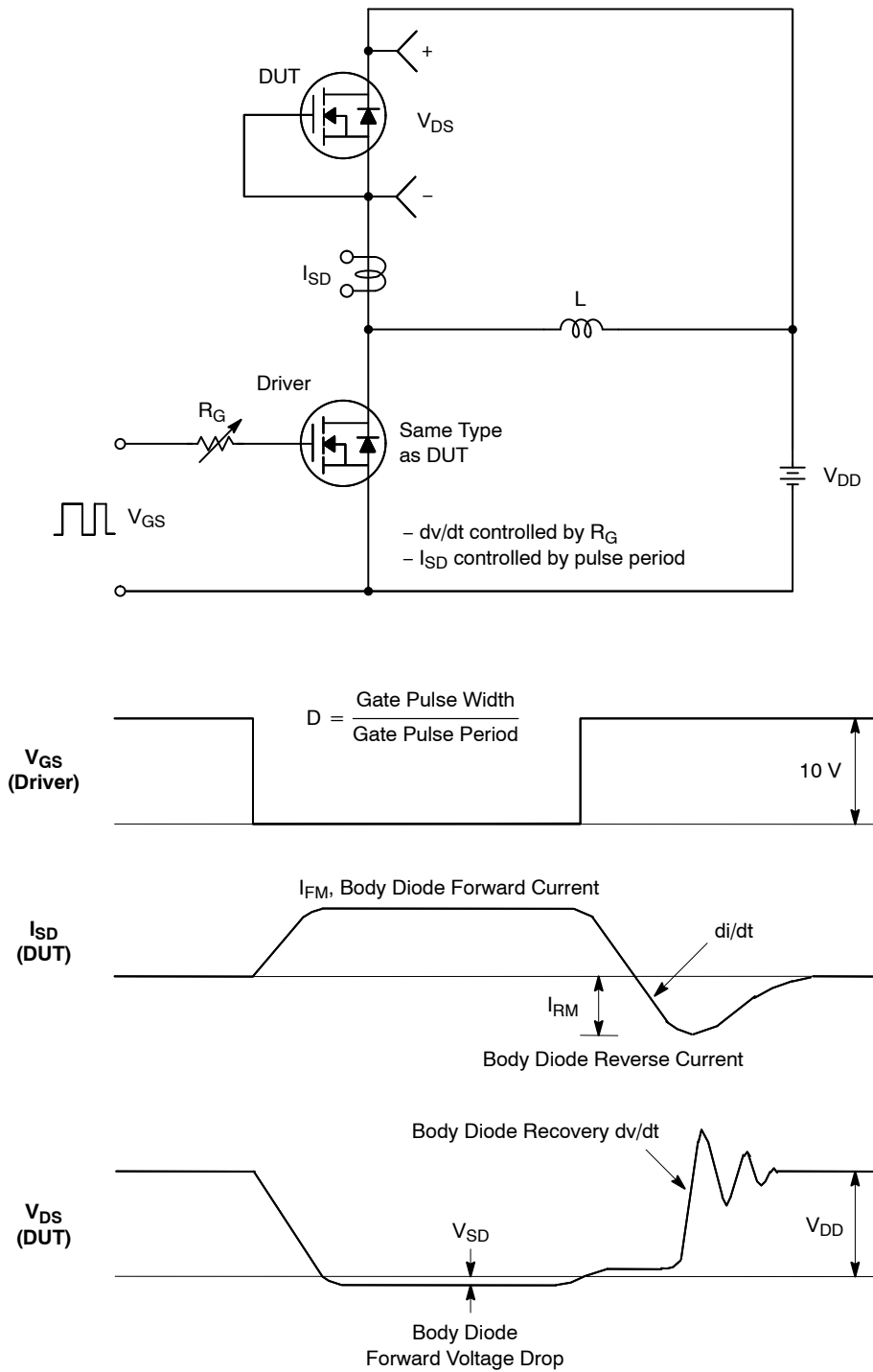


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

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

# MECHANICAL CASE OUTLINE

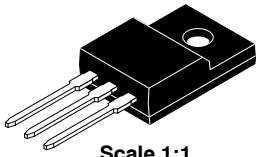
## PACKAGE DIMENSIONS

ON Semiconductor®

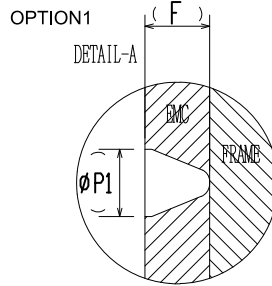
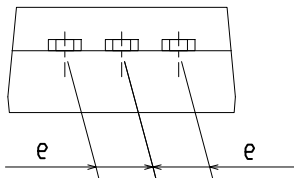
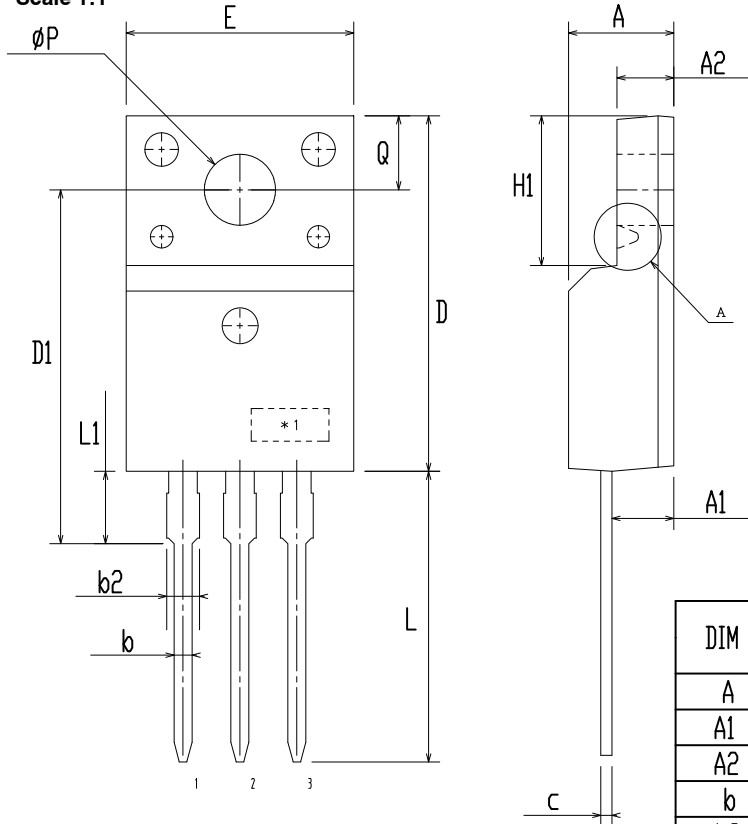


TO-220 Fullpack, 3-Lead / TO-220F-3SG  
CASE 221AT  
ISSUE B

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
∅ P	2.98	3.18	3.38
∅ 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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