FAIRCHILD SEMICONDUCTOR®

August 2006

FDFS6N754

Integrated N-Channel PowerTrench® MOSFET and Schottky Diode
30V, 4A, 56mΩ

Features

- Max $r_{DS(on)}$ = 56mΩ at V_{GS} = 0V, I_D = 4A

  Max $r_{DS(on)}$ = 75mΩ at V_{GS} = 4.5V, I_D = 3.5A
- 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
- Low Gate Charge (Qg = 4nC)
- Low Miller Charge

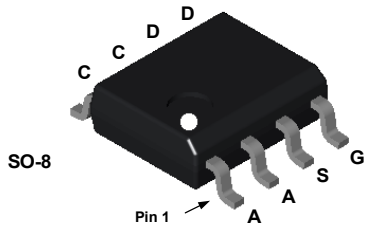
General Description

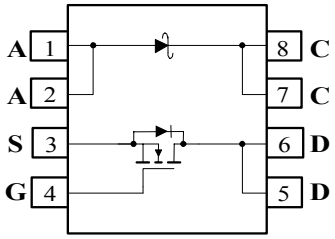
The FDFS6N754 combines the exceptional performance of Fairchild's PowerTrench MOSFET technology with a very low forward voltage drop Schottky barrier rectifier in an SO-8 package.

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.

Applications

- DC/DC converters





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		±20	V
I_D	Drain Current -Continuous	(Note 1a)	4	A
	-Pulsed		20	
P_D	Power Dissipation for Dual Operation		2	W
	Power Dissipation for Single Operation	(Note 1a)	1.6	
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 Temperature		-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	°C/W

Package Marking and Ordering Information

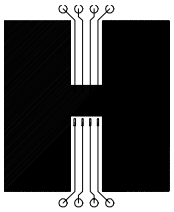
Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDFS6N754	FDFS6N754	SO-8	330mm	12mm	2500 units

Electrical Characteristics T_J = 25°C unless otherwise noted

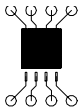
Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 250μA, V_{GS} = 0V	30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250μA, referenced to 25°C		24.5		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 24V, V_{GS} = 0V			1	μA
		V_{DS} = 24V, V_{GS} = 0V, T_J = 125°C			20	μA
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±20V, V_{DS} = 0V			±100	nA
On Characteristics (Note 2)						
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{DS} = V_{GS}, I_D = 250μA	1	1.7	2.5	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	I_D = 250μA, referenced to 25°C		-4.2		mV/°C
$r_{DS(on)}$	Drain to Source On Resistance	V_{GS} = 10V, I_D = 4A		42	56	mΩ
		V_{GS} = 4.5V, I_D =3.5A		53	75	mΩ
		V_{GS} = 10V, I_D = 4A, T_J = 125°C		61	81	mΩ
g_{FS}	Forward Transconductance	V_{DS} = 5V, I_D = 4A		10		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 15V, V_{GS} = 0V, f = 1.0MHz		225	299	pF
C_{oss}	Output Capacitance			80	107	pF
C_{rss}	Reverse Transfer Capacitance			42	63	pF
R_G	Gate Resistance	f = 1.0MHz		5.1		Ω
Switching Characteristics (Note 2)						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 15V, I_D = 1A, V_{GS} = 10V, R_{GS} = 6Ω		6	12	ns
t_r	Rise Time			8	16	ns
$t_{d(off)}$	Turn-Off Delay Time			20	32	ns
t_f	Fall Time			2	10	ns
$Q_{g(TOT)}$	Total Gate Charge at 10V	V_{DS} = 15V, I_D = 4A		4	6	nC
$Q_{g(5)}$	Total Gate Charge at 5V			2	3	nC
Q_{gs}	Gate to Source Gate Charge			0.6		nC
Q_{gd}	Gate to Drain “Miller” Charge			1		nC
Drain-Source Diode Characteristics and Maximum Ratings						
V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0V, I_S = 1.3A (Note 2)		0.8	1.2	V
t_{rr}	Reverse Recovery Time	I_F = 4A, di/dt = 100A/μs		13	20	ns
Q_{rr}	Reverse Recovery Charge	I_F = 4A, di/dt = 100A/μs		4	6	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:

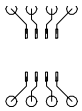
1: $R_{\theta JA}$ is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.



a) 78°C/W when mounted on a 0.5in^2 pad of 2 oz copper



b) 125°C/W when mounted on a 0.02 in^2 pad of 2 oz copper



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

Scale 1 : 1 on letter size paper

2: Pulse Test: Pulse Width < 300μs, Duty Cycle < 2.0%.