ON Semiconductor®

FDFS2P106A

Integrated 60V P-Channel PowerTrench® MOSFET and Schottky Diode

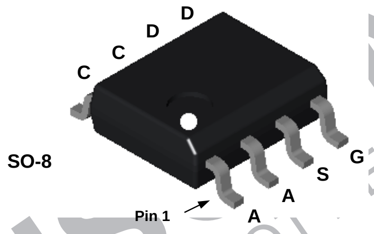
General Description

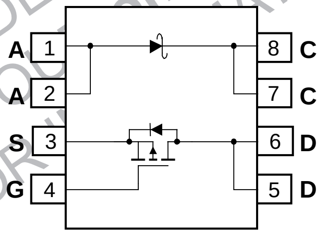
The FDFS2P106A combines the exceptional performance of ON Semiconductor's PowerTrench MOSFET technology with a very low forward voltage drop Schottky barrier rectifier in an SO-8 package.

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.

Features

- –3.0 A, –60V $R_{DS(ON)}$ = 110 mΩ @ V_{GS} = –10 V
  $R_{DS(ON)}$ = 140 mΩ @ V_{GS} = –4.5 V
- $V_F < 0.45$ V @ 1 A (T_J = 125°C)
  $V_F < 0.53$ V @ 1 A
  $V_F < 0.62$ V @ 2 A
- Schottky and MOSFET incorporated into single power surface mount SO-8 package
- Electrically independent Schottky and MOSFET pinout for design flexibility





Absolute Maximum Ratings

T_A=25°C unless otherwise noted

Symbol	Parameter	Ratings	Units
V_{DSS}	MOSFET Drain-Source Voltage	–60	V
V_{GSS}	MOSFET Gate-Source Voltage	±20	V
I_D	Drain Current – Continuous (Note 1a)	–3	A
	– Pulsed	–10	
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 Junction Temperature Range	–55 to +150	°C
V_{RRM}	Schottky Repetitive Peak Reverse Voltage	45	V
I_O	Schottky Average Forward Current (Note 1a)	1	A

Package Marking and Ordering Information

Device Marking	Device	Reel Size	Tape width	Quantity
FDFS2P106A	FDFS2P106A	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	–60			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = –250 µA, Referenced to 25°C		–60		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = –48 V, V_{GS} = 0 V			–1	µA
I_{GSSF}	Gate–Body Leakage, Forward	V_{GS} = 20V, V_{DS} = 0 V			100	nA
I_{GSSR}	Gate–Body Leakage, Reverse	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	–1.6	–3	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	I_D = –250 µA,Referenced to 25°C		4		mV/°C
$R_{DS(on)}$	Static Drain–Source On–Resistance	V_{GS} = –10 V, I_D = –3A V_{GS} = –4.5 V, I_D = –2.7 A V_{GS} = –10 V, I_D = –3 A, T_J=125°C		91 112 150	110 140 192	mΩ
$I_{D(on)}$	On–State Drain Current	V_{GS} = –10 V, V_{DS} = –5 V	–10			A
g_{FS}	Forward Transconductance	V_{DS} = –5 V, I_D = –3.3 A		8		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = –30 V, V_{GS} = 0 V, f = 1.0 MHz		714		pF
C_{oss}	Output Capacitance			84		pF
C_{rss}	Reverse Transfer Capacitance			33		pF
Switching Characteristics (Note 2)						
$t_{d(on)}$	Turn–On Delay Time	V_{DD} = –30 V, I_D = –1 A, V_{GS} = –10 V, R_{GEN} = 6 Ω		8	15	ns
t_r	Turn–On Rise Time			11	19	ns
$t_{d(off)}$	Turn–Off Delay Time			28	45	ns
t_f	Turn–Off Fall Time			8.5	17	ns
Q_g	Total Gate Charge	V_{DS} = –30V, I_D = –3A, V_{GS} = –10 V		15	21	nC
Q_{gs}	Gate–Source Charge			2		nC
Q_{gd}	Gate–Drain Charge			3		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

Electrical Characteristics (continued)

T_A = 25°C unless otherwise noted

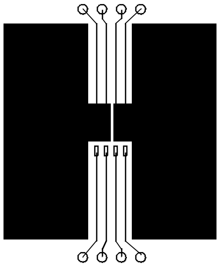
Symbol	Parameter	Test Conditions		Min	Typ	Max	Units
Schottky Diode Characteristics							
I_R	Reverse Leakage	V_R = 45 V	T_J = 25°C		2.8	80	µA
			T_J = 125°C		2.2	80	mA
V_F	Forward Voltage	I_F = 1 A	T_J = 25°C		0.44	0.53	V
			T_J = 125°C		0.34	0.45	
		I_F = 2 A	T_J = 25°C		0.49	0.62	
			T_J = 125°C		0.42	0.57	

Thermal Characteristics

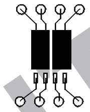
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	(Note 1a)	78	°C/W
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	(Note 1)	40	°C/W

Notes:

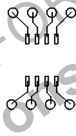
1. $R_{\theta JA}$ is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.



a) 78°C/W when mounted on a 0.5in^2 pad of 2 oz copper



b) 125°C/W when mounted on a 0.02 in^2 pad of 2 oz copper



c) 135°C/W when mounted on a minimum pad.

Scale 1 : 1 on letter size paper

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

Typical Characteristics

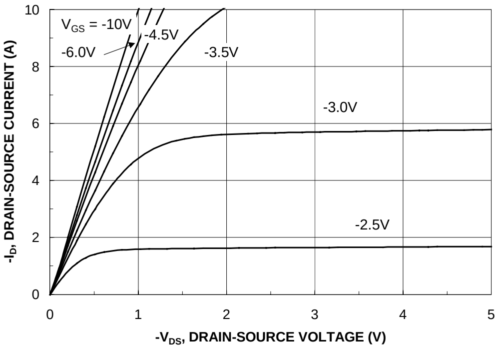


Figure 1. On-Region Characteristics.

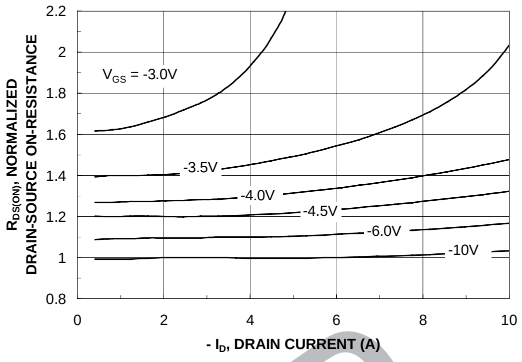


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

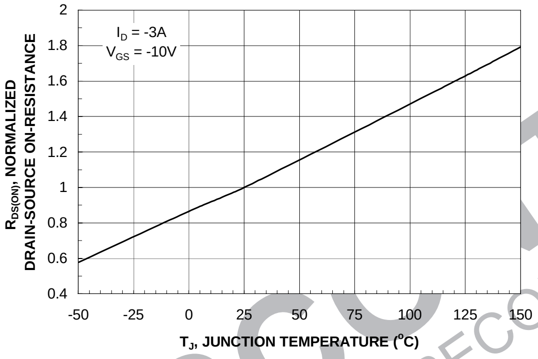


Figure 3. On-Resistance Variation with Temperature.

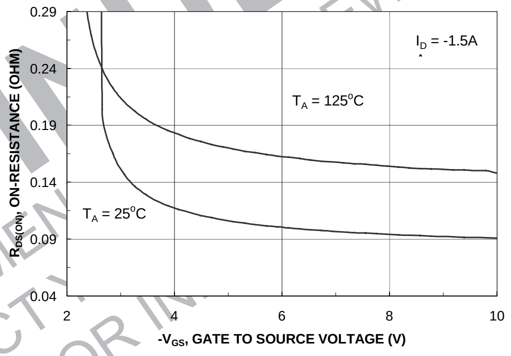


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

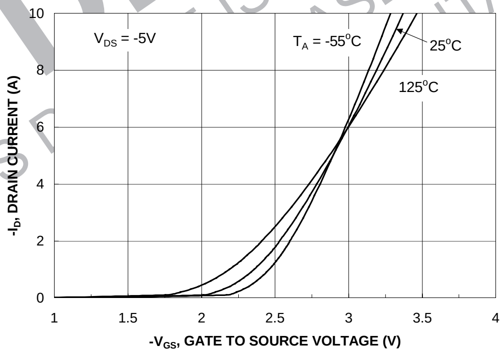


Figure 5. Transfer Characteristics.

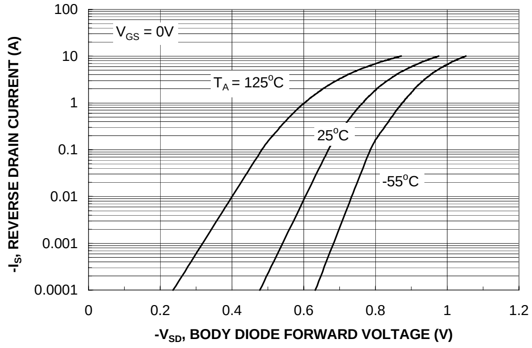


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Characteristics

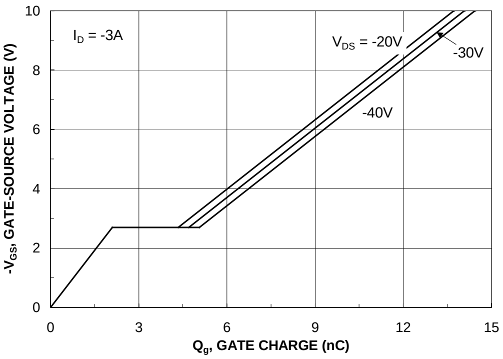


Figure 7. Gate Charge Characteristics.

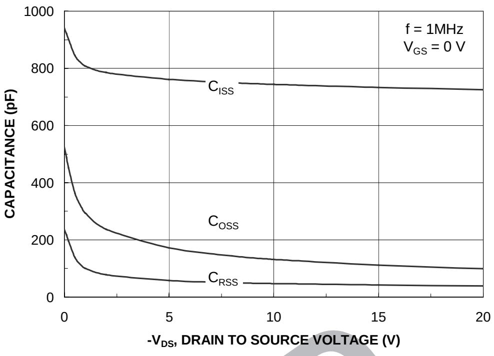


Figure 8. Capacitance Characteristics.

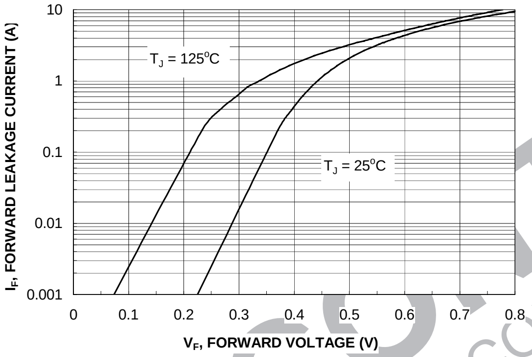


Figure 9. Schottky Diode Forward Voltage.

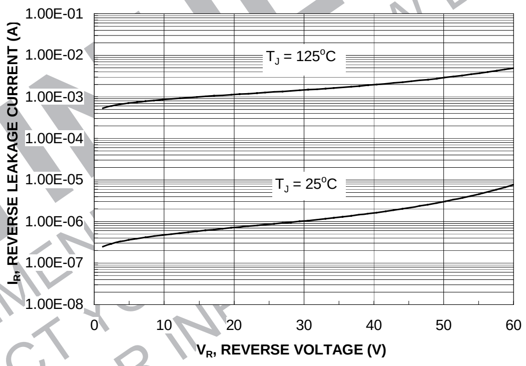


Figure 10. Schottky Diode Reverse Current.

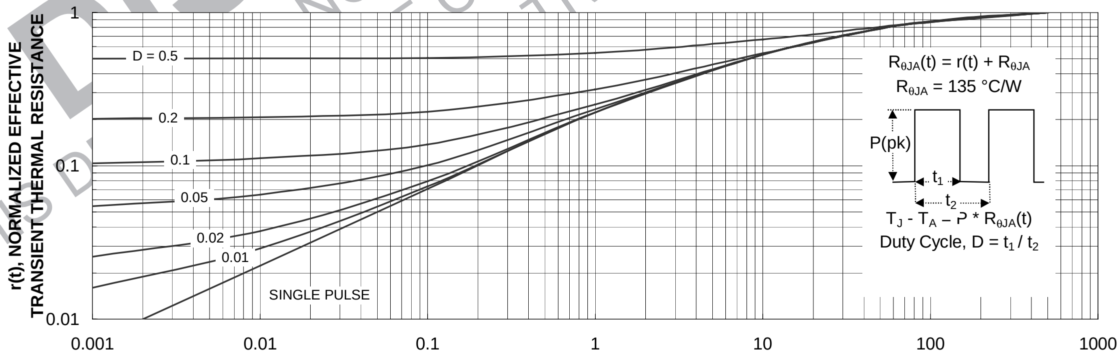


Figure 11. Transient Thermal Response Curve.

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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