

# 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.

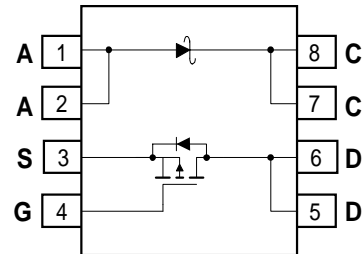
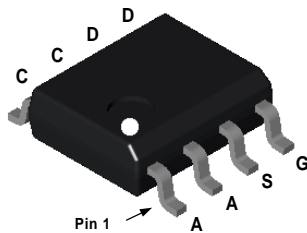
This device is designed specifically as a single package solution for DC to DC converters. It features a fast switching, low gate charge MOSFET with very low on-state resistance. The independently connected Schottky diode allows its use in a variety of DC/DC converter topologies.

### Applications

- DC/DC converters
- Load Switch
- Motor Drives

### Features

- -3.3 A, -20 V.  $R_{DS(ON)} = 0.125 \Omega @ V_{GS} = -10 \text{ V}$   
 $R_{DS(ON)} = 0.200 \Omega @ V_{GS} = -4.5 \text{ V}$ .
- $V_F < 0.39 \text{ V @ } 1 \text{ A } (T_J = 125 \text{ }^\circ\text{C})$ .  
 $V_F < 0.47 \text{ V @ } 1 \text{ A}$ .  
 $V_F < 0.58 \text{ V @ } 2 \text{ A}$ .
- 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<sub>A</sub>=25°C unless otherwise noted

Symbol	Parameter	Ratings	Units
V <sub>DSS</sub>	Drain-Source Voltage	-20	V
V <sub>GSS</sub>	Gate-Source Voltage	±20	V
I <sub>D</sub>	Drain Current - Continuous (Note 1a)	-3.3	A
	- Pulsed	-20	
P <sub>D</sub>	Power Dissipation for Dual Operation	2	W
	Power Dissipation for Single Operation (Note 1a)	1.6	
	(Note 1b)	1	
	(Note 1c)	0.9	
T <sub>J</sub> , T <sub>STG</sub>	Operating and Storage Temperature Range	-55 to +150	°C

### Schottky Diode Maximum Ratings T<sub>A</sub>=25°C unless otherwise noted

V <sub>RRM</sub>	Repetitive Peak Reverse Voltage	20	V
I <sub>O</sub>	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

## Electrical Characteristics T<sub>A</sub> = 25 C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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### Off Characteristics

BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> = 0 V, I <sub>D</sub> = -250 μA	-20			V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> = -16 V, V <sub>GS</sub> = 0 V			-1	μA
		T <sub>J</sub> = 55°C			-10	
I <sub>GSSF</sub>	Gate-Body Forward Leakage	V <sub>GS</sub> = 20 V, V <sub>DS</sub> = 0 V			100	nA
I <sub>GSSR</sub>	Gate-Body Reverse Leakage	V <sub>GS</sub> = -20 V, V <sub>DS</sub> = 0 V			-100	nA

### On Characteristics (Note 2)

V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250 μA	-1	-1.4	-2	V
R <sub>DS(on)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> = -10 V, I <sub>D</sub> = -3.3 A		0.100	0.125	Ω
		V <sub>GS</sub> = -4.5 V, I <sub>D</sub> = -2.5 A		0.167	0.2	
I <sub>D(on)</sub>	On-State Drain Current	V <sub>GS</sub> = -10 V, V <sub>DS</sub> = -5 V	-10			A
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> = -10 V, I <sub>D</sub> = -3.3 A		5		S

### Dynamic Characteristics

C <sub>ISS</sub>	Input Capacitance	V <sub>DS</sub> = -10 V, V <sub>GS</sub> = 0 V, f = 1.0 MHz		270		pF
C <sub>OSS</sub>	Output Capacitance			150		pF
C <sub>RSS</sub>	Reverse Transfer Capacitance			45		pF

### Switching Characteristics (Note 2)

t <sub>d(on)</sub>	Turn-On Delay Time	V <sub>DD</sub> = -15 V, I <sub>D</sub> = -1 A, V <sub>GS</sub> = -10 V, R <sub>GEN</sub> = 6 Ω		8	16	ns
t <sub>r</sub>	Turn-On Rise Time			7	14	ns
t <sub>d(off)</sub>	Turn-Off Delay Time			17	27	ns
t <sub>f</sub>	Turn-Off Fall Time			10	1.8	ns
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> = -5 V, I <sub>D</sub> = -3.3 A, V <sub>GS</sub> = -10 V		7	10	nC

### Drain-Source Diode Characteristics and Maximum Ratings

I <sub>S</sub>	Maximum Continuous Drain-Source Diode Forward Current				-1.3	A
V <sub>SD</sub>	Drain-Source Diode Forward Voltage	V <sub>GS</sub> = 0 V, I <sub>S</sub> = -1.3 A <small>(Note 2)</small>		-0.8	-1.2	V

### Schottky Diode Characteristics

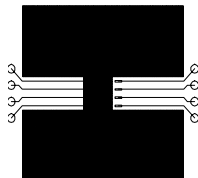
I <sub>R</sub>	Reverse Leakage	V <sub>R</sub> = 20 V	T <sub>J</sub> = 25°C		250	μA
			T <sub>J</sub> = 125°C		18	mA
V <sub>F</sub>	Forward Voltage	I <sub>F</sub> = 1 A	T <sub>J</sub> = 25°C		0.47	V
			T <sub>J</sub> = 125°C		0.39	
		I <sub>F</sub> = 2 A	T <sub>J</sub> = 25°C		0.58	
			T <sub>J</sub> = 125°C		0.53	

### Thermal Characteristics

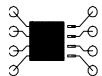
R <sub>JA</sub>	Thermal Resistance, Junction-to-Ambient	<small>(Note 1a)</small>	78		
R <sub>JC</sub>	Thermal Resistance, Junction-to-Case	<small>(Note 1)</small>	40		

#### Notes:

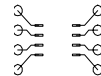
1: R<sub>θJA</sub> is the sum of the junction-to-case and case-to-ambient resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. R<sub>θJC</sub> is guaranteed by design while R<sub>θCA</sub> is determined by the user's board design.



a) 50° C/W when mounted on a 1 in<sup>2</sup> pad of 2 oz. copper.



b) 105° C/W when mounted on a 0.04 in<sup>2</sup> pad of 2 oz. copper.

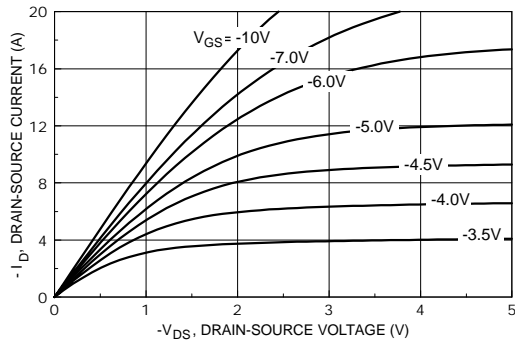


c) 125° C/W when mounted on a minimum pad.

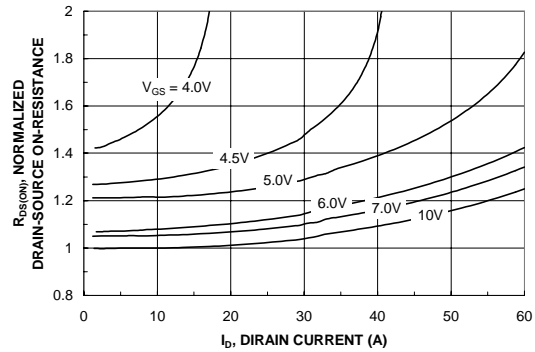
Scale 1 : 1 on letter size paper

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

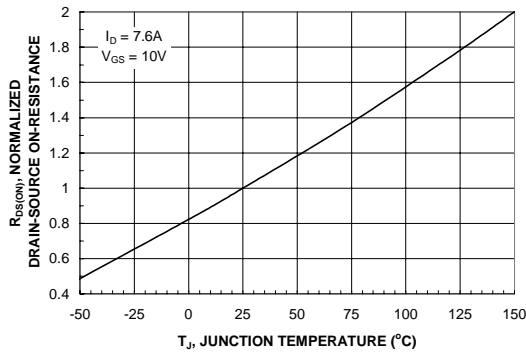
## Typical Characteristics



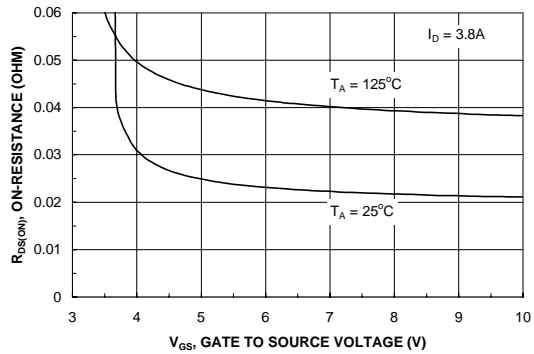
**Figure 1. On-Region Characteristics.**



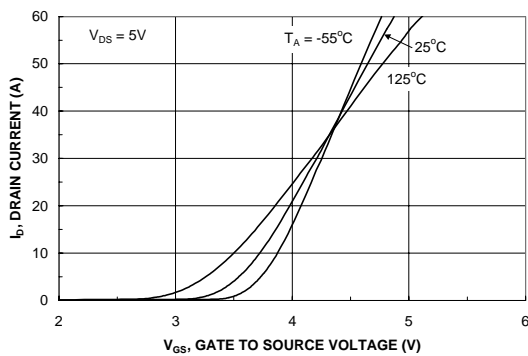
**Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.**



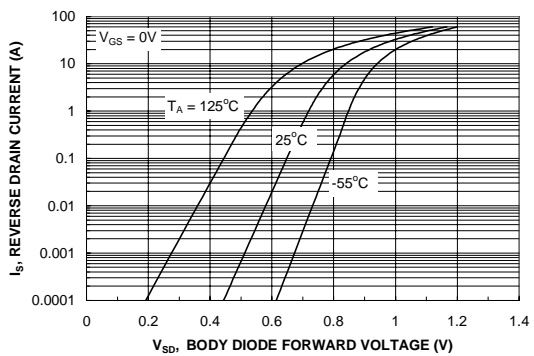
**Figure 3. On-Resistance Variation with Temperature.**



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

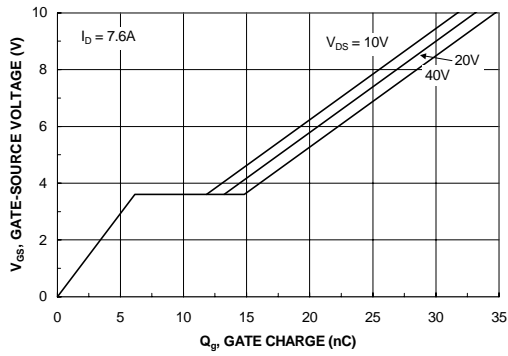


**Figure 5. Transfer Characteristics.**

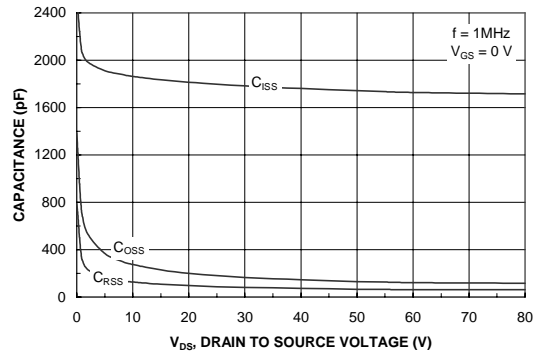


**Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.**

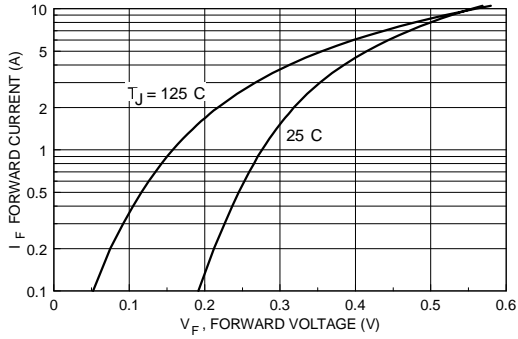
**Typical Characteristics** (continued)



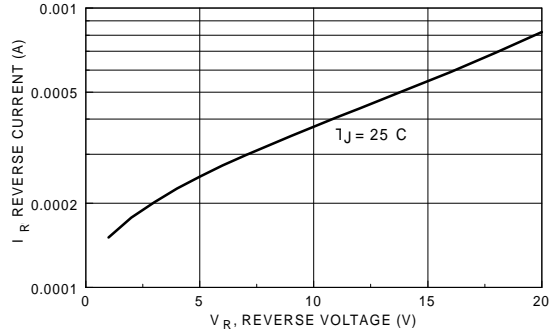
**Figure 7. Gate-Charge Characteristics.**



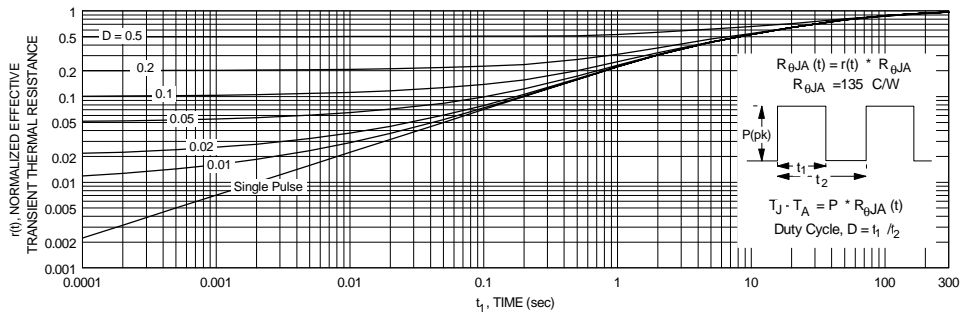
**Figure 8. Capacitance Characteristics.**



**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 thermal response will change depending on the circuit board design.

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