

MOSFET – P-Channel, QFET

-200 V, -5.2 A, 690 mΩ

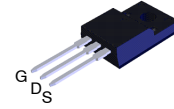
FQPF7P20

Description

This P-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, audio amplifier, DC motor control, and variable switching power applications.

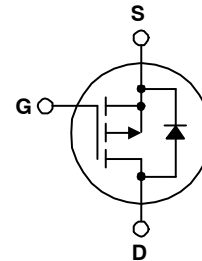
Features

- -5.2 A, -200 V, $R_{DS(on)} = 690 \text{ m}\Omega$ (Max.) @ $V_{GS} = -10 \text{ V}$, $I_D = -2.6 \text{ A}$
- Low Gate Charge (Typ. 19 nC)
- Low C_{RSS} (Typ. 25 pF)
- 100% Avalanche Tested

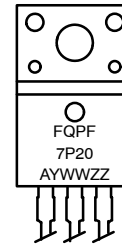


TO-220 Fullpack,
 3-Lead /
 TO-220F-3SG
 CASE 221AT

N-CHANNEL MOSFET



MARKING DIAGRAM



FQPF7P20	= Specific Device Code
A	= Assembly Location
YWW	= Date Code (Year & Week)
ZZ	= Assembly Lot

ORDERING INFORMATION

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

FQPF7P20

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

Symbol	Parameter	Rating	Unit
V _{DSS}	Drain–Source Voltage	–200	V
I _D	Drain Current	– Continuous (T _C = 25°C) – Continuous (T _C = 100°C)	A A
I _{DM}	Drain Current	– Pulsed (Note 1)	A
V _{GSS}	Gate–Source Voltage	±30	V
E _{AS}	Single Pulsed Avalanche Energy (Note 2)	570	mJ
I _{AR}	Avalanche Current (Note 1)	–5.2	A
E _{AR}	Repetitive Avalanche Energy (Note 1)	4.5	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	–5.5	V/ns
P _D	Power Dissipation	(T _C = 25°C) – Derate Above 25°C	W 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.

THERMAL CHARACTERISTICS

Symbol	Parameter	Value	Unit
R _{θJC}	Thermal Resistance, Junction–to–Case, Max.	2.78	°C/W
R _{θJA}	Thermal Resistance, Junction–to–Ambient, Max.	62.5	°C/W

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

BV _{DSS}	Drain–Source Breakdown Voltage	V _{GS} = 0 V, I _D = –250 μA	–200	–	–	V
ΔBV _{DSS} / ΔT _J	Breakdown Voltage Temperature Coefficient	I _D = –250 μA, Referenced to 25°C	–	–0.1	–	V/°C
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = –200 V, V _{GS} = 0 V V _{DS} = –160 V, T _C = 125°C	–	–	–1 –10	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	–	–5.0	V
R _{DS(on)}	Static Drain–Source On–Resistance	V _{GS} = –10 V, I _D = –2.6 A	–	0.54	0.69	Ω
g _{FS}	Forward Transconductance	V _{DS} = –40 V, I _D = –2.6 A	–	3.5	–	S

DYNAMIC CHARACTERISTICS

C _{iss}	Input Capacitance	V _{DS} = –25 V, V _{GS} = 0 V, f = 1.0 MHz	–	590	770	pF
C _{oss}	Output Capacitance		–	140	180	pF
C _{rss}	Reverse Transfer Capacitance		–	25	35	pF

FQPF7P20

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
SWITCHING CHARACTERISTICS						
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = -100\text{ V}$, $I_D = -7.3\text{ A}$, $R_G = 25\ \Omega$ (Note 4)	-	15	40	ns
t_r	Turn-On Rise Time		-	110	230	ns
$t_{d(off)}$	Turn-Off Delay Time		-	30	70	ns
t_f	Turn-Off Fall Time		-	42	90	ns
Q_g	Total Gate Charge	$V_{DS} = -160\text{ V}$, $I_D = -7.3\text{ A}$, $V_{GS} = -10\text{ V}$ (Note 4)	-	19	25	nC
Q_{gs}	Gate-Source Charge		-	4.6	-	nC
Q_{gd}	Gate-Drain Charge		-	9.5	-	nC

DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS

I_S	Maximum Continuous Drain-Source Diode Forward Current	-	-	-5.2	A	
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current	-	-	-20.8	A	
V_{SD}	Drain-Source Diode Forward Voltage	$V_{GS} = 0\text{ V}$, $I_S = -5.2\text{ A}$	-	-	-5.0	V
t_{rr}	Reverse Recovery Time	$V_{GS} = 0\text{ V}$, $I_S = -7.3\text{ A}$, $di_F/dt = 100\text{ A}/\mu\text{s}$	-	180	-	ns
Q_{rr}	Reverse Recovery Charge		-	1.07	-	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.

1. Repetitive rating; pulse-width limited by maximum junction temperature.
2. $L = 31.5\text{ mH}$, $I_{AS} = -5.2\text{ A}$, $V_{DD} = -50\text{ V}$, $R_G = 25\ \Omega$, starting $T_J = 25^\circ\text{C}$.
3. $I_{SD} \leq -7.3\text{ A}$, $di/dt \leq 300\text{ A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, starting $T_J = 25^\circ\text{C}$.
4. Essentially independent of operating temperature.

TYPICAL CHARACTERISTICS

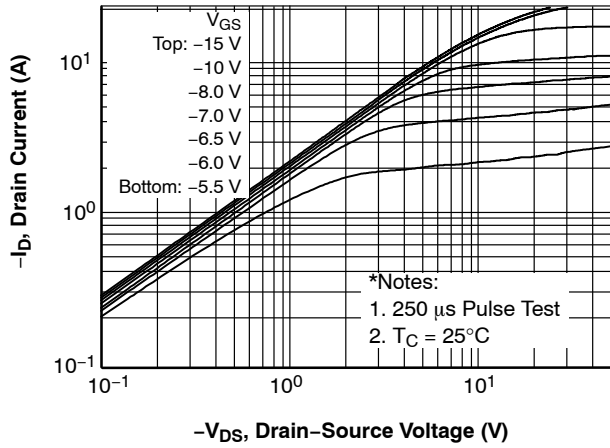


Figure 1. On-Region Characteristics

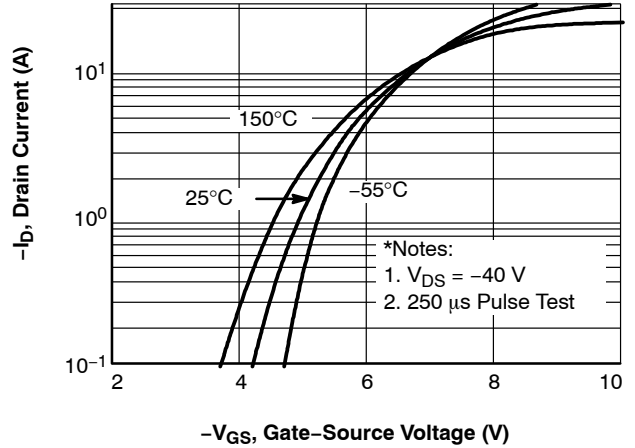


Figure 2. Transfer Characteristics

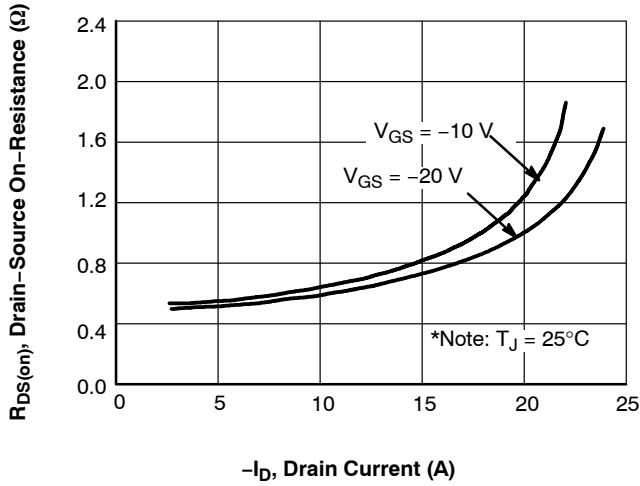


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

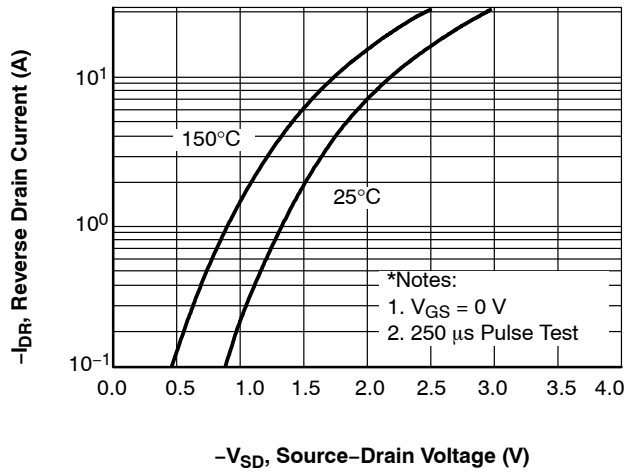


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

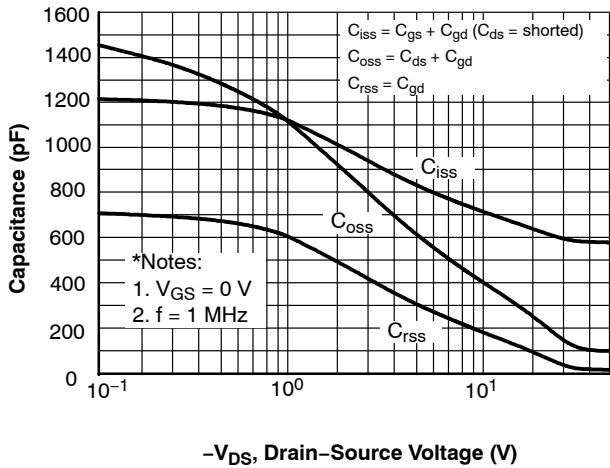


Figure 5. Capacitance Characteristics

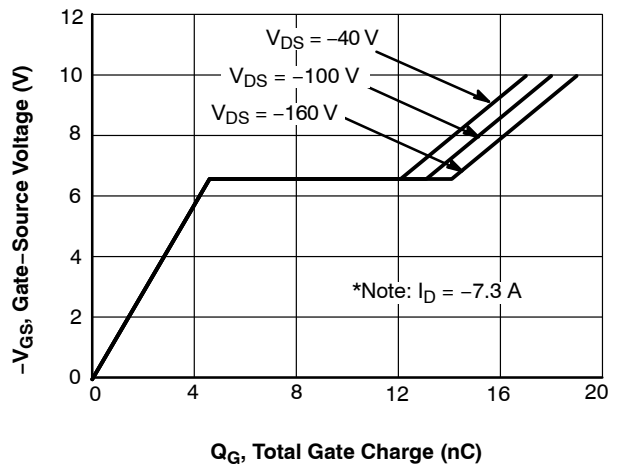


Figure 6. Gate Charge Characteristics

FQPF7P20

TYPICAL CHARACTERISTICS (continued)

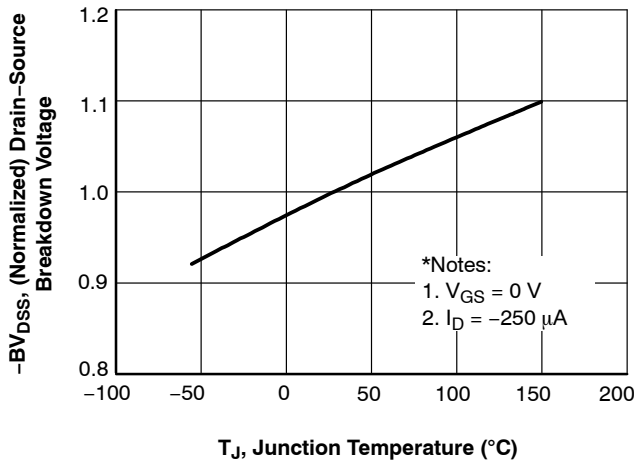


Figure 7. Breakdown Voltage Variation vs. Temperature

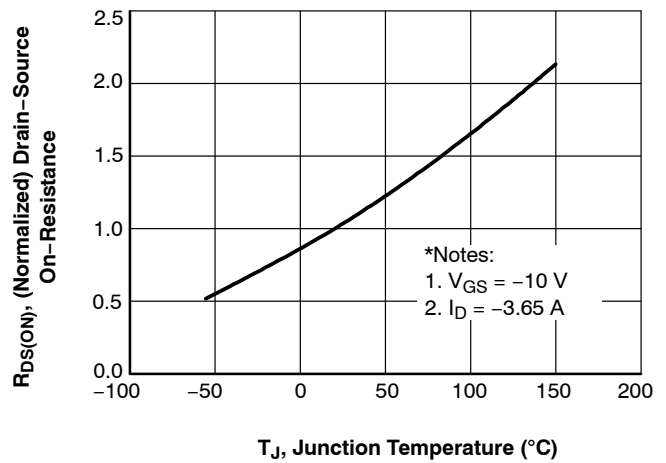


Figure 8. On-Resistance Variation vs. Temperature

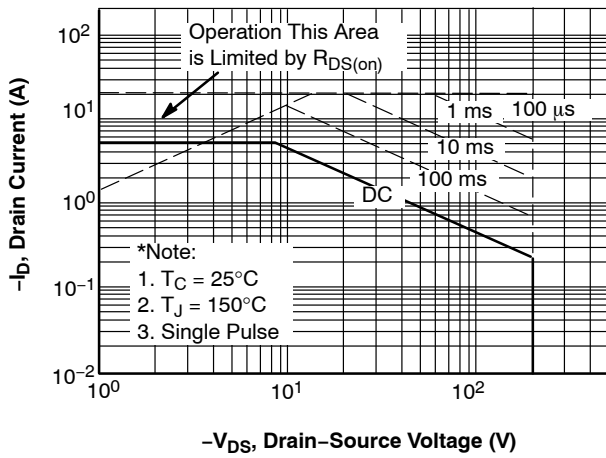


Figure 9. Maximum Safe Operating Area

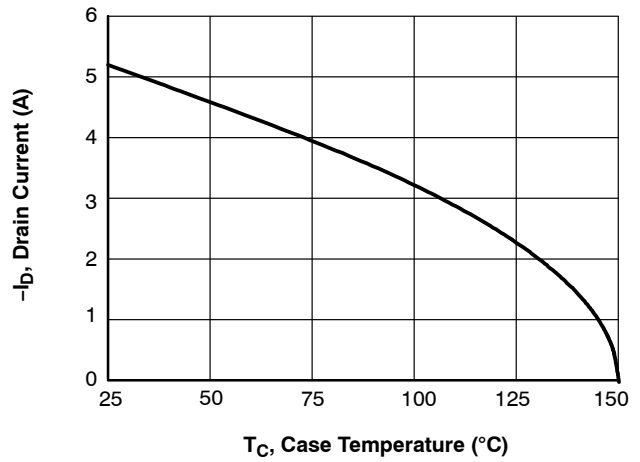


Figure 10. Maximum Drain Current vs. Case Temperature

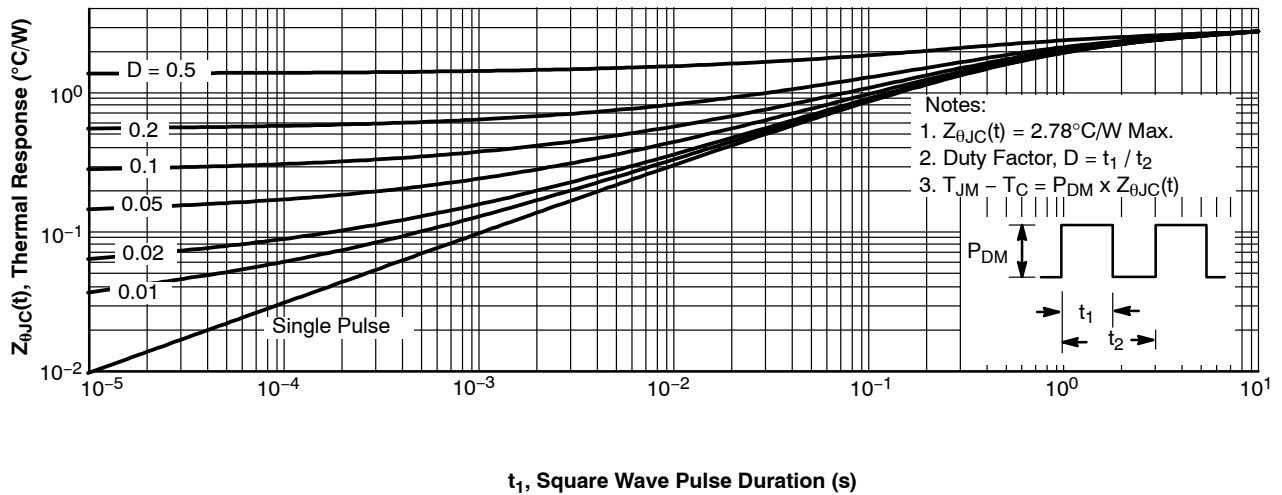


Figure 11. Transient Thermal Response Curve

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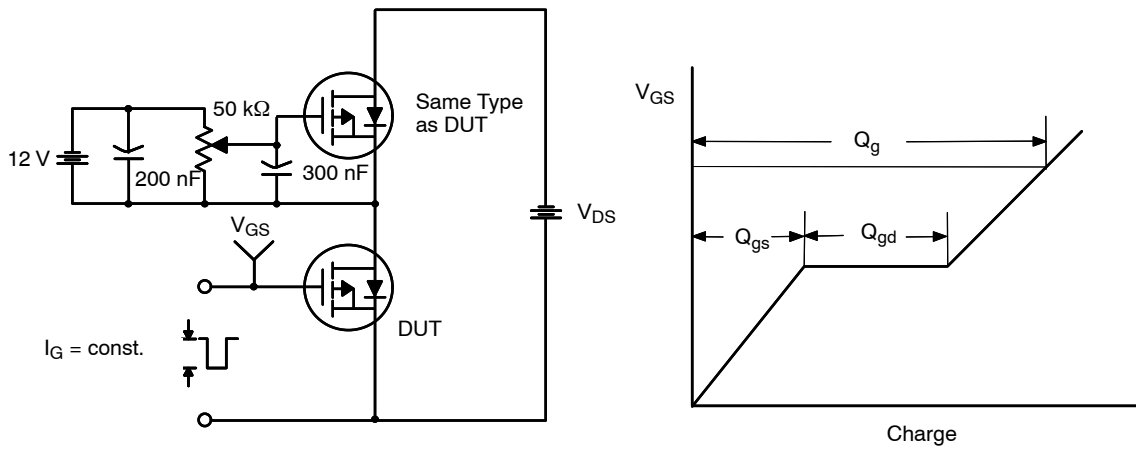


Figure 12. Gate Charge Test Circuit & Waveform

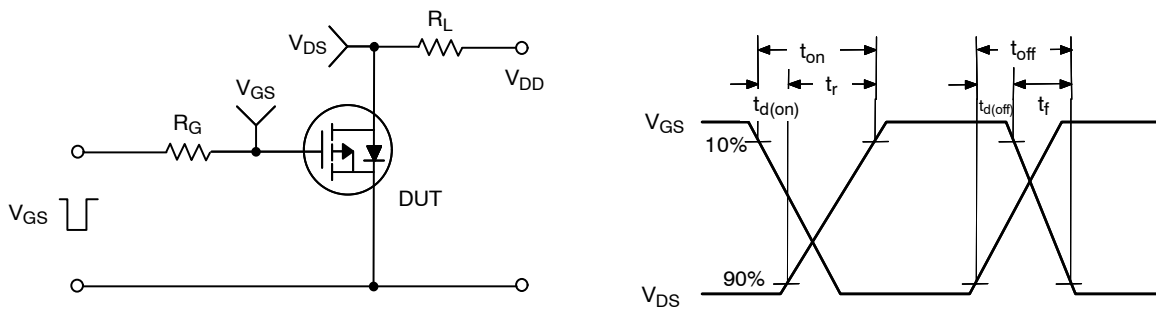


Figure 13. Resistive Switching Test Circuit & Waveforms

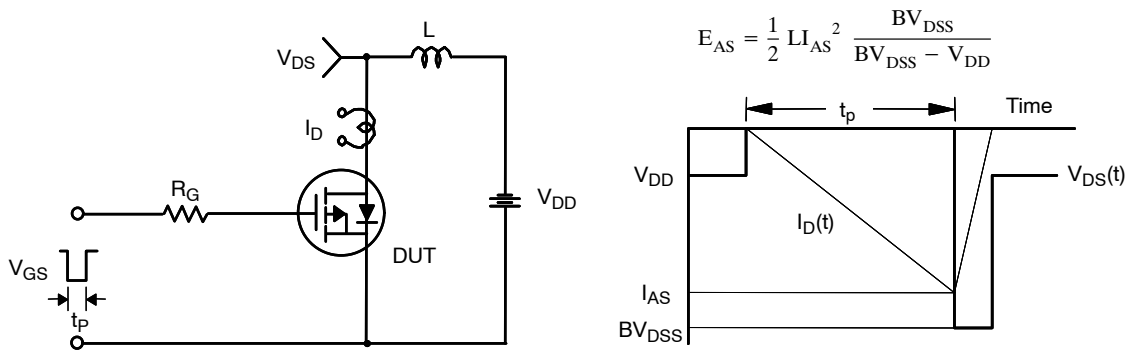


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

FQPF7P20

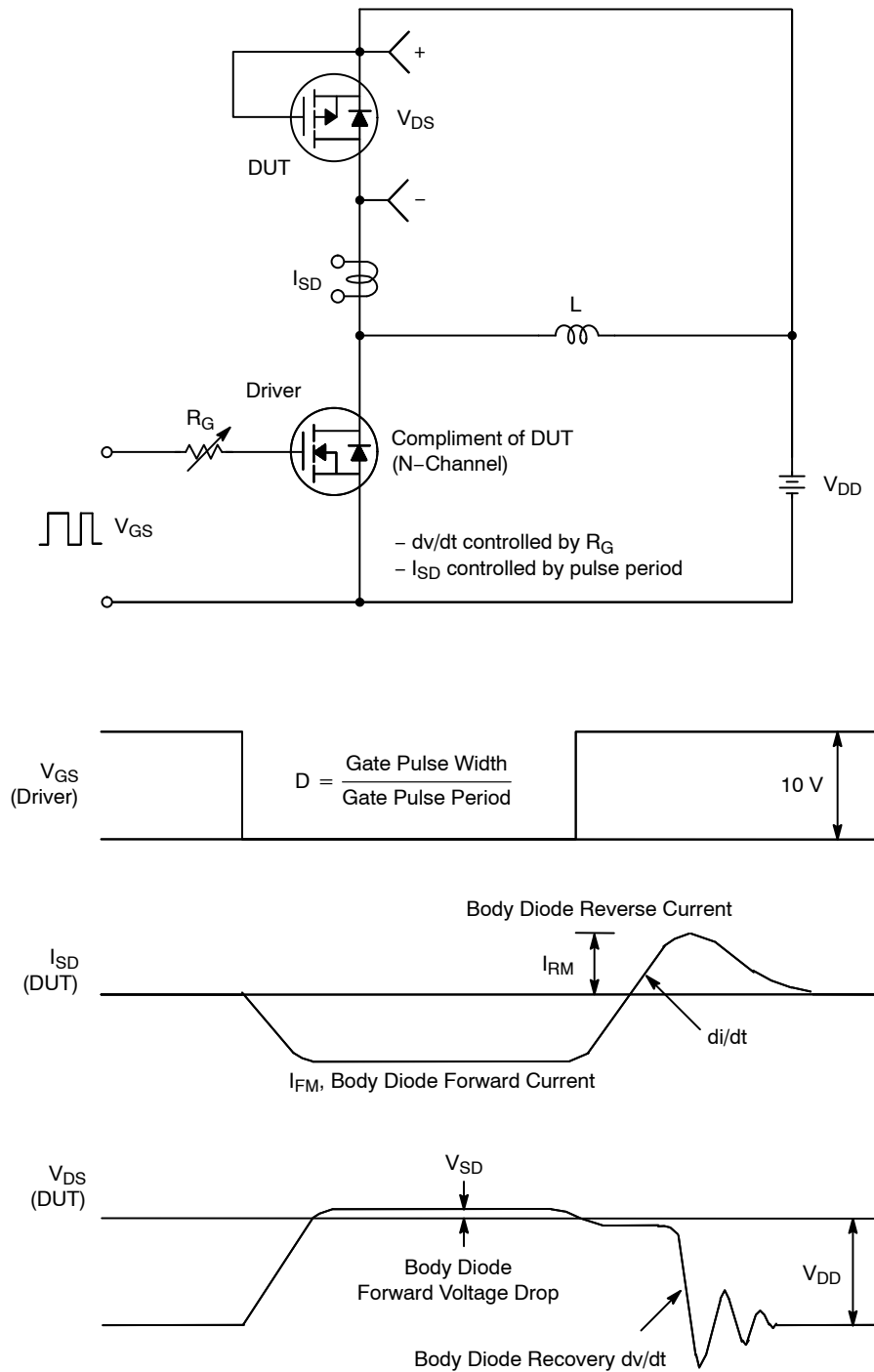


Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms

FQPF7P20

PACKAGE MARKING AND ORDERING INFORMATION

Part Number	Top Mark	Package	Shipping
FQPF7P20	FQPF7P20	TO-220 Fullpack, 3-Lead / TO-220F-3SG CASE 221AT	1,000 Units / Tube

MECHANICAL CASE OUTLINE

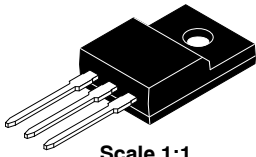
PACKAGE DIMENSIONS

ON Semiconductor®

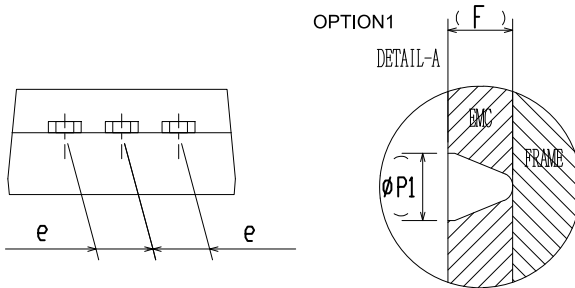
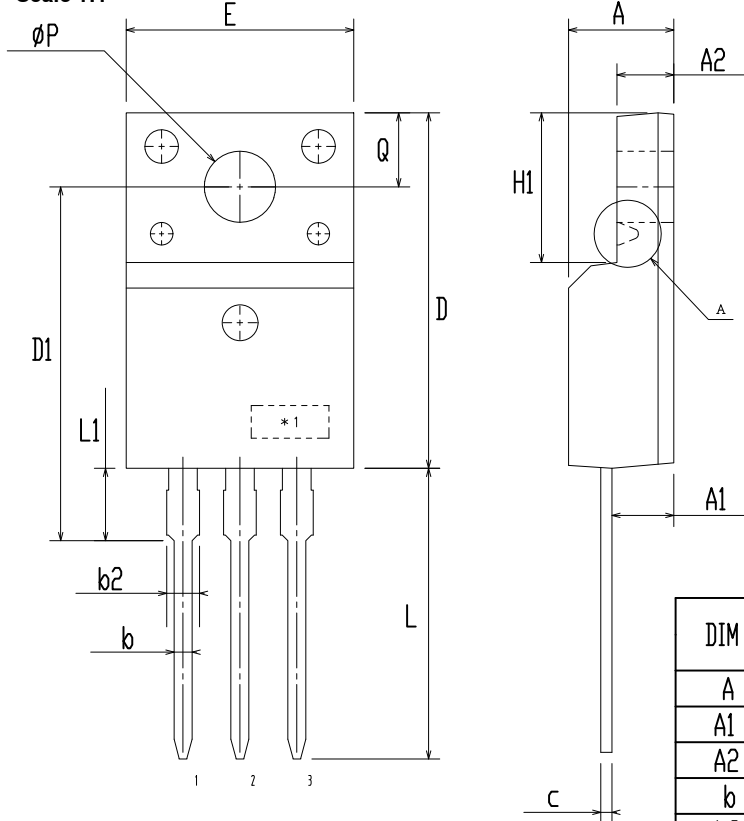


TO-220 Fullpack, 3-Lead / TO-220F-3SG CASE 221AT ISSUE B

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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