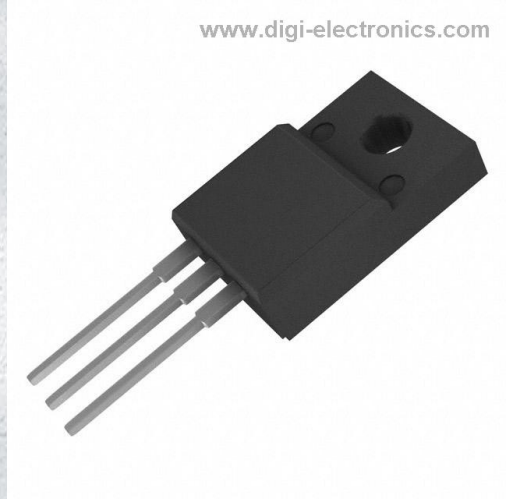
FQAF12P20 Datasheet



DiGi Electronics Part Number	FQAF12P20-DG
Manufacturer	onsemi
Manufacturer Product Number	FQAF12P20
Description	MOSFET P-CH 200V 8.6A TO3PF
Detailed Description	P-Channel 200 V 8.6A (Tc) 70W (Tc) Through Hole TO-3PF

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Purchase and inquiry

Manufacturer Product Number:	Manufacturer:
FQAF12P20	onsemi
Series:	Product Status:
QFET®	Obsolete
FET Type:	Technology:
P-Channel	MOSFET (Metal Oxide)
Drain to Source Voltage (Vdss):	Current - Continuous Drain (Id) @ 25°C:
200 V	8.6A (Tc)
Drive Voltage (Max Rds On, Min Rds On):	Rds On (Max) @ Id, Vgs:
10V	470mOhm @ 4.3A, 10V
Vgs(th) (Max) @ Id:	Gate Charge (Qg) (Max) @ Vgs:
5V @ 250µA	40 nC @ 10 V
Vgs (Max):	Input Capacitance (Ciss) (Max) @ Vds:
±30V	1200 pF @ 25 V
FET Feature:	Power Dissipation (Max):
-	70W (Tc)
Operating Temperature:	Mounting Type:
-55°C ~ 150°C (TJ)	Through Hole
Supplier Device Package:	Package / Case:
TO-3PF	TO-3P-3 Full Pack
Base Product Number:	
FQAF1	

Environmental & Export classification

Moisture Sensitivity Level (MSL):	REACH Status:
1 (Unlimited)	REACH Unaffected
ECCN:	HTSUS:
EAR99	8541.29.0095

FAIRCHILD SEMICONDUCTOR™

May 2000

QFET™

FQAF12P20

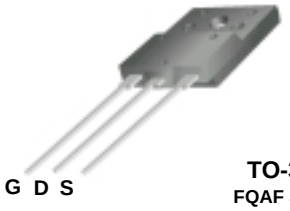
200V P-Channel MOSFET

General Description

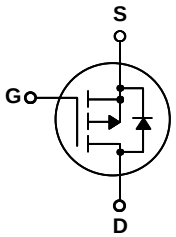
These P-Channel enhancement mode power field effect transistors are produced using Fairchild's proprietary, planar stripe, DMOS technology.
This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficiency switching DC/DC converters.

Features

- -11.5A, -200V, $R_{DS(on)}$ = 0.47Ω @V_{GS} = -10 V
- Low gate charge (typical 31 nC)
- Low Crss (typical 30 pF)
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability



TO-3PF
FQAF Series



Absolute Maximum Ratings

T_C = 25°C unless otherwise noted

Symbol	Parameter		FQAF12P20	Units
V_{DSS}	Drain-Source Voltage		-200	V
I_D	Drain Current - Continuous (T_C = 25°C)		-8.6	A
	- Continuous (T_C = 100°C)		-5.4	A
I_{DM}	Drain Current - Pulsed	(Note 1)	-34.4	A
V_{GSS}	Gate-Source Voltage		± 30	V
E_{AS}	Single Pulsed Avalanche Energy	(Note 2)	810	mJ
I_{AR}	Avalanche Current	(Note 1)	-8.6	A
E_{AR}	Repetitive Avalanche Energy	(Note 1)	7.0	mJ
dv/dt	Peak Diode Recovery dv/dt	(Note 3)	-5.5	V/ns
P_D	Power Dissipation (T_C = 25°C)		70	W
	- Derate above 25°C		0.56	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

Thermal Characteristics

Symbol	Parameter	Typ	Max	Units
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	--	1.79	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	--	40	°C/W

Elerical 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	-200	--	--	V
ΔBV_{DSS} / ΔT_J	Breakdown Voltage Temperature Coefficient	I_D = -250 µA, Referenced to 25°C	--	-	--	V/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = -200 V, V_{GS} = 0 V	--	--	-1	µA
		V_{DS} = -160 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	-3.0	--	-5.0	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	V_{GS} = -10 V, I_D = -4.3 A	--	0.36	0.47	Ω
g_{FS}	Forward Transconductance	V_{DS} = -40 V, I_D = -4.3 A (Note 4)	--	6.0	--	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = -25 V, V_{GS} = 0 V, f = 1.0 MHz	--	920	1200	pF
C_{oss}	Output Capacitance		--	190	250	pF
C_{rss}	Reverse Transfer Capacitance		--	30	40	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = -100 V, I_D = -11.5 A, R_G = 25 Ω (Note 4, 5)	--	20	50	ns
t_r	Turn-On Rise Time		--	195	400	ns
$t_{d(off)}$	Turn-Off Delay Time		--	40	90	ns
t_f	Turn-Off Fall Time		--	60	130	ns
Q_g	Total Gate Charge	V_{DS} = -160 V, I_D = -11.5 A, V_{GS} = -10 V (Note 4, 5)	--	31	40	nC
Q_{gs}	Gate-Source Charge		--	8.1	--	nC
Q_{gd}	Gate-Drain Charge		--	16	--	nC
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain-Source Diode Forward Current		--	--	-8.6	A
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current		--	--	-34.4	A
V_{SD}	Drain-Source Diode Forward Voltage	V_{GS} = 0 V, I_S = -8.6 A	--	--	-5.0	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0 V, I_S = -11.5 A, dI_F / dt = 100 A/µs (Note 4)	--	180	--	ns
Q_{rr}	Reverse Recovery Charge		--	1.44	--	µC

Notes:
1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. L = 16.4mH, I_{AS} = -8.6A, V_{DD} = -50V, R_G = 25 Ω, Starting T_J = 25°C
3. I_{SD} ≤ -11.5A, di/dt ≤ 300A/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

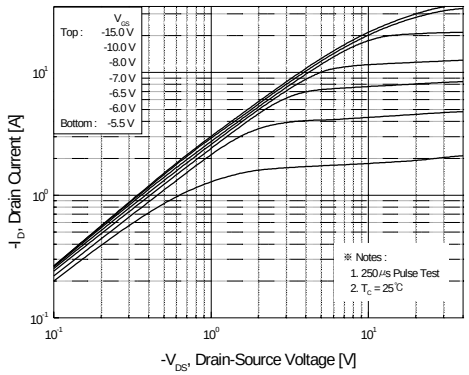


Figure 1. On-Region Characteristics

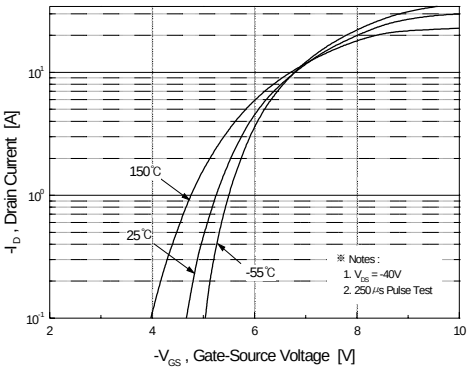


Figure 2. Transfer Characteristics

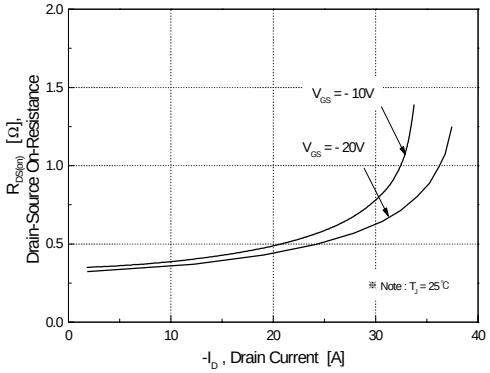


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

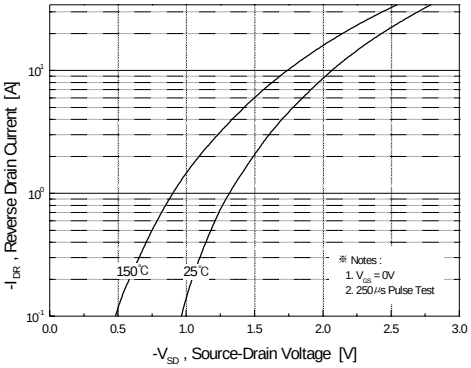


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

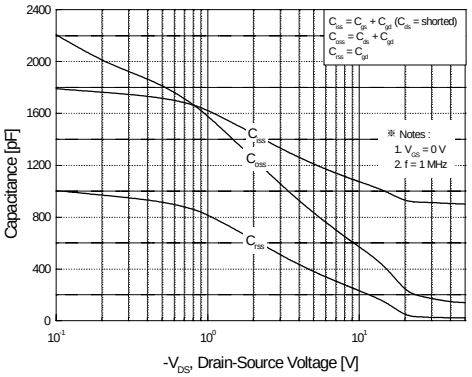


Figure 5. Capacitance Characteristics

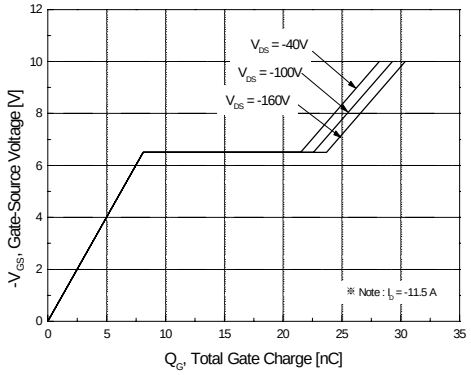


Figure 6. Gate Charge Characteristics

Typical Characteristics (Continued)

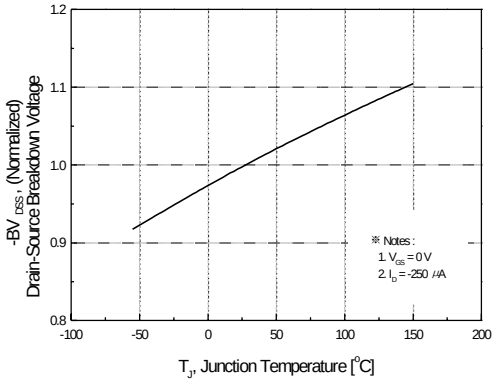


Figure 7. Breakdown Voltage Variation vs. Temperature

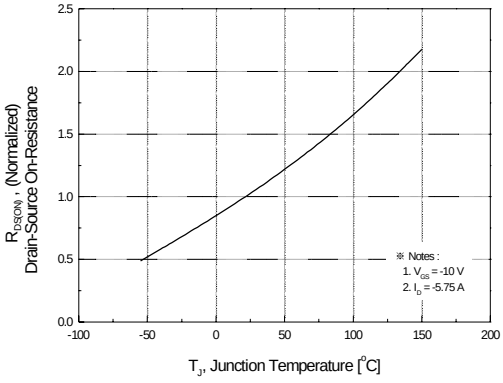


Figure 8. On-Resistance Variation vs. Temperature

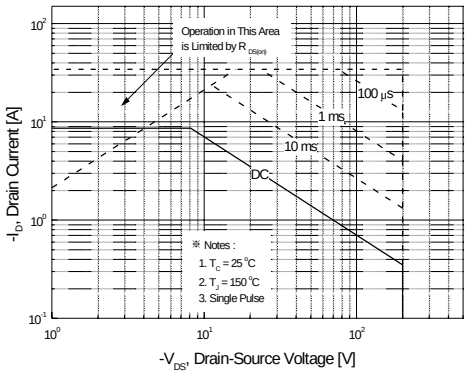


Figure 9. Maximum Safe Operating Area

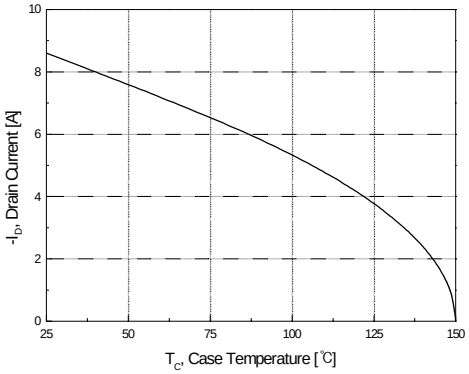


Figure 10. Maximum Drain Current vs. Case Temperature

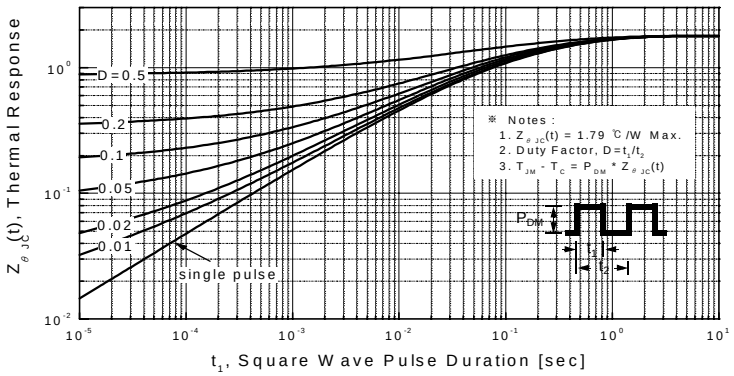
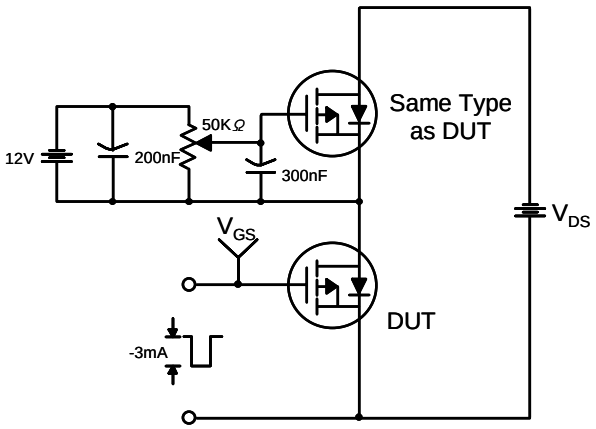
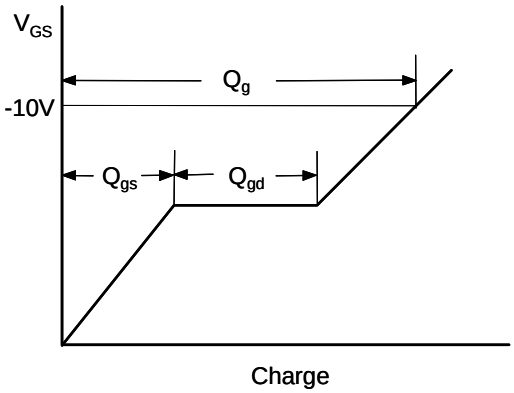


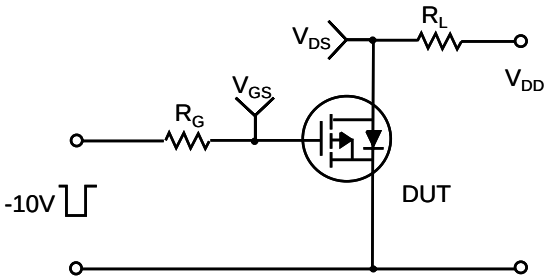
Figure 11. Transient Thermal Response Curve

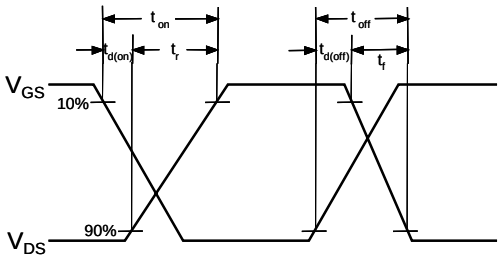
Gate Charge Test Circuit & Waveform



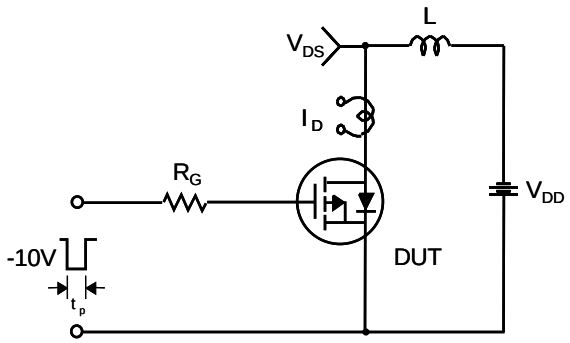


Resistive Switching Test Circuit & Waveforms

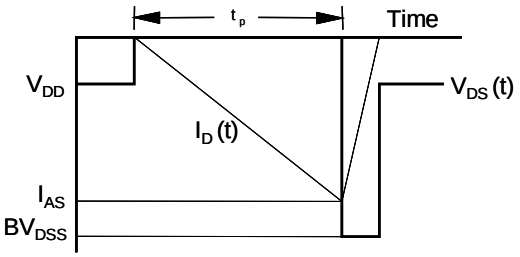




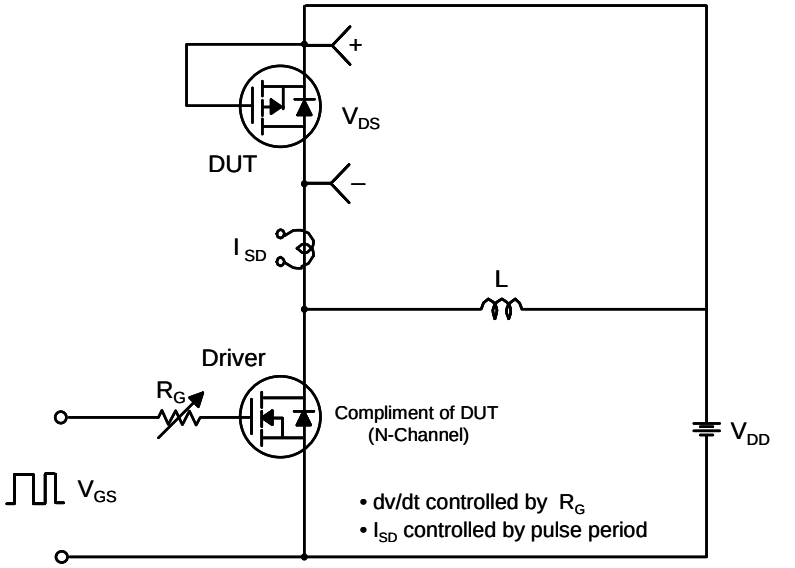
Unclamped Inductive Switching Test Circuit & Waveforms

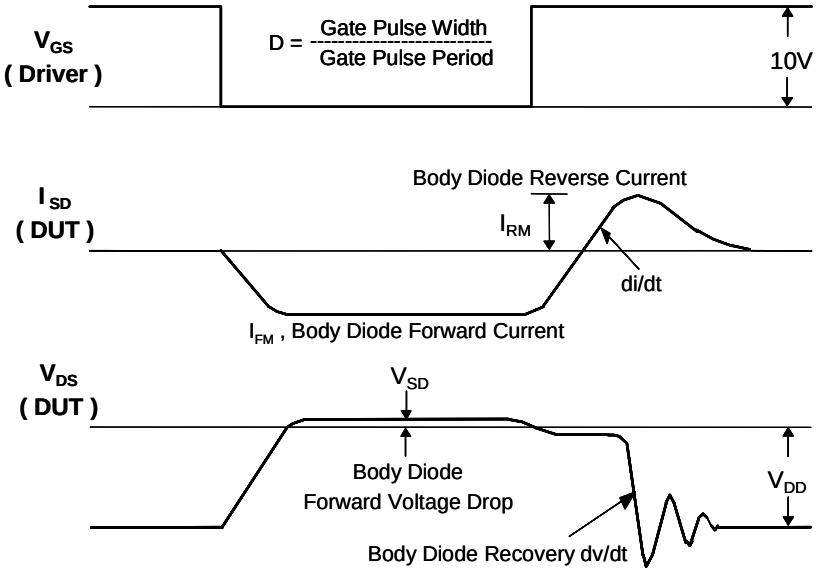


$$E_{AS} = \frac{1}{2} L I_{AS}^2 \frac{BV_{DSS}}{BV_{DSS} - V_{DD}}$$



Peak Diode Recovery dv/dt Test Circuit & Waveforms

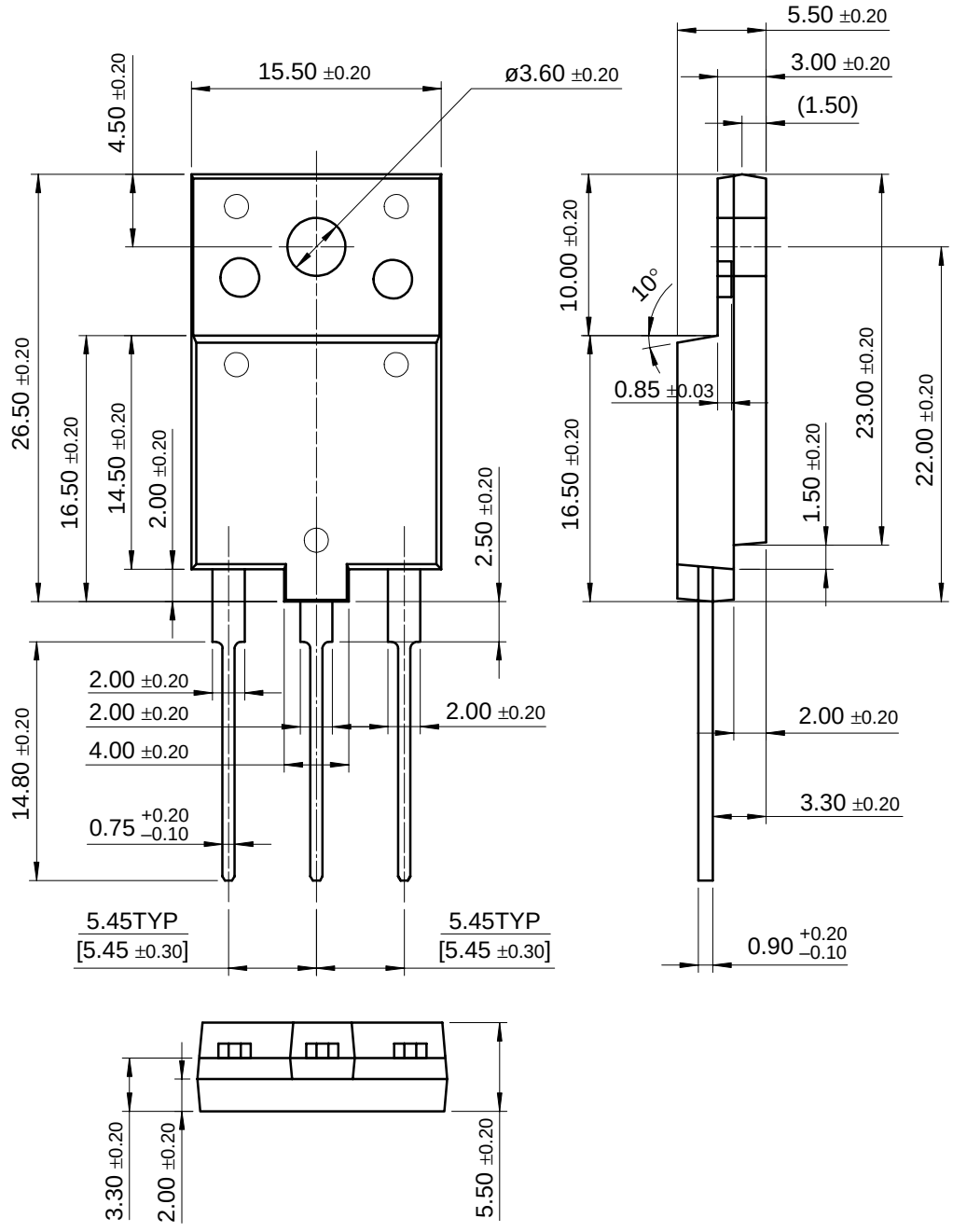




FQAF12P20

Package Dimensions

TO-3PF



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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.

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Definition of Terms

Datasheet Identification	Product Status	Definition
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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.

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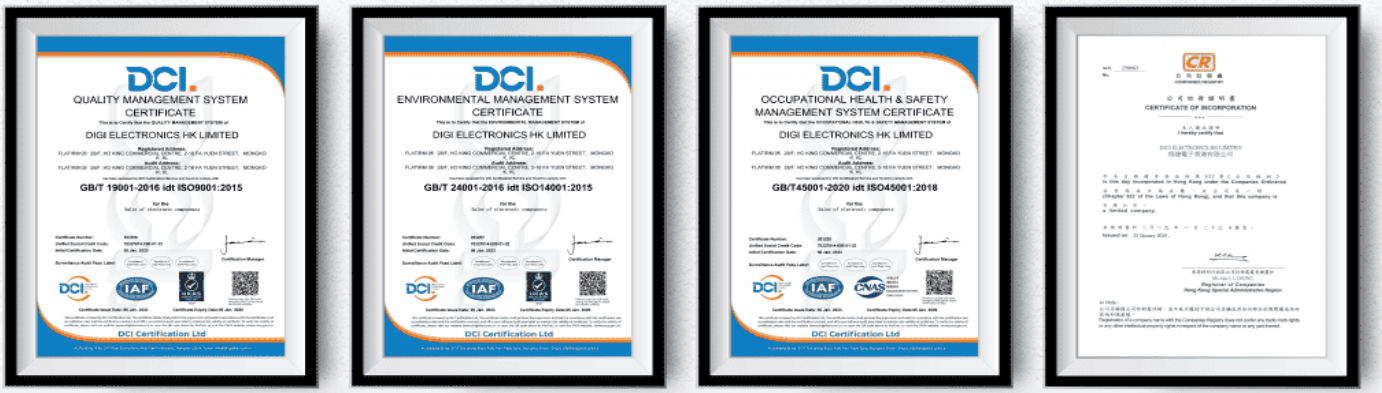

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