

# MOSFET – P-Channel, QFET

**-500 V, -2.7 A, 4.9 Ω**

## FQP3P50

### General 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

- -2.7 A, -500 V,  $R_{DS(on)} = 4.9 \Omega$  (Max.) at  $V_{GS} = -10$  V,  $I_D = -1.35$  A
- Low Gate Charge (Typ. 18 nC)
- Low  $C_{rss}$  (Typ. 9.5 pF)
- 100% Avalanche Tested
- This Device is Halide Free and RoHS Compliant with Exemption 7a, Pb-Free 2LI (on second level interconnection)

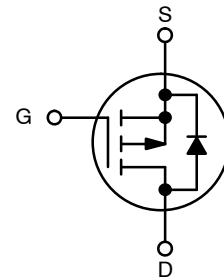
### ABSOLUTE MAXIMUM RATINGS ( $T_C = 25^\circ\text{C}$ unless otherwise noted)

| Symbol         | Parameter                                                            | Ratings                                  | Unit             |
|----------------|----------------------------------------------------------------------|------------------------------------------|------------------|
| $V_{DSS}$      | Drain-Source Voltage                                                 | -500                                     | V                |
| $I_D$          | Drain Current                                                        | Continuous ( $T_C = 25^\circ\text{C}$ )  | -2.7             |
|                |                                                                      | Continuous ( $T_C = 100^\circ\text{C}$ ) | -1.71            |
| $I_{DM}$       | Drain Current                                                        | Pulsed (Note 1)                          | -10.8            |
| $V_{GSS}$      | Gate-Source Voltage                                                  | $\pm 30$                                 | V                |
| $E_{AS}$       | Single Pulse Avalanche Energy (Note 2)                               | 250                                      | mJ               |
| $I_{AR}$       | Avalanche Current (Note 1)                                           | -2.7                                     | A                |
| $E_{AR}$       | Repetitive Avalanche Energy (Note 1)                                 | 8.5                                      | mJ               |
| $dv/dt$        | Peak Diode Recovery $dv/dt$ (Note 3)                                 | -4.5                                     | V/ns             |
| $P_D$          | Power Dissipation                                                    | ( $T_C = 25^\circ\text{C}$ )             | 85               |
|                |                                                                      | Derate above $25^\circ\text{C}$          | 0.68             |
| $T_J, T_{STG}$ | Operating and Storage Temperature Range                              | -55 to +150                              | $^\circ\text{C}$ |
| $T_L$          | Maximum Lead Temperature for Soldering, 1/8" from Case for 5 Seconds | 300                                      | $^\circ\text{C}$ |

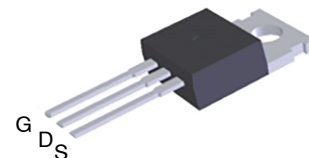
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Repetitive rating: pulse-width limited by maximum junction temperature.
2.  $L = 62$  mH,  $I_{AS} = -2.7$  A,  $V_{DD} = -50$  V,  $R_G = 25 \Omega$ , Starting  $T_J = 25^\circ\text{C}$
3.  $I_{SD} \leq -2.7$  A,  $di/dt \leq 200$  A/ $\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$

| $V_{DS}$ | $R_{DS(ON)}$ MAX     | $I_D$ MAX |
|----------|----------------------|-----------|
| -500 V   | 4.9 $\Omega$ @ -10 V | -2.7 A    |

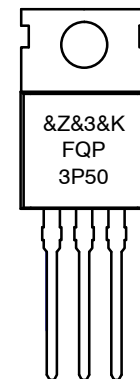


P-Channel MOSFET



TO-220-3LD  
CASE 340AT

### MARKING DIAGRAM



- &Z = Assembly Plant Code
- &3 = Data Code (Year & Week)
- &K = Lot Code
- FQP3P50 = Specific Device Code

### ORDERING INFORMATION

| Device  | Package    | Shipping          |
|---------|------------|-------------------|
| FQP3P50 | TO-220-3LD | 1000 Units / Tube |

# FQP3P50

## THERMAL CHARACTERISTICS

| Symbol          | Parameter                                     | Ratings | Unit |
|-----------------|-----------------------------------------------|---------|------|
| $R_{\theta JC}$ | Thermal Resistance, Junction-to-Case, Max.    | 1.47    | °C/W |
| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambient, Max. | 62.5    | °C/W |

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

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

### OFF CHARACTERISTICS

|                                |                                           |                                                                              |      |      |      |               |
|--------------------------------|-------------------------------------------|------------------------------------------------------------------------------|------|------|------|---------------|
| $BV_{DSS}$                     | Drain to Source Breakdown Voltage         | $V_{GS} = 0\text{ V}, I_D = -250\text{ }\mu\text{A}$                         | -500 | -    | -    | V             |
| $\Delta BV_{DSS} / \Delta T_J$ | Breakdown Voltage Temperature Coefficient | $I_D = -250\text{ }\mu\text{A}$ , Referenced to $25\text{ }^{\circ}\text{C}$ | -    | 0.42 | -    | V/°C          |
| $I_{DSS}$                      | Zero Gate Voltage Drain Current           | $V_{DS} = -500\text{ V}, V_{GS} = 0\text{ V}$                                | -    | -    | -1   | $\mu\text{A}$ |
|                                |                                           | $V_{DS} = -400\text{ V}, T_C = 125\text{ }^{\circ}\text{C}$                  | -    | -    | -10  |               |
| $I_{GSSF}$                     | 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            | $V_{DS} = V_{GS}, I_D = -250\text{ }\mu\text{A}$ | -3.0 | -    | -5.0 | V        |
| $R_{DS(on)}$ | Static Drain-Source On-Resistance | $V_{GS} = -10\text{ V}, I_D = -1.35\text{ A}$    | -    | 3.9  | 4.9  | $\Omega$ |
| $g_{FS}$     | Forward Transconductance          | $V_{DS} = -50\text{ V}, I_D = -1.35\text{ A}$    | -    | 2.35 | -    | S        |

### DYNAMIC CHARACTERISTICS

|           |                              |                                                                  |   |     |     |    |
|-----------|------------------------------|------------------------------------------------------------------|---|-----|-----|----|
| $C_{iss}$ | Input Capacitance            | $V_{DS} = -25\text{ V}, V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}$ | - | 510 | 660 | pF |
| $C_{oss}$ | Output Capacitance           |                                                                  | - | 70  | 90  | pF |
| $C_{rss}$ | Reverse Transfer Capacitance |                                                                  | - | 9.5 | 12  | pF |

### SWITCHING CHARACTERISTICS

|              |                     |                                                                                   |   |     |     |    |
|--------------|---------------------|-----------------------------------------------------------------------------------|---|-----|-----|----|
| $t_{d(on)}$  | Turn-On Delay Time  | $V_{DD} = -250\text{ V}, I_D = -2.7\text{ A}, R_G = 25\text{ }\Omega$<br>(Note 4) | - | 12  | 35  | ns |
| $t_r$        | Turn-On Rise Time   |                                                                                   | - | 56  | 120 | ns |
| $t_{d(off)}$ | Turn-Off Delay Time |                                                                                   | - | 35  | 80  | ns |
| $t_f$        | Turn-Off Fall Time  |                                                                                   | - | 45  | 100 | ns |
| $Q_g$        | Total Gate Charge   | $V_{DS} = -400\text{ V}, I_D = -2.7\text{ A}, V_{GS} = -10\text{ V}$<br>(Note 4)  | - | 18  | 23  | nC |
| $Q_{gs}$     | Gate-Source Charge  |                                                                                   | - | 3.6 | -   | nC |
| $Q_{gd}$     | Gate-Drain Charge   |                                                                                   | - | 9.2 | -   | nC |

### DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS

|                 |                                                       |                                                                                   |   |     |       |    |
|-----------------|-------------------------------------------------------|-----------------------------------------------------------------------------------|---|-----|-------|----|
| I <sub>S</sub>  | Maximum Continuous Drain-Source Diode Forward Current |                                                                                   | – | –   | –2.7  | A  |
| I <sub>SM</sub> | Maximum Pulsed Drain-Source Diode Forward Current     |                                                                                   | – | –   | –10.8 | A  |
| V <sub>SD</sub> | Drain-Source Diode Forward Voltage                    | V <sub>GS</sub> = 0 V, I <sub>S</sub> = –2.7 A                                    | – | –   | –5.0  | V  |
| t <sub>rr</sub> | Reverse Recovery Time                                 | V <sub>GS</sub> = 0 V, I <sub>S</sub> = –2.7 A,<br>dI <sub>F</sub> /dt = 100 A/μs | – | 270 | –     | ns |
| Q <sub>rr</sub> | Reverse Recovery Charge                               |                                                                                   | – | 1.5 | –     | 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

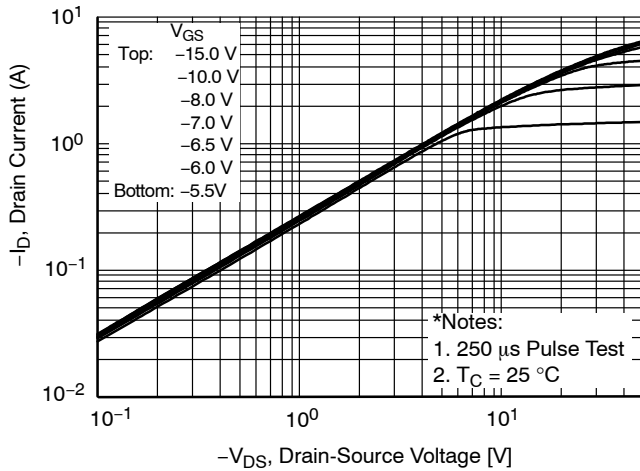


Figure 1. On-Region Characteristics

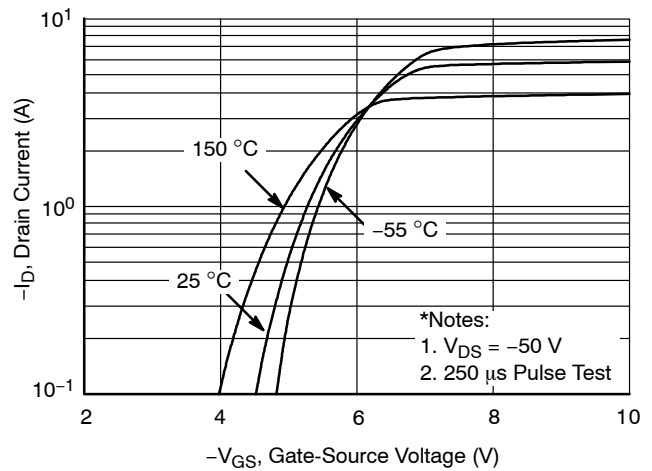


Figure 2. Transfer Characteristics

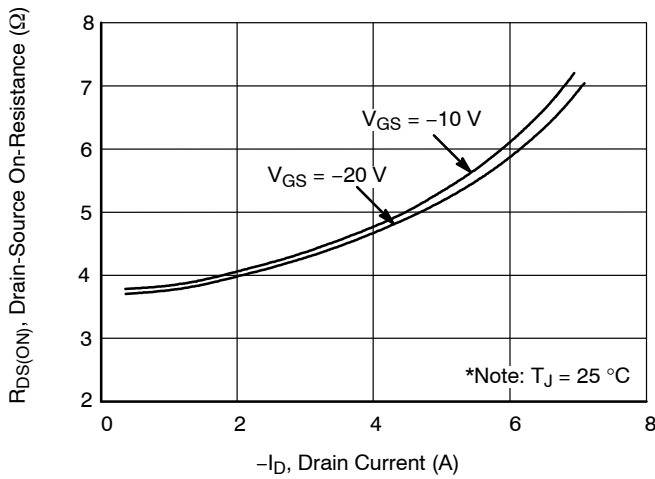


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

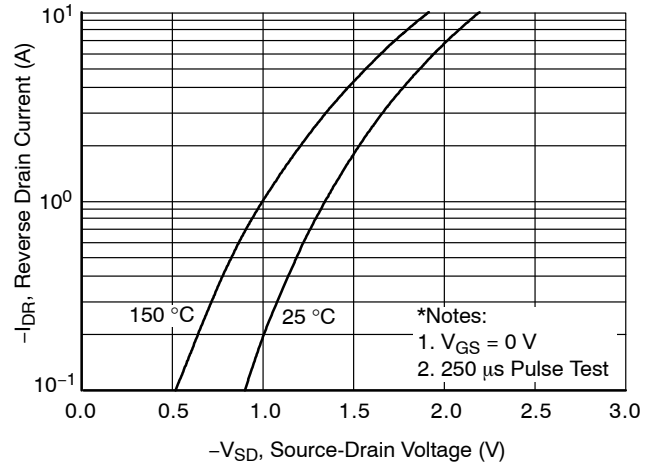


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

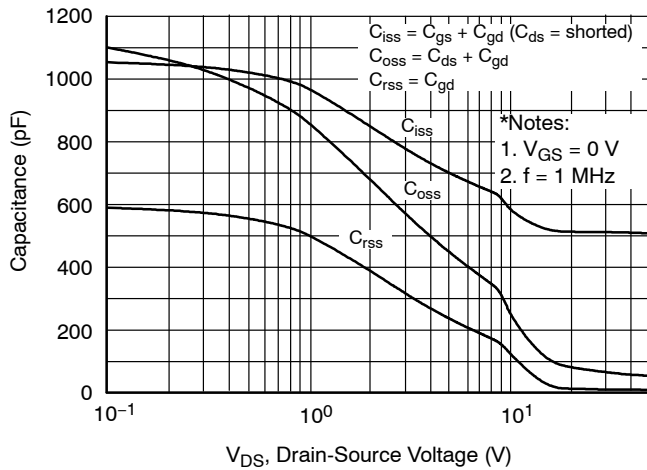


Figure 5. Capacitance Characteristics

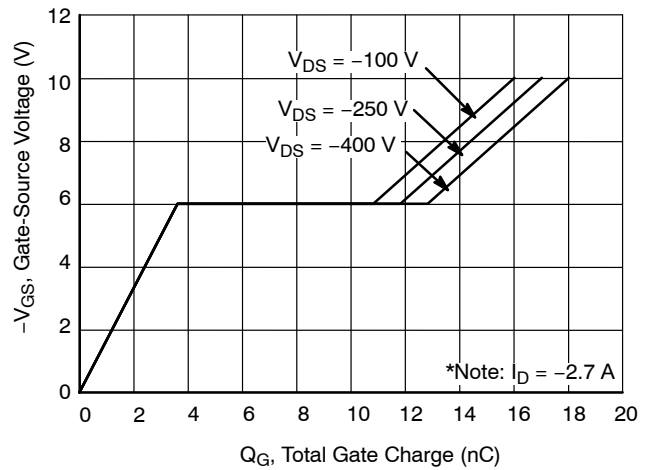
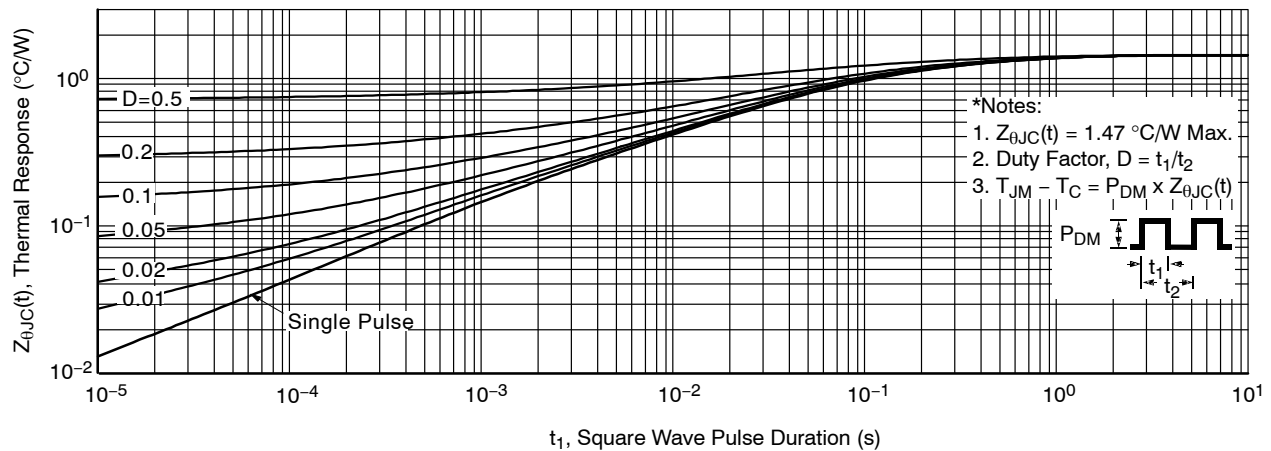
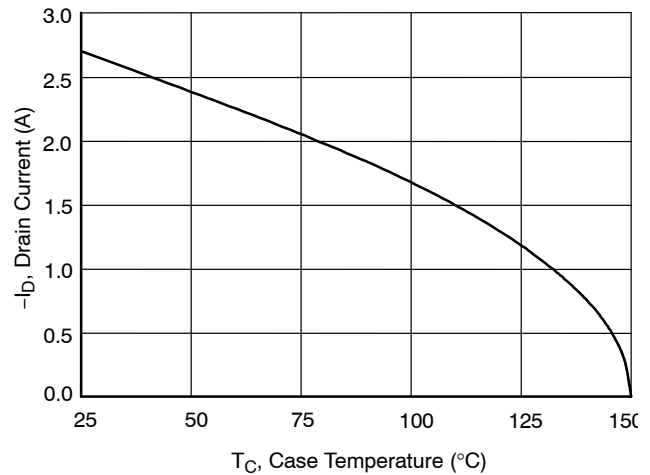
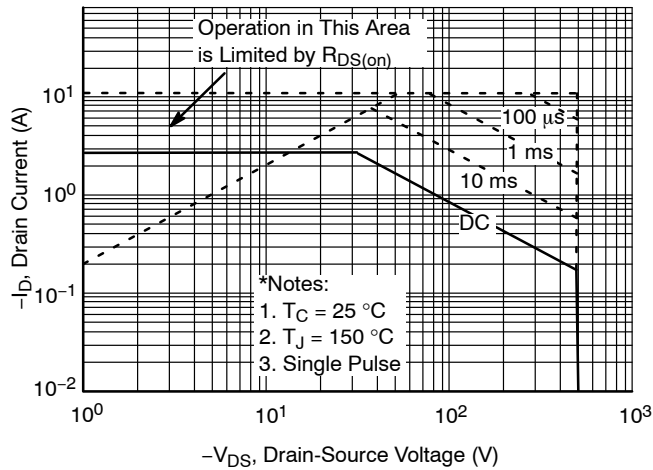
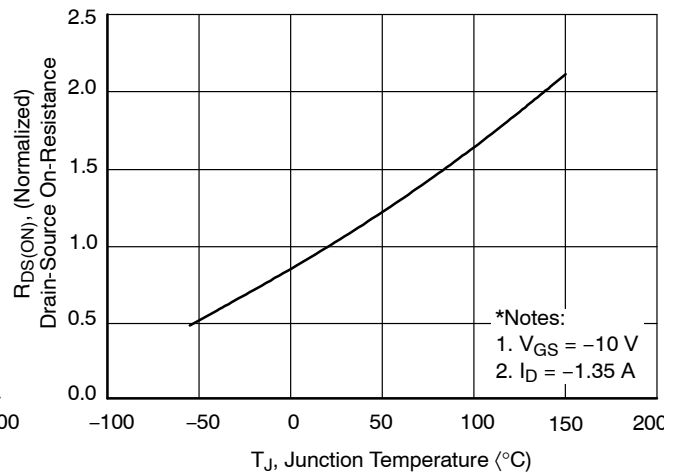
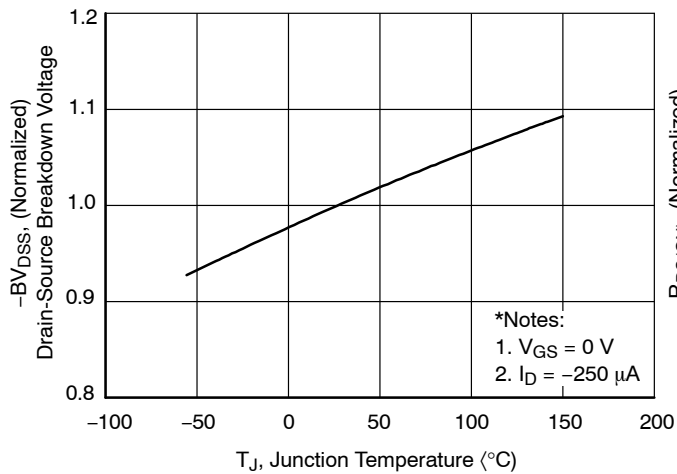
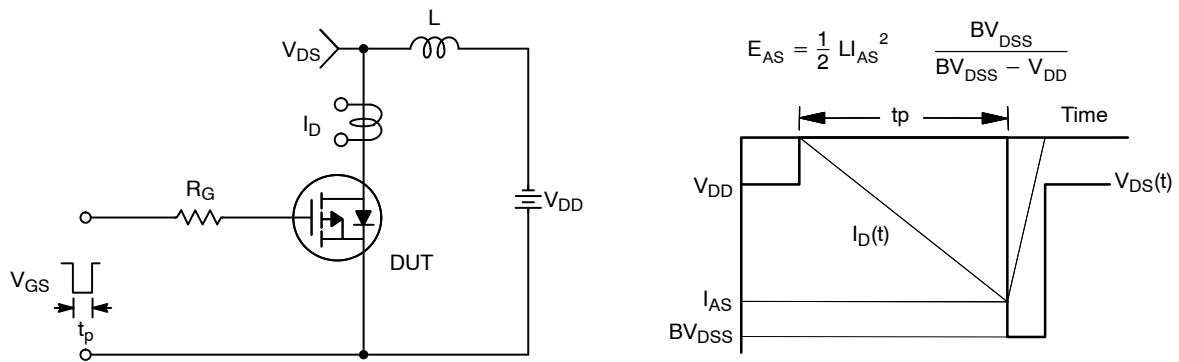
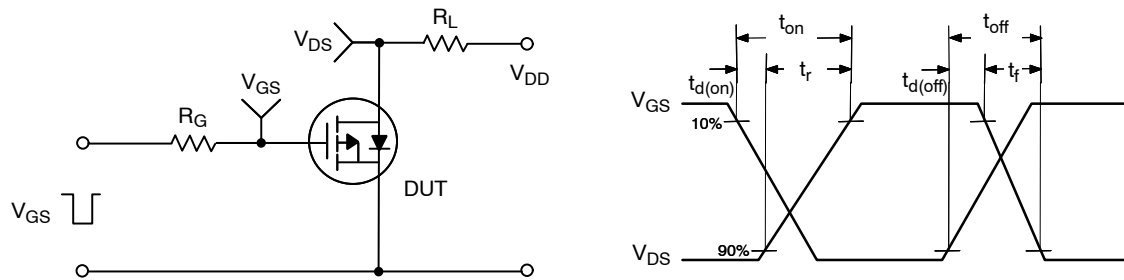
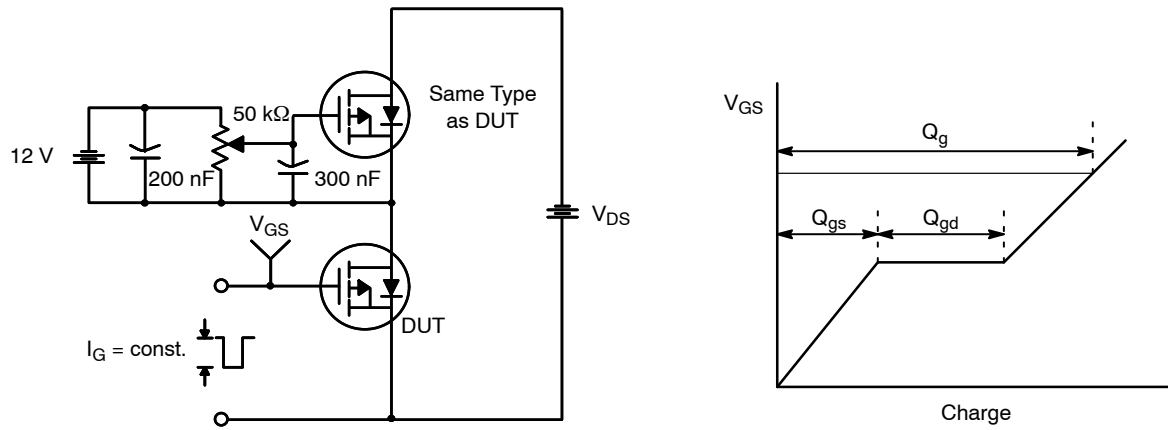


Figure 6. Gate Charge Characteristics

TYPICAL CHARACTERISTICS (continued)





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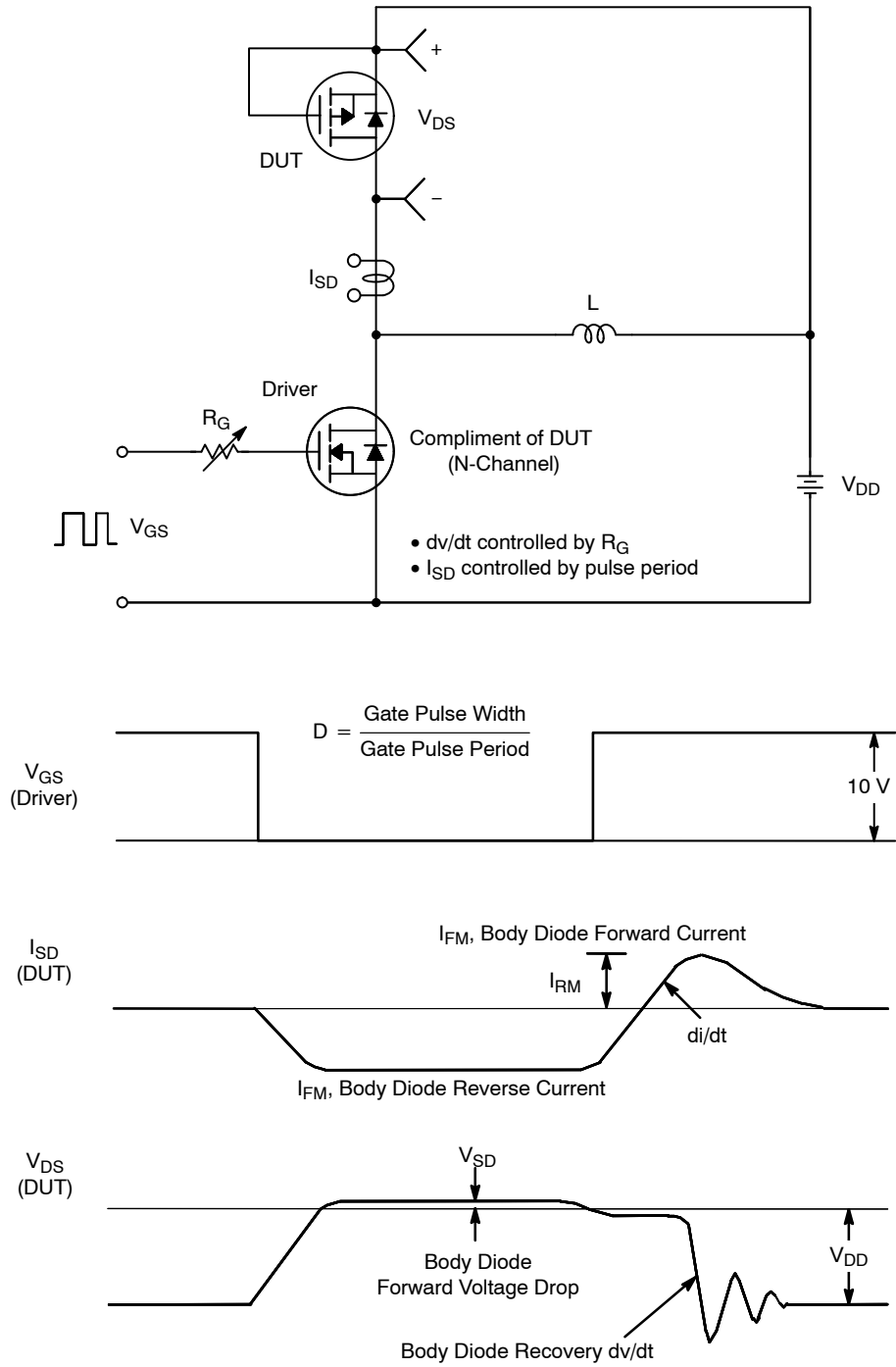


**Figure 15. Peak Diode Recovery  $dv/dt$  Test Circuit & Waveforms**

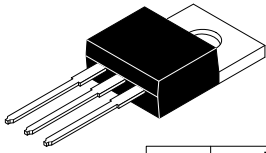
## FQP3P50

### REVISION HISTORY

| Revision | Description of Changes                      | Date     |
|----------|---------------------------------------------|----------|
| 4        | Document converted to <b>onsemi</b> format. | 5/6/2026 |

This document has undergone updates prior to the inclusion of this revision history table. The changes tracked here only reflect updates made on the noted approval dates.

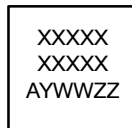



**TO-220-3LD**  
**CASE 340AT**  
**ISSUE B**

DATE 08 AUG 2022

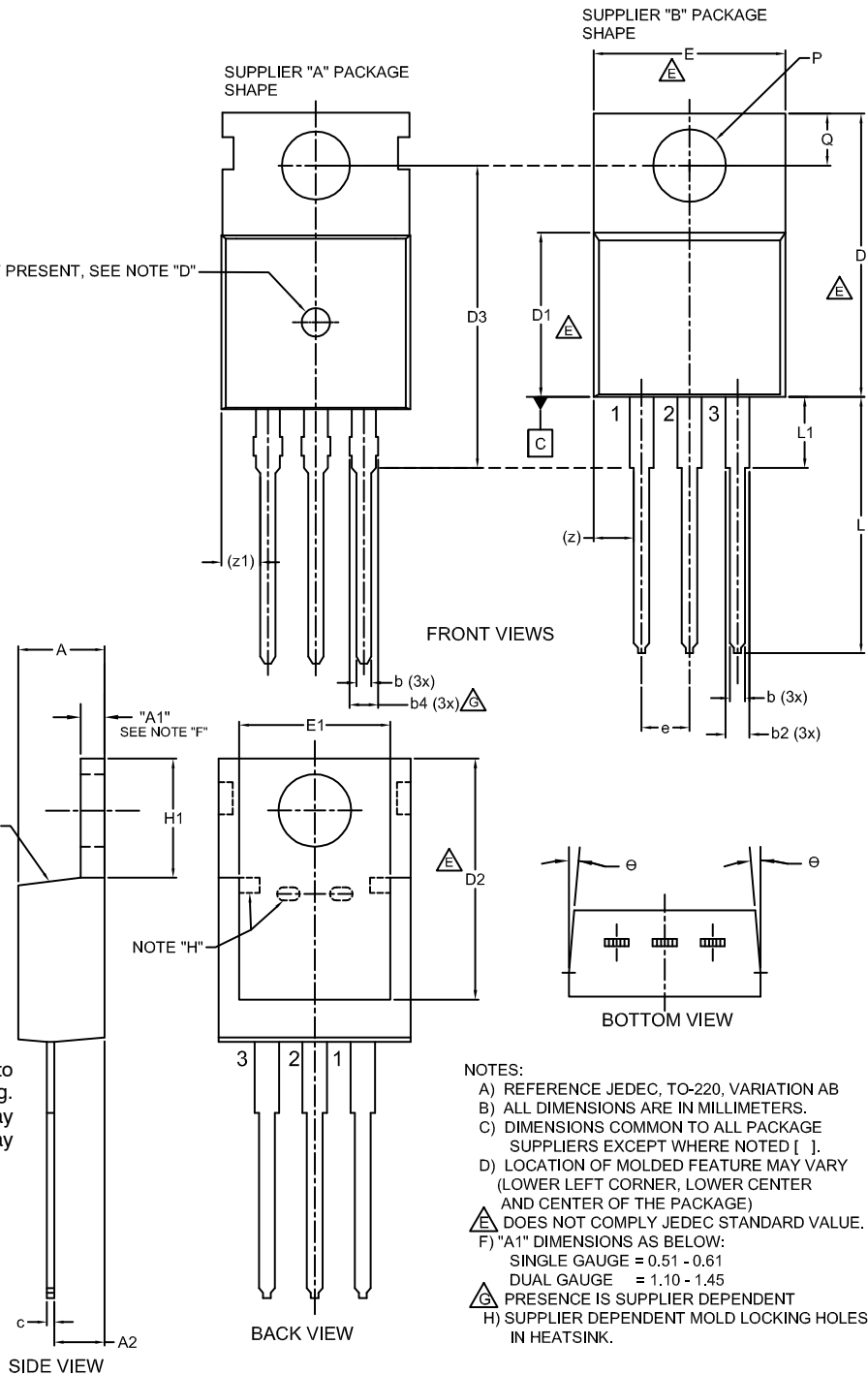
| DIM | MILLIMETERS  |      |       |
|-----|--------------|------|-------|
|     | MIN.         | NOM. | MAX.  |
| A   | 4.00         | --   | 4.70  |
| A1  | SEE NOTE "F" |      |       |
| A2  | 2.10         | --   | 2.85  |
| b   | 0.55         | --   | 1.00  |
| b2  | 1.10         | --   | 1.62  |
| b4  | 1.42         | --   | 1.62  |
| c   | 0.36         | --   | 0.60  |
| D   | 13.90        | --   | 16.30 |
| D1  | 8.13         | --   | 9.40  |
| D2  | 11.50        | --   | 14.30 |
| D3  | 15.42        | --   | 16.51 |
| E   | 9.65         | --   | 10.67 |
| E1  | 7.59         | --   | 8.65  |
| e   | 2.40         | --   | 2.67  |
| H1  | 6.06         | --   | 6.69  |
| L   | 12.70        | --   | 14.04 |
| L1  | 2.70         | --   | 4.10  |
| P   | 3.50         | --   | 4.00  |
| Q   | 2.50         | --   | 3.40  |
| z   | 2.13 REF     |      |       |
| z1  | 2.06 REF     |      |       |
| θ   | 3°           | --   | 5°    |

IF PRESENT, SEE NOTE "D"

**GENERIC**  
**MARKING DIAGRAM\***


XXXX = Specific Device Code  
A = Assembly Location  
Y = Year  
WW = Work Week  
ZZ = Assembly Lot Code

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.



|                         |                    |                                                                                                                                                                                     |
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