

BL59A66 datasheet

1. Introduction:

The BL59A66 is a low-current BiCMOS circuit providing all of the features for a photoelectric type smoke detector. BL59A66 can be used in conjunction with an infrared photoelectric chamber to sense scattered light from smoke particles. Special features are incorporated in the design to facilitate calibration and testing of the finished detector.

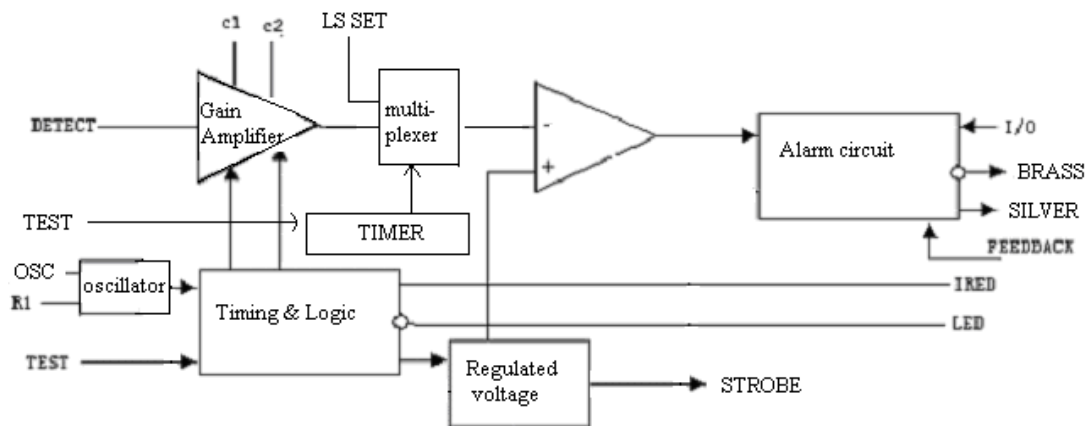
2.1 Applied Area:

Photoelectric Type Smoke Detector System.

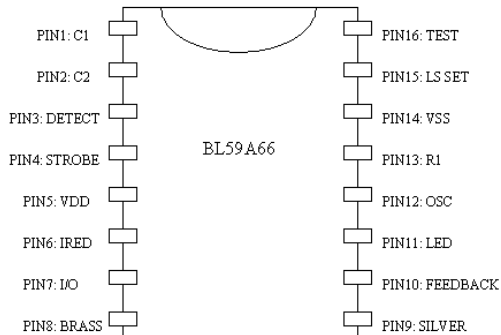
2.2 Features:

- 2.2.1 6 V to 12 V Operating Voltage Range
- 2.2.2 Internal Timer & Control for Reduced Sensitivity
- 2.2.3 Supply Voltage current: 0~10uA
- 2.2.4 Operating Temperature Range: $-25\sim 75^{\circ}\text{C}$
- 2.2.5 Power-ON Reset
- 2.2.6 ESD and Latch-up Protection Circuitry on All Pins
- 2.2.7 Piezoelectric Horn Driver
- 2.2.8 Interconnect Up to 50 Detectors
- 2.2.9 Continuous Modulated Tone Output For a Local or Remote Alarm Condition

2.3 FUNCTIONAL BLOCK DIAGRAM



2.4 Pin Description



2.5 Pin function

| Pin No. | Pin symbol | Input/Output | Function Description | |
|---------|---------------|--------------|---|--|
| 1,2 | C1, C2 | | Exterior capacitor connected to the pins | A capacitor connected to the pins determines the gain of the photo amplifier. |
| 3 | DETECT | Input | Input to the photo amplifier | This pin connects the cathode of the photo diode. The photo diode is operated at zero bias. |
| 4 | STROBE | Output | Regulated voltage Output | The pin is the Regulated voltage Output. The value is Vdd-5V. |
| 5,14 | Vdd, Vss | | Power/Gnd | Power supply |
| 6 | IRED | Output | Signal output | This pin is a output, which provides a pulsed base current for the external npn transistor, which drives the IR emitter. |
| 7 | I/O | | | A connection at this pin allows multiple smoke detectors (less than 50) to be interconnected. |
| 8,9 | BRASS, SILVER | Output | Piezoelectric Transducer Output | These TWO pins are used in conjunction with a piezoelectric transducer. |
| 10 | FEEDBACK | Input | Piezoelectric Transducer Input | The pin is used in conjunction with a piezoelectric transducer feedback electrode. |
| 11 | LED | Output | Signal output | This open-drain NMOS output is used to directly drive a visible LED. The LED also indicates detector status as follows (with component values as in the typical application, all times nominal) |
| 12 | OSC | Input | OSC Input | The pin connects with exterior capacitor and resistor, sets the internal clock low time. |
| 13 | R1 | | Exterior capacitor and resistor connected to the pins | The pin connects with exterior capacitor and resistor, sets the internal IRED output pulse period. |
| 15 | LS SET | Input | Low sensitive set | This input pin serves two purposes in normal operation. This reference is established by a resistive divider between VDD and STROBE. This allows the detector to have a different sensitivity set point during the timer mode. |
| 16 | TEST | Input | Test Input | This pin has an internal pull-down device and is used to manually invoke two test modes and a Timer Mode. |

3. Circuit characteristic:

- 3.1 The gain is determined by exterior capacitor C1 and C2. A capacitor connected to C2 determines the gain of the photo amplifier during standby. A typical value for this low-gain mode is 4700 pF but should be selected based on a specific photo chamber and the desired level of sensitivity to smoke. $AV \approx 1 + (C2/10)$ where C2 is in pF. This gain increases by a nominal 10% after a local alarm is detected (three consecutive detections).
- 3.2 I/O pin allows multiple smoke detectors to be interconnected. If a local smoke condition occurs, this pin is driven high. As an input, this pin is sampled nominally every 1.35 seconds during standby. Any local alarm condition causes I/O to be ignored as an input.
- 3.3 LED pin is a output pin, which is used to directly drive a visible LED. The load for the low-battery test is applied to this output. The low-battery test does not occur coincident with any other test or alarm signal. The LED also indicates detector status as follows (with component values as in the typical application, all times nominal):
 - Standby - Pulses every 43 seconds.
 - Local Smoke - Pulses every 0.67 second.
 - Remote Alarm - No pulses.
 - Test Mode - Pulses every 0.67 second.
 - Timer Mode - Pulses every 10 seconds.

4. Circuit characteristic parameter:

4.1 Absolute Maximum Rating

(Voltages are referenced to VSS)

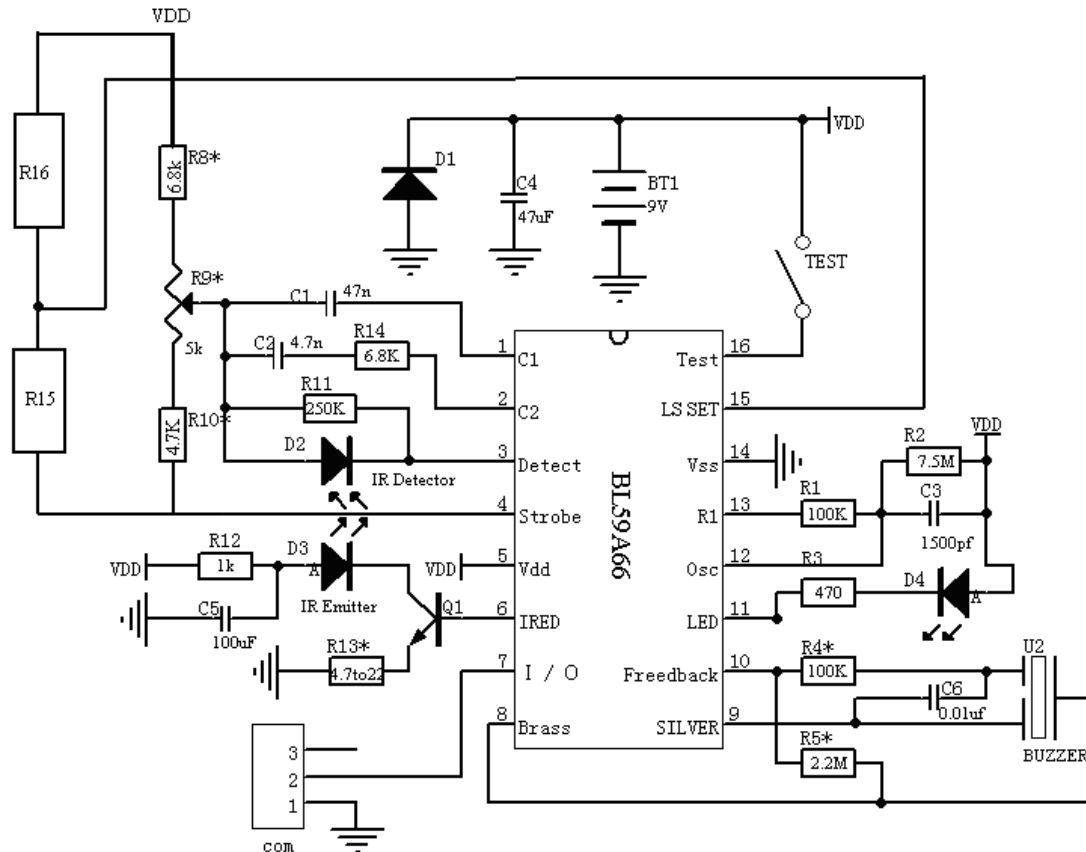
| Symbol | Parameter | Range | Unit |
|------------------|-----------------------|--------------|------|
| VDD | Supply Voltage | -0.5~+15 | V |
| VIN | Input Voltage | -0.3~VDD+0.3 | V |
| IIN | Input Current | 10 | mA |
| T _A | Operating Temperature | -25 ~ +75 | °C |
| T _{stg} | Storage Temperature | -55 ~ +125 | °C |
| T _L | Welding Temperature | 260 | °C |

4.2 DC characteristic (Voltages are referenced to VSS)

| Symbol | Parameter | Conditions | VDD | Min. | Max. | Unit |
|--------|--|---|-----|----------|----------|------|
| VDD | Supply Voltage Range | | - | 6.0 | 12 | V |
| VTH | Low VDD(th) threshold | | — | 6.9 | 7.5 | V |
| IDD | Operating Supply Current | Standby | 12 | — | 10 | uA |
| iDD | Operating Supply Current | Strobe on IRED off | 12 | - | 2.0 | mA |
| VIL | Low-Level Input Voltage | | | | | V |
| | I/O | | 9.0 | | 1.5 | |
| | Feedback | | 9.0 | | 2.7 | |
| | Test | | 9.0 | | 7.0 | |
| | LS SET | | 9.0 | | 0.5 | |
| VIH | High-Level Input Voltage | | 9.0 | | | V |
| | I/O | | 9.0 | 3.2 | | |
| | Feedback | | 9.0 | 6.3 | | |
| | Test | | 9.0 | 8.5 | | |
| | LS SET | | 9.0 | 1.6 | | |
| IIH | Input Leakage High | | | | | nA |
| | C1, C2 | Vin=VDD, Strobe active Pin 12=Vdd | 12 | | 100 | |
| | Detect, Feedback, OSC | Vin=VDD | 12 | | 100 | |
| IIL | Input Leakage Low | | | | | nA |
| | C1, C2, Detect | Vin=VST, Strobe active, Pin 12=Vdd | 12 | | -100 | |
| | Feedback, OSC | Vin=VSS | 12 | | -100 | |
| | LS SET, TEST | Vin=VSS | 12 | | -1.0 | |
| IIN | Input Pull-Down Current | | | | | uA |
| | Test, LS SET | Vin=VDD | 9.0 | 0.25 | 10 | |
| | I/O | No Local Alarm, Vin=VDD | 12 | 20 | 80 | |
| | I/O | No Local Alarm, Vin=17V | 12 | — | 140 | |
| VOL | Low-Level Output Voltage | | | | | V |
| | LED | I _o =10mA | 6.5 | | 0.6 | |
| | BRASS,SILVER | I _o =16mA | 6.5 | | 1.0 | |
| | R1 | I _o =5mA | 6.5 | | 0.5(typ) | |
| VOH | High-Level Output Voltage BRASS, SILVER | I _o =-16mA | 6.5 | 5.5 | - | V |
| VST | Strobe Output Voltage | | | | | V |
| | Strobe | Inactive, I _{out} =-1uA | 12 | VDD-0.1 | - | |
| | | Inactive, I _{out} =100uA to 500uA | 9.0 | VDD-5.25 | Vdd-4.75 | |
| IOH | High-Level Output Current I/O | Any Alarm Condition , V _o =VDD-2V | 9.0 | -4 | - | mA |
| IOZ | OFF Leakage Current High LED,R1 | V _{out} =V _{ss} | 12 | - | -1 | uA |

| | | | | | | |
|------|---------------------------------------|---------------------|---|---------|---------|---|
| VIC | Common Mode Voltage C1, C2, Detect | Any Alarm Condition | — | VDD-4 | VDD-2 | V |
| Vref | Smoke Comparator Ref. Volt. | Any Alarm Condition | — | VDD-3.7 | VDD-3.3 | V |

5. TYPICAL APPLICATION



6. Calibration Mode Description

For sensitive detecting and calibrating smoke system, BL59A66 could set calibration Mode. If TEST=V_{SS}-1V, and draining 100uA current from the pin. After one period, BL59A66 is in calibration Mode. If TEST pin is high impedance condition with one period, BL59A66 exit calibration Mode. The following table is shown the relative descriptions of calibration Mode.

| PIN Symbol | Function |
|-------------|---|
| 7:I/O | This pin is disabled as an output. A logic high on this pin places the photo amplifier output on pin 1 or pin 2 as determined by pin 15. The amplifier output appears as pulses. |
| 15:LS SET | If the I/O pin is high, this pin controls the amplifier gain capacitor. If pin 15 is low, normal gain is selected and the amplifier output is on pin 1. If pin 15 is high, supervisory gain is selected and the amplifier output is on pin 2. |
| 10:FEEDBACK | If pin 7 is high and pin 15 is low (normal gain), taking this pin to a high logic level increases the amplifier gain by ~10% (hysteresis). |
| 12:OSC | This pin may be driven by an external clock source. |
| 8:BRASS | This pin is reconfigured as the smoke integrator output. Three consecutive smoke detections will cause this pin to go high and three consecutive no smoke detections cause this pin to go low. |
| 11:LED | This pin becomes a low-battery indicator. The open-drain NMOS output is normally OFF. If VDD falls below the low battery threshold, the output turns on. |