FAIRCHILD

SEMICONDUCTOR ™

Si4542DY

## 30V Complementary PowerTrench®MOSFET

General Description

This complementary MOSFET device is produced using Fairchild's advanced PowerTrench process that has been especially tailored to minimize the on-state resistance and yet maintain low gate charge for superior switching performance.

Applications

- DC/DC converter
- Power management

Features

- **Q1**: **N-Channel**

  6 A, 30 V $R_{DS(on)} = 28$ mΩ @ $V_{GS} = 10$V

  $R_{DS(on)} = 35$ mΩ @ $V_{GS} = 4.5$V

- **Q2**: **P-Channel**

  –6 A, –30 V $R_{DS(on)} = 32$ mΩ @ $V_{GS} = -10$V

  $R_{DS(on)} = 45$ mΩ @ $V_{GS} = -4.5$V

SO-8

Pin 1
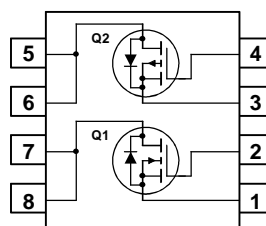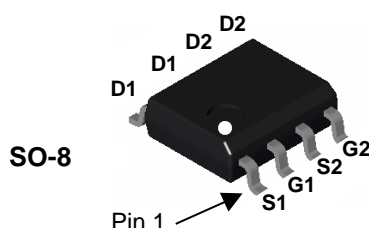
Absolute Maximum Ratings $T_A = 25°C$ unless otherwise noted

Symbol	Parameter		Q1	Q2	Units
V_{DSS}	Drain-Source Voltage		30	–30	V
V_{GSS}	Gate-Source Voltage		±20	±20	V
I_D	Drain Current - Continuous	(Note 1a)	6	–6	A
	- Pulsed		20	–20	
P_D	Power Dissipation for Dual Operation		2		W
	Power Dissipation for Single Operation	(Note 1a)	1.6		
		(Note 1b)	1.2		
		(Note 1c)	1		
T_J, T_{STG}	Operating and Storage Junction Temperature Range		–55 to +175		°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	Reel Size	Tape width	Quantity
4542	Si4542DY	13"	12mm	2500 units

Electrical Characteristics

$T_A = 25°C$ unless otherwise noted

Symbol	Parameter	Test Conditions	Type	Min	Typ	Max	Units
Off Characteristics							
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0$ V, $I_D = 250$ µA	Q1	30			V
		$V_{GS} = 0$ V, $I_D = -250$ µA	Q2	-30			
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250$ µA, Referenced to 25°C	Q1		23		mV/°C
		$I_D = -250$ µA, Referenced to 25°C	Q2		-21		
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 24$ V, $V_{GS} = 0$ V	Q1			1	µA
		$V_{DS} = -24$ V, $V_{GS} = 0$ V	Q2			-1	
I_{GSS}	Gate-Body Leakage	$V_{GS} = \pm 20$ V, $V_{DS} = 0$ V	Q1			± 100	nA
		$V_{GS} = \pm 20$ V, $V_{DS} = 0$ V	Q2			± 100	
On Characteristics (Note 2)							
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$, $I_D = 250$ µA	Q1	1	1.5	3	V
		$V_{DS} = V_{GS}$, $I_D = -250$ µA	Q2	-1	-1.7	-3	
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	$I_D = 250$ µA, Referenced to 25°C	Q1		-4		mV/°C
		$I_D = -250$ µA, Referenced to 25°C	Q2		4		
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = 10$ V, $I_D = 6$ A	Q1		19	28	mΩ
		$V_{GS} = 10$ V, $I_D = 6$ A, $T_J = 125°C$			32	48	
		$V_{GS} = 4.5$ V, $I_D = 5$ A			25	35	
		$V_{GS} = -10$ V, $I_D = -6$ A	Q2		21	32	
		$V_{GS} = -10$ V, $I_D = -6$ A, $T_J = 125°C$			29	51	
		$V_{GS} = -4.5$ V, $I_D = -5$ A			30	45	
$I_{D(on)}$	On-State Drain Current	$V_{GS} = 10$ V, $V_{DS} = 5$ V	Q1	20			A
		$V_{GS} = -10$ V, $V_{DS} = -5$ V	Q2	-20			
g_{FS}	Forward Transconductance	$V_{DS} = 15$ V, $I_D = 6$ A	Q1		18		S
		$V_{DS} = -10$ V, $I_D = -6$ A	Q2		16		
Dynamic Characteristics							
C_{iss}	Input Capacitance	Q1	Q1		830		pF
		$V_{DS} = 15$ V, $V_{GS} = 0$ V,	Q2		1540		
C_{oss}	Output Capacitance	f = 1.0 MHz	Q1		185		pF
		Q2	Q2		400		
C_{rss}	Reverse Transfer Capacitance	$V_{DS} = -15$ V, $V_{GS} = 0$ V,	Q1		80		pF
		f = 1.0 MHz	Q2		170		

Electrical Characteristics (continued)

$T_A = 25°C$ unless otherwise noted

Symbol	Parameter	Test Conditions	Type	Min	Typ	Max	Units
Switching Characteristics (Note 2)							
$t_{d(on)}$	Turn-On Delay Time	Q1	Q1		6	12	ns
		$V_{DS} = 15$ V, $I_D = 1$ A,	Q2		13	24	
t_r	Turn-On Rise Time	$V_{GS} = 10$V, $R_{GEN} = 6$ Ω	Q1		10	18	ns
			Q2		22	35	
$t_{d(off)}$	Turn-Off Delay Time	Q2	Q1		18	29	ns
		$V_{DS} = -15$ V, $I_D = -1$ A,	Q2		47	75	
t_f	Turn-Off Fall Time	$V_{GS} = -10$ V, $R_{GEN} = 6$ Ω	Q1		5	12	ns
			Q2		18	30	
Q_g	Total Gate Charge	Q1	Q1		9	13	nC
		$V_{DS} = 15$ V, $I_D = 7.5$ A, $V_{GS} = 5$ V	Q2		15	20	
Q_{gs}	Gate-Source Charge		Q1		2.8		nC
		Q2	Q2		4		
Q_{gd}	Gate-Drain Charge	$V_{DS} = -10$ V, $I_D = -6$ A, $V_{GS} = -5$V	Q1		3.1		nC
			Q2		5		

Drain-Source Diode Characteristics and Maximum Ratings

I_S	Maximum Continuous Drain-Source Diode Forward Current		Q1 Q2			1.3 −1.3	A
V_{SD}	Drain-Source Diode Forward Voltage	V_{GS} = 0 V, I_S = 1.3 A (Note 2) V_{GS} = 0 V, I_S = −1.3 A (Note 2)	Q1 Q2		0.7 −0.7	1.2 −1.2	V

Notes:

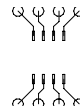**1.** $R_{\theta JA}$ is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.
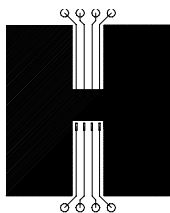
a) 78°C/W when mounted on a 0.5 in^2 pad of 2 oz copper
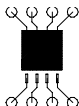
b) 125°C/W when mounted on a .02 in^2 pad of 2 oz copper

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

Scale 1 : 1 on letter size paper

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

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