FAIRCHILD SEMICONDUCTOR®

QFET™

FQP5N50C/FQPF5N50C

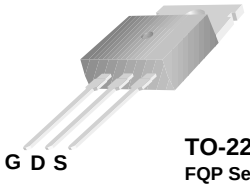
500V N-Channel MOSFET

General Description

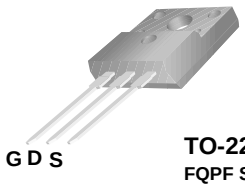
These N-Channel enhancement mode power field effect transistors are produced using Fairchild's proprietary, planar stripe, DMOS technology.
This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficiency switched mode power supplies, active power factor correction, electronic lamp ballasts based on half bridge topology.

Features

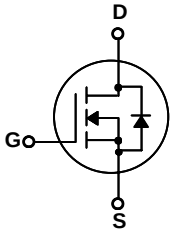
- 5A, 500V, $R_{DS(on)}$ = 1.4 Ω @V_{GS} = 10 V
- Low gate charge (typical 18nC)
- Low Crss (typical 15pF)
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability



TO-220
FQP Series



TO-220F
FQPF Series



Absolute Maximum Ratings

T_C = 25°C unless otherwise noted

Symbol	Parameter		FQP5N50C	FQPF5N50C	Units
V_{DSS}	Drain-Source Voltage		500		V
I_D	Drain Current - Continuous (T_C = 25°C)		5	5 *	A
	- Continuous (T_C = 100°C)		2.9	2.9 *	A
I_{DM}	Drain Current - Pulsed	(Note 1)	20	20 *	A
V_{GSS}	Gate-Source Voltage		± 30		V
E_{AS}	Single Pulsed Avalanche Energy	(Note 2)	300		mJ
I_{AR}	Avalanche Current	(Note 1)	5		A
E_{AR}	Repetitive Avalanche Energy	(Note 1)	7.3		mJ
dv/dt	Peak Diode Recovery dv/dt	(Note 3)	4.5		V/ns
P_D	Power Dissipation (T_C = 25°C)		73	38	W
	- Derate above 25°C		0.58	0.3	W/°C
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to +150		°C
T_L	Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds		300		°C

* Drain current limited by maximum junction temperature

Thermal Characteristics

Symbol	Parameter	FQP5N50C	FQPF5N50C	Units
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	1.71	3.31	°C/W
$R_{\theta JS}$	Thermal Resistance, Case-to-Sink Typ.	0.5	--	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	62.5	62.5	°C/W

Electrical Characteristics

T_C = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = 0 V, I_D = 250 μA	500	--	--	V
ΔBV_{DSS} / ΔT_J	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, Referenced to 25°C	--	0.5	--	V/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 500 V, V_{GS} = 0 V	--	--	1	μA
		V_{DS} = 400 V, T_C = 125°C	--	--	10	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} = 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 = 2.5A	--	1.14	1.4	Ω
g_{FS}	Forward Transconductance	V_{DS} = 40 V, I_D = 2.5A (Note 4)	--	5.2	--	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 25 V, V_{GS} = 0 V, f = 1.0 MHz	--	480	625	pF
C_{oss}	Output Capacitance		--	80	105	pF
C_{rss}	Reverse Transfer Capacitance		--	15	20	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 250 V, I_D = 5A, R_G = 25 Ω (Note 4, 5)	--	12	35	ns
t_r	Turn-On Rise Time		--	46	100	ns
$t_{d(off)}$	Turn-Off Delay Time		--	50	110	ns
t_f	Turn-Off Fall Time		--	48	105	ns
Q_g	Total Gate Charge	V_{DS} = 400 V, I_D = 5A, V_{GS} = 10 V (Note 4, 5)	--	18	24	nC
Q_{gs}	Gate-Source Charge		--	2.2	--	nC
Q_{gd}	Gate-Drain Charge		--	9.7	--	nC
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain-Source Diode Forward Current		--	--	5	A
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current		--	--	20	A
V_{SD}	Drain-Source Diode Forward Voltage	V_{GS} = 0 V, I_S = 5 A	--	--	1.4	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0 V, I_S = 5 A, dI_F / dt = 100 A/μs (Note 4)	--	263	--	ns
Q_{rr}	Reverse Recovery Charge		--	1.9	--	μC

Notes:
1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. L = 21.5 mH, I_{AS} = 5A, V_{DD} = 50V, R_G = 25 Ω, Starting T_J = 25°C
3. I_{SD} ≤ 5A, di/dt ≤ 200A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J = 25°C
4. Pulse Test : Pulse width ≤ 300μs, Duty cycle ≤ 2%
5. Essentially independent of operating temperature

Typical Characteristics

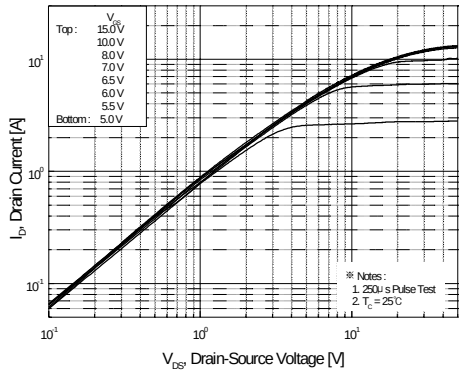


Figure 1. On-Region Characteristics

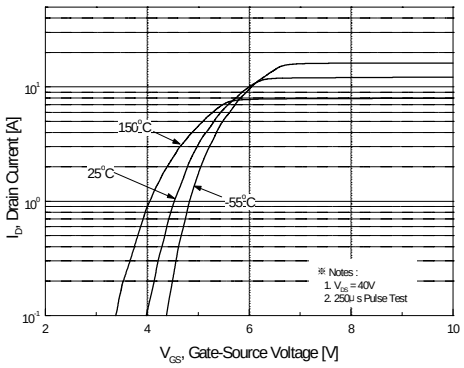


Figure 2. Transfer Characteristics

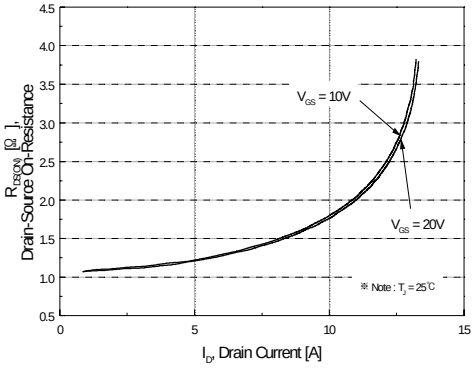


Figure 3. On-Resistance Variation vs Drain Current and Gate Voltage

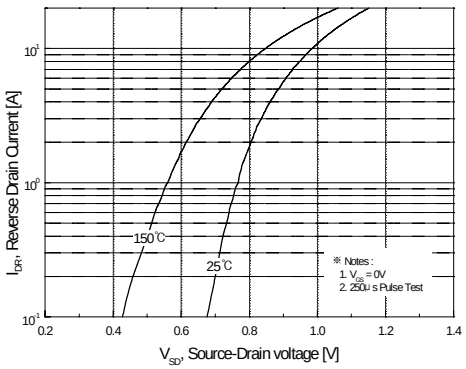


Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature

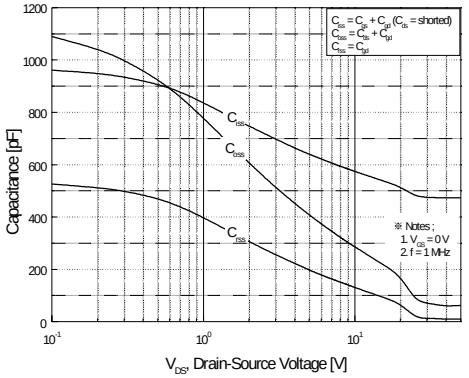


Figure 5. Capacitance Characteristics

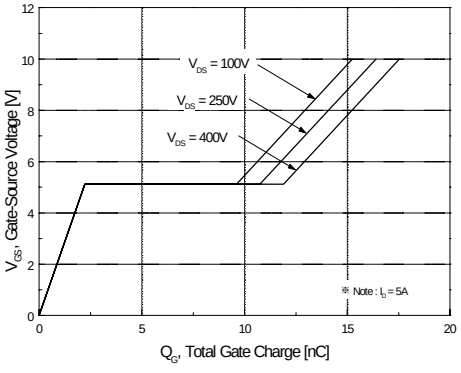


Figure 6. Gate Charge Characteristics

Typical Characteristics (Continued)

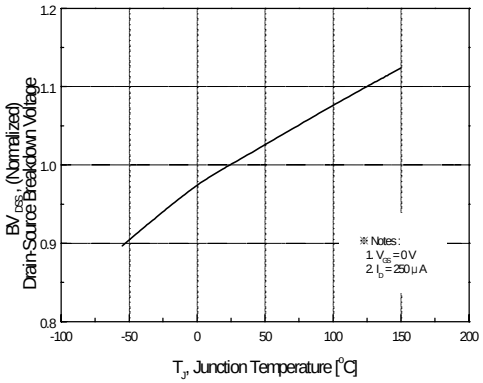


Figure 7. Breakdown Voltage Variation vs Temperature

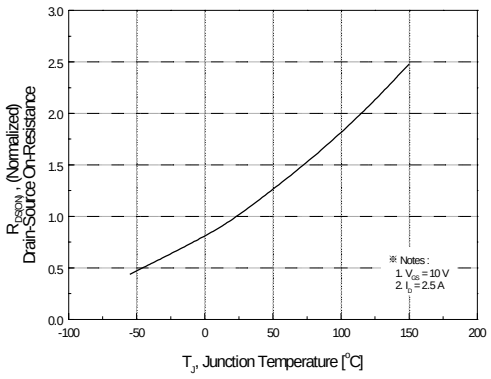


Figure 8. On-Resistance Variation vs Temperature

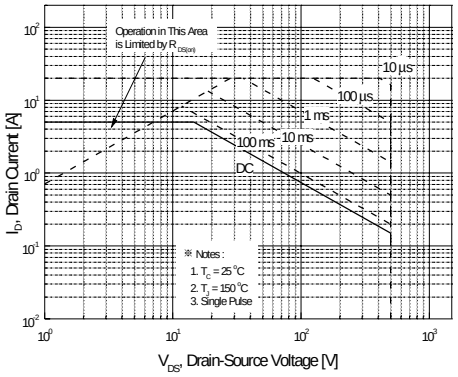


Figure 9-1. Maximum Safe Operating Area for FQP5N50C

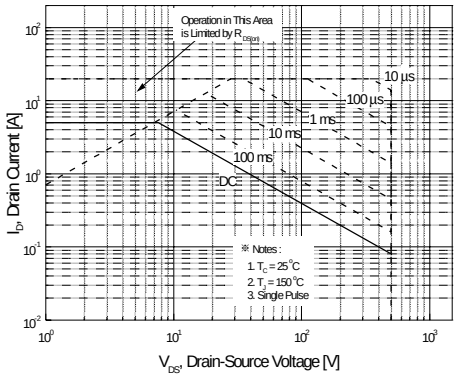


Figure 9-2. Maximum Safe Operating Area for FQPF5N50C

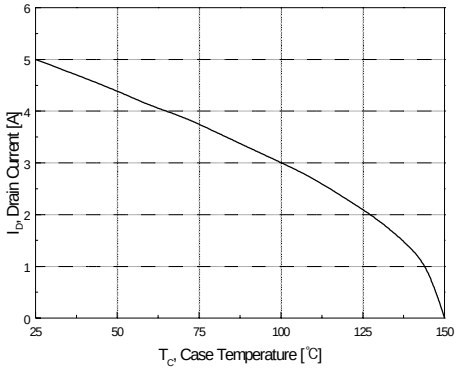


Figure 10. Maximum Drain Current vs Case Temperature

Typical Characteristics (Continued)

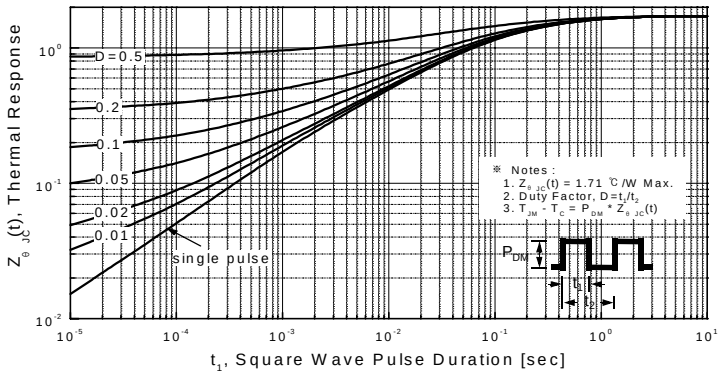


Figure 11. Transient Thermal Response Curve for FQP5N50C

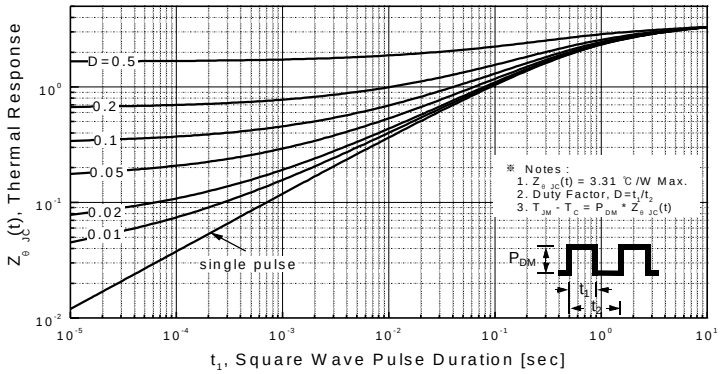
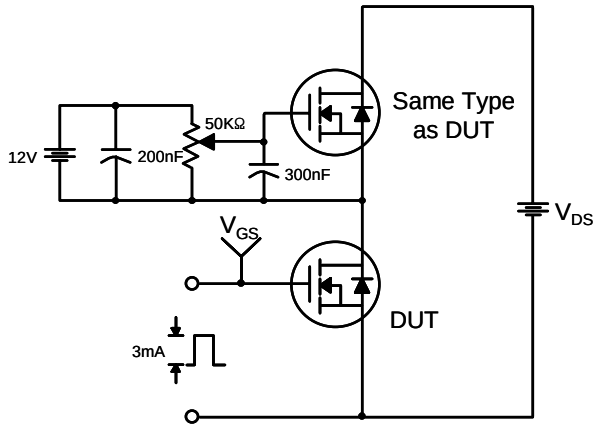
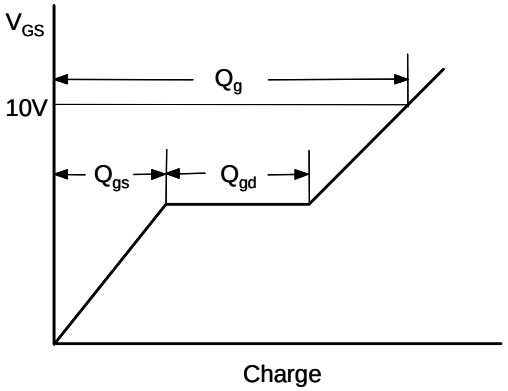


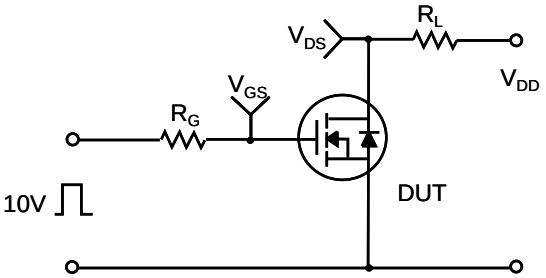
Figure 11-2. Transient Thermal Response Curve for FQPF5N50C

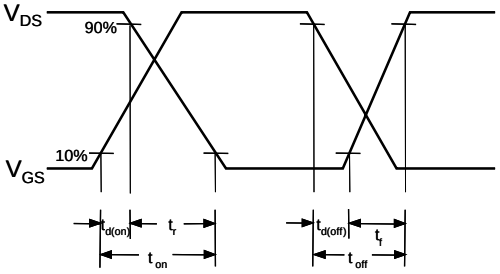
Gate Charge Test Circuit & Waveform



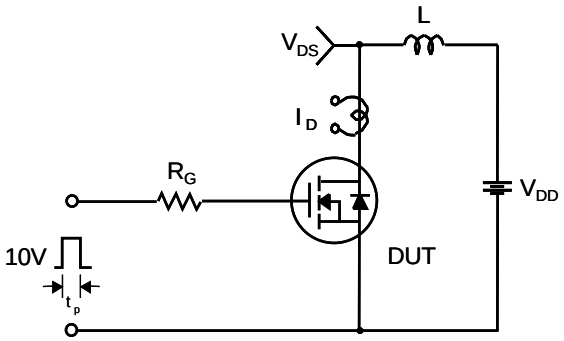


Resistive Switching Test Circuit & Waveforms

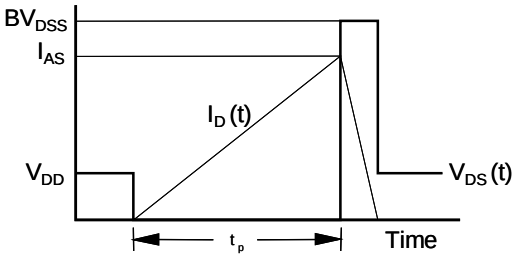




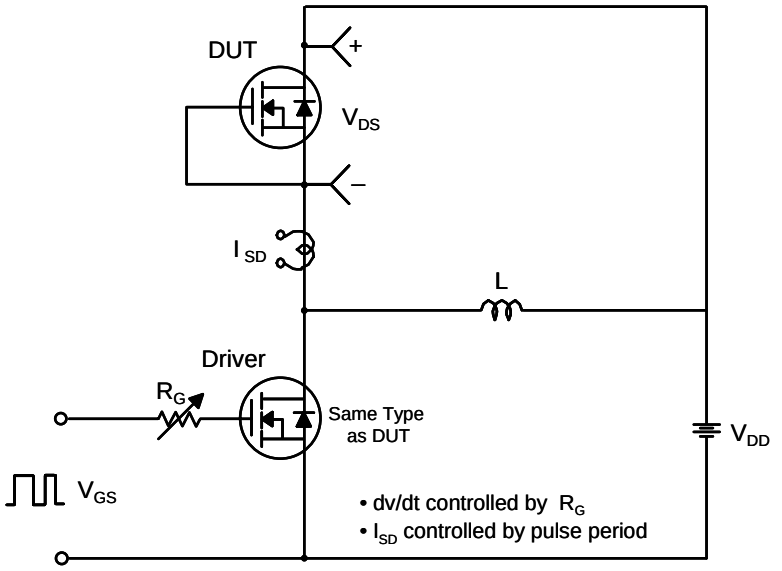
Unclamped Inductive Switching Test Circuit & Waveforms

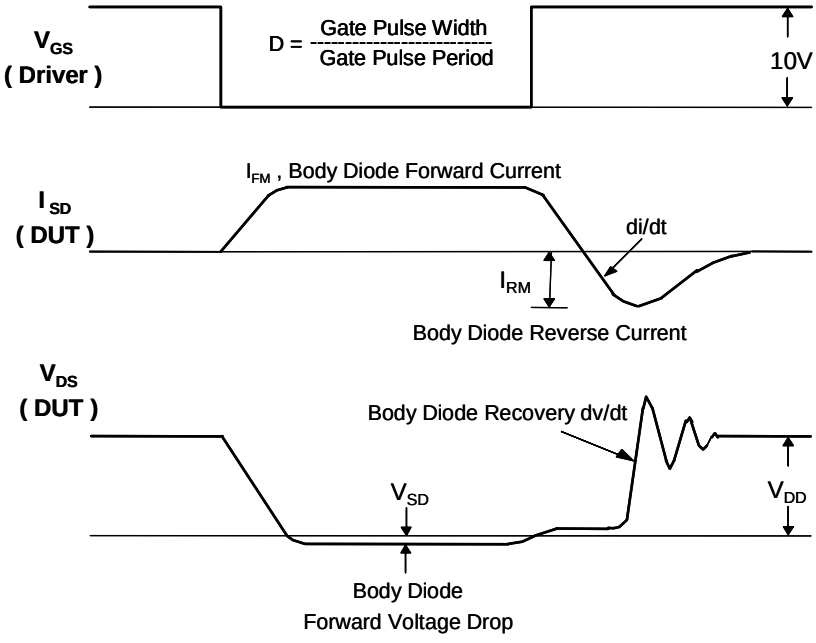


$$E_{AS} = \frac{1}{2} L I_{AS}^2 \frac{BV_{DSS}}{BV_{DSS} - V_{DD}}$$



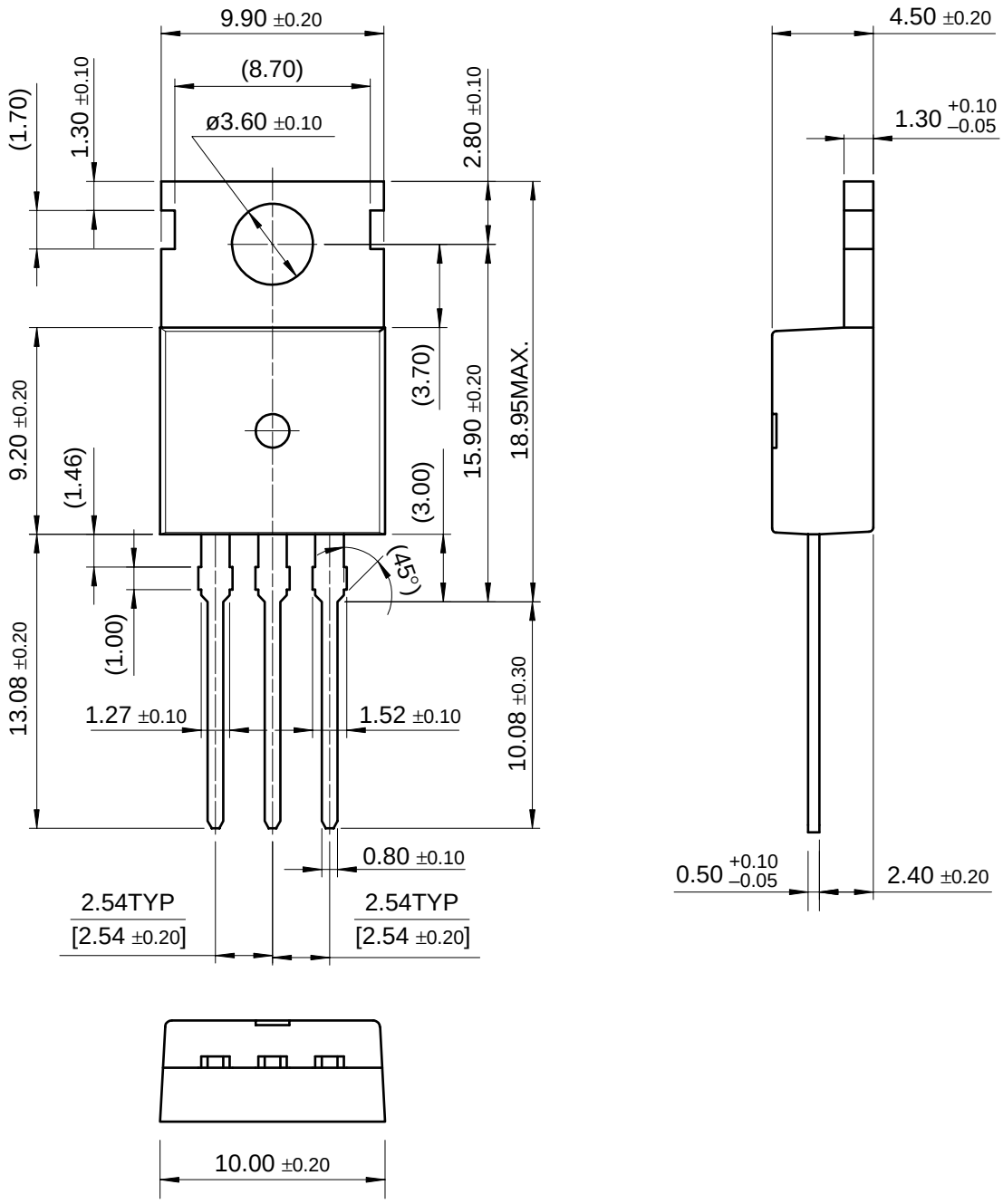
Peak Diode Recovery dv/dt Test Circuit & Waveforms





Package Dimensions

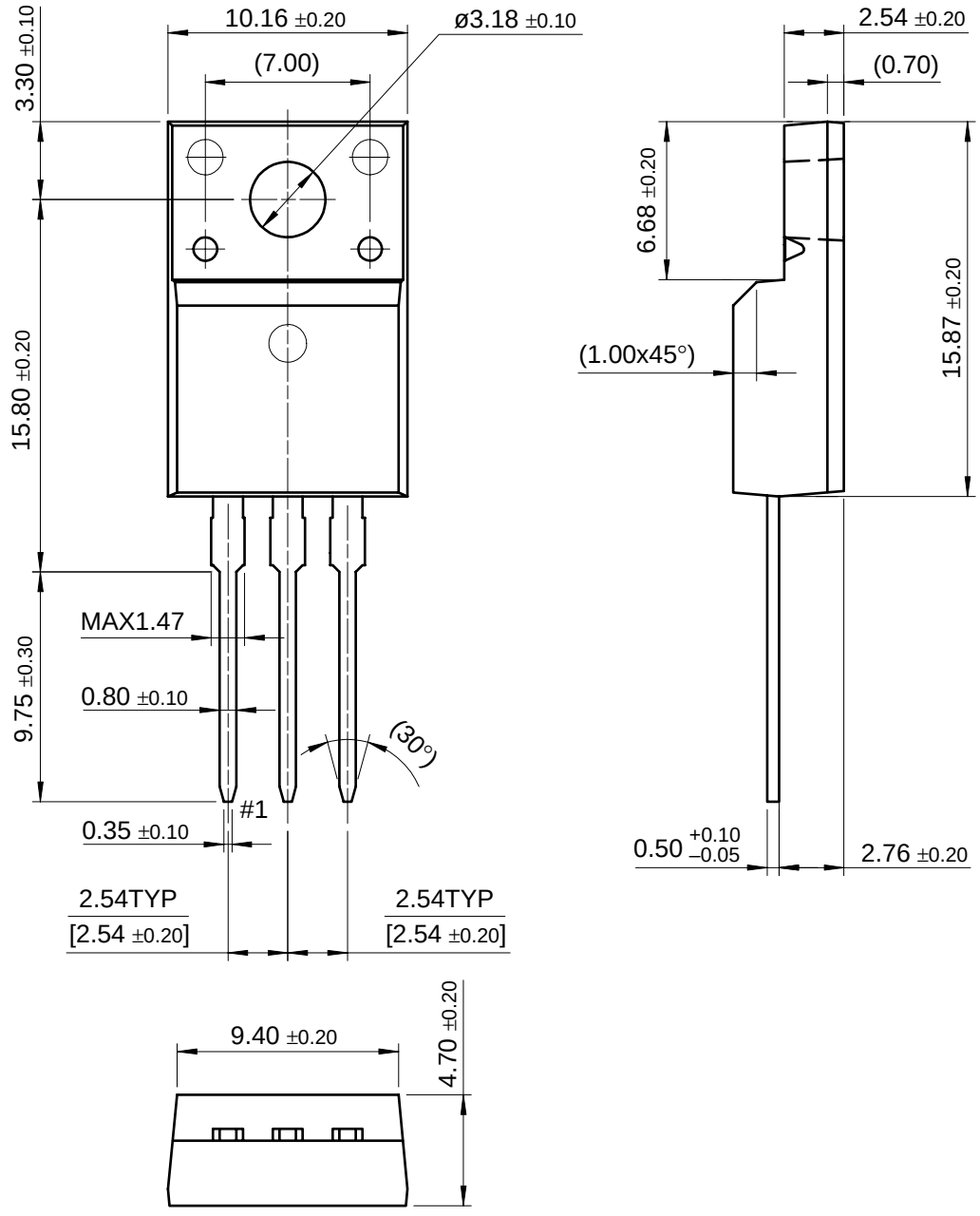
TO-220



Dimensions in Millimeters

Package Dimensions (Continued)

TO-220F



Dimensions in Millimeters

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CROSSVOLT™	FRFET™	MicroPak™	QFET™	SuperSOT™-8
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2. A critical component is 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, and supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice in order 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 in order 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.

FQPF5N50C

500V N-Channel Advance Q-FET C-Series

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- Design center

General description

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

This advanced 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 efficiency switched mode power supplies, active power factor correction, electronic lamp ballasts based on half bridge topology.

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  - $R_{DS(ON)}$ = 1.4 Ω @ V_{GS} = 10V
- Low gate charge (typical 18nC)
- Low Crss (typical 15pF)
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability

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Product status/pricing/packaging

BUY

Product	Product status	Pb-free Status	Pricing*	Package type	Leads	Packing method	Package Marking Convention**
FQPF5N50C	Full Production	Full Production	$0.87	TO-220F	3	RAIL	Line 1: **$Y** (Fairchild logo) &**Z** (Asm. Plant Code) &**4** (4-Digit Date Code) Line 2: FQPF Line 3: 5N50C
FQPF5N50CT	Full Production	Full Production	$0.90	TO-220F	3	RAIL	Line 1: **$Y** (Fairchild logo) &**Z** (Asm. Plant Code) &**4** (4-Digit Date Code)
FQPF5N50CYDTU	Full Production	Full Production	$0.90	TO-220F	3	RAIL	Line 1: **$Y** (Fairchild logo) &**Z** (Asm. Plant Code) &**4** (4-Digit Date Code)

* Fairchild 1,000 piece Budgetary Pricing
** A sample button will appear if the part is available through Fairchild's on-line samples program. If there is no sample button, please contact a Fairchild distributor to obtain samples

Indicates product with Pb-free second-level interconnect. For more information click here.

Package marking information for product FQPF5N50C is available. Click here for more information .

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Qualification Support

Click on a product for detailed qualification data

Product
FQPF5N50C
FQPF5N50CT
FQPF5N50CYDTU

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