Ambient Light Sensor IC Series

Digital 16bit Serial Output Type Color Sensor IC

BH1747NUC

General Description

BH1747NUC is a digital color sensor IC with I^{2}C bus interface. This IC senses Red, Green, Blue (RGB) and Infrared light and converts them to digital values. The high sensitivity, wide dynamic range and excellent Ircut characteristics makes this IC the most suitable to obtain the illuminance and color temperature of ambient light for adjusting LCD backlight of TV, mobile phone and tablet PC.

Features

- Built-in Ircut filter
- Rejecting 50Hz/60Hz light noise
- I^{2}C bus interface (f/s mode support)
- It is possible to select 2 type of I^{2}C bus slave address.
- Correspond to 1.8V logic interface
- Resolution 0.0125lx/count (Typ)
  (In highest gain and longest measurement time setting)

Applications

Mobile Phone, Tablet PC, Note PC, Digital Camera
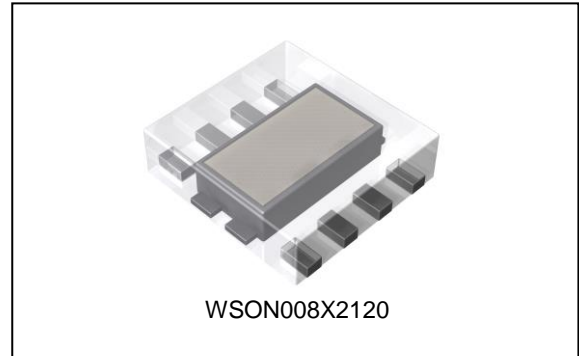Portable Game Machine, LCD TV

Key Specifications

- VCC Voltage Range: 2.3V to 3.6V
- Detection Range[Note 1]: 80klx (Typ)
- Current Consumption: 190µA (Typ)
- Power Down Current: 0.8µA (Typ)
- Operating Temperature Range: -40°C to +85°C

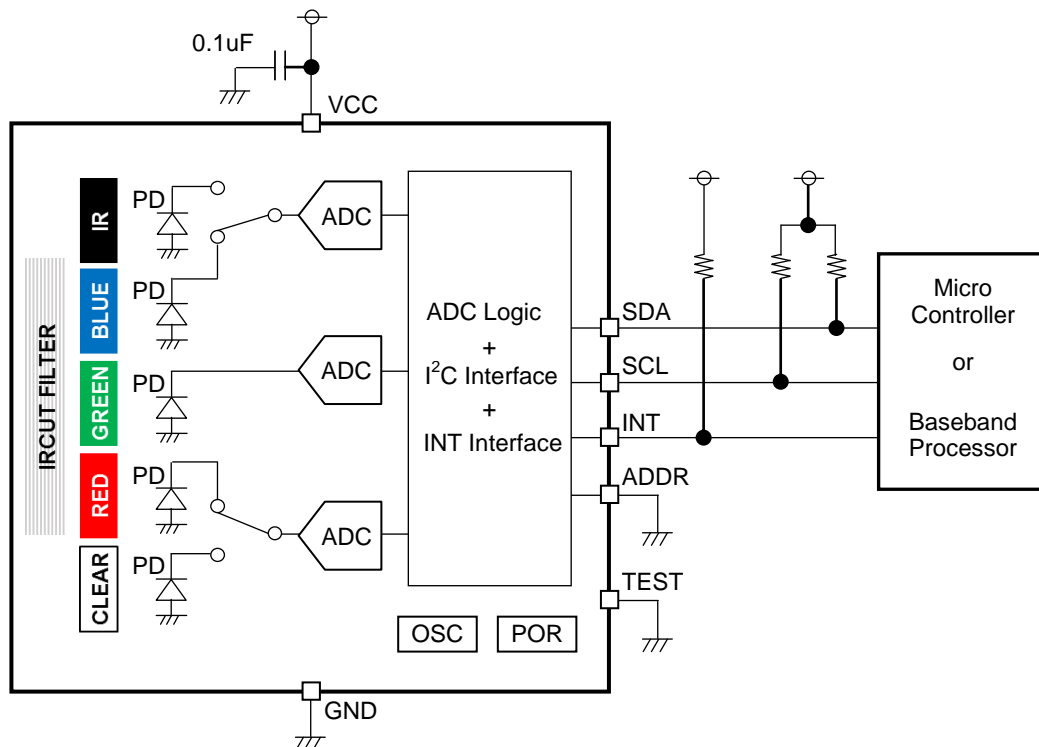(Note 1) White LED is used as optical source.

Package(s)

	W(Typ) x D(Typ) x H(Max)
WSON008X2120	2.10mm x 2.00mm x 0.6mm

WSON008X2120

Typical Application Circuits

○Product structure : Silicon monolithic integrated circuit.
○This product does not include laser transmitter.
○This product includes Photo detector, (Photo Diode) inside of it.

○This product has no designed protection against radioactive rays.
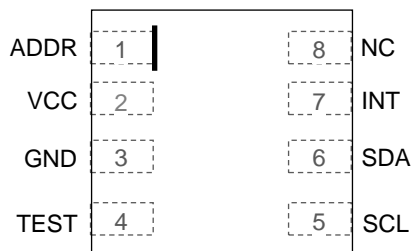○This product does not include optical load.

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Pin Configuration

TOP VIEW

ADDR	1		8	NC
VCC	2		7	INT
GND	3		6	SDA
TEST	4		5	SCL

Pin Description

Pin No.	Pin Name	Function
1	ADDR	I^2C bus slave address selector
2	VCC	Power supply[Note 1]
3	GND	Ground
4	TEST	Test pin (Connect to GND)
5	SCL	I^2C bus serial clock
6	SDA	I^2C bus serial data
7	INT	Interrupt
8	NC	Non connect

(Note 1) Dispose a bypass capacitor as close as possible to the IC

Block Diagram
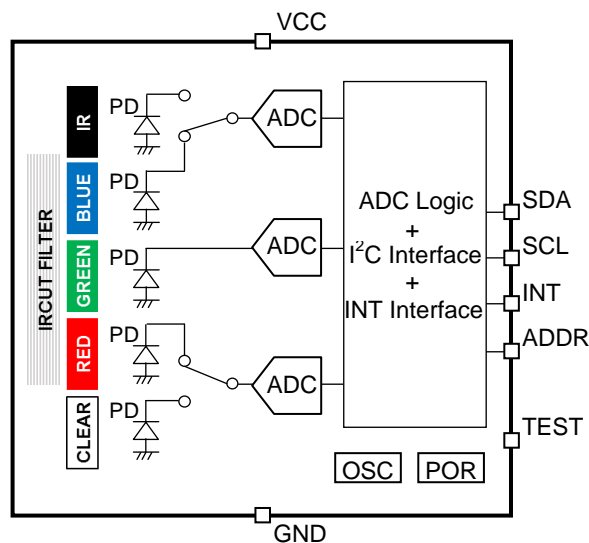
Description of Blocks

・IRCUT FILTER
  This filter passes visible light and blocks infrared light.
・RED, GREEN, BLUE, CLEAR, IR
  Red, Green, Blue, Clear and Infrared pass filter
・PD
  Photodiode
・ADC
  Analog-to-Digital Converter for obtaining 16bit digital data.
・ADC Logic + I^2C Interface + INT Interface
  ADC control logic and I/F logic
・OSC
  Oscillator for clock of internal logic
・POR
  Power ON Reset. All registers are reset after VCC is supplied.

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Absolute Maximum Ratings (Ta = 25°C)

Parameter	Symbol	Rating	Unit
Supply Voltage	V_{CC_MR}	4.5	V
Input Voltage 1 [INT,SCL,SDA]	V_{IN1_MR}	-0.3 to +4.5	V
Input Voltage 2 [ADDR]	V_{IN2_MR}	-0.3 to (VCC+0.3) or +4.5 whichever is less	V
Operating Temperature Range	Topr	-40 to +85	°C
Storage Temperature Range	Tstg	-40 to +100	°C
Maximum Junction Temperature	Tjmax	100	°C

Caution: Operating the IC over the absolute maximum ratings may damage the IC. The damage can either be a short circuit between pins or an open circuit between pins and the internal circuitry. Therefore, it is important to consider circuit protection measures, such as adding a fuse, in case the IC is operated over the absolute maximum ratings.

Thermal Resistance[Note 1]

Parameter	Symbol	Thermal Resistance (Typ)		Unit
		1s[Note 3]	2s2p[Note 4]	
WSON008X2120				
Junction to Ambient	θ_{JA}	384.2	54.2	°C/W
Junction to Top Characterization Parameter[Note 2]	Ψ_{JT}	82	12	°C/W

*(Note 1)*Based on JESD51-2A(Still-Air)
*(Note 2)*The thermal characterization parameter to report the difference between junction temperature and the temperature at the top center of the outside surface of the component package.
*(Note 3)*Using a PCB board based on JESD51-3.

Layer Number of Measurement Board	Material	Board Size
Single	FR-4	114.3mm x 76.2mm x 1.57mmt

Top	
Copper Pattern	Thickness
Footprints and Traces	70µm

*(Note 4)*Using a PCB board based on JESD51-5, 7.

Layer Number of Measurement Board	Material	Board Size	Thermal Via[NOTE 5]	
			Pitch	Diameter
4 Layers	FR-4	114.3mm x 76.2mm x 1.6mmt	1.20mm	Φ0.30mm

Top		2 Internal Layers		Bottom	
Copper Pattern	Thickness	Copper Pattern	Thickness	Copper Pattern	Thickness
Footprints and Traces	70µm	74.2mm x 74.2mm	35µm	74.2mm x 74.2mm	70µm

(Note 5) This thermal via connects with the copper pattern of all layers..

Recommended Operating Conditions (Ta = -40°C to +85°C)

Parameter	Symbol	Min	Typ	Max	Unit
Supply Voltage	V_{CC}	2.3	2.5	3.6	V
Input Voltage [INT,SCL,SDA]	V_{IN}	0	-	3.6	V

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Electrical Characteristics (Unless otherwise specified, VCC=2.5V, Ta=25°C, 120ms mode, x32 gain mode)

Parameter	Symbol	Min	Typ	Max	Unit	Conditions
Supply Current	I_{CC1}	-	190	295	µA	Ev = 100 lx *(Note 1)*
Power Down Current	I_{CC2}	-	0.8	1.5	µA	Power down mode No Input Light
Red Data Count Value	D_{RED}	1950	2300	2650	count	Ev = 20µW/cm^2 *(Note 2)*
Green Data Count Value	D_{GREEN}	2700	3180	3660	count	Ev = 20µW/cm^2 *(Note 3)*
Blue Data Count Value	D_{BLUE}	1910	2250	2590	count	Ev = 20µW/cm^2 *(Note 4)*
Clear Data Count Value	D_{CLEAR}	114	152	190	count	Ev = 20µW/cm^2 *(Note 3)*
Ir Data Count Value	D_{IR}	600	800	1000	count	Ev = 20µW/cm^2 *(Note 5)*
Dark Count Value	S_{0_0}	0	0	3	count	No input light
Measurement time at 120ms mode	Tmt1	-	120	170	msec	
Measurement time at 240ms mode	Tmt2	-	240	340	msec	
INT Output 'L' Voltage	V_{INTL}	0	-	0.4	V	IOL = 3mA
SCL SDA Input 'H' Voltage	V_{IH}	1.26	-	-	V	
SCL SDA Input 'L' Voltage	V_{IL}	-	-	0.54	V	
SDA Output 'L' Voltage	V_{OL}	0	-	0.4	V	IOL = 3mA
ADDR Input 'H' Voltage	V_{ADDRH}	0.7*VCC	-	-	V	
ADDR Input 'L' Voltage	V_{ADDRL}	-	-	0.3*VCC	V	

(Note 1) White LED is used as optical source.
(Note 2) Red LED is used as optical source.
(Note 3) Green LED is used as optical source.
(Note 4) Blue LED is used as optical source.
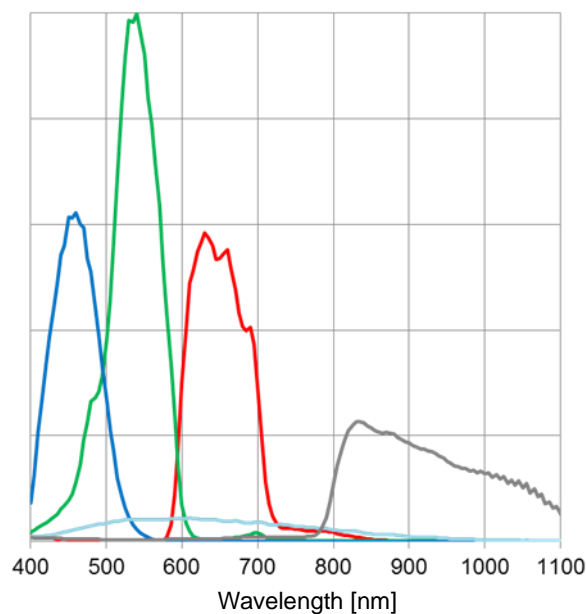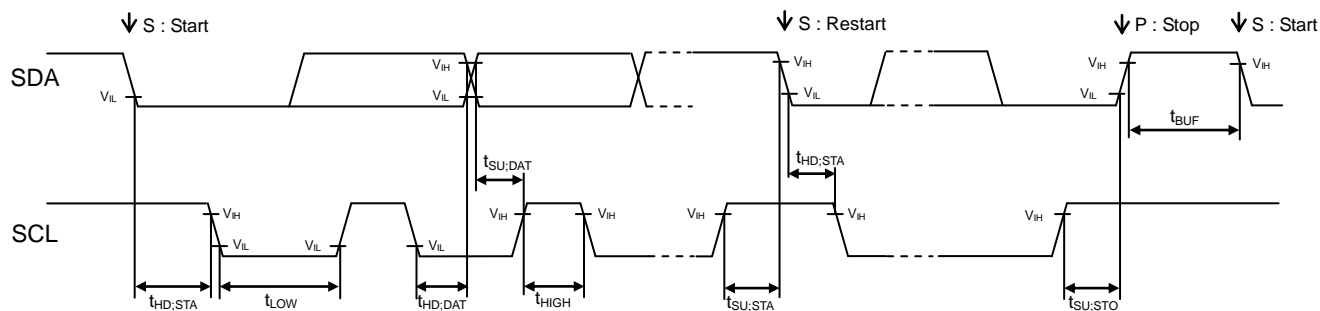*(Note 5)* Infrared LED is used as optical source.

Typical Performance Curves

Wavelength [nm]

Figure 1. Ratio vs Wavelength

(Spectral Response)

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I²C Bus Timing Characteristics (Unless otherwise specified V$_{CC}$ = 2.5V, Ta = 25°C)

Parameter	Symbol	Min	Typ	Max	Unit	Conditions
SCL Clock frequency	f$_{SCL}$	0	-	400	kHz	
'L' Period of the SCL Clock	t$_{LOW}$	1.3	-	-	µs	
'H' Period of the SCL Clock	t$_{HIGH}$	0.6	-	-	µs	
Setup Time for Repeated START	t$_{SU;STA}$	0.6	-	-	µs	
Hold Time for START	t$_{HD;STA}$	0.6	-	-	µs	
Data Setup Time	t$_{SU;DAT}$	100	-	-	ns	
Data Hold Time	t$_{HD;DAT}$	0	-	-	µs	
Setup Time for STOP	t$_{SU;STO}$	0.6	-	-	µs	
Bus Free Time between STOP and START	t$_{BUF}$	1.3	-	-	µs	

I²C Bus Communication
  1. Write Format
   (1) Indicate register address

S	Slave Address	W 0	ACK	Register Address	ACK	P

(2) Write data after indicating register address

S	Slave Address	W 0	ACK	Register Address	ACK

Data specified at register address field	ACK	· · ·	ACK	Data specified at register address field + N	ACK	P

  2. Read Format
   (1) Read data after indicating register address (Master issues restart condition)

S	Slave Address	W 0	ACK	Register Address	ACK

S	Slave Address	R 1	ACK	Data specified at register address field	ACK

Data specified at register address field + 1	ACK	· · ·	ACK	Data specified at register address field + N	NACK	P

(2) Read data from the specified register

S	Slave Address	R 1	ACK	Data specified at register address field	ACK

Data specified at register address field + 1	ACK	· · ·	ACK	Data specified at register address field + N	NACK	P

	from master to slave		from slave to master

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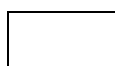
I²C bus Slave address

The slave address is selectable from 2 addresses by ADDR pin.

ADDR	Slave Address
L	0111000
H	0111001

Register MAP[(Note 1)]

Register Address	Register Name	R/W	D7	D6	D5	D4	D3	D2	D1	D0
0x40	SYSTEM_CONTROL	RW	SW RESET	INT RESET	PART ID [5:0]					
0x41	MODE_CONTROL1	RW	0	IR GAIN [1:0]		RGBC GAIN [1:0]		0	MEASUREMENT MODE [1:0]	
0x42	MODE_CONTROL2	RW	VALID	0	0	RGBC_EN	0	0	0	0
0x50	RED_DATA	R	RED_DATA [7:0]							
0x51		R	RED_DATA [15:8]							
0x52	GREEN_DATA	R	GREEN_DATA [7:0]							
0x53		R	GREEN_DATA [15:8]							
0x54	BLUE_DATA	R	BLUE_DATA [7:0]							
0x55		R	BLUE_DATA [15:8]							
0x56	CLEAR_DATA	R	CLEAR_DATA [7:0]							
0x57		R	CLEAR_DATA [15:8]							
0x58	IR_DATA	R	IR_DATA [7:0]							
0x59		R	IR_DATA [15:8]							
0x5A	GREEN2_DATA	R	GREEN2_DATA [7:0]							
0x5B		R	GREEN2_DATA [15:8]							
0x60	INTERRUPT	RW	INT STATUS	0	0	0	INT SOURCE [1:0]		0	INT ENABLE
0x61	PERSISTENCE	RW	0	0	0	0	0	0	PERSISTENCE [1:0]	
0x62	TH_HIGH	RW	TH_HIGH [7:0]							
0x63		RW	TH_HIGH [15:8]							
0x64	TH_LOW	RW	TH_LOW [7:0]							
0x65		RW	TH_LOW [15:8]							
0x92	MANUFACTURER_ID	R	MANUFACTURER_ID [7:0]							

*(Note 1)*Do not write any commands to other address except above. Do not write '1' to the field in which value is '0' in above table.

(0x40) SYSTEM_CONTROL

Fields	Function
SW RESET	All registers are reset and this IC becomes power down state by software reset. 0 : Software reset is not done. 1 : Software reset is done.
INT RESET	0 : INT pin status is not changed. 1 : INT pin becomes inactive (high impedance)
PART ID	Part ID 0x0D (Read only register)

default value 0x0D

(0x41) MODE_CONTROL1

Fields	Function
IR GAIN	Gain setting for Ir DATA. 00 : x1 gain mode 01 : X4 gain mode 10 : x32 gain mode 11 : x128 gain mode
RGBC GAIN	Gain setting for Red, Green, Blue and Clear DATA. 00 : x1 gain mode 01 : X4 gain mode 10 : x32 gain mode 11 : x128 gain mode
MEASUREMENT MODE	00 : Reserved 01 : Reserved 10 : 120ms mode 11 : 240ms mode Measurement time is specified in Electrical Characteristics.

default value 0x00

(0x42) MODE_CONTROL2

Fields	Function
VALID	Refer to "About VALID Register"
RGBC_EN	0 : Measurement is inactive and becomes power down. 1 : Measurement is active.

default value 0x00

(0x50 / 0x51) RED_DATA

Fields	Function
RED_DATA [15:0]	RED measurement result

default value 0x0000

(0x52 / 0x53) GREEN_DATA

Fields	Function
GREEN_DATA [15:0]	GREEN measurement result

default value 0x0000

(0x54 / 0x55) BLUE_DATA

Fields	Function
BLUE_DATA [15:0]	BLUE measurement result

default value 0x0000

(0x56 / 0x57) CLEAR_DATA

Fields	Function
CLEAR_DATA [15:0]	CLEAR measurement result

default value 0x0000

(0x58 / 0x59) IR_DATA

Fields	Function
IR_DATA [15:0]	IR measurement result

default value 0x0000

(0x5A / 0x5B) GREEN2_DATA

Fields	Function
GREEN2_DATA [15:0]	GREEN2 measurement result

default value 0x0000

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(0x60) INTERRUPT

Fields	Function
INT STATUS	Interrupt status output. (Read only register) 0 : Interrupt signal is inactive 1 : Interrupt signal is active
INT SOURCE	INT source select 00 : Red channel 01 : Green channel 10 : Blue channel 11 : Clear channel
INT ENABLE	0 : INT pin disable. 1 : INT pin enable.

default value 0x00

(0x61) PERSISTENCE

Fields	Function
PERSISTENCE	Interrupt persistence function. 00 : Interrupt status becomes active at each measurement end. 01 : Interrupt status is updated at each measurement end. 10 : Interrupt status is updated if 4 consecutive threshold judgments are the same. 11 : Interrupt status is updated if 8 consecutive threshold judgments are the same.

default value 0x01

(0x62 / 0x63) TH_HIGH

Fields	Function
TH_ HIGH [15:0]	Interrupt threshold upper level

default value 0xFFFF

(0x64 / 0x65) TH_LOW

Fields	Function
TH_LOW [15:0]	Interrupt threshold lower level

default value 0x0000

(0x92) MANUFACTURER ID

| Fields	Function
MANUFACTURER ID	MANUFACTURER ID : 0xE0

About VALID Register

VALID register is measurement data update flag. It turns to '1', when measurement data is updated.
It's cleared and turns to '0' by changing register setup or reading VALID register.
(Setting change target registers are 0x41, 0x42, 0x60, 0x61, 0x62, 0x63, 0x64, 0x65.)

Interval of VALID register read should be more than "Measurement Time(max)".
In 120ms mode   Tvalid > 170ms(Tmt1 max)
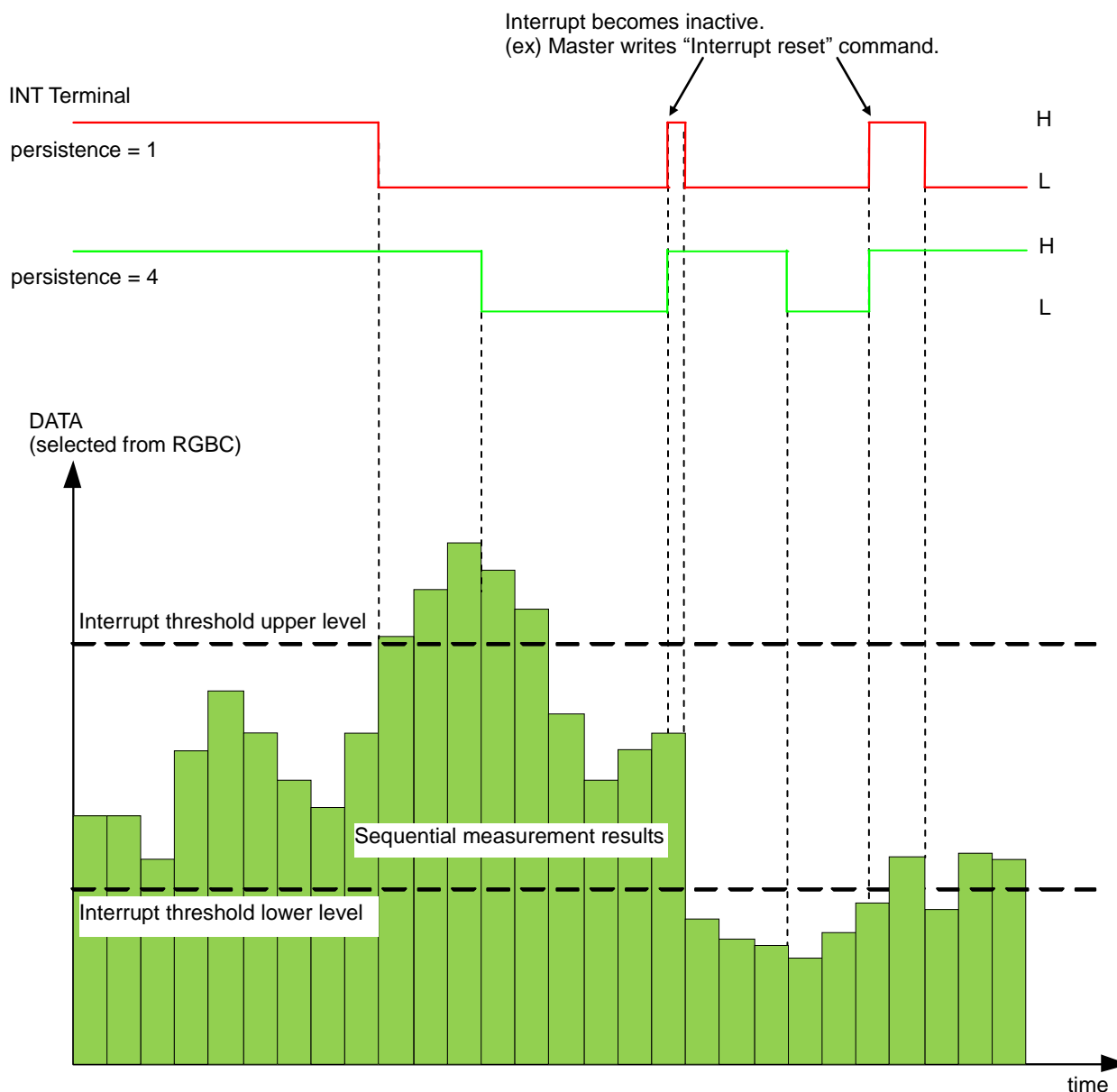In 240ms mode   Tvalid > 340ms(Tmt2 max)
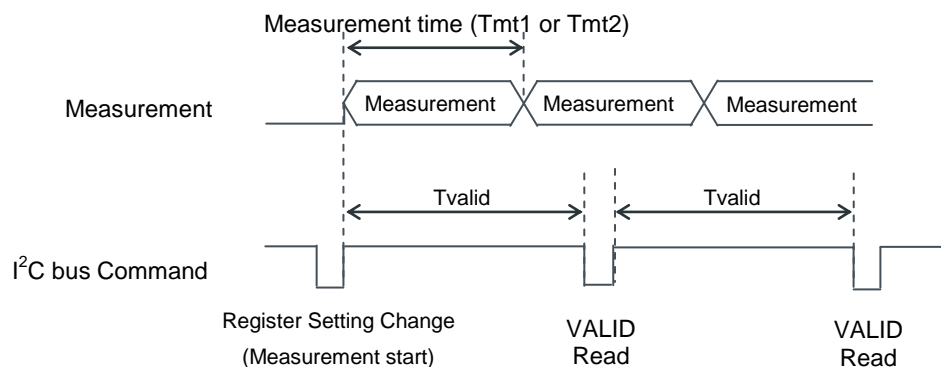
Interrupt Function

Interrupt function compares the measurement result selected from RGBC data by INT SOURCE register to preset interrupt threshold level. If measurement result is outside of two threshold level, INT pin outputs 'L'. This IC uses two threshold level(upper and lower). Interrupt threshold is defined at TH_HIGH register and TH_LOW register.

INT pin is high impedance when VCC is supplied.
To clear interrupt
1) Writing INT reset command
2) Reading INTERRUPT register.
3) Writing any command to register of 0x41, 0x42, 0x60, 0x61, 0x62, 0x63, 0x64, 0x65
4) Writing software reset command

Ex) Interrupt behavior example

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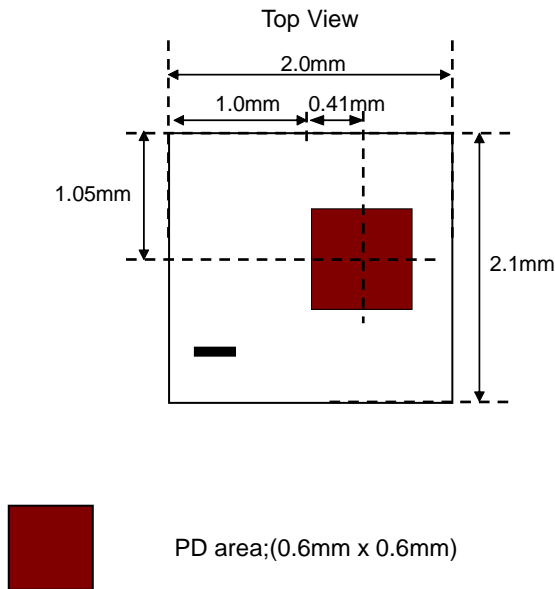
Power supply sequence

ALL register of this IC is reset when VCC powers up.
There are some notes about power up and down sequence as shown below.

(1) Power ON Time: t_1
More than 2ms is needed to activate this IC after VCC becomes more than 2.3V from less than 0.4V.

(2) Power OFF time: t_2
More than 1ms (VCC < 0.4V) is needed before supplying power to this IC.
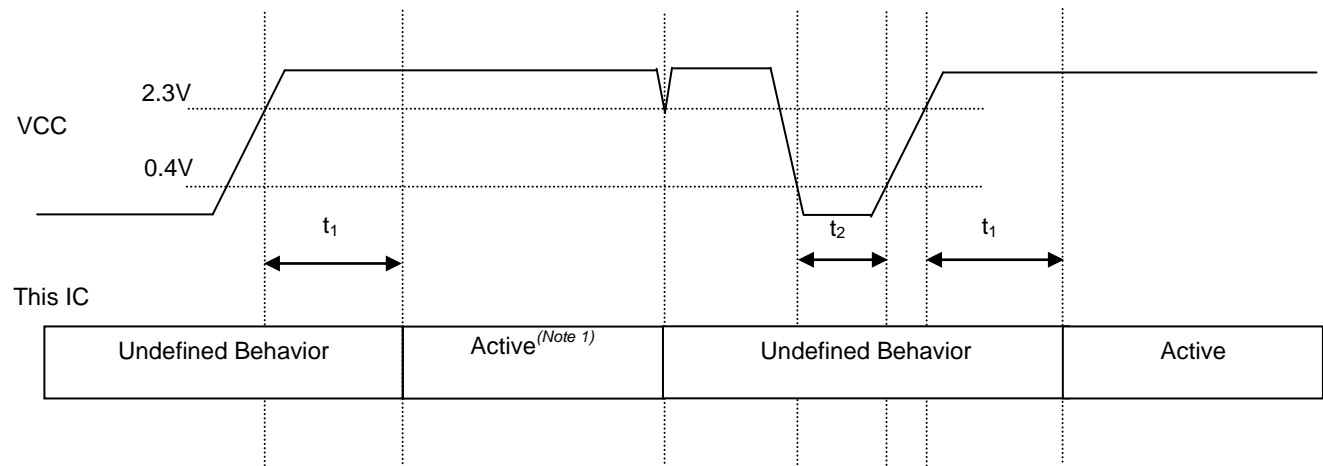
(Note1) "Active" state is that this IC works and accepts I²C bus access correctly.

Optical design for the device

PD area;(0.6mm x 0.6mm)

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I/O Equivalent Circuit

Pin Name	Equivalent Circuit
ADDR	
TEST	
SCL	
SDA	
INT	

Operational Notes

1. **Reverse Connection of Power Supply**
   Connecting the power supply in reverse polarity can damage the IC. Take precautions against reverse polarity when connecting the power supply, such as mounting an external diode between the power supply and the IC's power supply pins.

2. **Power Supply Lines**
   Design the PCB layout pattern to provide low impedance supply lines. Furthermore, connect a capacitor to ground at all power supply pins. Consider the effect of temperature and aging on the capacitance value when using electrolytic capacitors.

3. **Ground Voltage**
   Ensure that no pins are at a voltage below that of the ground pin at any time, even during transient condition.

4. **Ground Wiring Pattern**
   When using both small-signal and large-current ground traces, the two ground traces should be routed separately but connected to a single ground at the reference point of the application board to avoid fluctuations in the small-signal ground caused by large currents. Also ensure that the ground traces of external components do not cause variations on the ground voltage. The ground lines must be as short and thick as possible to reduce line impedance.

5. **Thermal Consideration**
   Should by any chance the maximum junction temperature rating be exceeded the rise in temperature of the chip may result in deterioration of the properties of the chip. In case of exceeding this absolute maximum rating, increase the board size and copper area to prevent exceeding the maximum junction temperature rating.

6. **Recommended Operating Conditions**
   These conditions represent a range within which the expected characteristics of the IC can be approximately obtained. The electrical characteristics are guaranteed under the conditions of each parameter.

7. **Inrush Current**
   When power is first supplied to the IC, it is possible that the internal logic may be unstable and inrush current may flow instantaneously due to the internal powering sequence and delays, especially if the IC has more than one power supply. Therefore, give special consideration to power coupling capacitance, power wiring, width of ground wiring, and routing of connections.

8. **Operation Under Strong Electromagnetic Field**
   Operating the IC in the presence of a strong electromagnetic field may cause the IC to malfunction.

9. **Testing on Application Boards**
   When testing the IC on an application board, connecting a capacitor directly to a low-impedance output pin may subject the IC to stress. Always discharge capacitors completely after each process or step. The IC's power supply should always be turned off completely before connecting or removing it from the test setup during the inspection process. To prevent damage from static discharge, ground the IC during assembly and use similar precautions during transport and storage.

10. **Inter-pin Short and Mounting Errors**
    Ensure that the direction and position are correct when mounting the IC on the PCB. Incorrect mounting may result in damaging the IC. Avoid nearby pins being shorted to each other especially to ground, power supply and output pin. Inter-pin shorts could be due to many reasons such as metal particles, water droplets (in very humid environment) and unintentional solder bridge deposited in between pins during assembly to name a few.

11. **Unused Input Pins**
    Input pins of an IC are often connected to the gate of a MOS transistor. The gate has extremely high impedance and extremely low capacitance. If left unconnected, the electric field from the outside can easily charge it. The small charge acquired in this way is enough to produce a significant effect on the conduction through the transistor and cause unexpected operation of the IC. So unless otherwise specified, unused input pins should be connected to the power supply or ground line.

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Operational Notes – continued

12. **Regarding the Input Pin of the IC**
This monolithic IC contains P+ isolation and P substrate layers between adjacent elements in order to keep them isolated. P-N junctions are formed at the intersection of the P layers with the N layers of other elements, creating a parasitic diode or transistor. For example (refer to figure below):

When GND > Pin A and GND > Pin B, the P-N junction operates as a parasitic diode.
When GND > Pin B, the P-N junction operates as a parasitic transistor.

Parasitic diodes inevitably occur in the structure of the IC. The operation of parasitic diodes can result in mutual interference among circuits, operational faults, or physical damage. Therefore, conditions that cause these diodes to operate, such as applying a voltage lower than the GND voltage to an input pin (and thus to the P substrate) should be avoided.
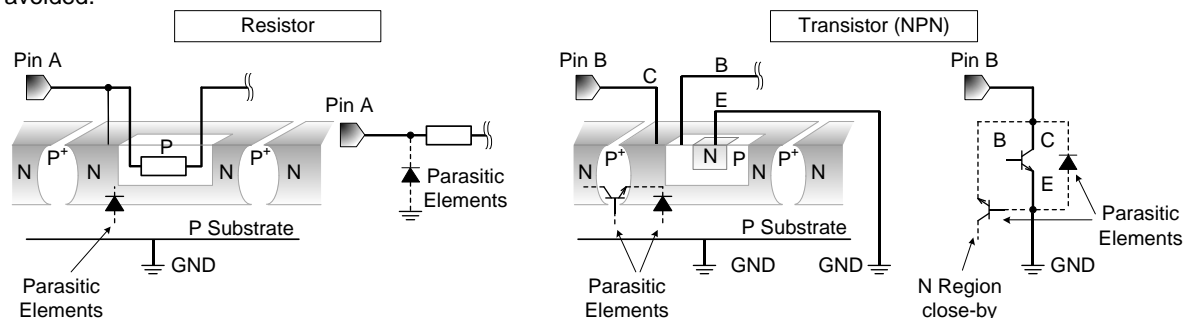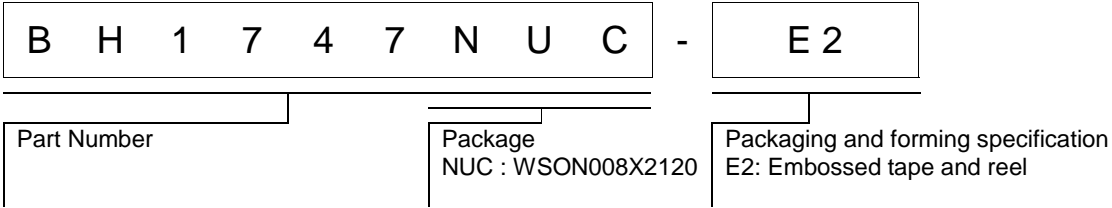

Figure 2. Example of monolithic IC structure

13. **Ceramic Capacitor**
When using a ceramic capacitor, determine the dielectric constant considering the change of capacitance with temperature and the decrease in nominal capacitance due to DC bias and others.
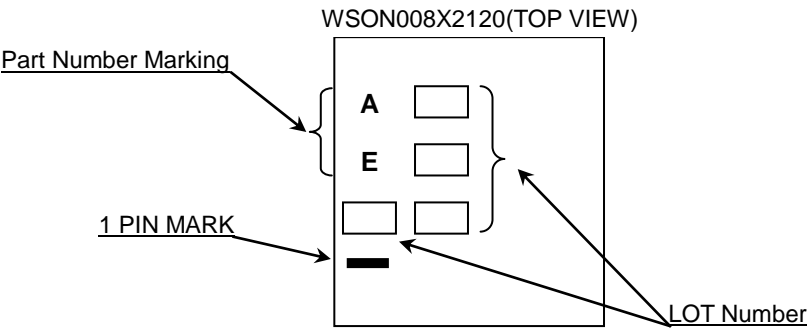
14. **Area of Safe Operation (ASO)**
Operate the IC such that the output voltage, output current, and power dissipation are all within the Area of Safe Operation (ASO).
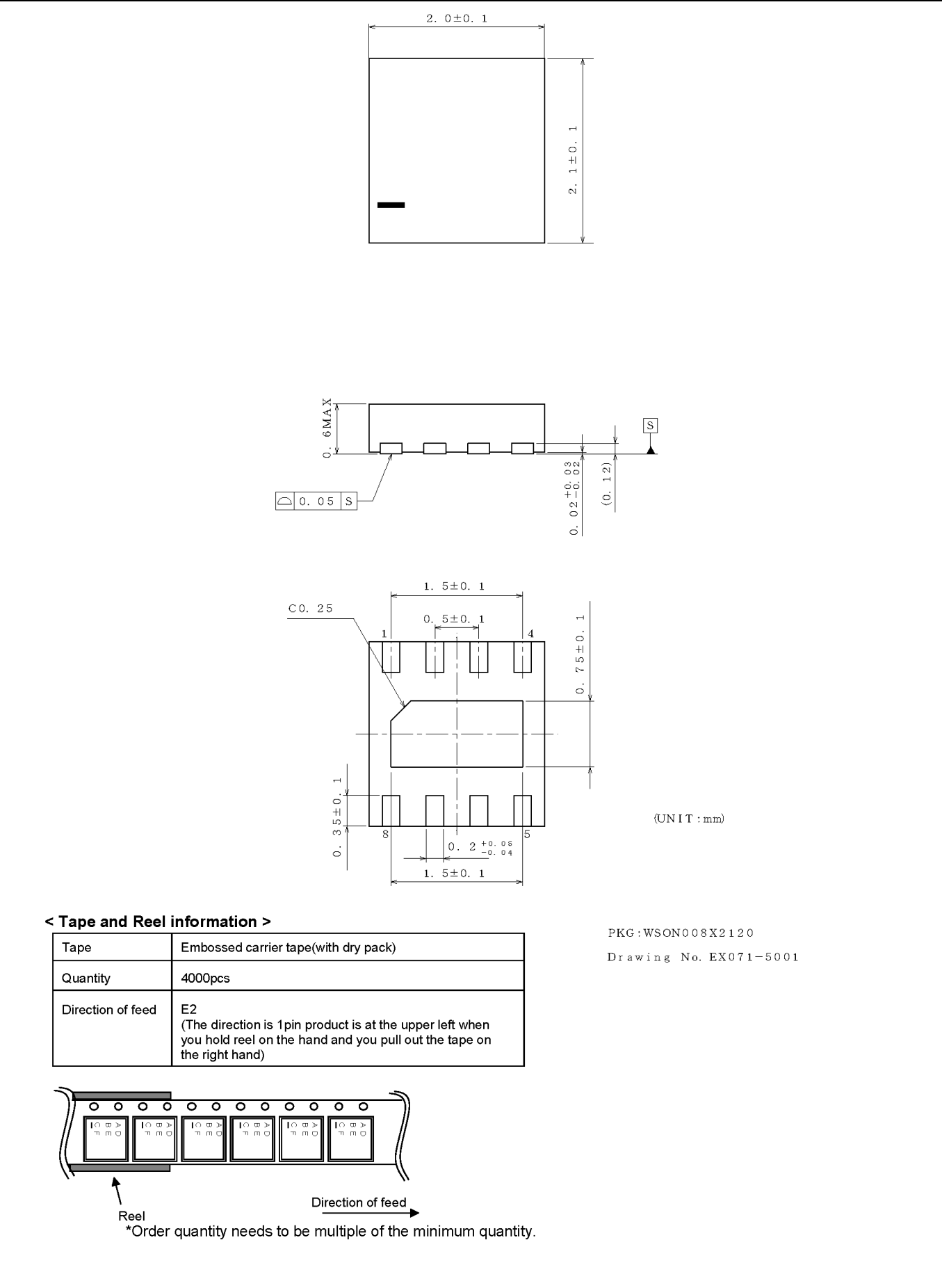
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Ordering Information

B H 1 7 4 7 N U C - E 2

Part Number

Package
NUC : WSON008X2120

Packaging and forming specification
E2: Embossed tape and reel

Marking Diagram

WSON008X2120(TOP VIEW)

Part Number Marking

A

E

1 PIN MARK

LOT Number

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Physical Dimension, Tape and Reel Information

Package Name	WSON008X2120

2. 0±0. 1

2. 1±0. 1

0. 6MAX

0. 02 +0.03 −0.02

(0. 12)

⌓ 0. 05 S

S

1. 5±0. 1

0. 5±0. 1

C0. 25

0. 75±0. 1

1

4

8

5

0. 35±0. 1

0. 2 +0.05 −0.04

1. 5±0. 1

(UNIT : mm)

PKG : WSON008X2120

Drawing No. EX071−5001

< Tape and Reel information >

Tape	Embossed carrier tape(with dry pack)
Quantity	4000pcs
Direction of feed	E2 (The direction is 1pin product is at the upper left when you hold reel on the hand and you pull out the tape on the right hand)

Reel

Direction of feed

*Order quantity needs to be multiple of the minimum quantity.

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3.Jul.2017 Rev.004

Revision History

Date	Revision	Changes
26.Sep.2016	001	New Release
25.Nov.2016	002	Correction of errors
13.Apr.2017	003	Addition of 1pin mark in PD area figure and correction of errors
3.Jul.2017	004	Addition of explanation about VALID register

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Notice

Precaution on using ROHM Products

1. Our Products are designed and manufactured for application in ordinary electronic equipments (such as AV equipment, OA equipment, telecommunication equipment, home electronic appliances, amusement equipment, etc.). If you intend to use our Products in devices requiring extremely high reliability (such as medical equipment [(Note 1)], transport equipment, traffic equipment, aircraft/spacecraft, nuclear power controllers, fuel controllers, car equipment including car accessories, safety devices, etc.) and whose malfunction or failure may cause loss of human life, bodily injury or serious damage to property ("Specific Applications"), please consult with the ROHM sales representative in advance. Unless otherwise agreed in writing by ROHM in advance, ROHM shall not be in any way responsible or liable for any damages, expenses or losses incurred by you or third parties arising from the use of any ROHM's Products for Specific Applications.

(Note1) Medical Equipment Classification of the Specific Applications

JAPAN	USA	EU	CHINA
CLASSⅢ	CLASSⅢ	CLASSⅡb	CLASSⅢ
CLASSⅣ		CLASSⅢ	

2. ROHM designs and manufactures its Products subject to strict quality control system. However, semiconductor products can fail or malfunction at a certain rate. Please be sure to implement, at your own responsibilities, adequate safety measures including but not limited to fail-safe design against the physical injury, damage to any property, which a failure or malfunction of our Products may cause. The following are examples of safety measures:
   [a] Installation of protection circuits or other protective devices to improve system safety
   [b] Installation of redundant circuits to reduce the impact of single or multiple circuit failure

3. Our Products are designed and manufactured for use under standard conditions and not under any special or extraordinary environments or conditions, as exemplified below. Accordingly, ROHM shall not be in any way responsible or liable for any damages, expenses or losses arising from the use of any ROHM's Products under any special or extraordinary environments or conditions. If you intend to use our Products under any special or extraordinary environments or conditions (as exemplified below), your independent verification and confirmation of product performance, reliability, etc, prior to use, must be necessary:
   [a] Use of our Products in any types of liquid, including water, oils, chemicals, and organic solvents
   [b] Use of our Products outdoors or in places where the Products are exposed to direct sunlight or dust
   [c] Use of our Products in places where the Products are exposed to sea wind or corrosive gases, including Cl_2, H_2S, NH_3, SO_2, and NO_2
   [d] Use of our Products in places where the Products are exposed to static electricity or electromagnetic waves
   [e] Use of our Products in proximity to heat-producing components, plastic cords, or other flammable items
   [f] Sealing or coating our Products with resin or other coating materials
   [g] Use of our Products without cleaning residue of flux (even if you use no-clean type fluxes, cleaning residue of flux is recommended); or Washing our Products by using water or water-soluble cleaning agents for cleaning residue after soldering
   [h] Use of the Products in places subject to dew condensation

4. The Products are not subject to radiation-proof design.

5. Please verify and confirm characteristics of the final or mounted products in using the Products.

6. In particular, if a transient load (a large amount of load applied in a short period of time, such as pulse. is applied, confirmation of performance characteristics after on-board mounting is strongly recommended. Avoid applying power exceeding normal rated power; exceeding the power rating under steady-state loading condition may negatively affect product performance and reliability.

7. De-rate Power Dissipation depending on ambient temperature. When used in sealed area, confirm that it is the use in the range that does not exceed the maximum junction temperature.

8. Confirm that operation temperature is within the specified range described in the product specification.

9. ROHM shall not be in any way responsible or liable for failure induced under deviant condition from what is defined in this document.

Precaution for Mounting / Circuit board design

1. When a highly active halogenous (chlorine, bromine, etc.) flux is used, the residue of flux may negatively affect product performance and reliability.

2. In principle, the reflow soldering method must be used on a surface-mount products, the flow soldering method must be used on a through hole mount products. If the flow soldering method is preferred on a surface-mount products, please consult with the ROHM representative in advance.

For details, please refer to ROHM Mounting specification

Precautions Regarding Application Examples and External Circuits

1. If change is made to the constant of an external circuit, please allow a sufficient margin considering variations of the characteristics of the Products and external components, including transient characteristics, as well as static characteristics.

2. You agree that application notes, reference designs, and associated data and information contained in this document are presented only as guidance for Products use. Therefore, in case you use such information, you are solely responsible for it and you must exercise your own independent verification and judgment in the use of such information contained in this document. ROHM shall not be in any way responsible or liable for any damages, expenses or losses incurred by you or third parties arising from the use of such information.

Precaution for Electrostatic

This Product is electrostatic sensitive product, which may be damaged due to electrostatic discharge. Please take proper caution in your manufacturing process and storage so that voltage exceeding the Products maximum rating will not be applied to Products. Please take special care under dry condition (e.g. Grounding of human body / equipment / solder iron, isolation from charged objects, setting of Ionizer, friction prevention and temperature / humidity control).

Precaution for Storage / Transportation

1. Product performance and soldered connections may deteriorate if the Products are stored in the places where:
   [a] the Products are exposed to sea winds or corrosive gases, including Cl2, H2S, NH3, SO2, and NO2
   [b] the temperature or humidity exceeds those recommended by ROHM
   [c] the Products are exposed to direct sunshine or condensation
   [d] the Products are exposed to high Electrostatic

2. Even under ROHM recommended storage condition, solderability of products out of recommended storage time period may be degraded. It is strongly recommended to confirm solderability before using Products of which storage time is exceeding the recommended storage time period.

3. Store / transport cartons in the correct direction, which is indicated on a carton with a symbol. Otherwise bent leads may occur due to excessive stress applied when dropping of a carton.

4. Use Products within the specified time after opening a humidity barrier bag. Baking is required before using Products of which storage time is exceeding the recommended storage time period.

Precaution for Product Label

A two-dimensional barcode printed on ROHM Products label is for ROHM's internal use only.

Precaution for Disposition

When disposing Products please dispose them properly using an authorized industry waste company.

Precaution for Foreign Exchange and Foreign Trade act

Since concerned goods might be fallen under listed items of export control prescribed by Foreign exchange and Foreign trade act, please consult with ROHM in case of export.

Precaution Regarding Intellectual Property Rights

1. All information and data including but not limited to application example contained in this document is for reference only. ROHM does not warrant that foregoing information or data will not infringe any intellectual property rights or any other rights of any third party regarding such information or data.

2. ROHM shall not have any obligations where the claims, actions or demands arising from the combination of the Products with other articles such as components, circuits, systems or external equipment (including software).

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3. In no event shall you use in any way whatsoever the Products and the related technical information contained in the Products or this document for any military purposes, including but not limited to, the development of mass-destruction weapons.

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2. All information contained in this docume nt is current as of the issuing date and subj ect to change without any prior notice. Before purchasing or using ROHM's Products, please confirm the la test information with a ROHM sale s representative.

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