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FQPF3N25

N-Channel QFET® MOSFET

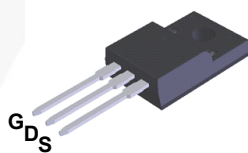
250 V, 2.3 A, 2.2 Ω

Description

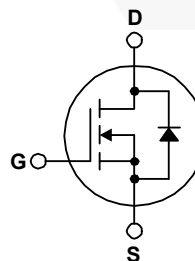
These N-Channel enhancement mode power field effect transistors are produced using Fairchild's proprietary, planar stripe, DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in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

Features

- 2.3 A, 250 V, $R_{DS(on)} = 2.2 \Omega$ (Max.) @ $V_{GS} = 10 V$, $I_D = 1.15 A$
- Low Gate Charge (Typ. 4.0 nC)
- Low Crss (Typ. 4.7 pF)
- 100% Avalanche Tested



TO-220F



Absolute Maximum Ratings $T_C = 25^\circ C$ unless otherwise noted.

Symbol	Parameter	FQPF3N25	Unit
V_{DSS}	Drain-Source Voltage	250	V
I_D	Drain Current - Continuous ($T_C = 25^\circ C$)	2.3	A
	- Continuous ($T_C = 100^\circ C$)	1.45	A
I_{DM}	Drain Current - Pulsed (Note 1)	9.2	A
V_{GSS}	Gate-Source Voltage	± 30	V
E_{AS}	Single Pulsed Avalanche Energy (Note 2)	40	mJ
I_{AR}	Avalanche Current (Note 1)	2.3	A
E_{AR}	Repetitive Avalanche Energy (Note 1)	2.7	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	5.5	V/ns
P_D	Power Dissipation ($T_C = 25^\circ C$)	27	W
	- Derate above $25^\circ C$	0.22	W/ $^\circ C$
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +150	$^\circ C$
T_L	Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds	300	$^\circ C$

Thermal Characteristics

Symbol	Parameter	FQPF3N25	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Max.	4.63	$^\circ C/W$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Max.	62.5	$^\circ C/W$

Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FQPF3N25	FQPF3N25	TO-220F	Tube	N/A	N/A	50 units

Electrical Characteristics T_c = 25°C unless otherwise noted.

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
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Off Characteristics

BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} = 0 V, I _D = 250 μA	250	--	--	V
ΔBV _{DSS} / ΔT _J	Breakdown Voltage Temperature Coefficient	I _D = 250 μA, Referenced to 25°C	--	0.24	--	V/°C
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 250 V, V _{GS} = 0 V	--	--	1	μA
		V _{DS} = 200 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 = 1.15 A	--	1.75	2.2	Ω
g _{FS}	Forward Transconductance	V _{DS} = 50 V, I _D = 1.15 A	--	1.4	--	S

Dynamic Characteristics

C _{iss}	Input Capacitance	V _{DS} = 25 V, V _{GS} = 0 V, f = 1.0 MHz	--	130	170	pF
C _{oss}	Output Capacitance		--	30	40	pF
C _{rss}	Reverse Transfer Capacitance		--	4.7	6.1	pF

Switching Characteristics

t _{d(on)}	Turn-On Delay Time	V _{DD} = 125 V, I _D = 2.8 A, R _G = 25 Ω (Note 4)	--	6.6	23	ns
t _r	Turn-On Rise Time		--	25	60	ns
t _{d(off)}	Turn-Off Delay Time		--	5.5	21	ns
t _f	Turn-Off Fall Time		--	20	50	ns
Q _g	Total Gate Charge	V _{DS} = 200 V, I _D = 2.8 A, V _{GS} = 10 V (Note 4)	--	4.0	5.2	nC
Q _{gs}	Gate-Source Charge		--	1.1	--	nC
Q _{gd}	Gate-Drain Charge		--	2.2	--	nC

Drain-Source Diode Characteristics and Maximum Ratings

I _S	Maximum Continuous Drain-Source Diode Forward Current	--	--	2.3	A
I _{SM}	Maximum Pulsed Drain-Source Diode Forward Current	--	--	9.2	A
V _{SD}	Drain-Source Diode Forward Voltage	V _{GS} = 0 V, I _S = 2.3 A	--	--	1.5 V
t _{rr}	Reverse Recovery Time	V _{GS} = 0 V, I _S = 2.8 A,	--	100	ns
Q _{rr}	Reverse Recovery Charge	dI _F / dt = 100 A/μs	--	0.3	μC

Notes:

1. Repetitive rating : pulse-width limited by maximum junction temperature.
2. L = 12 mH, I_{AS} = 2.3 A, V_{DD} = 50 V, R_G = 25 Ω, starting T_J = 25°C.
3. I_{SD} ≤ 2.8 A, di/dt ≤ 300 A/μs, V_{DD} ≤ BV_{DSS}, starting T_J = 25°C.
4. Essentially independent of operating temperature.

Typical Characteristics

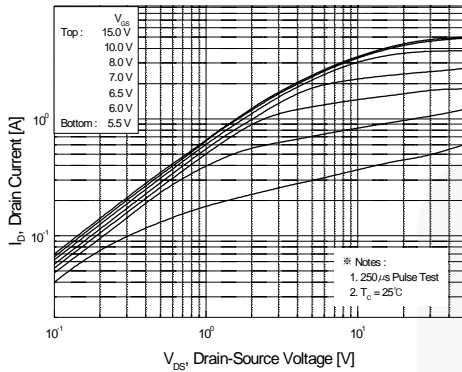


Figure 1. On-Region Characteristics

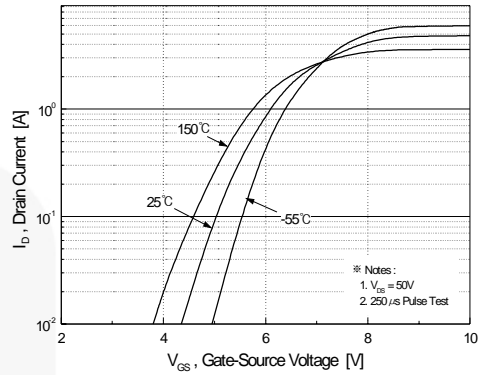


Figure 2. Transfer Characteristics

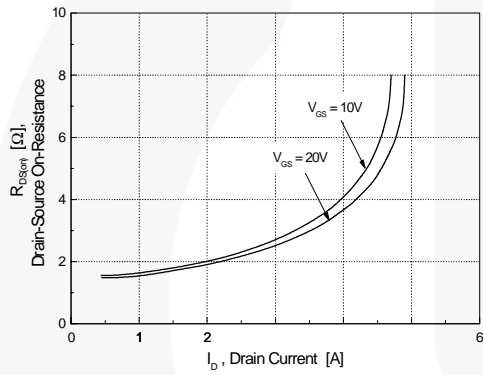


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

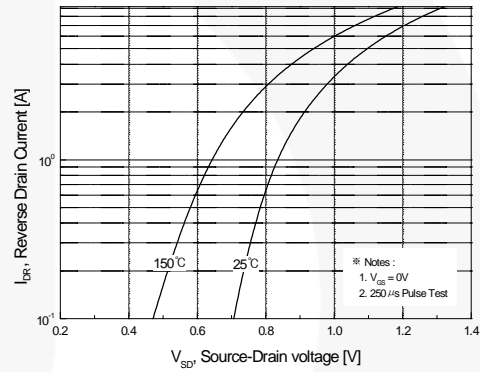


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

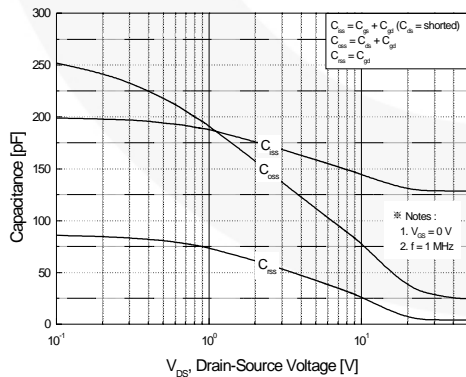


Figure 5. Capacitance Characteristics

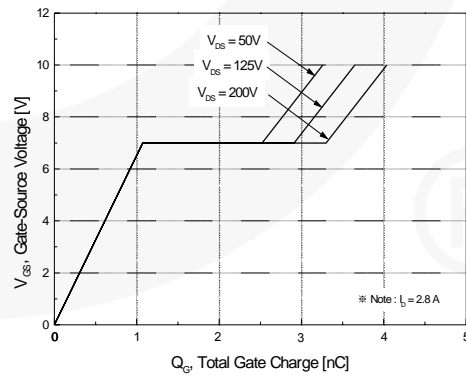


Figure 6. Gate Charge Characteristics

Typical Characteristics (continued)

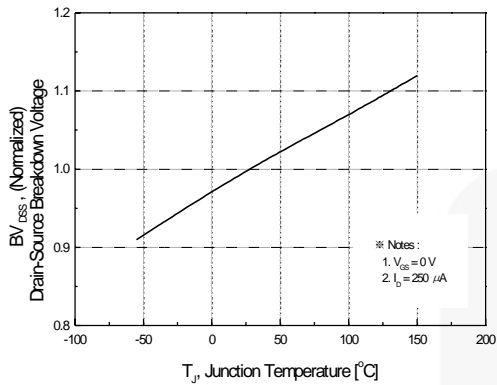


Figure 7. Breakdown Voltage Variation vs. Temperature

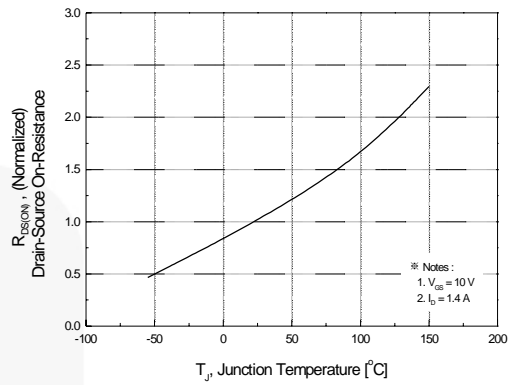


Figure 8. On-Resistance Variation vs. Temperature

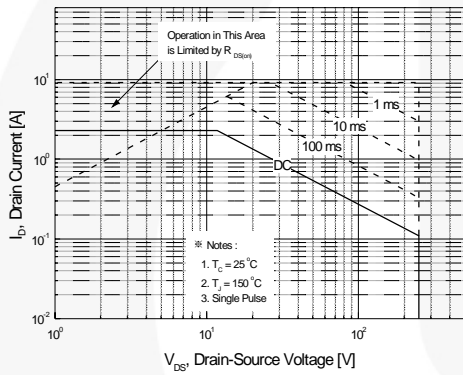


Figure 9. Maximum Safe Operating Area

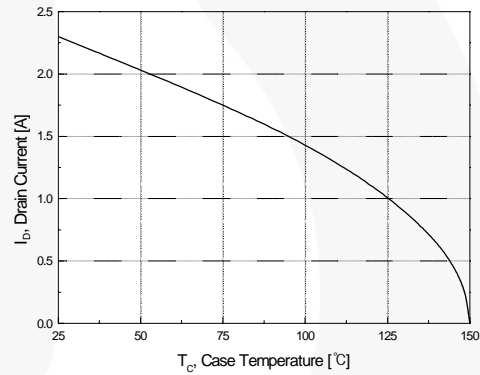


Figure 10. Maximum Drain Current vs. Case Temperature

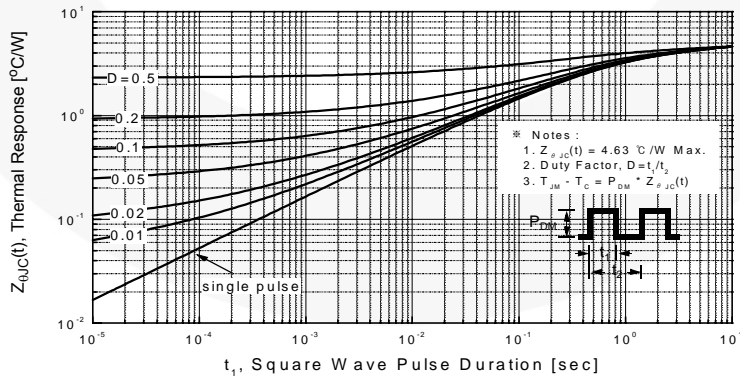


Figure 11. Transient Thermal Response Curve



Figure 12. Gate Charge Test Circuit & Waveform



Figure 13. Resistive Switching Test Circuit & Waveforms

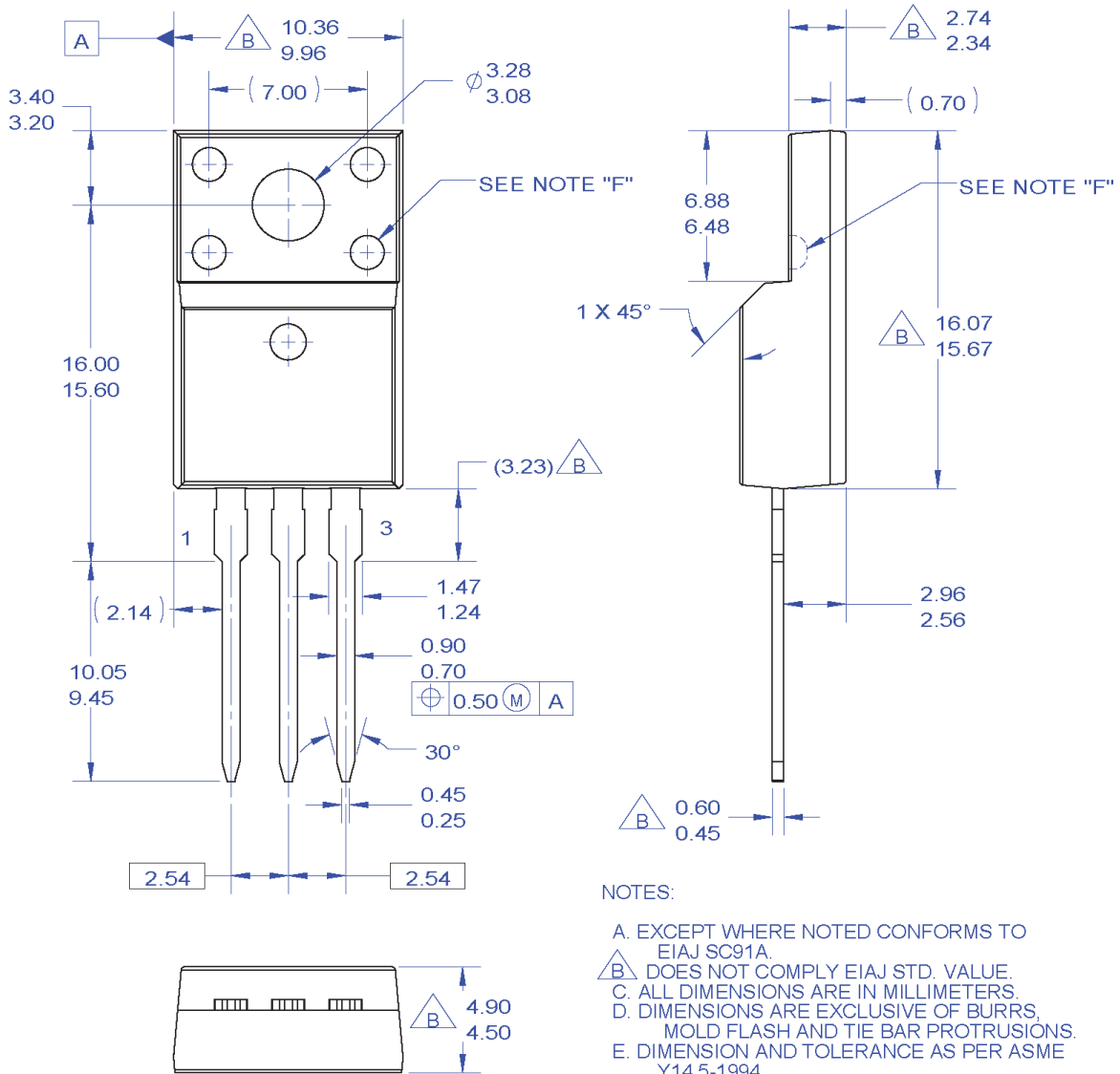


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms



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

Mechanical Dimensions



NOTES:

- A. EXCEPT WHERE NOTED CONFORMS TO EIAJ SC91A.
- B. DOES NOT COMPLY EIAJ STD. VALUE.
- C. ALL DIMENSIONS ARE IN MILLIMETERS.
- D. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR PROTRUSIONS.
- E. DIMENSION AND TOLERANCE AS PER ASME Y14.5-1994.
- F. OPTION 1 - WITH SUPPORT PIN HOLE.
OPTION 2 - NO SUPPORT PIN HOLE.
- G. DRAWING FILE NAME: TO220M03REV3

Figure 16. TO220, Molded, 3-Lead, Full Pack, EIAJ SC91, Straight Lead

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