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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



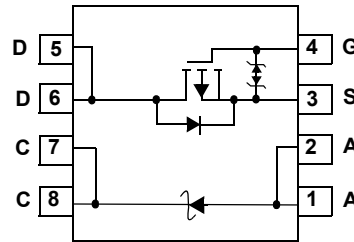
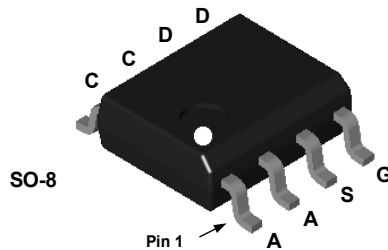
General Description

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	± 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°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	μA
I_{GSS}	Gate to Source Leakage Current	$V_{GS} = \pm 25\text{V}, V_{DS} = 0\text{V}$			± 10	μA

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°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 Ω
		$V_{GS} = -4.5\text{V}, I_D = -1.5\text{A}$		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		$V_{GS} = 0\text{V to } -10\text{V}$		6.6	9.3	nC
$Q_{g(4.5)}$	Total Gate Charge at -4.5V	$V_{GS} = 0\text{V to } -4.5\text{V}$	$V_{DD} = -10\text{V}$ $I_D = -3.0\text{A}$		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

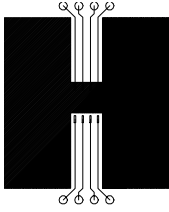
V_{SD}	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{V}, I_S = -2.0\text{A}$ (Note 3)		-0.9	-1.2	V
t_{rr}	Reverse Recovery Time	$I_F = -3.0\text{A}, di/dt = 100\text{A}/\mu\text{s}$		20	30	ns
Q_{rr}	Reverse Recovery Charge			14	21	nC

Schottky Diode Characteristics

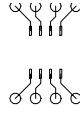
I_R	Reverse Leakage	$V_R = -20\text{V}$	$T_J = 25^\circ\text{C}$		-190	μA
			$T_J = 125^\circ\text{C}$		-66	mA
V_F	Forward Voltage	$I_F = 1\text{A}$	$T_J = 25^\circ\text{C}$		0.5	V
			$T_J = 125^\circ\text{C}$		0.39	
			$T_J = 25^\circ\text{C}$		0.58	
			$T_J = 125^\circ\text{C}$		0.53	

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 0.5in² 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 μs , Duty cycle < 2.0%.

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

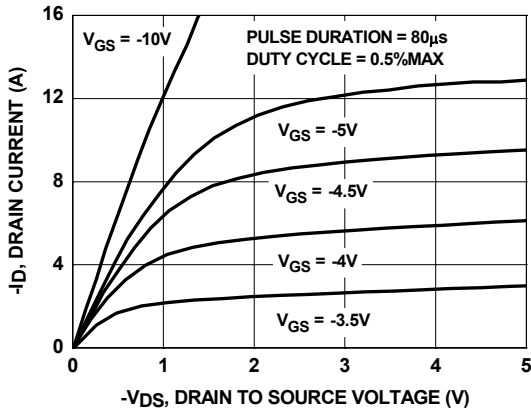


Figure 1. On Region Characteristics

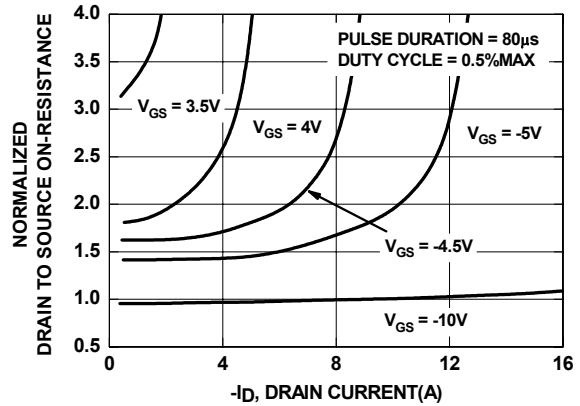


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

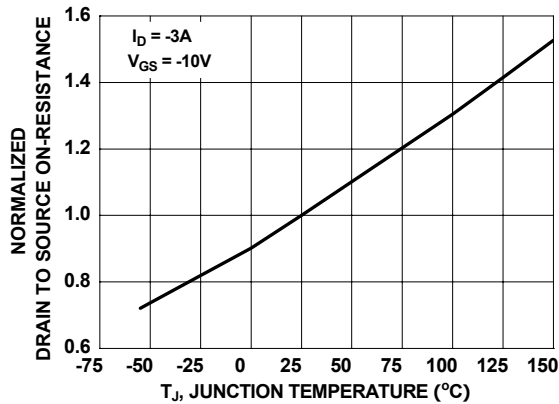


Figure 3. Normalized On-Resistance vs Junction Temperature

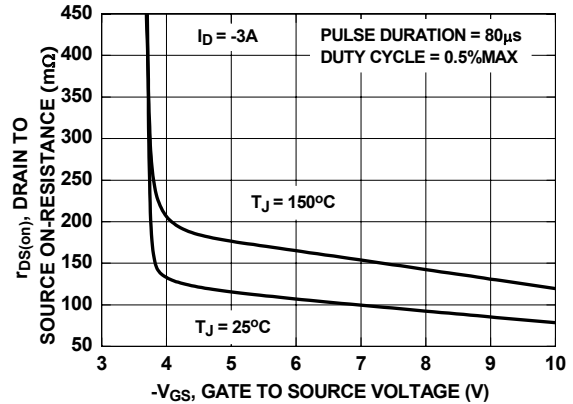


Figure 4. On-Resistance vs Gate to Source Voltage

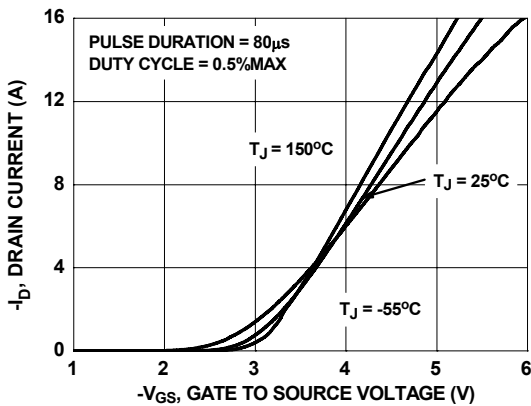


Figure 5. Transfer Characteristics

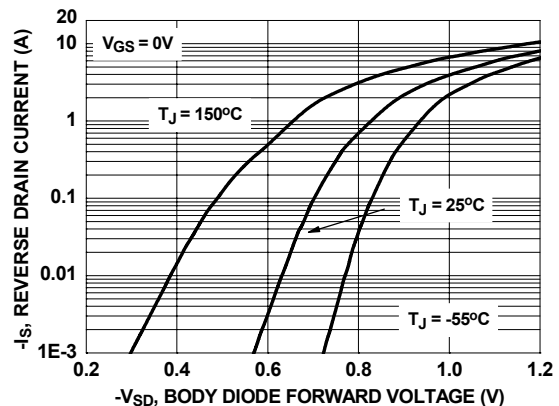


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

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

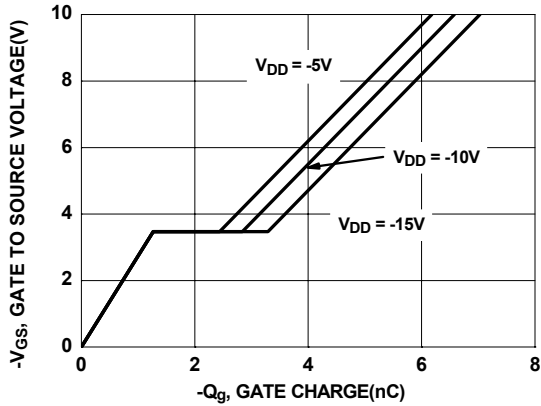


Figure 7. Gate Charge Characteristics

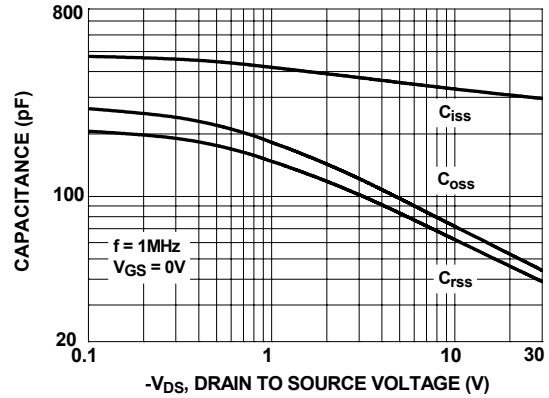


Figure 8. Capacitance vs Drain to Source Voltage

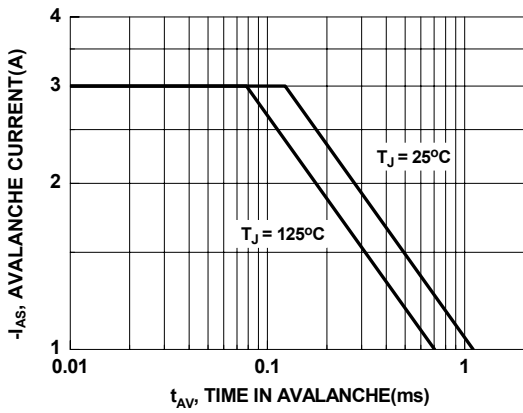


Figure 9. Unclamped Inductive Switching Capability

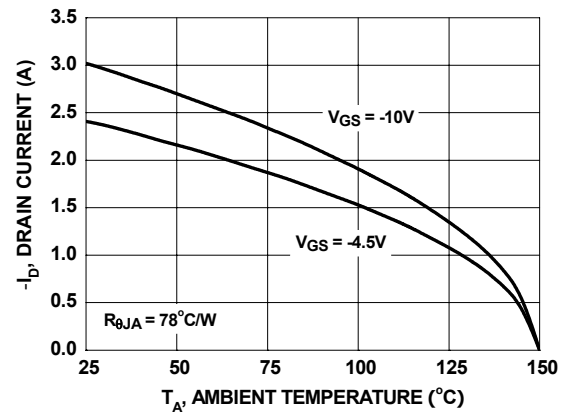


Figure 10. Maximum Continuous Drain Current vs Case Temperature

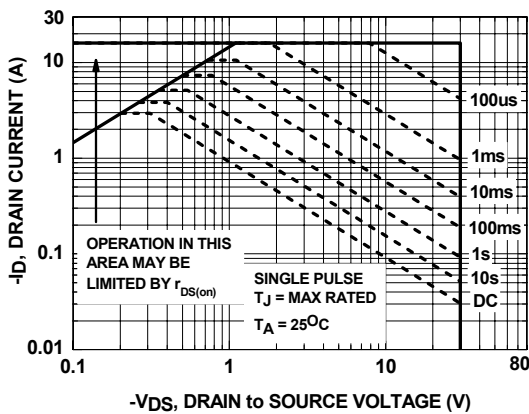


Figure 11. Forward Bias Safe Operating Area

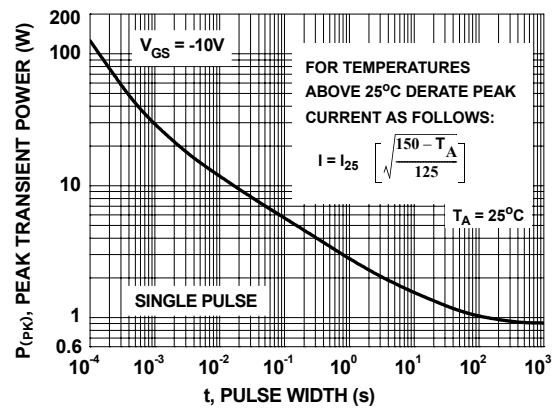


Figure 12. Single Pulse Maximum Power Dissipation

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

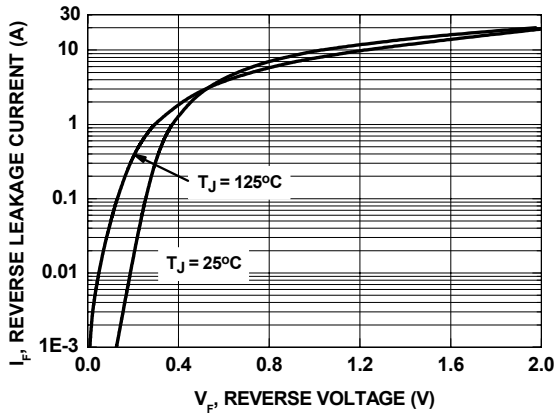


Figure 13. Schottky Diode Forward Voltage

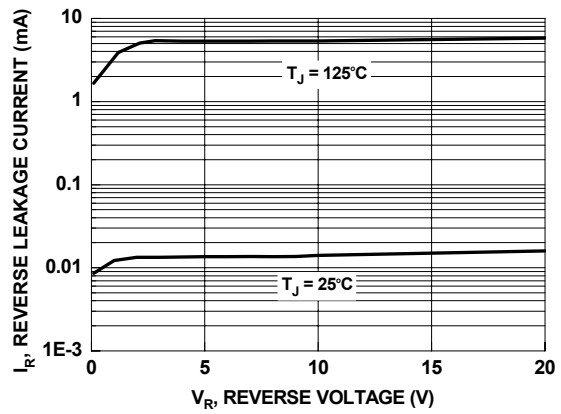


Figure 14. Schottky Diode Reverse Current

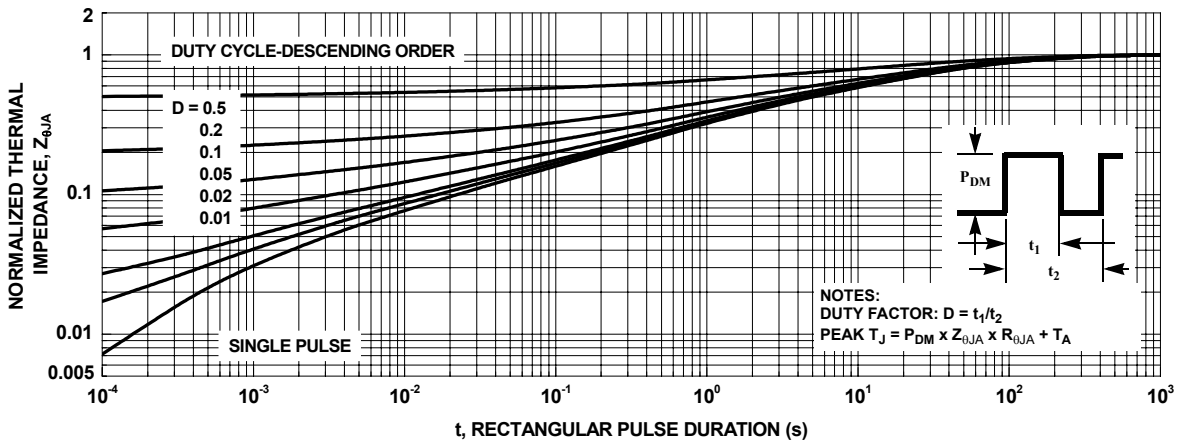






Figure 15. Transient Thermal Response Curve



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