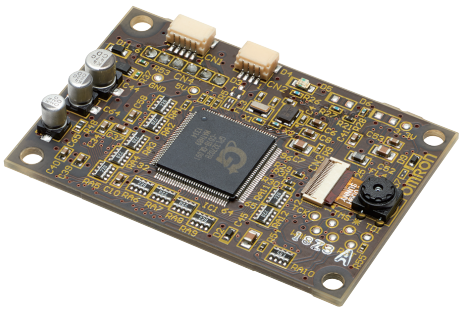
B5T-001001(G)

Human Vision Components

Human “Sensing” and “Understanding” by OMRON image sensing technology



- **People’s conditions recognizable simply by mounting an HVC on equipment**
- **Full range of functions**
  Ten different sensing functions are incorporated to recognize the intentions and conditions of people from a variety of perspectives.
  Available functions are:
  1) Human Body Detection, 2) Hand Detection, 3) Face Detection, 4) Face Direction Estimation, 5) Age Estimation, 6) Gender Estimation, 7) Blink Estimation, 8) Expression Estimation (satisfied, unsatisfied, five different expressions:happiness, surprise, anger, sadness, and neutral), 9) Face Recognition, and 10) Gaze Estimation
- **High precision**

RoHS compliant

Application Example

- Home appliances
- Marketing research (POS registers and automatic venders)
- Industrial equipment (food processing equipment)
- Robotics (robotic pets)

Ordering Information

■ Standard Models with Surface Mounting Terminals

Packaging	Model
BOX	**B5T-001001(G)**

Note: There are 2 product models, the development kit is B5T-E-001-S(G).
Refer to page 11 for details.

Ratings, Specifications, and Function

■ Rating

Item	Specifications
Power supply voltage	5 V ±10%
Power consumption	Less than 0.25 A
Operating temperature	0 to +50°C (no condensation or freezing)
Operating humidity	Below 90% RH (no condensation or freezing)
Storage temperature	-30 to +70°C (no condensation or freezing)
Storage humidity	Below 90% RH (no condensation or freezing)

■ Specifications and Functions

Input Image Specifications

Item	Specifications
Resolution	640 × 480 pixels
Horizontal detection range (angle of view)	49+/-3deg
Vertical detection range (angle of view)	37+/-3deg
Optical axis angle range	+/-7deg
Alignment angle range	+/-3deg

Output Image Specifications

Item	Specifications
Output image	No image / 160 × 120 pixels / 320 × 240 pixels (choose one)
Image format	RAW (8-bit, Y data)

Image Sensing Functions

Function	Output	Details
Human Body Detection, Hand Detection, Face Detection	Number of detected objects	Maximum of 35 per object type
	Position (center coordinates)	Coordinates on the screen from the top-left corner of the screen (in pixels)
	Size	Pixel size on the input image
	Degree of confidence	Confidence in the detection result (0 to 1000), a higher value indicates a higher confidence
Face Direction Estimation	Yaw angle	Positive to the right (in degrees)
	Pitch angle	Positive upwards (in degrees)
	Roll angle	Positive clockwise (in degrees)
	Degree of confidence	Confidence in the estimation result (0 to 1000), a higher value indicates a higher confidence
Age Estimation	Age	0 to 75 (75 includes higher ages)
	Degree of confidence	Confidence in the estimation result (0 to 1000), a higher value indicates a higher confidence
Gender Estimation	Gender	Male or female
	Degree of confidence	Confidence in the estimation result (0 to 1000), a higher value indicates a higher confidence
Blink Estimation	Blink degree	Output for both eyes (1 to 1000), a higher value indicates the eye is closer to being fully shut
Expression Estimation	Score for 5 expressions	0 to 100 The score will be output for each expression (“neutral”, “happiness”, “surprise”, “anger” and “sadness”). The score indicates the likeliness of a face displaying the estimated expression, where a higher score indicates a higher likeliness of being that expression.
	Expression degree (positive or negative)	+100 to -100 A degree closer to +100 indicates a high degree of “happiness” while a degree closer to -100 indicates a high degree of “surprise”, “anger” or “sadness”.
Face Recognition	Individual identification result	Displays the registered User ID, or “non-registered” for non-registered individuals Maximum number of users: 500
	Score	Matching degree (0 to 1000) The result of the user with the highest matching degree is output. A degree closer to 1000 indicates a higher likeliness of being that user.
Gaze Estimation	Yaw angle	Positive to the right (in degrees)
	Pitch angle	Positive upwards (in degrees)

Detection Distance (for reference *)

Function	Maximum distance
Human Body Detection	2.8 meters
Hand Detection	1.5 meters
Face Detection, Face Direction Estimation, Gaze Estimation, Blink Estimation, Age Estimation, Gender Estimation, Expression Estimation, Face Recognition	1.3 meters

* Caution: Please note that the detection and estimation performance will gradually fall when exceeding the maximum distance indicated for reference.
Please note that being within the range indicated above does not always guarantee successful detection.

Angle range (for reference *1)

Function	Pitch angle	Yaw angle	Roll angle
Human Body Detection	Up direction 15° Down direction -30° *2	360° *3	+/-10°
Hand Detection	+/-20°	+/-30°	
Face Detection	+/-30°	+/-90°	+/-45°
Face Direction Estimation	Face direction +/-20°	Face direction +/-30°	
Age Estimation			
Gender Estimation			
Blink Estimation			
Expression Estimation			
Face Recognition			
Gaze Estimation	Gaze angle +/-20° *4 (up to +/-10° for face direction)	Gaze angle +/-30° *4 Up to +/-20° for face direction	

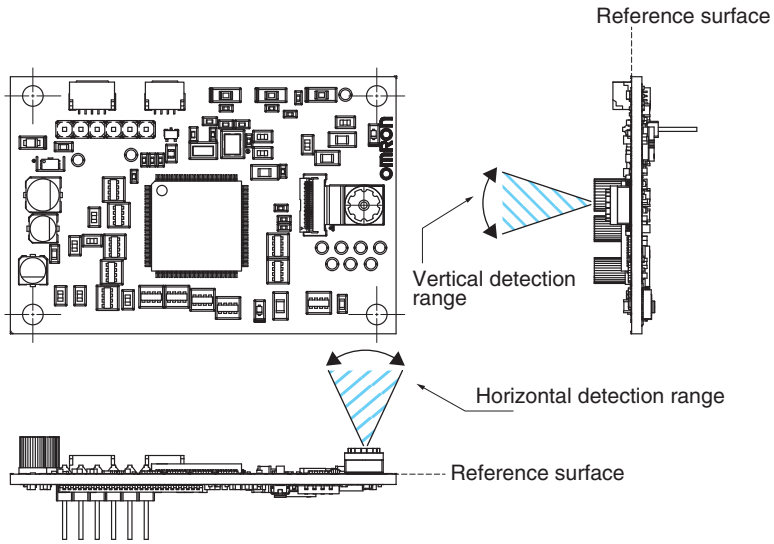
*1. The detection and estimation accuracy will fall when outside the specified angle range.
Please note that being within range indicated above does not always guarantee successful detection.
*2. “Up direction 15°” indicates that the camera is looking up to the target from a 15° downward angle and “Down direction -30°” indicates that the camera is looking down to the target from a 30° upward angle.
*3. This indicates all the directions to the left and right of the human body.
*4. This is the angle when facing the camera.

Specifications for Signal with Host

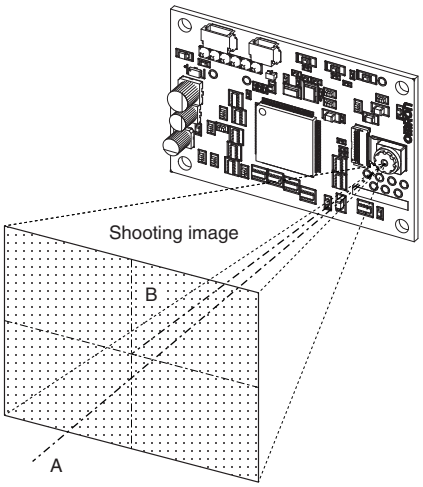
Item	Specifications
Outline	Receives the command controlling the module from the host and sends back the detection result info
Transmission system	Full-duplex bidirectional system
Transmission protocol	Non-procedure
Synchronization system	Asynchronous method
Data format	Start: 1 bit, Data: 8 bit, Stop: 1 bit, no parity
Transmission code	NRZ, Logic Low: 0V Logic High: 3.3V
Transmission speed	Please refer to the description of the DIP Switch SW2.

■ Definition of the image input specification

Horizontal and vertical detection ranges.

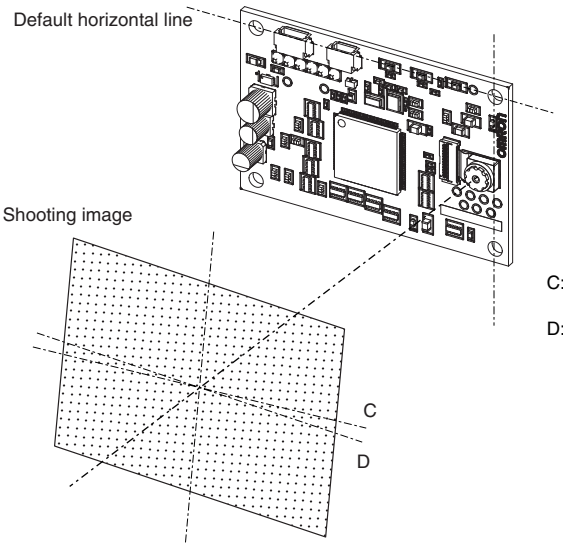


Optical axis angle



A: Optical axis from the camera center when mounted in default position.
B: Optical axis displaying the camera's shooting range. The optical axis angle will be the angle difference between A and B.

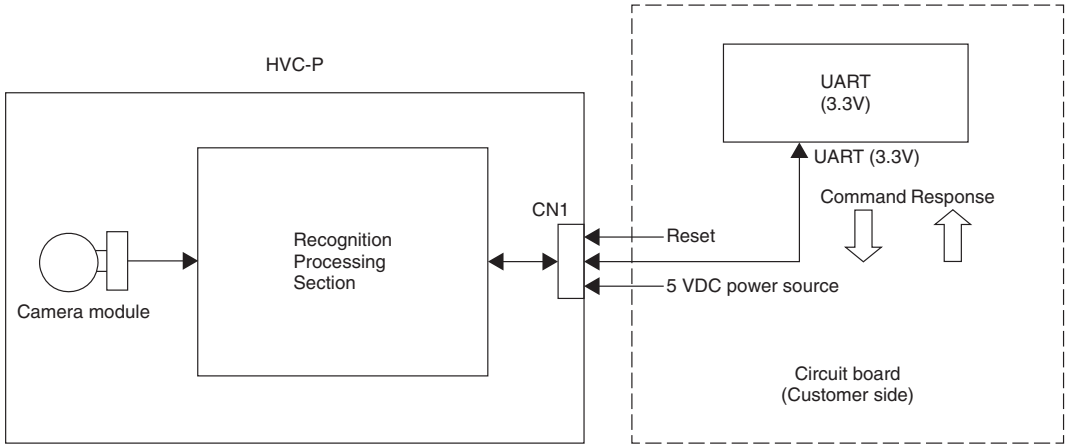
Alignment angle



C: Default horizontal line when mounted in default position.
D: Horizontal line for the shooting image. The alignment angle is the angle difference between C and D.

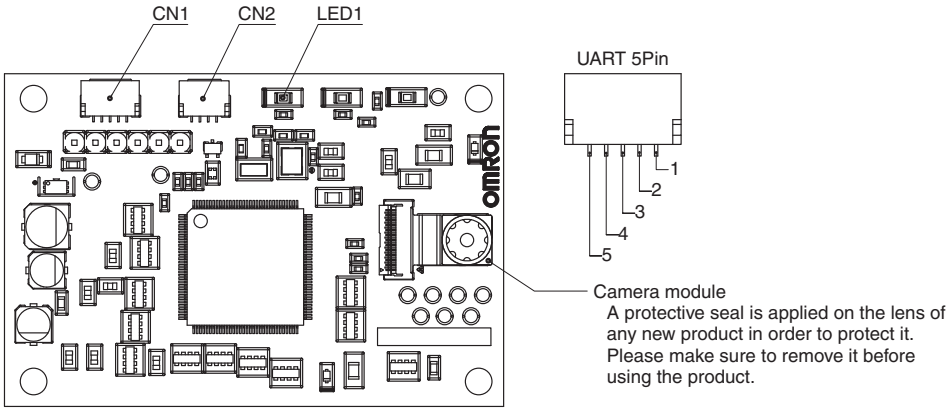
Connection

■ Block Diagram



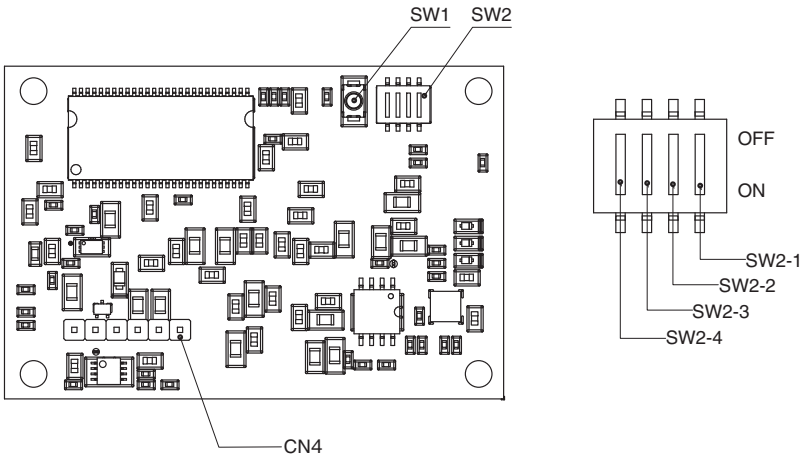
Parts Name and Functions

Front



Signal	Name	Function
CN1	Connector 1	UART signal, power switch, reset input (cannot be connected simultaneously with CN4)
CN2	Connector 2	Not usable
LED1	LED1	Lit when power is ON

Back



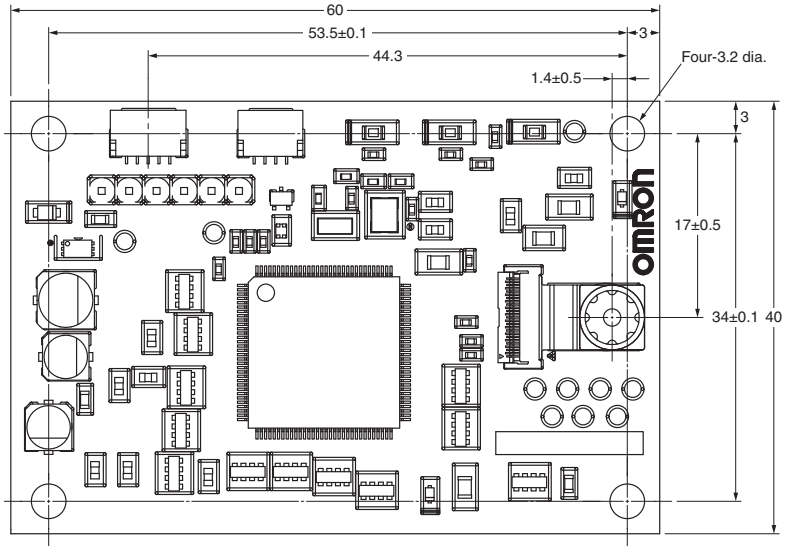
Signal	Name	Description
CN4	Connector 4	Reserved for OMRON HVC-P Evaluation Kit. (cannot be connected simultaneously with CN1)
SW1	Tact switch	Reset input for The Product
SW2	DIP switch	Transmission rate setting of the UART signal *

* DIP Switch SW2 setting.
The function of each bit is as follows:
SW2-1: Fixed to ON (Please do not set it to OFF).
SW2-2 to 2-4: Used to set the transmission rate setting of the UART signal.

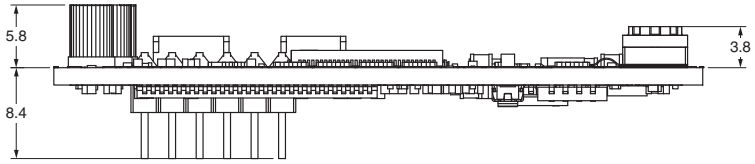
Transmission rate (bps)	SW2-2	SW2-3	SW2-4
9,600	OFF	OFF	OFF
38,400	ON	OFF	OFF
115,200	OFF	ON	OFF
230,400	ON	ON	OFF
460,800	OFF	OFF	ON
921,600 (factory setting)	ON	OFF	ON

Dimensions (Unit: mm)

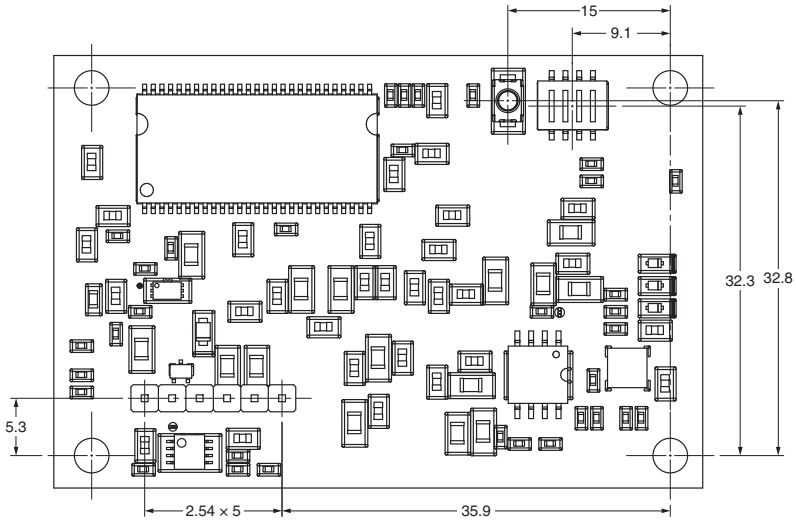
Front



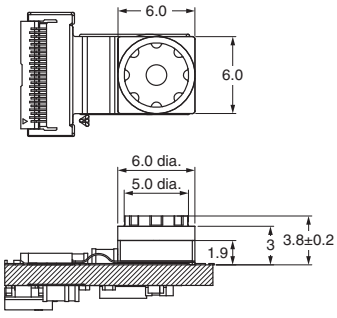
Side

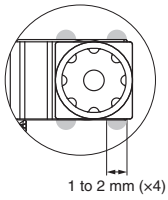


Back



Camera Device





Glue is applied as mentioned above for camera fixing.

Connector Pin Configuration

Please keep CN2 free of any connection.
CN4 is reserved for the OMRON HVC-P Evaluation Kit.
CN4 cannot be used simultaneously with CN1.

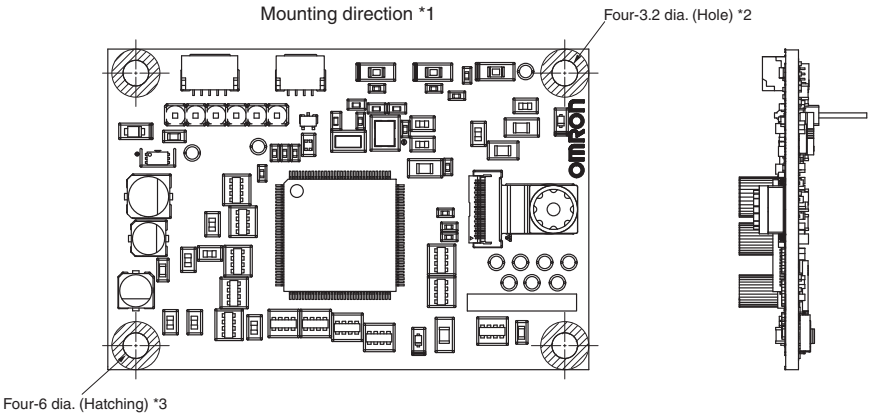
CN1 is used to connect to the power supply and the UART signal interface.
Connector: SM05B-SRSS-TB (made by J.S.T. Mfg. Co. Ltd.)

Recommended connector on the other end:
Housing: SHR-05V-S (made by J.S.T. Mfg. Co. Ltd.)
Contact: SSH-003T-P0.2 (made by J.S.T. Mfg. Co. Ltd.)

Pin number	Signal	I/O	Description
1	Vcc	-	Power supply: 5.0VÅ}10%
2	UART RX *	Input	UART signal (from host to HVC-P)
			Logic 0: 0V Logic 1: 3.3V
3	UART TX	Output	UART signal (from HVC-P to host)
			Logic 0: 0V Logic 1: 3.3V
4	GND	-	Ground
5	RESET	Input	Reset signal (from host to HVC-P)
			Logic 0: 0V Logic 1: 3.3V
			Reset is active on logic 0

* Set the UART RX logic 0 to 0V when the Product is turned OFF.

Mounting (Unit: mm)



*1. This figure is for a frontal mounting direction (0°) of the module.
The software settings need to be changed when set to a 90°, 180° or 270° clockwise mounting direction from the front (0°).
*2. Use the M3 screws to fix the board in the four corners.
Make sure to not bend or break the board when fixing the screws.
Make sure to also use the tightening torques provided.
Make sure to fix the board so that it is not warped, bent or any under unreasonable stress.
Make sure that the board is sufficiently distanced from any electrically-conductive part.
*3. The 6 dia. (×4) hatching sections indicate the acceptable area for metallic components.
*4. Do not subject the board to stress, such as twisting or bending, when fixing it.
*5. Fix the board in a safe distance from the surrounding current-carrying elements.

Safety Precautions

Precautions and disclaimer

(1) Definitions:

1) Omron Product: HVC-P described in specifications.
2) Customer: Distributor and/or the end Customer who introduces, uses, or integrates the Omron Product in the Customer Application.
3) Customer Application: Any kind form of application, integration or use of the Omron Product in connection with the Customer's end product.
4) Software: Omron's OKAO™ software, as embedded in the Omron Product.

(2) CAUTION ON DESCRIPTIONS
Attention is required to the following points:

1) Rated values and performance values are the product of tests performed for separate single conditions, including but not limited to temperature and humidity. **Omron does NOT warrant rated values and performance values for multiple combined conditions.**
2) Reference data are provided for reference only. **Omron does NOT warrant that the Omron Product works properly at all times in the range of reference data.**
3) Application examples are provided for reference only. **Omron does NOT warrant the fitness of the Omron Product in Customer Application.**
4) Omron may discontinue the production of the Omron Product or change the specifications of them for the purpose of improving such products or other reasons entirely at Omron's sole discretion at any time.

(3) PRECAUTIONS AND CONDITIONS OF USE
Customer accepts the following precautions and conditions when Customer introduces, uses or integrates the Omron Product in a Customer Application:

1) Customer shall use the Omron Product in compliance with usage conditions, including but not limited to, rating and performance.
2) The Omron Product is composed of (i) hardware and (ii) the Software. The Software is an inseparable part of the Omron Product and the use and application of this Software is strictly limited to the use and application of the Omron Product as a whole, to be integrated into Customer Application. **It is strictly forbidden to extract, copy, amend, reproduce the Software and/or to otherwise infringe Omron's intellectual property rights on the Omron Product and the Software, and doing or attempting to do so may be punishable by law.**
3) **THE OMRON PRODUCT SHALL NOT BE USED IN THE FOLLOWING APPLICATIONS:**
   (a) Applications with stringent safety requirements, including but not limited to nuclear power control equipment, combustion equipment, aerospace equipment, railway equipment, elevator/lift equipment, amusement park equipment, medical equipment, safety devices or any other applications that could cause danger/harm to people's body and life.
   (b) Applications that require high reliability, including but not limited to supply systems for gas, water and electricity, etc., 24 hour continuous operating systems, financial settlement systems and other applications that handle rights and property.
   (c) Applications for use under severe conditions or in severe environments, including but not limited to outdoor equipment, equipment exposed to chemical contamination, equipment exposed to electromagnetic interference and equipment exposed to vibration and shocks.
   (d) Applications under any conditions or environments not specifically described in specification.
   (e) Automotive applications (including automotive applications relating to two wheel vehicles). CUSTOMER SHALL NOT use the Omron Product for automotive applications.

   IF CUSTOMER INTRODUCES, USES, OR INTEGRATES THE OMRON PRODUCT IN THE APPLICATIONS DESCRIBED IN SECTION (3)3)(a) to (3)3)(e), OMRON SHALL NOT PROVIDE ANY WARRANTY FOR THE OMRON PRODUCT.

(4) CUSTOMER APPLICATION

1) The precautions and conditions of use written above also apply equally to the use of the Customer Application in which the Omron Product is integrated. **DISTRIBUTORS shall ensure that such conditions of use are being made clear to end-Customers.**

(5) LIMITED WARRANTY AND LIMITATION OF LIABILITY

ANY WARRANTY ON THE OMRON PRODUCT SHALL NOT APPLY IF THE OMRON PRODUCT IS NOT INTRODUCED, USED OR INTEGRATED IN ACCORDANCE WITH THE PRECAUTION AND DISCLAIMER STATEMENTS INCLUDED IN THIS DOCUMENT. OMRON DISCLAIMS ALL LIABILITY, TO THE EXTENT POSSIBLE BY LAW, FOR ANY AND ALL COSTS OR DAMAGES WHICH MAY ARISE IN RELATION TO THE OMRON PRODUCT OR CUSTOMER APPLICATION WHERE THE OMRON PRODUCT OR CUSTOMER APPLICATION IS INTRODUCED, INTEGRATED OR USED IN A MANNER THAT IS NON-COMPLIANT WITH THE PRECAUTION AND DISCLAIMER STATESMENTS INCLUDED IN THIS DOCUMENT.

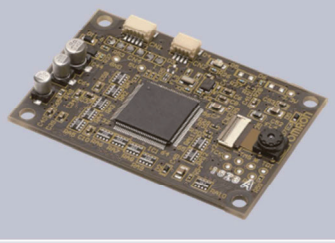
OMRON SHALL NOT BE LIABLE FOR LOSS OF USE OR ANY OTHER SPECIAL, INCIDENTAL, CONSEQUENTIAL OR INDIRECT COSTS, EXPENSES OR DAMAGES.

- Application examples provided in this document are for reference only. In actual applications, confirm equipment functions and safety before using the product.
- Consult your OMRON representative before using the product under conditions which are not described in the manual or applying the product to nuclear control systems, railroad systems, aviation systems, vehicles, combustion systems, medical equipment, amusement machines, safety equipment, and other systems or equipment that may have a serious influence on lives and property if used improperly. Make sure that the ratings and performance characteristics of the product provide a margin of safety for the system or equipment, and be sure to provide the system or equipment with double safety mechanisms.

Note: Do not use this document to operate the Unit.

OMRON Corporation
Electronic and Mechanical Components Company **Contact: www.omron.com/ecb**
Cat. No. A234-E1-03
0715(1014)(O)

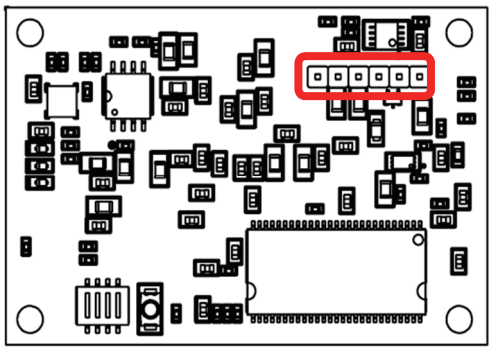
Appendix HVC-P Package Contents

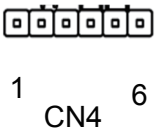
Model	Contents of Package
B5T-001001(G)	-HVC-P Image Sensing Component ※Download Supply - Instruction sheet - Command Specifications 
B5T-E-001-S(G) (HVC-P Evaluation Kit: Connect HVC-P to a PC to confirm and evaluate the HVC-P output results on the PC.)	-HVC-P Image Sensing Component -HVC Conversion Board -USB cable -Screw, spacer and nut (bolt)(1 of each) ※Download Supply -Instruction sheet -Command Specifications -Evaluation software -Evaluation software manual / install manual -Product Outline document -Sample code

Appendix HVC-P CN4 Specification

■Reserved for OMRON HVC-P Evaluation Kit

It cannot be connected simultaneously with CN1.





Connector : XG8S-0631 (OMRON)

■Connector Pin Configuration

Pin number	Signal	I/O	Description
1	GND	-	Ground
2	CTS	Input	UART flow control signal (not used)
3	Vcc	-	Power supply: 5.0V±10%
4	RXD	input	UART signal (from host to HVC-P) Logic 0: 0V Logic 1: 3.3V
5	TXD	output	UART signal(from HVC-P to host) Logic 0: 0V Logic 1: 3.3V
6	RTS	output	UART flow control signal (not used)