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.

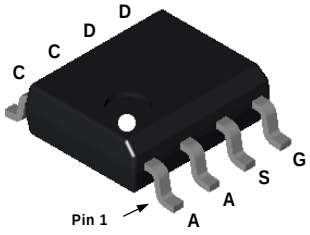
This device is designed specifically as a single package solution for DC to DC converters. It features a fast switching, low gate charge MOSFET with very low on-state resistance. The independently connected Schottky diode allows its use in a variety of DC/DC converter topologies.

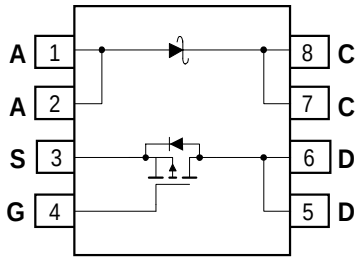
Applications

- 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

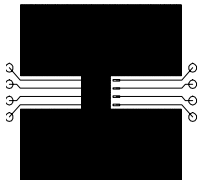
Electrical Characteristics

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

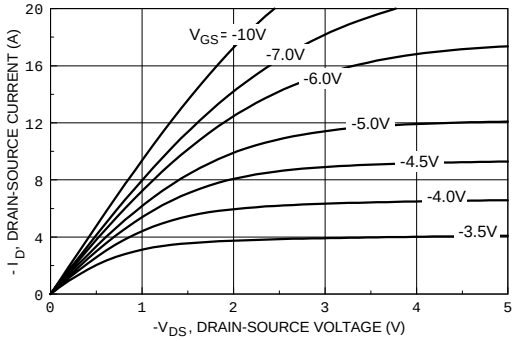


Figure 1. On-Region Characteristics.

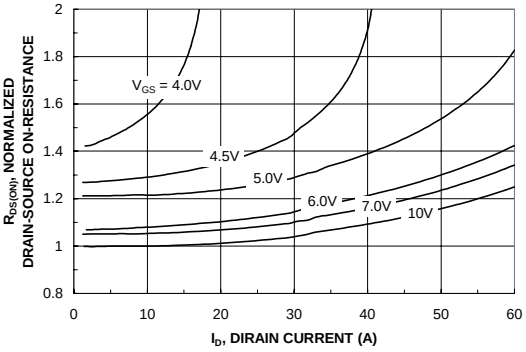


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

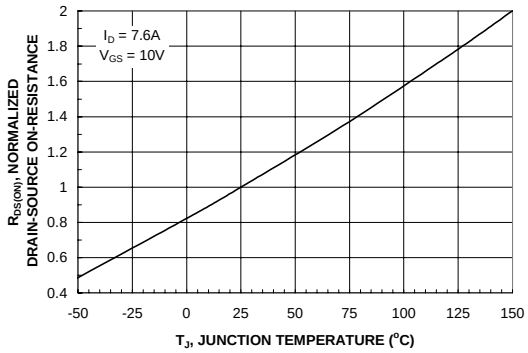


Figure 3. On-Resistance Variation with Temperature.

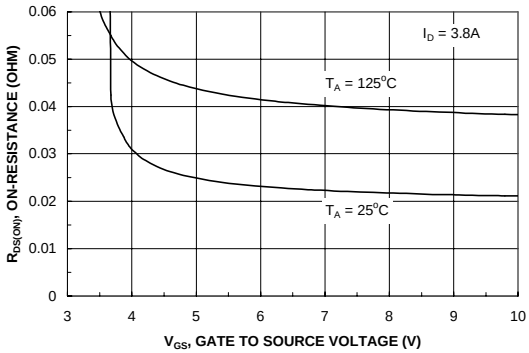


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

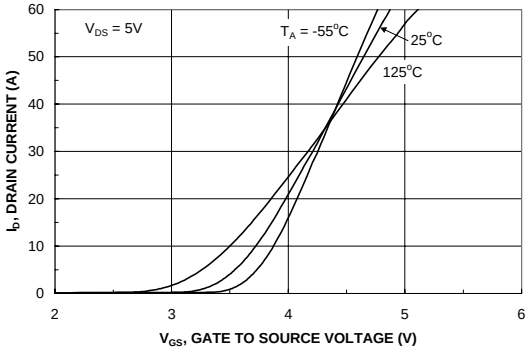


Figure 5. Transfer Characteristics.

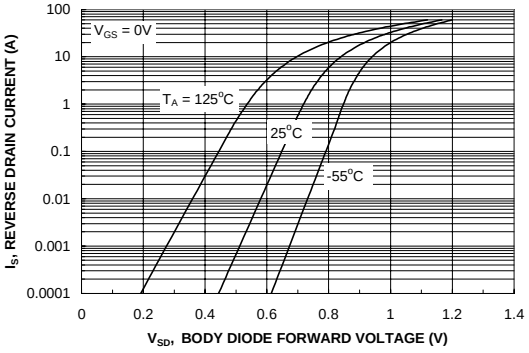


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Characteristics (continued)

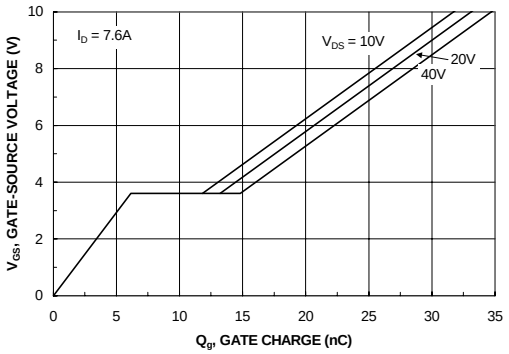


Figure 7. Gate-Charge Characteristics.

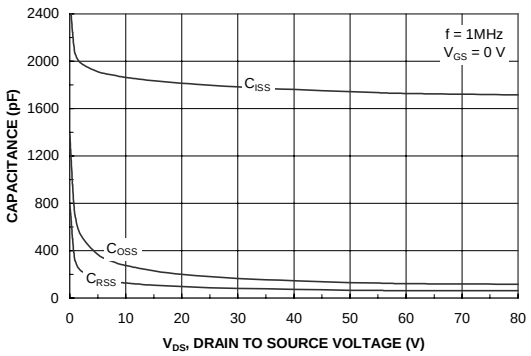


Figure 8. Capacitance Characteristics.

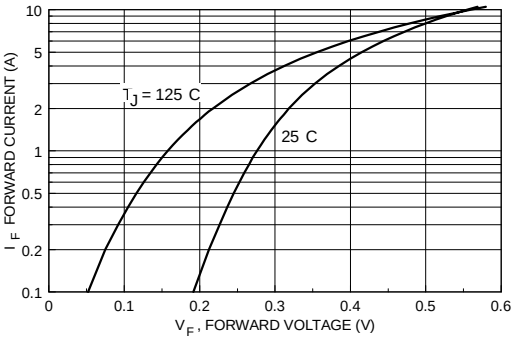


Figure 9. Schottky Diode Forward Voltage.

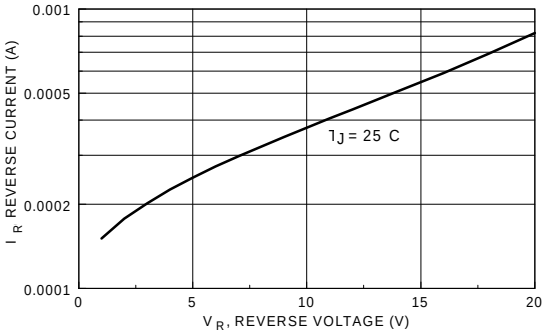


Figure 10. Schottky Diode Reverse Current.

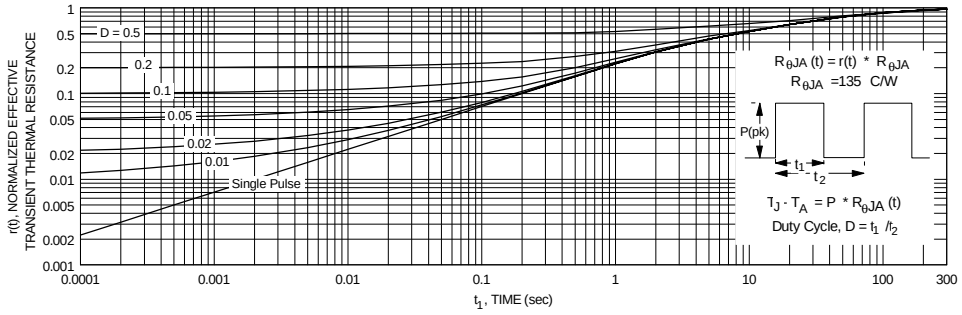


Figure 11. Transient Thermal Response Curve.

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

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