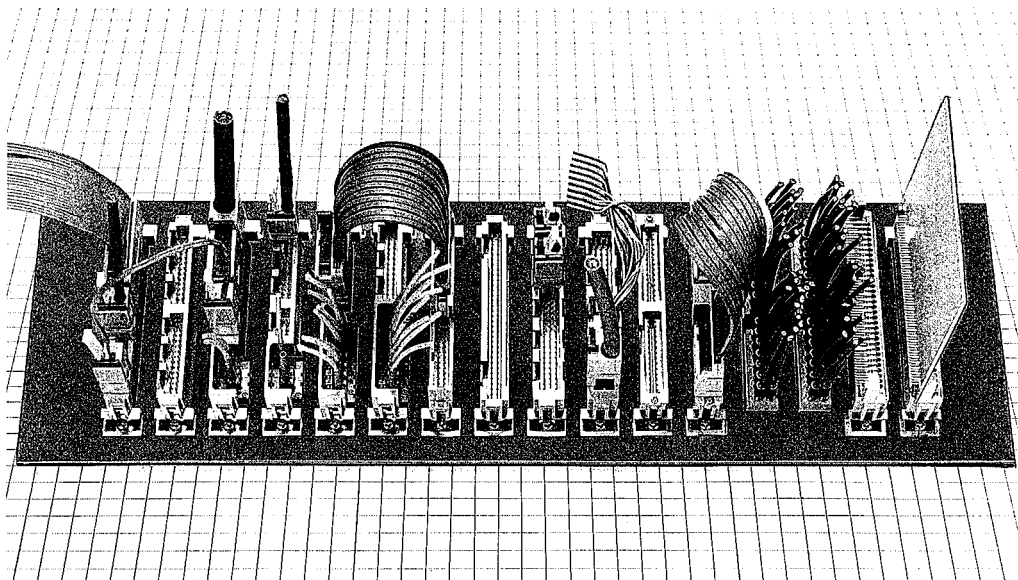


Connectors for Hi-PAS Mounting

HP5 · 6 Series C-G※※ Series

Overview

The HP5 Series and C-G※※ Series of Hi-PAS (High-density Packaging System) mounting connectors were developed to meet the demands of the high performance and trend toward high-density packaging of communications equipment.



Features

HP5 · 6 Series

- Compared with the contemporary PCN11M Series (of DS mounting connectors), the mounting density is approximately 1.5 times higher in terms of number of contacts and higher densities are planned.
- Package-side connectors are of a 3-stage sequenced structure in consideration of a circuit protection function.
- Through holes of the BWB and contact pins can be mounted without solder.
- Socket contacts make contact on both surfaces for high reliability.
- The through hole diameter and the rear surface contact diameter differ with the terminal board type and the box type and so their selection for a particular use should take into consideration such factors as pattern accommodation, wrapping quality, and the placement process.

C-G※※ Series

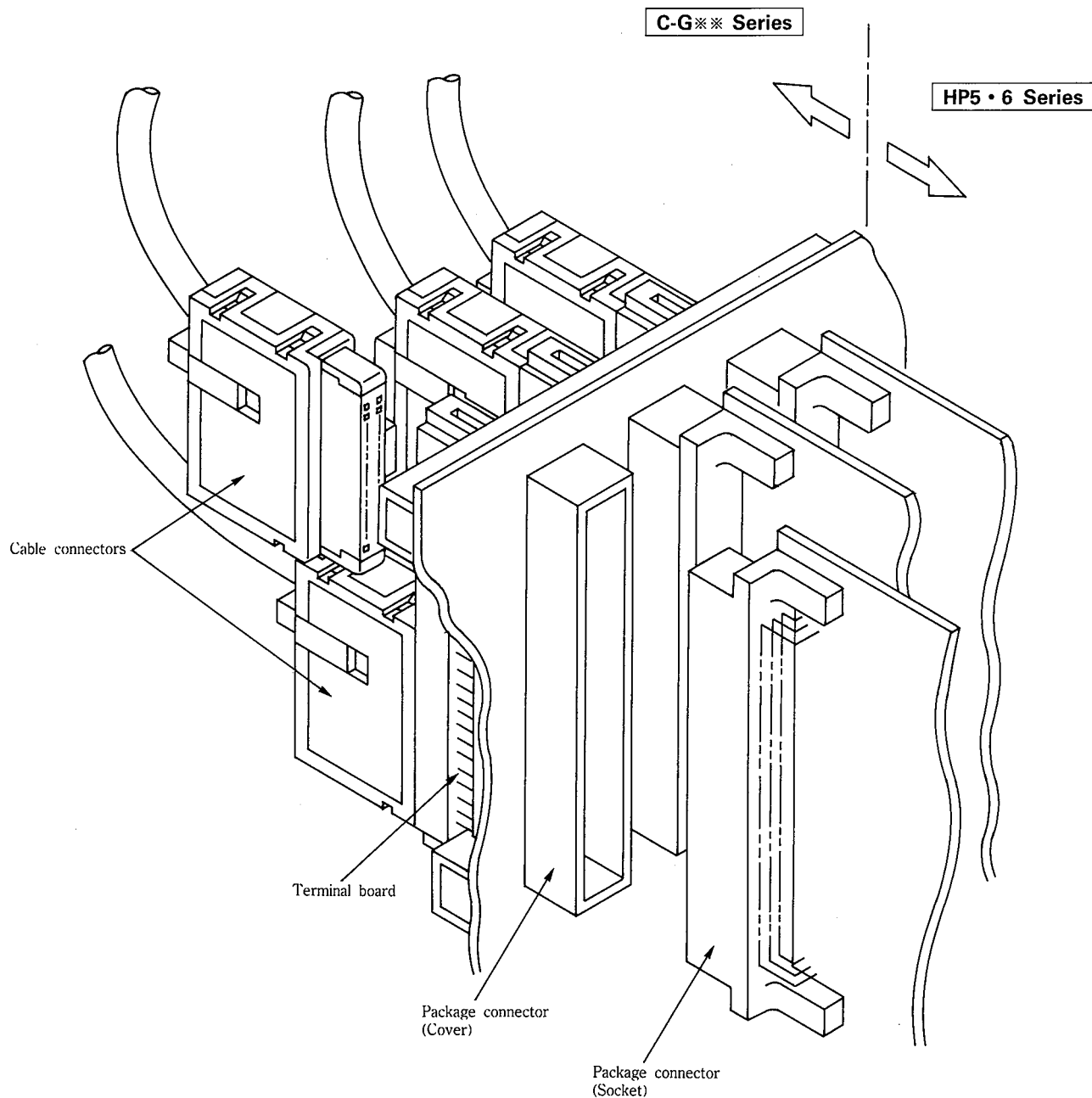
- Connectors for use with C-G** cables are of the U-groove batch pressure welding connection system which offers excellent wiring workability (including planned automatic wiring) and connection reliability.
- Pressure welding work is of the loose wire pressure welding method which enables easy changes of the wiring form e.g., lead number changes, etc.
- A simple lock system which does not use tools is employed for connector assembly and permits assembly of all parts (excluding wiring work).
- The lock operation of the connectors is a front-panel operation which permits high-density mounting.

Applications

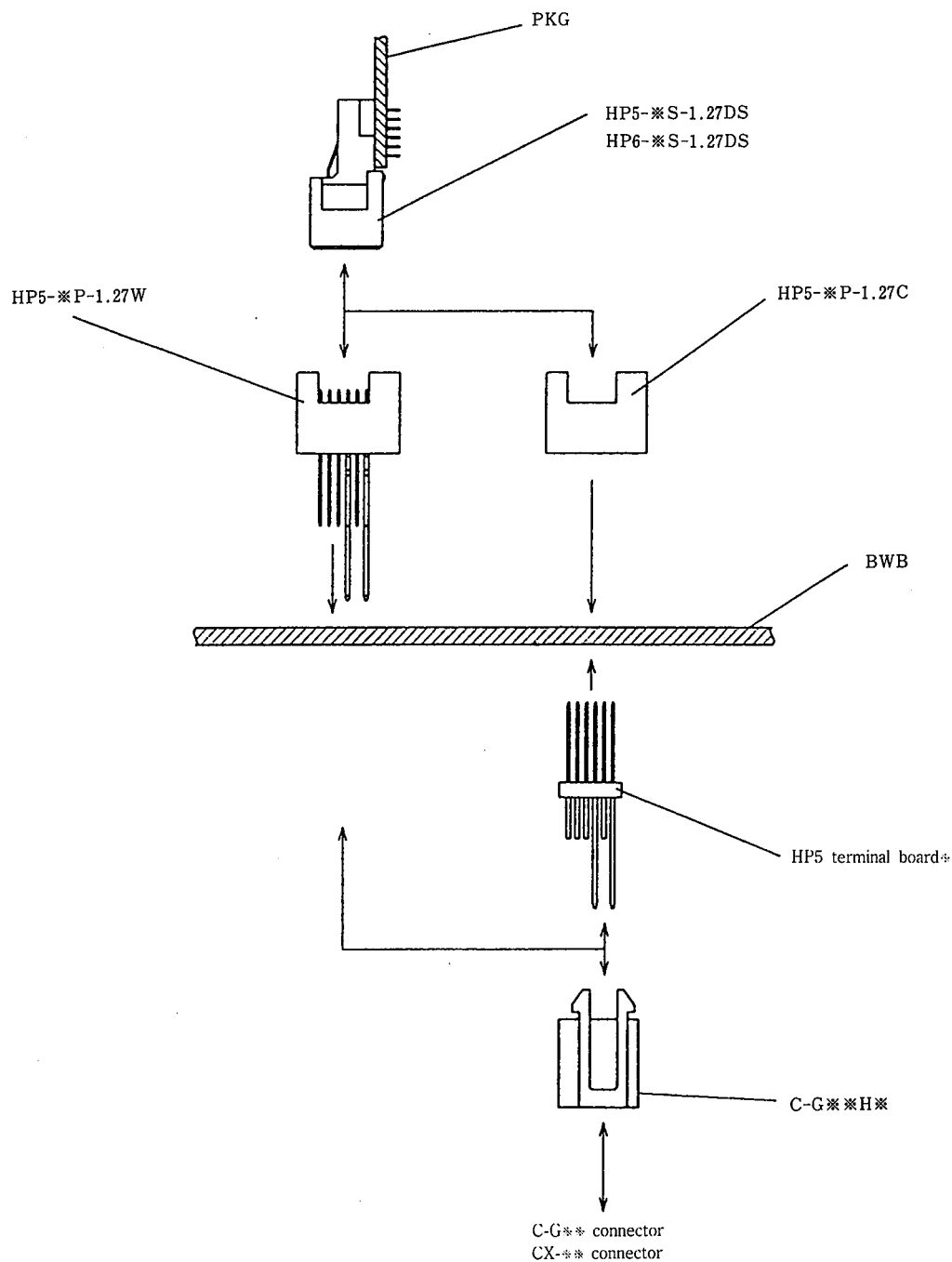
Exchange equipment, transmission equipment, measuring instruments, control equipment, etc.

High-density Packaging System

Diagram of Connector Mounting Conditions

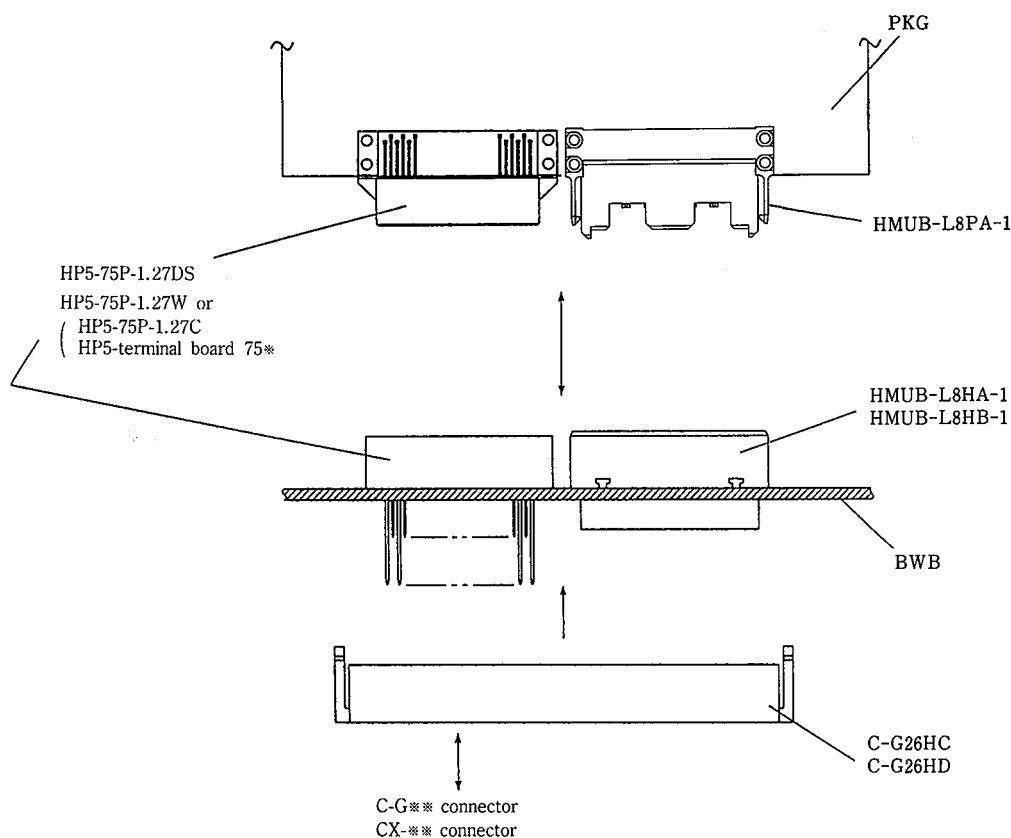


■ HP5 • 6 Series Function Diagram

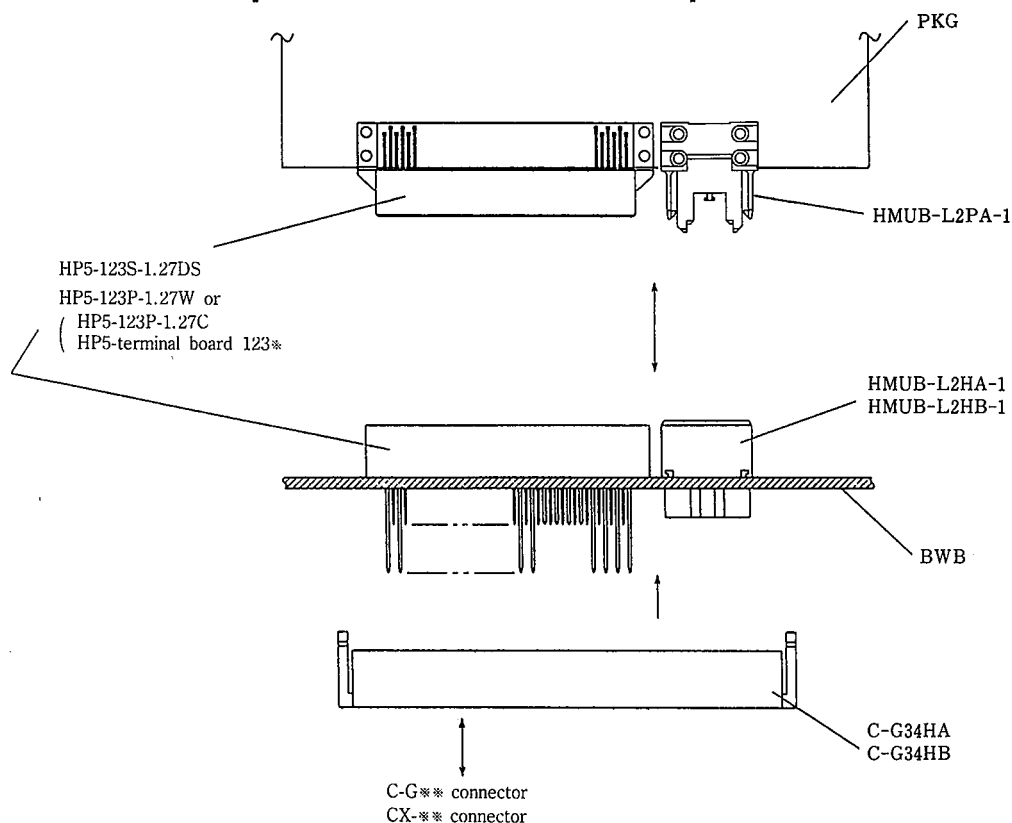


High-density Packaging System

■ Mixed Use of Optical Connectors Example 1



■ Mixed Use of Optical Connectors Example 2



Major Specifications

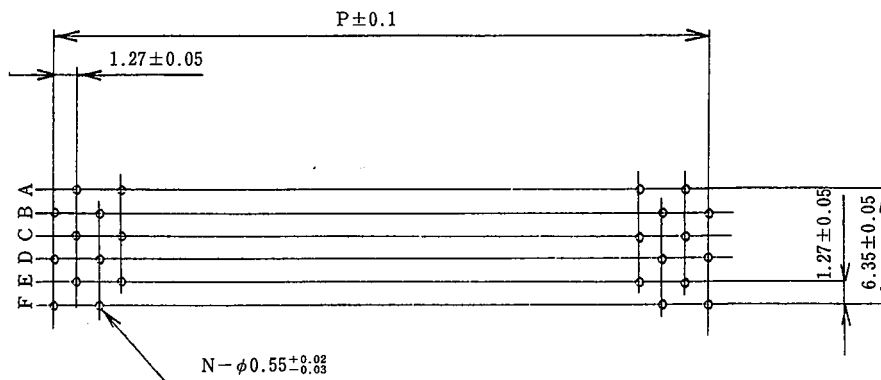
HP5 • 6 Series

Item		Specification	Remarks
Mounting spacing		15.24 mm	
Number of contacts		189, 123, or 75 contacts	• Maximum of 567 contacts with 300-mm high package • System: without rows C and E, without rows A, C, and E, without rows A, B, C, and E
Contact arrangement	BWB	2.54 mm irregular 6-row staggered matrix	
	PKG		
Contact connections	BWB	Press-fit connection	See (1) next page
	PKG	Solder connection	See (2) next page
Contact wiring		Wrapping connection	0.26 mm dia. leads
Insertion force		147 N max.	189 contacts
Number of insertions/removals		60 times, max.	Not conducting
Rated current		0.3 A	With 189 contacts conducting and a nominal temperature rise of 10°C or less
Connection resistance		40 mΩ or less	Including conductor resistance
Insulation resistance		100 MΩ or greater	500 V DC
Withstand voltage		500 V AC for 1 minute without irregularities	

1) Press-Fit Connections

(a) Terminal board type

Board conditions Board thickness 2.4 ± 0.25 mm (HP5 terminal board *A, HP5 terminal board *C)
 3.2 ± 0.25 mm (HP5 terminal board *B)
Through holes Cutting diameter: $0.65 \text{ mm} \pm 0.02 \text{ mm}$
Finished diameter: $0.55 \text{ mm} \pm 0.03 \text{ mm}$
Plating: Cu 30 to 70 μ



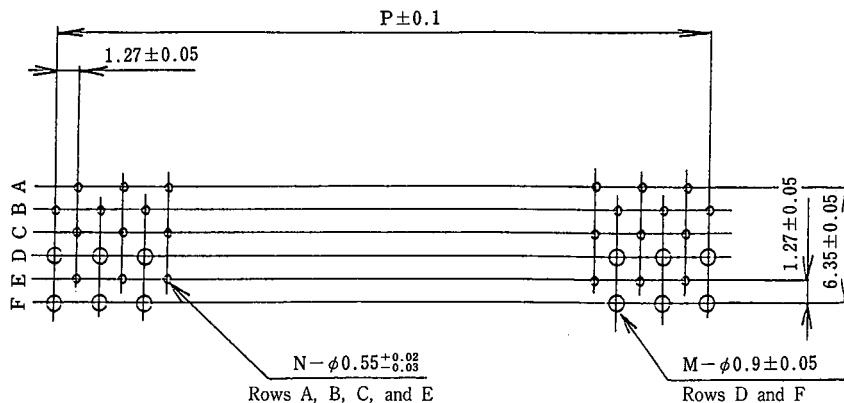
Board Reference Diagram

Number of Contacts	P	N
189	78.74	189
123	50.8	123
75	30.48	75

High-density Packaging System

(b) Box type (HP5-※P-1.27W)

Board conditions Board thickness 2.4 ± 0.25 mm or greater
 Through holes Cutting diameter: $0.65 \text{ mm} \pm 0.02 \text{ mm}$, $1 \text{ mm} \pm 0.02 \text{ mm}$
 Finished diameter: $0.55 \text{ mm} \pm_{0.03}^{0.02} \text{ mm}$, $0.9 \text{ mm} \pm 0.05 \text{ mm}$
 Plating: Plating: Cu 30 to 70 μ

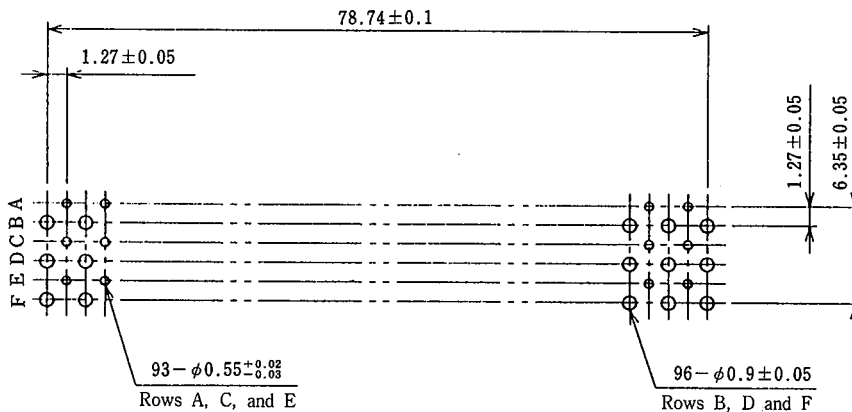


Board Reference Diagram

Number of Contacts	P	N	M
189	78.74	125	64
123	50.8	81	42
75	30.48	49	26

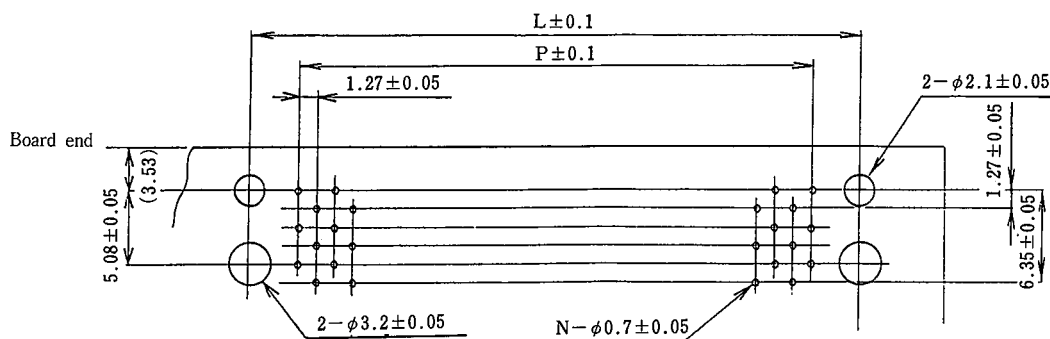
(c) Box type (HP5-189PB-1.27W)

Board conditions Board thickness 2.4 ± 0.25 mm or greater
 Through holes Cutting diameter: $0.65 \text{ mm} \pm 0.02 \text{ mm}$, $1 \text{ mm} \pm 0.02 \text{ mm}$
 Finished diameter: $0.55 \text{ mm} \pm_{0.03}^{0.02} \text{ mm}$, $0.9 \text{ mm} \pm 0.05 \text{ mm}$
 Plating: Cu 30 to 70 μ



2) Solder Connections (HP5-※S-1.27DS and HP6-※S-1.27DS)

Board conditions Through holes Finished diameter: 0.7 mm $\pm$ 0.05 mm



Board Reference Diagram

Number of Contacts	P	L	N
189	78.74	86.36	189
123	50.8	58.42	123
75	30.48	38.1	75

Major Specifications

C-G※※ Series

Item	C-G6FA	C-G18FA	C-G26FA
Number of contacts	6	18	26
Mounting spacing	15.24	15.24	15.24
Contact expansion	2.54 mm forward 2 rows	2.54 mm forward 2 rows	2.54 mm forward 2 rows
Suitable cable conductor diameter	0.4 mm	0.4 mm	0.4 mm
Wiring system	U-groove pressure welding connection	U-groove pressure welding connection	U-groove pressure welding connection
Suitable cable	0.4 mm 2 pair AC bus cable	0.4 mm FRPE 64 pair Office cable 0.4 mm 8 pair AC bus cable	0.26 mm 12 pair AC bus cable
Cable clamp system	Metal clamp Caulking system	Metal clamp Caulking system	Metal clamp Caulking system
Rated current	1A/contact, max. 6A/connector, max.	1A/contact, max. 18A/connector, max.	1A/contact, max. 6A/connector, max.
Contact resistance	30 mΩ, max.	30 mΩ, max.	30 mΩ, max.
Insulation resistance	100 MΩ or greater	100 MΩ or greater	100 MΩ or greater
Withstand voltage	500 V AC rms	500 V AC rms	500 V AC rms
Applications	Connections between units and between racks	Connections between units and between racks	Connections between units and between racks

High-density Packaging System

Item	C-G26FB	CXR-26FA	C-J18FNEY-01(08)	C-J18FNET-01(08)
Number of contacts	26	26	18	18
Mounting spacing	15.24	15.24	15.24	15.24
Contact expansion	2.54 mm forward 2 rows	2.54 mm forward 2 rows	2.54 mm forward 3 rows	2.54 mm forward 3 rows
Suitable cable conductor diameter	0.4 mm	0.4 mm	0.4 mm	0.4 mm
Wiring system	U-groove pressure welding connection	U-groove pressure welding connection	U-groove pressure welding connection	U-groove pressure welding connection
Suitable cable	0.4 mm FRPE 64 pair Office cable 0.4 mm 2 pair, 8 pair, and 12 pair AC bus cable	26-conductor ribbon cable (AWG 28)	18-conductor twisted lead cable (AWG 28)	0.4 mm 2 pair, and 8 pair AC bus cable
Cable clamp system	Nylon clamp Caulking system	Metal clamp Caulking system	Nylon clamp Caulking system	Nylon clamp Caulking system
Rated current	1A/contact, max. 18A/connector, max.	1A/contact, max. 6A/connector, max.	1A/contact, max. 18A/connector, max.	1A/contact, max. 6A/connector, max.
Contact resistance	30 mΩ, max.	30 mΩ, max.	30 mΩ, max.	30 mΩ, max.
Insulation resistance	100 MΩ or greater	100 MΩ or greater	100 MΩ or greater	100 MΩ or greater
Withstand voltage	500 V AC rms	500 V AC rms	500 V AC rms	500 V AC rms
Applications	Connections between units and between racks	Connections between units and between racks	Connections between units and between racks	Connections between units and between racks

Item	CX50-6FA	CX50-26FA	CX75-26FA
Number of contacts	6	26	26
Mounting spacing	15.24	15.24	15.24
Contact expansion	2.54 mm forward 2 rows	2.54 mm forward 2 rows	2.54 mm forward 2 rows
Suitable cable conductor diameter	0.26 mm	0.26 mm	0.26 mm
Wiring system	U-groove pressure welding connection	U-groove pressure welding connection	U-groove pressure welding connection
Suitable cable	50Ω coaxial Ribbon cable (AWG 30)	50Ω coaxial Ribbon cable (AWG 30)	75Ω coaxial Ribbon cable (AWG 30)
Cable clamp system	Metal clamp Caulking system	Metal clamp Caulking system	Metal clamp Caulking system
Rated current	1A/contact, max. 3A/connector, max.	1A/contact, max. 6A/connector, max.	1A/contact, max. 6A/connector, max.
Contact resistance	30 mΩ, max.	30 mΩ, max.	30 mΩ, max.
Insulation resistance	100 MΩ or greater	100 MΩ or greater	100 MΩ or greater
Withstand voltage	500 V AC rms	500 V AC rms	500 V AC rms
Applications	Connections between units and between racks	Connections between units and between racks	Connections between units and between racks

High-density Packaging System

Materials and Processing

HP5 • 6 Series

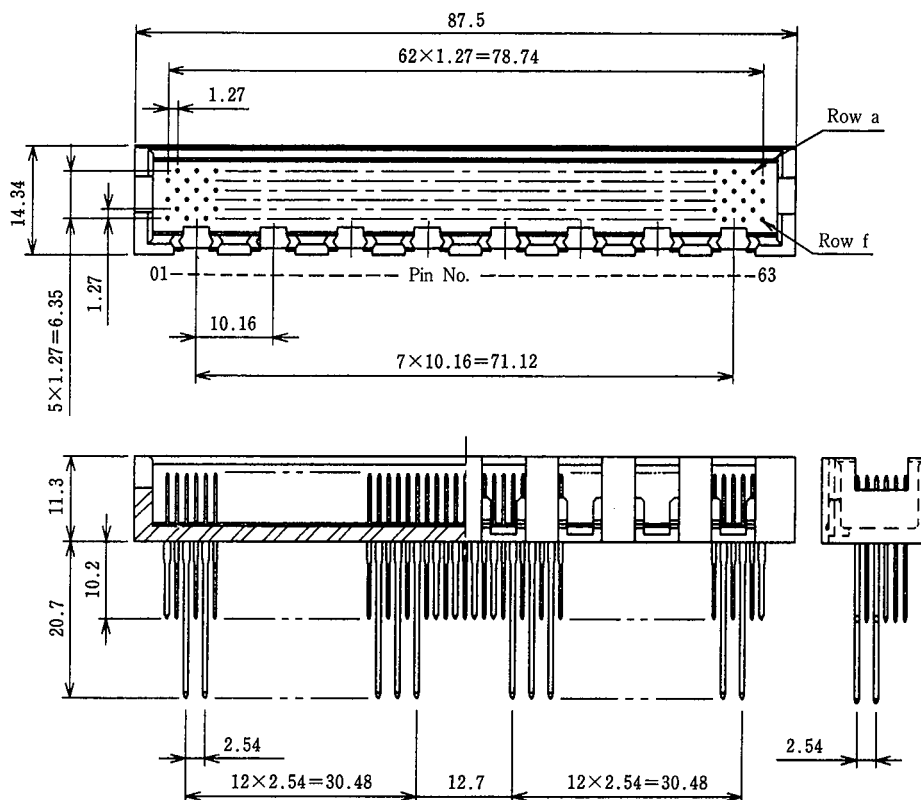
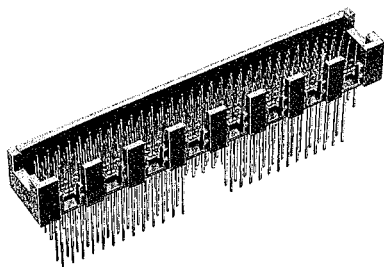
			Material	Processing
PKG-side connectors	HP5 Series	Insulation	PBT resin	Brown
		Contacts	Beryllium copper	Partial gold plating (Contact parts) Solder plating (Dip parts)
	HP6 Series	Insulation	PBT resin	Black
		Contacts	Copper alloy	Partial gold plating (Contact parts) Solder plating (Dip parts)
BWB-side connectors	Terminal board type	Insulation	PBT resin	Brown Black (Only for board thickness of 3.2 mm)
		Contacts	Copper alloy	Gold plating
	Box type	Insulation	PBT resin	Brown
		Contacts	Copper alloy	Gold plating

C-G※※ Series

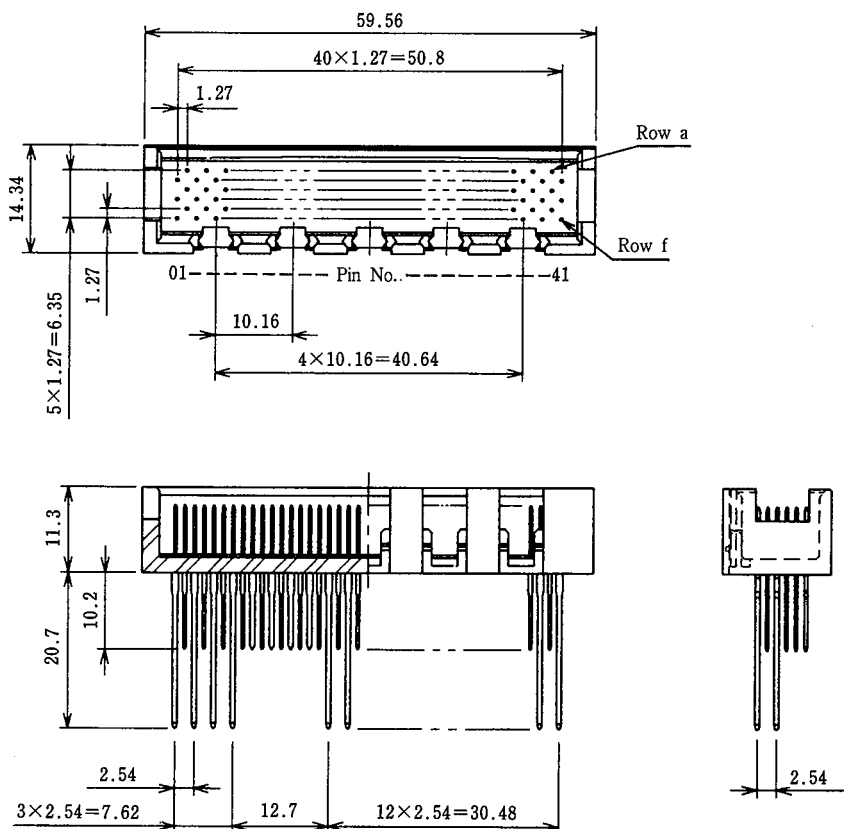
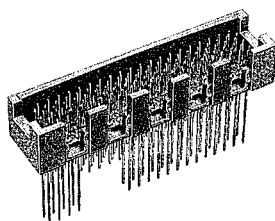
		Material	Processing
Cable connectors	Connector body	PBT resin	Brown and black
	Cover	Polycarbonate resin	Beige
	Contacts	Beryllium copper	Partial gold plating
Housing	Insulation	Polycarbonate resin	Beige

■ BWB (Back Wiring Board)-Side Connectors

● HP5-189P-1.27W
CL587-0011-0

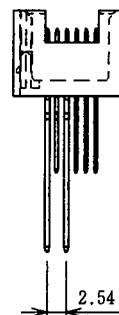
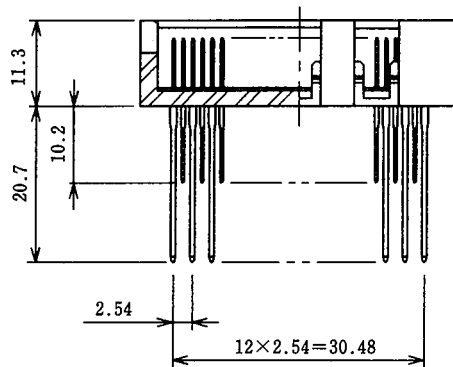
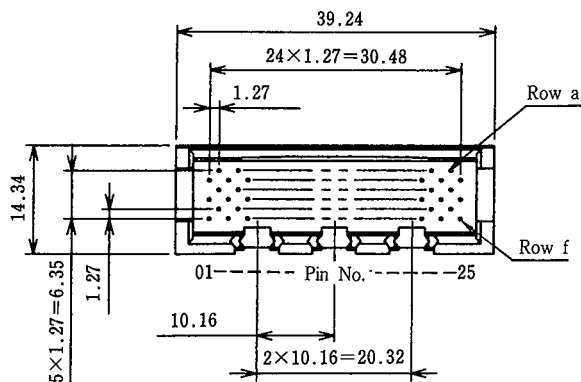
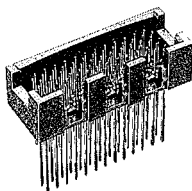


● HP5-123P-1.27W
CL587-0060-0

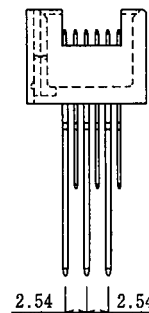
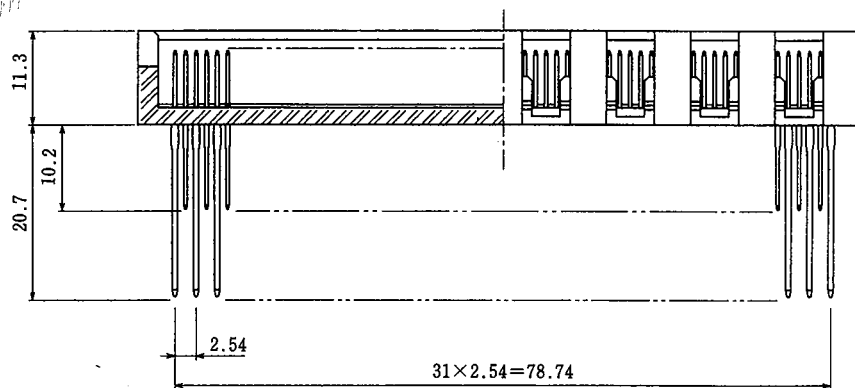
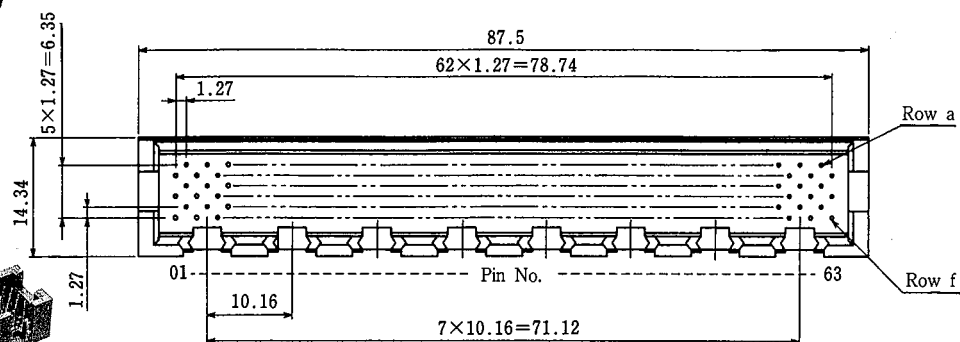
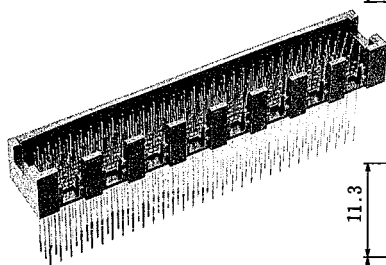


High-density Packaging System

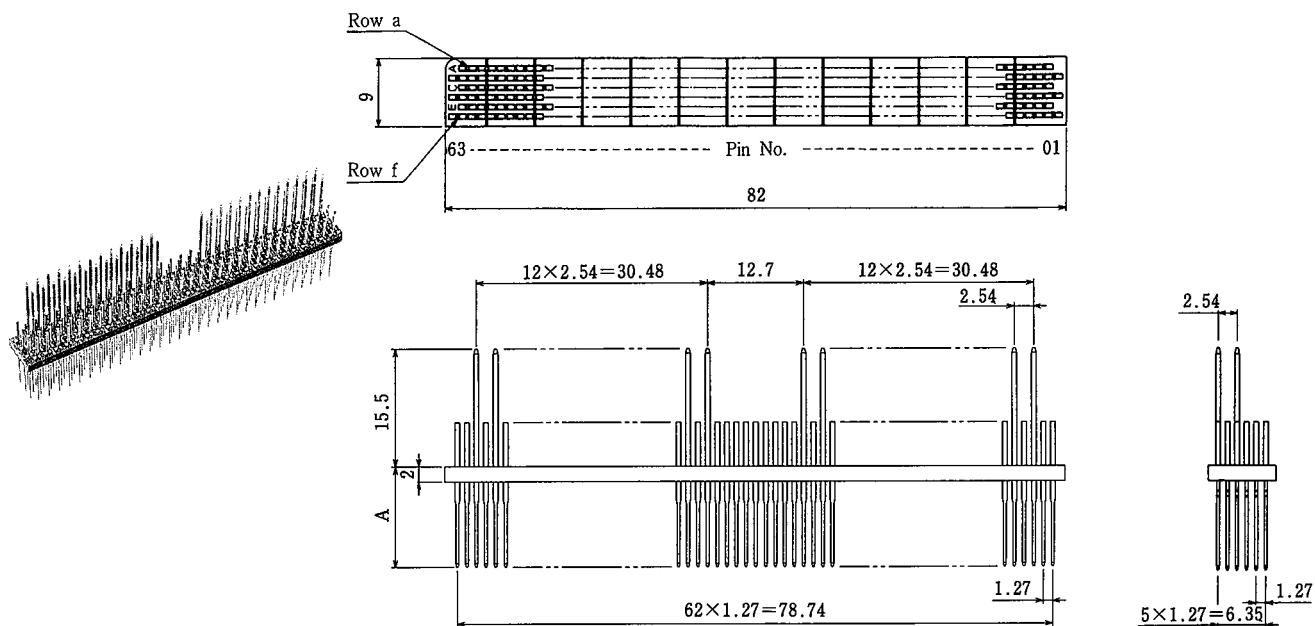
● HP5-75P-1.27W CL587-0065-0



● HP5-189PB-1.27W CL587-0118-4

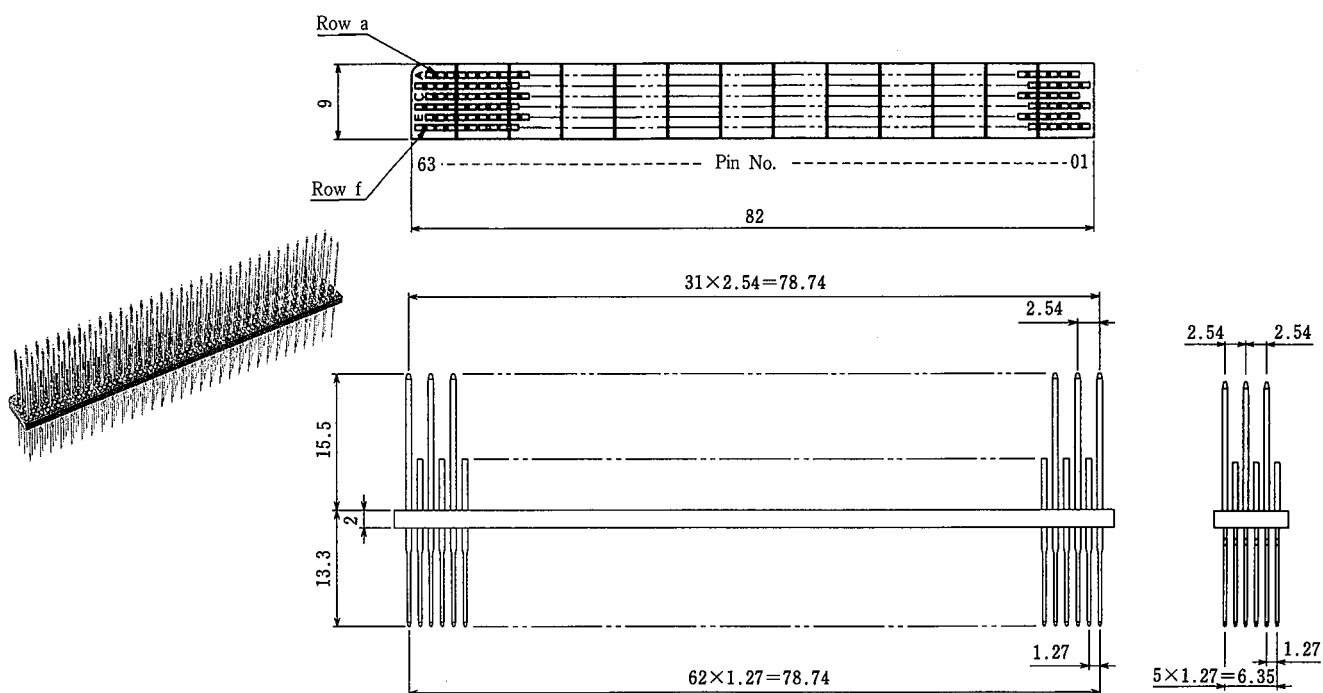


●HP5 Terminal Board 189※



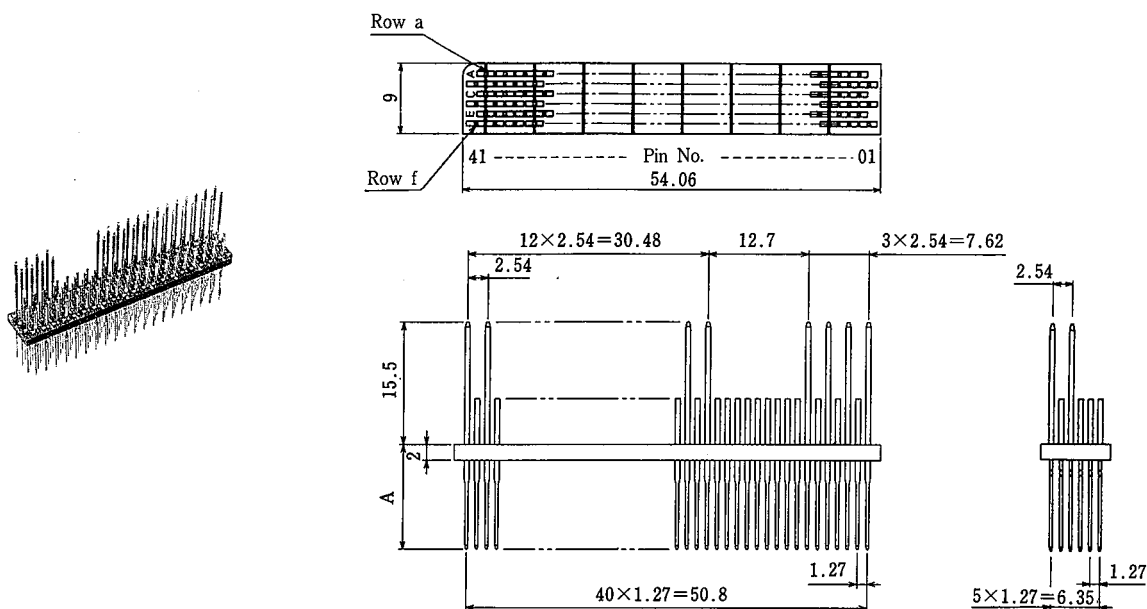
HRS No.	Product No.	A	Board Thickness
587-0004-5	HP5 Terminal Board 189A	13.3	T=2.4
587-0053-0	HP5 Terminal Board 189B	14.1	T=3.2

●HP5 Terminal Board 189C
CL587-0117-1



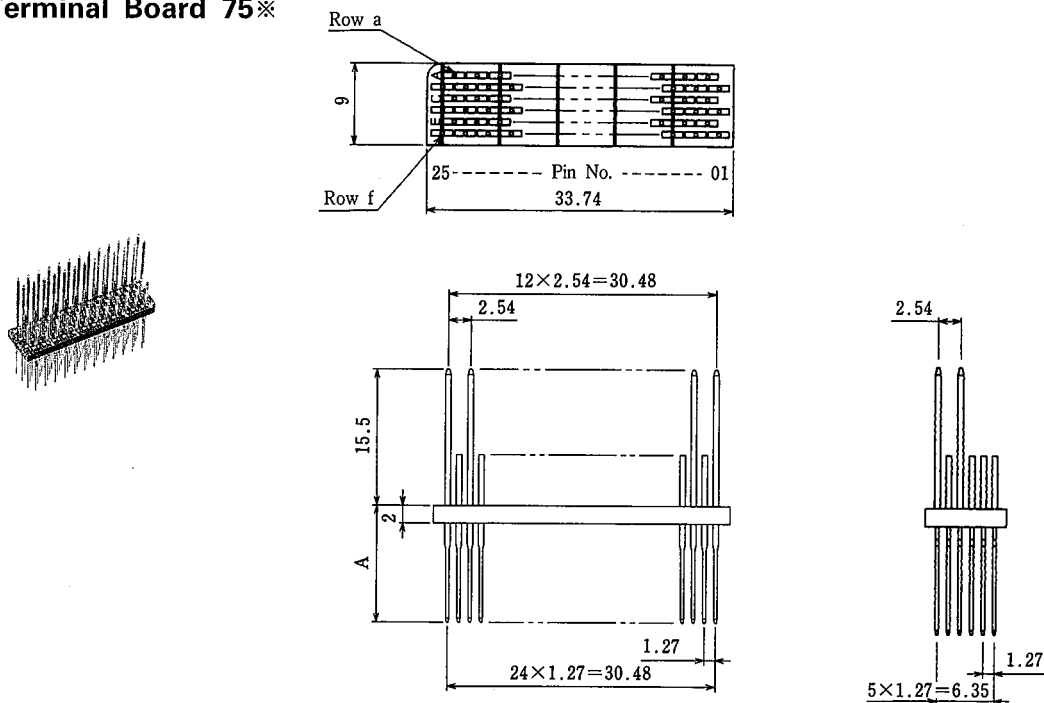
High-density Packaging System

●HP5 Terminal Board 123※



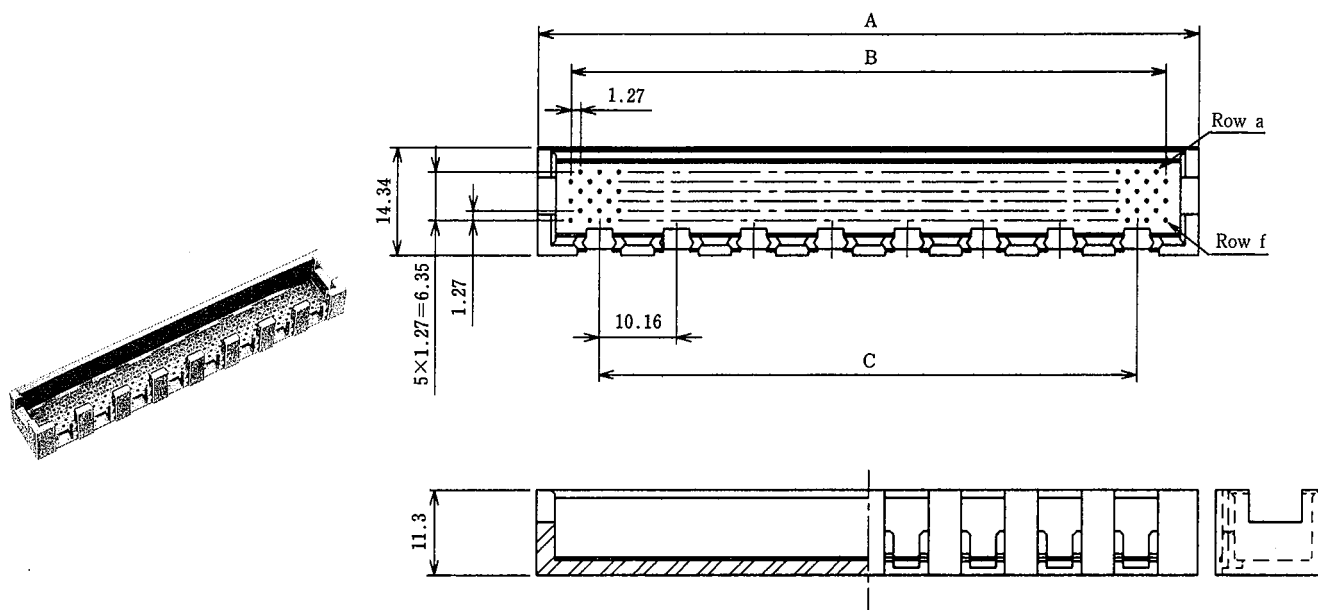
HRS No.	Product No.	A	Board Thickness
587-0017-7	HP5 Terminal Board 123A	13.3	T=2.4
587-0073-8	HP5 Terminal Board 123B	14.1	T=3.2

●HP5 Terminal Board 75※



HRS No.	Product No.	A	Board Thickness
587-0018-0	HP5 Terminal Board 75A	13.3	T=2.4
587-0081-6	HP5 Terminal Board 75B	14.1	T=3.2

●HP5-※※P-1.27C (Used in Conjunction with a Terminal Board Connector)

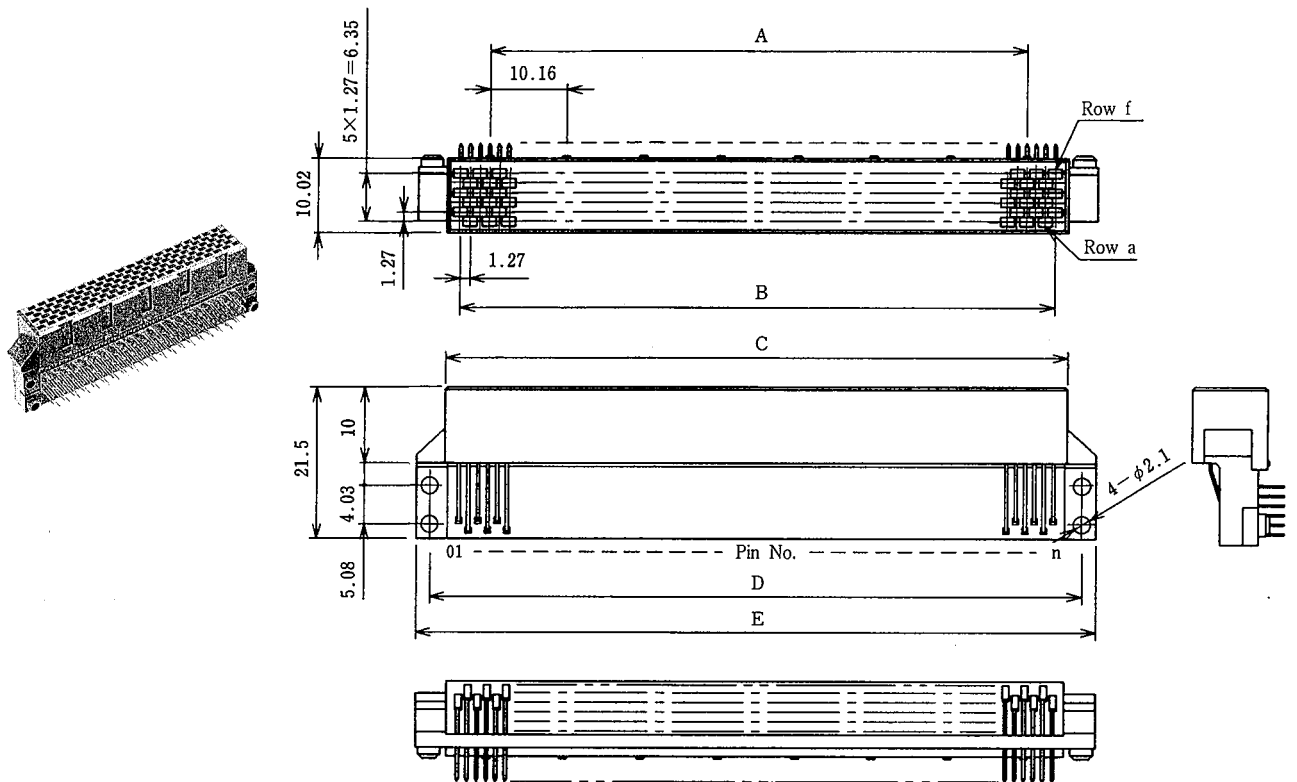


HRS No.	Product No.	Number of Contacts	A	B	C
587-0019-2	HP5-75P-1.27C	75	39.24	30.48	20.32
587-0020-1	HP5-123P-1.27C	123	59.56	50.80	40.64
587-0012-3	HP5-189P-1.27C	189	87.50	78.74	71.12

High-density Packaging System

■ PKG (Package)-Side Socket Connectors

● HP5-※※S-1.27DS



HRS No.	Product No.	Number of Contacts	A	B	C	D	E	Pin Configuration
587-0014-9	HP5-75S-1.27DS	75	30.32	30.48	34.01	38.10	41.74	Table 1
587-0015-1	HP5-123S-1.27DS	123	40.64	50.80	54.33	58.42	62.06	Table 2
587-0010-8	HP5-189S-1.27DS	189	71.12	78.74	82.27	86.36	90.00	Table 3

Pin Configuration Table

Table 1

No.	1	3	5	7	9	11	13	15	17	19	21
Row	2	4	6	8	10	12	14	16	18	20	
Row a	2	2	2	2	2	2	2	2	2	2	2
Row b	3	3	3	3	3	3	3	3	3	3	3
Row c	2	2	2	2	2	2	2	2	2	2	2
Row d	3	3	3	3	3	3	3	3	3	3	3
Row e	2	1	2	1	2	1	2	1	2	1	2
Row f	3	3	3	3	3	3	3	3	3	3	3

Table 2

No.	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29	31	33	35	37	39	41
Row	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	
Row a	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Row b	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Row c	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Row d	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Row e	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
Row f	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

Table 3

No.	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29	31	33	35	37	39	41	43	45	47	49	51	53	55	57	59	61	63
Row	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	
Row a	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Row b	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Row c	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Row d	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Row e	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
Row f	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

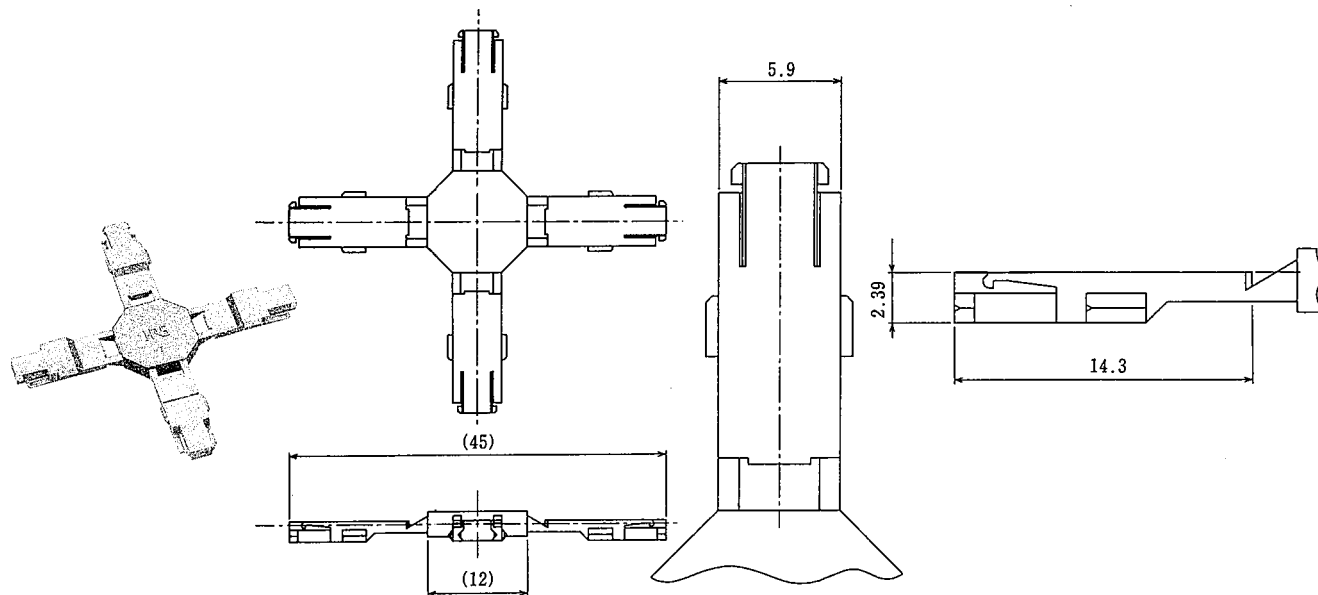
●HP6-189S-1.27DS
CL587-0501-0

[illegible]

NOTE: Contact order of the pins is 1, 2, 3.

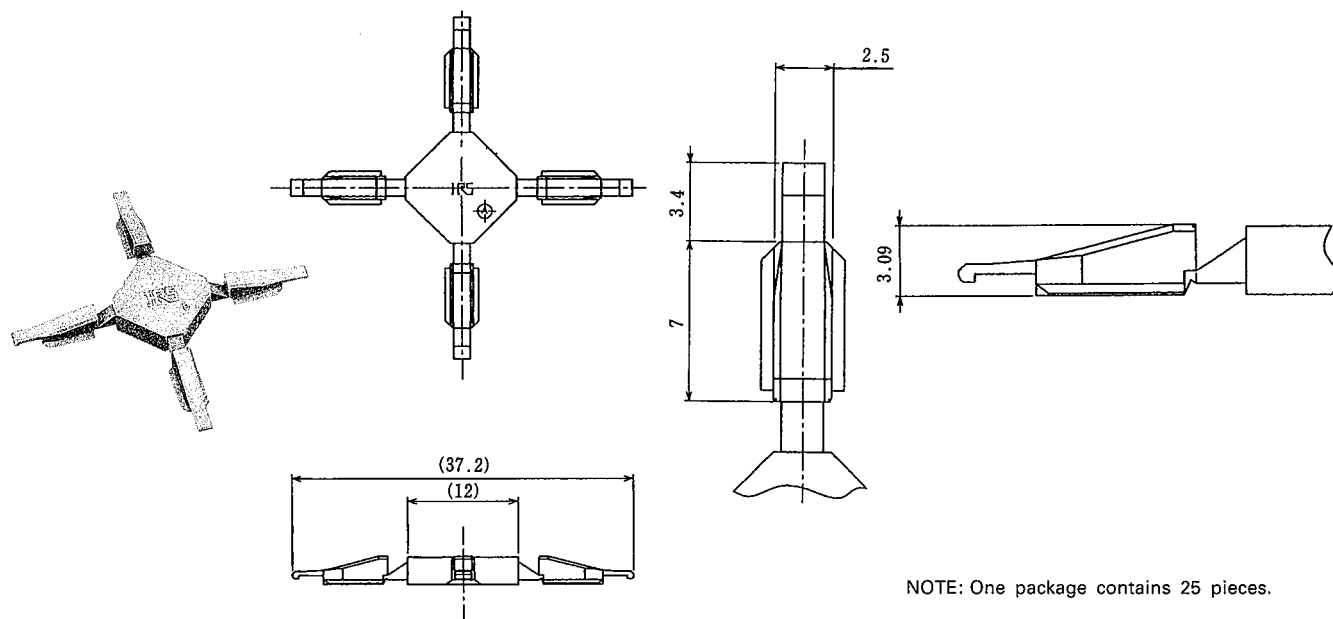
High-density Packaging System

● HP5-BP-GK(A)
CL587-0112-8



NOTE: One package contains 25 pieces.

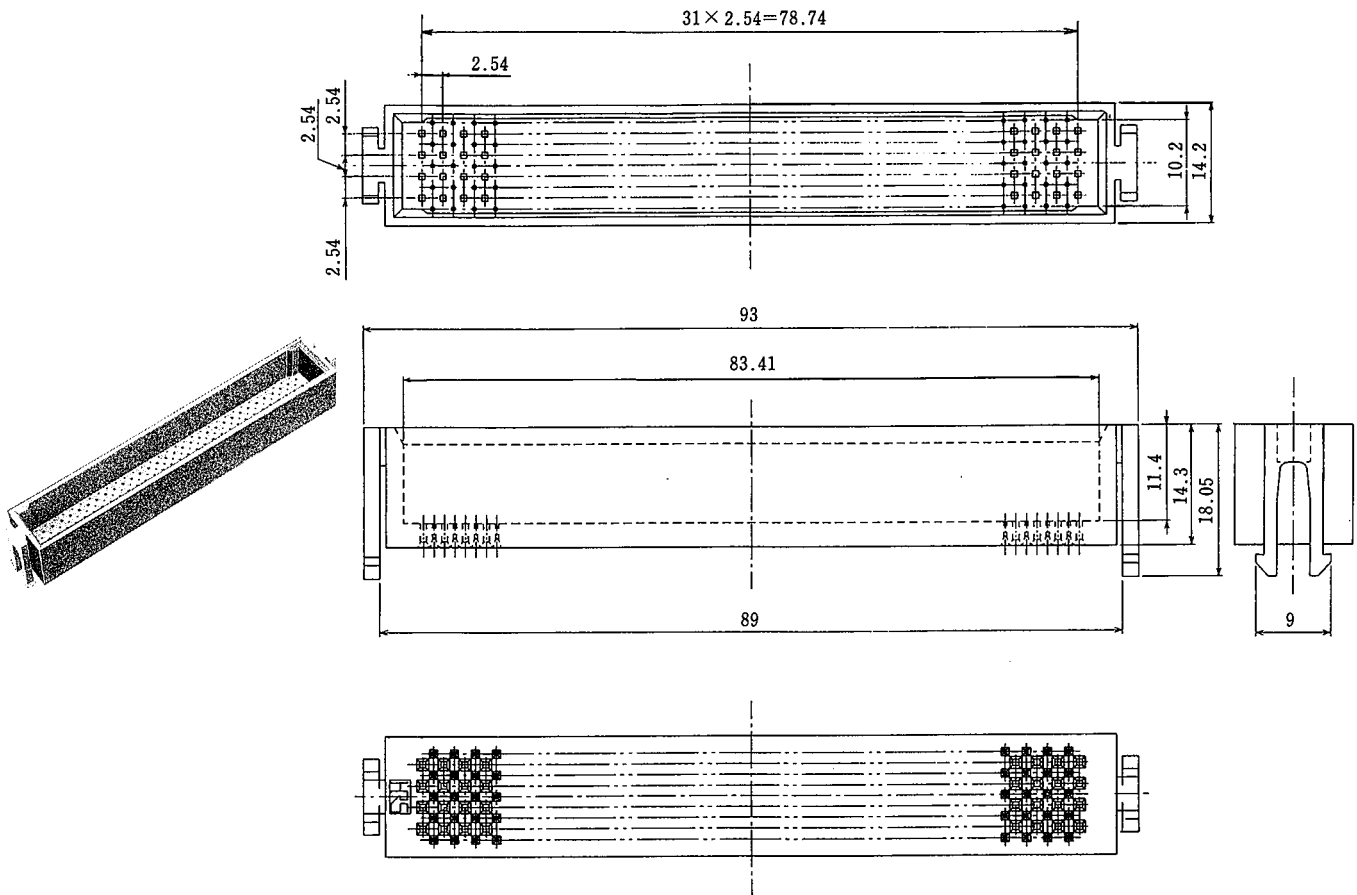
● HP5-PKG-GK(A)
CL587-0113-0



NOTE: One package contains 25 pieces.

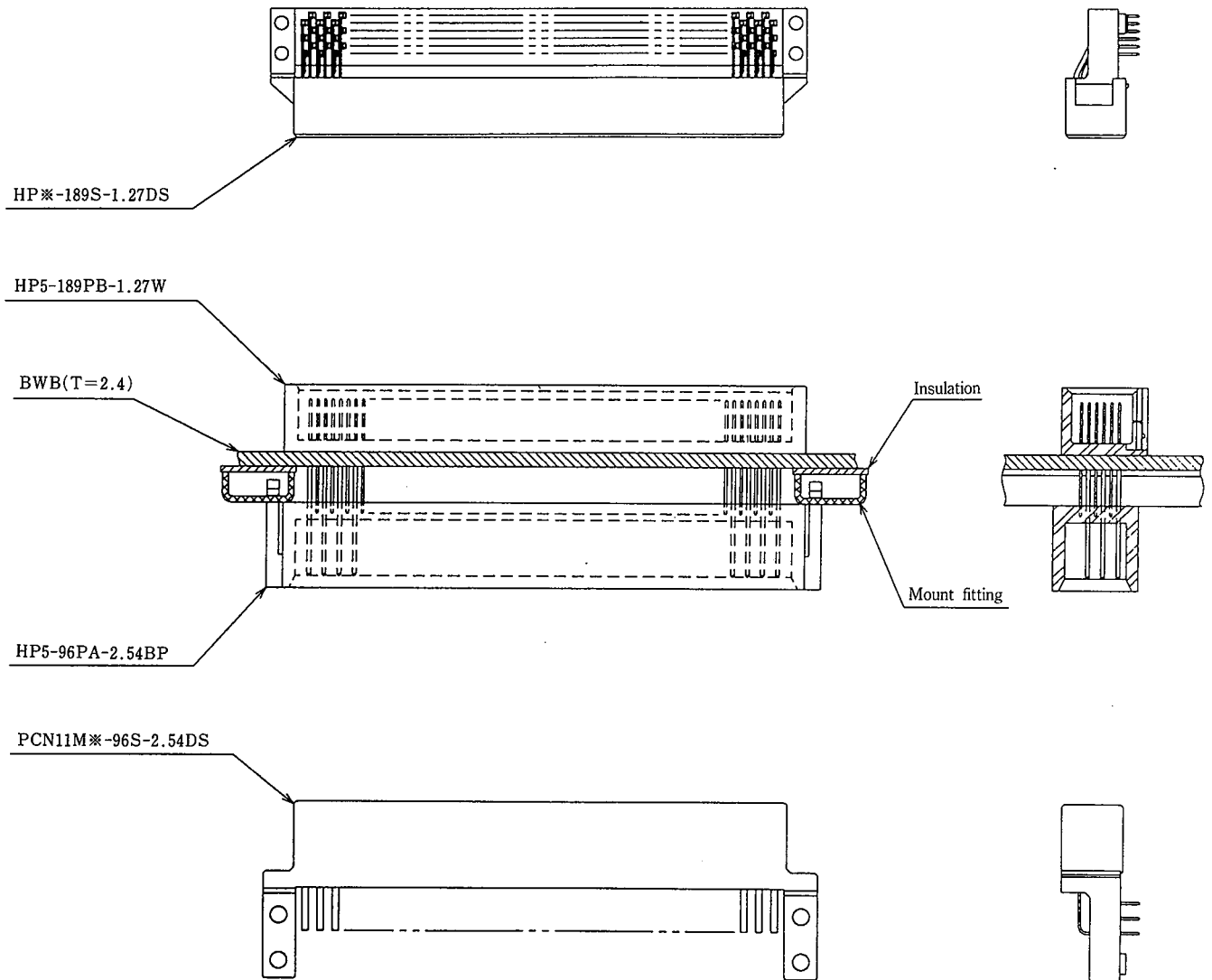
■ Backplane Housing

● HP5-96PA-2.54BP
CL587-0034-6



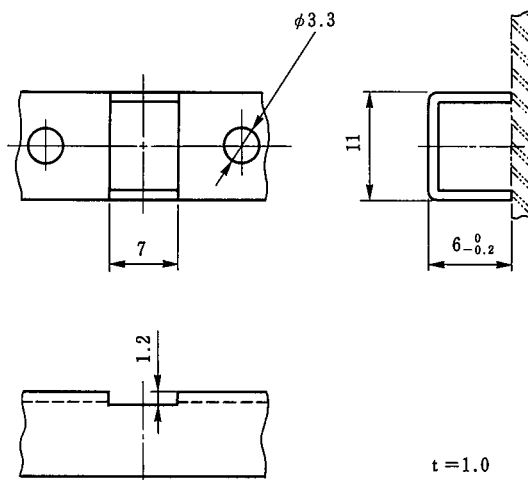
High-density Packaging System

Backplane Function Diagram

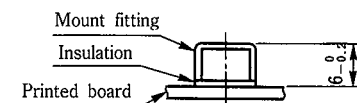


■ HP5-96PA-2.54BP Mount Fitting

A mount fitting of the dimensions indicated in the diagram below should be prepared when mounting the HP5-96PA-2.54BP.



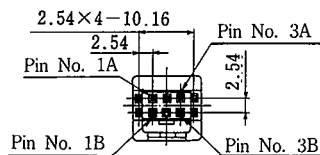
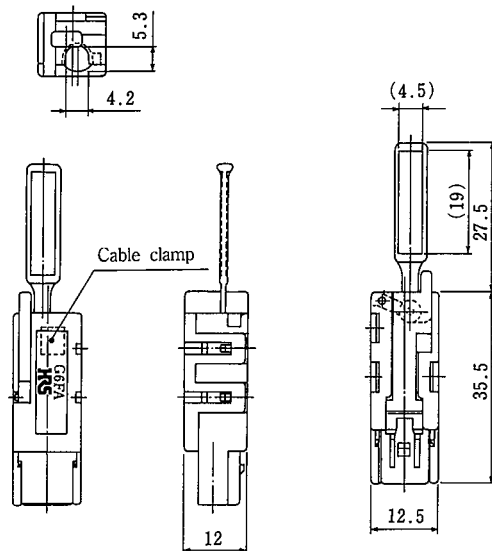
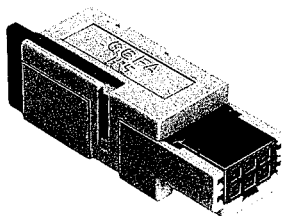
NOTE: The height dimension ($6_{-0.2}^0$) of the mount fitting is the height from the surface of the printed board. For example, when there are patterns or pads on the mount fitting mounting surface of the board, mount with a piece of insulation in between. The height from the surface of the printed board should also be specified as $6_{-0.2}^0$ in this situation.



High-density Packaging System

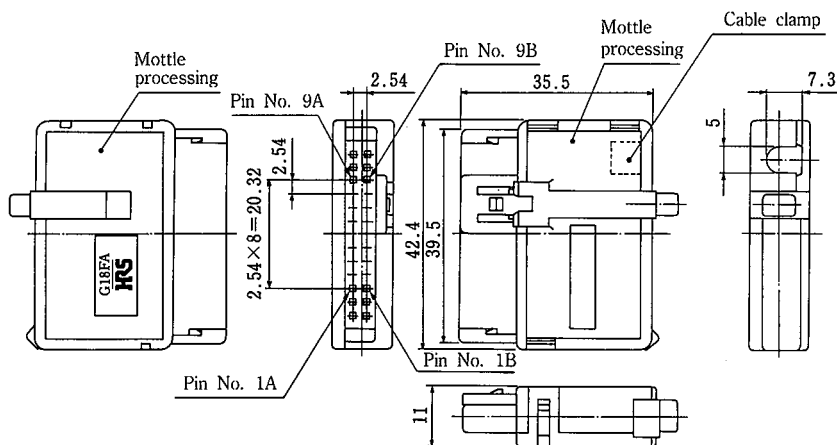
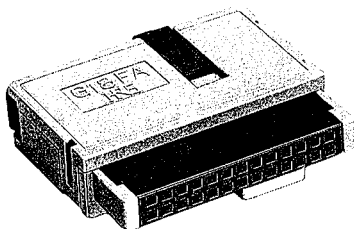
Cable Connectors

●C-G6FA



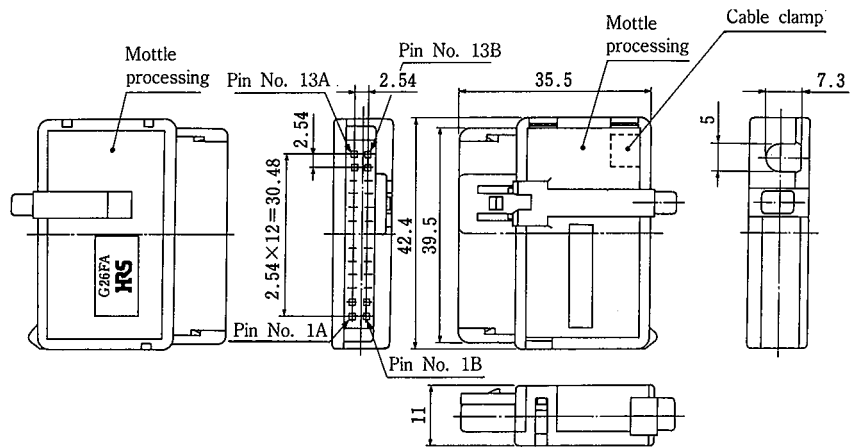
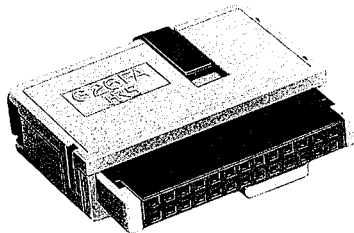
Product No.	HRS No.
C-G6FA	CL206-5086-8

●C-G18FA



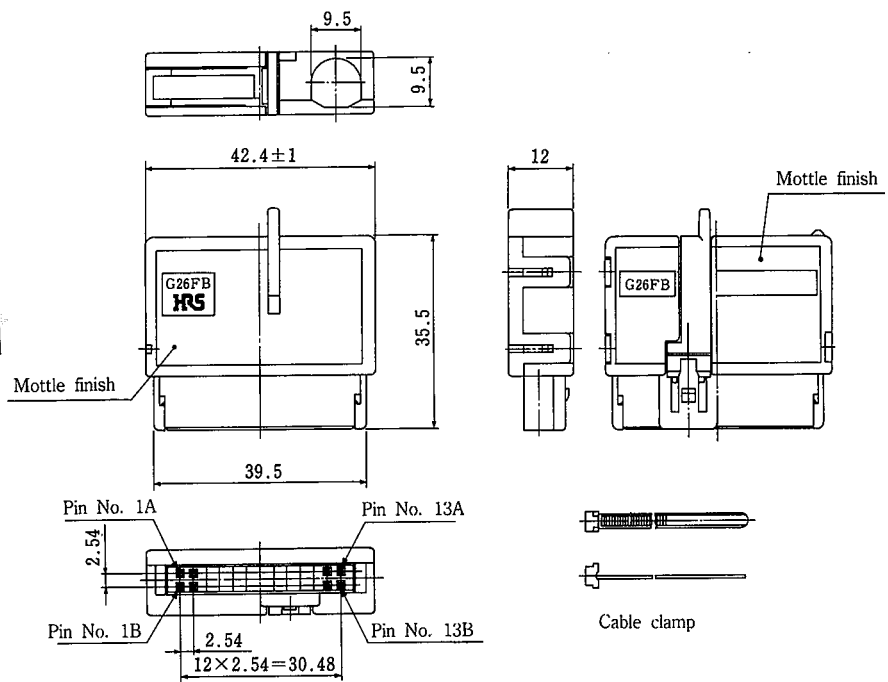
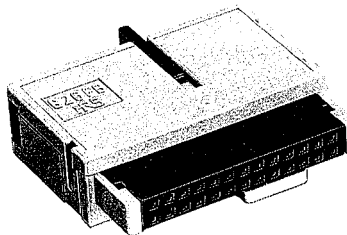
Product No.	HRS No.
C-G18FA	CL206-5004-3

●C-G26FA



Product No.	HRS No.
C-G26FA	CL206-5005-6

●C-G26FB

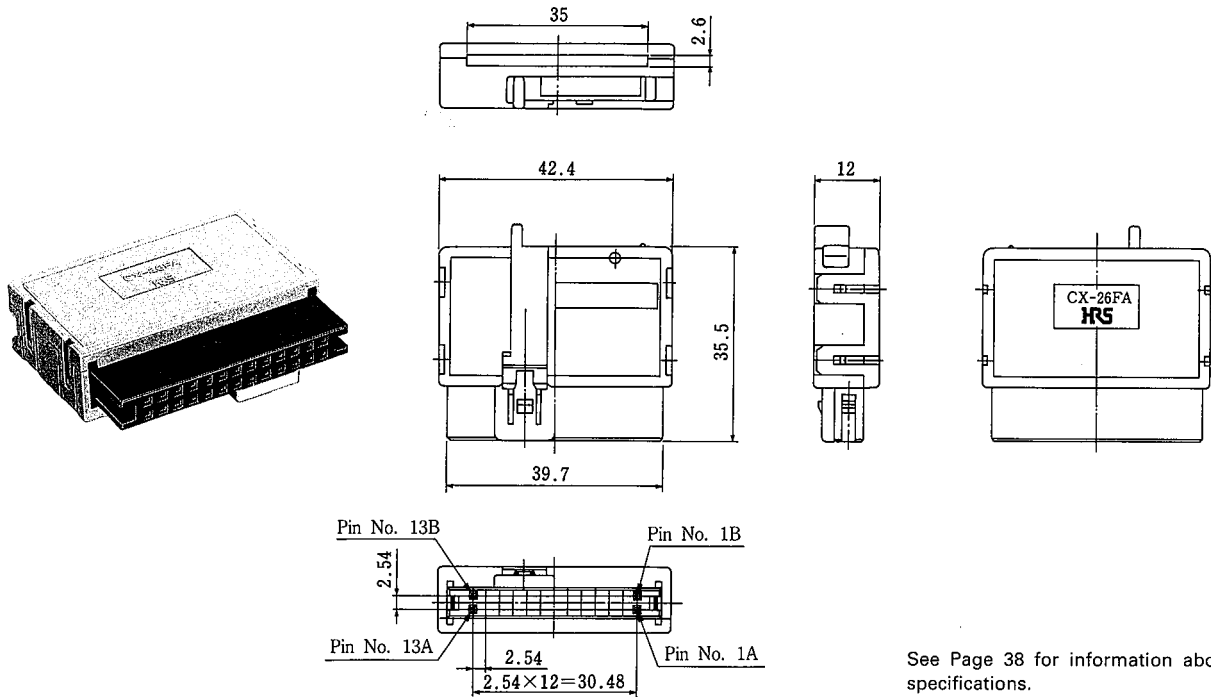


Product No.	HRS No.
C-G26FB	CL206-5095-9

High-density Packaging System

■ Ribbon Cable Connectors

● CXR-26FA

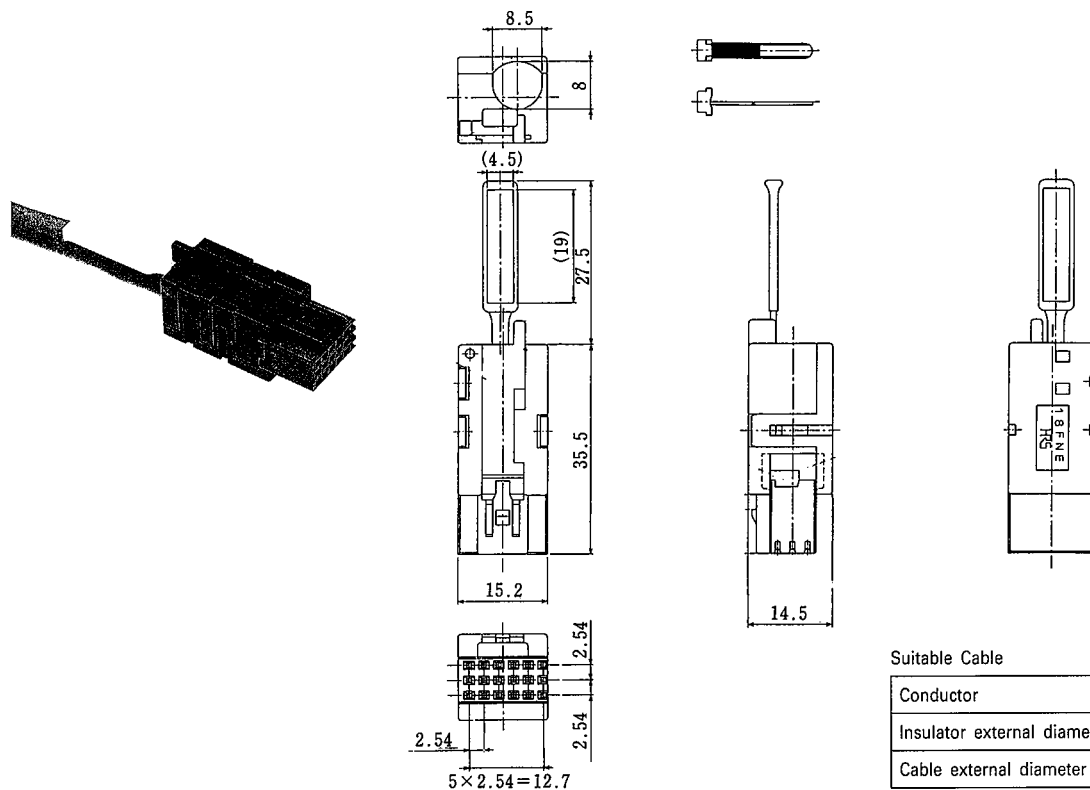


See Page 38 for information about cable specifications.

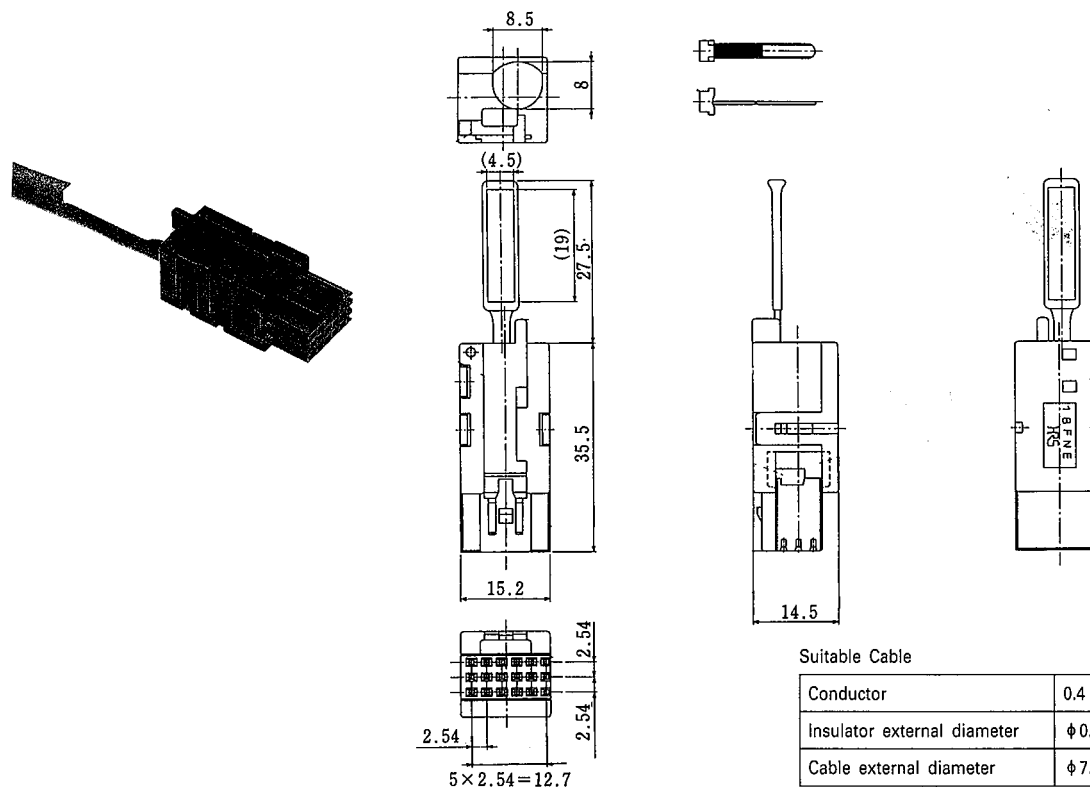
Product No.	HRS No.
CXR-26FA	CL206-5161-1

■ Connectors for 3-Row, 18-Conductor Cable

●C-J18FNEY-01(08) Twisted Lead Cable (AWG 28)



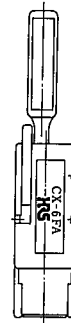
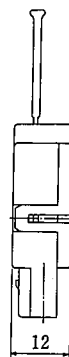
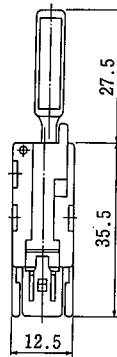
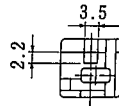
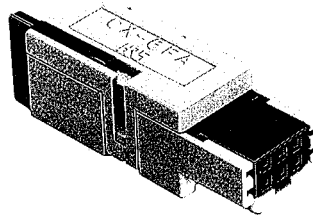
●C-J18FNET-01(08) Single Conductor Cable (0.4 mm Diameter)



High-density Packaging System

Connectors for 50Ω Coaxial Ribbon Cables

● CX50-6FA

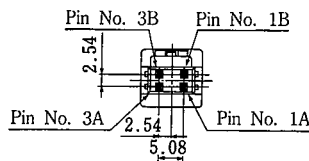


Cable connection position

Pin No.	Cable	Cable	Pin No.
3B	G	S	3A
2B		S	
1B	S	G	1A

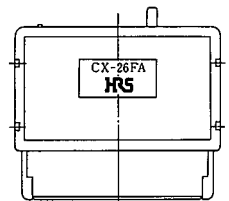
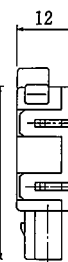
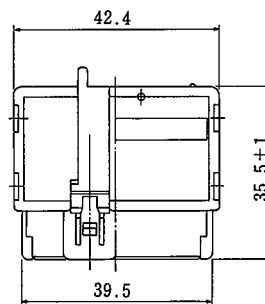
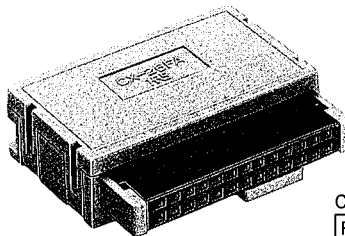
S: Signal lead
G: Ground lead

Product No.	HRS No.
CX50-6FA	CL206-5152-0



See Page 38 for information about cable specifications.

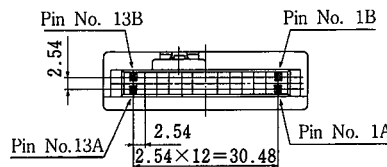
● CX50-26FA



Cable connection position

Pin No.	Cable	Cable	Pin No.
13B	S		
12B	G	G	13A
11B	S	S	12A
10B	G	G	11A
9B	S	S	10A
8B	S	G	9A
7B	G	G	8A
6B	S	S	7A
5B	G	G	6A
4B	S	S	5A
3B	G	G	4A
2B	S	S	3A
1B	G	G	2A
		S	1A

S: Signal lead
G: Ground lead

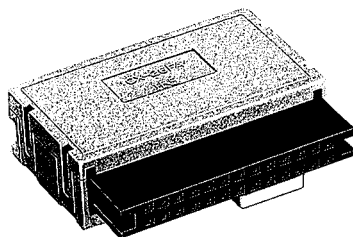


Product No.	HRS No.
CX50-26FA	CL206-5153-3

See Page 38 for information about cable specifications.

■ Connectors for 75Ω Coaxial Ribbon Cables

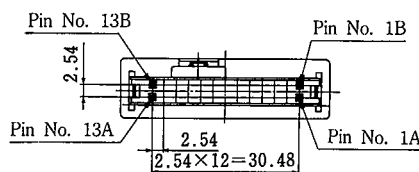
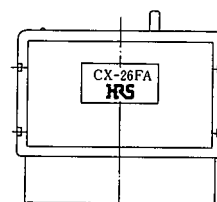
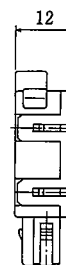
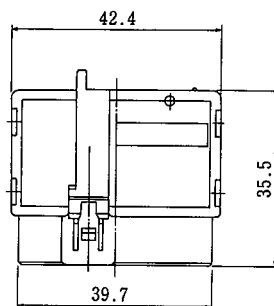
● CX75-26FA



Cable connection position

Pin No.	Cable	Cable	Pin No.
13B	S	G	13A
12B	S	G	12A
11B	S	G	11A
10B	S	G	10A
9B	S	G	9A
8B	S	G	8A
7B	S	G	7A
6B	S	G	6A
5B	S	G	5A
4B	S	G	4A
3B	S	G	3A
2B	S	G	2A
1B	S	G	1A

S: Signal lead
G: Ground lead



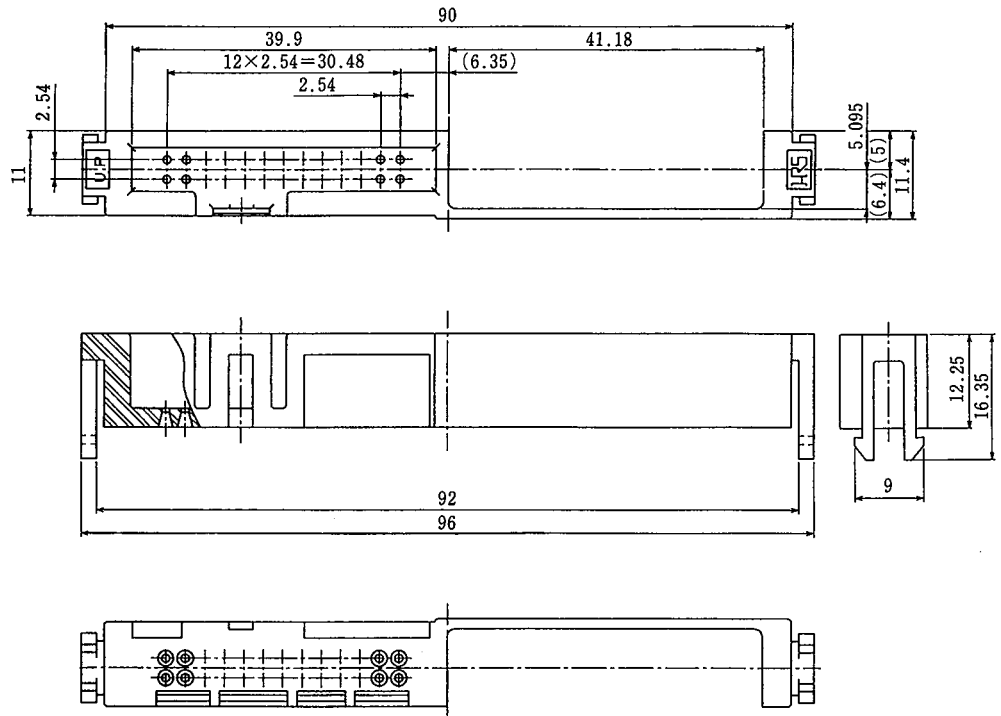
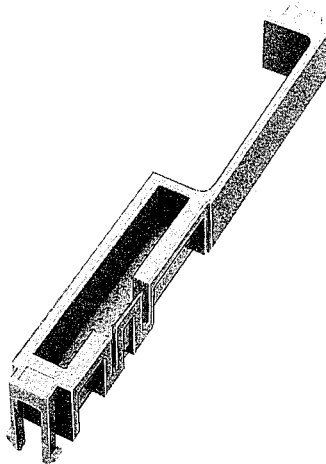
Product No.	HRS No.
CX75-26FA	CL206-5162-4

See Page 38 for information about cable specifications.

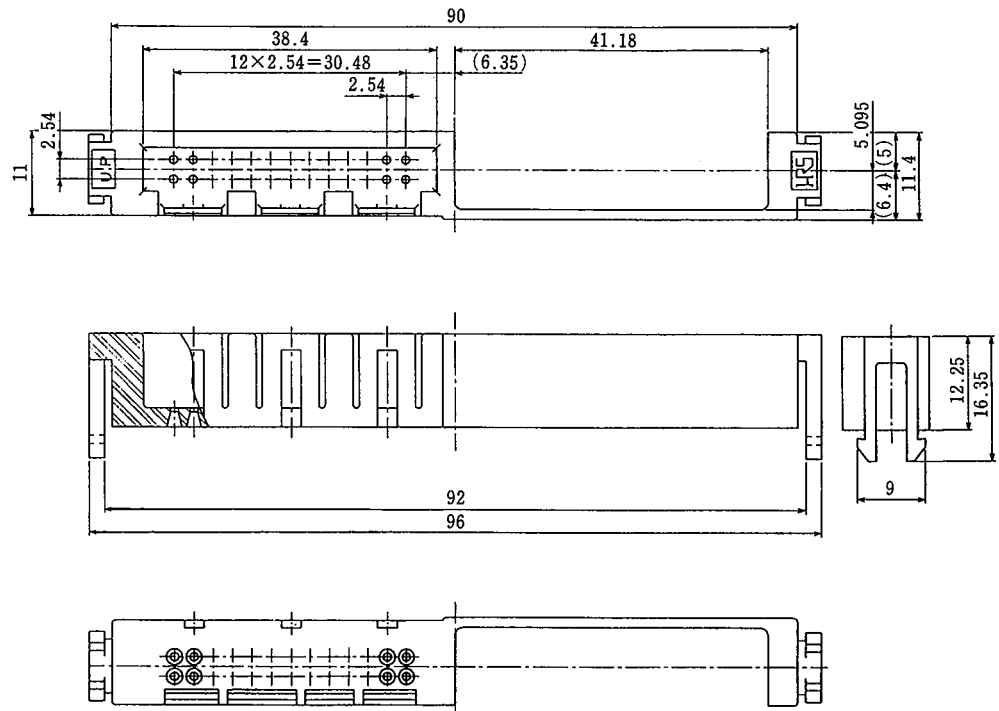
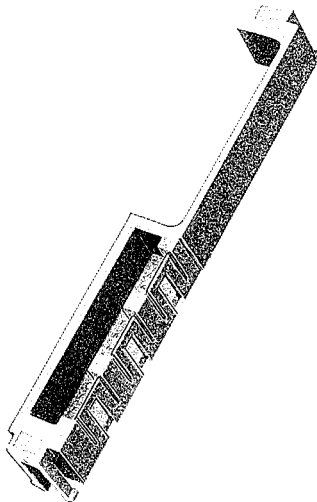
High-density Packaging System

■ Cable-Side Housing

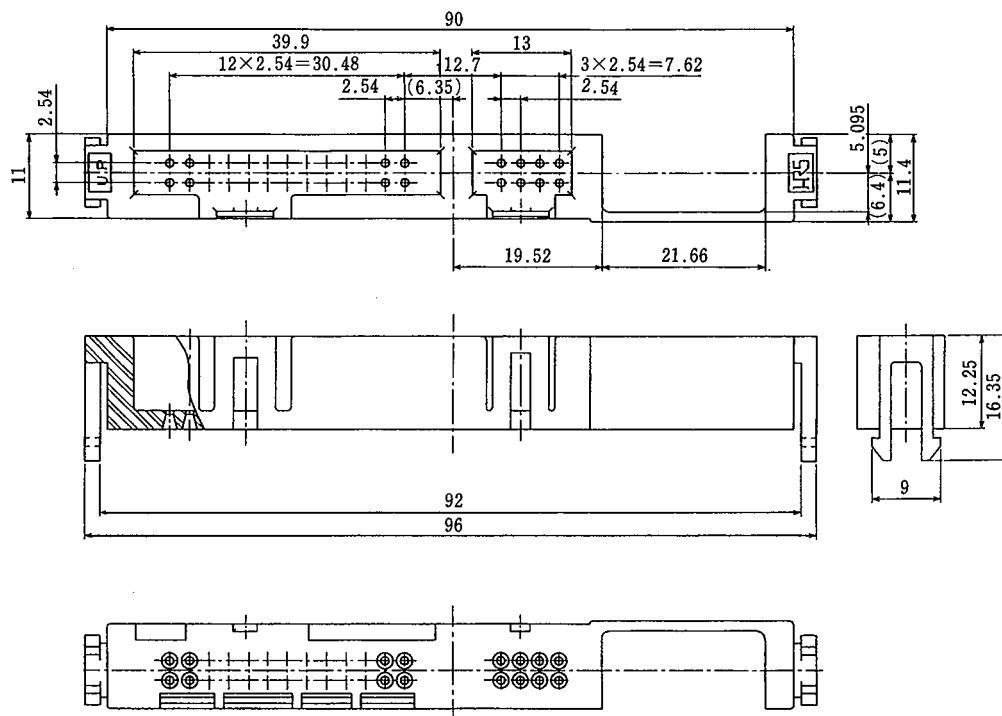
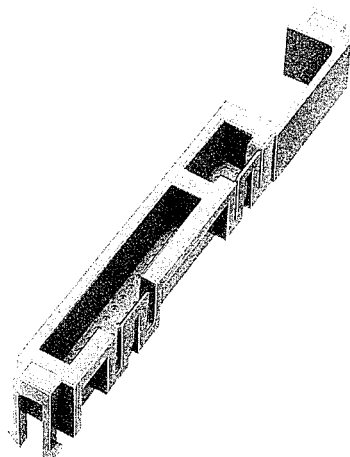
● C-G26HC CL206-5200-1



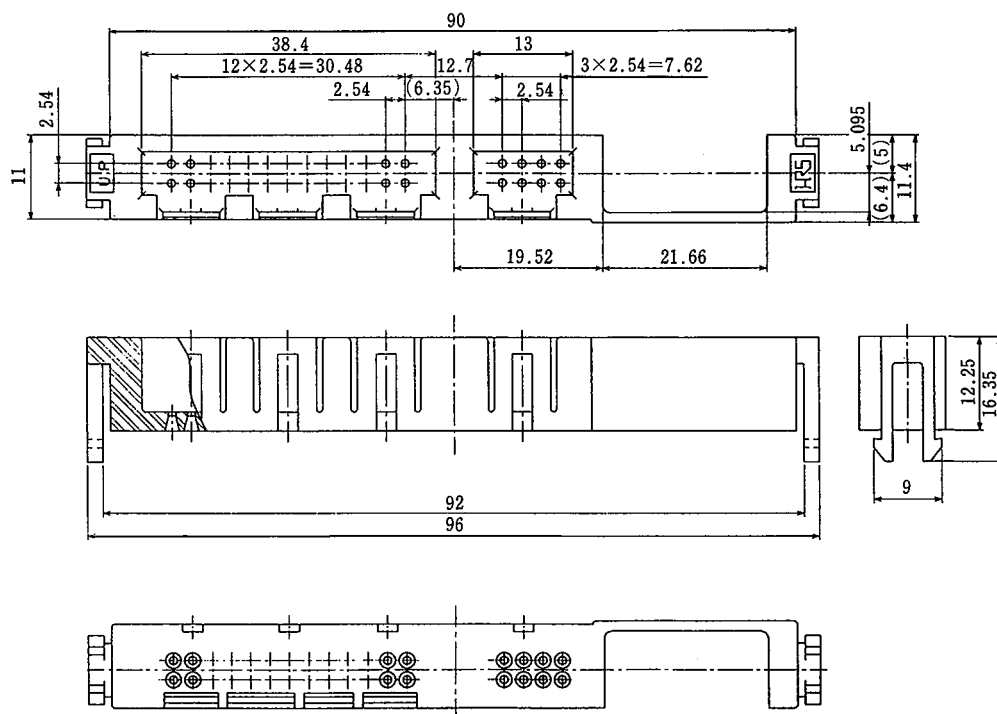
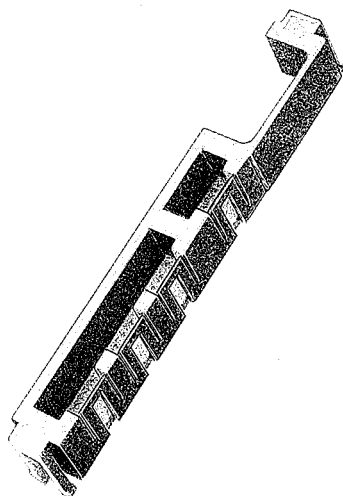
● C-G26HD CL206-5201-4



●C-G34HA
CL206-5202-7



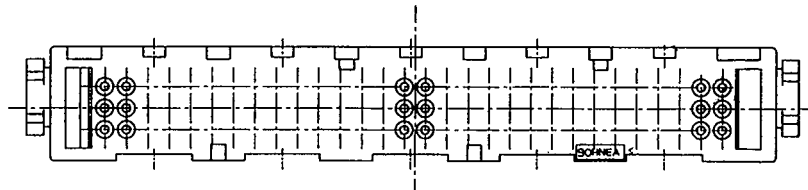
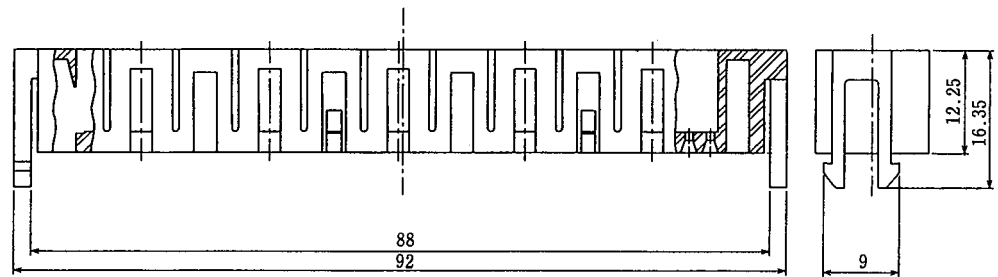
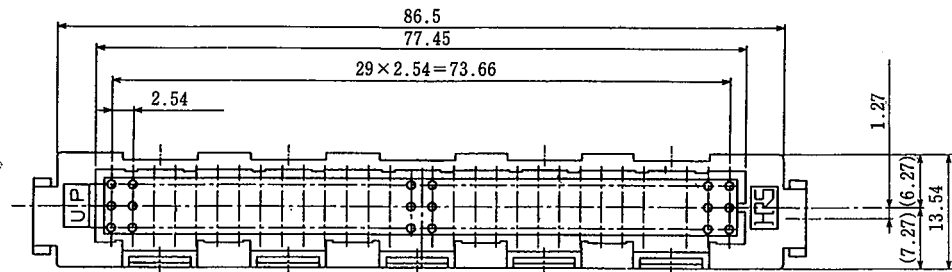
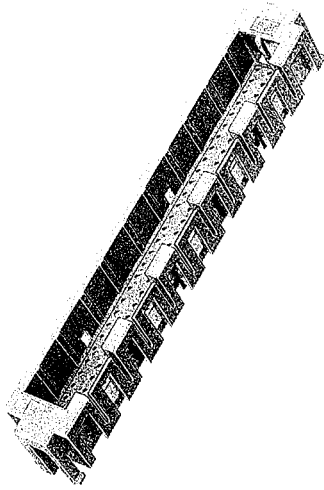
●C-G34HB
CL206-5203-0



High-density Packaging System

■ Cable-Side Housing for 3-Row, 18-Conductor Connectors

● C-90HNE-A



■ Combining Cable-Side Housing and Cable Connectors

Cable-Side Housing	Cable Connectors (Representative Examples)
C-G26HC	C-G18FA × 1 C-G26FA × 1 C-G26FB × 1 CXR-26FA × 1 CX50-26FA × 1 CX75-26FA × 1
C-G26HD	C-G6FA × 3 CX50-6FA × 3
C-G34HA	C-G18FA × 1 + C-G6FA × 1 C-G26FA × 1 + C-G6FA × 1 C-G26FB × 1 + C-G6FA × 1 CXR-26FA × 1 + C-G6FA × 1 CX50-26FA × 1 + CX50-6FA × 1 CX75-26FA × 1 + C-G6FA × 1
C-G34HB	C-G6FA × 4 CX50-6FA × 4
C-90HNE-A	C-J18FNEY-01(08) × 5 C-J18FNET-01(08) × 5

High-density Packaging System

■ Connector Wiring Application Tools Cable

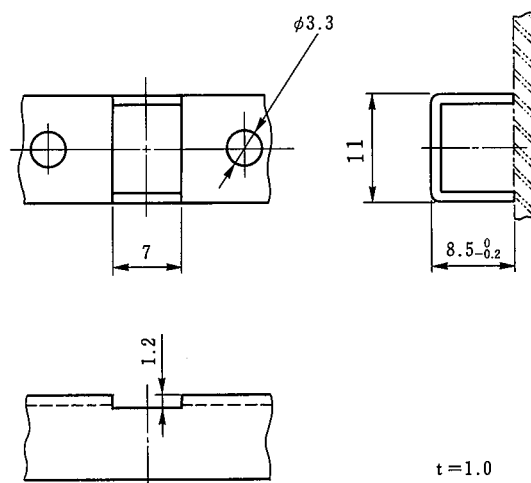
	C-G6FA	C-G18FA
Wiring tools	No. TD1 A connector wiring press No. TD1 D connector wiring wire forming plate No. TD1 A connector wiring spacer No. TD1 A connector wiring cutter	No. TD1 A connector wiring press No. TD1 A connector wiring wire forming plate No. TD1 A connector wiring spacer No. TD1 A connector wiring cutter
Cable clamp caulking tool	No. TD1 A connector wiring caulking articles	No. TD1 A connector wiring caulking articles
	C-G26FA	C-G26FB
Wiring tools	No. TD1 A connector wiring press No. TD1 A connector wiring wire forming plate No. TD1 A connector wiring spacer No. TD1 A connector wiring cutter	No. TD1 A connector wiring press No. TD1 E connector wiring wire forming plate No. TD1 A connector wiring spacer with cutter
Cable clamp caulking tool	No. TD1 A connector wiring caulking articles	(Examples) MK-VI by Titon GS2B by Pandwood GS2H by Pandwood

NOTE:

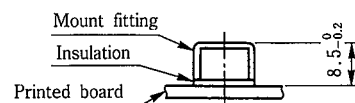
1. Please purchase "No. TD1" types of wiring tools and cable clamp caulking tools from Sumiden High Precision Co., Ltd.
2. For tools other than the "No. TD1" type of cable clamp caulking tools, the cable clamp tightening force of the tightening tool should be 15 kg or greater. (Reference examples appear in the Table.)

■ Cable-Side Housing Mount Fittings

A mount fitting of the dimensions indicated in the diagram below should be prepared when mounting the cable-side housing.



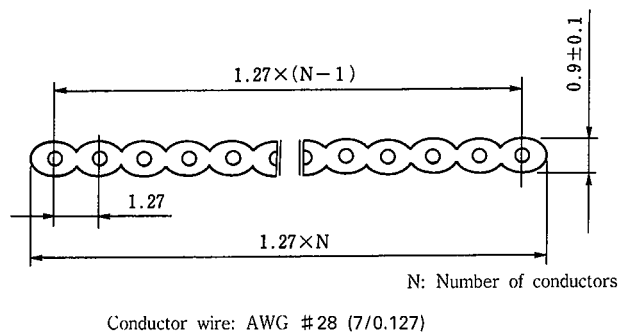
NOTE: The height dimension ($8.5_{-0.2}^0$) of the mount fitting is the height from the surface of the printed board. For example, when there are patterns or pads on the mounting surface of the board, mount with a piece of insulation in between. The height from the surface of the printed board should also be specified as $8.5_{-0.2}^0$ in this situation.



High-density Packaging System

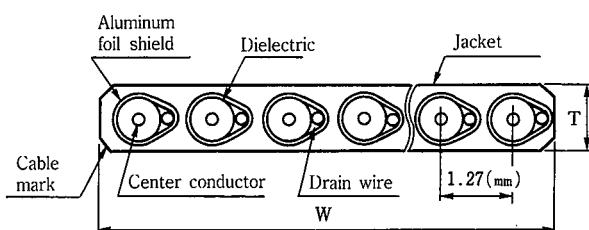
Ribbon Cable Specifications

● CXR-26FA



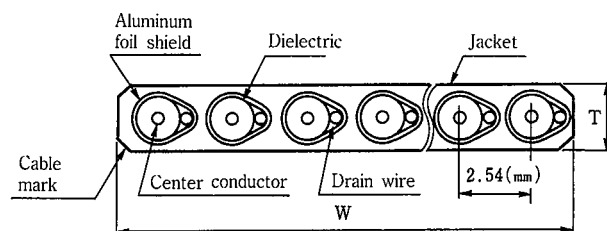
Coaxial Ribbon Cable Specifications

● CX50- 6FA CX50-26FA



NOTE: This illustrates just one example of cable form.

● CX75-26FA



NOTE: This illustrates just one example of cable form.

Electrical performance	Performance	50Ω
	Impedance	50±5Ω
	Capacitance (at 1 kHz)	80PF/m
	Delay time	3.9ns/m
	Maximum conductor resistance (20°C)	360Ω/km
Materials used	Center conductor	0.26 mm dia. Tin plated copper wire
	Dielectric	Polyolefine foam
	Shield	Aluminum foil
	Drain wire	0.26 mm dia. Tin plated copper wire
	Jacket	Vinyl chloride (grey)
	Cable mark	Yellow
	UL Style No.	20182

Electrical performance	Performance	75Ω
	Impedance	75±7Ω
	Capacitance (at 1 kHz)	60PF/m
	Delay time	4.0ns/m
	Maximum conductor resistance (20°C)	360Ω/km
Materials used	Center conductor	0.26 mm dia. Tin plated copper wire
	Dielectric	Polyolefine foam
	Shield	Aluminum foil
	Drain wire	0.26 mm dia. Tin plated copper wire
	Jacket	Vinyl chloride (grey)
	Cable mark	Blue
	UL Style No.	2689