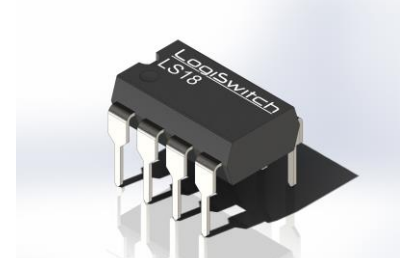


LS10 Series Switch Debounce/Noise-Rejection IC Users Guide



General Description

The LogiSwitch LS10 Series (LS18, LS19, and LS20) of High Noise Immunity Debounce/Noise Filter ICs was designed for trouble-free use in the most severe electrically hostile environments.

The LS10 Series of LogiSwitch debounce/noise filter chips features low-impedance 25 mA totem-pole outputs for each channel. Outputs and inputs are of the same polarity and may be selected for use as active high or active low. The LS10 Series utilizes LogiSwitch's proprietary NoBounce™ technology resulting in a high level of noise immunity. Noise spikes of less than 20 ms duration are prohibited from starting or terminating a cycle.

The input of each channel includes an internal pull-up resistor so the SPST interface requires just one pin (NO or COM) tied to ground and the other to a channel input of the device. All outputs are delayed for a period of 20 ms + bounce time on both activation and release regardless of the bounce duration.

Features

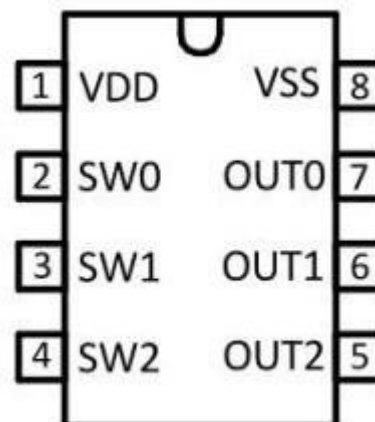
- Eliminates switch bounce.
- Utilizes adaptive NoBounce technology.
- High level of noise immunity.
- Eliminates < 20 ms noise spikes.
- Low impedance 25 mA totem pole output/channel.
- May be used in 2-position toggle switch On/Off applications.

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 |

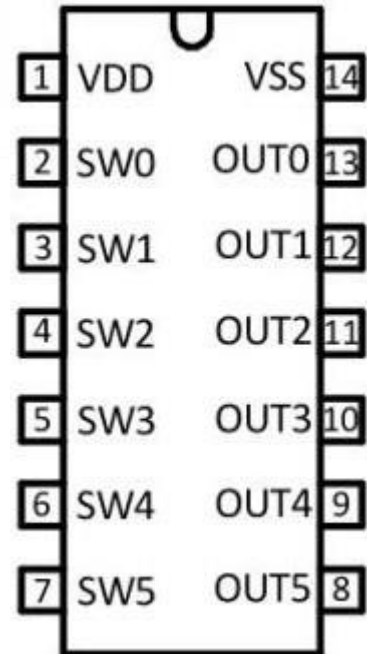
Pin Description LS18

| 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) |



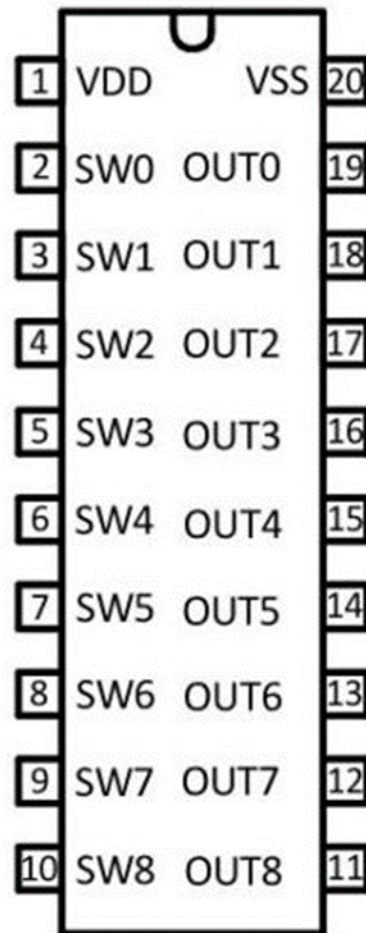
Pin Description LS19

| 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 | OUT0 | 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 | SW0 | 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 | OUT0 | Normally High Output 0 |
| 20 | VSS | Ground Reference |



Simply Plug and Play

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

LS10 Series Operating Conditions

| Parameter | Min | Typ | Max | Units |
|---------------------------------|-------------------------------------|-----|-----|-------|
| Operating Temperature | -40 | | +85 | °C |
| t_{bnc} Bounce Time | 0 | ~1 | | ms |
| t_{dbnc} Debounce Time | $t_{\text{dbnc}} + t_{\text{cltm}}$ | | | |
| t_{cltm} Clean Time | 20 | 20 | 20 | ms |

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 |
| Debounce Time | tdbnc | Vcc = 2.5 V to 5.5 V | | 21 | | ms |

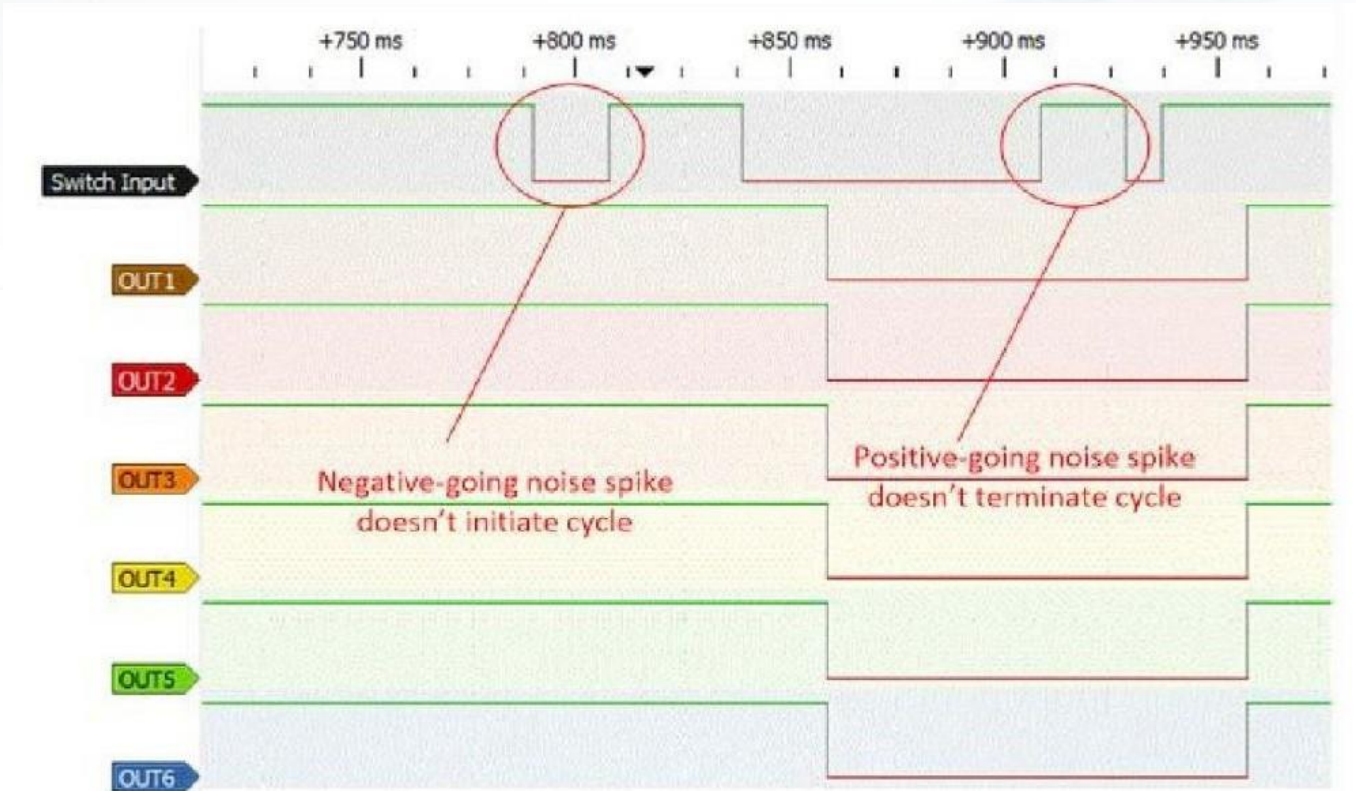
| Parameter | Symbol | Conditions | Min | Typ | Max | Units |
|---|--------|-----------------------------|-----|-----|-----|-------|
| Supply current - LS18 | icc | Vcc = 3.0V, All Inputs Open | | 1 | 1.6 | mA |
| Supply Current - LS19 | icc | Vcc = 3.0V, All Inputs Open | | 2.1 | 2.6 | mA |
| Supply 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 | tdbnc | Vcc = 2.5V to 5.5V | | 21 | | ms |
| Output Pin Drive Current | lout | Source or Sink | | | 25 | mA |
| Temperature Range LS18, LS19, LS20 | tmp | | -40 | | 125 | °C |

CAD Libraries

CAD libraries for the most popular CAD systems are available through SnapEDA as shown in the following table:

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

Logic Analyzer Capture of a LS10 Series IC Cycle



This logic analyzer capture of an LS10 series switch service cycle shows a noisy switch input commonly applied to all six device channels. Note the initial 19 ms low-going glitch at approximately +780 ms does not start a cycle, and the following 19ms high-going glitch at approximately +915 ms does not terminate the cycle. LS10 series devices are designed to function flawlessly in hostile electrical environments. These devices ignore any uninvited transitional pulses of < 20ms duration.