

# MOSFET – P-Channel, QFET®

**-60 V, -30 A, 26 mΩ**

## FQPF47P06, FQPF47P06YDTU

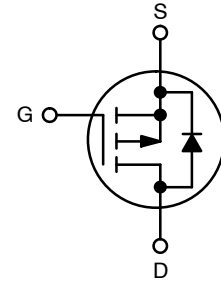
### Description

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.

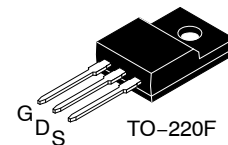
### Features

- -30 A, -60 V,  $R_{DS(on)} = 26 \text{ m}\Omega$  (Max.) @  $V_{GS} = -10 \text{ V}$ ,  $I_D = -15 \text{ A}$
- Low Gate Charge (Typ. 84 nC)
- Low  $C_{rss}$  (Typ. 320 pF)
- 100% Avalanche Tested
- 175°C Maximum Junction Temperature Rating

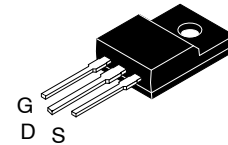
$V_{DSS}$	$R_{DS(on)}$ MAX	$I_D$ MAX
-60 V	26 mΩ @ -10 V	-30 A



P-Channel MOSFET

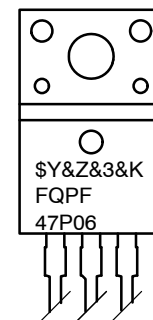


TO-220 Fullpack, 3-Lead / TO-220F-3SG  
CASE 221AT



TO-220-3LD LF  
CASE 340BJ

### MARKING DIAGRAM



- \$Y = onsemi Logo
- &Z = Assembly Plant Code
- &3 = 3-Digit Plant Code
- &K = 2-Digits Lot Run Traceability Code
- FQPF47P06 = Specific Device Code

### ORDERING INFORMATION

Device	Package	Shipping
FQPF47P06	TO-220-3 (Pb-Free)	1000 Units / Tube
FQPF47P06YDTU	TO-220-3 (Pb-Free)	800 Units / Tube

# FQPF47P06, FQPF47P06YDTU

## ABSOLUTE MAXIMUM RATINGS (T<sub>C</sub> = 25°C unless otherwise specified)

Symbol	Parameter	FQPF47P06 / FQPF47P06YDTU	Unit
V <sub>DSS</sub>	Drain-Source Voltage	-60	V
I <sub>D</sub>	Drain Current	- Continuous (T <sub>C</sub> = 25°C)	-30
		- Continuous (T <sub>C</sub> = 100°C)	-21.2
I <sub>DM</sub>	Drain Current (Note 1)	- Pulsed	-120
V <sub>GSS</sub>	Gate-Source Voltage	+ 25	V
E <sub>AS</sub>	Single Pulsed Avalanche Energy (Note 2)	820	mJ
I <sub>AR</sub>	Avalanche Current (Note 1)	-30	A
E <sub>AR</sub>	Repetitive Avalanche Energy (Note 1)	6.2	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	-7.0	V/ns
P <sub>D</sub>	Power Dissipation (T <sub>C</sub> = 25°C)		62
		- Derate above 25°C	0.41
T <sub>J</sub> , T <sub>STG</sub>	Operating and Storage Temperature Range	-55 to +175	°C
T <sub>L</sub>	Maximum Lead Temperature for Soldering Purposes, 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 = 1.06 mH, I<sub>AS</sub> = -30 A, V<sub>DD</sub> = -25 V, R<sub>G</sub> = 25 Ω, Starting T<sub>J</sub> = 25°C
3. I<sub>SD</sub> ≤ -47 A, di/dt ≤ 300A/μs, V<sub>DD</sub> ≤ BV<sub>DSS</sub>, Starting T<sub>J</sub> = 25°C

## THERMAL CHARACTERISTICS

Symbol	Characteristic	Typ	Max	Unit
R <sub>θJC</sub>	Thermal Resistance, Junction-to-Case	-	2.42	°C/W
R <sub>θJA</sub>	Thermal Resistance, Junction-to-Ambient	-	62.5	°C/W

# FQPF47P06, FQPF47P06YDTU

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

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

BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> = 0 V, I <sub>D</sub> = -250 μA	-60	--	-	V
ΔBV <sub>DSS</sub> / ΔT <sub>J</sub>	Breakdown Voltage Temperature Coefficient	I <sub>D</sub> = -250 μA, Referenced to 25°C	-	-0.06	-	V/°C
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> = -60 V, V <sub>GS</sub> = 0 V	-	-	-1	μA
		V <sub>DS</sub> = -48 V, T <sub>C</sub> = 150°C	-	-	-10	μA
I <sub>GSSF</sub>	Gate-Body Leakage Current, Forward	V <sub>GS</sub> = -25 V, V <sub>DS</sub> = 0 V	-	-	-100	nA
I <sub>GSSR</sub>	Gate-Body Leakage Current, Reverse	V <sub>GS</sub> = 25 V, V <sub>DS</sub> = 0 V	-	-	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	-2.0	-	-4.0	V
R <sub>DS(on)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> = -10 V, I <sub>D</sub> = -15 A	-	0.021	0.026	Ω
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> = -30 V, I <sub>D</sub> = -15 A (Note 4)	-	19	-	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	-	2800	3600	pF
C <sub>oss</sub>	Output Capacitance		-	1300	1700	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		-	320	420	pF

### SWITCHING CHARACTERISTICS

t <sub>d(on)</sub>	Turn-On Delay Time	V <sub>DD</sub> = -30 V, I <sub>D</sub> = -23.5 A, R <sub>G</sub> = 25 Ω (Note 4, 5)	-	50	110	ns
t <sub>r</sub>	Turn-On Rise Time		-	450	910	ns
t <sub>d(off)</sub>	Turn-Off Delay Time		-	100	210	ns
t <sub>f</sub>	Turn-Off Fall Time		-	195	400	ns
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> = -48 V, I <sub>D</sub> = -47 A, V <sub>GS</sub> = -10 V (Note 4, 5)	-	84	110	nC
Q <sub>gs</sub>	Gate-Source Charge		-	18	-	nC
Q <sub>gd</sub>	Gate-Drain Charge		-	44	-	nC

### DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATING

I <sub>S</sub>	Maximum Continuous Drain-Source Diode Forward Current		-	-	-30	A
I <sub>SM</sub>	Maximum Pulsed Drain-Source Diode Forward Current		-	-	-120	A
V <sub>SD</sub>	Drain-Source Diode Forward Voltage	V <sub>GS</sub> = 0 V, I <sub>S</sub> = -30 A	-	-	-4.0	V
t <sub>rr</sub>	Reverse Recovery Time	V <sub>GS</sub> = 0 V, I <sub>S</sub> = -47 A, dI <sub>F</sub> / dt = 100 A/μs (Note 4)	-	130	-	ns
Q <sub>rr</sub>	Reverse Recovery Charge		-	0.55	-	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. Pulse Test: Pulse width ≤ 300 μs, Duty cycle ≤ 2%
5. Essentially independent of operating temperature

TYPICAL CHARACTERISTICS

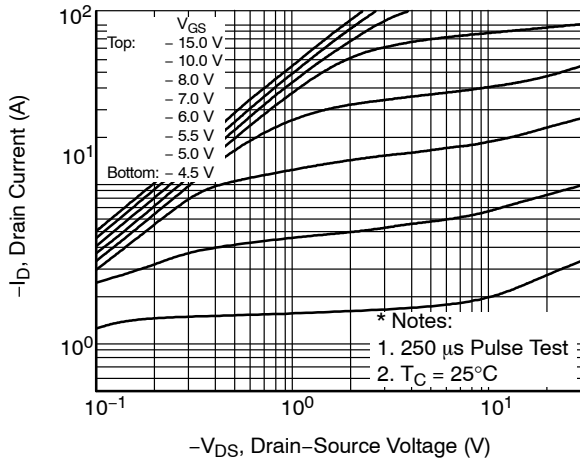


Figure 1. On-Region Characteristics

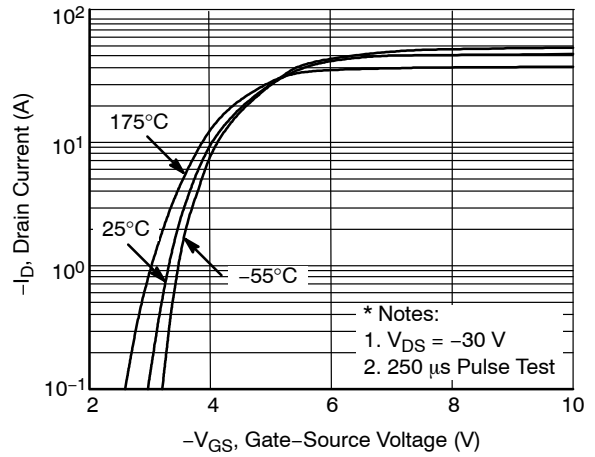


Figure 2. Transfer Characteristics

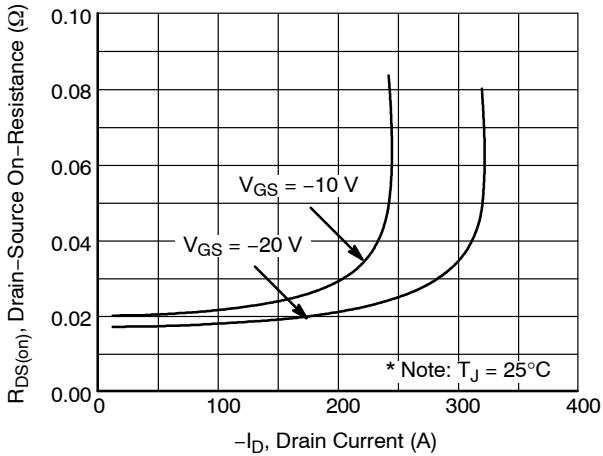


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

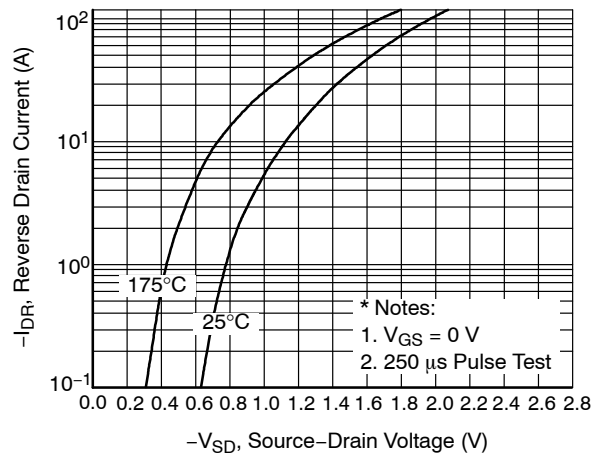


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

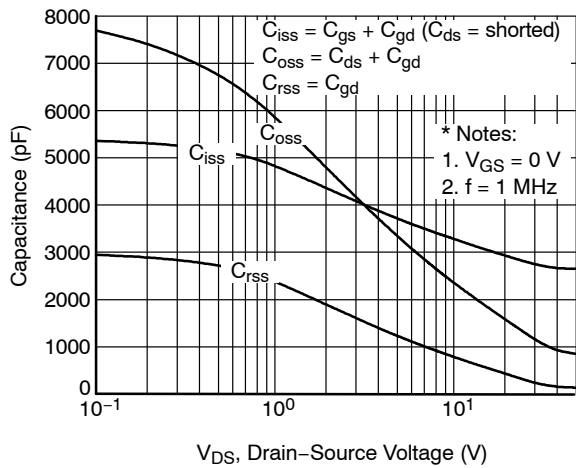


Figure 5. Capacitance Characteristics

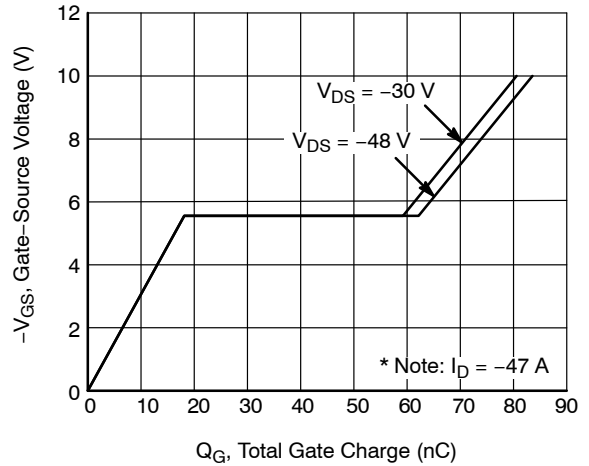
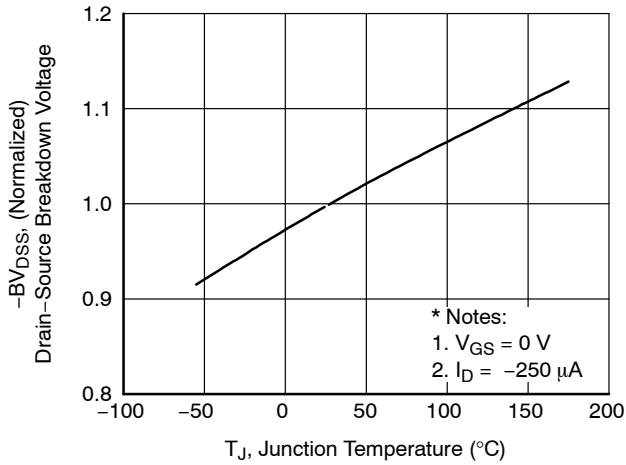


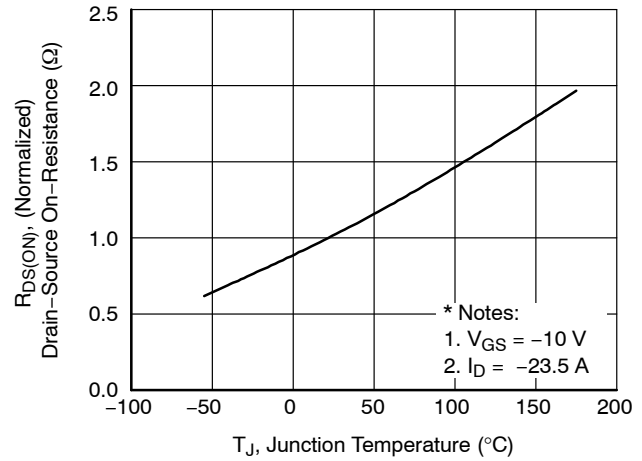
Figure 6. Gate Charge Characteristics

# FQPF47P06, FQPF47P06YDTU

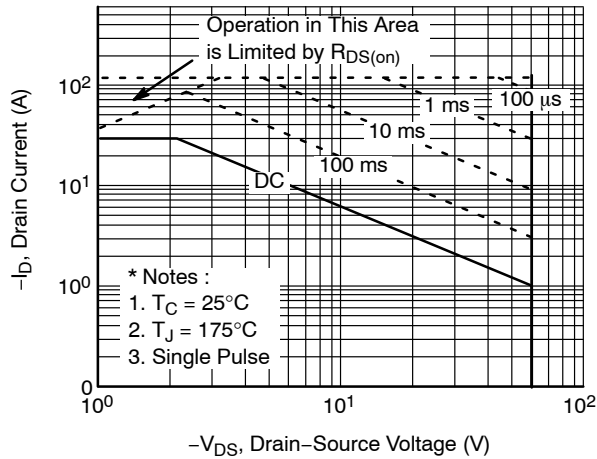
## TYPICAL CHARACTERISTICS (Continued)



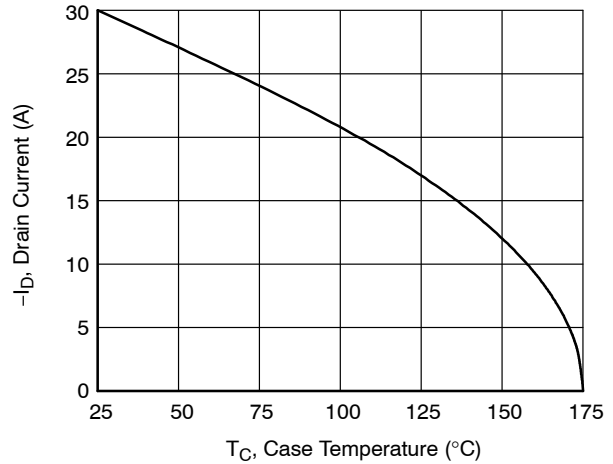
**Figure 7. Breakdown Voltage Variation vs. Temperature**



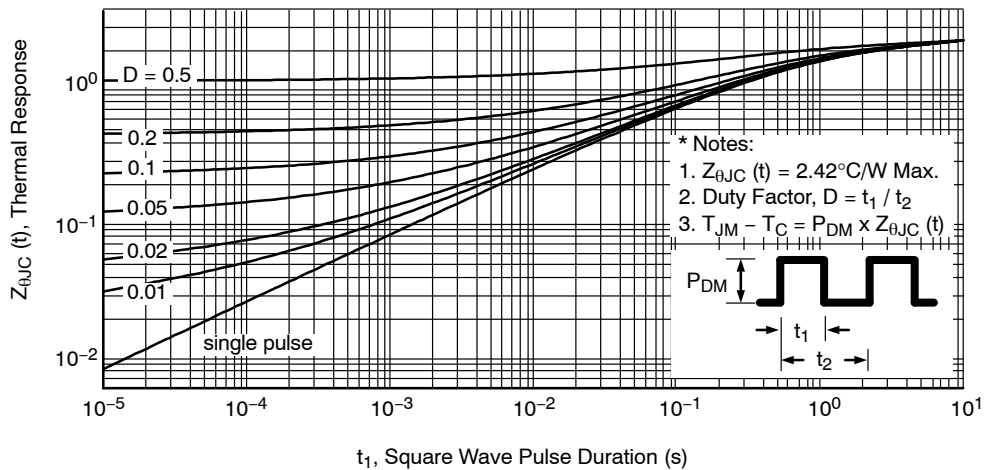
**Figure 8. On-Resistance Variation vs. Temperature**



**Figure 9. Maximum Safe Operating Area**



**Figure 10. Maximum Drain Current vs. Case Temperature**



**Figure 11. Transient Thermal Response Curve**

# FQPF47P06, FQPF47P06YDTU

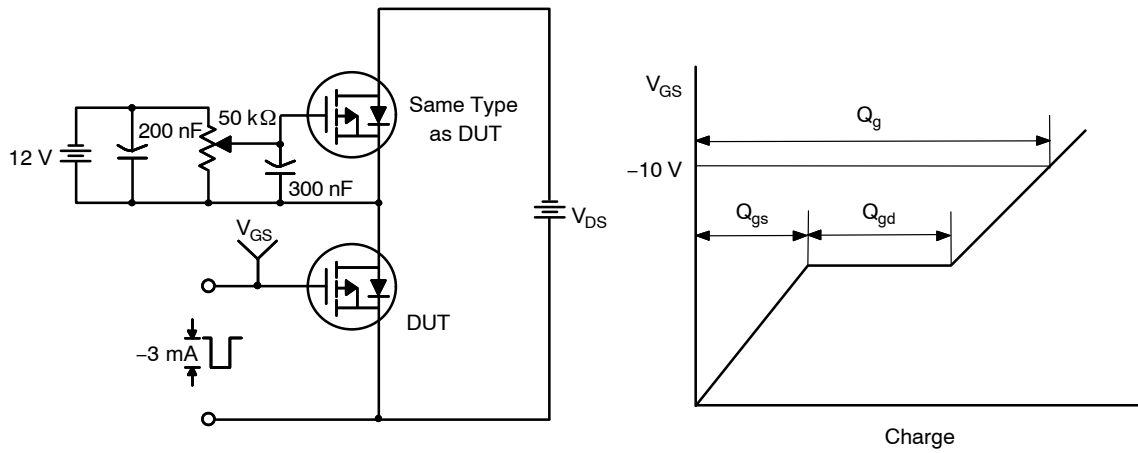


Figure 12. Gate Charge Test Circuit & Waveform

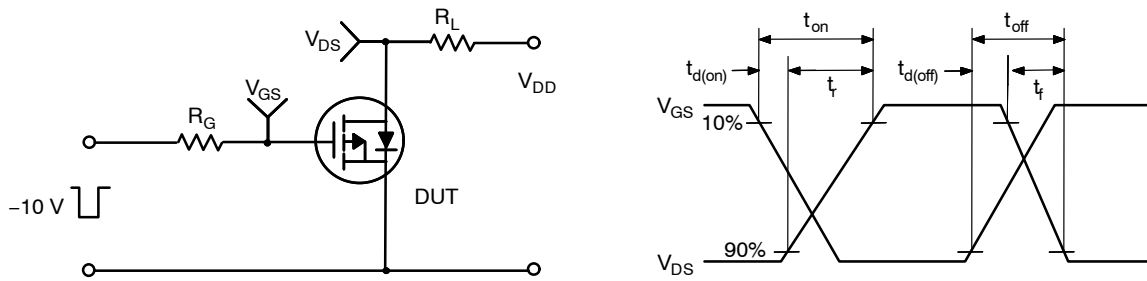


Figure 13. Resistive Switching Test Circuit & Waveforms

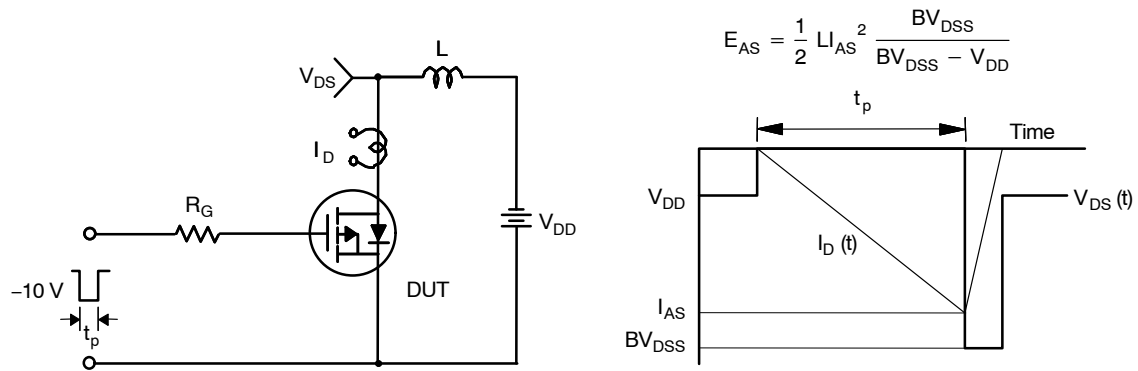
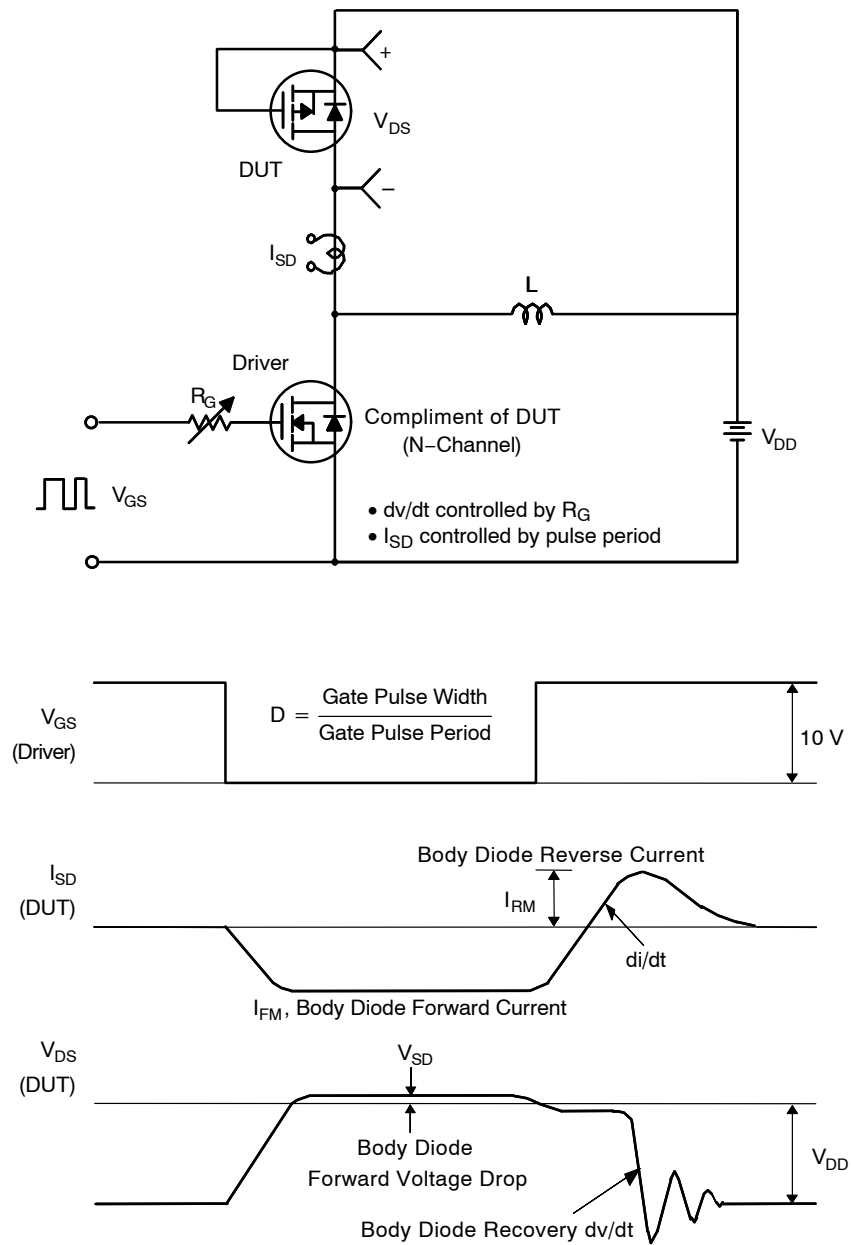


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

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

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# MECHANICAL CASE OUTLINE

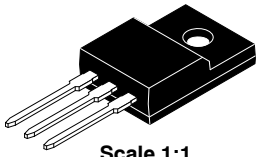
## PACKAGE DIMENSIONS

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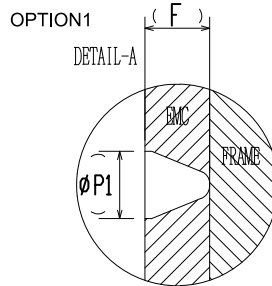
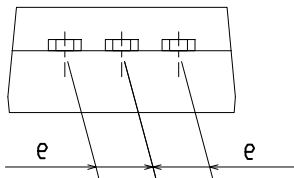
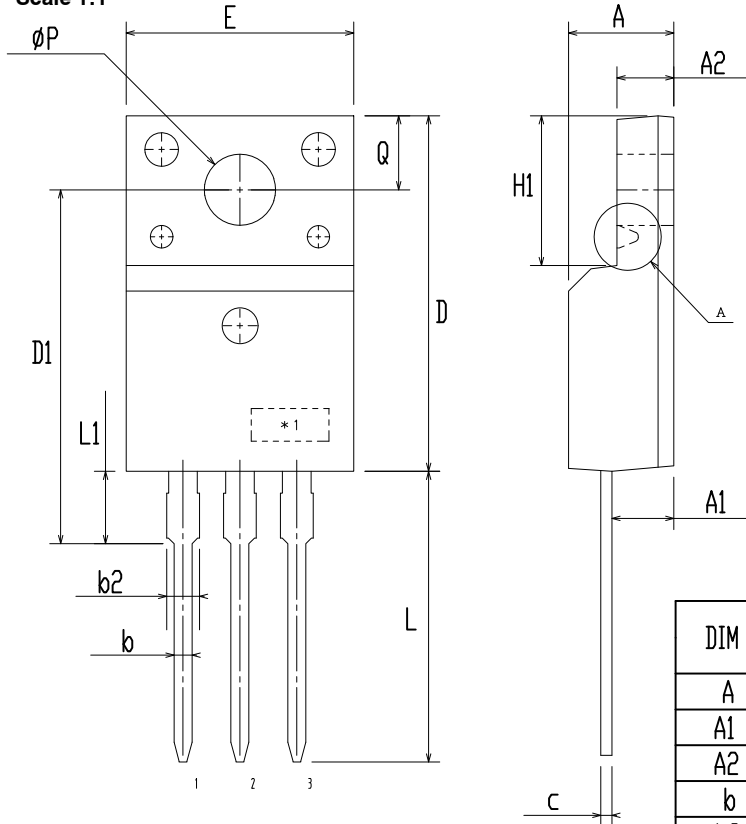


### TO-220 Fullpack, 3-Lead / TO-220F-3SG CASE 221AT ISSUE B

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

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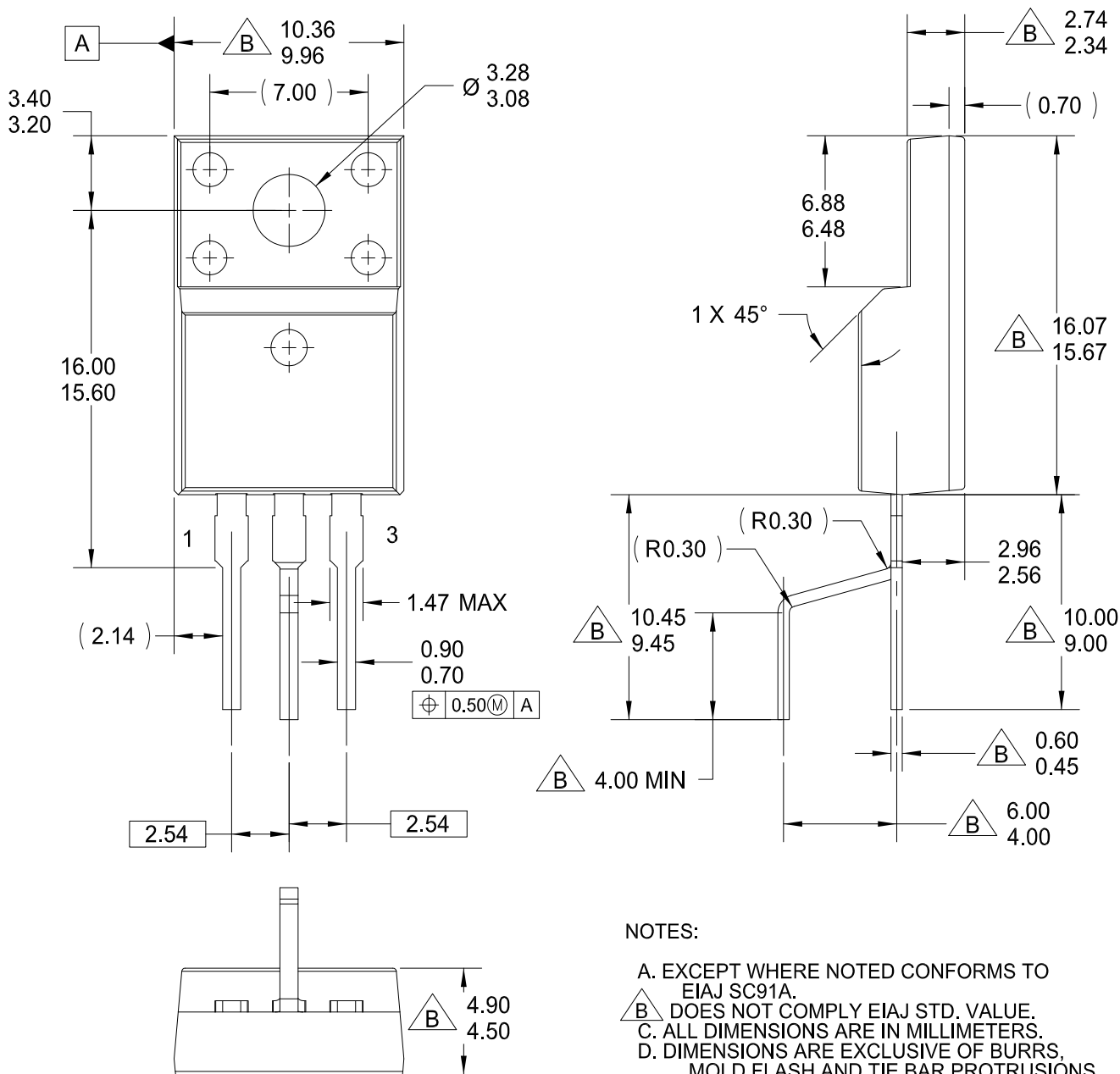
**MECHANICAL CASE OUTLINE**  
**PACKAGE DIMENSIONS**

ON Semiconductor®



**TO-220-3LD LF**  
**CASE 340BJ**  
**ISSUE O**

DATE 31 AUG 2016



- NOTES:**
- A. EXCEPT WHERE NOTED CONFORMS TO EIAJ SC91A.
  - B.** DOES NOT COMPLY EIAJ STD. VALUE.
  - C. ALL DIMENSIONS ARE IN MILLIMETERS.
  - D. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR PROTRUSIONS.
  - E. DIMENSION AND TOLERANCE AS PER ASME Y14.5-1994.

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