

MOSFET – P-Channel, QFET®

-60 V, -17 A, 70 mΩ

FQPF27P06

Description

This P-Channel enhancement mode MOSFET is produced using ON Semiconductor'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

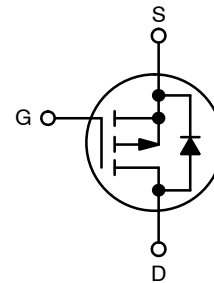
- -17 A, -60 V, $R_{DS(on)} = 70 \text{ m}\Omega$ (Max.) @ $V_{GS} = -10 \text{ V}$, $I_D = -8.5 \text{ A}$
- Low Gate Charge (Typ. 33 nC)
- Low C_{rss} (Typ. 120 pF)
- 100% Avalanche Tested
- 175°C Maximum Junction Temperature Rating



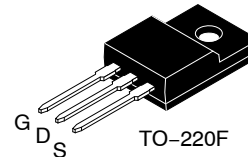
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| V_{DSS} | $R_{DS(on)}$ MAX | I_D MAX |
|-----------|------------------|-----------|
| -60 V | 70 mΩ @ 10 V | -17 A |

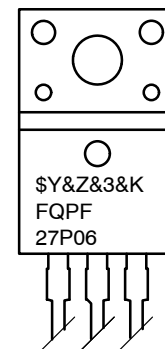


P-Channel MOSFET



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

MARKING DIAGRAM



\$Y = ON Semiconductor Logo
&Z = Assembly Plant Code
&3 = 3-Digit Plant Code
&K = 2-Digits Lot Run Traceability Code
FQPF27P06 = Specific Device Code

ORDERING INFORMATION

| Device | Package | Shipping |
|-----------|-----------------------|-------------------|
| FQPF27P06 | TO-220-3 (Pb-Free) | 1000 Units / Tube |

FQPF27P06

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

| Symbol | Parameter | FQPF27P06 | Unit |
|----------------|---|--|--------------------------|
| V_{DSS} | Drain-Source Voltage | -60 | V |
| I_D | Drain Current | - Continuous ($T_C = 25^\circ\text{C}$) | -17 A |
| | | - Continuous ($T_C = 100^\circ\text{C}$) | -12 A |
| I_{DM} | Drain Current (Note 1) | - Pulsed | -68 A |
| V_{GSS} | Gate-Source Voltage | + 25 | V |
| E_{AS} | Single Pulsed Avalanche Energy (Note 2) | 560 | mJ |
| I_{AR} | Avalanche Current (Note 1) | -17 | A |
| E_{AR} | Repetitive Avalanche Energy (Note 1) | 4.7 | mJ |
| dv/dt | Peak Diode Recovery dv/dt (Note 3) | -7.0 | V/ns |
| P_D | Power Dissipation ($T_C = 25^\circ\text{C}$) | | 47 W |
| | | - Derate above 25°C | 0.31 W/ $^\circ\text{C}$ |
| T_J, T_{STG} | Operating and Storage Temperature Range | -55 to +175 | $^\circ\text{C}$ |
| 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. $L = 2.25\text{ mH}$, $I_{AS} = -17\text{ A}$, $V_{DD} = -25\text{ V}$, $R_G = 25\ \Omega$, 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 $T_J = 25^\circ\text{C}$

THERMAL CHARACTERISTICS

| Symbol | Characteristic | Typ | Max | Unit |
|-----------------|---|-----|------|---------------------------|
| $R_{\theta JC}$ | Thermal Resistance, Junction-to-Case | - | 3.19 | $^\circ\text{C}/\text{W}$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambient | - | 62.5 | $^\circ\text{C}/\text{W}$ |

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

| Symbol | Parameter | Test Condition | Min | Typ | Max | Unit |
|--------|-----------|----------------|-----|-----|-----|------|
|--------|-----------|----------------|-----|-----|-----|------|

OFF CHARACTERISTICS

| | | | | | | |
|--------------------------------------|---|---|-----|-------|------|------|
| BV _{DSS} | Drain-Source Breakdown Voltage | V _{GS} = 0 V, I _D = -250 μA | -60 | -- | - | V |
| ΔBV _{DSS} / ΔT _J | Breakdown Voltage Temperature Coefficient | I _D = -250 μA, Referenced to 25°C | - | -0.06 | - | V/°C |
| I _{DSS} | Zero Gate Voltage Drain Current | V _{DS} = -60 V, V _{GS} = 0 V | - | - | -1 | μA |
| | | V _{DS} = -48 V, T _C = 150°C | - | - | -10 | μA |
| I _{GSSF} | Gate-Body Leakage Current, Forward | V _{GS} = -25 V, V _{DS} = 0 V | - | - | -100 | nA |
| I _{GSSR} | Gate-Body Leakage Current, Reverse | V _{GS} = 25 V, V _{DS} = 0 V | - | - | 100 | nA |

ON CHARACTERISTICS

| | | | | | | |
|---------------------|-----------------------------------|--|------|-------|------|---|
| V _{GS(th)} | Gate Threshold Voltage | V _{DS} = V _{GS} , I _D = -250 μA | -2.0 | - | -4.0 | V |
| R _{DS(on)} | Static Drain-Source On-Resistance | V _{GS} = -10 V, I _D = -8.5 A | - | 0.055 | 0.07 | Ω |
| g _{FS} | Forward Transconductance | V _{DS} = -30 V, I _D = -8.5 A (Note 4) | - | 12 | - | S |

DYNAMIC CHARACTERISTICS

| | | | | | | |
|------------------|------------------------------|---|---|------|------|----|
| C _{iss} | Input Capacitance | V _{DS} = -25 V, V _{GS} = 0 V, f = 1.0 MHz | - | 1100 | 1400 | pF |
| C _{oss} | Output Capacitance | | - | 510 | 660 | pF |
| C _{rss} | Reverse Transfer Capacitance | | - | 120 | 155 | pF |

SWITCHING CHARACTERISTICS

| | | | | | | |
|---------------------|---------------------|--|---|-----|-----|----|
| t _{d(on)} | Turn-On Delay Time | V _{DD} = -30 V, I _D = -13.5 A, R _G = 25 Ω (Note 4, 5) | - | 18 | 45 | ns |
| t _r | Turn-On Rise Time | | - | 185 | 380 | ns |
| t _{d(off)} | Turn-Off Delay Time | | - | 30 | 70 | ns |
| t _f | Turn-Off Fall Time | | - | 90 | 190 | ns |
| Q _g | Total Gate Charge | V _{DS} = -48 V, I _D = -27 A, V _{GS} = -10 V (Note 4, 5) | - | 33 | 43 | nC |
| Q _{gs} | Gate-Source Charge | | - | 6.8 | - | nC |
| Q _{gd} | Gate-Drain Charge | | - | 18 | - | nC |

DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATING

| | | | | | | |
|-----------------|---|---|---|------|------|----|
| I _S | Maximum Continuous Drain-Source Diode Forward Current | | - | - | -17 | A |
| I _{SM} | Maximum Pulsed Drain-Source Diode Forward Current | | - | - | -68 | A |
| V _{SD} | Drain-Source Diode Forward Voltage | V _{GS} = 0 V, I _S = -17 A | - | - | -4.0 | V |
| t _{rr} | Reverse Recovery Time | V _{GS} = 0 V, I _S = -27 A, dI _F / dt = 100 A/μs (Note 4) | - | 105 | - | ns |
| Q _{rr} | Reverse Recovery Charge | | - | 0.41 | - | 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

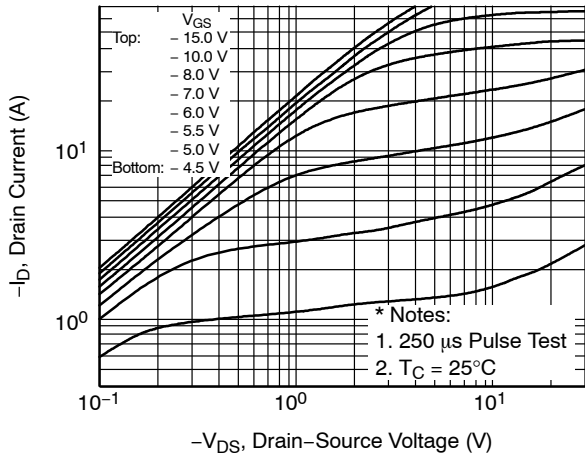


Figure 1. On-Region Characteristics

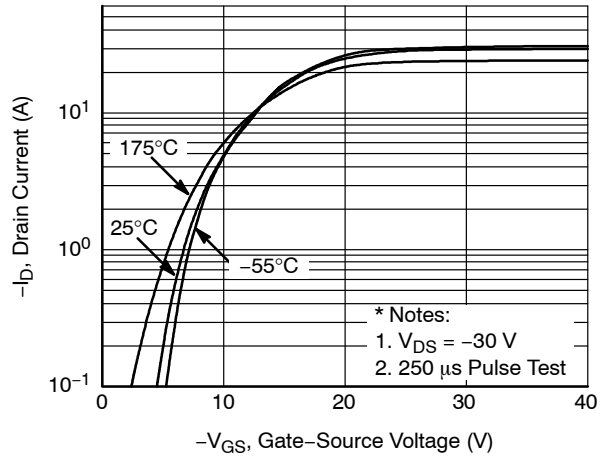


Figure 2. Transfer Characteristics

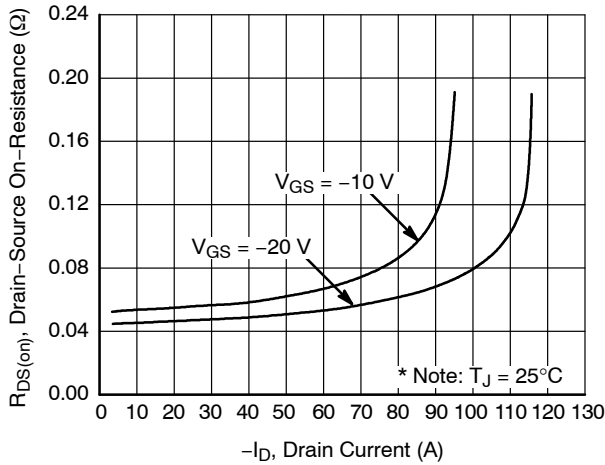


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

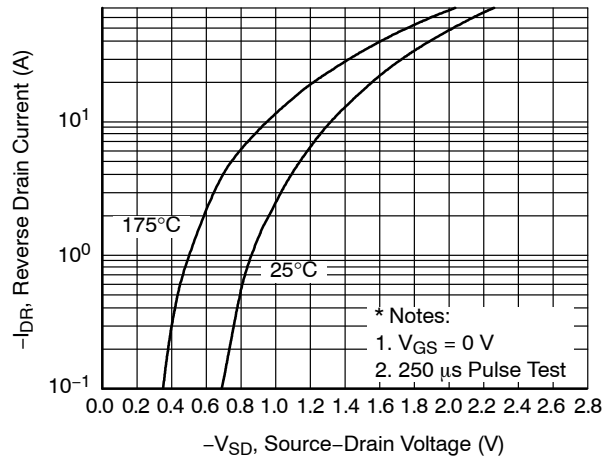


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

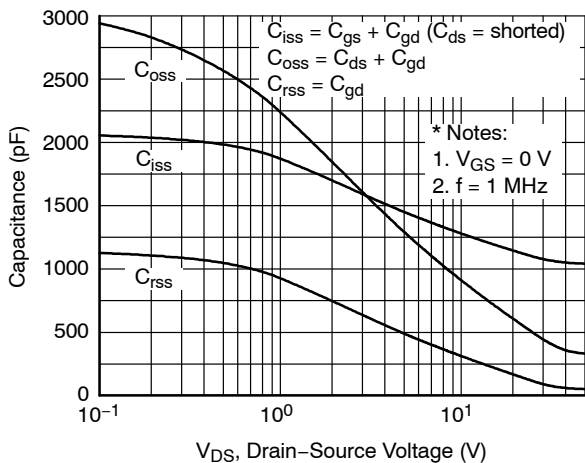


Figure 5. Capacitance Characteristics

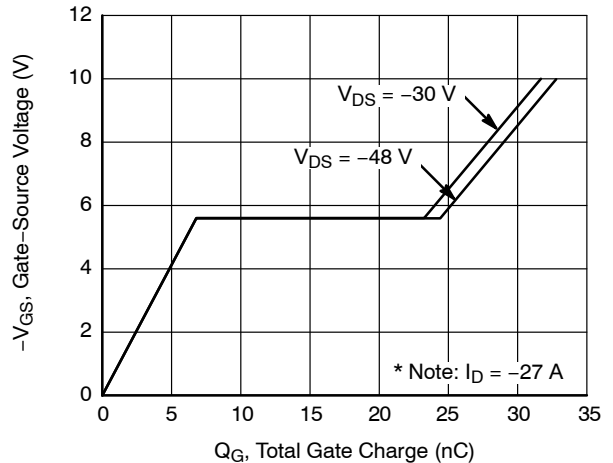


Figure 6. Gate Charge Characteristics

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TYPICAL CHARACTERISTICS (Continued)

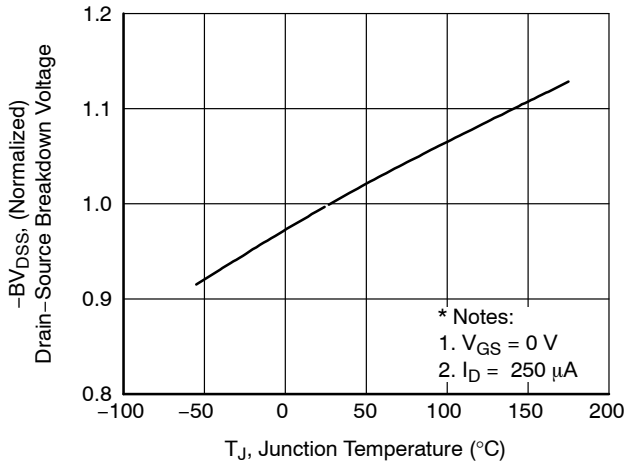


Figure 7. Breakdown Voltage Variation vs. Temperature

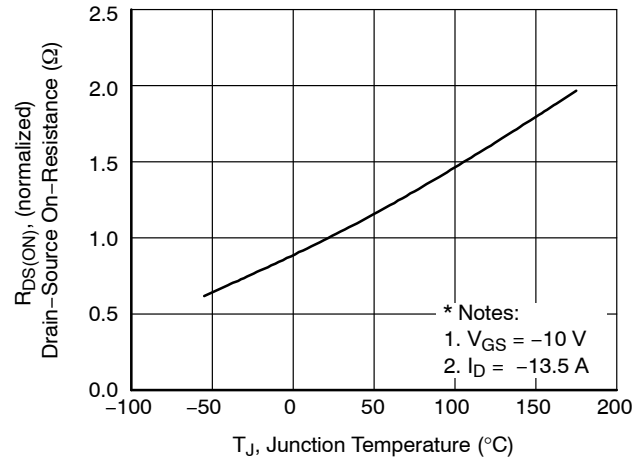


Figure 8. On-Resistance Variation vs. Temperature

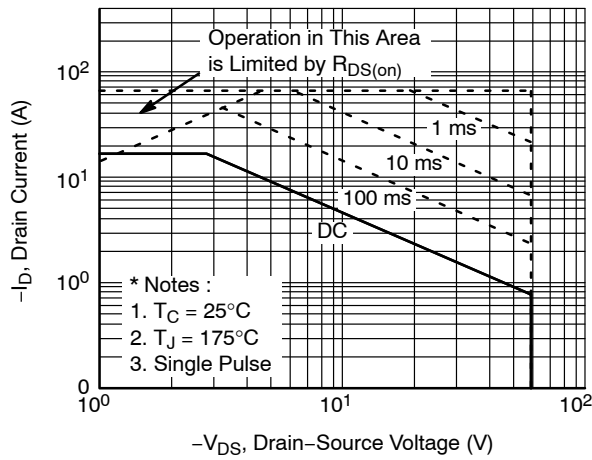


Figure 9. Maximum Safe Operating Area

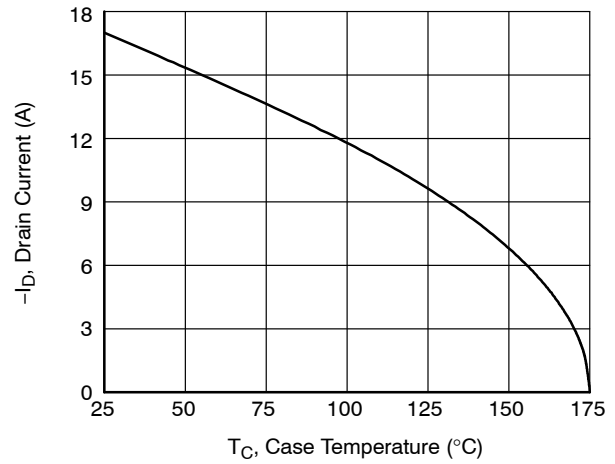


Figure 10. Maximum Drain Current vs. Case Temperature

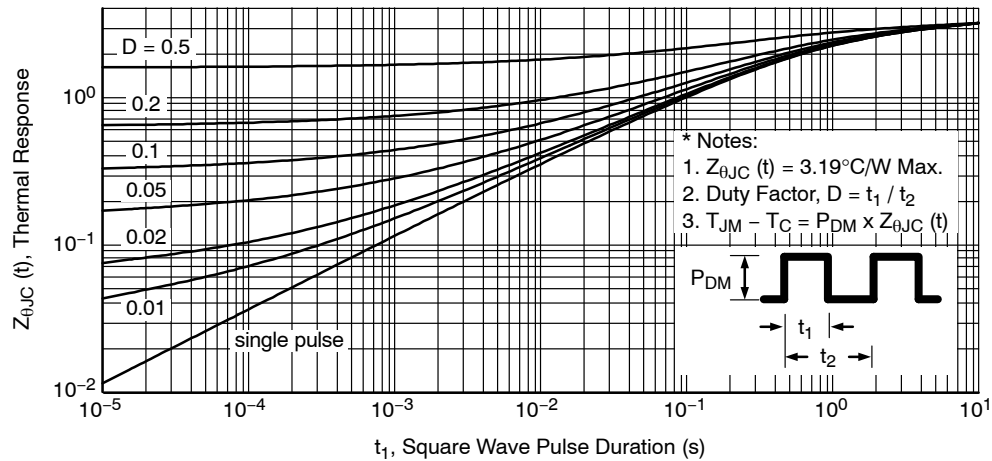


Figure 11. Transient Thermal Response Curve

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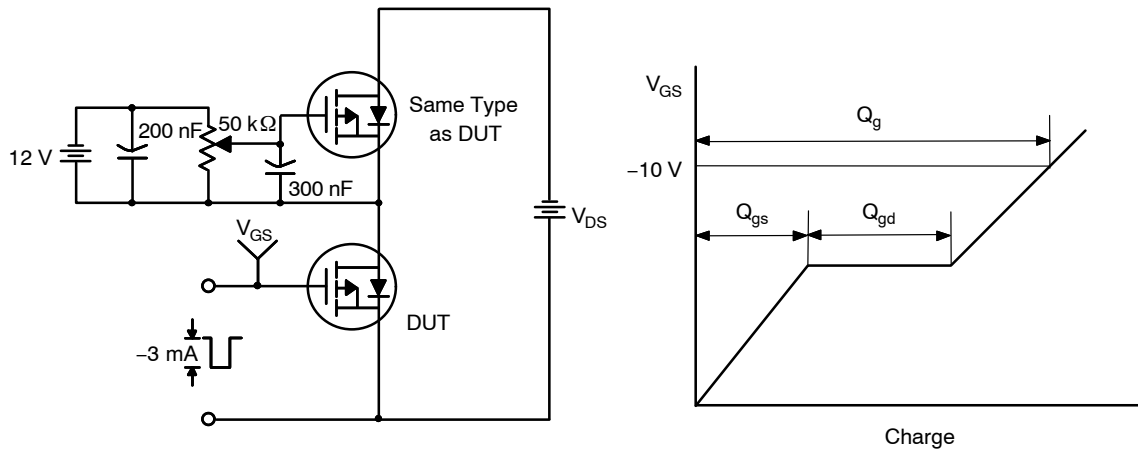


Figure 12. Gate Charge Test Circuit & Waveform

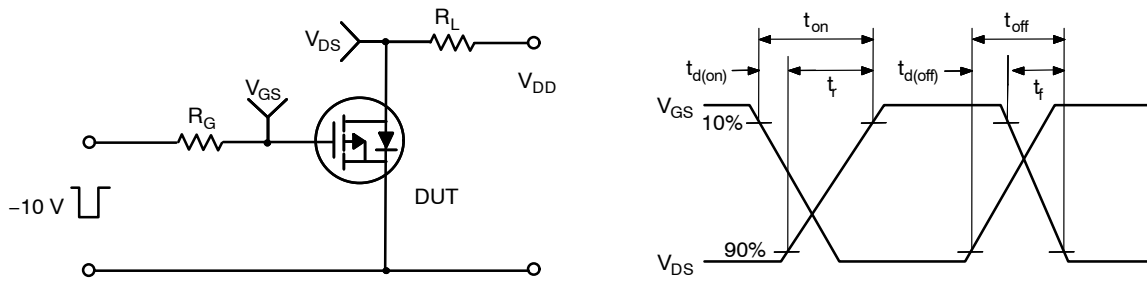


Figure 13. Resistive Switching Test Circuit & Waveforms

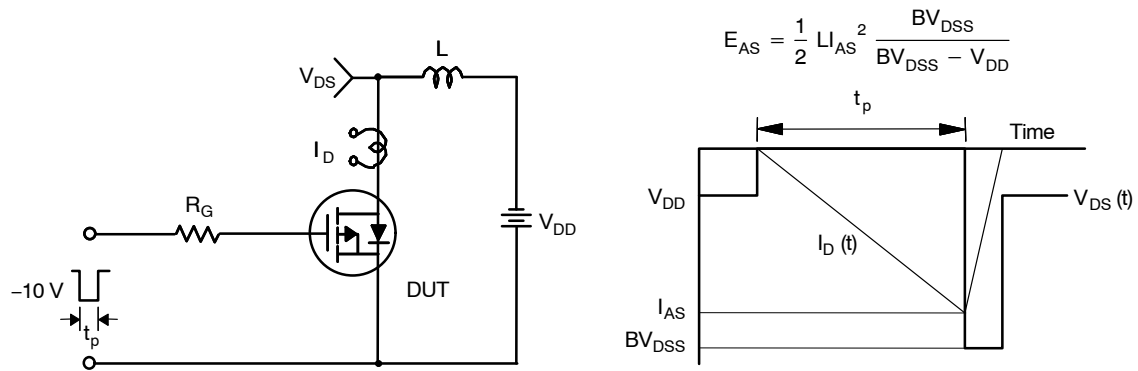


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

MECHANICAL CASE OUTLINE

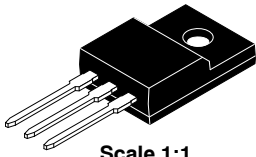
PACKAGE DIMENSIONS

ON Semiconductor®

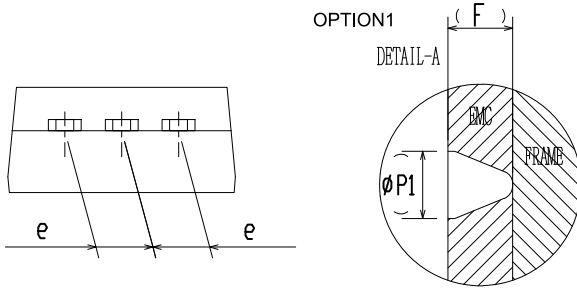
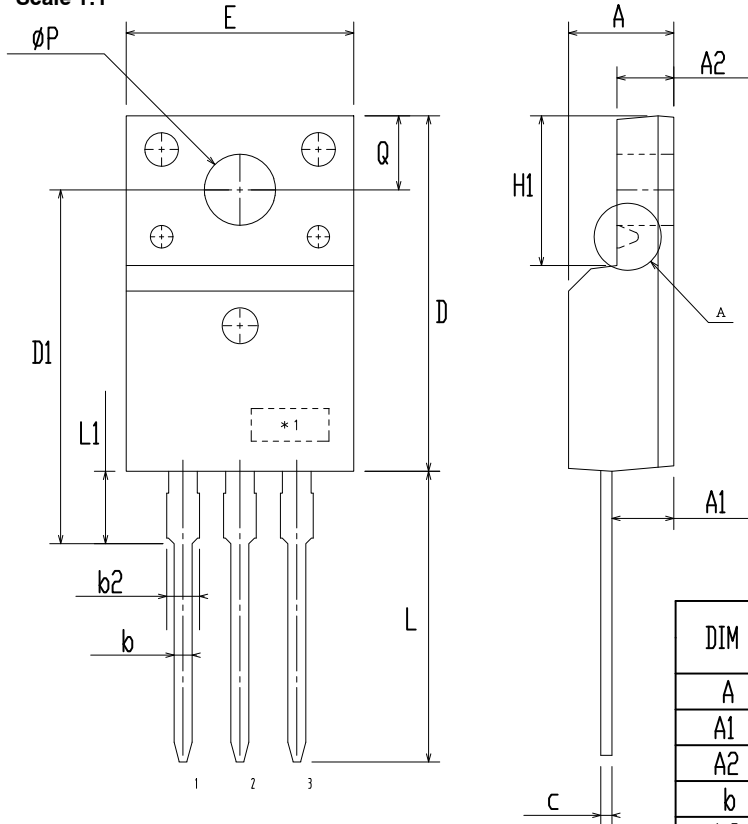


TO-220 Fullpack, 3-Lead / TO-220F-3SG CASE 221AT ISSUE B

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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