



THE DATASHEET OF FDPF7N50F



FDP7N50F / FDPF7N50F

N-Channel MOSFET, FRFET

500V, 6A, 1.15Ω

Features

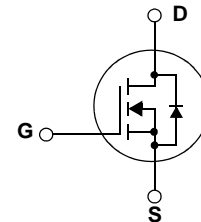
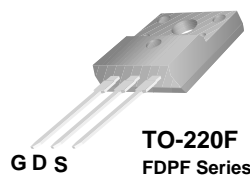
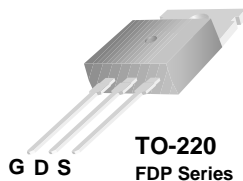
- $R_{DS(on)} = 0.95\Omega$ (Typ.) @ $V_{GS} = 10V, I_D = 3A$
- Low gate charge (Typ. 15nC)
- Low C_{rss} (Typ. 6.3pF)
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability
- RoHS compliant



Description

These N-Channel enhancement mode power field effect transistors are produced using Fairchild's proprietary, planar stripe, DMOS technology.

This advance technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficient switching mode power supplies and active power factor correction.



FDP7N50F / FDPF7N50F N-Channel MOSFET

MOSFET Maximum Ratings $T_C = 25^\circ\text{C}$ unless otherwise noted*

| Symbol | Parameter | FDP7N50F | FDPF7N50F | Units |
|----------------|--|---|-----------|------------------|
| V_{DSS} | Drain to Source Voltage | 500 | | V |
| V_{GSS} | Gate to Source Voltage | ±30 | | V |
| I_D | Drain Current | -Continuous ($T_C = 25^\circ\text{C}$) | 6 | 6* |
| | | -Continuous ($T_C = 100^\circ\text{C}$) | 3.6 | 3.6* |
| I_{DM} | Drain Current | - Pulsed (Note 1) | 24 | 24* |
| E_{AS} | Single Pulsed Avalanche Energy (Note 2) | 270 | | mJ |
| I_{AR} | Avalanche Current (Note 1) | 6 | | A |
| E_{AR} | Repetitive Avalanche Energy (Note 1) | 20 | | mJ |
| dv/dt | Peak Diode Recovery dv/dt (Note 3) | 4.5 | | V/ns |
| P_D | Power Dissipation | ($T_C = 25^\circ\text{C}$) | 200 | 38.5 |
| | | - Derate above 25°C | 1.59 | 0.3 |
| T_J, T_{STG} | Operating and Storage Temperature Range | -55 to +150 | | $^\circ\text{C}$ |
| T_L | Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds | 300 | | $^\circ\text{C}$ |

*Drain current limited by maximum junction temperature

Thermal Characteristics

| Symbol | Parameter | FDP7N50F | FDPF7N50F | Units |
|-----------------|---|----------|-----------|---------------------------|
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case | 1.4 | 4.0 | $^\circ\text{C}/\text{W}$ |
| $R_{\theta CS}$ | Thermal Resistance, Junction to Ambient | 0.5 | - | |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient | 62.5 | 62.5 | |

Package Marking and Ordering Information $T_C = 25^\circ\text{C}$ unless otherwise noted

| Device Marking | Device | Package | Reel Size | Tape Width | Quantity |
|----------------|-----------|---------|-----------|------------|----------|
| FDP7N50F | FDP7N50F | TO-220 | - | - | 50 |
| FDPF7N50F | FDPF7N50F | TO-220F | - | - | 50 |

Electrical Characteristics

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Units |
|--------|-----------|-----------------|------|------|------|-------|
|--------|-----------|-----------------|------|------|------|-------|

Off Characteristics

| | | | | | | |
|--------------------------------------|---|---|-----|-----|-----------|---------------------------|
| BV_{DSS} | Drain to Source Breakdown Voltage | $I_D = 250\mu\text{A}, V_{GS} = 0\text{V}, T_J = 25^\circ\text{C}$ | 500 | - | - | V |
| $\frac{\Delta BV_{DSS}}{\Delta T_J}$ | Breakdown Voltage Temperature Coefficient | $I_D = 250\mu\text{A}$, Referenced to 25°C | - | 0.5 | - | $\text{V}/^\circ\text{C}$ |
| I_{DSS} | Zero Gate Voltage Drain Current | $V_{DS} = 500\text{V}, V_{GS} = 0\text{V}$ $V_{DS} = 400\text{V}, T_C = 125^\circ\text{C}$ | - | - | 10 100 | μA |
| I_{GSS} | Gate to Body Leakage Current | $V_{GS} = \pm 30\text{V}, V_{DS} = 0\text{V}$ | - | - | ± 100 | nA |

On Characteristics

| | | | | | | |
|--------------|--------------------------------------|---|-----|------|------|----------|
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{GS} = V_{DS}, I_D = 250\mu\text{A}$ | 3.0 | - | 5.0 | V |
| $R_{DS(on)}$ | Static Drain to Source On Resistance | $V_{GS} = 10\text{V}, I_D = 3\text{A}$ | - | 0.95 | 1.15 | Ω |
| g_{FS} | Forward Transconductance | $V_{DS} = 40\text{V}, I_D = 3\text{A}$ (Note 4) | - | 4.3 | - | S |

Dynamic Characteristics

| | | | | | | |
|--------------|-------------------------------|---|---|-----|-----|----|
| C_{iss} | Input Capacitance | $V_{DS} = 25\text{V}, V_{GS} = 0\text{V}$ $f = 1\text{MHz}$ | - | 720 | 960 | pF |
| C_{oss} | Output Capacitance | | - | 85 | 115 | pF |
| C_{rss} | Reverse Transfer Capacitance | | - | 6.3 | 10 | pF |
| $Q_{g(tot)}$ | Total Gate Charge at 10V | $V_{DS} = 400\text{V}, I_D = 6\text{A}$ $V_{GS} = 10\text{V}$ (Note 4, 5) | - | 15 | 20 | nC |
| Q_{gs} | Gate to Source Gate Charge | | - | 4.5 | - | nC |
| Q_{gd} | Gate to Drain "Miller" Charge | | - | 6 | - | nC |

Switching Characteristics

| | | | | | | |
|--------------|---------------------|--|---|----|----|----|
| $t_{d(on)}$ | Turn-On Delay Time | $V_{DD} = 250\text{V}, I_D = 6\text{A}$ $R_G = 25\Omega$ (Note 4, 5) | - | 17 | 45 | ns |
| t_r | Turn-On Rise Time | | - | 30 | 70 | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | - | 35 | 80 | ns |
| t_f | Turn-Off Fall Time | | - | 20 | 50 | ns |

Drain-Source Diode Characteristics

| | | | | | | |
|----------|--|--|---|------|-----|---------------|
| I_S | Maximum Continuous Drain to Source Diode Forward Current | - | - | 6 | A | |
| I_{SM} | Maximum Pulsed Drain to Source Diode Forward Current | - | - | 24 | A | |
| V_{SD} | Drain to Source Diode Forward Voltage | $V_{GS} = 0\text{V}, I_{SD} = 6\text{A}$ | - | - | 1.5 | V |
| t_{rr} | Reverse Recovery Time | $V_{GS} = 0\text{V}, I_{SD} = 6\text{A}$ | - | 85 | - | ns |
| Q_{rr} | Reverse Recovery Charge | $di_F/dt = 100\text{A}/\mu\text{s}$ (Note 4) | - | 0.15 | - | μC |

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. $L = 13\text{mH}, I_{AS} = 6\text{A}, V_{DD} = 50\text{V}, R_G = 25\Omega$, Starting $T_J = 25^\circ\text{C}$
3. $I_{SD} \leq 6\text{A}, di/dt \leq 200\text{A}/\mu\text{s}, V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$
4. Pulse Test: Pulse width $\leq 300\mu\text{s}$, Duty Cycle $\leq 2\%$
5. Essentially Independent of Operating Temperature Typical Characteristics

Typical Performance Characteristics

Figure 1. On-Region Characteristics

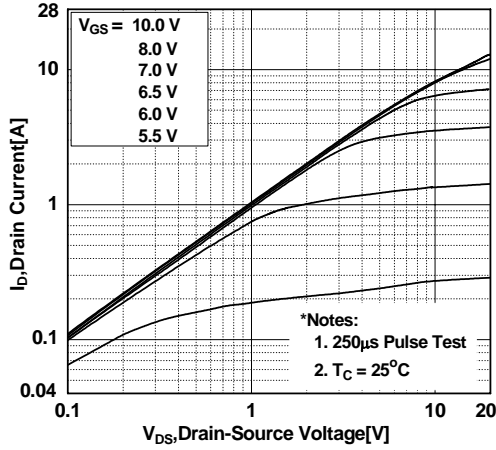


Figure 2. Transfer Characteristics

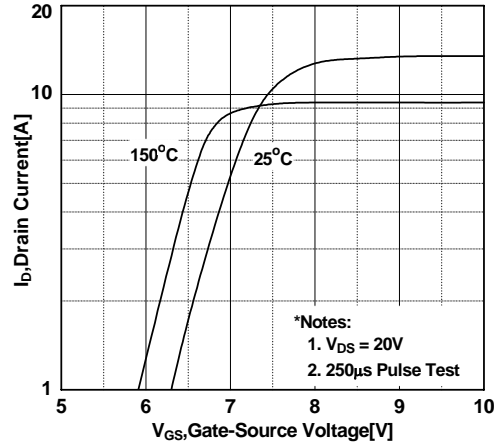


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

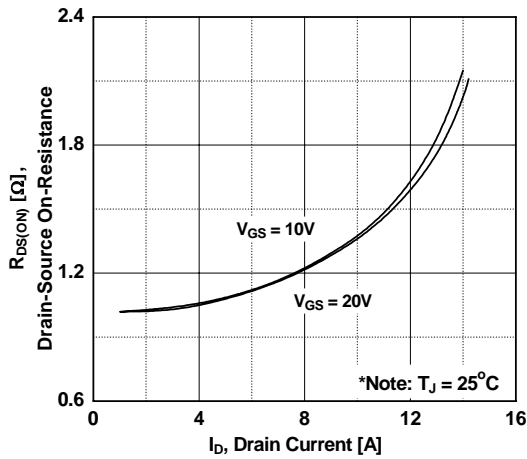


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

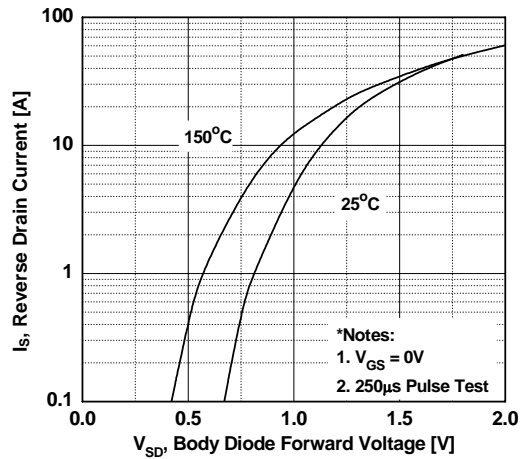


Figure 5. Capacitance Characteristics

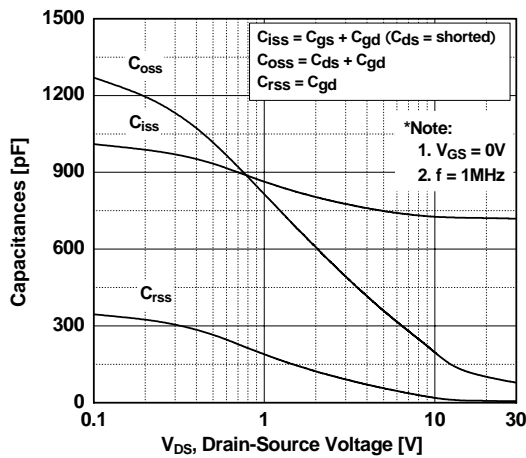
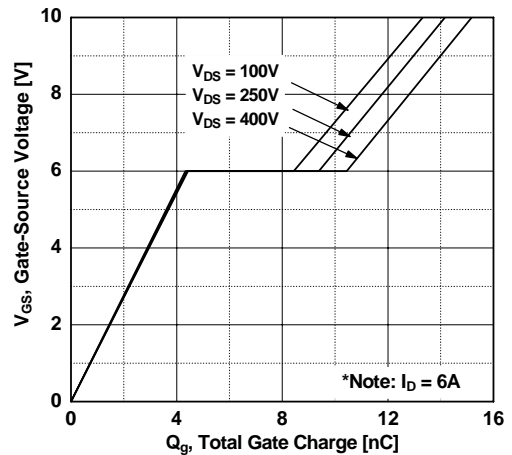


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

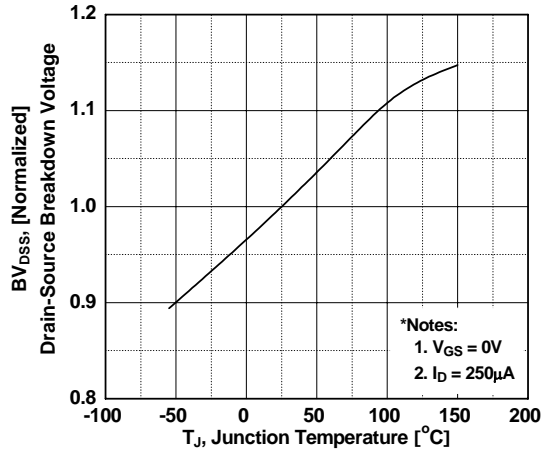


Figure 8. Maximum Safe Operating Area - FDPF7N50F

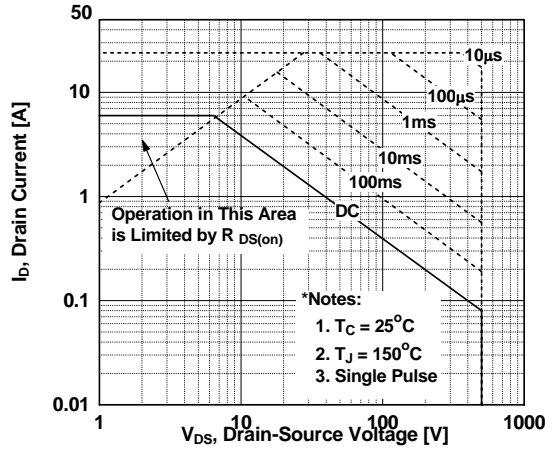


Figure 9. Maximum Drain Current vs. Case Temperature - FDPF7N50F

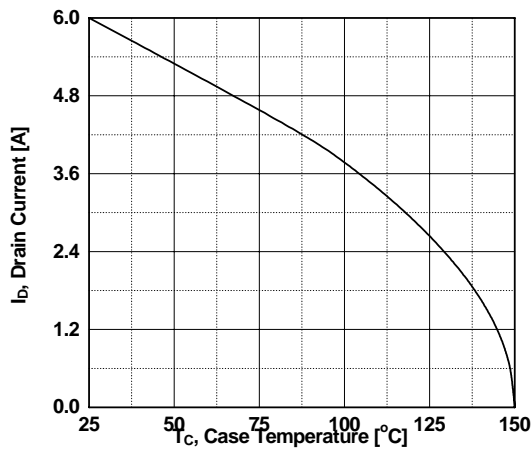
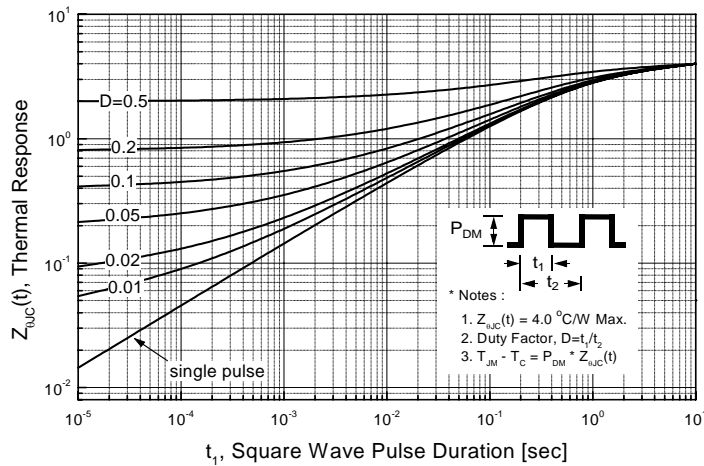
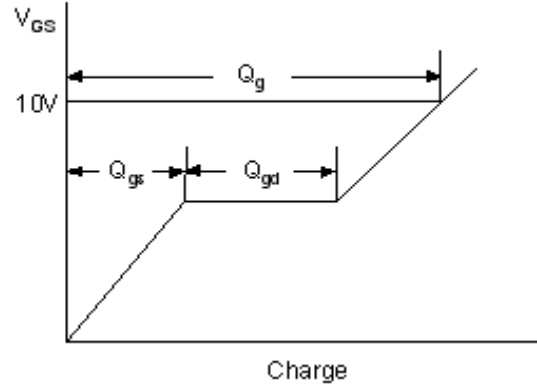
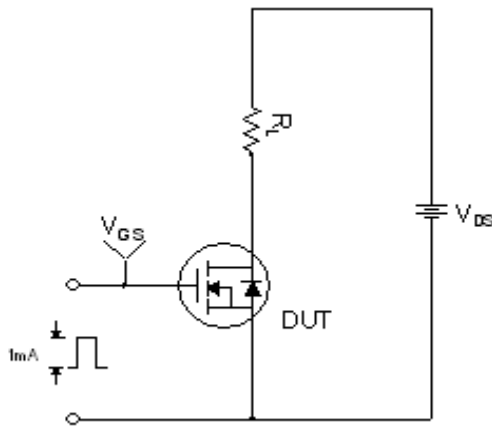


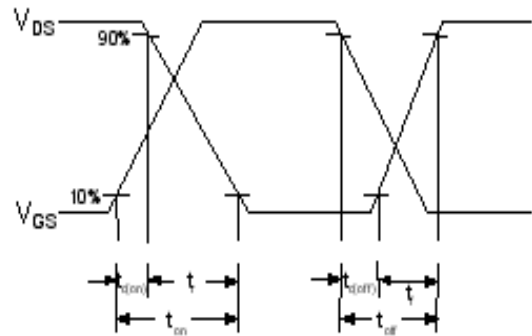
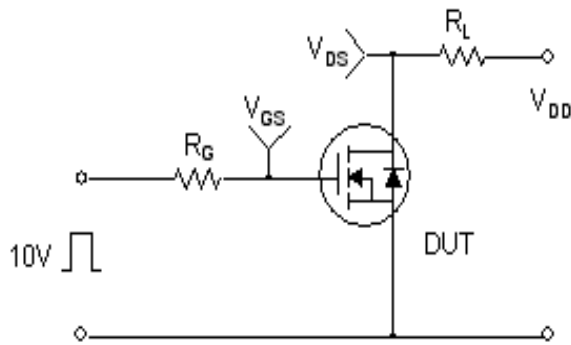
Figure 10. Transient Thermal Response Curve - FDPF7N50F



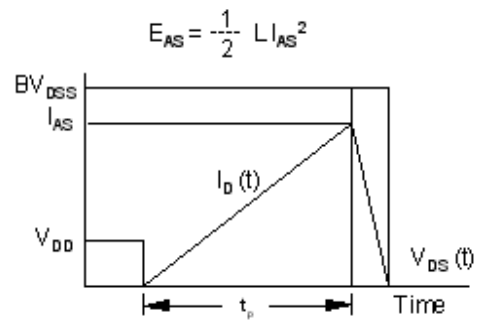
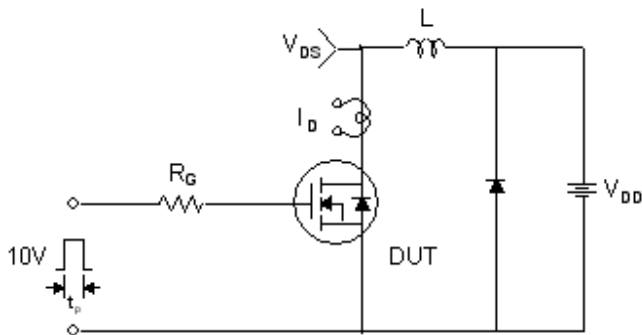
Gate Charge Test Circuit & Waveform



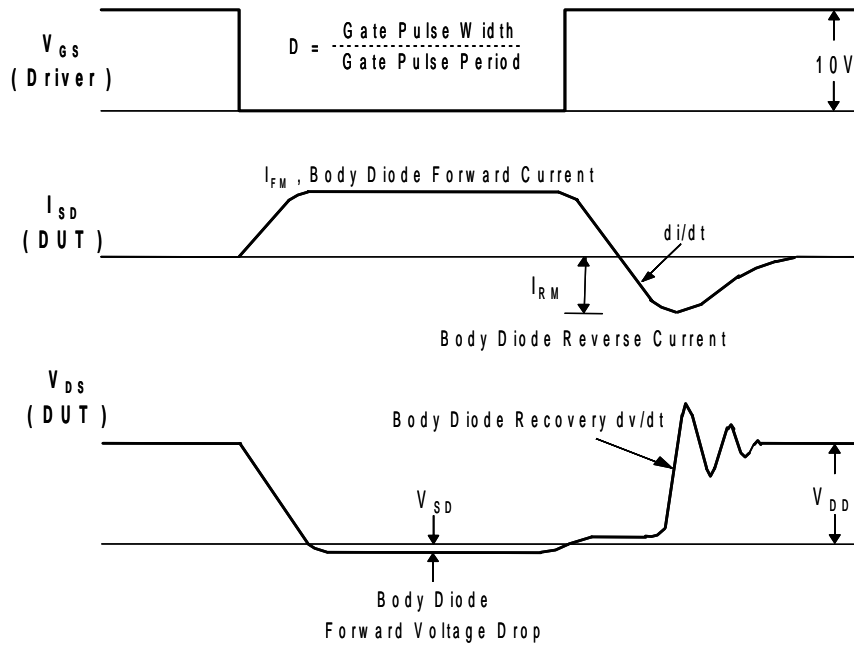
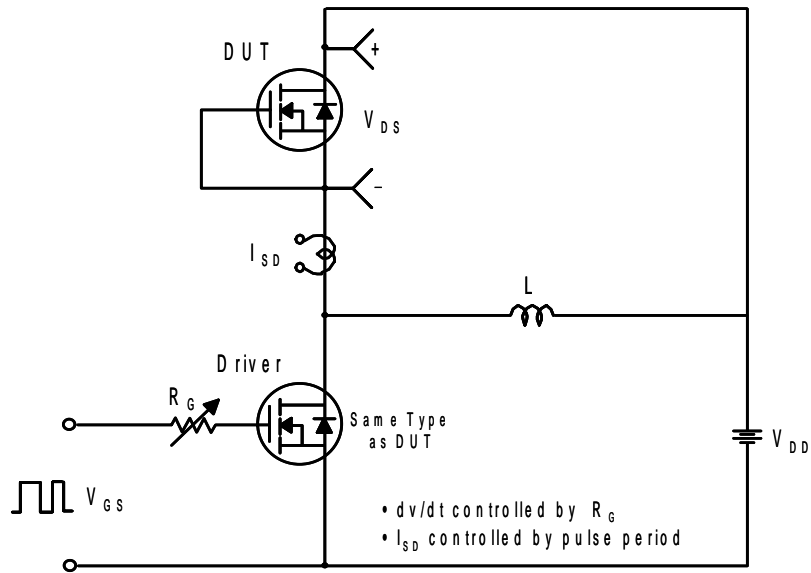
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms

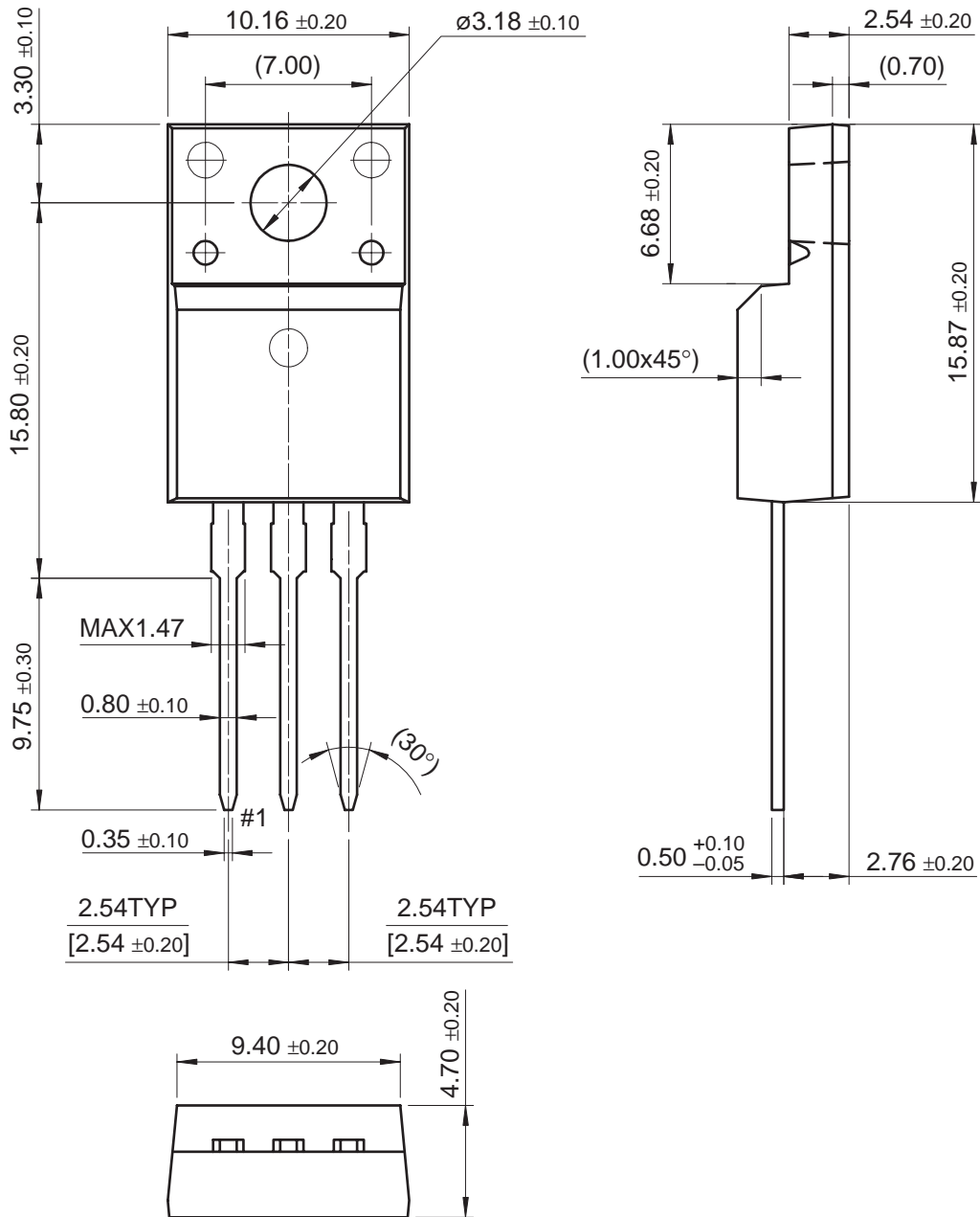


Peak Diode Recovery dv/dt Test Circuit & Waveforms



Mechanical Dimensions

TO-220F




Dimensions in Millimeters



TRADEMARKS

The following are registered and unregistered trademarks and service marks Fairchild Semiconductor owns or is authorized to use and is not intended to be an exhaustive list of all such trademarks.

| | | | |
|--------------------------------------|--|--|----------------------------------|
| ACEx [®] | Green FPS [™] | Power247 [®] | SuperSOT [™] -8 |
| Build it Now [™] | Green FPS [™] e-Series [™] | POWEREDGE [®] | SyncFET [™] |
| CorePLUS [™] | GTO [™] | Power-SPM [™] | The Power Franchise [®] |
| CROSSVOLT [™] | <i>i-Lo</i> [™] | PowerTrench [®] | power the franchise |
| CTL [™] | IntelliMAX [™] | Programmable Active Droop [™] | TinyBoost [™] |
| Current Transfer Logic [™] | ISOPLANAR [™] | QFET [®] | TinyBuck [™] |
| EcoSPARK [®] | MegaBuck [™] | QST [™] | TinyLogic [®] |
| F [®] | MICROCOUPLER [™] | QT Optoelectronics [™] | TINYOPTO [™] |
| Fairchild [®] | MicroFET [™] | Quiet Series [™] | TinyPower [™] |
| Fairchild Semiconductor [®] | MicroPak [™] | RapidConfigure [™] | TinyPWM [™] |
| FACT Quiet Series [™] | MillerDrive [™] | SMART START [™] | TinyWire [™] |
| FACT [®] | Motion-SPM [™] | SPM [®] | μSerDes [™] |
| FAST [®] | OPTOLOGIC [®] | STEALTH [™] | UHC [®] |
| FastvCore [™] | OPTOPLANAR [®] | SuperFET [™] | UniFET [™] |
| FPS [™] |  [®] | SuperSOT [™] -3 | VCX [™] |
| FRFET [®] | PDP-SPM [™] | SuperSOT [™] -6 | |
| Global Power Resource SM | Power220 [®] | | |

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION, OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS. THESE SPECIFICATIONS DO NOT EXPAND THE TERMS OF FAIRCHILD'S WORLDWIDE TERMS AND CONDITIONS, SPECIFICALLY THE WARRANTY THEREIN, WHICH COVERS THESE PRODUCTS.

LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION.

As used herein:

- Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
- A critical component in any component of a life support, device, or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

PRODUCT STATUS DEFINITIONS



Definition of Terms

| Datasheet Identification | Product Status | Definition |
|--------------------------|------------------------|--|
| Advance Information | Formative or In Design | This datasheet contains the design specifications for product development. Specifications may change in any manner without notice. |
| Preliminary | First Production | This datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design. |
| No Identification Needed | Full Production | This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design. |
| Obsolete | Not In Production | This datasheet contains specifications on a product that has been discontinued by Fairchild Semiconductor. The datasheet is printed for reference information only. |

Rev. I31

Looking for pricing, stock, or lifecycle information?

Click below to explore more details on WIN SOURCE:

-  [View FDPF7N50F on WIN SOURCE](#)
-  [Fairchild/ON Semiconductor Information](#)

Optimize Your Supply Chain with WIN SOURCE Solutions

-  Global Sourcing Solution
-  Obsolete Management
-  Cost Control Management
-  Shortage Management
-  Alternative Solution
-  Excess Inventory Management