



# FQA46N15 / FQA46N15\_F109 150V N-Channel MOSFET

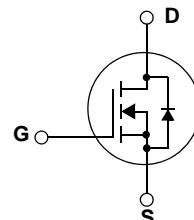
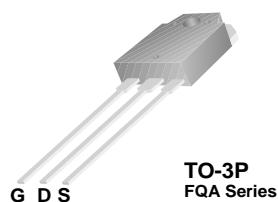
## Features

- 50A, 150V,  $R_{DS(on)} = 0.042\Omega$  @  $V_{GS} = 10$  V
- Low gate charge ( typical 85 nC)
- Low  $C_{rss}$  ( typical 100pF)
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability
- 175°C maximum junction temperature rating

## 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 efficient switched mode power supplies, active power factor correction, electronic lamp ballast based on half bridge topology.



## Absolute Maximum Ratings

Symbol	Parameter	FQA46N15	Units
$V_{DSS}$	Drain-Source Voltage	150	V
$I_D$	Drain Current - Continuous ( $T_C = 25^\circ C$ )	50	A
	- Continuous ( $T_C = 100^\circ C$ )	35.3	A
$I_{DM}$	Drain Current - Pulsed	(Note 1)	A
$V_{GSS}$	Gate-Source Voltage	$\pm 25$	V
$E_{AS}$	Single Pulsed Avalanche Energy	(Note 2)	mJ
$I_{AR}$	Avalanche Current	(Note 1)	A
$E_{AR}$	Repetitive Avalanche Energy	(Note 1)	mJ
$dv/dt$	Peak Diode Recovery $dv/dt$	(Note 3)	V/ns
$P_D$	Power Dissipation ( $T_C = 25^\circ C$ )	250	W
	- Derate above $25^\circ C$	1.67	W/ $^\circ C$
$T_J, T_{STG}$	Operating and Storage Temperature Range	-55 to +175	$^\circ C$
$T_L$	Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds	300	$^\circ C$

## Thermal Characteristics

Symbol	Parameter	Typ	Max	Units
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	--	0.6	$^\circ C/W$
$R_{\theta CS}$	Thermal Resistance, Case-to-Sink	0.24	--	$^\circ C/W$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	--	40	$^\circ C/W$

## Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FQA46N15	FQA46N15	TO-3P	--	--	30
FQA46N15	FQA46N15_F109	TO-3PN	--	--	30

## Electrical Characteristics

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

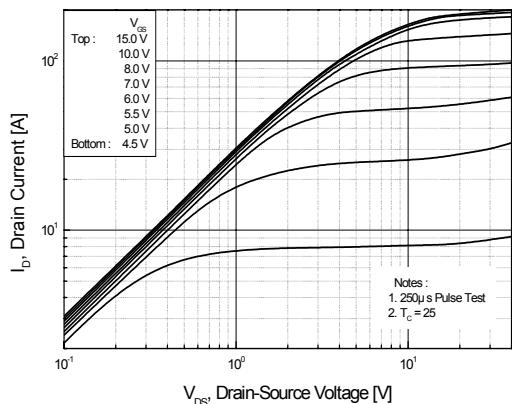
Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
<b>Off Characteristics</b>						
$\text{BV}_{\text{DSS}}$	Drain-Source Breakdown Voltage	$V_{\text{GS}} = 0 \text{ V}$ , $I_D = 250 \mu\text{A}$	150	--	--	V
$\Delta \text{BV}_{\text{DSS}}/\Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250 \mu\text{A}$ , Referenced to $25^\circ\text{C}$	--	0.16	--	$\text{V}/^\circ\text{C}$
$I_{\text{DSS}}$	Zero Gate Voltage Drain Current	$V_{\text{DS}} = 150 \text{ V}$ , $V_{\text{GS}} = 0 \text{ V}$	--	--	1	$\mu\text{A}$
		$V_{\text{DS}} = 120 \text{ V}$ , $T_C = 150^\circ\text{C}$	--	--	10	$\mu\text{A}$
$I_{\text{GSSF}}$	Gate-Body Leakage Current, Forward	$V_{\text{GS}} = 25 \text{ V}$ , $V_{\text{DS}} = 0 \text{ V}$	--	--	100	nA
$I_{\text{GSSR}}$	Gate-Body Leakage Current, Reverse	$V_{\text{GS}} = -25 \text{ V}$ , $V_{\text{DS}} = 0 \text{ V}$	--	--	-100	nA
<b>On Characteristics</b>						
$V_{\text{GS(th)}}$	Gate Threshold Voltage	$V_{\text{DS}} = V_{\text{GS}}$ , $I_D = 250 \mu\text{A}$	2.0	--	4.0	V
$R_{\text{DS(on)}}$	Static Drain-Source On-Resistance	$V_{\text{GS}} = 10 \text{ V}$ , $I_D = 25\text{A}$	--	0.033	0.042	$\Omega$
$g_{\text{FS}}$	Forward Transconductance	$V_{\text{DS}} = 40 \text{ V}$ , $I_D = 25\text{A}$ (Note 4)	--	36	--	S
<b>Dynamic Characteristics</b>						
$C_{\text{iss}}$	Input Capacitance	$V_{\text{DS}} = 25 \text{ V}$ , $V_{\text{GS}} = 0 \text{ V}$ , $f = 1.0 \text{ MHz}$	--	2500	3250	pF
$C_{\text{oss}}$	Output Capacitance		--	520	670	pF
$C_{\text{rss}}$	Reverse Transfer Capacitance		--	100	130	pF
<b>Switching Characteristics</b>						
$t_{\text{d(on)}}$	Turn-On Delay Time	$V_{\text{DD}} = 75 \text{ V}$ , $I_D = 45.6\text{A}$ , $R_G = 25 \Omega$	--	35	80	ns
$t_r$	Turn-On Rise Time		--	320	650	ns
$t_{\text{d(off)}}$	Turn-Off Delay Time		--	210	430	ns
$t_f$	Turn-Off Fall Time		--	200	410	ns
$Q_g$	Total Gate Charge	$V_{\text{DS}} = 120 \text{ V}$ , $I_D = 45.6\text{A}$ , $V_{\text{GS}} = 10 \text{ V}$	--	85	110	nC
$Q_{\text{gs}}$	Gate-Source Charge		--	15	--	nC
$Q_{\text{gd}}$	Gate-Drain Charge		--	41	--	nC
<b>Drain-Source Diode Characteristics and Maximum Ratings</b>						
$I_S$	Maximum Continuous Drain-Source Diode Forward Current	--	--	50	--	A
$I_{\text{SM}}$	Maximum Pulsed Drain-Source Diode Forward Current	--	--	200	--	A
$V_{\text{SD}}$	Drain-Source Diode Forward Voltage	$V_{\text{GS}} = 0 \text{ V}$ , $I_S = 50\text{A}$	--	--	1.5	V
$t_{\text{rr}}$	Reverse Recovery Time	$V_{\text{GS}} = 0 \text{ V}$ , $I_S = 45.6 \text{ A}$ , $dI_F / dt = 100 \text{ A}/\mu\text{s}$	--	130	--	ns
$Q_{\text{rr}}$	Reverse Recovery Charge		--	0.55	--	$\mu\text{C}$

### NOTES:

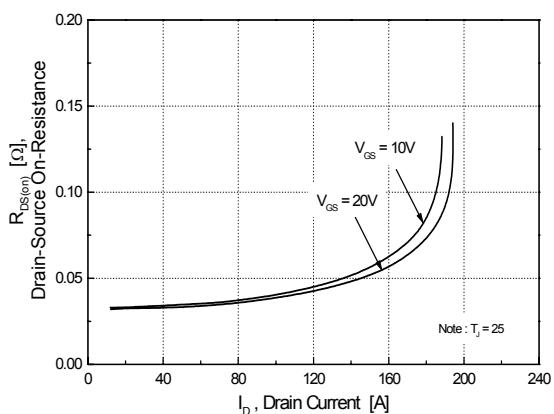
1. Repetitive Rating : Pulse width limited by maximum junction temperature
2.  $L = 0.43\text{mH}$ ,  $I_{AS} = 50\text{A}$ ,  $V_{DD} = 25\text{V}$ ,  $R_G = 25 \Omega$ , Starting  $T_J = 25^\circ\text{C}$
3.  $I_{SD} \leq 45.6\text{A}$ ,  $dI/dt \leq 300\text{A}/\mu\text{s}$ ,  $V_{DD} \leq \text{BV}_{\text{DSS}}$ , 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 Performance Characteristics

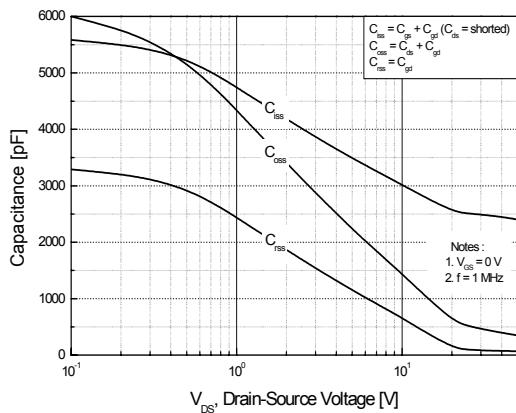
**Figure 1. On-Region Characteristics**



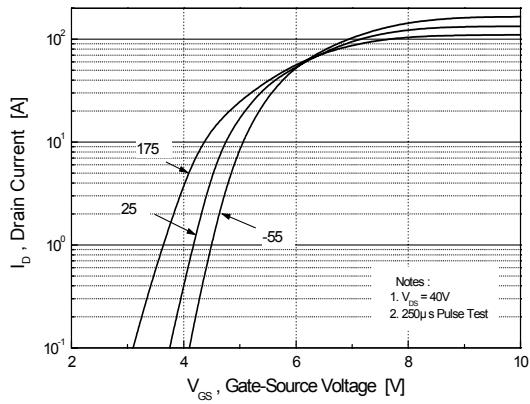
**Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage**



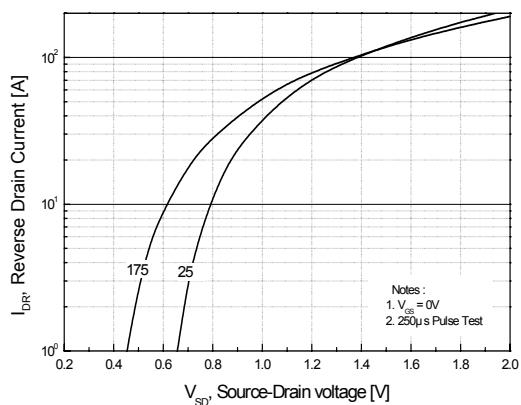
**Figure 5. Capacitance Characteristics**



**Figure 2. Transfer Characteristics**



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



**Figure 6. Gate Charge Characteristics**

