

# 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



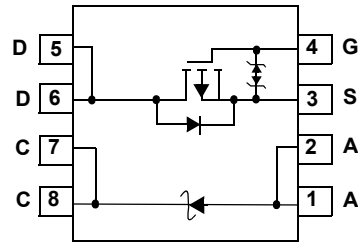
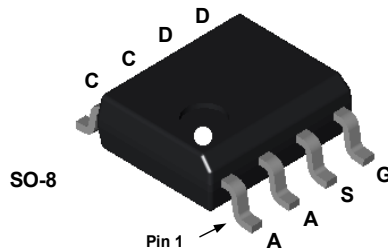
### General Description

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 $T_A = 25^\circ C$ unless otherwise noted

Symbol	Parameter	Ratings	Units
$V_{DS}$	Drain to Source Voltage	-30	V
$V_{GS}$	Gate to Source Voltage	$\pm 25$	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	$^\circ C$

### Thermal Characteristics

$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	78	$^\circ C/W$
$R_{\theta JC}$	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 $T_J = 25^\circ\text{C}$ unless otherwise noted

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

$BV_{DSS}$	Drain to Source Breakdown Voltage	$I_D = -250\mu\text{A}, V_{GS} = 0\text{V}$	-30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = -250\mu\text{A}$ , referenced to $25^\circ\text{C}$		-21		mV/ $^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = -24\text{V},$ $V_{GS} = 0\text{V}$ $T_J = 125^\circ\text{C}$			-1 -100	$\mu\text{A}$
$I_{GSS}$	Gate to Source Leakage Current	$V_{GS} = \pm 25\text{V}, V_{DS} = 0\text{V}$			$\pm 10$	$\mu\text{A}$

#### On Characteristics

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}, I_D = -250\mu\text{A}$	-1	-2.1	-3	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = -250\mu\text{A}$ , referenced to $25^\circ\text{C}$		5		mV/ $^\circ\text{C}$
$r_{DS(on)}$	Drain to Source On-Resistance	$V_{GS} = -10\text{V}, I_D = -3.0\text{A}$		69	115	m $\Omega$
		$V_{GS} = -4.5\text{V}, I_D = -1.5\text{A}$		115	180	
		$V_{GS} = -10\text{V}, I_D = -3.0\text{A}, T_J = 125^\circ\text{C}$		97	162	
$g_{FS}$	Forward Transconductance	$V_{DS} = -5\text{V}, I_D = -3.0\text{A}$		6		S

#### Dynamic Characteristics

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

#### Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = -10\text{V}, I_D = -3.0\text{A}$ $V_{GS} = -10\text{V}, R_{GEN} = 6\Omega$		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		$V_{GS} = 0\text{V to } -10\text{V}$	$V_{DD} = -10\text{V}$ $I_D = -3.0\text{A}$	6.6	9.3
$Q_{g(4.5)}$	Total Gate Charge at -4.5V	$V_{GS} = 0\text{V to } -4.5\text{V}$	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

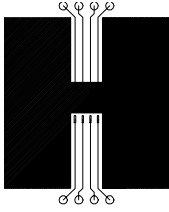
$V_{SD}$	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{V}, I_S = -2.0\text{A}$ (Note 3)		-0.9	-1.2	V
$t_{rr}$	Reverse Recovery Time	$I_F = -3.0\text{A}, di/dt = 100\text{A}/\mu\text{s}$		20	30	ns
$Q_{rr}$	Reverse Recovery Charge			14	21	nC

#### Schottky Diode Characteristics

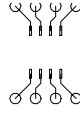
$I_R$	Reverse Leakage	$V_R = -20\text{V}$	$T_J = 25^\circ\text{C}$		-190	$\mu\text{A}$
			$T_J = 125^\circ\text{C}$		-66	mA
$V_F$	Forward Voltage	$I_F = 1\text{A}$	$T_J = 25^\circ\text{C}$		0.5	V
			$T_J = 125^\circ\text{C}$		0.39	
			$T_J = 25^\circ\text{C}$		0.58	
			$T_J = 125^\circ\text{C}$		0.53	

**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 0.5in<sup>2</sup> pad of 2 oz copper



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

2: Starting  $T_J = 25^\circ\text{C}$ ,  $L = 3\text{mH}$ ,  $I_{AS} = 2\text{A}$ ,  $V_{DD} = 27\text{V}$ ,  $V_{GS} = 10\text{V}$

3: Pulse Test: Pulse Width < 300 $\mu\text{s}$ , Duty cycle < 2.0%.

**Typical Characteristics**  $T_J = 25^\circ\text{C}$  unless otherwise noted

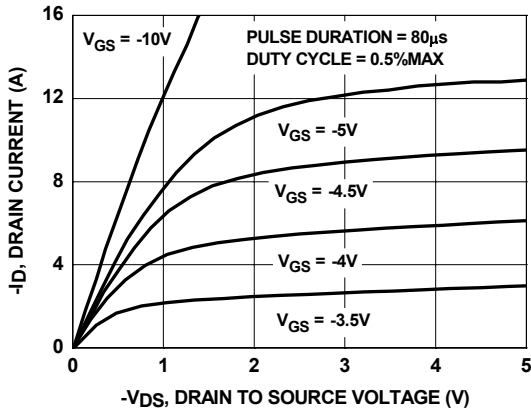


Figure 1. On Region Characteristics

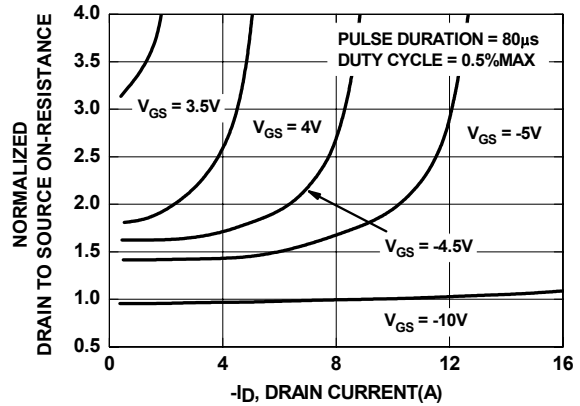


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

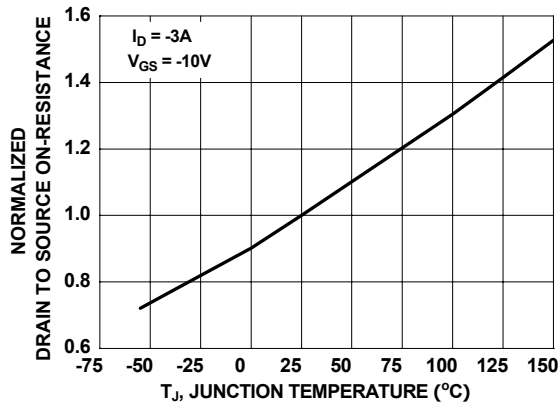


Figure 3. Normalized On-Resistance vs Junction Temperature

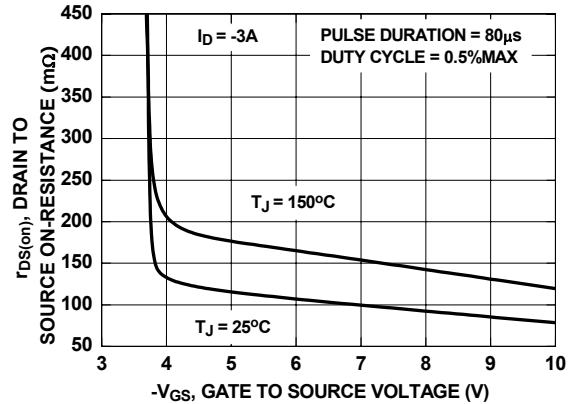


Figure 4. On-Resistance vs Gate to Source Voltage

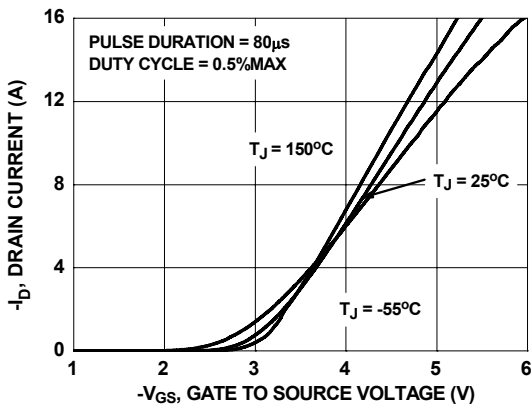


Figure 5. Transfer Characteristics

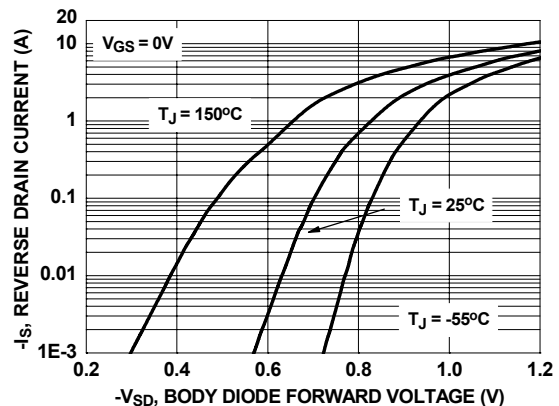
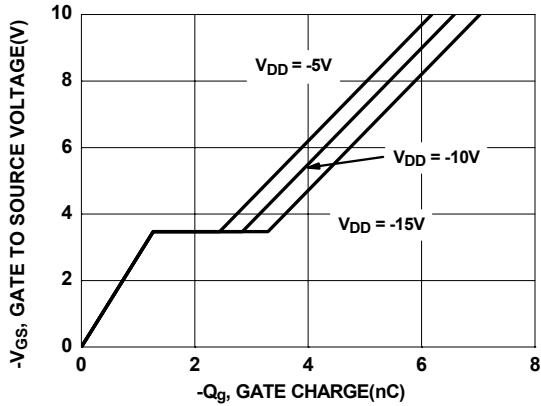
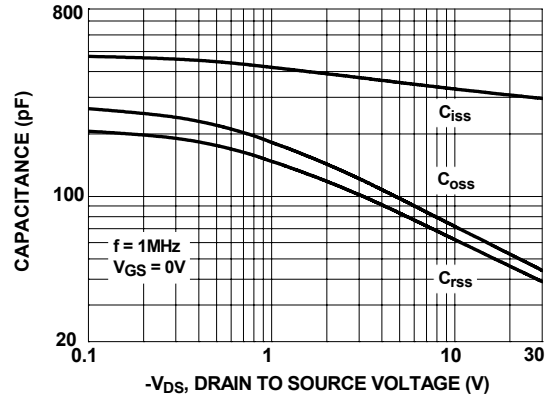


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

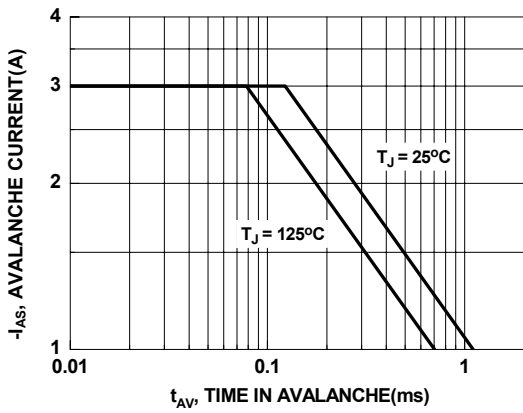
**Typical Characteristics**  $T_J = 25^\circ\text{C}$  unless otherwise noted



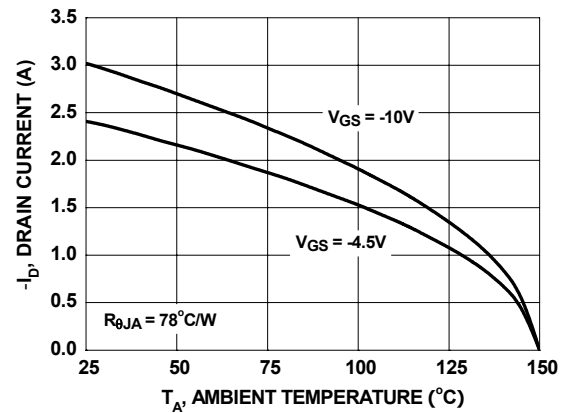
**Figure 7. Gate Charge Characteristics**



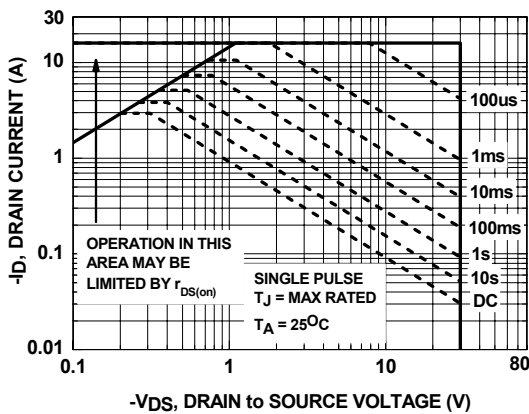
**Figure 8. Capacitance vs Drain to Source Voltage**



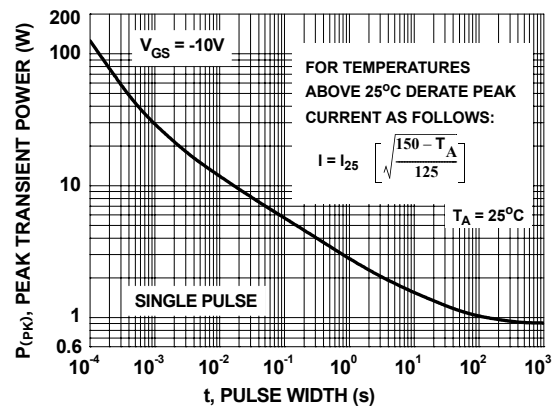
**Figure 9. Unclamped Inductive Switching Capability**



**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**  $T_J = 25^\circ\text{C}$  unless otherwise noted

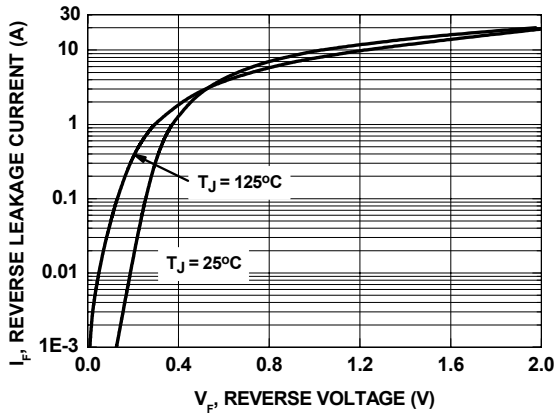


Figure 13. Schottky Diode Forward Voltage

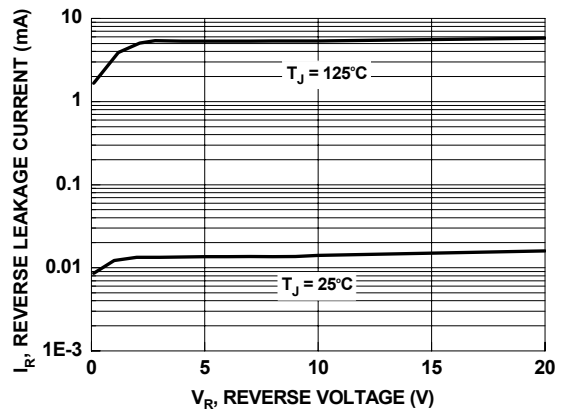


Figure 14. Schottky Diode Reverse Current

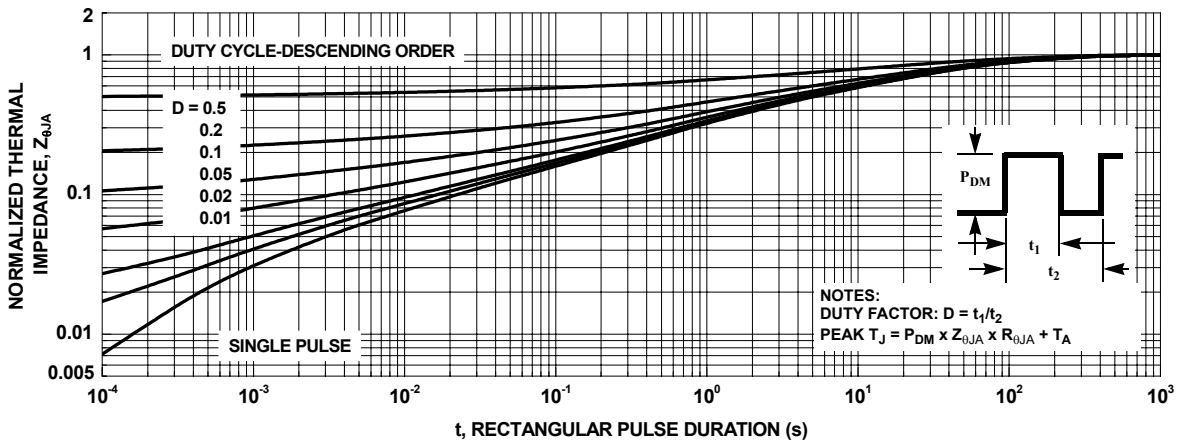


Figure 15. Transient Thermal Response Curve

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