

FDFC2P100

Integrated P-Channel PowerTrench® MOSFET and Schottky Diode

-20V, -3A, 150mΩ

Features

- Max $r_{DS(on)}$ = 150mΩ at $V_{GS} = -4.5V$, $I_D = -3.0A$
- Max $r_{DS(on)}$ = 200mΩ at $V_{GS} = -2.5V$, $I_D = -2.2A$
- Low Gate Charge (3.4nC typ)
- Compact industry standard SuperSOT™-6 package

Schottky:

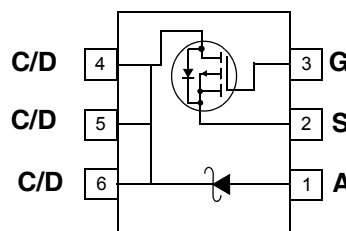
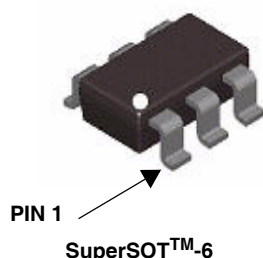
- $V_F < 0.45V$ at $I_F = 1A$
- RoHS Compliant



General Description

The FDFC2P100 combine the exceptional performance of Fairchild's PowerTrench MOSFET technology with a very low forward voltage drop Schottky barrier rectifier in an SSOT-6 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. Significant improvement of Thermal Characteristics and Power Dissipation via replacement of independently connected Schottky with internal connection of Schottky Diode Cathode pn to P-Channel PowerTrench MosFET Drain pin.



MOSFET Maximum Ratings $T_A = 25^\circ C$ unless otherwise noted

Symbol	Parameter	Ratings	Units
V_{DS}	Drain to Source Voltage	-20	V
V_{GS}	Gate to Source Voltage	± 12	V
I_D	Drain Current -Continuous (Note 1a)	-3	A
	-Pulsed	-6	
P_D	Power Dissipation (Note 1a) (Note 1b)	1.5	W
		0.8	
V_{RRM}	Schottky Repetitive Peak Reverse Voltage	20	V
I_O	Schottky Average Forward Current (Note 1a)	1	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)	87	$^\circ C/W$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1b)	166	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
.100	FDFC2P100	SSOT-6	7"	8mm	3000units

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	$I_D = -250\mu\text{A}$, $V_{GS} = 0\text{V}$	-20			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = -250\mu\text{A}$, referenced to 25°C		-12		mV/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{GS} = 0\text{V}$, $V_{DS} = -16\text{V}$			-1	μA
I_{GSS}	Gate to Source Leakage Current	$V_{GS} = \pm 12\text{V}$, $V_{DS} = 0\text{V}$			± 100	μA

On Characteristics

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$, $I_D = -250\mu\text{A}$	-0.6	-0.9	-1.5	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		3		mV/ $^\circ\text{C}$
$r_{DS(on)}$	Drain to Source On-Resistance	$V_{GS} = -4.5\text{V}$, $I_D = -3.0\text{A}$		95	150	m Ω
		$V_{GS} = -2.5\text{V}$, $I_D = -2.2\text{A}$		150	200	
		$V_{GS} = -4.5\text{V}$, $I_D = -3.0\text{A}$, $T_J = 125^\circ\text{C}$		130	252	
g_{FS}	Forward Transconductance	$V_{DS} = -5\text{V}$, $I_D = -3.0\text{A}$		5.4		S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = -10\text{V}$, $V_{GS} = 0\text{V}$, $f = 1\text{MHz}$		335	445	pF
C_{oss}	Output Capacitance			80	105	pF
C_{rss}	Reverse Transfer Capacitance			40	60	pF
R_g	Gate Resistance	$f = 1\text{MHz}$		6		Ω

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = -10\text{V}$, $I_D = -3.0\text{A}$ $V_{GS} = -4.5\text{V}$, $R_{GEN} = 6\Omega$		9	16	ns
t_r	Rise Time			11	20	ns
$t_{d(off)}$	Turn-Off Delay Time			12	22	ns
t_f	Fall Time			4	8	ns
$Q_{g(TOT)}$	Total Gate Charge at -10V	$V_{GS} = 0\text{V}$ to -10V	$V_{DD} = -4.5\text{V}$	3.4	4.7	nC
Q_{gs}	Gate to Source Gate Charge	$I_D = -3.0\text{A}$		0.9		nC
Q_{gd}	Gate to Drain "Miller" Charge			1.0		nC

Drain-Source Diode Characteristics

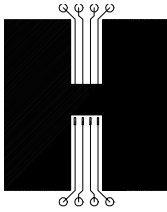
I _S	Maximum Continuous Drain to Source Diode forward Current				-1.2	A
V _{SD}	Source to Drain Diode Forward Voltage	V _{GS} = 0V, I _S = -1.2A (Note 2)		-0.8	-1.2	V
t _{rr}	Reverse Recovery Time	I _F = -3.0A, di/dt = 100A/μs		17		ns
Q _{rr}	Reverse Recovery Charge			5		nC

Schottky Diode Characteristics

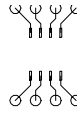
I_R	Reverse Leakage	$V_R = 20\text{V}$	$T_J = 25^\circ\text{C}$		26	400	μA
			$T_J = 100^\circ\text{C}$		2.7	20	mA
		$V_R = 10\text{V}$	$T_J = 25^\circ\text{C}$		23	200	μA
			$T_J = 100^\circ\text{C}$		2.5	10	mA
V_F	Forward Voltage	$I_F = 500\text{mA}$	$T_J = 25^\circ\text{C}$		0.31	0.4	V
			$T_J = 100^\circ\text{C}$		0.24	0.35	
		$I_F = 1\text{A}$	$T_J = 25^\circ\text{C}$		0.37	0.45	
			$T_J = 100^\circ\text{C}$		0.3	0.42	

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) 87°C/W when mounted on a 1in² pad of 2 oz copper



b) 166°C/W when mounted on a minimum pad

2: Pulse Test: Pulse Width $\leq$ 300 ms, Duty Cycle < 2.0%

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

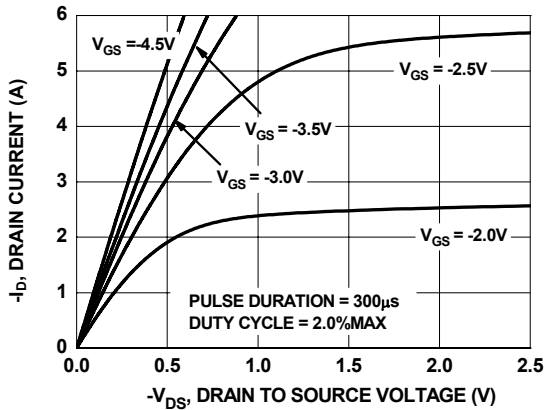


Figure 1. On Region Characteristics

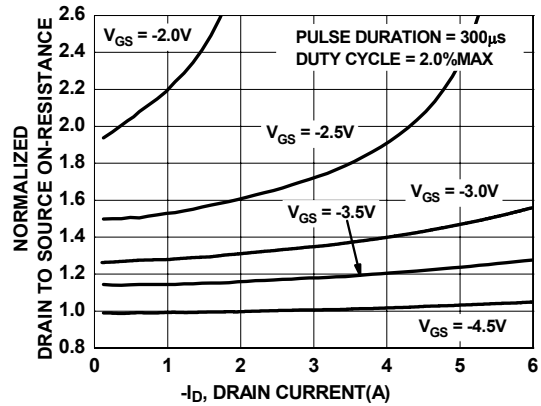


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

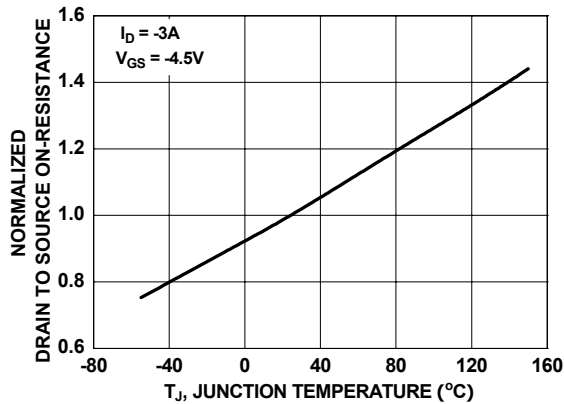


Figure 3. Normalized On-Resistance vs Junction Temperature

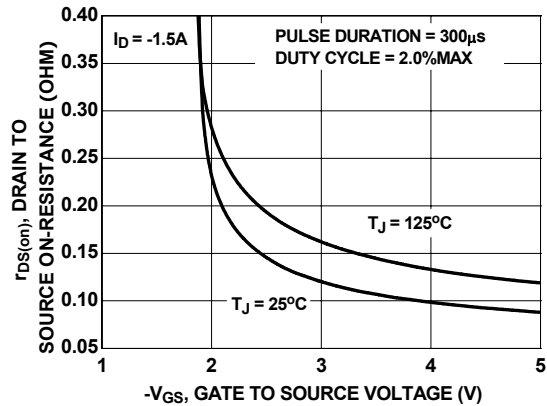


Figure 4. On-Resistance vs Gate to Source Voltage

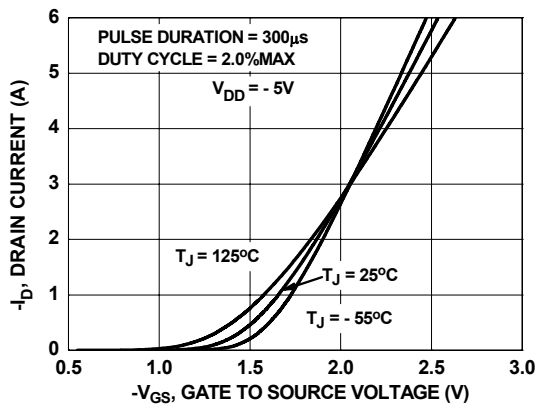


Figure 5. Transfer Characteristics

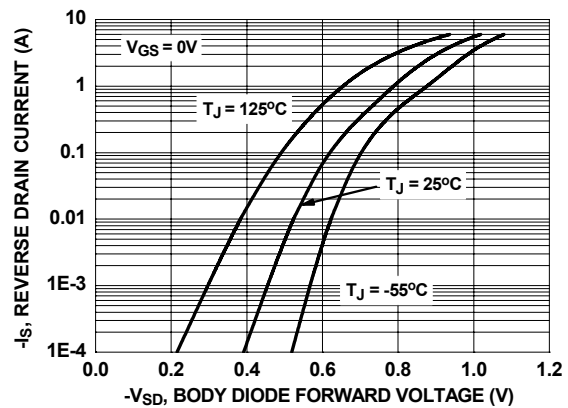


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

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

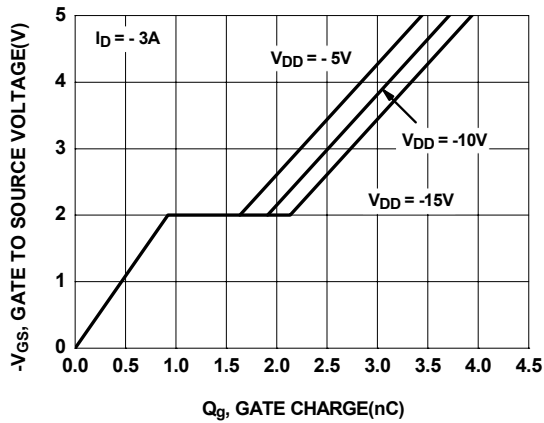


Figure 7. Gate Charge Characteristics

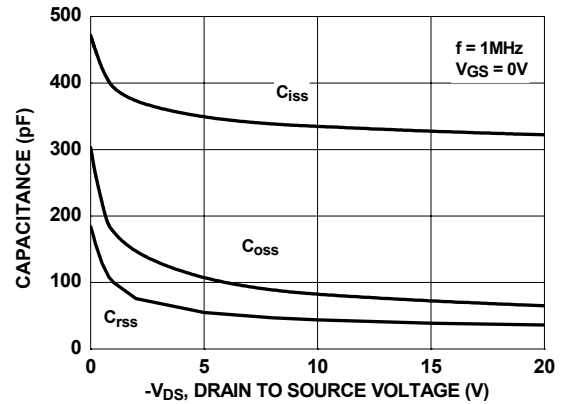


Figure 8. Capacitance vs Drain to Source Voltage

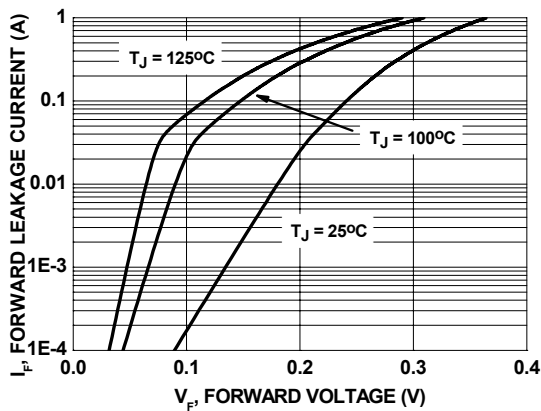


Figure 9. Schottky Diode Forward Voltage

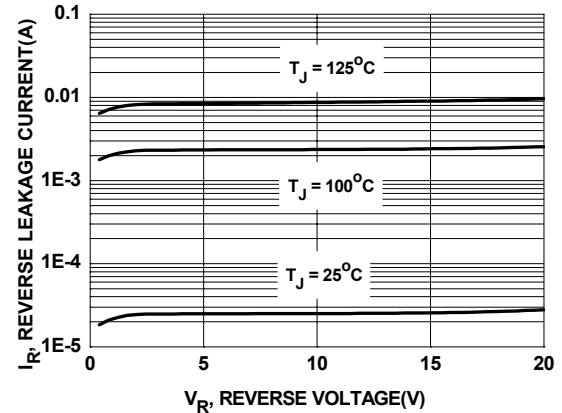


Figure 10. Schottky Diode Reverse Current

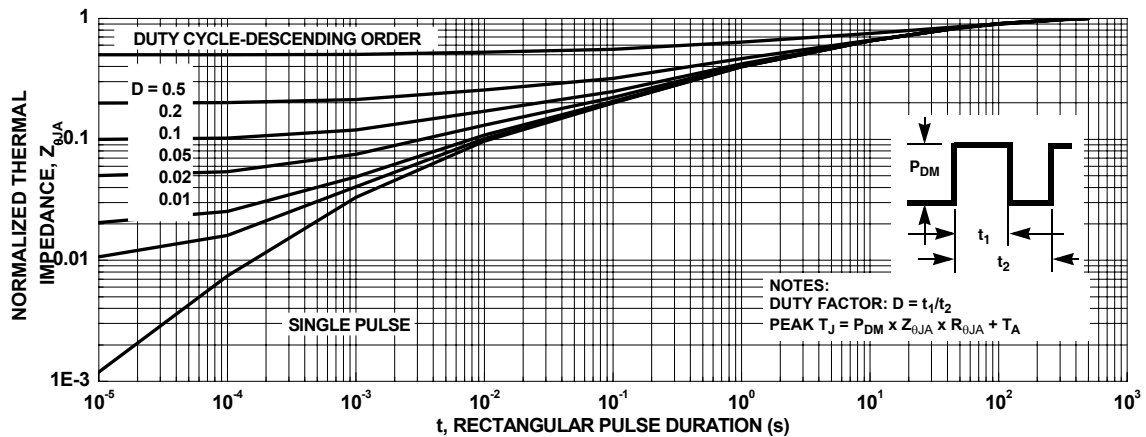


Figure 11. Transient Thermal Response Curve

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