

# Low-side Switch ICs [Surface-mount 4-circuits with Output Monitor] **SPF5012**

## Features

- Output monitor circuit (DIAG)
- DMOS 4ch output
- Allows ON/OFF using C-MOS logic level
- Built-in overcurrent, overvoltage and thermal protection circuits

## Absolute Maximum Ratings

(Ta=25°C)

Parameter	Symbol	Ratings	Unit	Conditions
Power supply voltage 1	V <sub>B</sub>	40	V	
Power supply voltage 2	V <sub>CC</sub>	7.5	V	
Output voltage	V <sub>O</sub>	40 (DC)	V	*1
Logic input voltage	V <sub>IN</sub>	-0.5 to +7.5	V	
Output current	I <sub>O</sub>	Self Limited	A	
Diag output voltage	V <sub>DIAG</sub>	0 to V <sub>CC</sub>	V	
Power Dissipation	P <sub>D</sub>	2.8 to 5	W	*2
Storage temperature	T <sub>stg</sub>	-40 to +150	°C	
Channel temperature	T <sub>ch</sub>	150	°C	
Output avalanche capability	E <sub>AV</sub>	100	mJ	Single pulse

\*1. At the clamping operation, refer to the section of V<sub>OUT (clamp)</sub> in electrical characteristics

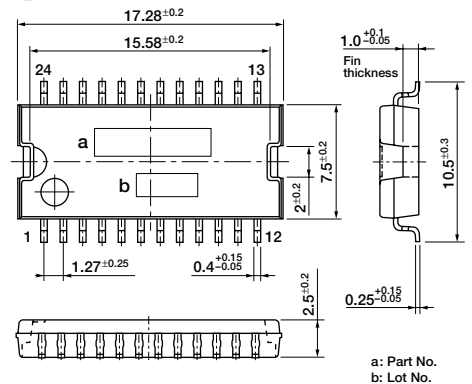
\*2. Changes by the pattern of mounted substrate

## Electrical Characteristics

(V<sub>B</sub>=14V, Ta=25°C unless otherwise specified)

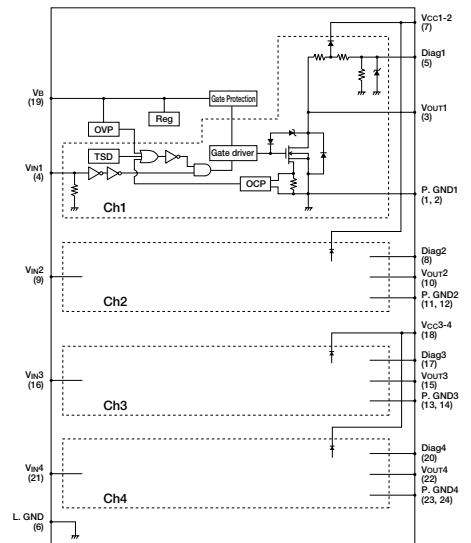
Parameter	Symbol	Ratings			Unit	Conditions
		min	typ	max		
Operating power supply voltage 1	V <sub>B (opr)</sub>	5.5		40	V	
Operating power supply voltage 2	V <sub>CC (opr)</sub>	4.5		5.5	V	
Quiescent circuit current	I <sub>q</sub>		4	6	mA	V <sub>B</sub> =14V, V <sub>IN</sub> =0V
Operating circuit current	I <sub>d</sub>		8	12	mA	V <sub>B</sub> =14V, V <sub>IN</sub> =5V
Input voltage	Hi output	V <sub>IN</sub>	3.5	5.5	V	V <sub>B</sub> =14V, V <sub>O</sub> =1A
	Lo output	V <sub>IN</sub>	-0.5	1.5	V	V <sub>B</sub> =14V
Input current	Hi output	I <sub>IN</sub>		50	μA	V <sub>B</sub> =14V, V <sub>IN</sub> =5V
	Lo output	I <sub>IN</sub>		-30	μA	V <sub>B</sub> =14V, I <sub>O</sub> 1A
Output ON resistance	R <sub>DS (ON)</sub>			0.3	Ω	V <sub>B</sub> =14V, I <sub>O</sub> =1A, Ta=125°C
				0.2	Ω	V <sub>B</sub> =14V, I <sub>O</sub> =1A, Ta=25°C
Output clamp voltage	V <sub>OUT (clamp)</sub>	45	50	55	V	V <sub>B</sub> =14V, I <sub>O</sub> =1A
Output leak current	I <sub>O H</sub>			2.8	mA	V <sub>B</sub> =14V, V <sub>CC</sub> =5V, V <sub>IN</sub> =0V, V <sub>O</sub> =40V, Ta=25°C
				900	μA	V <sub>B</sub> =14V, V <sub>CC</sub> =5V, V <sub>IN</sub> =0V, V <sub>O</sub> =14V, Ta=25°C
Forward voltage of output stage diode	V <sub>F</sub>			1.6	V	I <sub>F</sub> =1A
Overvoltage protection starting voltage	V <sub>B (ovp)</sub>	25		40	V	
Overvoltage protection hysteresis voltage	V <sub>B (ovp+hys)</sub>		8		V	
Thermal shutdown operating temperature	T <sub>TSD</sub>	151	165		°C	V <sub>B</sub> =14V
Overcurrent protection operating current	I <sub>S</sub>		6		A	V <sub>B</sub> =14V, Ta=-40°C
			6		A	V <sub>B</sub> =14V, Ta=25°C
			5		A	V <sub>B</sub> =14V, Ta=125°C
Output transfer time	T <sub>ON</sub>			12	μs	V <sub>B</sub> =14V, R <sub>L</sub> =14Ω, I <sub>O</sub> =1A
	T <sub>OFF</sub>			8	μs	
Output rise time	T <sub>r</sub>			5	μs	
Output fall time	T <sub>f</sub>			10	μs	
Output-diag voltage ratio	r <sub>a (DIAG)</sub>	0.195	0.2	0.205		V <sub>B</sub> =14V, V <sub>O</sub> =1 to 14V, R <sub>diag</sub> =500kΩ
Diag output clamping voltage	V <sub>DIAG (clamp)</sub>			4.85	V	V <sub>B</sub> =14V, V <sub>CC</sub> =5V, V <sub>O</sub> =40V

## External Dimensions (unit: mm)

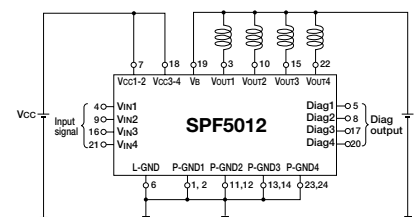


a: Part No.  
b: Lot No.

## Equivalent Circuit Diagram



## Circuit Example

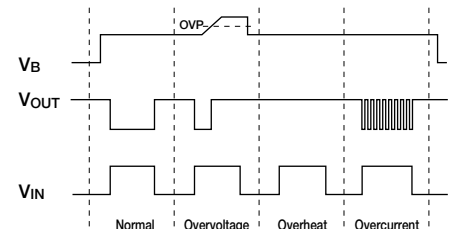


Truth table

V <sub>IN</sub>	V <sub>O</sub>
H	L
L	H

Short L-GND and P-GND in a pattern near the product.

## Timing Chart



\* Self-excited frequency is used in the overcurrent protection.