| STRUCTURE | Silicon Monolithic Integrated Circuit |

| PRODUCT SERIES | Serial output digital Ambient Light Sensor IC |

TYPE BH1721FVC

FUNCTION

1. Correspond to I^2C bus interface (f/s Mode Support, Slave Address : "0100011")
2. Spectral responsibility is approximate human eyes response (Peak Wave Length : typ. 560nm)
3. Illuminance to digital converter
4. Correspond to wide range of light intensity (1 - 65528 lx range)
5. Low Current by power down function
6. Rejecting 50Hz/60Hz light noise enables a more stable sensing
7. Correspond to 1.8V logic interface
8. No need any external parts
9. Small measurement variation (+/- 15%)
10. Compact surface mount package 1.6× 1.6mm

Absolute Maximum Ratings (Ta = 25)

Parameter	Symbol	Limits	Units
Supply Voltage	Vmax	4.5	V
Operating Temperature	Topr	-40 85	
Storage Temperature	Tstg	-40 100	
SDA Sink Current	Imax	7	mA
Power Dissipation	Pd	165	mW

70mm × 70mm × 1.6mm glass epoxy board. Derating in done at 2.2mW/ for operating above Ta=25 .

Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Units
VCC Voltage	Vcc	2.4	3.0	3.6	V
I^2C Reference Voltage	V$_{DVI}$	1.65	-	VCC	V

NOTE This product is not designed for protection against radioactive rays.
This product does not include laser transmitter. This product does not include optical load.
This product includes Photo detector, (Photo Diode) inside of it.

Status of this document
The Japanese version of this document is the formal specification. A customer may use this translation version only for a reference to help reading the formal version. If there are any differences in translation version of this document, formal version takes priority.

Electrical Characteristics (VCC = 3.0V, DVI = 3.0V, Ta = 25)

Parameter	Symbol	Mn.	Typ.	Max.	Units	Conditions
Supply Current	Icc1		140	199	uA	Ev=100 lx [1]
Powerdown Current	Icc2		0.01	1.0	uA	No Input Light
Measurement Accuracy	S/A	1.02	1.2	1.38	Times	Sensor out / Actual lx Ev=1000 lx [1], [2]
Dark (0 lx) Sensor out	SO	0	0	2	count	H-Resolution Mode [3]
H-Res Mode Measure Time	tHR		120	180	ms	
L-Res Mode Measure Time	tLR		16	24	ms	
DVI input 'L' Voltage	VDVL			0.4	V	
SCL SDA input 'H' Voltage 1	VIH1	0.7*DVI			V	DVI 1.8V
SCL SDA input 'H' Voltage 2	VIH2	1.26			V	1.65V DVI 1.8V
SCL SDA input 'L' Voltage 1	VIL1			0.3*DVI	V	DVI 1.8V
SCL SDA input 'L' Voltage 2	VIL2			DVI-1.26	V	1.65V DVI 1.8V
SCL SDA input 'H' Current	IIH			10	uA	
SCL SDA input 'L' Current	IIL			10	uA	
I^{2}C SDA Output 'L' Voltage	VOL	0		0.4	V	IOL=3 mA
I^{2}C SCL Clock Frequency	fSCL			400	kHz	
I^{2}C Hold Time (Repeated) START Condition	tHDSTA	0.6			us	
I^{2}C 'L' Period of the SCL Clock	tLOW	1.3			us	
I^{2}C 'H' Period of the SCL Clock	tHIGH	0.6			us	
I^{2}C Set up time for a Repeated START Condition	tSUSTA	0.6			us	
I^{2}C Data Hold Time	tHDDAT	0			us	
I^{2}C Data Valid Time	tVDDAT			0.9	us	
I^{2}C Data Valid Acknowledge Time	tVDACK			0.9	us	
I^{2}C Data Setup Time	tSUDAT	100			ns	
I^{2}C Set up Time for STOP Condition	tSUSTO	0.6			us	
I^{2}C Bus Free Time between a STOP and START Condition	tBUF	1.3			us	

[1] White LED is used as optical source.
[2] Measurement Accuracy typical value is possible to change '1' by "Measurement result adjustment function".
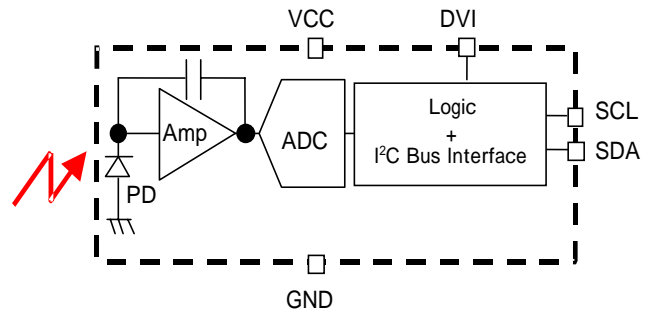[3] Use H-Resolution Mode if dark data (less than 20 lx) is need.

Package Outlines

Production code   Lot No.
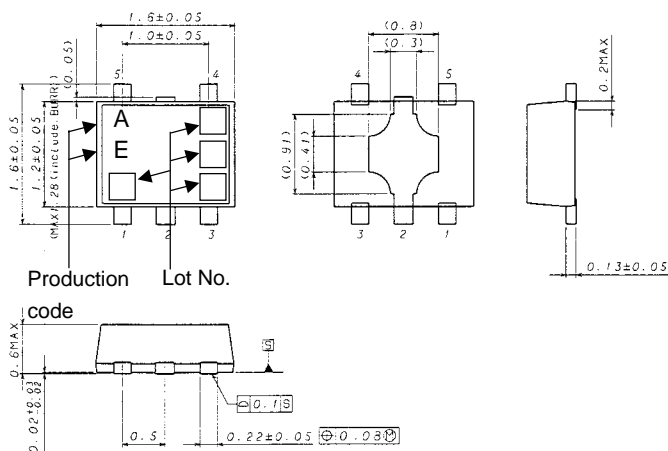
WSOF5 (Unit : mm)

(UNIT : mm)

Block Diagram and Pin Description

Pin No.	Pin Name	Function
1	VCC	Power Supply Voltage Pin
2	GND	GND Pin
3	SDA	I²C Bus SDA Pin
4	DVI	I²C Bus Reference Voltage and initial reset Pin ('L' reset)
5	SCL	I²C Bus SCL Pin

Initial reset is necessary on power supply sequence.
(More than 1us)

I²C Bus Access

Write Format (Instruction of measurement beginning etc.)

ST	Slave Address "0100011"	R/W 0	Ack	Opecode	Ack	SP

Read Format (Reading of Illuminance Data)

ST	Slave Address "0100011"	R/W 1	Ack	High Byte [15:8] 2^{15} 2^{14} 2^{13} 2^{12} 2^{11} 2^{10} 2^{9} 2^{8}	Ack

Low Byte [7:0] 2^{7} 2^{6} 2^{5} 2^{4} 2^{3} 2^{2} 2^{1} 2^{0}	$\overline{Ack}$	SP

▨	from Master to Slave
☐	from Slave to Master

Ex) When   High Byte = 1000_0011
            Low Byte = 1001_0000
    calculate illuminance by following expression.
(2^{15} + 2^{9} + 2^{8} + 2^{7} + 2^{4}) / 1.2   28067 [lx]

Please refer formality I²C bus specification of NXP semiconductors.

Instruction Set Architecture   Opecode of Write Format

Instruction	Opecode
POWER DOWN	0000_0000
POWER ON	0000_0001
Continuously Measurement Auto-Resolution Mode	0001_0000, or 0010_0000,
Continuously Measurement H-Resolution Mode	0001_0010, or 0010_0010,
Continuously Measurement L-Resolution Mode	0001_0011, or 0010_0011, 0001_0110, or 0010_0110,

Cautions on use

1) Absolute Maximum Ratings

An excess in the absolute maximum ratings, such as supply voltage (Vmax), temperature range of operating conditions (Topr), etc., can break down devices, thus making impossible to identify breaking mode such as a short circuit or an open circuit. If any special mode exceeding the absolute maximum ratings is assumed, consideration should be given to take physical safety measures including the use of fuses, etc.

2) GND voltage

Make setting of the potential of the GND terminal so that it will be maintained at the minimum in any operating state. Furthermore, check to be sure no terminals are at a potential lower than the GND voltage including an actual electric transient.

3) Short circuit between terminals and erroneous mounting

In order to mount ICs on a set PCB, pay thorough attention to the direction and offset of the ICs. Erroneous mounting can break down the ICs. Furthermore, if a short circuit occurs due to foreign matters entering between terminals or between the terminal and the power supply or the GND terminal, the ICs can break down.

4) Operation in strong electromagnetic field

Be noted that using ICs in the strong electromagnetic field can malfunction them.

5) Inspection with set PCB

On the inspection with the set PCB, if a capacitor is connected to a low-impedance IC terminal, the IC can suffer stress. Therefore, be sure to discharge from the set PCB by each process. Furthermore, in order to mount or dismount the set PCB to/from the jig for the inspection process, be sure to turn OFF the power supply and then mount the set PCB to the jig. After the completion of the inspection, be sure to turn OFF the power supply and then dismount it from the jig. In addition, for protection against static electricity, establish a ground for the assembly process and pay thorough attention to the transportation and the storage of the set PCB.

6) Input terminals

In terms of the construction of IC, parasitic elements are inevitably formed in relation to potential. The operation of the parasitic element can cause interference with circuit operation, thus resulting in a malfunction and then breakdown of the input terminal. Therefore, pay thorough attention not to handle the input terminals; such as to apply to the input terminals a voltage lower than the GND respectively, so that any parasitic element will operate. Furthermore, do not apply a voltage to the input terminals when no power supply voltage is applied to the IC. In addition, even if the power supply voltage is applied, apply to the input terminals a voltage lower than the power supply voltage or within the guaranteed value of electrical characteristics.

7) Thermal design

Perform thermal design in which there are adequate margins by taking into account the power dissipation (Pd) in actual states of use.

8) Treatment of package

Dusts or scratch on the photo detector may affect the optical characteristics. Please handle it with care.

9) When power is first supplied to the CMOS IC, it is possible that the internal logic may be unstable and rush current may flow instantaneously. Therefore, give special consideration to power coupling capacitance, power wiring, width of GND wiring, and routing of connections.

10) The exposed central pad on the back side of the package

There is an exposed central pad on the back side of the package. Please mount by Footprint dimensions described in the Jisso Information for WSOF5. This pad is GND level, therefore there is a possibility that LSI malfunctions and heavy-current is generated.