November 2006

FDFS2P753Z

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 < 500mV @ 1A
  V_F < 580mV @ 2A
- Schottky and MOSFET incorporated into single power surface mount SO-8 package
- Electrically independent Schottky and MOSFET pinout for design flexibility
- RoHS Compliant

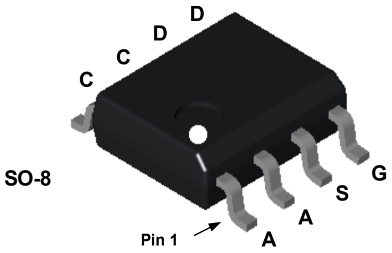
General Description

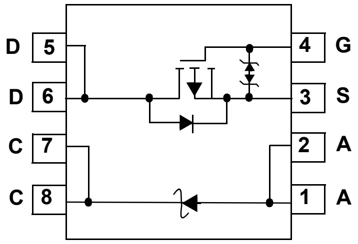
The FDFS2P753Z combines the exceptional performance of Fairchild's PowerTrench MOSFET technology with a very low forward voltage drop Schottky barrier rectifier in an SO-8 package.

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.

Application

- DC - DC Conversion





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	(Note 1a)	1.6	W
E_{AS}	Single Pulse Avalanche Energy	(Note 2)	6	mJ
V_{RRM}	Schottky Repetitive Peak Reverse Voltage		-20	V
I_O	Schottky Average Forward Current	(Note 1a)	-2	A
T_J, T_{STG}	Operating and Storage Junction Temperature Range		-55 to +150	°C

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	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDFS2P753Z	FDFS2P753Z	SO-8	330mm	12mm	2500 units

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
		T_J = 125°C			-100	
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	-2.1	-3	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
$r_{DS(on)}$	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	
		V_{GS} = -10V, I_D = -3.0A, T_J = 125°C		97	162	
g_{FS}	Forward Transconductance	V_{DS} = -5V, I_D = -3.0A		6		S

Dynamic Characteristics

C_{iss}	Input Capacitance	V_{DS} = -10V, V_{GS} = 0V, f = 1MHz		340	455	pF
C_{oss}	Output Capacitance			80	110	pF
C_{rss}	Reverse Transfer Capacitance			65	100	pF
R_g	Gate Resistance	f = 1MHz		18		Ω

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	V_{DD} = -10V, I_D = -3.0A V_{GS} = -10V, R_{GEN} = 6Ω		7	14	ns
t_r	Rise Time			31	50	ns
$t_{d(off)}$	Turn-Off Delay Time			18	33	ns
t_f	Fall Time			20	35	ns
$Q_{g(TOT)}$	Total Gate Charge at -10V	V_{GS} = 0V to -10V; V_{DD} = -10V, I_D = -3.0A		6.6	9.3	nC
$Q_{g(4.5)}$	Total Gate Charge at -4.5V	V_{GS} = 0V to -4.5V		3.3	4.6	nC
Q_{gs}	Gate to Source Gate Charge			1.3		nC
Q_{gd}	Gate to Drain "Miller" Charge			1.6		nC

Drain-Source Diode Characteristics

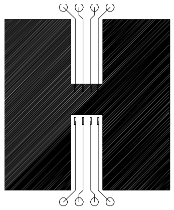
V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0V, I_S = -2.0A (Note 3)		-0.9	-1.2	V
t_{rr}	Reverse Recovery Time	I_F = -3.0A, di/dt = 100A/µs		20	30	ns
Q_{rr}	Reverse Recovery Charge			14	21	nC

Schottky Diode Characteristics

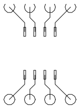
I_R	Reverse Leakage	V_R = -20V	T_J = 25°C			-190	µA
			T_J = 125°C			-66	mA
V_F	Forward Voltage	I_F = 1A	T_J = 25°C			0.5	V
			T_J = 125°C			0.39	
		I_F = 2A	T_J = 25°C			0.58	
			T_J = 125°C			0.53	

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 0.5in2 pad of 2 oz copper



b) 135°C/W when mounted on a minimun pad

2: Starting $T_J = 25^oC$, $L = 3mH$, $I_{AS} = 2A$, $V_{DD} = 27V$, $V_{GS} = 10V$
3: Pulse Test: Pulse Width < 300μs, Duty cycle < 2.0%.

Typical Characteristics T_J = 25°C unless otherwise noted

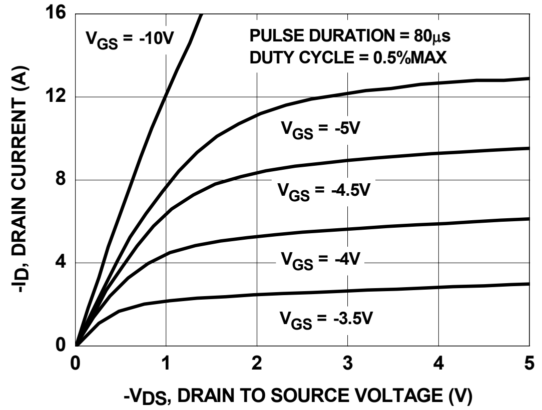


Figure 1. On Region Characteristics

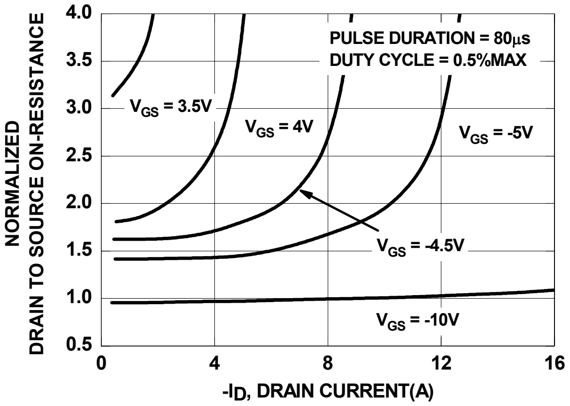


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

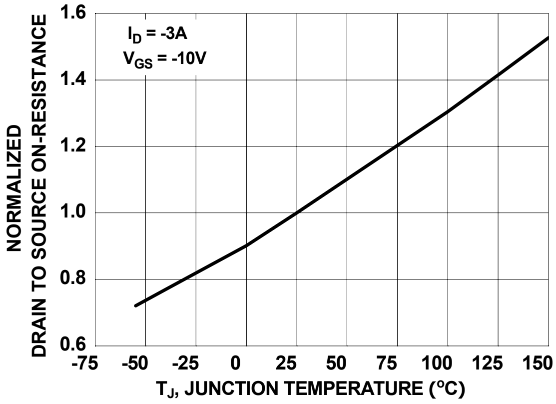


Figure 3. Normalized On-Resistance vs Junction Temperature

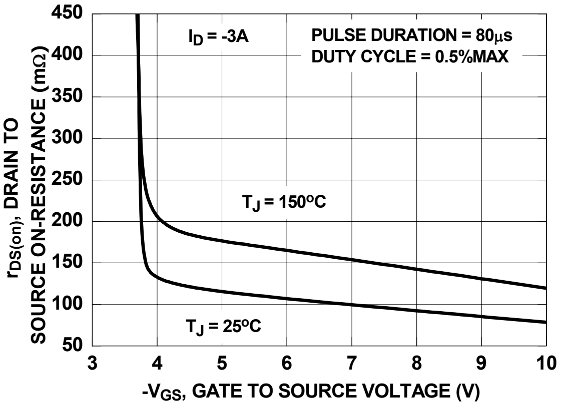


Figure 4. On-Resistance vs Gate to Source Voltage

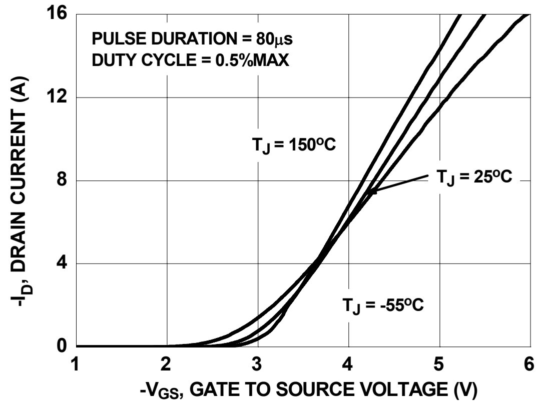


Figure 5. Transfer Characteristics

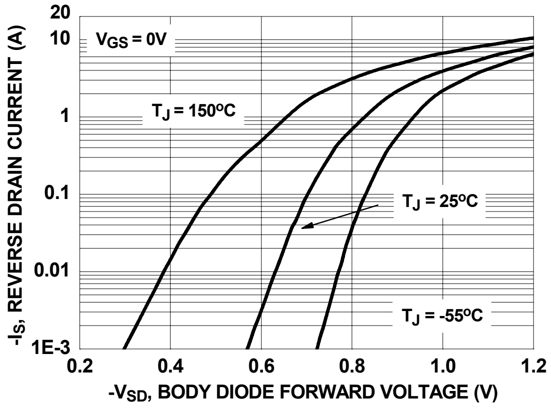


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics T_J = 25°C unless otherwise noted

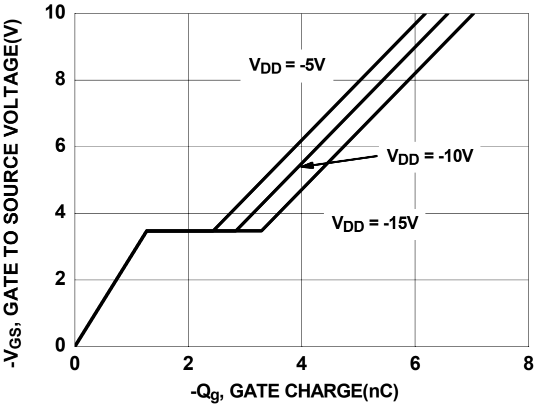


Figure 7. Gate Charge Characteristics

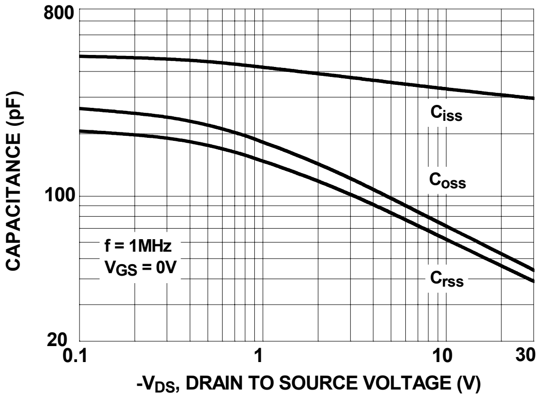


Figure 8. Capacitance vs Drain to Source Voltage

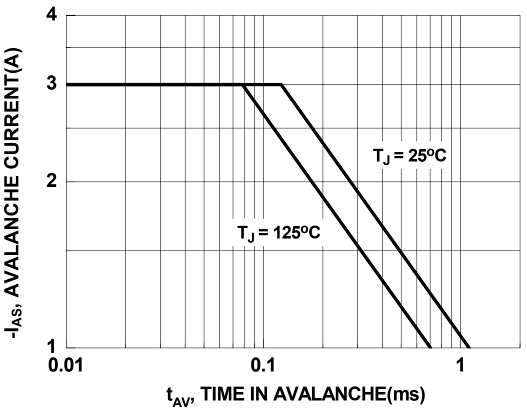


Figure 9. Unclamped Inductive Switching Capability

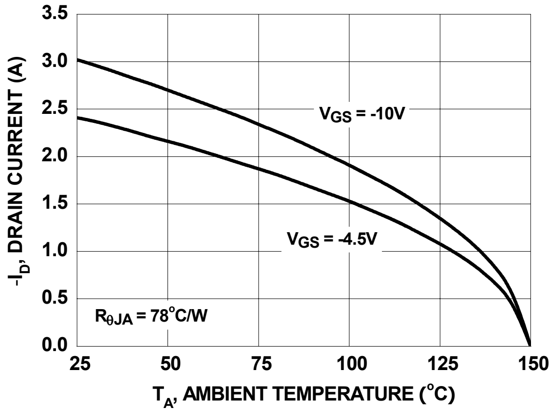


Figure 10. Maximum Continuous Drain Current vs Case Temperature

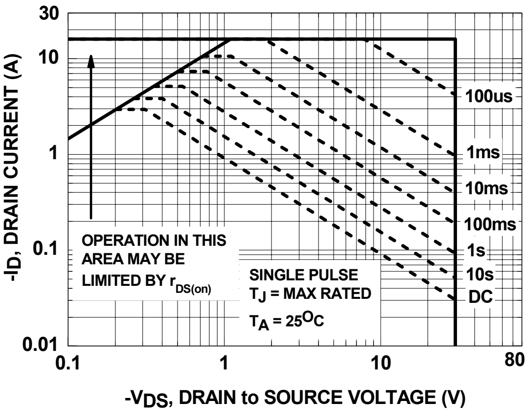


Figure 11. Forward Bias Safe Operating Area

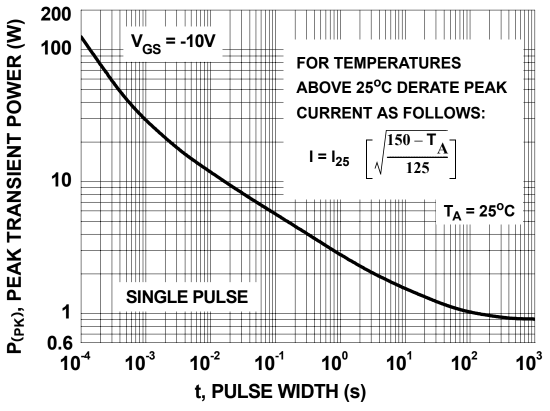


Figure 12. Single Pulse Maximum Power Dissipation

Typical Characteristics T_J = 25°C unless otherwise noted

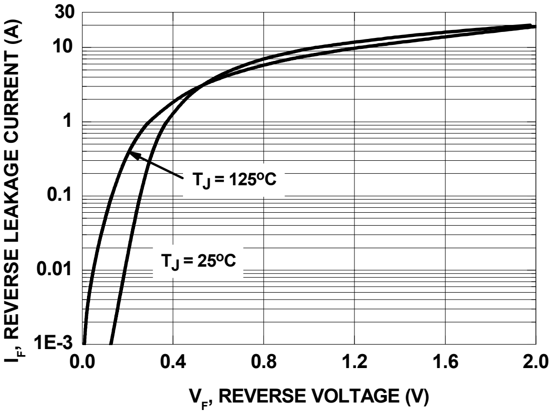


Figure 13. Schottky Diode Forward Voltage

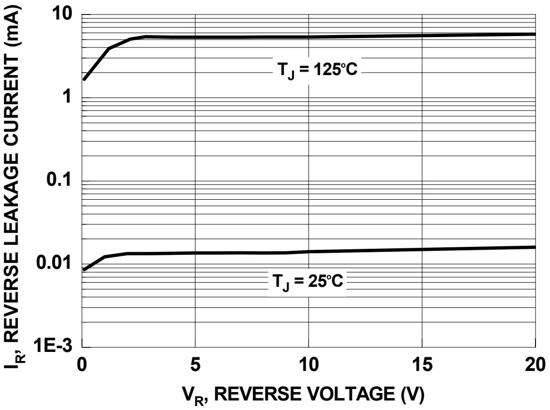


Figure 14. Schottky Diode Reverse Current

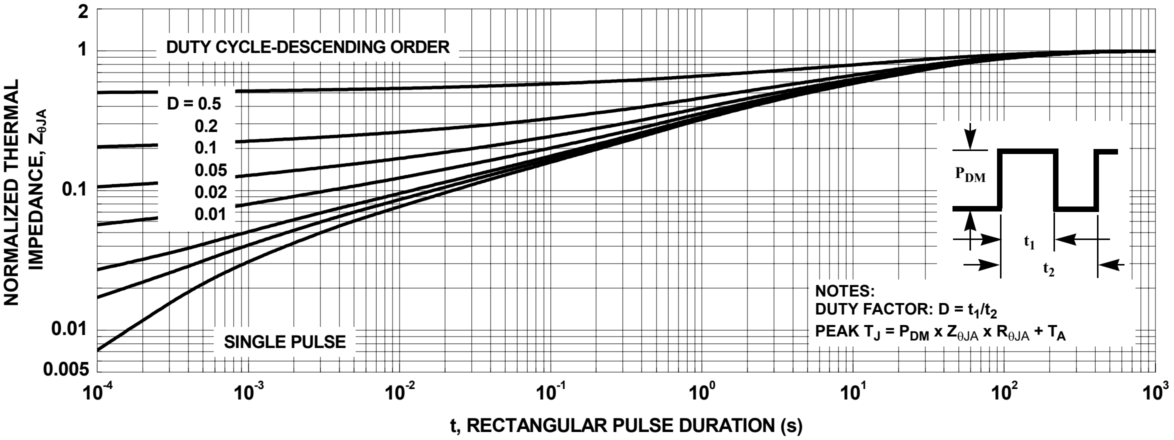


Figure 15. Transient Thermal Response Curve

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