



**CPS303AT**  
Digital Ambient Light Sensor

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**CPS303AT**  
**Digital Ambient Light Sensor**  
(I2C Protocol Interface )

*Data Sheet*

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Note: The contents of this document may be revised without prior notice for improvement of the product.

## 1. Product summary

CPS303AT is a light sensor with integrated photo diode that has spectral sensitivity near to luminosity factor, current amplifier circuit, and digital conversion circuit in a single chip.

CPS303AT outputs detection result in 16-bit digital value via I2C interface.

CPS303AT enables to improve visibility of indication and life of light source, and reduce power consumption by brightness adjustment and on/off control of monitor displays etc.

## 2. Features

- Small and low-profile package (TCOB: 2.0 mm x 2.0 mm x 0.58mm)
- Spectral sensitivity characteristics near to luminosity factor
- Output characteristics proportional to illuminance of environmental lights
- Small output dependence to light source
- Compatible with I2C interface
- Shut down function by software sleep
- Flexible setting of integration time and resolution setting
- Supports reflow soldering
- Pb free and RoHS compatible
- Halogen free

## 3. Maximum rating

Item	Code	Rating	Unit
Voltage	VDDmax	5	V
Storage temperature	Tstg	-40~+85	°C

## 4. Recommended operating conditions

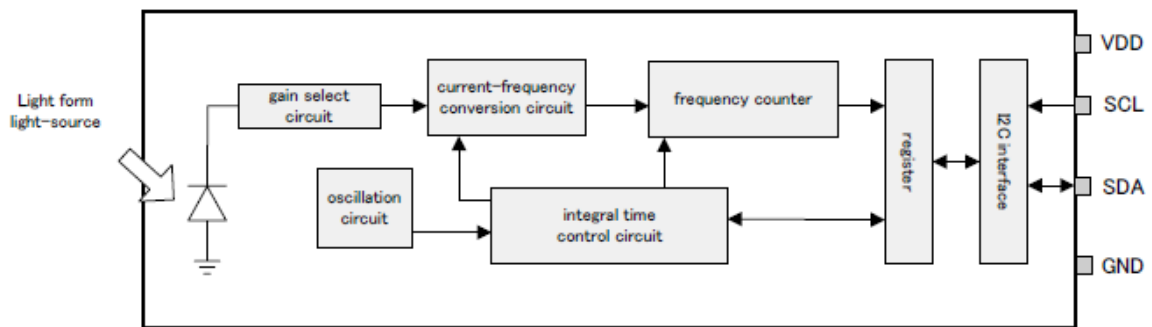
Item	Code	Condition	Min.	Typ.	Max.	Unit
Supply voltage	VDD	-	2.7	-	3.6	V
Operating temperature	Topr		-20		+70	°C
I2C bus Pull-up voltage (*1)	Vbus	R <sub>p</sub> =2.2KΩ	1.8	-	VDD+0.3	V
H level input voltage	Vih	-	2.6	-	VDD+0.3	V
L level input voltage	Vil	-	-0.5	-	0.4	V
BUS capacity	Cbus	-	-	-	400	pF

(\*1): pull up resistance depends on Cbus capacitance and Vbus voltage.

**5. Pin functions**

PIN No.	Code	I/O type	Pin function
1	GND	GND	GND pin
2	SDA	I/O(open drain)	SDA pin for I2C
3	SCL	I	SCL pin for I2C
4	VDD	VDD	VDD pin

**6. Block diagram**



## 7. Electrical and optical properties

Measuring conditions: VDD=3.3V Ta=25°C

Item	Code	Condition	Min.	Typ.	Max.	Unit
Wavelength of peak sensitivity	$\lambda_p$	(*2)		515		nm
Illuminance detection range	Smin	CLKS="0", IT=0.5T, Gain: x1.0 (*1) (*2)	0.1			lx
	Smax	CLKS="1", IT=1T, Gain: x0.5 (*1) (*2)	100000			lx
Illuminance count	Scnt1	CLKS="1", IT=1T, Gain: x1.0 Ev=100lx (*1)	90	120	150	count
Light receiving sensitivity	Scnt2	CLKS="1", IT=1T, Gain: x1.0 (*1)	0.9	1.2	1.5	count/lx
Darkness count	Doffset	CLKS="1", IT=1T, Gain: x1.0 E=0lx (dark condition)	0	0	5	count
Dynamic consumption current	Iddd	CLKS="1", IT=1T, Gain: x1.0 E=0lx (dark condition)			1.9	mA
Static current	Idds	CLKS="1", IT=1T, Gain: x1.0 E=0lx (dark condition)			1.0	uA

\*1 Light source: White LED

\*2 It is design guarantee item

Measurement conditions of I2C: VDD=3.3V Ta=25°C

Item	Code	Condition	Min.	Typ.	Max.	Unit
I2C address	ADDR	7bit	0x25 (0100101)			
I2C clock frequency	fclk		-	-	400	kHz
SDA output voltage	Vol	Rp=2.2kΩ	0	-	0.4	V
Input/output pin capacity	Ci		-	-	20	pF
SDA output fall time	tf	Rp=2.2kΩ Cbus=400pF	-	-	250	ns

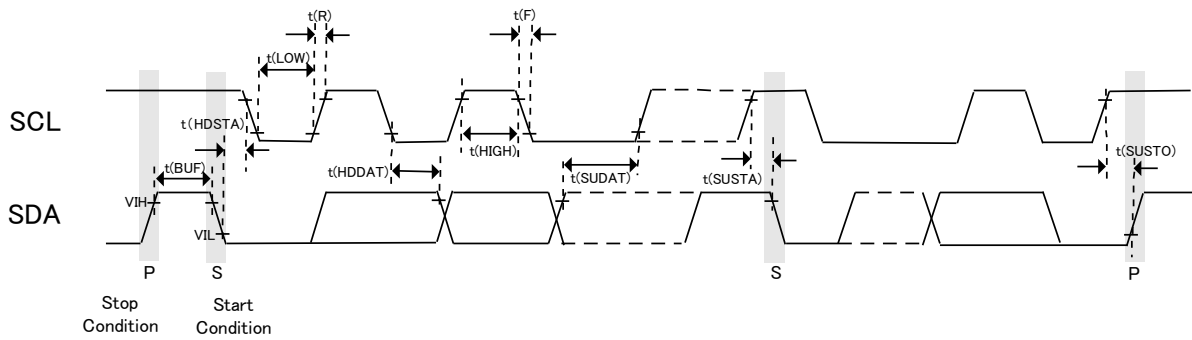
Output rise time of SCL/SDA will be decided by of time constant of Cbus x Rp.

## 8. Register map

Slave Address: 0x25 (0100101) (Write: 01001010, Read: 01001011)

Index No.	Code	Register name	Details		R/W	Initial
00h	CTRL	System control registers	PD_SM[7:6]	Set light receiving sensitivity “00” : ×1 “01” : ×2 “10” : ×0.5 “11” : unused	R/W	19h
			ITMG[5:4]	Set integration time “00” : 0.5T “01” : 1T “10” : 2T “11” : 4T “T” is decided by clock selection bit (CLKS)	R/W	
			CLKS[3]	Set clock “1” : 1T=6.7mS “0” : 1T=67mS	R/W	
			SLP[0]	Set on/off of software sleep “0” : Sleep off Normal operation “1” : Sleep on Switch to power save mode (I2C communication is possible)	R/W	
01h	SDTL	Measurement result registers (lower)	DT[7:0]	Store the lower bits of measurement result. Measurement result will be 16bit by adding upper bits of 02h.	R	-
02h	SDTH	Measurement result registers (higher)	DT[15:8]	Store the upper bits of measurement result. Measurement result will be 16bit by adding lower bits of 01h.	R	-
0Fh	FTST	Test control registers	TST[7:0]	Keep the initial setting (00h).	R/W	00h

## 9. I2C Timing Characteristics

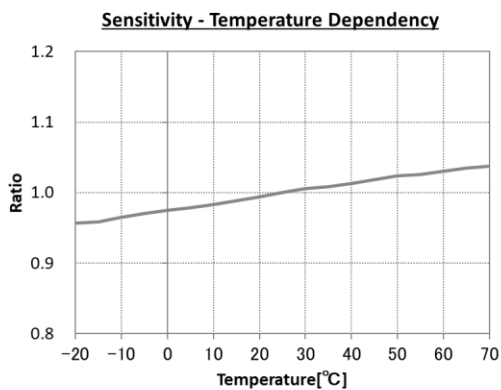
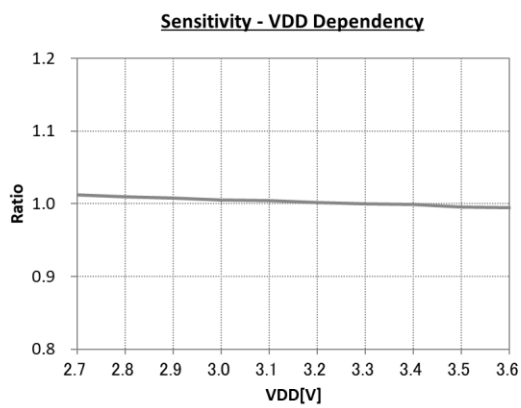
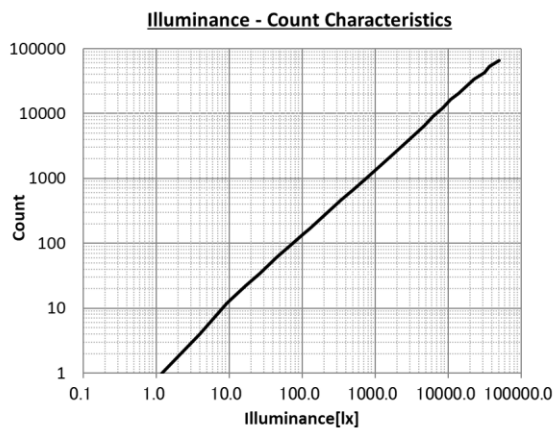
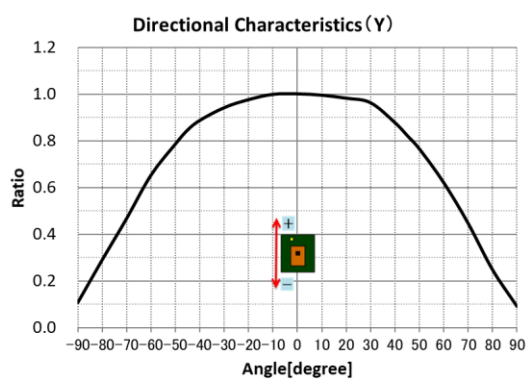
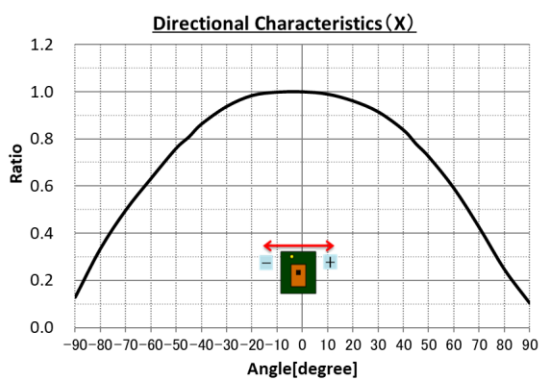
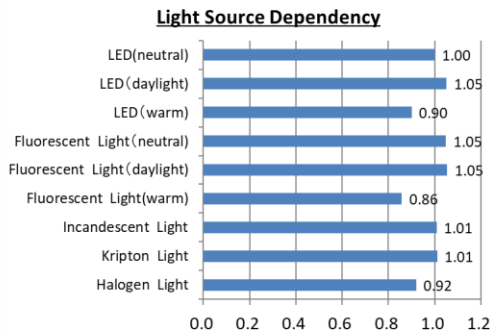
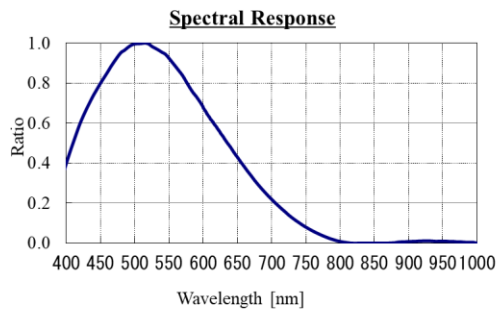


Condition : VDD=3.3V Ta=25°C

Item	Code	MIN	MAX	unit
Clock frequency	f(SCL)		400	kHz
Bus free time *	t(BUF)	1.3		uS
Start condition hold time *	t(HDSTA)	0.6		uS
Start condition setup time *	t(SUSTA)	0.6		uS
Stop condition setup time *	t(SUSTO)	0.6		uS
Data hold time *	t(HDDAT)		0.9	uS
Data setup time *	t(SUDAT)	100		nS
SCL "L" period *	t(L)	1.3		uS
SCL "H" period *	t(H)	0.6		uS
SCL, SDA fall time *	t(F)		250	nS
SCL, SDA rise time *	t(R)		300	nS

\* Design guarantee item.

10. Reference data

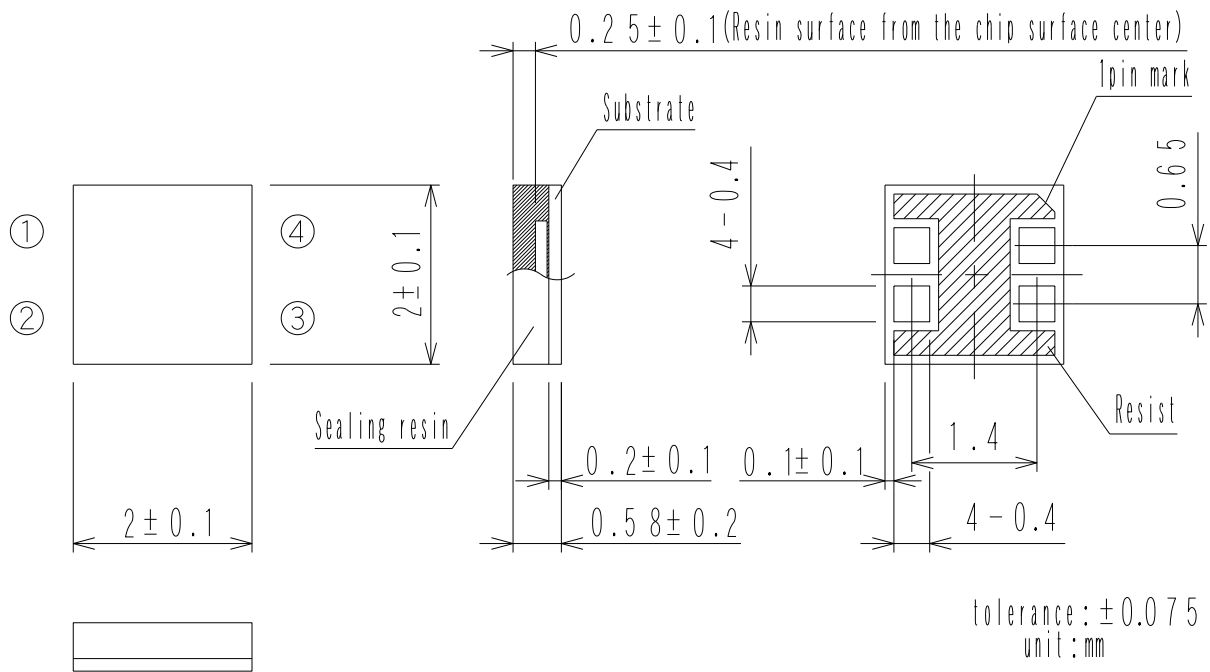


11. External dimensions

TCOB : 2.0mm×2.0mm×0.58mm

TOP VIEW

BOTTOM VIEW



Pin No.	Pin Name
①	GND
②	SDA
③	SCL
④	VDD



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