Product Document

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TMF8701

Time-of-Flight Sensor

General Description

The TMF8701 is a true direct time-of-flight (ToF) sensor system in a single modular package which offers highly accurate depth accuracy detection through a sub-nanosecond light pulse and an antialiasing "stop-watch" method to measure round-trip time of pulse. It provides single zone detection of an object irrespective of the color, reflectivity and texture of the object. The single module with VCSEL emitter offers high dynamic range and operates in either a proximity mode (0 – 10 cm) or a ranging mode (10 – 60 cm) for detection sensing. The device utilizes highly sensitive SPAD detection with fast compact time-to digital converters to make high accurate distance measurement within ±5% and is capable of operation in dark environments. A built-in histogram is featured to detect cover glass and objects behind glass to select object with highest SNR while compensating for dirt and smudges on cover glass to produce artifact free measurement of multiple objects. The histogram enables greater distance between cover glass, delivers dynamic cover glass calibration and crosstalk compensation. Class 1 eye safety is also featured through the narrow sub-nanosecond (<500 ps) fast pulse 940 nm VCSEL driver. Background light noise is minimized through on-chip superior sunlight rejection filter. Data output is through a 1.8V I^2C fast-mode communications interface and an integrated micro controller is featured with all algorithms included on-chip with no need for external optics.

Key Benefits & Features

The benefits and features of TMF8701, Time-of-Flight Sensor are listed below:

Figure 1:
Added Value of Using TMF8701

Benefits	Feature
• Modular package - 2.2mm x 3.6mm x 1.0mm	• Small footprint fits in the mobile phone bezel
• 21º FOI	• Detecting central closest objects
• Time-to-Digital converter (TDC) • Direct time-of-flight measurement	• Within 5% of measurement (accuracy); no multi-path and no multiple object problems as for iToF
• Single Photon Avalanche Photodiode (SPAD) • Histogram based architecture	• Better accuracy detects reliably closest object • Min. distance 1mm (black target) • Max. distance 60cm
• Dynamic cover glass calibration	• No complex calibration
• Reliable operation under demanding use cases	• Compensates for dirt on glass

Benefits	Feature
• Reference SPAD	• Improved accuracy over temperature and life
• Distance and signal quality reported	• Make better decisions
• Fast VCSEL driver with protection	• Class 1 Eye Safe
• 940µA power consumption at 10Hz (proximity mode) • 26mA power consumption at 60Hz operation (distance and proximity mode) • 0.26µA power-down current consumption (EN=0)	• Longer battery life

Applications

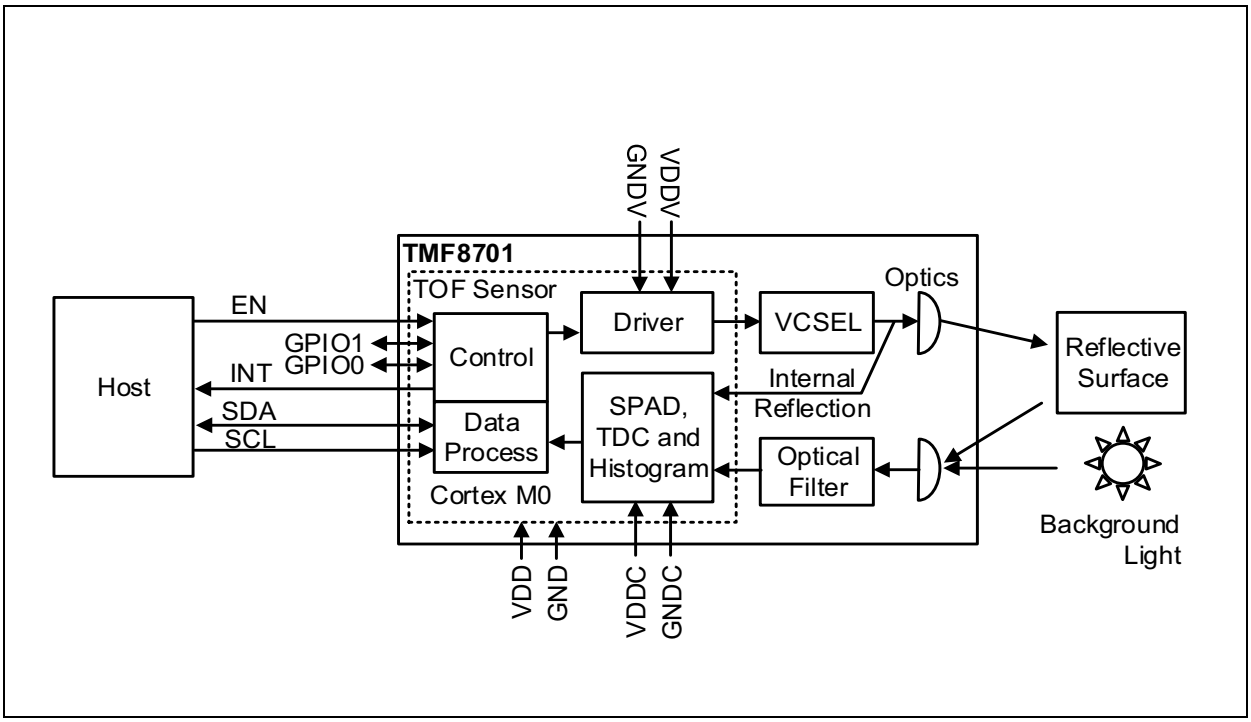
The device is ideal for use in the mobile phone market with applications including:

- Distance measurement for camera autofocus (Laser Detect Autofocus - LDAF)
- Supporting low-power system operation by enabling high-power components (i.e. 3D facial recognition) only when an object is in the detection range
- Proximity detection
- Presence detection - Object detection
- Collision avoidance

Block Diagram

The functional blocks of this device are shown below:

Figure 2:
TMF8701 Block Diagram



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