

FQAF34N25

250V N-Channel MOSFET

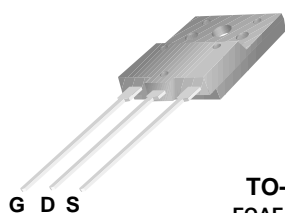
General Description

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

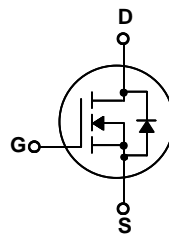
This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficiency switching DC/DC converters and switch mode power supplies.

Features

- 21.7A, 250V, $R_{DS(on)} = 0.085\Omega @ V_{GS} = 10V$
- Low gate charge (typical 60 nC)
- Low C_{rss} (typical 60 pF)
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability



TO-3PF
FQAF Series



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

Symbol	Parameter	FQAF34N25	Units
V_{DSS}	Drain-Source Voltage	250	V
I_D	Drain Current - Continuous ($T_C = 25^\circ\text{C}$) - Continuous ($T_C = 100^\circ\text{C}$)	21.7	A
		13.7	A
I_{DM}	Drain Current - Pulsed (Note 1)	86.8	A
V_{GSS}	Gate-Source Voltage	± 30	V
E_{AS}	Single Pulsed Avalanche Energy (Note 2)	700	mJ
I_{AR}	Avalanche Current (Note 1)	21.7	A
E_{AR}	Repetitive Avalanche Energy (Note 1)	10	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	4.8	V/ns
P_D	Power Dissipation ($T_C = 25^\circ\text{C}$) - Derate above 25°C	100	W
		0.8	W/ $^\circ\text{C}$
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +150	$^\circ\text{C}$
T_L	Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds	300	$^\circ\text{C}$

Thermal Characteristics

Symbol	Parameter	Typ	Max	Units
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	--	1.25	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	--	40	$^\circ\text{C}/\text{W}$

Electrical Characteristics

$T_C = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	250	--	--	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$, Referenced to 25°C	--	0.27	--	V/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 250\text{ V}, V_{GS} = 0\text{ V}$	--	--	10	μA
		$V_{DS} = 200\text{ V}, T_C = 125^\circ\text{C}$	--	--	100	μA
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	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$	3.0	--	5.0	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = 10\text{ V}, I_D = 10.9\text{ A}$	--	0.067	0.085	Ω
g_{FS}	Forward Transconductance	$V_{DS} = 40\text{ V}, I_D = 10.9\text{ A}$ (Note 4)	--	21	--	S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V},$ $f = 1.0\text{ MHz}$	--	2110	2750	pF
C_{oss}	Output Capacitance		--	465	610	pF
C_{riss}	Reverse Transfer Capacitance		--	60	80	pF

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 125\text{ V}, I_D = 34\text{ A},$ $R_G = 25\ \Omega$	--	45	100	ns	
t_r	Turn-On Rise Time		--	335	680	ns	
$t_{d(off)}$	Turn-Off Delay Time		(Note 4, 5)	--	110	230	ns
t_f	Turn-Off Fall Time		(Note 4, 5)	--	150	310	ns
Q_g	Total Gate Charge	$V_{DS} = 200\text{ V}, I_D = 34\text{ A},$ $V_{GS} = 10\text{ V}$	--	60	80	nC	
Q_{gs}	Gate-Source Charge		(Note 4, 5)	--	14	--	nC
Q_{gd}	Gate-Drain Charge		(Note 4, 5)	--	36	--	nC

Drain-Source Diode Characteristics and Maximum Ratings

I_S	Maximum Continuous Drain-Source Diode Forward Current	--	--	21.7	A	
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current	--	--	86.8	A	
V_{SD}	Drain-Source Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 21.7\text{ A}$	--	--	1.5	V
t_{rr}	Reverse Recovery Time	$V_{GS} = 0\text{ V}, I_S = 34\text{ A},$	--	220	--	ns
Q_{rr}	Reverse Recovery Charge	$di_F / dt = 100\text{ A}/\mu\text{s}$ (Note 4)	--	1.9	--	μC

Notes:

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. $L = 2.4\text{ mH}, I_{AS} = 21.7\text{ A}, V_{DD} = 50\text{ V}, R_G = 25\ \Omega$, Starting $T_J = 25^\circ\text{C}$
3. $I_{SD} \leq 34\text{ A}, di/dt \leq 300\text{ A}/\mu\text{s}, V_{DD} \leq BV_{DSS}$, 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

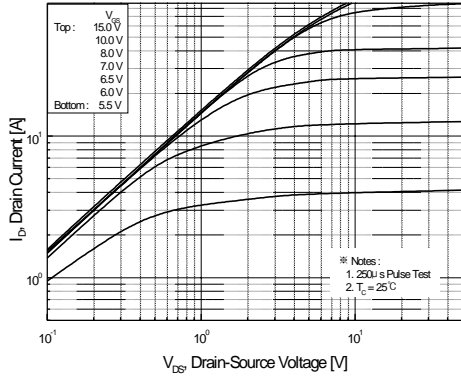


Figure 1. On-Region Characteristics.

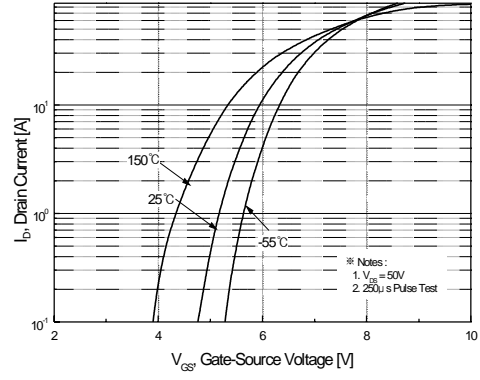


Figure 2. Transfer Characteristics.

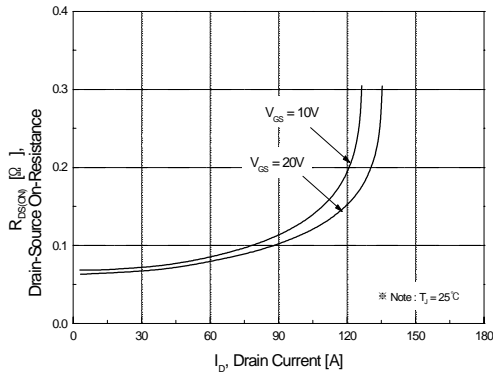


Figure 3. On-Resistance Variation vs Drain Current and Gate Voltage.

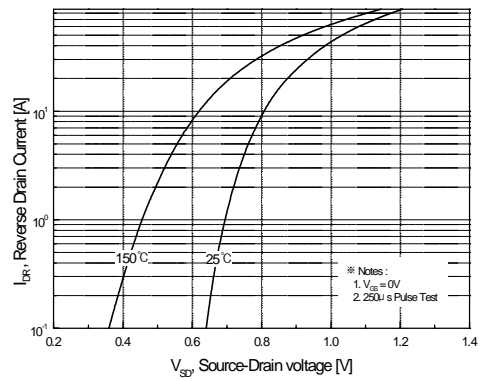


Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature.

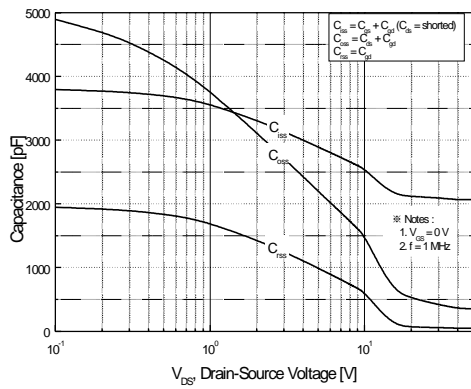


Figure 5. Capacitance Characteristics.

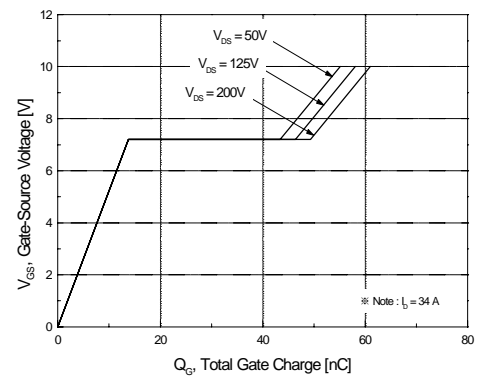


Figure 6. Gate -Charge Characteristics.

Typical Characteristics (Continued)

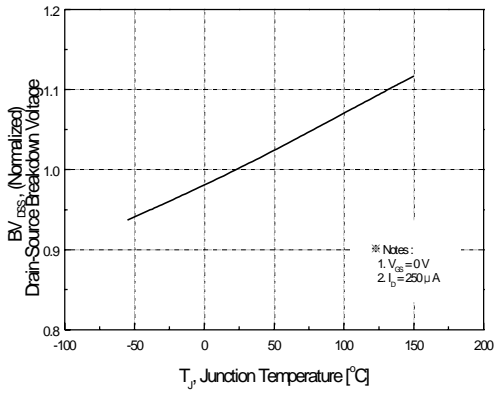


Figure 7. Breakdown Voltage Variation vs Temperature.

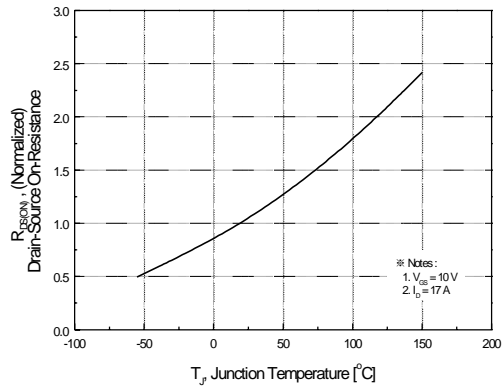


Figure 8. On-Resistance Variation vs Temperature.

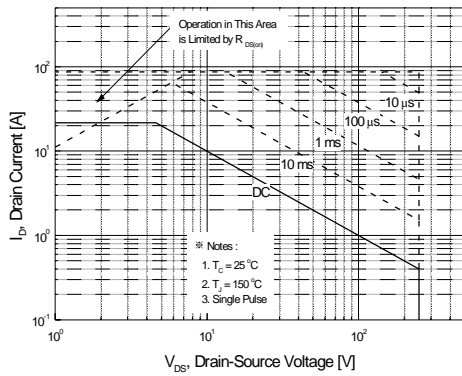


Figure 9. Maximum Safe Operating Area.

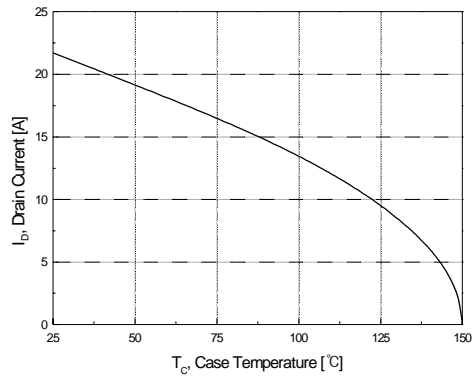


Figure 10. Maximum Drain Current vs Case Temperature.

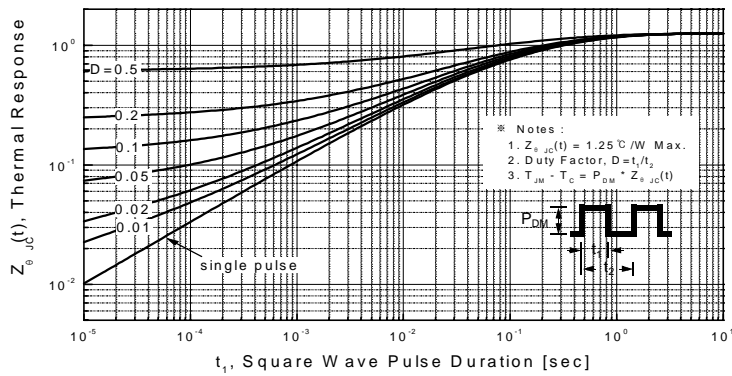


Figure 11. Transient Thermal Response Curve.

Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms



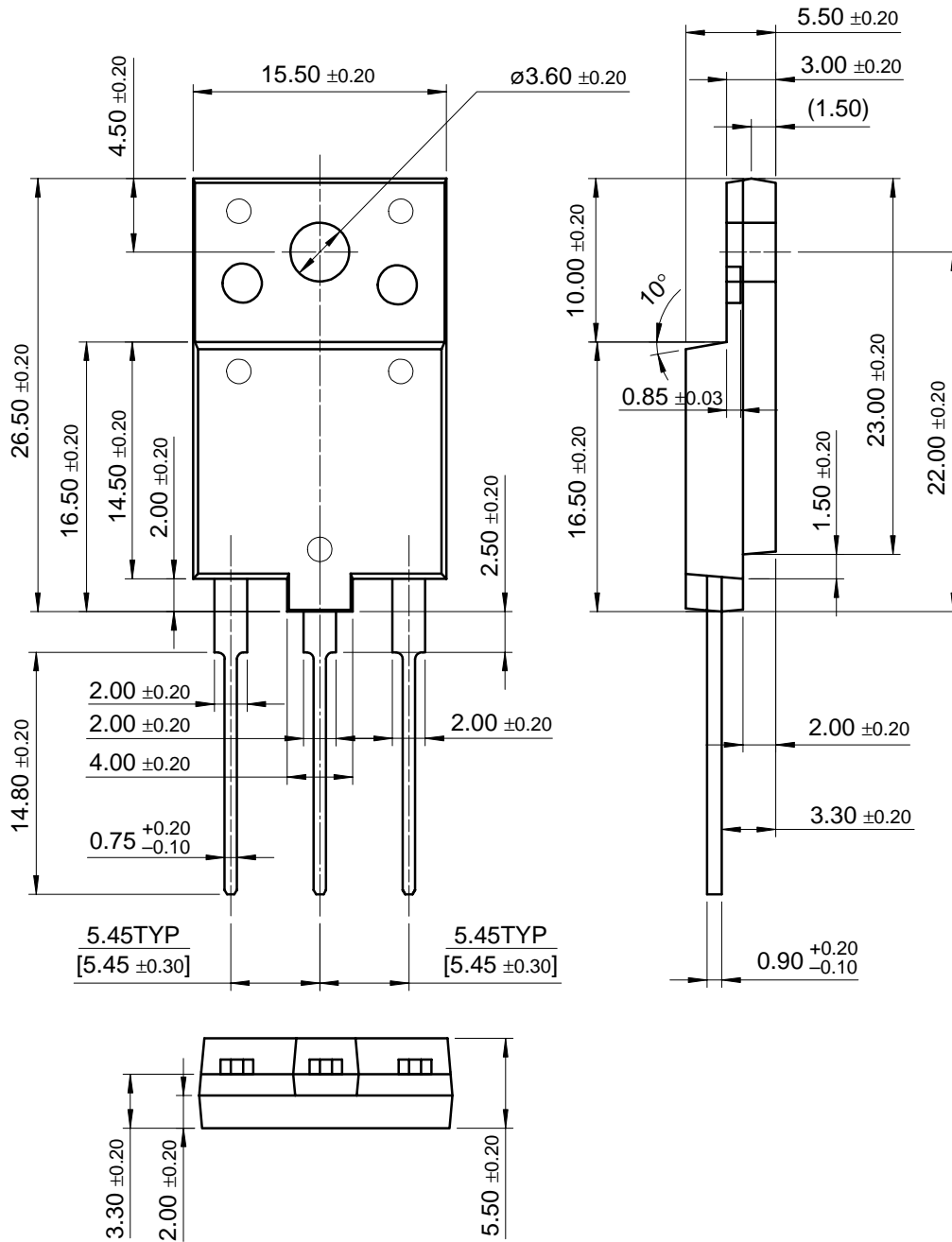
Peak Diode Recovery dv/dt Test Circuit & Waveforms



Package Dimensions

TO-3PF

FOAF34N25



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