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Si4420DY*

Single N-Channel Logic Level PowerTrench® MOSFET

General Description

This N-Channel Logic Level MOSFET is produced using Fairchild Semiconductor's advanced PowerTrench process that has been especially tailored to minimize on-state resistance and yet maintain superior switching performance.

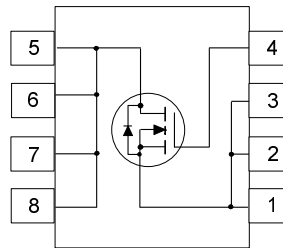
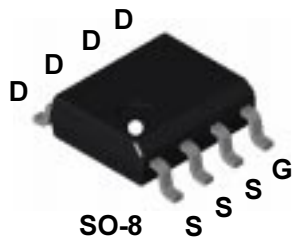
This device is well suited for low voltage and battery powered applications where low in-line power loss and fast switching are required.

Applications

- Battery switch
- Load switch
- Motor controls

Features

- 12.5 A, 30 V. $R_{DS(ON)} = 0.009 \Omega @ V_{GS} = 10 \text{ V}$
 $R_{DS(ON)} = 0.013 \Omega @ V_{GS} = 4.5 \text{ V}$
- Low gate charge.
- Fast switching speed.
- High performance trench technology for extremely low $R_{DS(ON)}$.
- High power and current handling capability.



Absolute Maximum Ratings T_A = 25°C unless otherwise noted

Symbol	Parameter	Ratings	Units	
V _{DSS}	Drain-Source Voltage	30	V	
V _{GSS}	Gate-Source Voltage	±20	V	
I _D	Drain Current - Continuous (Note 1a)	12.5	A	
		- Pulsed		50
P _D	Power Dissipation for Single Operation (Note 1a)	2.5	W	
		(Note 1b)		1.2
		(Note 1c)		1
T _J , T _{STG}	Operating and Storage Junction Temperature Range	-55 to +150	°C	

Thermal Characteristics

R _{θJA}	Thermal Resistance, Junction-to-Ambient (Note 1a)	50	°C/W
R _{θJC}	Thermal Resistance, Junction-to-Case (Note 1)	25	°C/W

Package Outlines and Ordering Information

Device Marking	Device	Reel Size	Tape Width	Quantity
4420	SI4420DY	13"	12mm	2500 units

* Die and manufacturing source subject to change without prior notification.

Electrical Characteristics $T_A = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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Off Characteristics

BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	30			V
$\frac{\Delta BV_{DSS}}{\Delta T_j}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$, Referenced to 25°C		33		mV/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 30\text{ V}, V_{GS} = 0\text{ V}$ $V_{DS} = 30\text{ V}, V_{GS} = 0\text{ V}, T_j = 55^\circ\text{C}$			1 5	μA
I_{GSSF}	Gate-Body Leakage Current, Forward	$V_{GS} = 20\text{ V}, V_{DS} = 0\text{ V}$			100	nA
I_{GSSR}	Gate-Body Leakage Current, Reverse	$V_{GS} = -20\text{ V}, V_{DS} = 0\text{ V}$			-100	nA

On Characteristics (Note 2)

$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$	1.0			V
$\frac{\Delta V_{GS(th)}}{\Delta T_j}$	Gate Threshold Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$, Referenced to 25°C		-4.5		mV/ $^\circ\text{C}$
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = 10\text{ V}, I_D = 12.5\text{ A}$ $V_{GS} = 4.5\text{ V}, I_D = 10.5\text{ A}$			0.009 0.013	Ω
$I_{D(on)}$	On-State Drain Current	$V_{GS} = 10\text{ V}, V_{DS} = 5\text{ V}$	30			A
g_{FS}	Forward Transconductance	$V_{DS} = 15\text{ V}, I_D = 12.5\text{ A}$		35		S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 15\text{ V}, V_{GS} = 0\text{ V},$ $f = 1.0\text{ MHz}$		2180		pF
C_{oss}	Output Capacitance			500		pF
C_{rss}	Reverse Transfer Capacitance			255		pF

Switching Characteristics (Note 2)

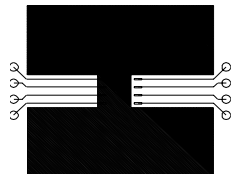
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 15\text{ V}, I_D = 1\text{ A}, R_L = 15\ \Omega$ $V_{GS} = 10\text{ V}, R_{GEN} = 6\ \Omega$		13	25	ns
t_r	Turn-On Rise Time			14	25	ns
$t_{d(off)}$	Turn-Off Delay Time			43	200	ns
t_f	Turn-Off Fall Time			15	70	ns
t_{rr}	Drain-Source Reverse Recovery Time	$I_F = 2.3\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$			90	nS
Q_g	Total Gate Charge	$V_{DS} = 15\text{ V}, I_D = 12.5\text{ A},$ $V_{GS} = 5\text{ V}$		23	53	nC
Q_{gs}	Gate-Source Charge			7		nC
Q_{gd}	Gate-Drain Charge			11		nC

Drain-Source Diode Characteristics and Maximum Ratings

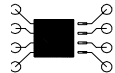
I_S	Maximum Continuous Drain-Source Diode Forward Current			2.3		A
V_{SD}	Drain-Source Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 2.3\text{ A}$ (Note 2)		0.72	1.1	V

Notes:

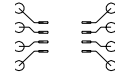
1: $R_{\theta JA}$ is the sum of the junction-to-case and case-to-ambient resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.



a) 50° C/W when mounted on a 1 in^2 pad of 2 oz. copper.



b) 105° C/W when mounted on a 0.04 in^2 pad of 2 oz. copper.



c) 125° C/W on a minimum mounting pad.

Scale 1 : 1 on letter size paper

2: Pulse Test: Pulse Width $\leq 300\ \mu\text{s}$, Duty Cycle $\leq 2.0\%$

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