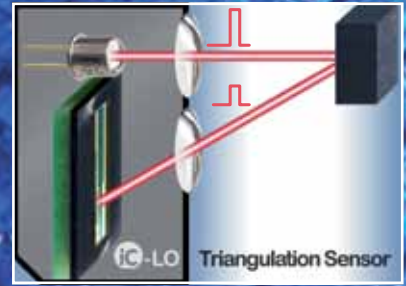


iC-LO SMART TRIANGULATION SENSOR IC



iC-LO is suitable for diffuse reflective photoelectric sensors based on the principle of triangulation. The iC-LO requires only a few external components: a transmitting LED, a low-cost micro-controller, and an output driver.

The photodiode currents are assigned to two AC amplifiers (near and far channel) ensuring suppression of low-frequency interference and ambient light. A programmable filter evaluates multiple measurements and generates the switching output signal SO and a warning message, indicating weak light conditions.

The transimpedance amplifier's gain is dynamically adjusted to the received light intensity. The logarithmic characteristic results in a wide dynamic range coping with powerful signals of reflective objects.

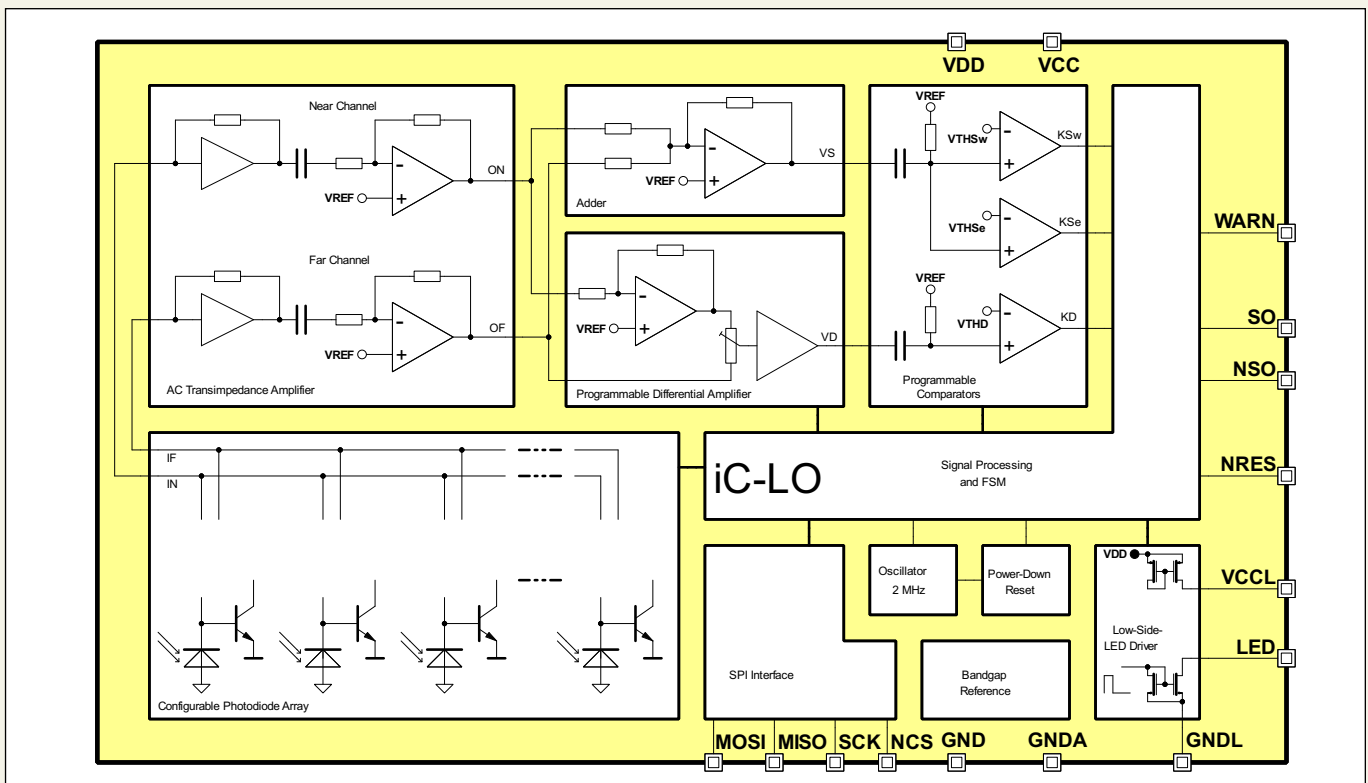
The lowside LED driver output can directly operate the LED or control an external driver. iC-LO is configured using an SPI interface.

Features

- High switching frequency of up to 13.9 kHz
- Detection latency down to 8.5 μ s
- Specially formed line image sensor with 129 elements
- High ambient light suppression of up to 100 kLux with optional filter glass
- Dynamic range of 100 dB
- 2 complementary switching outputs
- Warning message output
- Power-down reset indication output
- SPI controller interface
- Register write protection

Applications

- Diffuse reflective photoelectric sensors



iC-LO

SMART TRIANGULATION SENSOR IC

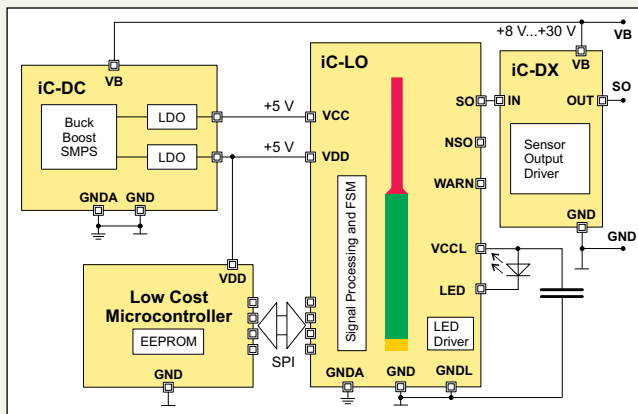
iC-LO's photodiode array is partitioned by configuration into a near and far channel. The photocurrents are channelwise added, converted to voltages and amplified, and feed a differential comparator. When the outgoing light pulse is reflected by the object, the incoming spot moves along the array according to the object distance.

Is the object within the defined near range, the near channel receives the larger signal and switching output SO is set high. Weak light detection is performed by comparing the sum of both channel signals applying a programmable threshold.

Each measurement cycle consists of several individual measurements to suppress noise; a finite response filter is used for evaluation. The switching output (SO) and warning output (WARN) always result from filtered cycles. A configurable rise delay permits peak suppression, a configurable fall delay provides a minimum pulse duration.

The internal oscillator can be calibrated to adjust the system's timing. A status register provides information on the transimpedance level and the switching and warning states.

Application Example



Pin Functions

| Pin | Name | Function |
|-----|-------|--|
| A1 | MOSI | SPI Master Output / Slave Input |
| A3 | NSO | Complementary Switching Output |
| B1 | SCK | SPI Clock Input |
| B3 | SO | Switching Output |
| C1 | MISO | SPI Master Input / Slave Output |
| C3 | WARN | Warning Message Output |
| D1 | NCS | SPI Chip Select Input (low active) |
| D3 | NRES | Power-down Reset Indication Output |
| E1 | GNDA | Analog Ground |
| E3 | VDD | +5 V Digital Supply |
| F1 | VCC | +5 V Analog Supply |
| F3 | GND | Digital Ground |
| G1 | VCCCL | LED Supply Output |
| G2 | LED | LED Driver Lowside Current Sink Output |
| G3 | GNDL | LED Driver Ground |

Key Specifications

| Photo Sensors | |
|----------------------------|--|
| Active Area | |
| Nearfield Diode D0 | 0.927 mm ² |
| Midfield Diodes D1 to D127 | 0.0176 mm ² |
| Farfield Diode D128 | 0.1635 mm ² |
| Spectral Sensitivity | typ. 0.38 A/W @ λpk (680 nm) |
| Spectral Application Range | 400 to 950 nm (sensitivity decreased to 25 %) |

| Signal Conditioning | |
|-------------------------------------|--------------------------------|
| Current-to-Voltage Conversion | 50 kΩ to 45 Ω (static, autom.) |
| Transimpedance Amplifier | |
| Lower Cut-Off Frequency | typ. 25 kHz |
| Upper Cut-Off Frequency | typ. 200 kHz |
| Adder Ampl. Upper Cut-Off Frequency | typ. 230 kHz |
| Diff. Ampl. Upper Cut-Off Frequency | typ. 150 kHz |
| Near/Far Channel Gain Ratio | 0.33 to 3.06 |
| Hyst. Comparator Difference Signal | 3 mV to 72 mV |
| Number of Measurements | 1 to 16 takes/cycle |
| Signal Monitoring | 2 level, warning and error |

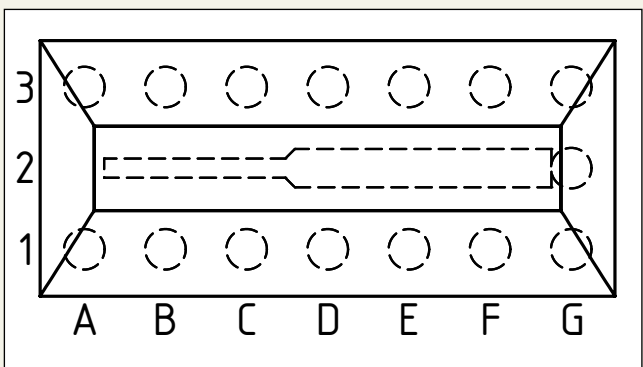
| LED Driver Output | |
|---------------------------|-------------------------------|
| Operating Mode | lowside driver or CMOS output |
| Pulse Current Range | 86 mA to 1150 mA |
| Saturation Voltage | 2 V max. at 1150 mA |
| Generated Pulse Frequency | 5 kHz to 13.9 kHz |
| Generated Pulse Width | 2 μs to 9.5 μs |

| SPI Interface | |
|---------------------------|--------------------------|
| Pins NCS, SCK, MOSI, MISO | clock rate of 1 MHz max. |

| Switch Outputs | |
|------------------------------|---------------------------------|
| Configurable Rise Delay | 0 to 50 ms for peak suppression |
| Configurable Fall Delay | 0 to 50 ms for minimum pulse |
| Output Short-Circuit Current | +/- 1.7 mA |

| Other Operational Data | |
|-------------------------------|----------------------------------|
| Supply Voltage | single 5 V, +/- 10 %, typ. 20 mA |
| Operational Temperature Range | -40 °C to +85 °C |
| Package | oBGA L01C 9 mm x 4 mm |

Pin Configuration oBGA L01C



This preliminary information is not tantamount to a guarantee of device characteristics. All rights to technical changes reserved