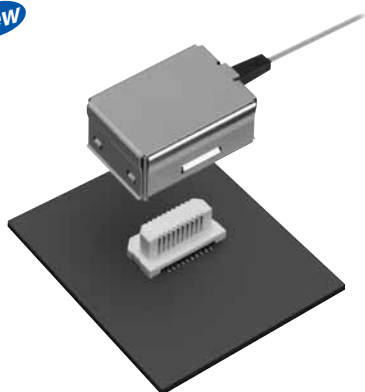


Suitable for
high-speed transmission
in the equipment

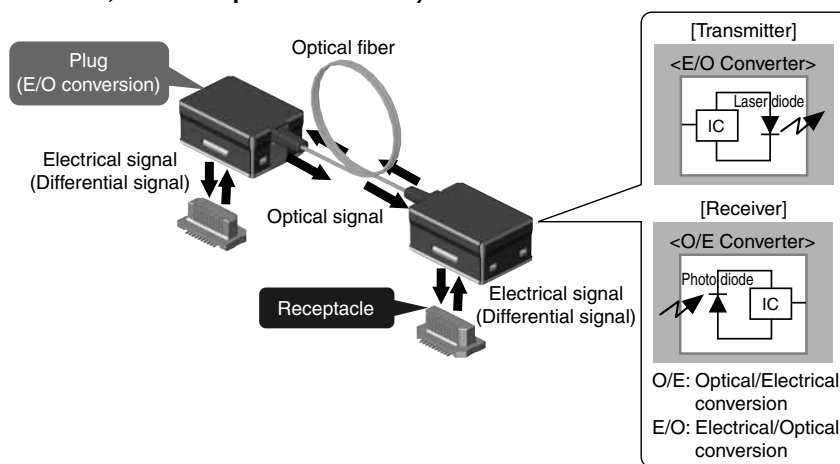
Active Optical Connector
V Series
(Vertical insertion type)

New



FEATURES

1. Plug connector is equipped with electrical/optical conversion function (bi-direction, Max. 6 Gbps transmission).



2. High speed and wide data rate transmission possible: 20 Mbps to 6 Gbps
3. Integration is possible to a small apparatus with compact, bi-directional transmission device.
4. Noise reduction and electrical isolation easily achieved.

APPLICATIONS

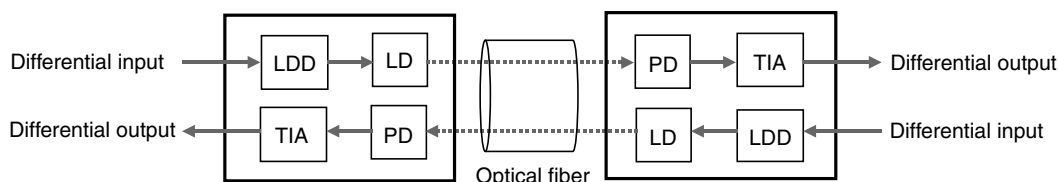
Recommended for the following high speed device transmission or electrical isolation applications

- Measuring equipment
- Production equipment
- Industrial robots, etc.
- Image processing instrument
- Medical equipment

BLOCK DIAGRAM

The differential input signal is converted to an optical signal by the Laser Diode Driver (LDD) and Laser Diode (LD) in the plug.

The optical signal is transmitted through the optical fiber and reproduced as differential output signal by the Photo Diode (PD) and Trans Impedance Amplifier (TIA).



LDD: Laser Diode Driver, LD: Laser Diode, TIA: Trans Impedance Amplifier, PD: Photo Diode

PRODUCT TYPES

1. Integrated cable and plug

Transmission rate	Transmission specifications	Cable length	Part No.	Packing quantity
20 Mbps to 6 Gbps	Bi-direction, 1 channel	50 mm	AYG4V10565M1	10 pieces
		300 mm	AYG4V13065M1	
		1 m	AYG4V1A065M1	
		50 mm	AYG4V10565M3	100 pieces
		300 mm	AYG4V13065M3	
		1 m	AYG4V1A065M3	

2. Receptacle (PC board side)

Receptacle	Part No.	Packing quantity
Receptacle	AXK6S20447M1	20 pieces
	AXK6S20447M3	200 pieces (reel)

SPECIFICATIONS

1. Rated specifications

Item	Min.	Typical	Max.	Unit	Condition
Supply voltage	3.2	3.3	3.4	V	—
Power consumption	—	—	230	mW	Bi-direction 1channel
Transmission rate	0.02	—	6	Gbps	8b/10b coding
Input/output characteristic impedance	80	100	125	Ω	—
Differential input voltage	200	—	1200	mV	—
Input common mode voltage	150	—	340	mV	Note 1)
Input rise-time	—	—	0.30	UI	—
Input fall-time	—	—	0.30	UI	—
Differential output voltage	150	220	275	mV	Note 2)
Output common mode voltage	150	250	275	mV	Note 2)
Output rise-time	—	—	0.50	UI	Note 2)
Output fall-time	—	—	0.50	UI	Note 2)
Output total jitter	—	—	0.60	UI	Note 2), Dj + Rjpp

Notes: 1. When performing AC coupling, the input common mode voltage is 0 to 3.6 V.

2. Input data pattern is PRBS 2⁷-1.

Rjpp is equivalent to BER 10⁻¹².

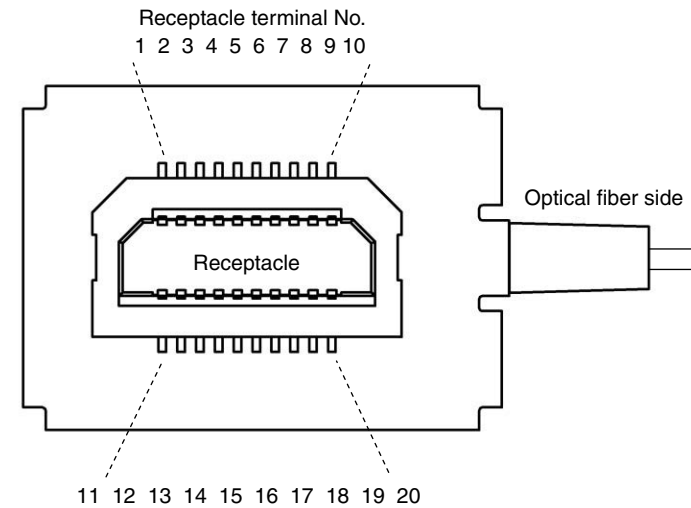
2. Use conditions

Item	Performance	Remarks
Operating ambient temperature	0 to +70°C	—
Storage temperature	-20°C to +50°C (Packaged form) -20°C to +85°C (Single item form)	Environment change without causing condensation and freezing
Relative humidity	20 to 80%RH	Environment change without causing condensation
Electrical static discharge	2kV	Applied 3 times on the external shell C = 100pF, R = 1.5k Ω C = 150pF, R = 330 Ω
Immunity	Conformed to IEC61000-6-2 standard	—
Electromagnetic interference	Conformed to VCCI class B standard	—

3. Materials specifications

Component name	Materials	Specifications and Remarks
Shell	Copper alloy	Nickel plating
Bushing	Elastomer	Black, equivalent to UL94V-0
Optical fiber	Silica, UV-cured resin	0.4 × 0.6, 2 cores
Connector	LCP resin, copper alloy	Terminal (Au-plating on Ni-base)
Photoelectric conversion PC board	Glass-fibered epoxy, epoxy resin, etc.	—
IC	CMOS	—
LD	GaAs	—
Photo diode	GaAs	—

TERMINAL LAYOUT



Terminal layout diagram
(Viewed from the top, receptacle as transparent)

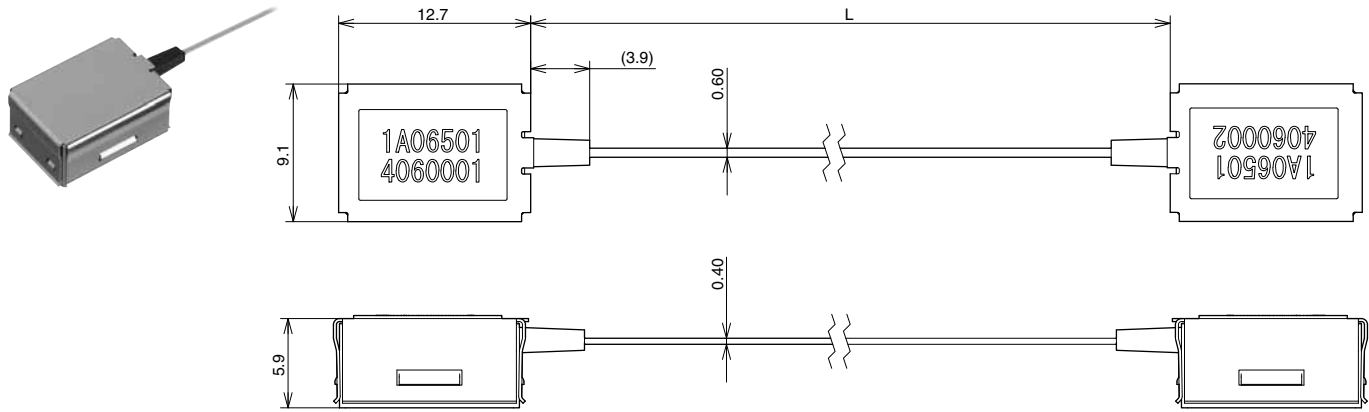
No.	Name	Wiring
20	GND	—
19	Power Supply	DC3.3V
18	Power Supply	DC3.3V
17	Power Supply	DC3.3V
16	GND	—
15	GND	—
14	Differential input +	Differential input
13	Differential input -	Differential input
12	GND	—
11	Open	No connection
10	GND	—
9	Power Supply	DC3.3V
8	Power Supply	DC3.3V
7	Open	No connection
6	Open	No connection
5	GND	—
4	Differential output +	Differential output
3	Differential output -	Differential output
2	GND	—
1	Open	No connection

Active Optical Connector V Series

DIMENSIONS (Unit: mm)

1. Integrated cable and plug

External dimensions

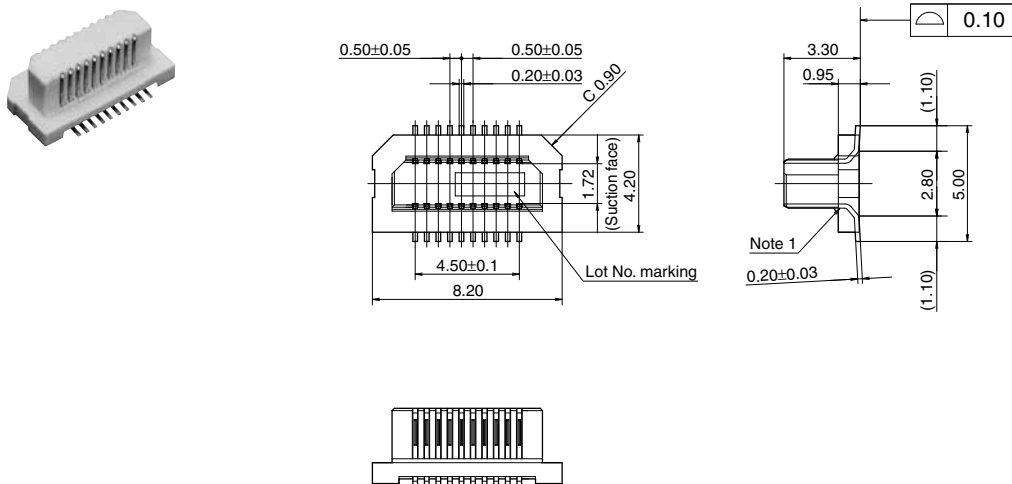


General tolerance: ± 0.3

L: Cable length	Tolerance (mm)		Part No.
	Unit		
50	mm	+10 -0	AYG4V10565
300	mm	+50 -0	AYG4V13065
1	m	+100 -0	AYG4V1A065

2. Receptacle

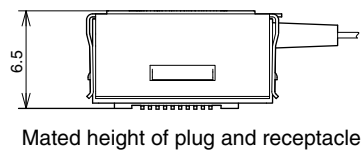
External dimensions



General tolerance: ± 0.2

Note 1: The terminal close to the portion to be soldered have nickel barriers (except nickel portions).

3. Plug and receptacle are mated

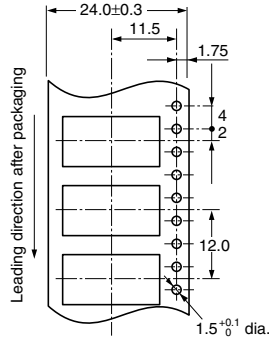


Mated height of plug and receptacle

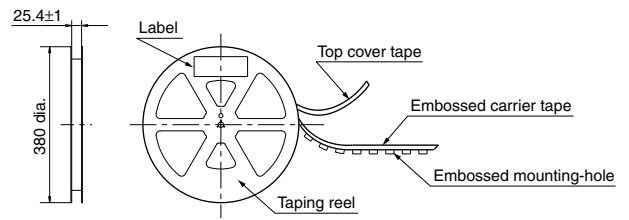
EMBOSSED TAPE DIMENSIONS (Unit: mm)

Receptacle: Embossed tape packaging

• Specifications for taping (In accordance with JIS C 0806:1990. However, not applied to the mounting-hole pitch of some connectors.)



• Specifications for the plastic reel (In accordance with EIAJ ET-7200B.)



Receptacle orientation with respect to embossed tape feeding direction

Direction of tape progress	Type	Receptacle

NOTES

■ Safety cautions during product use

Observe the following safety precautions to prevent accidents and injuries

1) The use of the product outside of the specified rated current and breakdown voltage ranges may cause abnormal heating, smoke, and fire. Never use the product beyond the specified ranges.

2) In order to avoid accidents, make sure you have thoroughly reviewed the specifications before use. Consult us if you plan to use the product in a way not covered by the specifications.

3) We are consistently striving to improve quality and reliability. However, the fact remains that electrical components and devices generally fail at a given statistical probability.

Furthermore, their durability varies depending on where and how they are used. Please be sure to verify electrical components and devices under actual conditions before use. Continuously using them in a state of degraded performance may cause deterioration in insulation performance, thus resulting in abnormal heat generation, smoke generation, or fire. To avoid that, we ask you to implement safe designs that include redundancy, fire prevention, and malfunction prevention. Also, please conduct periodic maintenance so that no accidents resulting in injury or death, fire, or harm to society will be caused as a result of product failure or service life.

4) Caution at the time of a breakage of the optical fiber

When the optical fiber breaks, immediately shut off the power. This product uses a laser diode (class 1M) of invisible light with wavelength 850 nm. The laser beam does not irradiate outside in normal operation, but a breakage of the optical fiber may cause irradiation outside. Do not look into the optical fiber by using optical equipment. Laser beam may cause danger to human eyes.

■ Cautions when using the product

Please use the product in accordance with the conditions described in these specifications.

The product quality cannot be warranted if the product fails because it is used outside the conditions in these specifications.

1) Cautions about the operating and storage environments

- Product failure due to condensation cannot be warranted.

- Use caution for avoiding dust.

- The following environment may deteriorate the product's appearance and affect the product characteristics, and should thus be avoided.

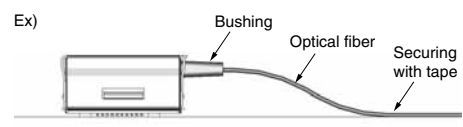
- An environment in which the possible adherence of chemicals such as acid and alkali exists.

- In a gaseous atmosphere of salt, sulfide, etc.

2) This product has a structure requiring an insertion force for mating, but the mating may come off when an external force is applied to the plug, impact is applied by dropping, or vibration is applied in equipment. Sufficient caution should be used with the equipment to avoid such incidents.

3) The product cannot be used in a movable parts while the optical fiber is bent. Such use may cause deformation of the receptacle or breakage of the optical fiber.

4) In order to avoid a load on the plug and receptacle applied by the tensile force of the optical fiber, a redundant design is required with respect to the optical fiber length.



Active Optical Connector V Series

5) Use caution for wiring the optical fiber to avoid getting entangled or twisting. Also, use adhesive tape for securing the optical fiber for preventing excessive stress caused by vibration and impact.

6) Insertion and removal operations must be performed while the power is off.

Insertion or removal operations in a live condition (with current and voltage) may lead to a breakage.

7) Use caution with regard to the generation and handling of static electricity in the operating environment to protect the plug.

8) Secure sufficient insulation distance between the external metal enclosure of the plug and the peripheral components. The plug enclosure, which is connected to the ground, may give rise to danger from a short-circuit.

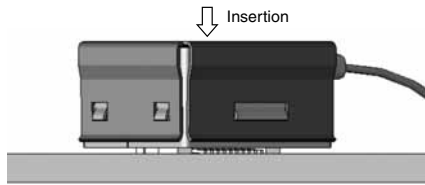
9) Mating of plug

Mating direction

Mating of the plug and receptacle requires orientation. Align the receptacle shape in the direction of the optical fiber of plug.

Mated condition

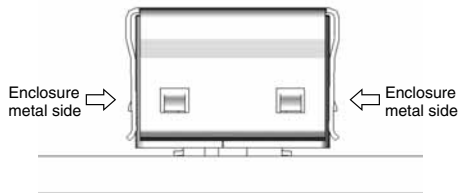
Make sure the plug is securely inserted into the receptacle. After mating, a gap remains between the PC board and plug. Avoid applying excessive pressure.



10) Plug removal

For the removal operation, hold both sides of the metal enclosure and lift the plug upward.

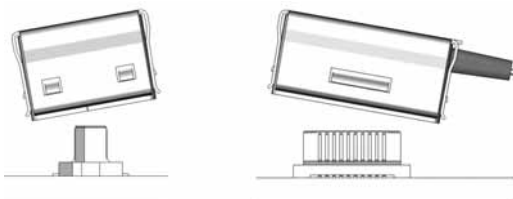
* Do not pull the optical fiber and bushing.



11) Plug insertion

Because this product has been designed with a thin mating structure between the plug and receptacle for compact-sizing purposes, excessive tilting during insertion or removal leads to product fracture and separation of the solder section of terminals.

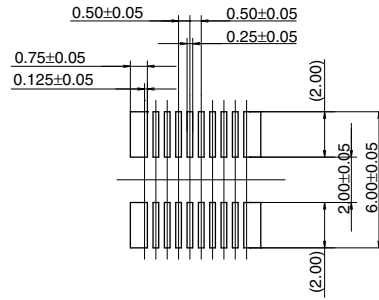
For avoiding breakage of the mating parts, confirm the alignment before mating.



12) When the product is used in a different environment and in accordance with a method other than described in this document, please consult us.

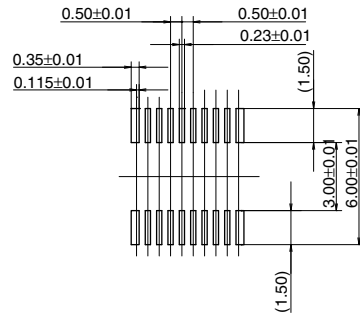
Receptacle

Recommended PC board pattern (TOP VIEW)



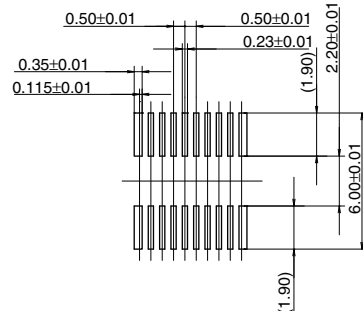
Recommended metal mask pattern

Metal mask thickness: When 150 μ m
(Opening ratio: 69%)



Recommended metal mask pattern

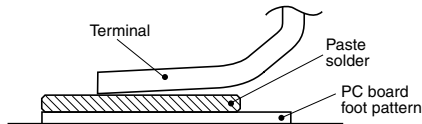
Metal mask thickness: When 120 μ m
(Opening ratio: 87%)



Regarding soldering (for Receptacle)

1. Reflow soldering

- 1) Measure the recommended profile temperature for reflow soldering by placing a sensor on the PC board near the connector surface or terminals. (The setting for the sensor will differ depending on the sensor used, so be sure to carefully read the instructions that comes with it.)
- 2) As for cream solder printing, screen printing is recommended.
- 3) To determine the relationship between the screen opening area and the PC-board foot pattern area, refer to the diagrams in the recommended patterns for PC boards and metal masks. Make sure to use the terminal tip as a reference position when setting. Avoid an excessive amount of solder from being applied, otherwise, interference by the solder will cause an imperfect contact.

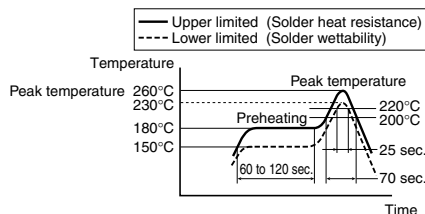


- 4) Consult us when using a screen-printing thickness other than that recommended.
- 5) When mounting on both sides of the PC board and the connector is mounting on the underside, use adhesives or other means to ensure the connector is properly fixed to the PC board. (Double reflow soldering on the same side is possible.)
- 6) N₂ reflow, conducting reflow soldering in a nitrogen atmosphere, increases the solder flow too greatly, enabling wicking to occur. Make sure that the solder feed rate and temperature profile are appropriate.

Soldering conditions

Please use the reflow temperature profile conditions recommended below for reflow soldering. Please contact us before using a temperature profile other than that described below (e.g. lead-free solder).

- Narrow pitch connectors (except P8 type)



- 7) The temperatures are measured at the surface of the PC board near the connector terminals. (The setting for the sensor will differ depending on the sensor used, so be sure to carefully read the instructions that comes with it.)
- 8) The temperature profiles given in this catalog are values measured when using the connector on a resin-based PC board. When performed reflow soldering on a metal board (iron, aluminum, etc.) or a metal table to mount on a FPC, make sure there is no deformation or discoloration of the connector beforehand and then begin mounting.
- 9) Consult us when using a screen-printing thickness other than that recommended.
- 10) Some solder and flux types may cause serious solder or flux creeping. Solder and flux characteristics should be taken into consideration when setting the reflow soldering conditions.

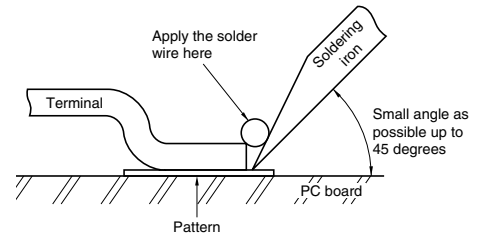
2. Hand soldering

- 1) Set the soldering iron so that the tip temperature is less than that given in the table below.

Table A

Product name	Soldering iron temperature
SMD type connectors	300°C within 5 sec. 350°C within 3 sec.

- 2) Do not allow flux to spread onto the connector leads or PC board. This may lead to flux rising up to the connector inside.
- 3) Touch the soldering iron to the foot pattern. After the foot pattern and connector terminal are heated, apply the solder wire so it melts at the end of the connector terminals.



- 4) Be aware that soldering while applying a load on the connector terminals may cause improper operation of the connector.
- 5) Thoroughly clean the soldering iron.
- 6) Flux from the solder wire may get on the contact surfaces during soldering operations. After soldering, carefully check the contact surfaces and clean off any solder before use.
- 7) For soldering of prototype devices during product development, you can perform soldering at the necessary locations by heating with a hot-air gun by applying cream solder to the foot pattern beforehand. However, at this time, make sure that the air pressure does not move connectors by carefully holding them down with tweezers or other similar tool. Also, be careful not to go too close to the connectors and melt any of the molded components.
- 8) If an excessive amount of solder is applied during manual soldering, the solder may creep up near the contact points, or solder interference may cause imperfect contact.

3. Solder reworking

- 1) Finish reworking in one operation.
- 2) For reworking of the solder bridge, use a soldering iron with a flat tip. To prevent flux from climbing up to the contact surfaces, do not add more flux.
- 3) Keep the soldering iron tip temperature below the temperature given in Table A.

Handling Single Components (for Receptacle)

- 1) Make sure not to drop or allow parts to fall from work bench
- 2) Excessive force applied to the terminals could cause warping, come out, or weaken the adhesive strength of the solder. Handle with care.
- 3) Repeated bending of the terminals may cause terminals to break.
- 4) Do not insert or remove the connector when it is not soldered. Forcibly applied external pressure on the terminals can weaken the adherence of the terminals to the molded part or cause the terminals to lose their evenness.

- 5) Excessive prying-force applied to one end may cause product breakage and separation of the solder joints at the terminal. Excessive force applied for insertion in a pivot action as shown may also cause product breakage. Align the header and socket positions before connecting them.

Cleaning flux from PC board (for Receptacle)

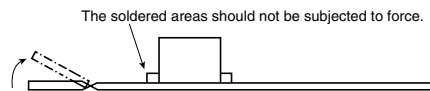
- 1) To increase the cleanliness of the cleaning fluid and cleaning operations, prepare equipment for cleaning process beginning with boil cleaning, ultrasonic cleaning, and then vapor cleaning.
- 2) Carefully oversee the cleanliness of the cleaning fluids to make sure that the contact surfaces do not become dirty from the cleaning fluid itself.

- 3) Since some powerful cleaning solutions may dissolve molded components of the connector and wipe off or discolor printed letters, we recommend aqua pura electronic parts cleaners. Please consult us if you wish to use other types of cleaning fluids.
- 4) Please note that the surfaces of molded parts may whiten when cleaned with alcohol.

Handling the PC board (for Receptacle)

• Handling the PC board after mounting the connector

When cutting or bending the PC board after mounting the connector, be careful that the soldered sections are subjected to excessive force.



Storage of connectors (for Receptacle)

- 1) To prevent problems from voids or air pockets due to heat of reflow soldering, avoid storing the connectors in areas of high humidity. When storing the connectors for more than six months, be sure to consider storage area where the humidity is properly controlled.
- 2) Depending on the connector type, the color of the connector may vary from connector to connector depending on when it is produced. Some connectors may change color slightly if subjected to ultraviolet rays during storage. This is normal and will not affect the operation of the connector.

- 3) When storing the connectors with the PC boards assembled and components already set, be careful not to stack them up so the connectors are subjected to excessive forces.
- 4) Avoid storing the connectors in locations with excessive dust. The dust may accumulate and cause improper connections at the contact surfaces.

Other Notes (for Receptacle)

- 1) These products are made for the design of compact and lightweight devices and therefore the thickness of the molded components has been made very thin. Therefore, be careful during insertion and removal operations for excessive forces applied may damage the products.
- 2) Dropping of the products or rough mishandling may bend or damage the terminals and possibly hinder proper reflow soldering.

- 3) Before soldering, try not to insert or remove the connector more than absolutely necessary.
- 4) When coating the PC board after soldering the connector to prevent the deterioration of insulation, perform the coating in such a way so that the coating does not get on the connector.
- 5) There may be variations in the colors of products from different production lots. This is normal.
- 6) The connectors are not meant to be used for switching.

Please refer to the latest product specifications when designing your product.