

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.

B5T-001001(G)

Ratings, Specifications, and Function

■ Rating

Item	Specifications
Power supply voltage	5 V \pm 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	

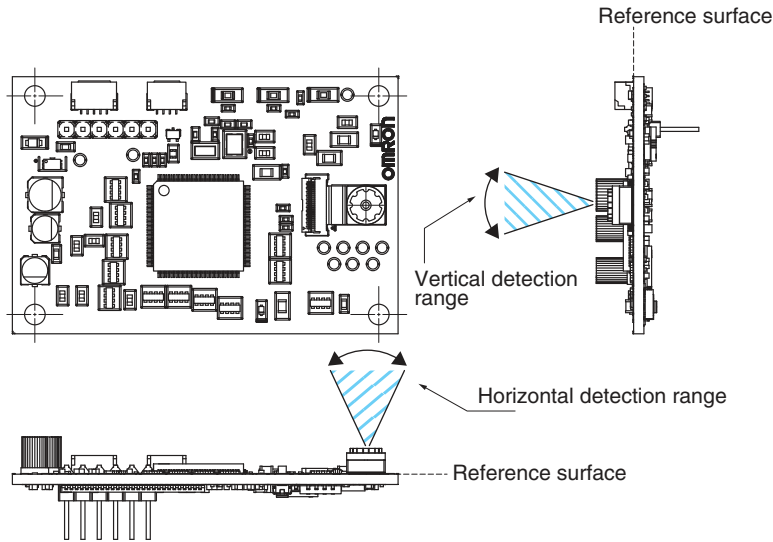
- *1. The detection and estimation accuracy will fall when outside the specified angle range. Please note that being within range indicated above does not always guarantee successful detection.
- *2. "Up direction 15°" indicates that the camera is looking up to the target from a 15° downward angle and "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

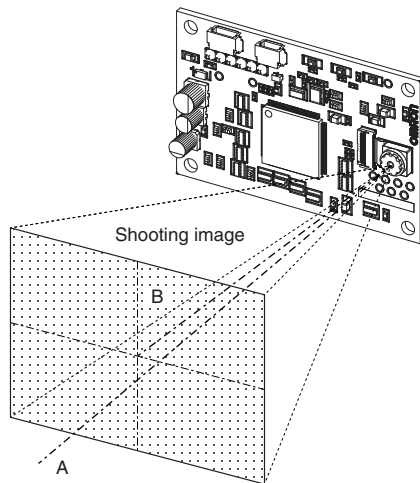
Item	Specifications
Outline	Receives the command controlling the module from the host and sends back the detection result info
Transmission system	Full-duplex bidirectional system
Transmission protocol	Non-procedure
Synchronization system	Asynchronous method
Data format	Start: 1 bit, Data: 8 bit, Stop: 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.

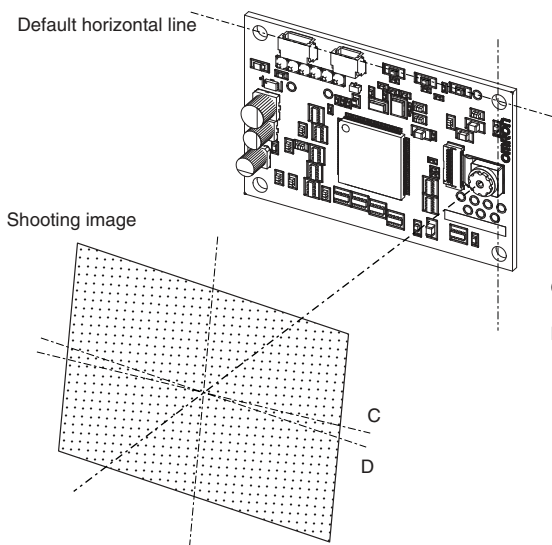


Optical axis angle



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.

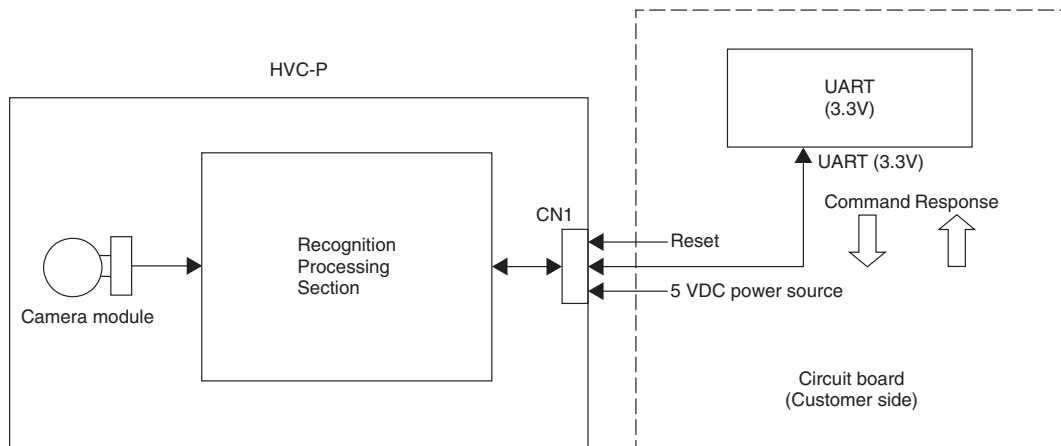
Alignment angle



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.

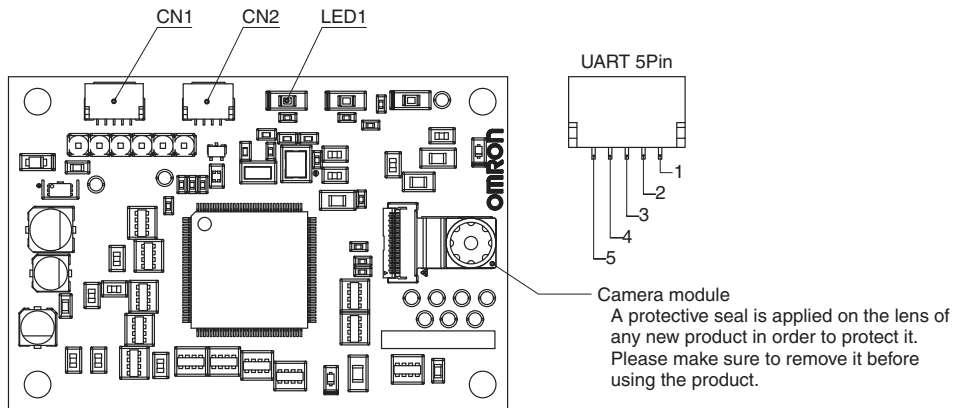
Connection

■ Block Diagram



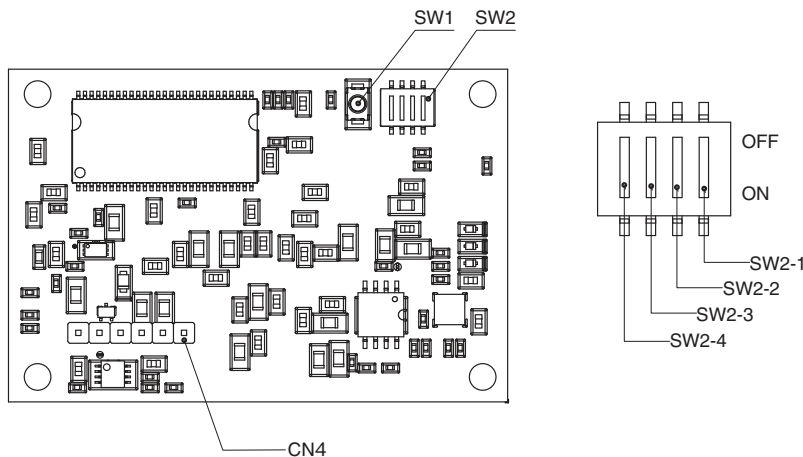
Parts Name and Functions

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:

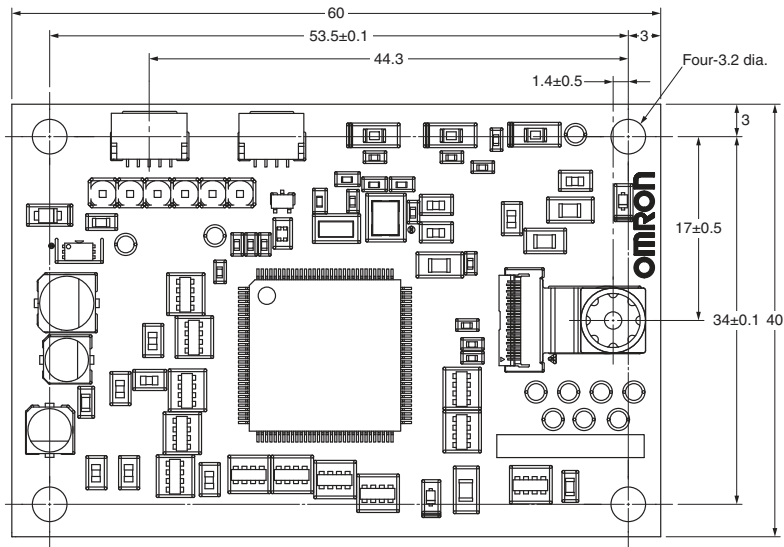
SW2-1: Fixed to ON (Please do not set it to OFF).

SW2-2 to 2-4: Used to set the transmission rate setting of the UART signal.

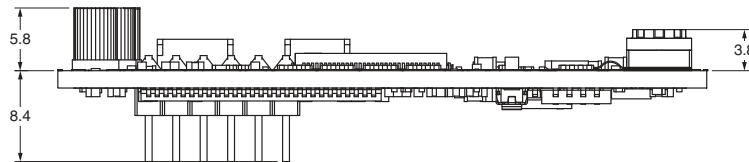
Transmission rate (bps)	SW2-2	SW2-3	SW2-4
9,600	OFF	OFF	OFF
38,400	ON	OFF	OFF
115,200	OFF	ON	OFF
230,400	ON	ON	OFF
460,800	OFF	OFF	ON
921,600 (factory setting)	ON	OFF	ON

Dimensions (Unit: mm)

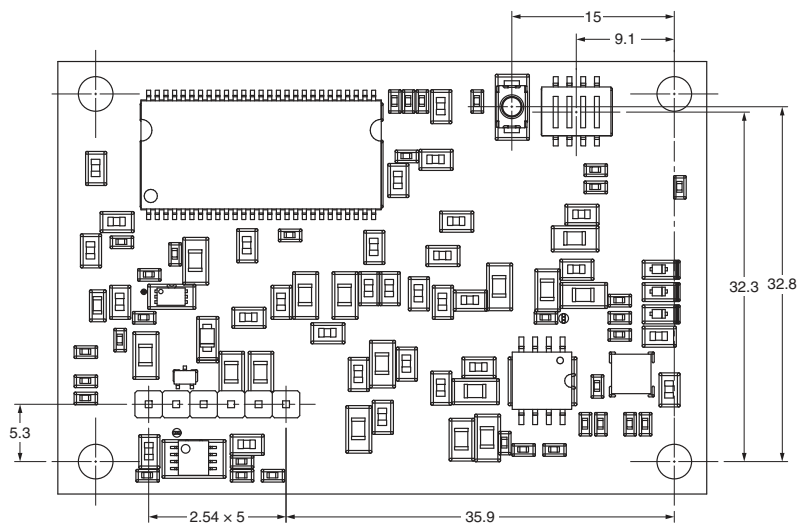
Front



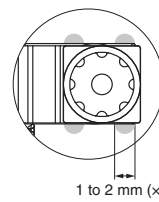
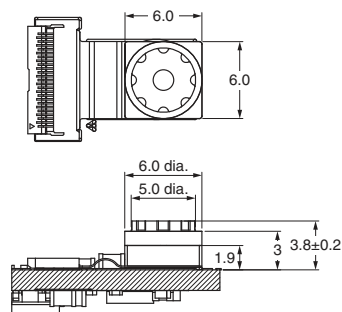
Side



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:

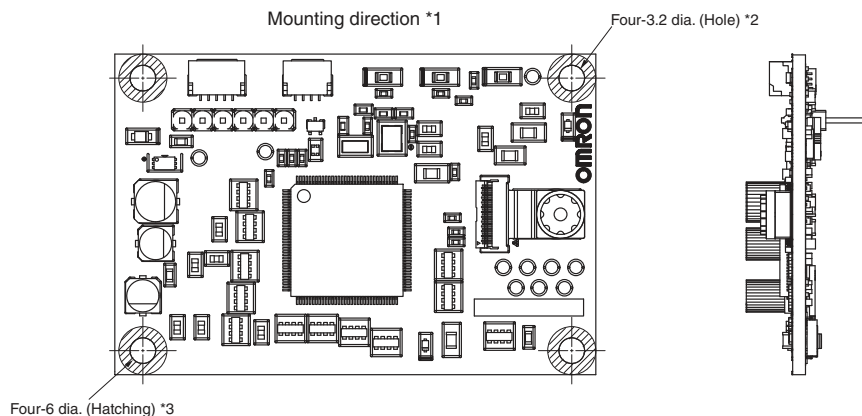
Housing: SHR-05V-S (made by J.S.T. Mfg. Co. Ltd.)

Contact: SSH-003T-P0.2 (made by J.S.T. Mfg. Co. Ltd.)

Pin number	Signal	I/O	Description
1	Vcc	-	Power supply: 5.0V \pm 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. (x4) 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

Warranty and Limited Warranty

Definition

The definition of terms used in these Terms and Conditions are as follows:

- (1) Omron Product: HVC-P described in specifications.
- (2) Usage conditions: Usage conditions, rating, performance, operating environment, handling instructions, cautions, prohibited use, etc. of Omron products described in specifications, documentations or manuals.
- (3) Customer devices etc.: Parts/components, electronic substrates, devices, equipment or systems manufactured by customers.
- (4) Customer application: Application of Omron products by customers which include embedding and/or using Omron products in Customer devices etc.
- (5) Fitness: (a) Fitness, (b) performance, (c) non-infringement of third-party intellectual property, (d) compliance with laws and regulations and (e) conformity to various standards.

Caution on Descriptions

Attention is required to the following points on descriptions in specifications.

- (1) Rated values and performance values are the product of tests performed for separate single conditions, including but not limited to temperature and humidity. It is not intended to warrant rated values and performance values for multiple combined conditions.
- (2) Reference data are provided for reference only. Omron does NOT warrant that Omron products work properly at all time in the range of reference data.
- (3) Application examples are provided for reference only. Omron does NOT warrant the Fitness of Omron products under such application.
- (4) Omron may discontinue the production of Omron products or change the specifications of them for the purpose of improving such products or other reasons entirely at its own discretion.
- (5) Descriptions in specifications and technical information provided by Omron shall be deemed confidential information of Omron. Please do not disclose them to any third party.

Precautions

Please be aware of and accept the following when you introduce or use Omron products:

- (1) Please use Omron products in compliance with usage conditions including rating and performance.
- (2) Customers are granted to use software program provided as a part of Omron products (hereinafter referred to as "Software") solely combined with Omron product to be integrated into Customer devices etc. Please do NOT do or have others do any of the following.
 - (a) Use other than Customer application
 - (b) Transfer or loan Omron products singularly for purposes other than Customer application

- (c) Extract Software out of Omron products
- (d) Decompile, disassemble or reverse-engineer Software.
- (e) Disclose performance information of singular Omron products for purposes other than Customer application.
- (f) Agree anything conflicting with Warranty and Limited Warranty herein with customers of Customers or end users of Customer devices etc.

- (3) Please confirm fitness of Omron products in your application and use your own judgment to determine the appropriateness of using them in such application. Omron shall not warrant the fitness of Omron products in customer application.
- (4) Please confirm that Omron products are properly wired and installed for their intended use in your overall system.
- (5) When using Omron products, please make sure to (i) maintain a margin of safety vis-?-vis the published rated and performance values, (ii) design to minimize risks to customer application in case of failure of Omron products, such as introducing redundancy, (iii) introduce system-wide safety measures to notify risks to users of Customer devices etc., and (iv) conduct regular maintenance on Omron products and customer application.
- (6) Omron products are designed and manufactured as general-purpose products for use in general industrial products. They are not intended to be used in the following applications.

If you are using Omron products in the following applications, Omron shall not provide any warranty for such Omron products.

- (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 and 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 under severe condition or in severe environment, 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 conditions and environment not described in specification.
- (7) In addition to the applications listed from (a) to (d) above, Omron products are not intended for use in automotive applications (including two wheel vehicles). Please do NOT use Omron products for automotive applications. Please contact Omron sales staff for products for automotive use.

Warranty Terms and Conditions

The terms and conditions for warranty of Omron products are as follows:

- (1) Warranty period: One year after the purchase.
- (2) Coverage: Omron will provide free replacement of the malfunctioning Omron products with the same number of replacement/alternative products.
- (3) Exceptions: Omron will not cover Omron products under its warranty if the cause of the malfunction falls under any of the following.
 - (a) Usage in a manner other than the original intended use for the Omron product.
 - (b) Usage outside of the usage conditions.
 - (c) Modification or repair made to the Omron product by other than Omron personnel.
 - (d) Software program embedded by other than Omron or alteration of originally installed software by other than Omron.
 - (e) Cause which could not have been foreseen with the level of science and technology at the time of shipping from Omron.
 - (f) Causes originating from other than Omron or Omron products (including force majeure such as but not limited to natural disasters).

Limitation of Liability

The warranty set out in these Terms and Conditions is the whole and sole liability for Omron products. There are no other warranties, expressed or implied. Omron and the distributors of Omron products are not liable for any damages which may arise from or be related to Omron products.


Export Controls

Customers of Omron products shall comply with all applicable laws and regulations of other relevant countries with regard to security export control, when exporting Omron products and/or technical documents or providing such products and/or documents to a non-resident.

Omron may not provide customers with Omron products and/or technical documents should Omron judge that they fail to comply with such laws and regulations.

• 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.

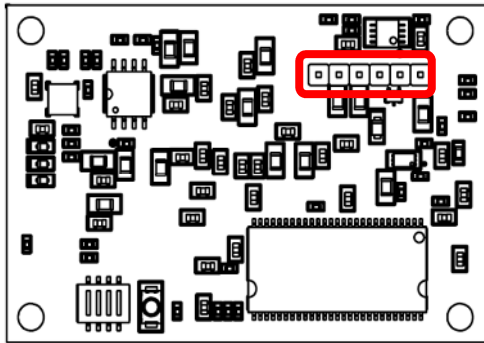
Note: Do not use this document to operate the Unit.

Model	Contents of Package
B5T-001001(G)	<ul style="list-style-type: none"> -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.)	<ul style="list-style-type: none"> -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.



1 6
CN4

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)