**TOF05140 manual**

TOF10120 range sensor provides accurate and repeatable long range distance measurement for high-speed autofocus (AF). The innovative time-of-flight technology allows performance independent of object reflectance.

TOF10120’s time-of-flight sensing technology is realized by Sharp’s original SPAD (Single Photon Avalanche Diodes ) using low-cost standard CMOS process. It enables accurate ranging result, higher immunity to ambient light and better robustness to cover-glass optical cross-talk by special optical package design.

940nm laser classified as class 1 under operation condition

by IEC 60825-1:2014-3rd edition

Small ceramic package (20×13.2×2.0mm)

Long range absolute range measurement up to 1.8m

within 5%accuracy at indoor

Reported range is independent of the target reflectance

Operates in high infrared ambient light levels

Advanced optical cross-talk compensation

High speed ranging MAX 30ms

Standard solder reflow compatible

No additional optics

Single power supply

Txd interface for device control and data transfer

Lead-free, RoHS compliant

High-speed AF

Continuous AF for video

User detection for Personal Computers/ Laptops/Tablets

Robotics (obstacle detection)

White goods (hand detection in automatic Faucets, refrigerator etc.)

**2.1   Recommended Operating Conditions**

|  |  |  |
| --- | --- | --- |
| Items | Rating | Unit |
| Ranging Range | 100-1800 | mm |
| VDD | 3〜5 | V |
| ICC—VDD | 35 | mA |
| Topr | -20〜+70 | °C |
| Tstg | -40〜+85 | °C |
| Board size | 20×13.2 | mm |

**2.2 Pin Description**

|  |  |  |  |
| --- | --- | --- | --- |
| Pin | Pin name | Condition | Function |
| ① | GND | — | GND |
| ② | VDD | — | 3〜5V |
| ③ | RXD | INPUT | RXD OUTPUT TTL |
| ④ | TXD | OUTPUT | TXD OUTPUT TTL |
| ⑤ | SDA | INPUT/OUTPUT | I2C DATA I/O TTL |
| ⑥ | SCL | OUTPUT | I2C CLK OPUTPUT TTL |

**Communicationprotocol**

1) Baud rate: 9600 bit/s; Data bit 8, no parity bit, stop bit 1.

**2) Data transmission format:**

1 Read deviation value Command r1# Return value D=xx Description xx=00~99mm 0 before calibration

2 Read serial port send interval Command r2# Return value T=xxxx Description xxxx=10~9999ms Default 100ms

3 Read distance mode Command r3# Return value M=x Description x=0 Distance after filtering x=1 Real-time distance Default=0Filtered distance

4 Read the maximum distance Command r4# Return value Max=x Description xxxx=100~2000mm Default does not limit the maximum distance>2000mm

5 Read distance transmission mode Command r5# Return value S=x Description x=0 Active transmission (UART) x=1 Passive reading (UART/I2C) Default=0 Active transmission

6 Read distance Command r6# Return value L=xxxx Description xxxx=100~2000mm Only valid if the transmission mode is passive read

7 Read module I2C slave ID command r7# Return value I=xxx Description xxx=1~254 (0x01~0xFE) Default 164 (0xA4)

8 Read xtal calibration parameters Command r8# Return value X=xxx Description xx=0~200 0 before calibration

**Write command / Write a command**

|  |  |  |  |
| --- | --- | --- | --- |
| 1  Set the positive and negative deviation of the deviation value | Command | s1+xx# | Return message>Setting success: ok Setting failed: fail |
| Command | s1-xx# | S1+xx# (positive deviation) or s1-xx# (negative deviation) |
|  | Description | Xx=00~99mm s1+0# or s1-0# deviation clear |
| 2 Set the serial port transmission interval | Command | s2-xxxx# | Return message>Setting success: ok Setting failed: fail |
|  | Description | Xxxx=10~9999ms default 100ms |
| 3 Set the distance mode | Command | s3-x# | Return message > Set successfully: ok Set failed: fail |
|  | Description | x=0 filtered distance x=1 real-time distance default=0 filtered distance |
| 4 Set the maximum distance | Command | s4-xxxx# | Return message>Setting success: ok Setting failed: fail |
|  | Description | Xxxx=100~2000mm xxxx=0 is the maximum distance not limited |
| 5 Set the distance sending method | Command | s5-x# | Return message>Setting success: ok Setting failed: fail |
|  | Description | X=0 active send x=1 passive read |
| 6 Set the I2C slave ID | Command | s7-xxx# | Return message>Setting success: ok Setting failed: fail |
|  | Description | xxx=1~254(0x01~0xFE) default 164(0xA4) |
| 7 calibration command | Command | s8-x# | Calibration successful: x=0 return >offset deviation value x=1 return>xtalk deviation parameter setting failed: fail |
|  | Description | Offset deviation value (-99~99mm) xtalk deviation parameter 0~200 |

**Routine**

|  |  |  |  |
| --- | --- | --- | --- |
| Command | Send | Description | Return information |
| String input box | s4-1000# | OK | successfully: ok Description Distance setting up to 1000mm |

**Ranging Characteristics**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Symbol | Min. | Typ. | max. | Unit | Condition |
| Min Range distance & accuracy (White indoor) | Rmin | － | 10 | － | cm | ※ Condition ① |
| Rminacc | － | － | ±5 | % |  |  |
| Max Range distance & accuracy (White indoor) | Rinw | 120 | 180 | － | cm | ※ Condition ② |
| Rinaccw | － | － | ±4 | % |  |  |
| Max Range distance & accuracy (White indoor) | Ring | 70 | 80 | － | cm | ※ Condition ③ |
| Rinaccw | － | － | ±7 | % |  |  |
| Max Range distance & accuracy (White outdoor) | Routw | 60 | － | － | cm | ※ Condition ④ |
| Routaccw | － | － | ±7 | % |  |  |
| Max Range distance & accuracy (Gray outdoor) | Routg | 40 | － | － | cm | ※ Condition ⑤ |
| Routaccg | － | － | ±12 | % |  |  |
| Ranging speed | Trange | － | － | 33 | msec |  |

2.5.1 Ranging condition

|  |  |  |  |
| --- | --- | --- | --- |
| Condition | Target & Reflectance | Environment | Range Accuracy & Offset condition |
| ① | White 88％ | Indoor : no infrared | 10cm |
| ② | White 88％ | Indoor : no infrared | 120cm |
| ③ | Gray 17％ | Indoor : no infrared | 70cm |
| ④ | White 88％ | Outdoor : equivalent to 5kLux daylight | 60cm |
| ⑤ | Gray 17％ | Outdoor : equivalent to 5kLux daylight | 40cm |

**Electrical and Optical Characteristics**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Symbol | Min. | Typ. | Max. | Unit | Remarks |
| VCSEL peak wavelength | λP\_PS | － | 940 | － | nm |  |
| VCSEL peak current | Ivcsel | 59 | mA |  |  |  |

**with cover window**It is important to keep the cover window surface finish smooth



