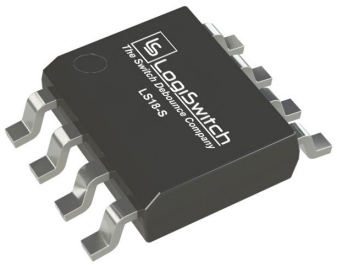
LogiSwitch

The Switch Debounce Company

LS10 Series Switch Debounce/Noise-Rejection IC Users Guide



General Description

The LogiSwitch LS10 Series (LS18, LS19, and LS20) of High Noise Immunity Debounce/Noise Filter ICs requires no external components and is designed to eliminate switch bounce in the most severe electrically hostile environments.

The LS10 Series of LogiSwitch debounce/noise filter chips features low-impedance 25mA totem-pole outputs for each channel. Inputs and outputs are of the same polarity and may be used in active high or active low roles. The LS10 Series utilizes LogiSwitch's proprietary NoBounce™ technology resulting in a high level of noise immunity. Noise spikes of any width less than the Clean Time (t_{cltm}) are prohibited from starting or terminating a cycle (see Operating Conditions on Page 7 for more details). The input of each channel includes an internal pull-up resistor, so the SPST switch requires just one pin (COM) tied to ground and the other (NO or NC) connected to a channel input of the device. All outputs are delayed the Clean Time (t_{cltm}) + the Bounce Time (t_{bnc}) on both activation and release regardless of the bounce duration (see Operating Conditions on Page 7 for more details).

Features

- Eliminates switch bounce.
- Utilizes adaptive NoBounce technology.
- High level of noise immunity.
- Eliminates noise spikes.
- No external components required (excluding decoupling capacitors – see notes on page 5).
- Low impedance 25mA totem pole output/channel.
- For use with single pole single throw (SPST) switch applications*.
- 3/6/9 channel options
- PDIP or SOIP package options

* Works with toggle switches, pushbutton switches, limit switches, microswitches, magnetic reed switches, etc.

Works with switches used in active high or active low roles.

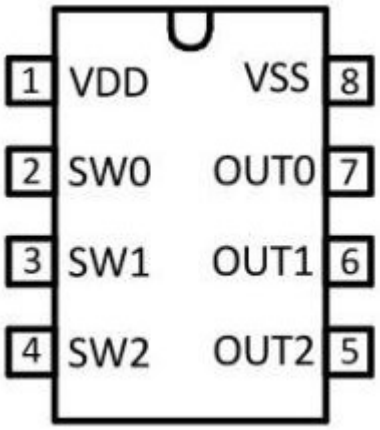
Works with switches with normally open (NO) or normally closed (NC) contacts.

Device Information

Part Number	Channels	Package	Size Information
LS18-P	3	PDIP (8)	Plastic DIP 300 mil
LS18-S	3	SOIC (8)	Narrow SOIC 150 mil
LS19-P	6	PDIP (14)	Plastic DIP 300 mil
LS19-S	6	SOIC (14)	Narrow SOIC 150 mil
LS20-P	9	PDIP (20)	Plastic DIP 300 mil
LS20-S	9	SOIC (20)	Wide SOIC 300 mil

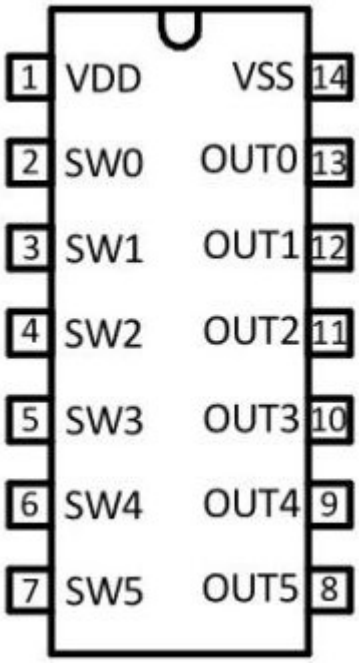
Pin Description LS18

Pin	Name	Function
1	VDD	+2.3 V to +5.5 V Supply Voltage
2	SW0	Normally Open Switch Input 0
3	SW1	Normally Open Switch Input 1
4	SW2	Normally Open Switch Input 2
5	OUT2	Normally High Output 2
6	OUT1	Normally High Output 1
7	OUT0	Normally High Output 0
8	VSS	Ground Reference (Switch Common)



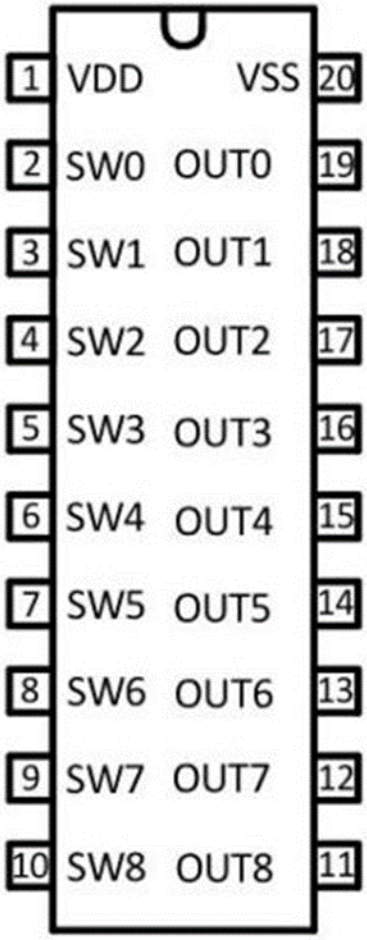
Pin Description LS19

Pin	Name	Function
1	VDD	+2.3 V to +5.5 V Supply Voltage
2	SW0	Normally Open Switch Input 0
3	SW1	Normally Open Switch Input 1
4	SW2	Normally Open Switch Input 2
5	SW3	Normally Open Switch Input 3
6	SW4	Normally Open Switch Input 4
7	SW5	Normally Open Switch Input 5
8	OUT5	Normally High Output 5
9	OUT4	Normally High Output 4
10	OUT3	Normally High Output 3
11	OUT2	Normally High Output 2
12	OUT1	Normally High Output 1
13	OUTO	Normally High Output 0
14	VSS	Ground Reference (Switch Common)



Pin Description LS20

Pin	Name	Function
1	VDD	+2.3 V to +5.5 V Supply
2	SWO	Normally Open Switch
3	SW1	Normally Open Switch
4	SW2	Normally Open Switch
5	SW3	Normally Open Switch
6	SW4	Normally Open Switch
7	SW5	Normally Open Switch
8	SW6	Normally Open Switch
9	SW7	Normally Open Switch
10	SW8	Normally Open Switch
11	OUT5	Normally High Output 8
12	OUT7	Normally High Output 7
13	OUT6	Normally High Output 6
14	OUTS	Normally High Output 5
15	OUT4	Normally High Output 4
16	OUT3	Normally High Output 3
17	OUT2	Normally High Output 2
18	OUT1	Normally High Output 1
19	OUTO	Normally High Output 0
20	VSS	Ground Reference



See the LS10 & LS100 Series applications note for help in locating pin 1.

CAD Models

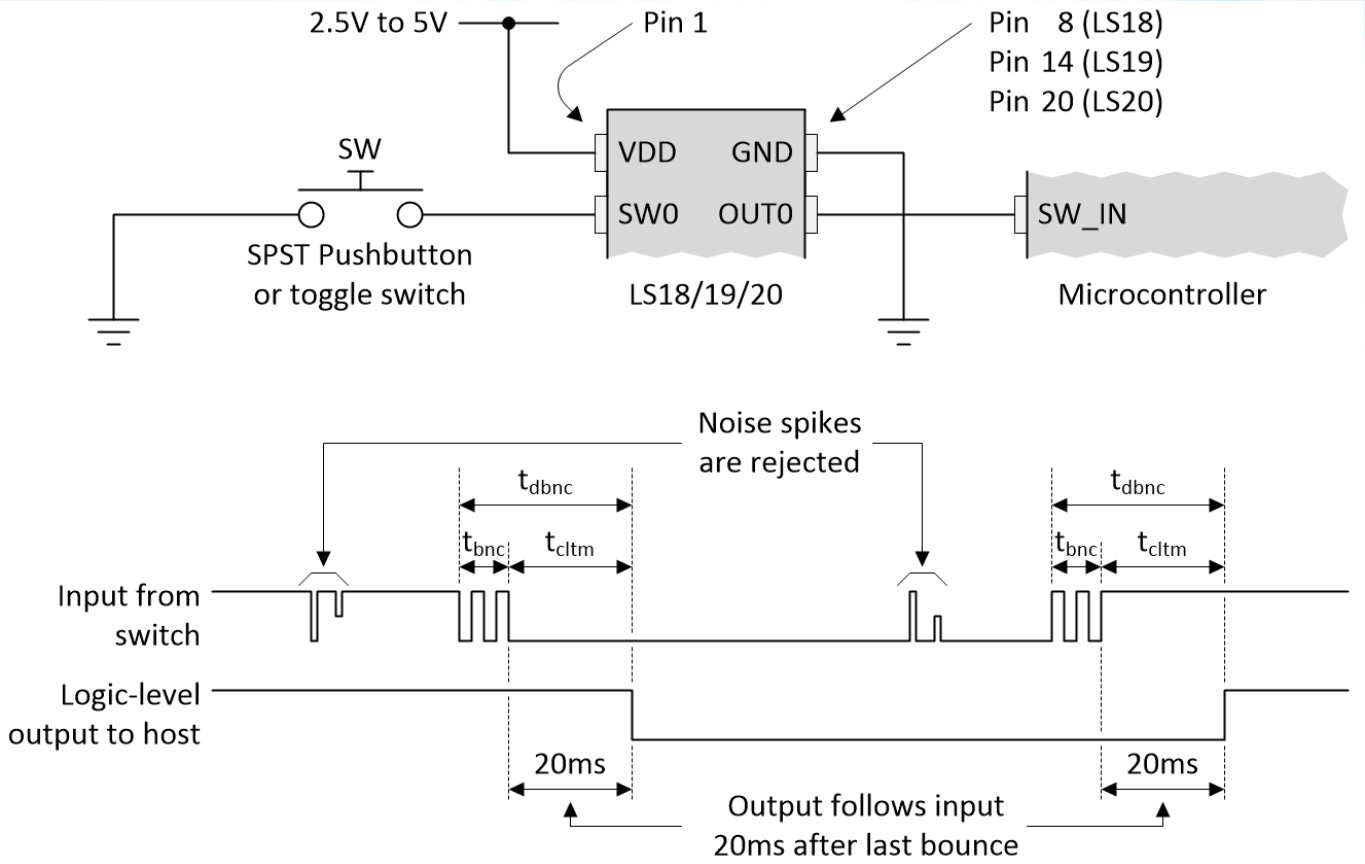
CAD models for the most popular CAD systems are available through SnapMagic as shown in the following table:

SnapMagic			
Part #	**Function**	**Package**	**SnapMagic Link**
LS18-P	3-Channel Debounce	8-Pin PDIP	Link
LS18-S	3-Channel Debounce	8-Pin SOIC	Link
LS19-P	6-Channel Debounce	14-Pin PDIP	Link
LS19-S	6-Channel Debounce	14-Pin SOIC	Link
LS20-P	9-Channel Debounce	20-Pin PDIP	Link
LS20-S	9-Channel Debounce	20-Pin SOIC	Link

Simply Plug and Play

The LS10 Series of debounce chips, like all LogiSwitch products, requires **no external clocks, no additional components or math calculations** based on the switch application. ***The LogiSwitch advanced adaptive debounce architecture does it all!***

LS10 Series Debounce

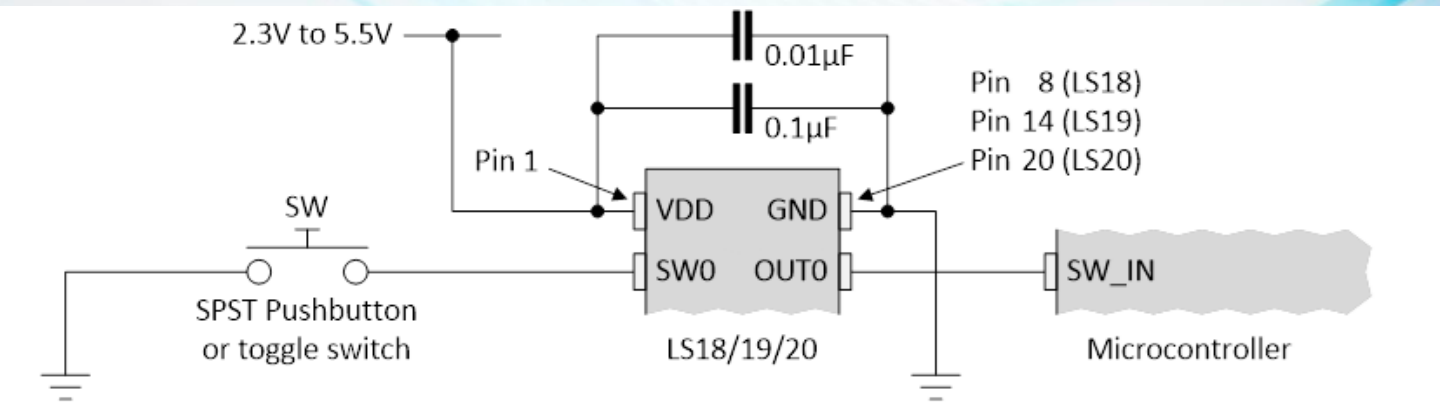


As you can see the LS10 series eliminates noise spikes and generates a clean output signal 20ms after the last switch bounce. The LS10 series devices are designed to function flawlessly in hostile electrical environments. These devices ignore noise spikes <20ms in duration.

Power Supply Decoupling Capacitors

LogiSwitch NoBounce ICs do not require decoupling capacitors except for electrically noisy environments or environments with weak power supplies.

In cases where decoupling capacitors are needed, add a 0.1µF decoupling capacitor between the power pin and the ground plane for each chip on the board. In the case of mission-critical or safety-critical designs, add a 0.01µF capacitor in parallel with the 0.1µF capacitor (for high-frequency noise).



For additional safety, add a 10uF Electrolytic capacitor between the power and ground planes as close as possible to where the supply enters the board.

LS10 Series Operating Conditions

Parameter	Min	Typ	Max	Units	Comments
Operating Temperature	-40		+85	°C	
t_{bnc} Bounce Time	0	~1		ms	Dependent on the switch
t_{cltm} Clean Time	18.6	20	21.4	ms	0°C -+85°C Vdd 2.5V – 5.5V
t_{cltm} Clean Time	17.6	20	22.4	ms	-40°C -+85°C Vdd 2.5V – 5.5V
t_{dbnc} Debounce Time	t_{bnc} + t_{cltm}				

Electrical Specifications

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Operating Voltage Range	Vcc		2.5		5.5	V
Supply Current - LS18	Icc	Vcc = 3.0 V, All Inputs Open		1.0	1.6	mA
Supply Current - LS19	Icc	Vcc = 3.0 V, All Inputs Open		2.1	2.6	mA
Supply Current - LS20	Icc	Vcc = 3.0 V, All Inputs Open		2.1	2.6	mA
Input Pull-up Current per Pin	Ipu	LS18	25	100	200	µA
Input Pull-up Current per Pin	Ipu	LS19, LS20	25	120	200	µA

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Supply current - LS18	Icc	Vcc = 3.0V, All Inputs Open		1	1.6	mA
Supply Current - LS19	Icc	Vcc = 3.0V, All Inputs Open		2.1	2.6	mA
Supply Current - LS20	Icc	Vcc = 3.0V, All Inputs Open		2.1	2.6	mA
Input Pull-up Current per Pin - Switch Closed	Ipu	LS18	25	100	200	uA
Input Pull-up Current per Pin - Switch Closed	Ipu	LS19, LS20	25	120	200	uA
Debounce Time	t_{dbnc}	Vcc = 2.5V to 5.5V		21		ms
Output Pin Drive Current	Iout	Source or Sink			25	mA
Temperature Range LS18, LS19, LS20	tmp		-40		+85	°C

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