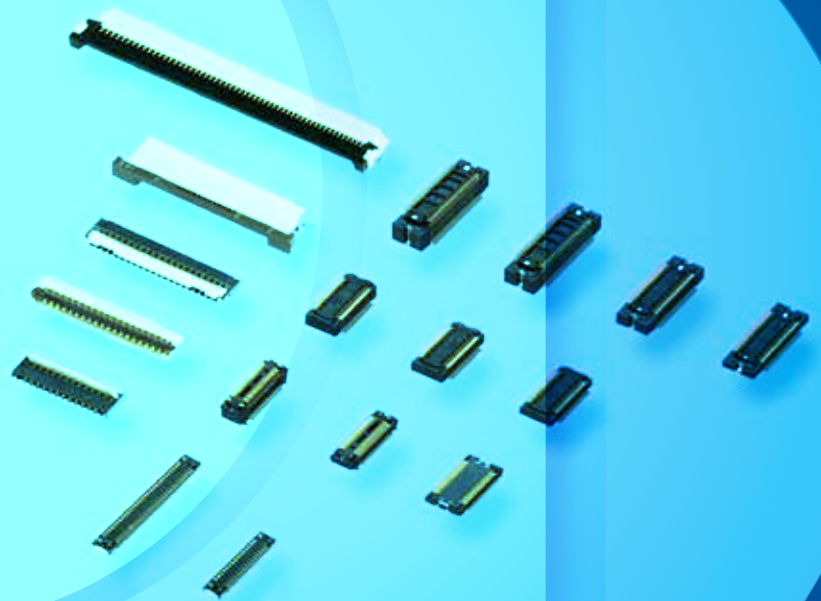


**SHORT FORM
CONNECTORS**



European activities:

The activities of Panasonic Electric Works in Europe started more than 30 years ago by developing, in cooperation with their European customers, new generations of electromechanical relays which successfully contributed to more efficient and economical devices.

Meanwhile, our European organization is gradually involved in the sales, production and development of products from all divisions of the mother company Panasonic Electric Works in Japan. This is mainly done under Panasonic brand.

Panasonic Electric Works Europe AG is the Headquarters for the sales companies in a large number of European countries. With the cooperation of these and various other partner companies, we can offer a full-coverage service throughout Europe.

Our sales companies are organized on a local basis so that they reflect national characteristics and take account of the economic conditions specific to each country.

Within a framework where tasks are shared with the Panasonic Electric Works companies, PEW Europe AG is responsible for planning, development, technical service, central marketing, material management, controlling, IT and worldwide co-ordination. A central European warehouse and production facilities in Pfaffenhofen (D), Plana (CZ), Enns (A) also fall under PEW Europe AG's administrative umbrella.

The Panasonic Electric Works European group has offices located in Austria, the Benelux countries, Czech Republic, Germany, France, Poland, United Kingdom, Ireland, Italy, Nordic countries, Portugal, Sweden, Switzerland, Spain and Hungary.

Connectors

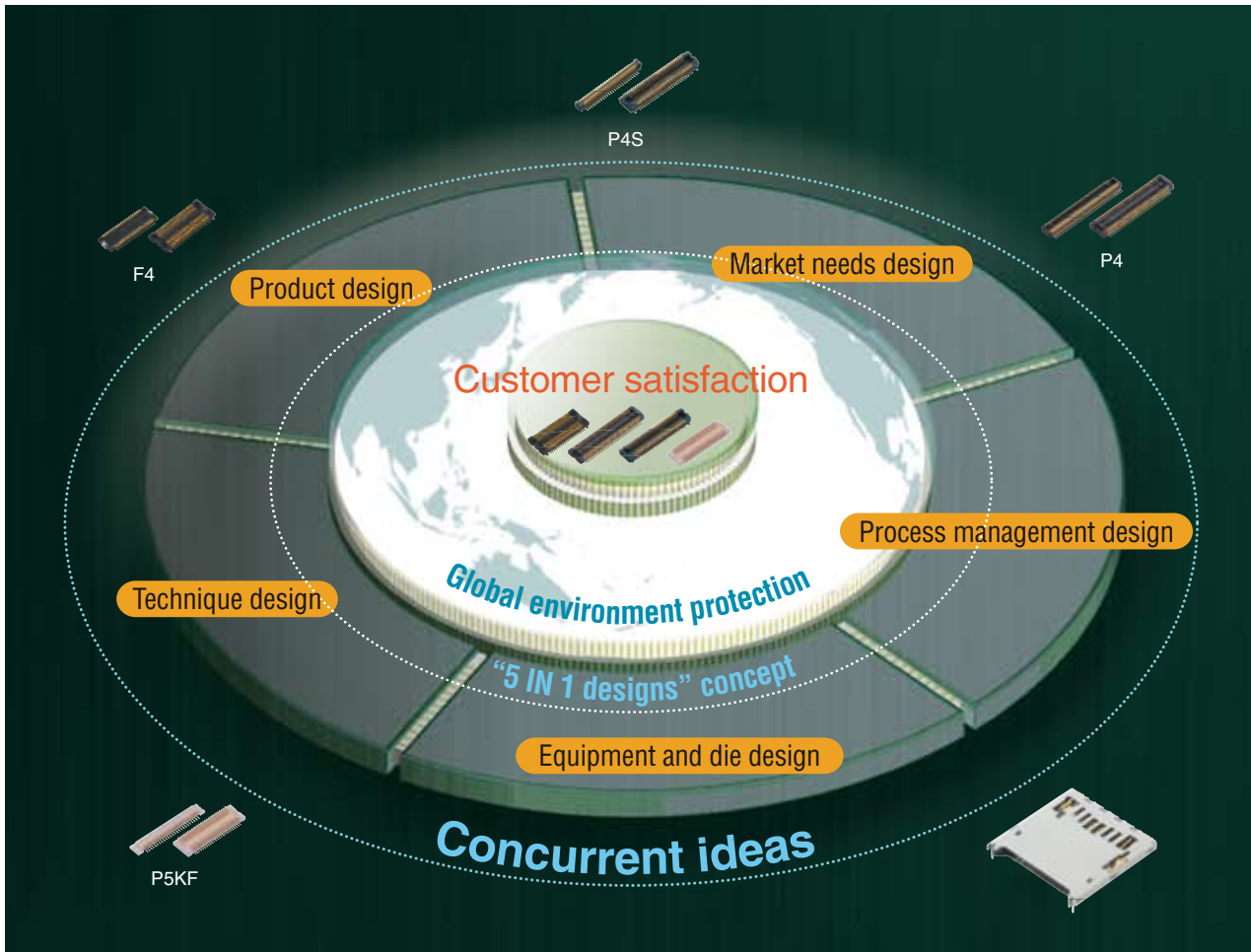
Applying multi-faceted computer analyses that make use of our vast know-how, we develop highly reliable, ultra-miniature connectors that are able to withstand various environments.

Featuring superior anti-shock characteristics with an ultra-low profile, the lineup comprises with Board-to-Board and Board-to-FPC connectors. These connectors meet the connection needs of the digital era.

Changes in specifications being strived for include such factors as smaller devices and the ability to function in a multitude of environments, which in turn increase the level of reliability required of connectors.

Panasonic Electric Works has developed the tough contact, a technology that will increase device reliability in a wide range of environments.

“5 IN 1 designs” concept



From control devices and electronic materials that support state-of-the-art electronic technology to products essential for living, Panasonic Electric Works brings you products that affect a wide range of aspects in our daily lives.

Looking ahead, we will continue to create and offer attractive products that accurately reflect society's needs.

At the same time we are paying attention to changes in lifestyle and to the heightened awareness in regard to global environmental conservation. Our business activities are focused directly on the future of our social environment.

Our unique



TOUGH CONTACT

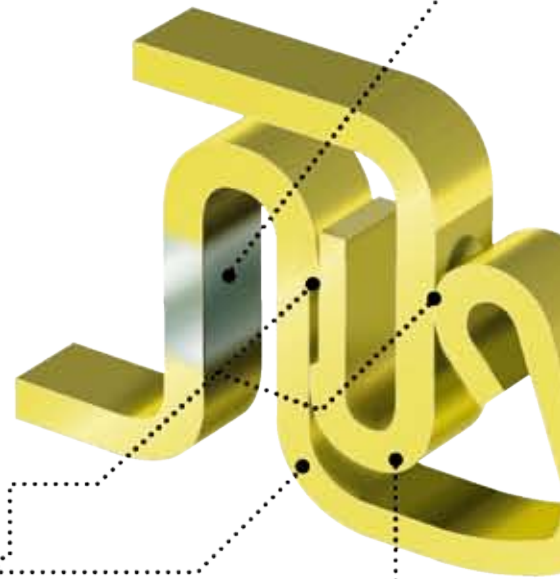
Tough against dropping!

Bellows contact construction improved the ability to withstand twisting and increased resistance to shock of dropping

High precision curved molding that provides the right amount of spring characteristics for contacts, is made possible through precision metal processing, one of our core technologies. A high-level ability to resist shocks has been made possible. The need to withstand the shock of dropping and twisting during insertion has increased in mobile devices.

■ **Simulation analysis**

We analyzed what the ideal spring shape would be to bring the right spring characteristic to the contact, and then precision molded it using precision metal processing, one of our core technologies.



*Contact image of A4S

Tough against foreign particles and flux!

V notch improves contact reliability (resistance to entry of foreign particles)

By using the edge for the contacting part, contact pressure per unit area has been increased. Compared to contacts up to now, the ability to remove flux and foreign particles has increased. Also, the ability to prevent entry of foreign particles before it happens has increased.

- **2-point contacting** • **Surface contact to edge contact**
- **Improved contact movement effect before and after V notch passage** • **The combination of these effects greatly improves contact reliability (resistance to entry of foreign matter)**

■ **Evaluation example of plastic powder adhered on post contact surface**



■ **Product without notch**



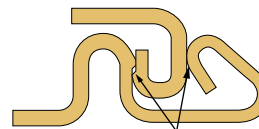
Cross section of the socket side contact



■ **V notched product**

More effective in eliminating flux and foreign particles, and also more effective in keeping foreign particles from getting inside

■ **A4F Contact Construction View**



Double contact

Same effect as V notch attained by double contact. (A4F, F4)

Patent and Design now under application	Japan: Registration of patent (Patent No. 3726836)	Korea: Registration of patent (Patent No. 531938)	Taiwan: Registration of patent (Patent No. I225323)	China and North America: Patent now under application.

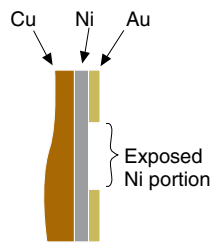
Tough against solder rise!

Anti-solder-rise efficiency increased due to Ni barrier

Exposed nickel is placed on mid part of socket contacts. This contact, while being ultra low in profile, prevents solder rise.

- Influence of solder controlled in contact and contact spring parts.
- Solder remains in the terminals and stable fillet mold is possible.

■ Exposed Ni barrier portion

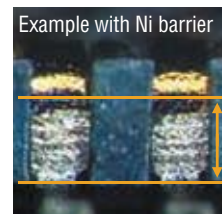


Cross section of the socket side contact

■ Solder rise after reflow



Rises past lead and into horizontal area.



Ni exposure part

Limit of solder rise.

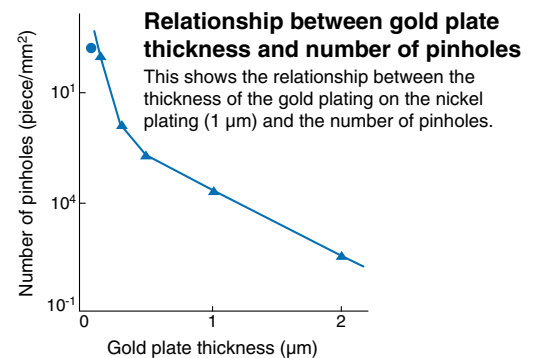
Solder paste coating conditions:
Metal screen thickness; 120 μm; Open ratio 90% (solder amount 136% of recommended value)
Reflow conditions:
(lead-free solder conditions) temperature profile; 260 C peak temperature, atmosphere;
N2 reflow (oxygen concentration 1,000 ppm)

Tough against corrosive gases!

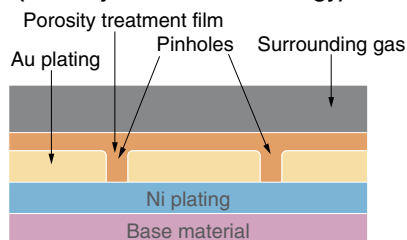
Improved resistance to corrosion by gas, etc., due to porosity treatment

This treatment consists of coating surface with a very thin film to seal pinholes in the gold plating. We have developed this porosity treatment technology, which ensures the same contact reliability for thin gold plating as that of thick gold plating.

- Improvement in resistance to corrosion
- Improvement in insertion/ removal durability
- Improvement in contact reliability for digital signals



■ Plating technology (Porosity treatment technology)



■ Improvement of the corrosion resistance

Status of the post's contact after the sulfur dioxide test

<Porosity-treated product>








<Conventional product> Corroded mainly at the pinholes.





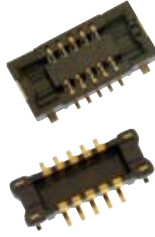
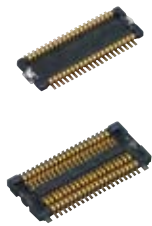






Test conditions SO₂ concentration: 10±3 ppm, Humidity: 90 to 95% RH
Temperature: 40±2 C Time: 145 hours





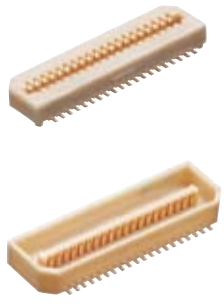
Product Range Overview

Connector Series	A35S	A4S	A4F	F35S	P35S	F4S	F4	P4S		P4						P5KL	P5KF			P5K	
	AXE7/ AXE8	AXE5/ AXE6	AXE3/ AXE4	AXT7/ AXT8	AXT1/ AXT2	AXT5/ AXT6	AXK7L/ AXK8L	AXT3/ AXT4	AXK7/ AXK8						AXK5L/ AXK6L	AXK5F/ AXK6F			AXK5/6		
Contact-Pitch/mm	0.35	0.4	0.4	0.35	0.35	0.4	0.4	0.4		0.4						0.5	0.5			0.5	
Mating height / mm	0.8	0.8/ 1.0	0.6	1.0	1.5	1.0	0.9	1.5	3.0	1.5	2.0	2.5	3.0	3.5	4.0	1.2	1.5	2.0	2.5	3.0	3.5
Number of Contacts																					
10		•	•			•	•	•		•						•	•	•	•		
12		•	•			•	•			•						•	•	•	•		
14		•	•				•			•	•	•					•	•	•		
16		•	•			•	•	•		•							•	•	•		
18		•															•	•	•		
20		•	•		•	•	•	•		•	•	•	•	•		•	•	•	•	•	•
22		•	•		•	•	•	•		•							•	•	•	•	•
24		•	•		•	•	•	•		•	•	•	•			•	•	•	•		
26		•	•		•	•	•	•		•	•						•	•			
28		•	•		•	•	•	•		•											
30		•	•		•	•	•	•	•	•	•	•	•	•		•	•	•	•	•	•
32		•	•		•	•	•	•				•					•				
34		•	•		•	•	•	•		•	•				•	•	•	•	•		
36		•	•		•	•	•	•		•									•		
38		•	•		•	•	•	•													
40		•	•	•	•	•	•	•		•	•	•	•			•	•	•	•	•	•
42			•			•															
44		•	•			•	•	•		•		•							•		
46						•				•											
48						•	•														
50	•	•	•	•	•	•	•	•		•	•	•	•	•	•	•	•	•	•	•	•
52					•																
54		•	•				•	•		•											
56								•	•												
60	•	•	•	•	•		•	•	•	•	•	•	•	•		•	•	•	•	•	•
64		•	•							•											
66							•														
70		•	•	•	•		•	•		•	•	•					•	•	•	•	•
80		•	•	•	•		•	•	•	•	•	•	•	•	•		•	•	•	•	•
90					•			•		•		•	•								
100					•			•	•	•	•	•						•	•	•	•
120	•							•												•	•
130																					
160																					

Type	Board to FPC ZIF Connector	Board to FPC ZIF Connector	Board to FPC ZIF Connector	Board to FPC ZIF Connector	Board to FPC ZIF Connector
					
Series	Y3FT	Y3F	Y3B	Y5S	Y5F
Part number	AYF31	AYF32	AYF33	AYF51	AYF52
Mounting method	SMD	SMD	SMD	SMD	SMD
Contact pitch (mm)	0.3	0.3	0.3	0.5	0.5
Features	<p>Low profile, space-saving design.</p> <p>FPC with tabs contributing to hold FPC temporarily.</p> <p>Resistant to twisting due retention fittings.</p> <p>Improved PC board design flexibility. Front lock structure.</p>	<p>Low profile, space-saving design.</p> <p>FPC without tabs allowing smooth FPC insertion.</p> <p>Wiring patterns can be located underneath the connector.</p> <p>Front lock structure.</p>	<p>Slimest low profile design.</p> <p>Smooth FPC insertion.</p> <p>Wiring patterns can be located underneath the connector.</p> <p>Back lock structure.</p>	<p>Resistant to twisting due to retention fittings.</p> <p>Slide lock structure.</p>	<p>Resistant to twisting due to retention fittings.</p> <p>Front lock structure.</p>
Stacking height (mm)	0.9	0.9	0.9	1.9	2
Number of contacts	15 – 51	15 – 51	7 / 15 / 25 / 33 / 39 / 45 / 51	15 / 24	26 / 28 / 34 / 40 / 45 / 50 / 54
Rated current / contact (A)	0.2	0.2	0.2	0.5	0.5
Rated current at total contacts (A)	n.a.	n.a.	n.a.	n.a.	n.a.
Rated voltage (VAC/VDC)	50	50	50	50	50
Insertion and removal life times	30	30	20	30	30
Ambient temperature	-55°C to +85°C	-55°C to +85°C	-55°C to +85°C	-55°C to +85°C	-55°C to +85°C

Board to FPC	Board to FPC	Board to Board Board to FPC	Board to FPC	Board to FPC	Board to FPC
					
F35S	A35S	P35S	A4F	A4S	F4
AXT7/AXT8	AXE7/AXE8	AXT1 / AXT2	AXE3 / AXE4	AXE5 / AXE6	AXK7L / AXK8L
SMD	SMD	SMD	SMD	SMD	SMD
0.35	0.35	0.35	0.4	0.4	0.4
Space saving design 0.35mm pitch, TOUGH CONTACT structure. Simple lock structure ensures a superior mating/unmating operation feel.	One of the world's smallest two-piece connectors having a 0,8mm mating height. Space saving design. Bellows-type V notch Ni barrier. Porosity treatment. Available with 120 contacts.	Strong resistance to various environments. Pattern wiring possible on PC board below connectors. Bellows-type V notch Ni barrier. Porosity treatment.	One of the world's thinnest two-piece connectors having a 0.6mm mating height. Space saving design. Bellows-type V notch Ni barrier. Porosity treatment.	One of the world's slimmest two-piece connectors having a 2.5mm width. Gull wing terminal structure. Bellows-type V notch Ni barrier. Porosity treatment.	Strong resistance to various environments. Pattern wiring possible on PC board below connectors. Bellows-type V notch Ni barrier. Porosity treatment.
1.0	0.8	1.5	0.6	0.8	0.9
40 / 50 / 60 / 70 / 80	50 / 60 / 120	20–100	10–80	10–80	10–80
0.25	0.25	0.25	0.3	0.3	0.3
4	4	4	5	5	5
60	60	60	60	60	60
50	30	50	30	30	50
-55°C to +85°C	-55°C to +85°C	-55°C to +85°C	-55°C to +85°C	-55°C to +85°C	-55°C to +85°C

Type	Board to FPC	Board to Board Board to FPC	Board to Board Board to FPC	Board to Board Board to FPC
				
Series	F4S	P4	P4S	P5KL
Part number	AXT5 / AXT6	AXK7 / AXK8	AXT3 / AXT4	AXK5L / AXK6L
Mounting method	SMD	SMD	SMD	SMD
Contact pitch (mm)	0.4	0.4	0.4	0.5
Features	Strong resistance to various environments. Bellows-type V notch (double contact) Ni barrier. Porosity treatment.	Strong resistance to various environments. Pattern wiring possible on PC board below connectors. Bellows-type V notch Ni barrier. Porosity treatment.	Strong resistance to various environments. Pattern wiring possible on PC board below connectors. Bellows-type V notch Ni barrier. Porosity treatment.	Strong resistance to various environments. Pattern wiring possible on PC board below connectors. Bellows-type V notch Ni barrier. Porosity treatment.
Stacking height (mm)	1.0	1.2	1.5 / 3.0	1.2
Number of contacts	10–50	10–60	10–100	10–60
Rated current / contact (A)	0.3	0.5	0.3	0.5
Rated current at total contacts (A)	5	10	5	10
Rated voltage (VAC/VDC)	60	60	60	60
Insertion and removal life times	50	50	50	50
Ambient temperature	–55°C to +85°C	–55°C to +85°C	–55°C to +85°C	–55°C to +85°C

Board to Board Board to FPC	Board to Board	Board to Board	Board to Board	Board to Board
				
P5KF	P5K	P5KS	P5 Floating type	P8
AXK5F / AXK6F	AXK5 / AXK6	AXK5S / AXK6S	AXN5 / AXN6	AXN1 / AXN3 / AXN4
SMD	SMD	SMD	SMD	SMD
0.5	0.5	0.5	0.5	0.8
Strong resistance to various environments. Pattern wiring possible on PC board below connectors. Bellows-type V notch Ni barrier. Porosity treatment.	Strong resistance to various environments. Bellows-type V notch (double contact) Ni barrier. Porosity treatment.	Strong resistance to various environments. Bellows-type V notch (double contact) Ni barrier. Porosity treatment.	Porosity treatment.	Bellows-type. Porosity treatment.
1.5 / 2.0 / 2.5	3.0 / 3.5	4.0 / 4.5 / 5.0 / 5.5 / 6.0 / 6.5 / 7.0 8.0 / 9.0	5.0	3.0 / 3.5 / 4.0 / 4.5 / 5.0 / 5.5 / 6.0 / 7.0 / 8.0 / 11.5 / 13.0 / 14.0
10–100	20–100	20–160	20–100	12–100
0.5	0.5	0.2	0.2	0.5
10	10	16	–	–
60	60	60	60	60
50	50	50	20	50; 100 (11.5mm)
–55°C to +85°C	–55°C to +85°C	–55°C to +85°C	–55°C to +85°C	–55°C to +85°C

NOTES FOR USING SMD TYPE CONNECTORS (Common)

Regarding the design of devices and PC board patterns

1) When connecting several connectors together by stacking, make sure to maintain proper accuracy in the design of structure and mounting equipment so that the connectors are not subjected to twisting and torsional forces.

2) With mounting equipment, there may be up to a ± 0.2 to 0.3mm error in positioning. Be sure to design PC boards and patterns while taking into consideration the performance and abilities of the required equipment.

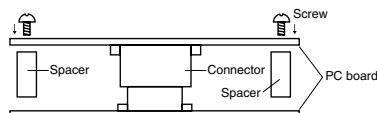
3) Some connectors have tabs embossed on the body to aid in positioning. When using these connectors, make sure that the PC board is designed with positioning holes to match these tabs.

4) To ensure the required mechanical strength when soldering the connector terminals, make sure the PC board meets recommended PC board pattern design dimensions given.

5) For all connectors of the narrow-pitch series, to prevent the PC board from

coming off during vibrations or impacts, and to prevent loads from falling directly on the soldered portions, be sure to design some means to fix the PC board in place.

Example: Secure in place with screws



When connecting PC boards, take appropriate measures to prevent the connector from coming off.

6) Notes when using a FPC.

(1) When the connector is soldered to an FPC board, during its insertion and removal procedures, forces may be applied to the terminals and cause the soldering to come off. It is recommended to use a reinforcement board (dimensions bigger than outer limits of the recommended PC board pattern drawings; determine the required thickness through

experimentation) on the backside of the FPC board to which the connector is being connected.

(2) Collisions, impacts, or turning of FPC boards, may apply forces on the connector and cause it to come loose. Therefore, make to design retaining plates or screws that will fix the connector in place.

7) The narrow-pitch connector series is designed to be compact and thin. Although ease of handling has been taken into account, take care when mating the connectors, as displacement or angled mating could damage or deform the connector.

Regarding the selection of the connector placement machine and the mounting procedures

1) Select the placement machine taking into consideration the connector height, required positioning accuracy, and packaging conditions.

2) Be aware that if the catching force of the placement machine is too great, it may deform the shape of the connector body or connector terminals.

3) Be aware that during mounting, external forces may be applied to the connector contact surfaces and terminals and cause deformations.

4) Depending on the size of the connector being used, self alignment may not be possible. In such cases, be sure to carefully position the terminal with the PC board

pattern.

5) The positioning bosses give an approximate alignment for positioning on the PC board. For accurate positioning of the connector when mounting it to the PC board, we recommend using an automatic positioning machine.

Regarding soldering

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) See the specifications and drawings for the product in question for the metal mask pattern diagrams.

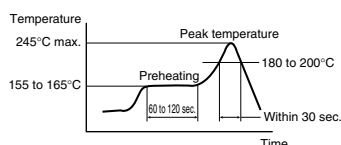
4) When mounting on both sides of the PC board and the connector is mounting on the underside, use adhesives or other means to ensure the connector is properly fixed to the PC board. (Double reflow soldering on the same side is possible.)

5) N_2 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 connector for all series



6) The temperatures are measured at the surface of the PC board near the connector terminals.

7) 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.

2. Hand soldering

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

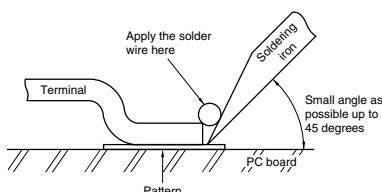
Table A

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.

NOTES FOR USING SMD TYPE CONNECTORS (Common)

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.

Example:

Influidge Industrial, Ltd.
Super Air Heater
Digital temperature controller
Air heater with internal temperature sensor

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

- 1) Make sure not to drop or allow parts to fall from work bench.
- 2) Excessive force applied to the terminals could cause them to warp, come out, or weaken the adhesive strength of the solder. Handle with care.
- 3) Repeated bending of the terminals may break them.
- 4) Do not use alcohol for cleaning. Doing so may whiten the surface of molded parts.

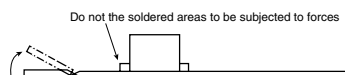
Cleaning flux from PC board

- 1) To increase the cleanliness of the cleaning fluid and cleaning operations, prepare equipment for a cleaning process that begins with boil cleaning, ultrasonic cleaning, and then to 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 may dissolve molded components of the connector and wipe off printed letters, we recommend semi-aqueous electronic parts cleaners. Consult us if you wish other types of cleaning fluids.
- 4) Please note that the surfaces of molded parts may whiten when cleaned with alcohol.

Handling the PC board

• 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 forces.



Storage of connectors

- 1) To prevent trouble from voids or air pockets by 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 store them in a 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 if produced at different times, and some connectors more even 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

- 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 rugged mishandling may bend or damage the terminals and even hinder proper reflow soldering.

- 3) Before soldering, try not to insert or remove the connector more than absolutely necessary. If necessary, be careful not to bend or damage any of the terminals. Also, applying external forces on the terminals will result in the loosening of the terminals from the molded portion of the connectors, eventually leading to improper operation.
- 4) When coating the PC board after soldering the connector to prevent the deterioration of insulation, perform the

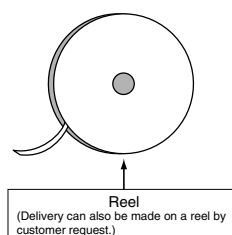
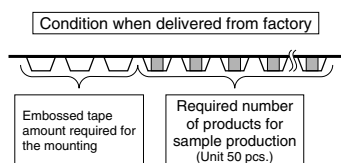
coating in such a way so that the coating does not get on the connector.

- 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.
- 7) Be sure not to allow external pressure to act on connectors when assembling PCBs or moving in block assemblies.

Regarding sample orders to confirm proper mounting

When ordering samples to confirm proper mounting with the placement machine, connectors are delivered in 50-piece units in the condition given right. Consult a sales representative for ordering sample units.

For other details, please verify with the product specification sheets.



Related Products from Panasonic

Panasonic Electric Works offers a wide product range from one source, from individual components to complete systems. Technology support for advice, design-in, installation and commissioning by our qualified application engineers round off the Panasonic service profile.

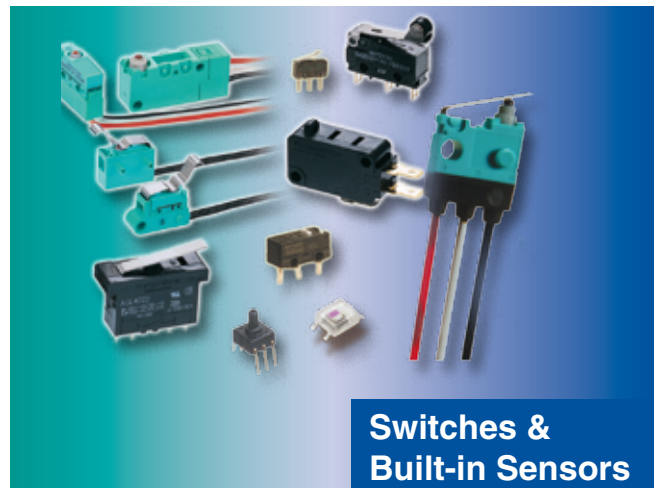


Relays

- Solid state relays
- Signal relays
- High-frequency relays
- Power relays
- Automotive relays
- Safety relays
- PhotoMOS relays

Application areas:

Measurement and control engineering	Consumer and domestic
Radio and television technology	Automotive industry
Industrial control systems	Safety systems



Switches & Built-in Sensors

- | | |
|---|----------------------------|
| ■ Microswitches (including IP67) | ■ Motion detection sensors |
| ■ Miniature switches | ■ Light sensors |
| ■ Toggle switches | ■ Pressure sensors |
| ■ Power push-button & push-button switches | ■ Acceleration sensors |
| ■ Selector switches & key selector switches | |

Application areas:

Automotive industry	Consumer and home entertainment products
Industrial control systems	Healthcare products
Safety technology	Lighting control
White & brown ware	

If you need more detailed information about Panasonic components, please contact us to send you detailed catalogs and brochures.

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Europe

Asia Pacific

China

Japan

Panasonic Electric Works

Please contact our Global Sales Companies in:

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▶ France	Panasonic Electric Works Sales Western Europe B.V.	Succursale française, 10, rue des petits ruisseaux, 91370 Verrières Le Buisson, Tél. +33 (0) 1 6013 5757, Fax +33 (0) 1 6013 5758, www.panasonic-electric-works.fr
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▶ Poland	Panasonic Electric Works Polska sp. z o.o	Jungmansgatan 12, 21119 Malmö, Tel. +46 40 697 7000, Fax +46 40 697 7099, www.panasonic-fire-security.com
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▶ USA	PEW Corporation of America	629 Central Avenue, New Providence, N.J. 07974, Tel. 1-908-464-3550, Fax 1-908-464-8513, www.pewa.panasonic.com
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▶ Singapore	Panasonic Electric Works Asia Pacific Pte. Ltd.	101 Thomson Road, #25-03/05, United Square, Singapore 307591, Tel. (06255) 5473, Fax (06253) 5689