## FAIRCHILD

## FQD2N100／FQU2N100

 N－Channel QFET ${ }^{\circledR}$ MOSFET1000 V，1．6 A， $9 \Omega$

## Description

This N－Channel enhancement mode power MOSFET is produced using Fairchild Semiconductor＇s proprietary planar stripe and DMOS technology．This advanced MOSFET technology has been especially tailored to reduce on－state resistance，and to provide superior switching performance and high avalanche energy strength．These devices are suitable for switched mode power supplies，active power factor correction（PFC），and electronic lamp ballasts．

## Features

－1．6 A， $1000 \mathrm{~V}, \mathrm{R}_{\mathrm{DS}(\mathrm{on})}=9 \Omega$（Max．）＠ $\mathrm{V}_{\mathrm{GS}}=10 \mathrm{~V}$ ， $\mathrm{I}_{\mathrm{D}}=0.8 \mathrm{~A}$
－Low Gate Charge（ Typ． 12 nC ）
－Low Crss（Typ． 5 pF）
－100\％Avalanche Tested
－RoHS Compliant

Absolute Maximum Ratings $T_{c}=25^{\circ} \mathrm{C}$ unless otherwise noted

| Symbol | Parameter | FQD2N100TM／FQU2N100TU | Unit |
| :---: | :---: | :---: | :---: |
| $\mathrm{V}_{\text {DSS }}$ | Drain－Source Voltage | 1000 | V |
| $\mathrm{I}_{\mathrm{D}}$ | －Continuous（ $\mathrm{T}_{\mathrm{C}}=25^{\circ} \mathrm{C}$ ） <br> －Continuous $\left(\mathrm{T}_{\mathrm{C}}=100^{\circ} \mathrm{C}\right)$ | 1.6 | A |
|  |  | 1.0 | A |
| $\mathrm{I}_{\mathrm{DM}}$ | Drain Current－Pulsed（Note 1） | 6.4 | A |
| $\mathrm{V}_{\text {GSS }}$ | Gate－Source Voltage | $\pm 30$ | V |
| $\mathrm{E}_{\text {AS }}$ | Single Pulsed Avalanche Energy（Note 2） | 160 | mJ |
| $\mathrm{I}_{\text {AR }}$ | Avalanche Current（Note 1） | 1.6 | A |
| $\mathrm{E}_{\text {AR }}$ | Repetitive Avalanche Energy（Note 1） | 5.0 | mJ |
| dv／dt | Peak Diode Recovery dv／dt（Note 3） | 5.5 | V／ns |
| $\mathrm{P}_{\mathrm{D}}$ | Power Dissipation（ $\mathrm{T}_{\mathrm{A}}=25^{\circ} \mathrm{C}$ ）＊ | 2.5 | W |
|  | Power Dissipation（ $\mathrm{T}_{\mathrm{C}}=25^{\circ} \mathrm{C}$ ） <br> －Derate above $25^{\circ} \mathrm{C}$ | 50 | W |
|  |  | 0.4 | W／${ }^{\circ} \mathrm{C}$ |
| $\mathrm{T}_{\mathrm{J}}, \mathrm{T}_{\text {STG }}$ | Operating and Storage Temperature Range | -55 to +150 | ${ }^{\circ} \mathrm{C}$ |
| $\mathrm{T}_{\mathrm{L}}$ | Maximum lead temperature for soldering purposes， $1 / 8^{\prime \prime}$ from case for 5 seconds | 300 | ${ }^{\circ} \mathrm{C}$ |

## Thermal Characteristics

| Symbol | Parameter | FQD2N100TM <br> FQU2N100TU | Unit |
| :---: | :---: | :---: | :---: |
| $\mathrm{R}_{\text {өJC }}$ | Thermal Resistance，Junction to Case，Max． | 2.5 | ${ }^{\circ} \mathrm{C} / \mathrm{W}$ |
| $\mathrm{R}_{\text {өJA }}$ | Thermal Resistance，Junction to Ambient（minimum pad of 2 oz copper），Max． | 110 |  |
|  | Thermal Resistance，Junction to Ambient（ $1 \mathrm{in}^{2}$ pad of 2 oz copper），Max． | 50 |  |

## Package Marking and Ordering Information

| Device Marking | Device | Package | Reel Size | Tape Width | Quantity |
| :---: | :---: | :---: | :---: | :---: | :---: |
| FQD2N100 | FQD2N100TM | DPAK | 330 mm | 16 mm | 2500 |
| FQU2N100 | FQU2N100TU | IPAK | - | - | 70 |

Electrical Characteristics $T_{C}=25^{\circ} \mathrm{C}$ unless othemise noted

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Unit |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Off Characteristics |  |  |  |  |  |  |
| BV ${ }_{\text {DSS }}$ | Drain-Source Breakdown Voltage | $\mathrm{V}_{\mathrm{GS}}=0 \mathrm{~V}, \mathrm{I}_{\mathrm{D}}=250 \mu \mathrm{~A}$ | 1000 | -- | -- | V |
| $\begin{aligned} & \Delta \mathrm{BV}_{\mathrm{DSS}} \\ & \mathrm{I} \quad \Delta \mathrm{~T}_{\mathrm{J}} \end{aligned}$ | Breakdown Voltage Temperature Coefficient | $\mathrm{I}_{\mathrm{D}}=250 \mu \mathrm{~A}$, Referenced to $25^{\circ} \mathrm{C}$ | -- | 0.976 | -- | V/ ${ }^{\circ} \mathrm{C}$ |
| $\mathrm{l}_{\text {DSs }}$ | Zero Gate Voltage Drain Current | $\mathrm{V}_{\mathrm{DS}}=1000 \mathrm{~V}, \mathrm{~V}_{\mathrm{GS}}=0 \mathrm{~V}$ | -- | -- | 10 | $\mu \mathrm{A}$ |
|  |  | $\mathrm{V}_{\mathrm{DS}}=800 \mathrm{~V}, \mathrm{~T}_{\mathrm{C}}=125^{\circ} \mathrm{C}$ | -- | -- | 100 | $\mu \mathrm{A}$ |
| IGSSF | Gate-Body Leakage Current, Forward | $\mathrm{V}_{\mathrm{GS}}=30 \mathrm{~V}, \mathrm{~V}_{\mathrm{DS}}=0 \mathrm{~V}$ | -- | -- | 100 | nA |
| IGSSR | Gate-Body Leakage Current, Reverse | $\mathrm{V}_{G S}=-30 \mathrm{~V}, \mathrm{~V}_{\mathrm{DS}}=0 \mathrm{~V}$ | -- | -- | -100 | nA |

On Characteristics

| $\mathrm{V}_{\mathrm{GS}(\mathrm{th})}$ | Gate Threshold Voltage | $\mathrm{V}_{\mathrm{DS}}=\mathrm{V}_{\mathrm{GS}}, \mathrm{I}_{\mathrm{D}}=250 \mu \mathrm{~A}$ | 3.0 | -- | 5.0 | V |
| :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| $\mathrm{R}_{\mathrm{DS}(\mathrm{on})}$ | Static Drain-Source <br> On-Resistance | $\mathrm{V}_{\mathrm{GS}}=10 \mathrm{~V}, \mathrm{I}_{\mathrm{D}}=0.8 \mathrm{~A}$ | -- | 7.1 | 9 | $\Omega$ |
| $\mathrm{~g}_{\mathrm{FS}}$ | Forward Transconductance | $\mathrm{V}_{\mathrm{DS}}=50 \mathrm{~V}, \mathrm{I}_{\mathrm{D}}=0.8 \mathrm{~A}$ | -- | 1.9 | -- | S |

## Dynamic Characteristics

| $\mathrm{C}_{\text {iss }}$ | Input Capacitance | $\mathrm{V}_{\mathrm{DS}}=25 \mathrm{~V}, \mathrm{~V}_{\mathrm{GS}}=0 \mathrm{~V}$ | -- | 400 | 520 | pF |
| :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| $\mathrm{C}_{\text {oss }}$ | Output Capacitance |  | -- | 40 | 52 | pF |
|  |  |  | - | 5 | 6.5 | pF |

Switching Characteristics

| $\mathrm{t}_{\mathrm{d}(\text { on) }}$ | Turn-On Delay Time | $\begin{aligned} & \mathrm{V}_{\mathrm{DD}}=500 \mathrm{~V}, \mathrm{I}_{\mathrm{D}}=2.0 \mathrm{~A}, \\ & \mathrm{R}_{\mathrm{G}}=25 \Omega \end{aligned}$ | (Note 4) | -- | 13 | 35 | ns |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $\mathrm{t}_{\mathrm{r}}$ | Turn-On Rise Time |  |  | -- | 30 | 70 | ns |
| $\mathrm{t}_{\mathrm{d} \text { (off) }}$ | Turn-Off Delay Time |  |  | -- | 25 | 60 | ns |
| $\mathrm{t}_{\mathrm{f}}$ | Turn-Off Fall Time |  |  | -- | 35 | 80 | ns |
| $\mathrm{Q}_{\mathrm{g}}$ | Total Gate Charge | $\begin{aligned} & \mathrm{V}_{\mathrm{DS}}=800 \mathrm{~V}, \mathrm{I}_{\mathrm{D}}=2.0 \mathrm{~A}, \\ & \mathrm{~V}_{\mathrm{GS}}=10 \mathrm{~V} \end{aligned}$ | (Note 4) | -- | 12 | 15.5 | nC |
| $\mathrm{Q}_{\mathrm{gs}}$ | Gate-Source Charge |  |  | -- | 2.5 | -- | nC |
| $\mathrm{Q}_{\mathrm{gd}}$ | Gate-Drain Charge |  |  | -- | 6.5 | -- | nC |

## Drain-Source Diode Characteristics and Maximum Ratings

| $\mathrm{I}_{\mathrm{S}}$ | Maximum Continuous Drain-Source Diode Forward Current | -- | -- | 1.5 | A |  |
| :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| $\mathrm{I}_{\mathrm{SM}}$ | Maximum Pulsed Drain-Source Diode Forward Current | -- | -- | 6.0 | A |  |
| $\mathrm{~V}_{\mathrm{SD}}$ | Drain-Source Diode Forward Voltage | $\mathrm{V}_{\mathrm{GS}}=0 \mathrm{~V}, \mathrm{I}_{\mathrm{S}}=1.6 \mathrm{~A}$ | -- | -- | 1.4 | V |
| $\mathrm{t}_{\mathrm{rr}}$ | Reverse Recovery Time | $\mathrm{V}_{\mathrm{GS}}=0 \mathrm{~V}, \mathrm{I}_{\mathrm{S}}=2.0 \mathrm{~A}$, | -- | 520 | -- | ns |
| $\mathrm{Q}_{\mathrm{rr}}$ | Reverse Recovery Charge | $\mathrm{dI}_{\mathrm{F}} / \mathrm{dt}=100 \mathrm{~A} / \mu \mathrm{s}$ | -- | 2.3 | -- | $\mu \mathrm{C}$ |

## Notes:

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. $\mathrm{L}=120 \mathrm{mH}, \mathrm{I}_{\mathrm{AS}}=1.6 \mathrm{~A}, \mathrm{~V}_{\mathrm{DD}}=50 \mathrm{~V}, \mathrm{R}_{\mathrm{G}}=25 \Omega$, Starting $\mathrm{T}_{\mathrm{J}}=25^{\circ} \mathrm{C}$
3. $\mathrm{I}_{\mathrm{SD}} \leq 2.0 \mathrm{~A}$, di/dt $\leq 300 \mathrm{~A} / \mu \mathrm{s}, \mathrm{V}_{\mathrm{DD}} \leq \mathrm{BV}_{\mathrm{DSS}}$, Starting $\mathrm{T}_{\mathrm{J}}=25^{\circ} \mathrm{C}$
4. Essentially independent of operating temperature

## Typical 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


Figure 14. Unclamped Inductive Switching Test Circuit \& Waveforms



## Mechanical Dimensions

## TO-252 3L (DPAK)



LAND PATTERN RECOMMENDATION


NOTES: UNLESS OTHERWISE SPECIFIED
A) THIS PACKAGE CONFORMS TO JEDEC, TO-252 ISSUE C, VARIATION AA.
B) ALL DIMENSIONS ARE IN MILLIMETERS
) DIMENSIONING AND TOLERANCING PER
ASME Y14.5M-1994.
D) HEAT SINK TOP EDGE COULD BE IN CHAMFERED

CORNERS OR EDGE PROTRUSION.
) PRESENCE OF TRIMMED CENTER LEAD IS OPTIONAL.
) DIMENSIONS ARE EXCLUSSIVE OF BURSS, MOLD FLASH AND TIE BAR EXTRUSIONS.
LAND PATTERN RECOMENDATION IS BASED ON IPC7351A STD TO220P1003X238-3N.
H) DRAWING NUMBER AND REVISION: MKT-TO252AO3REV8


Figure 16. TO252 (D-PAK), Molded, 3 Lead, Option AA\&AB
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## Mechanical Dimensions

## TO-251 3L (IPAK)



NOTES: UNLESS OTHERWISE SPECIFIED
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B) THIS PACKAGE CONFORMS TO JEDEC, TO-251, ISSUE C, VARIATION AA, DATED SEP' 1988.
C) DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994.

Figure 17. TO-251 (I-PAK) Molded, 3 Lead Option AA
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