# FAIRCHILD

SEMICONDUCTOR

# FQB9N25C/FQI9N25C 250V N-Channel MOSFET

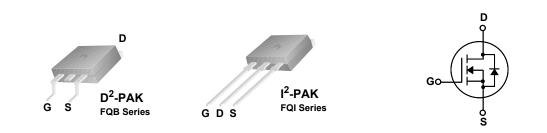
#### **General Description**

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

#### Features

- 8.8A, 250V,  $R_{DS(on)}$  = 0.43 $\Omega$  @V<sub>GS</sub> = 10 V Low gate charge ( typical 26.5 nC)
- Low Crss (typical 45.5 pF) •
- · Fast switching
- 100% avalanche tested
- Improved dv/dt capability



## Absolute Maximum Ratings T<sub>C</sub> = 25°C unless otherwise noted

Symbol	Parameter	FQB9N25C / FQI9N25C	Units	
V <sub>DSS</sub>	Drain-Source Voltage		250	V
I <sub>D</sub>	Drain Current - Continuous ( $T_C = 25^{\circ}C$ ) - Continuous ( $T_C = 100^{\circ}C$ )		8.8	А
			5.6	А
I <sub>DM</sub>	Drain Current - Pulsed (Note 1)		35.2	А
V <sub>GSS</sub>	Gate-Source Voltage		± 30	V
E <sub>AS</sub>	Single Pulsed Avalanche Energy (Note		285	mJ
I <sub>AR</sub>	Avalanche Current (Not		8.8	А
E <sub>AR</sub>	Repetitive Avalanche Energy	(Note 1)	7.4	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)		5.5	V/ns
	Power Dissipation $(T_A = 25^{\circ}C)^*$		3.13	W
PD	Power Dissipation ( $T_C = 25^{\circ}C$ )		74	W
	- Derate above 25°C		0.59	W/°C
T <sub>J</sub> , T <sub>STG</sub>	Operating and Storage Temperature Rar	-55 to +150	°C	
TL	Maximum lead temperature for soldering 1/8" from case for 5 seconds	g purposes,	300	°C

## **Thermal Characteristics**

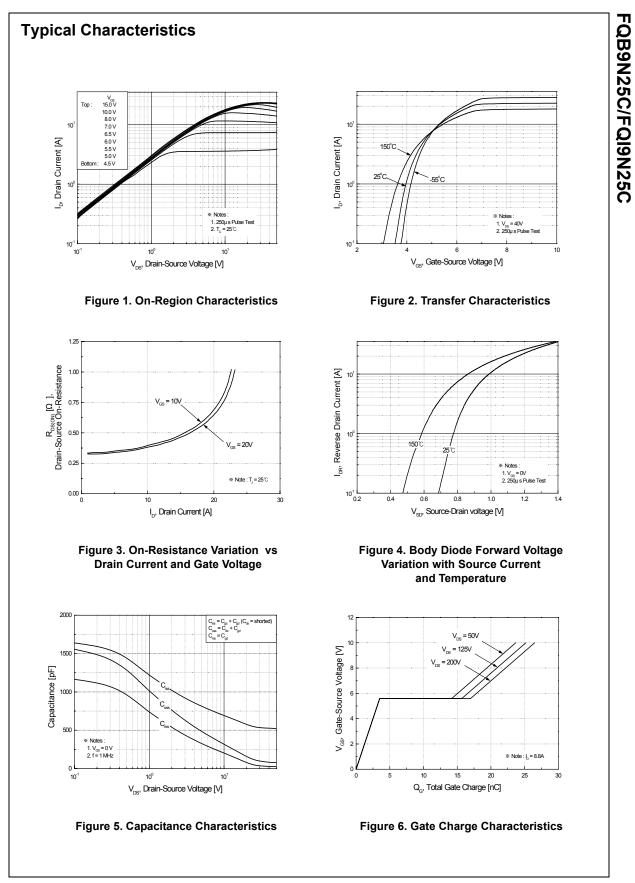
Junction-to-Case		1.69	°C/W
Junction-to-Ambient*		40	°C/W
Junction-to-Ambient		62.5	°C/W
	Junction-to-Ambient*	Junction-to-Ambient* Junction-to-Ambient	Junction-to-Ambient*40Junction-to-Ambient62.5

©2004 Fairchild Semiconductor Corporation

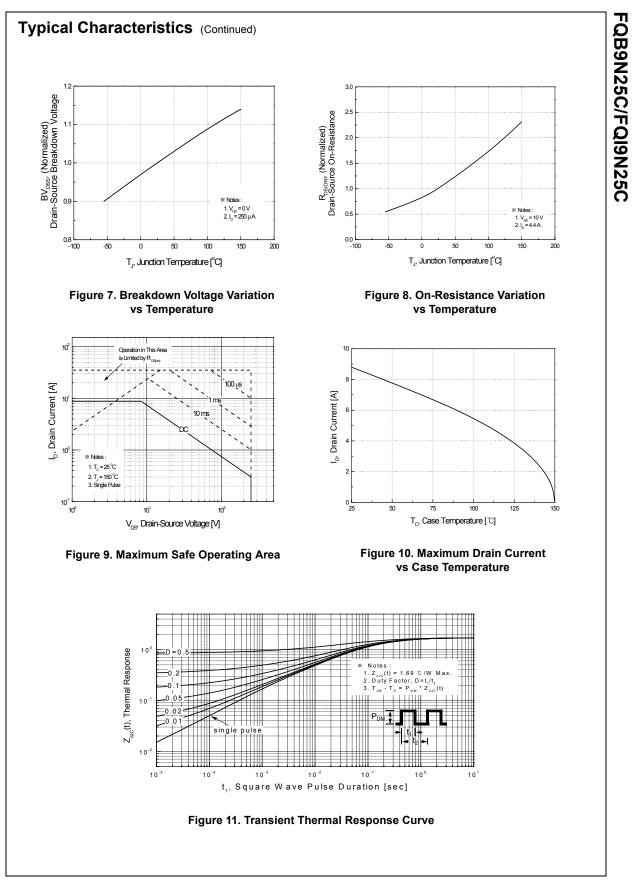
# FQB9N25C/FQI9N25C

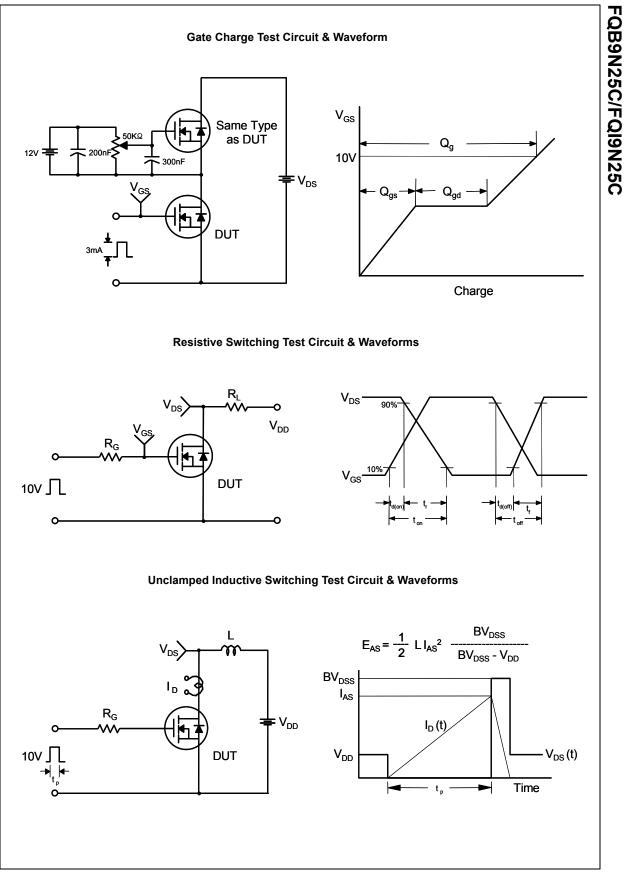
**F**T®

$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Symbol	Parameter	Test Conditions	Min	Тур	Мах	Units
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Off Cha	aracteristics					
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA	250			V
$\begin{array}{ c c c c c c c } \hline \mbox{Zero Gate Voltage Drain Current} & $V_{DS} = 200 \ V, \ T_C = 125^\circ C & & & 100 & $\mu$ \\ \hline \mbox{M}_{GSSF} & Gate-Body Leakage Current, Forward & $V_{GS} = 30 \ V, $V_{DS} = 0 \ V & & & 100 & $n$ \\ \hline \mbox{M}_{GSSR} & Gate-Body Leakage Current, Reverse & $V_{GS} = -30 \ V, $V_{DS} = 0 \ V & & & -100 & $n$ \\ \hline \mbox{M}_{GS(th)} & Gate Threshold Voltage & $V_{DS} = V_{GS} \ I_D = 250 \ \mu A & $2.0 \ & $4.0 \ V$ \\ \hline \mbox{M}_{SS(th)} & Gate Threshold Voltage & $V_{DS} = 10 \ V, \ I_D = 4.4 \ A & $ & $0.35 \ 0.43 \ C & $0$ \\ \hline \mbox{M}_{OR} & $On-Resistance & $V_{DS} = 40 \ V, \ I_D = 4.4 \ A & $(Note 4) \ & $7.0 \ & $5$ \\ \hline \mbox{M}_{SS} & Forward Transconductance & $V_{DS} = 40 \ V, \ I_D = 4.4 \ A & $(Note 4) \ & $7.0 \ & $5$ \\ \hline \mbox{M}_{SS} & $Output Capacitance & $V_{DS} = 25 \ V, \ V_{GS} = 0 \ V, $ $f = 1.0 \ MHz \ & $ \ 115 \ 150 \ p$ $ $115 \ 160 \ p$ $ $100 \ 100 \ n$ $ $15 \ 135 \ n$ $ $15 \ n$ $ \ $15 \ n$ $ \ n$ $15$		<b>o</b> .	$I_D = 250 \ \mu A$ , Referenced to 25°	°C	0.30		V/°C
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	IDSS		V <sub>DS</sub> = 250 V, V <sub>GS</sub> = 0 V			10	μA
Gate-Body Leakage Current, Reverse $V_{GS} = -30 \text{ V}, V_{DS} = 0 \text{ V}$ 0.0         nn           On Characteristics         VGS = 10 V, I_D = 4.4 A          0.35         0.43         0          5           Dynamic Characteristics         VDS = 40 V, I_D = 4.4 A         (Note 4)          7.0          5           Dynamic Characteristics         VDS = 25 V, VGS = 0 V, I_D = 4.4 A         (Note 4)          7.0          5           Dynamic Characteristics         VDS = 25 V, VGS = 0 V, I_D = 4.4 A         (Note 4)          7.0          5           Dynamic Characteristics         VDS = 25 V, VGS = 0 V, I_D = 8.8 A, I_S = 10 V          115         40         n           Case         Dial Gate Charge         VDS = 200 V, I_D = 8.8 A, I_S = 25 O <th< td=""><td></td><td>Zero Gate Voltage Drain Current</td><td>V<sub>DS</sub> = 200 V, T<sub>C</sub> = 125°C</td><td></td><td></td><td>100</td><td>μA</td></th<>		Zero Gate Voltage Drain Current	V <sub>DS</sub> = 200 V, T <sub>C</sub> = 125°C			100	μA
On Characteristics           VGS(th)         Gate Threshold Voltage         VDS = VGS: ID = 250 $\mu$ A         2.0          4.0         V           RDS(on)         Static Drain-Source On-Resistance         VDS = 10 V, ID = 4.4 A          0.35         0.43         C           Gyster         Forward Transconductance         VDS = 40 V, ID = 4.4 A          0.35         0.43         C           Dynamic Characteristics         VDS = 40 V, ID = 4.4 A         (Note 4)          7.0          545         710         P           Coss         Output Capacitance         VDS = 25 V, VGS = 0 V, Grss          545         710         P           Coss         Output Capacitance         VDS = 25 V, VGS = 0 V, Grss          155         60         P           Switching Characteristics         VDD = 125 V, ID = 8.8 A, Gate Turn-On Delay Time         VDD = 125 V, ID = 8.8 A, Gate Source Charge          85         180         n           Qg         Total Gate Charge         VDS = 200 V, ID = 8.8 A, Gase = 10 V          3.5          m           Qgg         Gate Orain Charge         VDS = 200 V, ID = 8.8 A, Gase = 10 V          3.5          m	I <sub>GSSF</sub>	Gate-Body Leakage Current, Forward	V <sub>GS</sub> = 30 V, V <sub>DS</sub> = 0 V			100	nA
	I <sub>GSSR</sub>	Gate-Body Leakage Current, Reverse	$V_{GS}$ = -30 V, $V_{DS}$ = 0 V			-100	nA
	On Cha	aractoristics					
RDS(on)         Static Drain-Source On-Resistance $V_{GS} = 10 \text{ V}, I_D = 4.4 \text{ A}$ 0.35         0.43         C           GFS         Forward Transconductance $V_{DS} = 40 \text{ V}, I_D = 4.4 \text{ A}$ (Note 4)          7.0          58           Dynamic Characteristics         VDS $= 40 \text{ V}, I_D = 4.4 \text{ A}$ (Note 4)          7.0          58           Dynamic Characteristics         VDS $= 25 \text{ V}, V_{GS} = 0 \text{ V}, I_D = 4.4 \text{ A}$ (Note 4)          7.0          58           Dynamic Characteristics         VDS $= 25 \text{ V}, V_{GS} = 0 \text{ V}, I_D = 4.4 \text{ A}$ (Note 4)          7.0          58           Output Capacitance         VDS $= 25 \text{ V}, V_{GS} = 0 \text{ V}, I_D = 4.4 \text{ A}$ 15         40         p           Crss         Reverse Transfer Capacitance         VDS $= 125 \text{ V}, I_D = 8.8 \text{ A}, I_S = -          15         40         n           td(off)         Turn-On Rise Time         VDS = 200 V, I_D = 8.8 \text{ A}, I_S = -          13.5          n           Qg         Total Gate Charge         VDS = 200 V, I_D = 8.8 \text{ A}, I_S = -          $		i	Vps = Vcs. lp = 250 µA	20		40	V
$g_{FS}$ Forward Transconductance $V_{DS} = 40 \text{ V}, I_D = 4.4 \text{ A}$ (Note 4)          7.0          S           Dynamic Characteristics         Input Capacitance $V_{DS} = 25 \text{ V}, V_{GS} = 0 \text{ V}, f = 1.0 \text{ MHz}$ 545         710         p           Coss         Output Capacitance $Y_{DS} = 25 \text{ V}, V_{GS} = 0 \text{ V}, f = 1.0 \text{ MHz}$ 545         710         p           Crss         Reverse Transfer Capacitance $f = 1.0 \text{ MHz}$ 15         40         n           Switching Characteristics $Turn-On Blay Time$ $V_{DD} = 125 \text{ V}, I_D = 8.8 \text{ A},$ 15         40         n $t_q(off)$ Turn-Off Belay Time $V_{DS} = 200 \text{ V}, I_D = 8.8 \text{ A},$ 26.5         35         n $q_g$ Total Gate Charge $V_{DS} = 200 \text{ V}, I_D = 8.8 \text{ A},$ 26.5         35         n $q_{gd}$ Gate-Drain Charge $V_{GS} = 10 \text{ V}$ 13.5          n $d_{gd}$ Gate-Drain Charge $V_{GS} = 10 \text{ V}$ 13.5          n $I_S$ Maximum		Static Drain-Source					Ω
Dynamic Characteristics $C_{iss}$ Input Capacitance $V_{DS} = 25 \text{ V}, V_{GS} = 0 \text{ V},$ 545710p $C_{oss}$ Output Capacitancef = 1.0 MHz115150p $C_{rss}$ Reverse Transfer Capacitancef = 1.0 MHz45.560pSwitching Characteristics $t_{d(on)}$ Turn-On Delay Time $V_{DD} = 125 \text{ V}, I_D = 8.8 \text{ A},$ 1540n $t_r$ Turn-On Rise Time $R_G = 25 \Omega$ 85180n $t_{d(off)}$ Turn-Off Delay Time $V_{DS} = 200 \text{ V}, I_D = 8.8 \text{ A},$ 65140n $q_g$ Total Gate Charge $V_{DS} = 200 \text{ V}, I_D = 8.8 \text{ A},$ 26.535nr $Q_{gd}$ Gate-Drain Charge $V_{GS} = 10 \text{ V}$ $(Note 4, 5)$ 13.5nrDrain-Source Diode Characteristics and Maximum Ratings $I_S$ Maximum Pulsed Drain-Source Diode Forward Current8.8A $I_{SM}$ Maximum Pulsed Drain-Source Diode Forward Current35.2A $V_{SD}$ Drain-Source Diode Forward Voltage $V_{GS} = 0 \text{ V}, I_S = 8.8 \text{ A},$ 1.5V $I_{rr}$ Reverse Recovery Time $V_{GS} = 0 \text{ V}, I_S = 8.8 \text{ A},$ 1.5V	9 <sub>ES</sub>		$V_{DS} = 40 \text{ V}, I_D = 4.4 \text{ A}$ (Note	e 4)	7.0		S
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Dynam	ic Characteristics			I	I	I
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $			$V_{DS} = 25 V_{.} V_{CS} = 0 V_{.}$		545	710	pF
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	C <sub>oss</sub>	Output Capacitance			115	150	pF
Switching Characteristics $t_{d(on)}$ Turn-On Delay Time $V_{DD} = 125 \text{ V}, \text{ I}_D = 8.8 \text{ A},$ $R_G = 25 \Omega$ $$ $15$ $40$ n $t_r$ Turn-On Rise Time $R_G = 25 \Omega$ $$ $85$ $180$ n $t_d(off)$ Turn-Off Delay Time $(Note 4, 5)$ $$ $90$ $190$ n $t_f$ Turn-Off Fall Time $(Note 4, 5)$ $$ $65$ $140$ n $Q_g$ Total Gate Charge $V_{DS} = 200 \text{ V}, \text{ I}_D = 8.8 \text{ A},$ $$ $26.5$ $35$ n $Q_{gd}$ Gate-Source Charge $V_{GS} = 10 \text{ V}$ $$ $3.5$ $$ n $Q_{gd}$ Gate-Drain Charge $V_{GS} = 10 \text{ V}$ $$ $3.5$ $$ nDrain-Source Diode Characteristics and Maximum Ratings $I_S$ Maximum Continuous Drain-Source Diode Forward Current $$ $$ $35.2$ $A$ $V_{SD}$ Drain-Source Diode Forward Voltage $V_{GS} = 0 \text{ V}, \text{ I}_S = 8.8 \text{ A},$ $$ $$ $1.5 \text{ V}$ $V_{Tr}$ Reverse Recovery Time $V_{GS} = 0 \text{ V}, \text{ I}_S = 8.8 \text{ A},$ $$ $$ $1.5 \text{ V}$		Reverse Transfer Capacitance			45.5	60	pF
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	t <sub>d(on)</sub>	Turn-On Delay Time					ns ns
trTurn-Off Fall Time(Note 4, 5)65140n $Q_g$ Total Gate Charge $V_{DS} = 200 \text{ V}, \text{ I}_D = 8.8 \text{ A},$ 26.535n $Q_{gd}$ Gate-Source Charge $V_{GS} = 10 \text{ V}$ 3.5n $Q_{gd}$ Gate-Drain Charge(Note 4, 5)13.5nDrain-Source Diode Characteristics and Maximum RatingsIsMaximum Continuous Drain-Source Diode Forward Current8.8A $I_{SM}$ Maximum Pulsed Drain-Source Diode Forward Current35.2A $V_{SD}$ Drain-Source Diode Forward Voltage $V_{GS} = 0 \text{ V}, I_S = 8.8 \text{ A},$ 1.5V $t_{rr}$ Reverse Recovery Time $V_{GS} = 0 \text{ V}, I_S = 8.8 \text{ A},$ 218n		Turn-Off Delay Time	$R_{G} = 23.52$		90	190	ns
$            \begin{array}{c cccccccccccccccccccccccc$		Turn-Off Fall Time	(Note 4	, 5)	65	140	ns
$            \begin{array}{c cccccccccccccccccccccccc$		Total Gate Charge	$V_{\rm PO} = 200  \text{V}$ lo = 8.8 A		26.5	35	nC
Q <sub>gd</sub> Gate-Drain Charge       (Note 4, 5)        13.5        ni         Drain-Source Diode Characteristics and Maximum Ratings         Is       Maximum Continuous Drain-Source Diode Forward Current         8.8       A         Is       Maximum Pulsed Drain-Source Diode Forward Current         35.2       A         VSD       Drain-Source Diode Forward Voltage       V <sub>GS</sub> = 0 V, I <sub>S</sub> = 8.8 A         1.5       V         trr       Reverse Recovery Time       V <sub>GS</sub> = 0 V, I <sub>S</sub> = 8.8 A,        218        n					3.5		nC
Drain-Source Diode Characteristics and Maximum Ratings         Is       Maximum Continuous Drain-Source Diode Forward Current         8.8       A         IsM       Maximum Pulsed Drain-Source Diode Forward Current         35.2       A         VSD       Drain-Source Diode Forward Voltage       VGS = 0 V, IS = 8.8 A         1.5       V         trr       Reverse Recovery Time       VGS = 0 V, IS = 8.8 A,        218        n		-		, 5)	13.5		nC
IsMaximum Continuous Drain-Source Diode Forward Current8.8AIsMMaximum Pulsed Drain-Source Diode Forward Current35.2AVSDDrain-Source Diode Forward Voltage $V_{GS} = 0 V$ , $I_S = 8.8 A$ 1.5V $t_{rr}$ Reverse Recovery Time $V_{GS} = 0 V$ , $I_S = 8.8 A$ ,218n	Drain-S	Source Diode Characteristics a	nd Maximum Ratings		1	1	1
	_					8.8	А
$V_{SD}$ Drain-Source Diode Forward Voltage $V_{GS} = 0 V$ , $I_S = 8.8 A$ 1.5         V $t_{rr}$ Reverse Recovery Time $V_{GS} = 0 V$ , $I_S = 8.8 A$ ,          218          n		Maximum Pulsed Drain-Source Diode F	Forward Current			35.2	Α
$t_{rr}$ Reverse Recovery Time $V_{GS} = 0 V$ , $I_S = 8.8 A$ , 218 n		Drain-Source Diode Forward Voltage	V <sub>GS</sub> = 0 V, I <sub>S</sub> = 8.8 A			1.5	V
					218		ns
	Q <sub>rr</sub>	Reverse Recovery Charge	$dI_F / dt = 100 \text{ A}/\mu \text{s}$ (Note	e 4)	1.58		μC
tes:	π Q <sub>rr</sub>	Reverse Recovery Time	V <sub>GS</sub> = 0 V, I <sub>S</sub> = 8.8 A,		218		ns

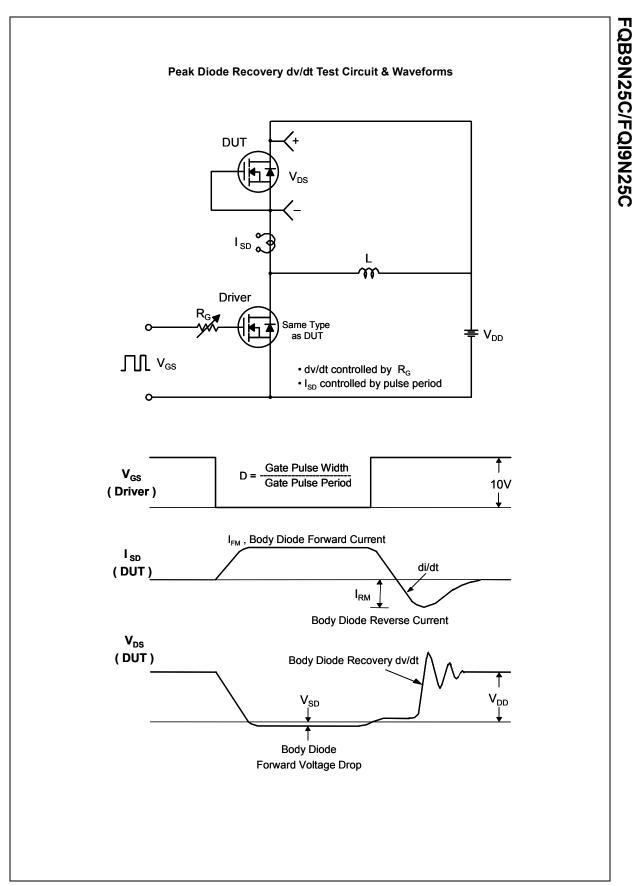


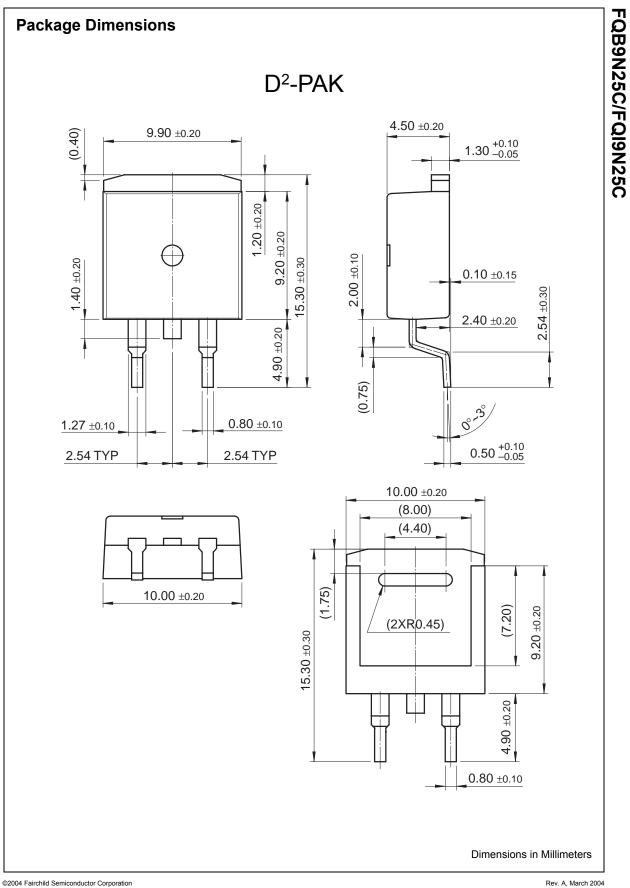
©2004 Fairchild Semiconductor Corporation

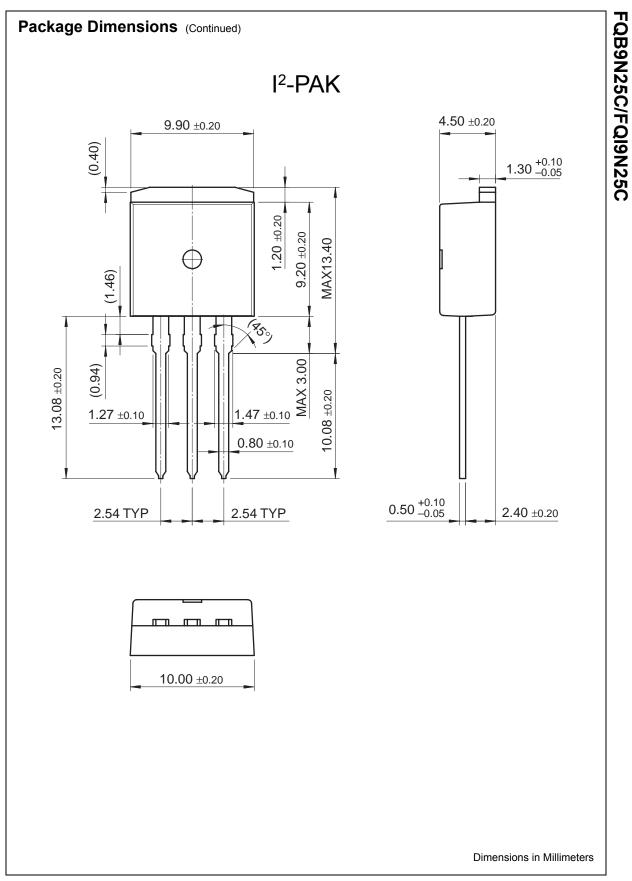




©2004 Fairchild Semiconductor Corporation







©2004 Fairchild Semiconductor Corporation

#### TRADEMARKS

The following are registered and unregistered trademarks Fairchild Semiconductor owns or is authorized to use and is not intended to be an exhaustive list of all such trademarks.

ACEx™	FACT Quiet Series™	ISOPLANAR™	POP™	Stealth™
ActiveArray™	FAST®	LittleFET™	Power247™	SuperFET™
Bottomless™	FASTr™	MICROCOUPLER™	PowerSaver™	SuperSOT™-3
CoolFET™	FPS™	MicroFET™	PowerTrench <sup>®</sup>	SuperSOT <sup>™</sup> -6
CROSSVOLT™	FRFET™	MicroPak™	QFET <sup>®</sup>	SuperSOT <sup>™</sup> -8
DOME™	GlobalOptoisolator™	MICROWIRE™	QS™	SyncFET™
EcoSPARK™	GTO™່	MSX™	QT Optoelectronics™	TinyLogic <sup>®</sup>
E <sup>2</sup> CMOS <sup>™</sup>	HiSeC™	MSXPro™	Quiet Series <sup>™</sup>	TINYOPTO™
EnSigna™	I²C™	OCX™	RapidConfigure™	TruTranslation™
FACT™	ImpliedDisconnect™	OCXPro™	RapidConnect™	UHC™
Across the boar	d. Around the world.™	OPTOLOGIC <sup>®</sup>	SILENT SWITCHER®	UltraFET <sup>®</sup>
The Power Fran		OPTOPLANAR™	SMART START™	VCX™
Programmable A		PACMAN™	SPM™	

#### DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

#### LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, or (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in significant injury to the user.

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.

#### **PRODUCT STATUS DEFINITIONS**

**Definition of Terms** 

Product Status	Definition
Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
First Production	This datasheet contains preliminary data, and supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
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.
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.
	Formative or In Design First Production Full Production



Home >> Find products >>

# FQB9N25C

250V N-Channel Advance Q-FET C-Series

#### Contents

 General description Features Product status/pricing/packaging

Qualification Support

- •Order Samples

#### **General 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 switched mode power supplies, active power factor correction, electronic lamp ballasts based on half bridge topology.

#### back to top

#### Features

- 8.8 A, 250V, R<sub>DS(on)</sub> = 0.43Ω @VGS = 10 V
- Low gate charge (typical 26.5 nC)
- Low Crss (typical 45.5pF)
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability

#### back to top

Product status/pricing/packaging

BUY

801
Datasheet
Download this
<u>datasheet</u>
PDF

BUIV



e-mail this datasheet = **'** 

## **Related Links**

Request samples

- How to order products
- Product Change Notices (PCNs)

Support

- Sales support
- Quality and reliability

Design center

This page Print version

Product	Product status	Pb-free Status	Pricing*	Package type	Leads	Packing method	Package Marking Convention**

FQB9N25CTM	Full Production	Full Production	\$1.02	<u>TO-263(D2PAK)</u>	2	TAPE REEL	Line 1: <b>\$Y</b> (Fairchild logo) & <b>Z</b> (Asm. Plant Code) & <b>4</b> (4-Digit Date Code)
------------	-----------------	--------------------	--------	----------------------	---	-----------	---

\* Fairchild 1,000 piece Budgetary Pricing
 \*\* A sample button will appear if the part is available through Fairchild's on-line samples program. If there is no sample button, please contact a <u>Fairchild distributor</u> to obtain samples

Ø Indicates product with Pb-free second-level interconnect. For more information click here.

Package marking information for product FQB9N25C is available. Click here for more information .

#### back to top

#### **Qualification Support**

Click on a product for detailed qualification data

Product FQB9N25CTM

back to top

© 2007 Fairchild Semiconducto	© 2007	' Fairchild	Semiconducto
-------------------------------	--------	-------------	--------------



Products | Design Center | Support | Company News | Investors | My Fairchild | Contact Us | Site Index | Privacy Policy | Site Terms & Conditions | Standard Terms & Conditions (