Time-of-Flight ranging Sensor

Description/Descripti

The TOF10120 range sensor provides accurate and repeatable long-distance measurements for high-speed autofocus (AF). Innovative TOF time-of-flight technology makes the sensor performance independent of the reflectivity of the target object.

The TOF (time-of-flight) measurement technology of TOF10120 is implemented using Sharp's original low-cost CMOS process SPAD (single photon avalanche diode). It makes the measurement results accurate and has higher immunity to ambient light.

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.

Features/Features

•940nm laser complies with Class 1 operating conditions specified in IEC 60825-1:2014 3rd edition

•Sensor size (20×13.2×2.0mm)

•The maximum measurement distance indoors can reach 1.8 meters, and the accuracy is within 5%

•The measurement range has nothing to do with the reflectivity of the target object

•Can work in high infrared light environment

•High optical crosstalk compensation

•Measurement time is less than 30ms

•Standard-compliant reflow soldering process

•No additional optics required

•Single power supply

•Standard TTL level serial port

•Lead-free, RoHS compliant

•940nm laser classified as class 1 under operating 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

Applications/Applications

•High-speed autofocus

•Video continuous autofocus

•User detection of computers and other equipment

•Obstacle detection

•Automatic gesture recognition for white goods (such as faucets, refrigerators, etc.)

•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**

project Items	Rated Rating	unit Unit
Measuring rangeRanging Range	100ÿ1800	mm
Working voltage VCC	3ÿ5	V
Operating current ICC_VDD	35	mA
Working temperature Topr	- 20 + 70	°C
Storage temperature Tstg	- 40 + 85	°C

2.2 Pin Description /**Pin Description**

pin Pin	Pin name Pin name	condition Condition	Function Function
ÿ	GND		Power ground GND
ÿ	VDD		Positive power supply 3~5V
ÿ	RXD	inputINPUT	Serial port input TTL level RXD OUTPUT TTL
ÿ	TxD	OUTPUT	Serial port output TTL level TXD OUTPUT TTL
ÿ	SDA	Input/OutputINPUT/OUTPUT	I2C DATA TTL levelI2C DATA I/O TTL
ÿ	SCL	OUTPUT	I2C clock TTL levelI2C CLK OPUTPUT TTL

2.3 Communication protocol / **Communication protocol**

Baud rate Bits per Second:	9600
Data Bits:	8
No Parity:	None
Stop bits:	1
Flow Control:	None

2.4.1 Data delivery format /**Data delivery format**

ÿ

ÿ Read the deviation value	Command r1# Return value D=xx Description xx=00~99mm 0 before calibration
ÿ Read serial port sending interval command	r2# Return value T=xxxx Description xxxx=10~9999ms Default 100ms
ÿ Reading distance mode	Command r3# Return value M=x Description x=0 Distance after filtering x=1 Real-time distance Default=0 Distance after filtering
ÿ Read the maximum distance	Command r4# Return value Max=x Description xxxx=100~2000mm The default is not to limit the maximum distance >2000mm
ÿ Read distance sending mode command	r5# Return value S=x Description x=0 Active sending (UART) x=1 Passive reading (UART/I2C) Default=0 Active sending
ÿ Reading distance	Command r6# Return value L=xxxx Description xxxx=100~2000mm is only valid when the sending mode is passive reading
ÿ Read module I2C slave ID command	r7# Return value I=xxx Description xxx=1~254(0x01~0xFE) Default 164(0xA4)
ÿ Read xtal calibration parameter command	r8# Return value X=xxx Description xx=0~200 0 before calibration

2.4.2 Write a command /**Write a command**

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ÿ Set the positive and negative deviation command	s1+xx#		Return informationÿSuccessful setting: ok Setting failed: fail
	Command s1-xx#		s1+xx# (positive deviation) or s1-xx# (negative deviation)
		Note that xx=00~99mm s1+0# or s1-0# clear the deviation to 0	
ÿ Set the serial port sending interval command	s2-xxxx#		Return informationÿSuccessful setting: ok Setting failed: fail
		Description xxxx=10~9999ms, default 100ms	
ÿ Set distance mode	Command s3-x#		Return informationÿSuccessful setting: ok Setting failed: fail
		Description x=0 Distance after filtering x=1 Real-time distance Default=0 Distance after filtering	
ÿSet the maximum distance	Command s4-xxxx#		Return informationÿSuccessful setting: ok Setting failed: fail
		Note that xxxx=100~2000mm xxxx=0 means no limit on the maximum distance	
ÿ Set distance sending mode command	s5-x#		Return informationÿSuccessful setting: ok Setting failed: fail
		Description x=0 active sending x=1 passive reading	
ÿ Set I2C slave ID command	s7-xxx#		Return informationÿSuccessful setting: ok Setting failed: fail
		Description xxx=1~254(0x01~0xFE) Default 164(0xA4)	
ÿ Calibration command	Command s8-x#		Calibration successful: x=0 Returnÿoffset deviation value x=1 Returnÿxtalk Offset parameter setting failed: fail
		Description offset deviation value (-99~99mm) xtalk deviation parameter 0~200	

2.4.3 Routine /**Routine**

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Order	send	illustrate	returned messages
String input box	s4-1000#	OK	Setup successful: ok It means the maximum distance setting is 1000mm

2.5 Ranging Characteristics /**Ranging Characteristics**

parameter Parameter	conform to Symbol	minimum value Min.	Typical maximum units Typ.	 Max.	 Unit	condition Condition
Minimum distance and accuracy (indoor white) Min Range distance & accuracy (White indoor)	Rmin	-	10	-	cm	ÿ Condition ÿ
	Rminacc	-	-	±5	%	
Maximum range distance and accuracy (white indoors) Max Range distance & accuracy (White indoor)	Rinw	120	180	-	cm	ÿ Condition ÿ
	Rinaccw	-	-	±4	%	
Maximum range distance and accuracy (indoor gray) Max Range distance & accuracy (White indoor)	Ring	70	80	-	cm	ÿ Condition ÿ
	Rinaccw	-	-	±7	%	
Maximum range distance and accuracy (white outdoor) Max Range distance & accuracy (White outdoor)	Routw	60	-	-	cm	ÿ Condition ÿ
	Routacc	-	-	±7	%	
Maximum range distance and accuracy (gray outdoor) Max Range distance & accuracy (Gray outdoor)	Routg	40	-	-	cm	ÿ Condition ÿ
	Routaccg	-	-	±12	%	
Ranging speed Ranging speed	Trange	-	-	33	msec	

2.5.1 ÿ Ranging condition /**Ranging condition**

condition Condition	Targets and Reflectivity Target & Reflectance	environment Environment	Distance accuracy and offset conditions Range Accuracy & Offset condition
ÿ	White card White 88%	Indoor: no infrared Indoor: no infrared	10cm
ÿ	White card White 88%	Indoor: no infrared Indoor: no infrared	120cm
ÿ	Gray card Gray 17%	Indoor: no infrared Indoor: no infrared	70cm
ÿ	White card White 88%	Outdoor: Equivalent to 5KLUX daylight Outdoor: equivalent to 5kLux daylight	60cm
ÿ	Gray card Gray 17%	Outdoor: Equivalent to 5KLUX daylight Outdoor: equivalent to 5kLux daylight	40cm

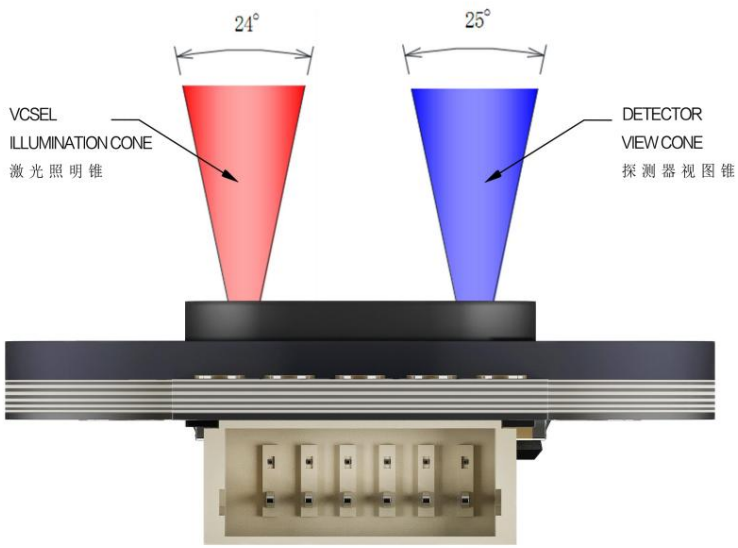
2.6 Electrical and Optical Characteristics /**Electrical and Optical Characteristics**

parameter Parameter	conform to Symbol	minimum value Min.	Typical maximum units Typ.	 Max.	 Unit	Remark Remarks
Vertical cavity surface emitting laser peak wavelength VCSEL peak wavelength	ÿP_PS	-	940	-	nm	
Vertical cavity surface emitting laser peak current VCSEL peak current	Ivcsel		59		mA	

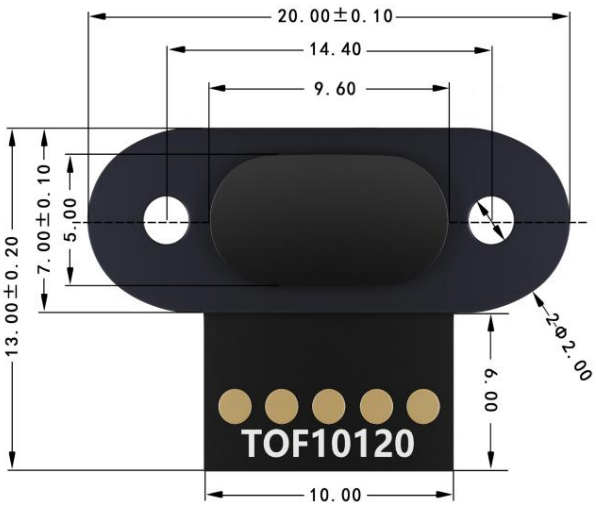
2.7With cover glass/ **with cover window**

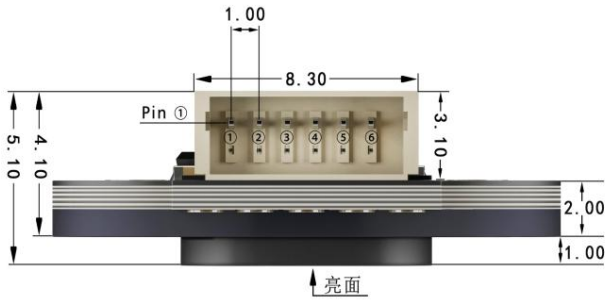
It is important to maintain the surface finish of your cover windows.

It is important to keep the cover window surface finish smooth.

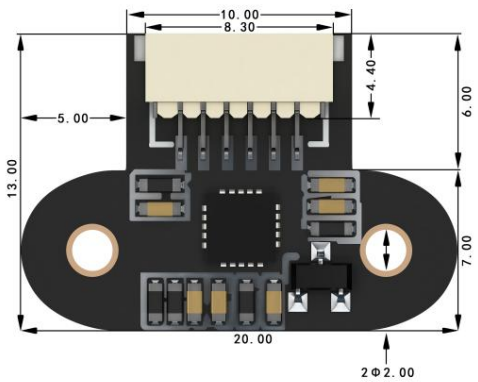


2.8Outline Dimensions _





PIN	Signal NameSignal Name
ÿ	GND
ÿ	VDD
ÿ	RXD
ÿ	TxD
ÿ	SDA
ÿ	SCL



Unit:mm

Product weight: about 1.0 grams

Product mass: Approx. 1.0g

TOF10120

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