**EN** - For pricing and availability in your local country please visit one of the below links:

**DE** - Informationen zu Preisen und Verfügbarkeit in Ihrem Land erhalten Sie über die unten aufgeführten Links:

**FR** - Pour connaître les tarifs et la disponibilité dans votre pays, cliquez sur l'un des liens suivants:

FDFS2P102

**EN**
This Datasheet is presented by the manufacturer

**DE**
Dieses Datenblatt wird vom Hersteller bereitgestellt

**FR**
Cette fiche technique est présentée par le fabricant

October 2000

FAIRCHILD SEMICONDUCTOR TM

# FDFS2P102

## Integrated P-Channel MOSFET and Schottky Diode

### General Description

The FDFS2P102 combines the exceptional performance of Fairchild's high cell density MOSFET with a very low forward voltage drop Schottky barrier rectifier in an SO-8 package.

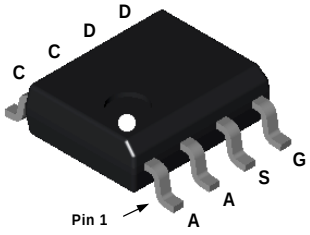
This device is designed specifically as a single package solution for DC to DC converters. It features a fast switching, low gate charge MOSFET with very low on-state resistance. The independently connected Schottky diode allows its use in a variety of DC/DC converter topologies.

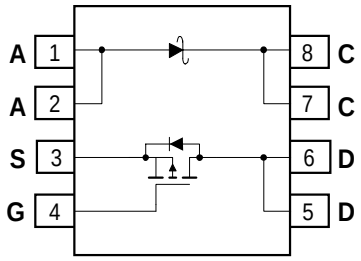
### Applications

- DC/DC converters
- Load Switch
- Motor Drives

### Features

- –3.3 A, –20 V. $R_{DS(ON)}$ = 0.125 Ω @ $V_{GS}$ = –10 V
  $R_{DS(ON)}$ = 0.200 Ω @ $V_{GS}$ = –4.5 V.
- $V_F$ < 0.39 V @ 1 A ($T_J$ = 125 °C).
  $V_F$ < 0.47 V @ 1 A.
  $V_F$ < 0.58 V @ 2 A.
- Schottky and MOSFET incorporated into single power surface mount SO-8 package.
- Electrically independent Schottky and MOSFET pinout for design flexibility.




## MOSFET Maximum Ratings $T_A$=25°C unless otherwise noted

| Symbol | Parameter | | Ratings | Units |
|---|---|---|---|---|
| $V_{DSS}$ | Drain-Source Voltage | | -20 | V |
| $V_{GSS}$ | Gate-Source Voltage | | ±20 | V |
| $I_D$ | Drain Current - Continuous | (Note 1a) | -3.3 | A |
| | - Pulsed | | -20 | |
| $P_D$ | Power Dissipation for Dual Operation | | 2 | W |
| | Power Dissipation for Single Operation | (Note 1a) | 1.6 | |
| | | (Note 1b) | 1 | |
| | | (Note 1c) | 0.9 | |
| $T_J$, $T_{STG}$ | Operating and Storage Temperature Range | | -55 to +150 | °C |

## Schottky Diode Maximum Ratings $T_A$=25°C unless otherwise noted

| | | | | |
|---|---|---|---|---|
| $V_{RRM}$ | Repetitive Peak Reverse Voltage | | 20 | V |
| $I_O$ | Average Forward Current | (Note 1a) | 1 | A |

## Package Marking and Ordering Information

| Device Marking | Device | Reel Size | Tape Width | Quantity |
|---|---|---|---|---|
| FDFS2P102 | FDFS2P102 | 13 | 12mm | 2500 units |

©2000 Fairchild Semiconductor International

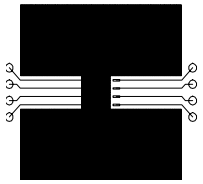
## Electrical Characteristics

$T_A$ = 25 C unless otherwise noted

| Symbol | Parameter | Test Conditions | | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|---|
| **Off Characteristics** | | | | | | | |
| $BV_{DSS}$ | Drain-Source Breakdown Voltage | $V_{GS}$ = 0 V, $I_D$ = -250 µA | | -20 | | | V |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$ = - 16 V, $V_{GS}$ = 0 V | | | | -1 | µA |
| | | | $T_J$ = 55°C | | | -10 | |
| $I_{GSSF}$ | Gate-Body Forward Leakage | $V_{GS}$ = 20 V, $V_{DS}$ = 0 V | | | | 100 | nA |
| $I_{GSSR}$ | Gate-Body Reverse Leakage | $V_{GS}$ = -20 V, $V_{DS}$ = 0 V | | | | -100 | nA |
| **On Characteristics** (Note 2) | | | | | | | |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}$ = $V_{GS}$, $I_D$ = -250 µA | | -1 | -1.4 | -2 | V |
| $R_{DS(on)}$ | Static Drain-Source On-Resistance | $V_{GS}$ = -10 V, $I_D$ = -3.3 A | | | 0.100 | 0.125 | Ω |
| | | $V_{GS}$ = -4.5 V, $I_D$ = -2.5 A | | | 0.167 | 0.2 | |
| $I_{D(on)}$ | On-State Drain Current | $V_{GS}$ = -10 V, $V_{DS}$ = -5 V | | -10 | | | A |
| $g_{FS}$ | Forward Transconductance | $V_{DS}$ = -10 V, $I_D$ = -3.3 A | | | 5 | | S |
| **Dynamic Characteristics** | | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{DS}$ = -10 V, $V_{GS}$ = 0 V, f = 1.0 MHz | | | 270 | | pF |
| $C_{oss}$ | Output Capacitance | | | | 150 | | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | | | 45 | | pF |
| **Switching Characteristics** (Note 2) | | | | | | | |
| $t_{d(on)}$ | Turn-On Delay Time | $V_{DD}$ = -15 V, $I_D$ = -1 A, $V_{GS}$ = -10 V, $R_{GEN}$ = 6 Ω | | | 8 | 16 | ns |
| $t_r$ | Turn-On Rise Time | | | | 7 | 14 | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | | | 17 | 27 | ns |
| $t_f$ | Turn-Off Fall Time | | | | 10 | 1.8 | ns |
| $Q_g$ | Total Gate Charge | $V_{DS}$ = -5 V, $I_D$ = -3.3 A, $V_{GS}$ = -10 V, | | | 7 | 10 | nC |
| **Drain-Source Diode Characteristics and Maximum Ratings** | | | | | | | |
| $I_S$ | Maximum Continuous Drain-Source Diode Forward Current | | | | | -1.3 | A |
| $V_{SD}$ | Drain-Source Diode Forward Voltage | $V_{GS}$ = 0 V, $I_S$ = -1.3 A (Note 2) | | | -0.8 | -1.2 | V |
| **Schottky Diode Characteristics** | | | | | | | |
| $I_R$ | Reverse Leakage | $V_R$ = 20 V | $T_J$ = 25°C | | | 250 | uA |
| | | | $T_J$ = 125°C | | | 18 | mA |
| $V_F$ | Forward Voltage | $I_F$ = 1 A | $T_J$ = 25°C | | | 0.47 | V |
| | | | $T_J$ = 125°C | | | 0.39 | |
| | | $I_F$ = 2 A | $T_J$ = 25°C | | | 0.58 | |
| | | | $T_J$ = 125°C | | | 0.53 | |
| **Thermal Characteristics** | | | | | | | |
| $R_{JA}$ | Thermal Resistance, Junction-to-Ambient (Note 1a) | | | | 78 | | |
| $R_{JC}$ | Thermal Resistance, Junction-to-Case (Note 1) | | | | 40 | | |

**Notes:**

**1:** $R_{\theta JA}$ is the sum of the junction-to-case and case-to-ambient resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.



a) 50° C/W when mounted on a 1 in² pad of 2 oz. copper.

b) 105° C/W when mounted on a 0.04 in² pad of 2 oz. copper.

c) 125° C/W when mounted on a minimum pad.

Scale 1 : 1 on letter size paper

**2:** Pulse Test: Pulse Width ≤ 300 µs, Duty Cycle ≤ 2.0%

## Typical Characteristics

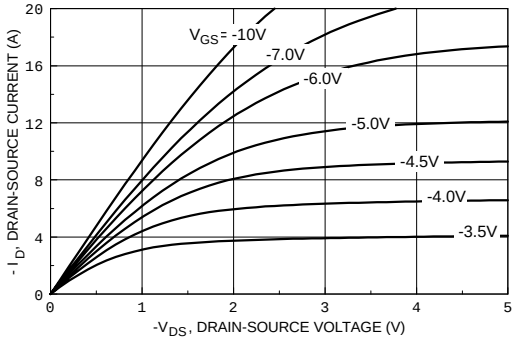



**Figure 1. On-Region Characteristics.**

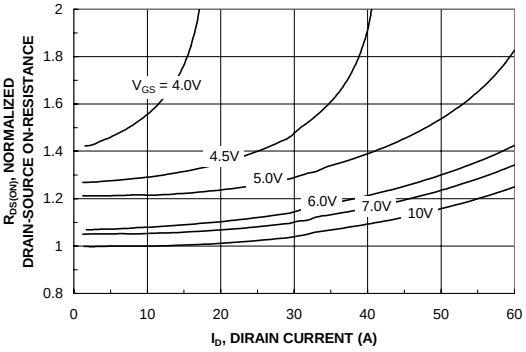



**Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.**

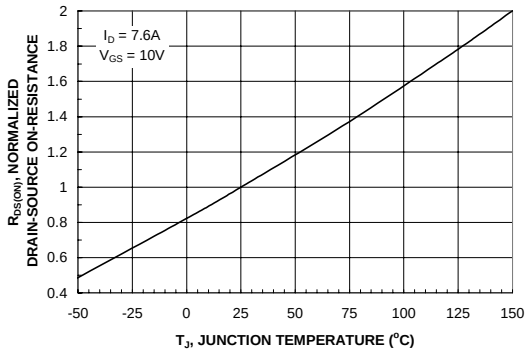



**Figure 3. On-Resistance Variation with Temperature.**

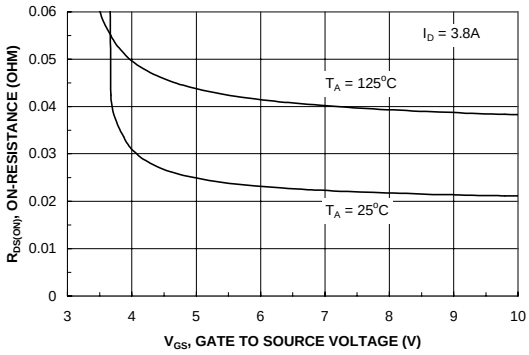



**Figure 4. On-Resistance Variation with Gate-to-Source Voltage.**

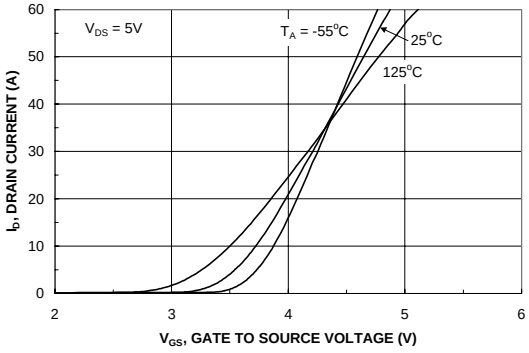



**Figure 5. Transfer Characteristics.**

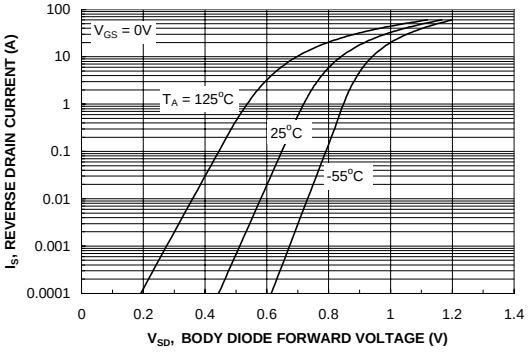



**Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.**

## Typical Characteristics (continued)

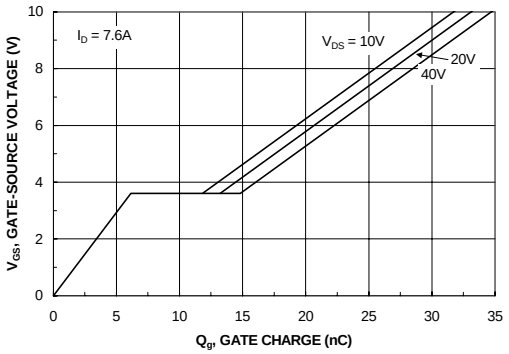



**Figure 7. Gate-Charge Characteristics.**

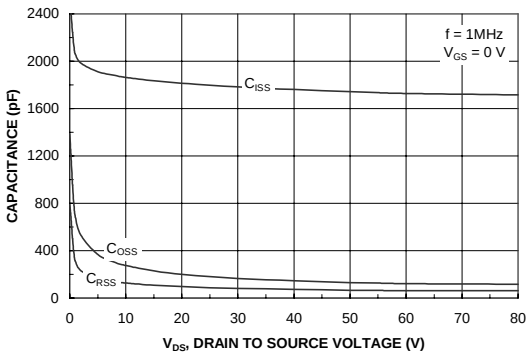



**Figure 8. Capacitance Characteristics.**

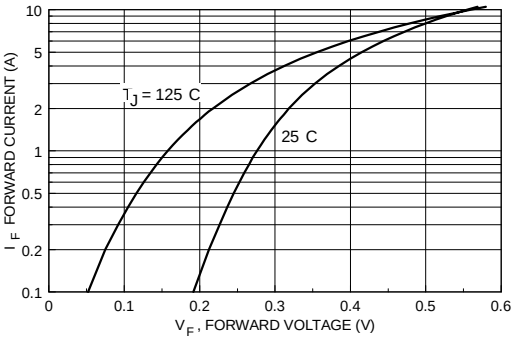



**Figure 9. Schottky Diode Forward Voltage.**

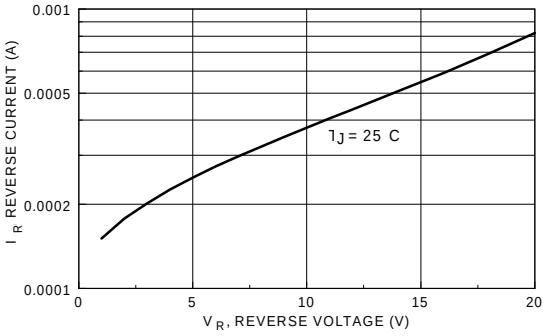



**Figure 10. Schottky Diode Reverse Current.**

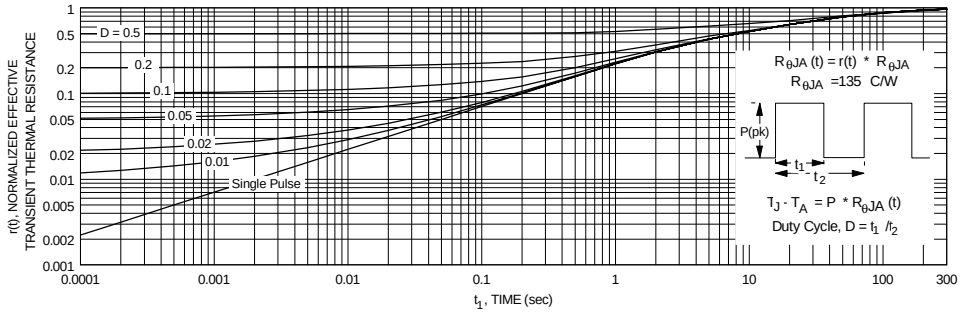



**Figure 11. Transient Thermal Response Curve.**

Thermal characterization performed using the conditions described in Note 1c.
Transient themal response will change depending on the circuit board design.

## 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™
Bottomless™
CoolFET™
CROSSVOLT™
DOME™
E²CMOS™
EnSigna™
FACT™
FACT Quiet Series™
FAST®
FASTr™
GlobalOptoisolator™
GTO™
HiSeC™
ISOPLANAR™
MICROWIRE™
OPTOLOGIC™
OPTOPLANAR™
POP™
PowerTrench®
QFET™
QS™
QT Optoelectronics™
Quiet Series™
SuperSOT™-3
SuperSOT™-6
SuperSOT™-8
SyncFET™
TinyLogic™
UHC™
VCX™

## 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

| Datasheet Identification | Product Status | Definition |
|---|---|---|
| Advance Information | Formative or In Design | This datasheet contains the design specifications for product development. Specifications may change in any manner without notice. |
| Preliminary | 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. |
| No Identification Needed | 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. |
| Obsolete | 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. |

This datasheet has been download from:

www.datasheetcatalog.com

Datasheets for electronics components.

**EN** - For pricing and availability in your local country please visit one of the below links:

**DE** - Informationen zu Preisen und Verfügbarkeit in Ihrem Land erhalten Sie über die unten aufgeführten Links:

**FR** - Pour connaître les tarifs et la disponibilité dans votre pays, cliquez sur l'un des liens suivants:

FDFS2P102

**EN**
This Datasheet is presented by the manufacturer

**DE**
Dieses Datenblatt wird vom Hersteller bereitgestellt

**FR**
Cette fiche technique est présentée par le fabricant