



October 2001

FQAF34N25

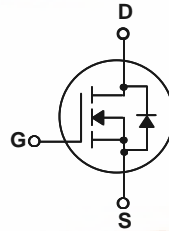
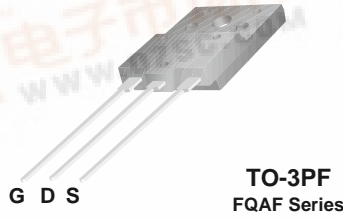
250V N-Channel MOSFET

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 Crss (typical 60 pF)
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability



Absolute Maximum Ratings T_C = 25°C unless otherwise noted

Symbol	Parameter	FQAF34N25	Units
V _{DSS}	Drain-Source Voltage	250	V
I _D	Drain Current - Continuous (T _C = 25°C) - Continuous (T _C = 100°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°C) - Derate above 25°C	100	W
		0.8	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 _{θJC}	Thermal Resistance, Junction-to-Case	--	1.25	°C/W
R _{θJA}	Thermal Resistance, Junction-to-Ambient	--	40	°C/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
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$, Referenced to 25°C	--	0.27	--	$\text{V}/^\circ\text{C}$
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_{rss}	Reverse Transfer Capacitance		--	60	80	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 125\text{ V}, I_D = 34\text{ A},$ $R_G = 25\ \Omega$ (Note 4, 5)	--	45	100	ns
t_r	Turn-On Rise Time		--	335	680	ns
$t_{d(off)}$	Turn-Off Delay Time		--	110	230	ns
t_f	Turn-Off Fall Time		--	150	310	ns
Q_g	Total Gate Charge	$V_{DS} = 200\text{ V}, I_D = 34\text{ A},$ $V_{GS} = 10\text{ V}$ (Note 4, 5)	--	60	80	nC
Q_{gs}	Gate-Source Charge		--	14	--	nC
Q_{gd}	Gate-Drain Charge		--	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

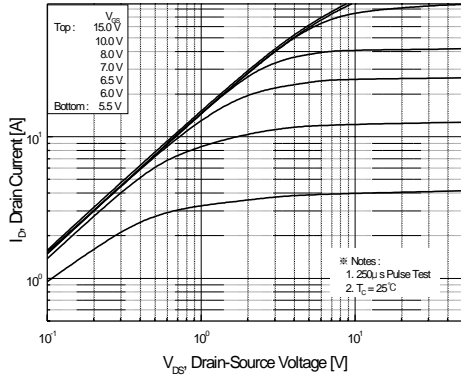


Figure 1. On-Region Characteristics.

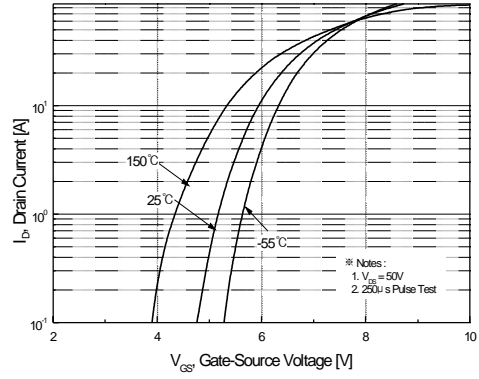


Figure 2. Transfer Characteristics.

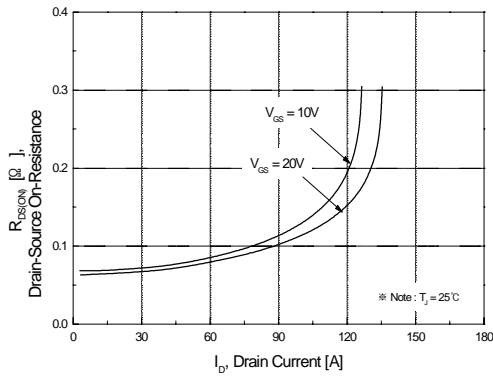


Figure 3. On-Resistance Variation vs Drain Current and Gate Voltage.

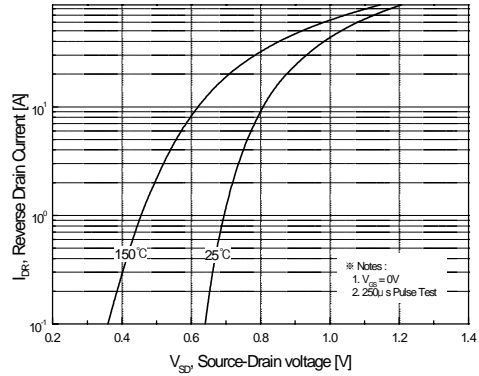


Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature.

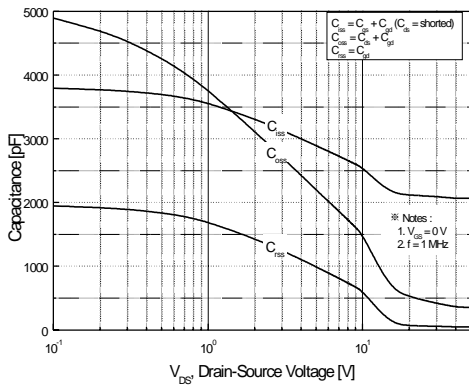


Figure 5. Capacitance Characteristics.

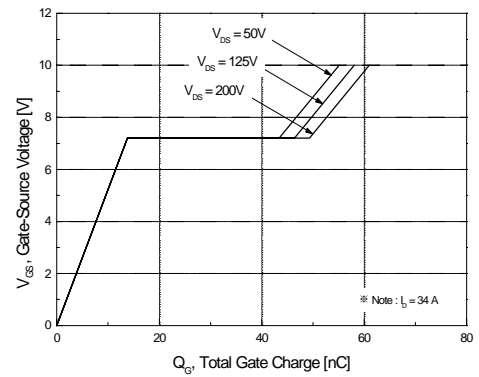


Figure 6. Gate-Charge Characteristics.

Typical Characteristics (Continued)

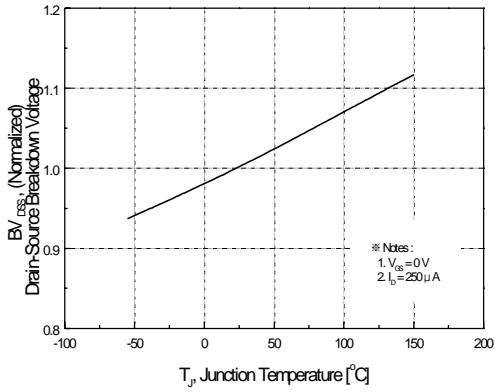


Figure 7. Breakdown Voltage Variation vs Temperature.

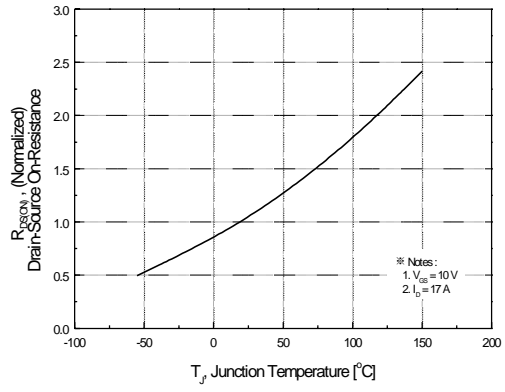


Figure 8. On-Resistance Variation vs Temperature.

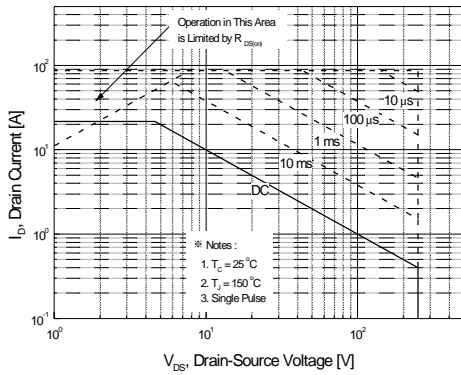


Figure 9. Maximum Safe Operating Area.

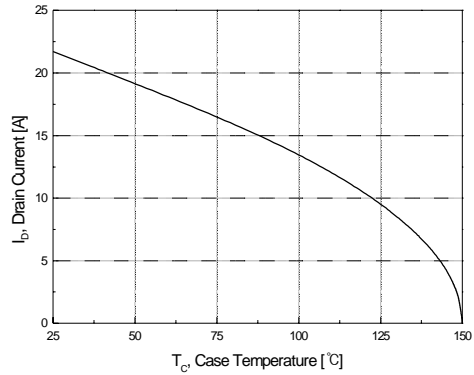


Figure 10. Maximum Drain Current vs Case Temperature.

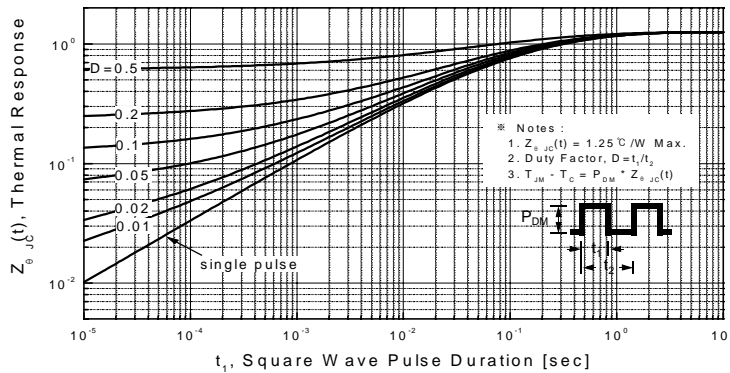
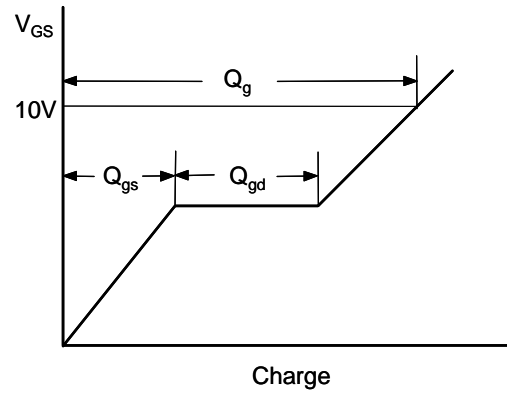
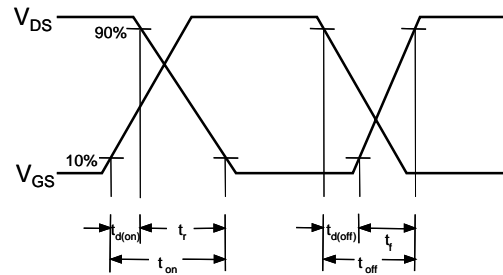
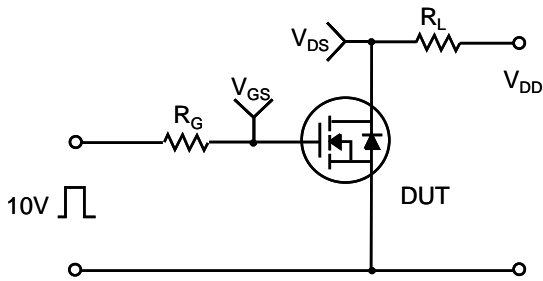


Figure 11. Transient Thermal Response Curve.

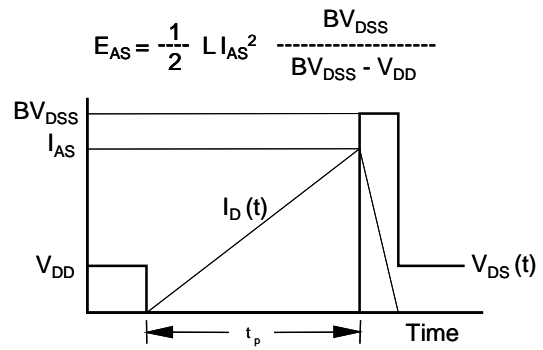
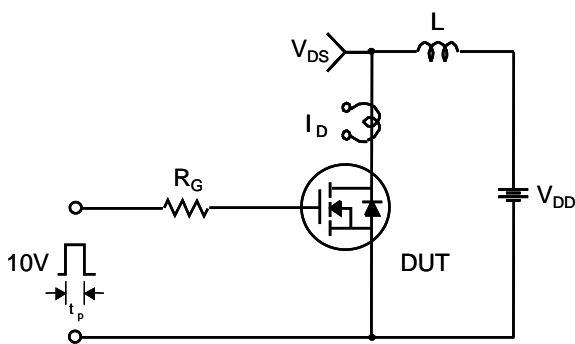
Gate Charge Test Circuit & Waveform



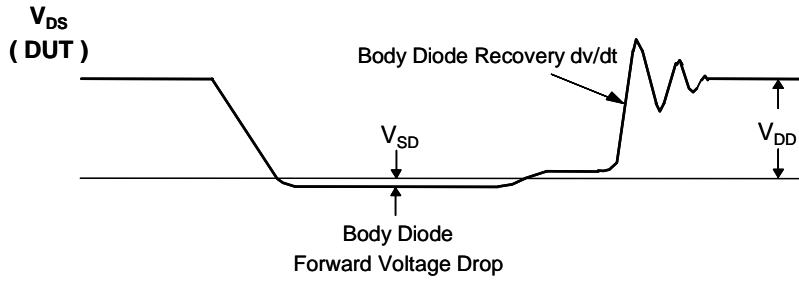
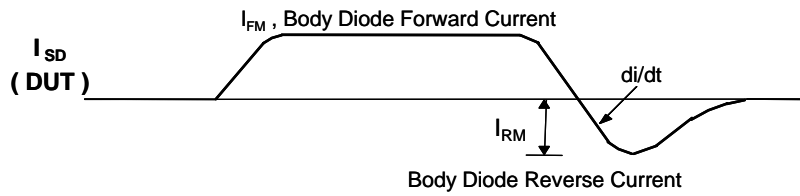
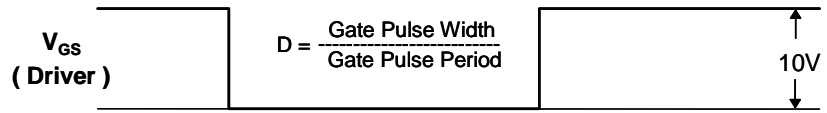
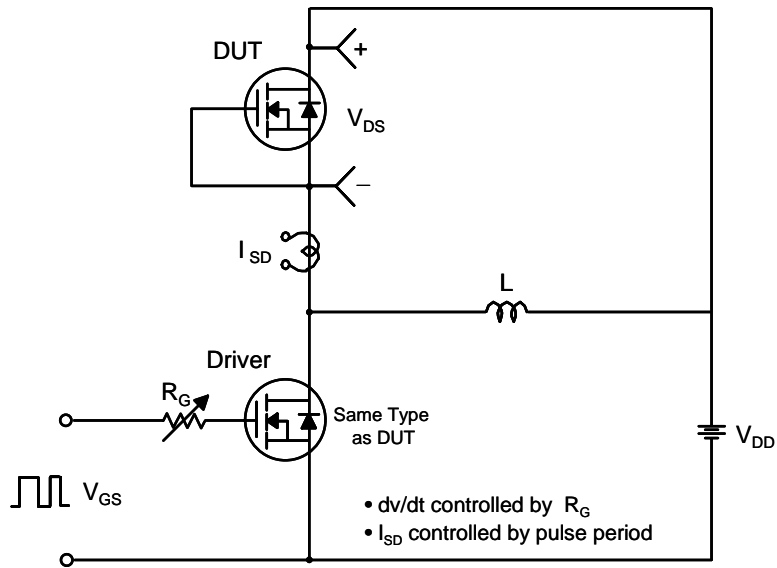
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms



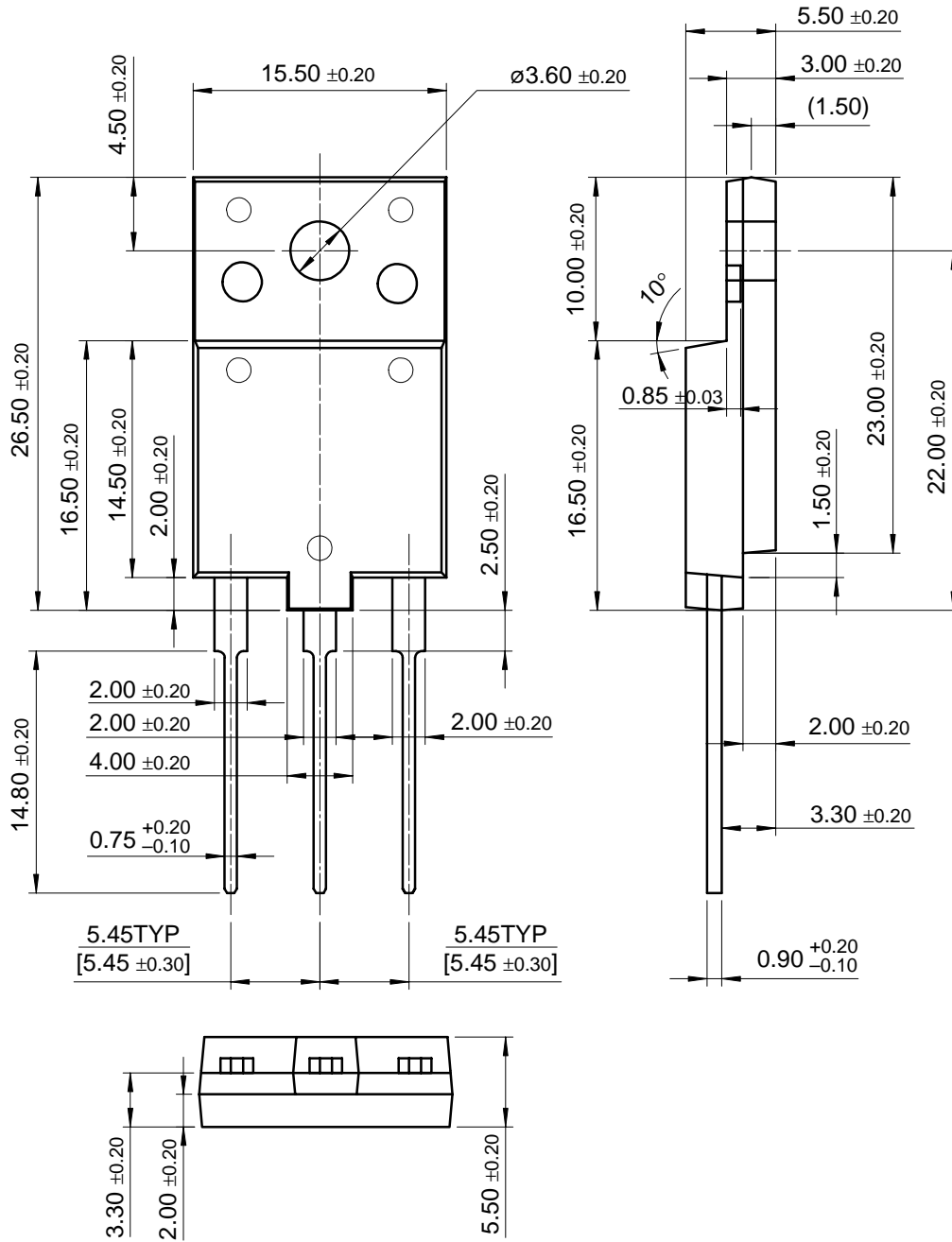
Peak Diode Recovery dv/dt Test Circuit & Waveforms



Package Dimensions

TO-3PF

FOAF34N25



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