FAIRCHILD SEMICONDUCTOR®

July 2007

FDFS2P753AZ

Integrated P-Channel PowerTrench® MOSFET and Schottky Diode

-30V, -3A, 115mΩ

Features

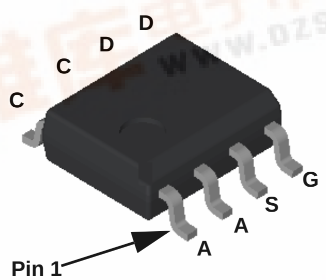
- Max $r_{DS(on)}$ = 115mΩ at V_{GS} = -10V, I_D = -3.0A
- Max $r_{DS(on)}$ = 180mΩ at V_{GS} = -4.5V, I_D = -1.5A
- V_F < 0.45V @ 2A
  V_F < 0.28V @ 100mA
- Schottky and MOSFET incorporated into single power surface mount SO-8 package
- Electrically independent Schottky and MOSFET pinout for design flexibility
- RoHS Compliant

General Description

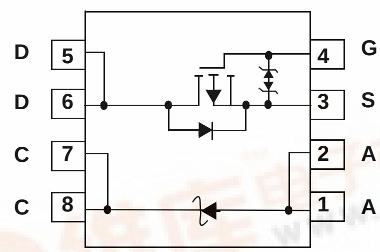
The FDFS2P753AZ offers a single package solution for DC/DC conversion. It combines an excellent Fairchild's PowerTrench MOSFET with a Schottky diode in an SO-8 package. The MOSFET features a low on-state resistance and an optimized gate charge to achieve fast switching. The independently connected Schottky diode has a low forward voltage drop to minimize power loss. This device is an Ideal DC-DC solution for up to 3A peak load current.

Applications

- DC - DC Conversion



SO-8



MOSFET Maximum Ratings T_A = 25°C unless otherwise noted

Symbol	Parameter	Ratings	Units
V_{DS}	Drain to Source Voltage	-30	V
V_{GS}	Gate to Source Voltage	±25	V
I_D	Drain Current -Continuous (Note 1a)	-3	A
	-Pulsed	-16	
P_D	Power Dissipation T_C = 25°C	3.1	W
	Power Dissipation T_A = 25°C (Note 1a)	1.6	
E_{AS}	Single Pulse Avalanche Energy (Note 2)	6	mJ
V_{RRM}	Schottky Repetitive Peak Reverse Voltage	30	V
I_O	Schottky Average Forward Current	2	A
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to +150	°C

Thermal Characteristics

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

Package Marking and Ordering Information

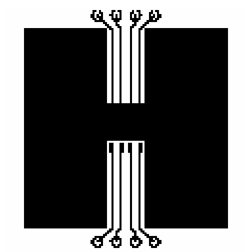
Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDFS2P753AZ	FDFS2P753AZ	SO-8	330mm	12mm	2500units

Electrical Characteristics T_J = 25°C unless otherwise noted

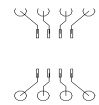
Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = -250μA, V_{GS} = 0V	-30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = -250μA, referenced to 25°C		-21		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = -24V, V_{GS} = 0V			-1	μA
		V_{DS} = -24V, V_{GS} = 0V, T_J = 125°C			-100	μA
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±25V, V_{DS} = 0V			±10	μA
On Characteristics						
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = -250μA	-1.0	-2.1	-3.0	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	I_D = -250μA, referenced to 25°C		5		mV/°C
$r_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = -10V, I_D = -3.0A		69	115	mΩ
		V_{GS} = -4.5V, I_D = -1.5A		115	180	mΩ
		V_{GS} = -10V, I_D = -3.0A, T_J = 125°C		97	162	mΩ
g_{FS}	Forward Transconductance	V_{DD} = -5V, I_D = -3.0A		6		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = -15V, V_{GS} = 0V, f = 1MHz		330	455	pF
C_{oss}	Output Capacitance			60	110	pF
C_{rss}	Reverse Transfer Capacitance			55	100	pF
R_g	Gate Resistance	f = 1MHz		18		Ω
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = -15V, I_D = -3.0A, V_{GS} = -10V, R_{GEN} = 6Ω		6	12	ns
t_r	Rise Time			4	10	ns
$t_{d(off)}$	Turn-Off Delay Time			19	34	ns
t_f	Fall Time			15	27	ns
Q_g	Total Gate Charge	V_{GS} = 0V to -10V; V_{DD} = -15V, I_D = -3.0A		7.9	11.0	nC
Q_g	Total Gate Charge	V_{GS} = 0V to -4.5V; V_{DD} = -15V, I_D = -3.0A		4.1	5.7	nC
Q_{gs}	Gate to Source Charge	V_{DD} = -15V, I_D = -3.0A		1.3		nC
Q_{gd}	Gate to Drain "Miller" Charge			2.0		nC
Drain-Source Diode Characteristics						
V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0V, I_S = -2.0A (Note 3)		-0.9	-1.2	V
t_{rr}	Reverse Recovery Time	I_F = -3.0A, di/dt = 100A/μs		20	30	ns
Q_{rr}	Reverse Recovery Charge			14	21	nC
Schottky Diode Characteristics						
V_R	Reverse Breakdown Voltage	I_R = 1mA	30			V
I_R	Reverse Leakage	V_R = 10V, T_J = 25°C		39	250	μA
		V_R = 10V, T_J = 125°C		18		mA
V_F	Forward Voltage	I_F = 100mA, T_J = 25°C		225	280	mV
		I_F = 100mA, T_J = 125°C		140		mV
		I_F = 2A, T_J = 25°C		364	450	mV
		I_F = 2A, T_J = 125°C		290		mV

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 0.5 in^2 pad of 2 oz copper.



b. 135°C/W when mounted on a minimum pad of 2 oz copper.

2. Starting T_J = 25°C, L = 3 mH, I_{AS} = -2A, V_{DD} = -27V, V_{GS} = -10V.

3. Pulse Test: Pulse Width < 300μs, Duty cycle < 2.0%.

Typical Characteristics T_J = 25°C unless otherwise noted

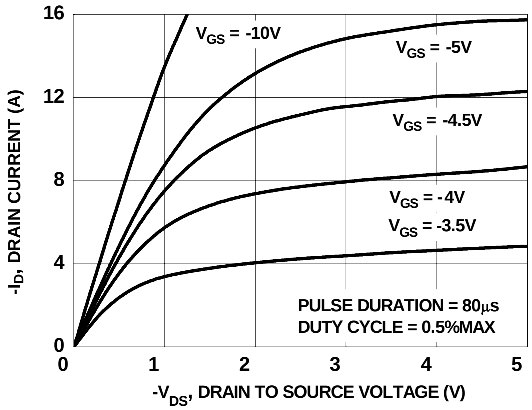


Figure 1. On-Region Characteristics

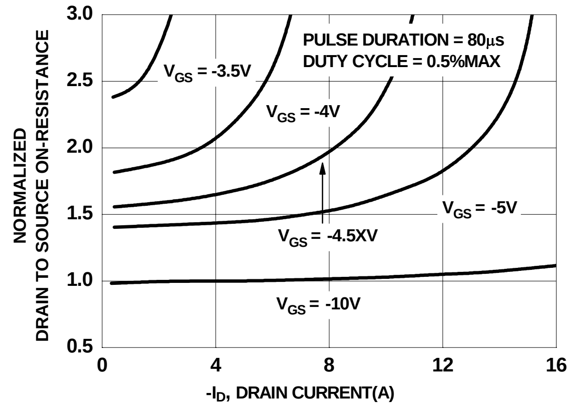


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

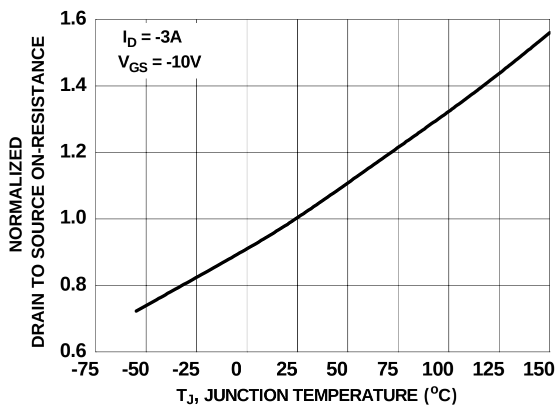


Figure 3. Normalized On-Resistance vs Junction Temperature

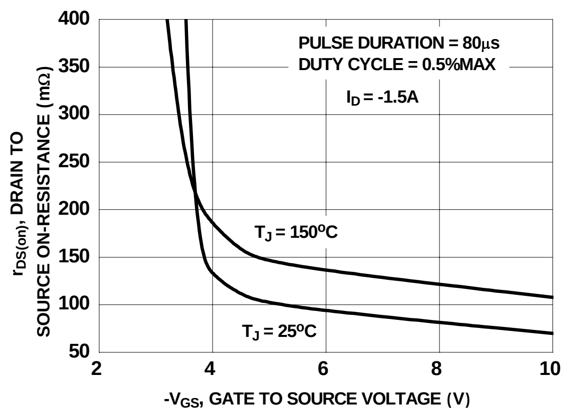


Figure 4. On-Resistance vs Gate to Source Voltage

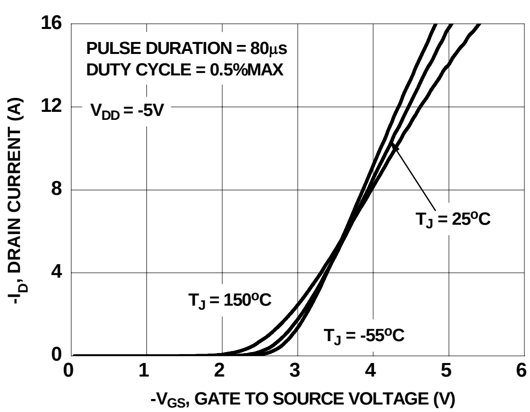


Figure 5. Transfer Characteristics

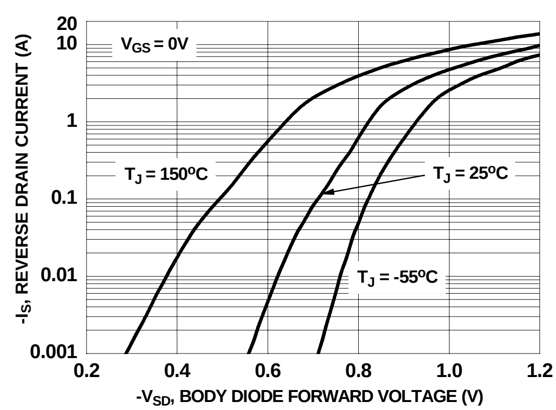


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics T_J = 25°C unless otherwise noted

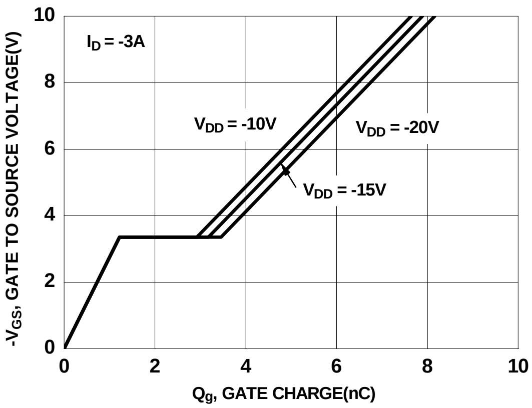


Figure 7. Gate Charge Characteristics

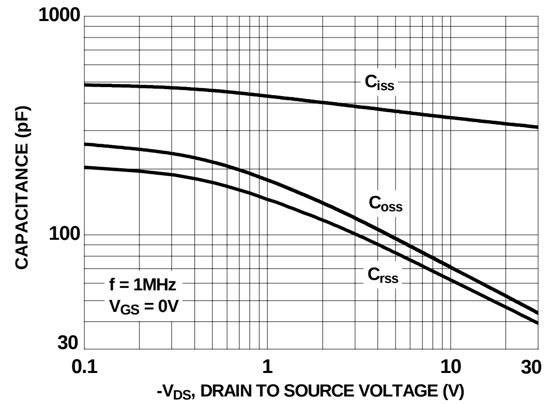


Figure 8. Capacitance vs Drain to Source Voltage

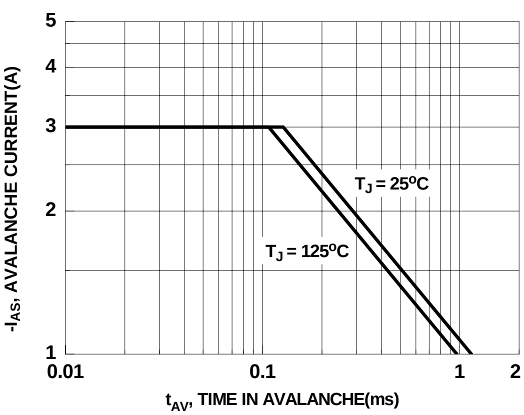


Figure 9. Unclamped Inductive Switching Capability

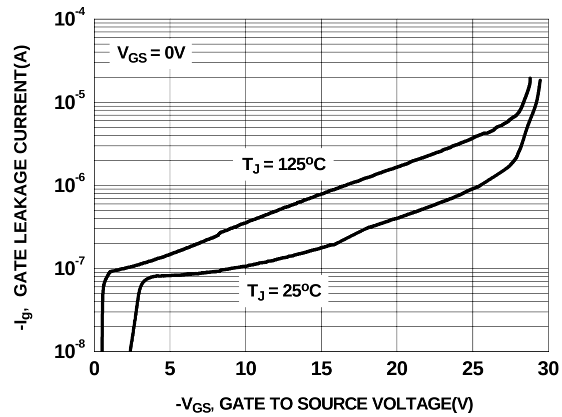


Figure 10. Gate Leakage Current vs Gate to Source Volatge

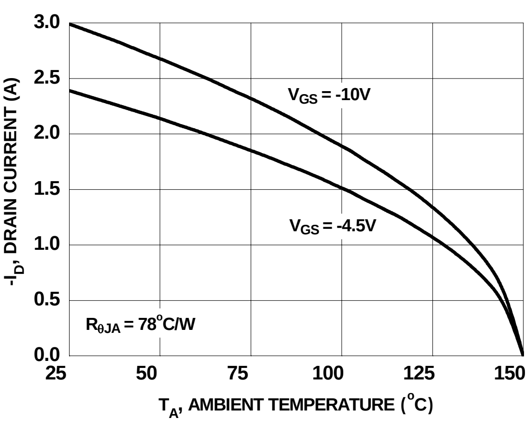


Figure 11. Maximum Continuous Drain Current vs Ambient Temperature

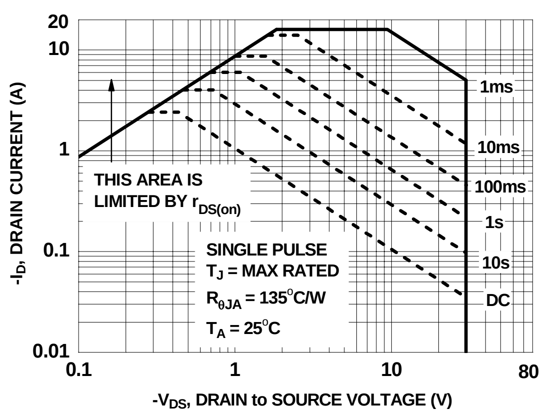


Figure 12. Forward Bias Safe Operating Area

Typical Characteristics T_J = 25°C unless otherwise noted

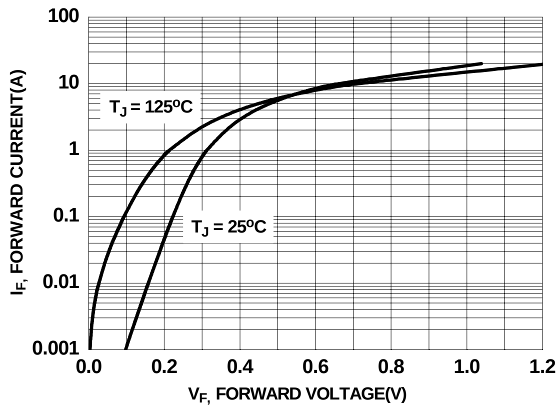


Figure 13. Schottky Diode Forward Voltage

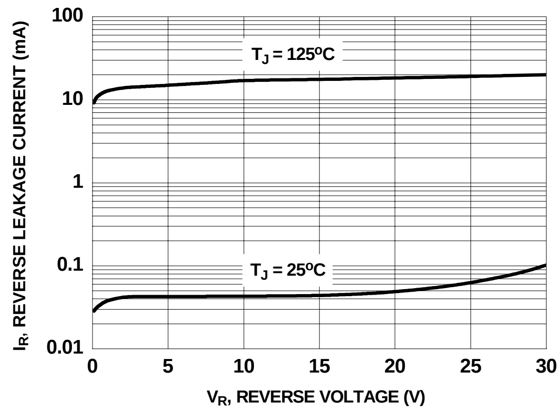


Figure 14. Schottky Diode Reverse Current

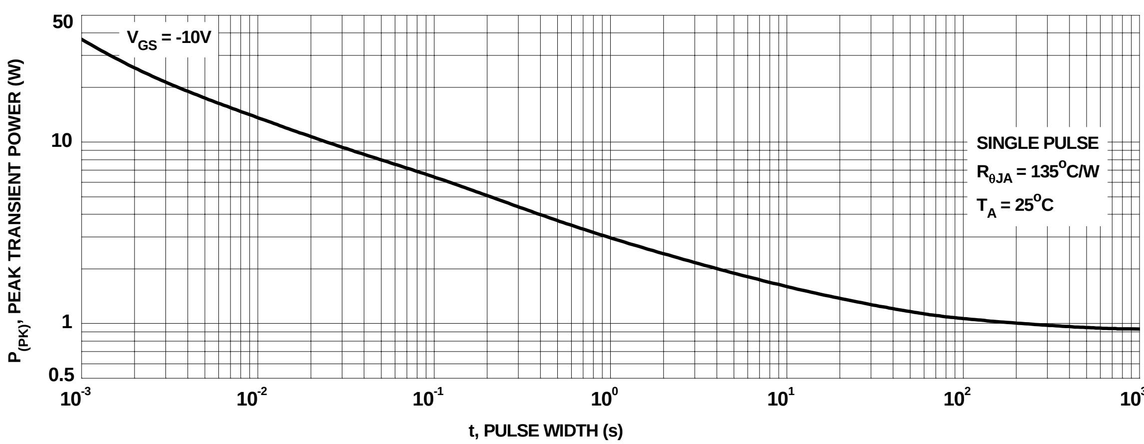


Figure 15. Single Pulse Maximum Power Dissipation

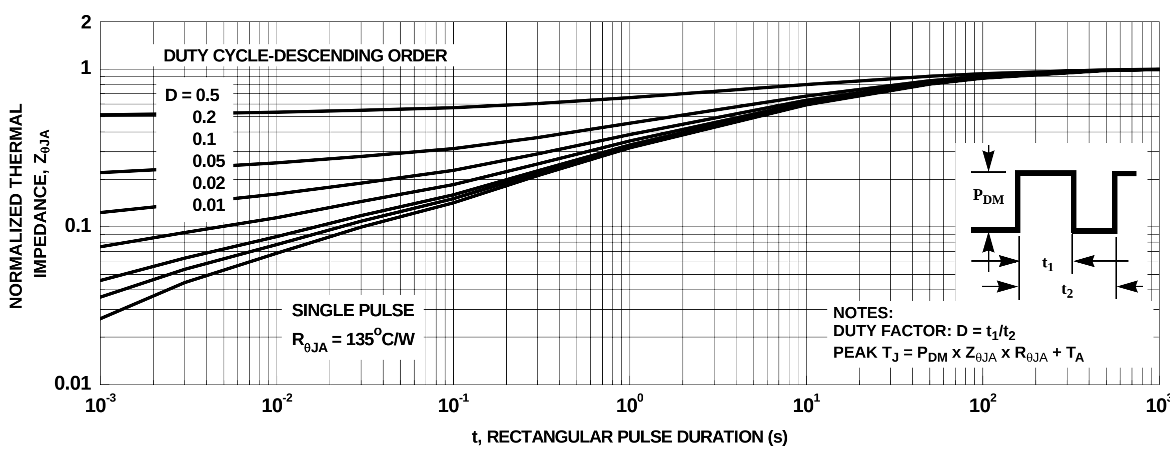


Figure 16. Transient Thermal Response Curve

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