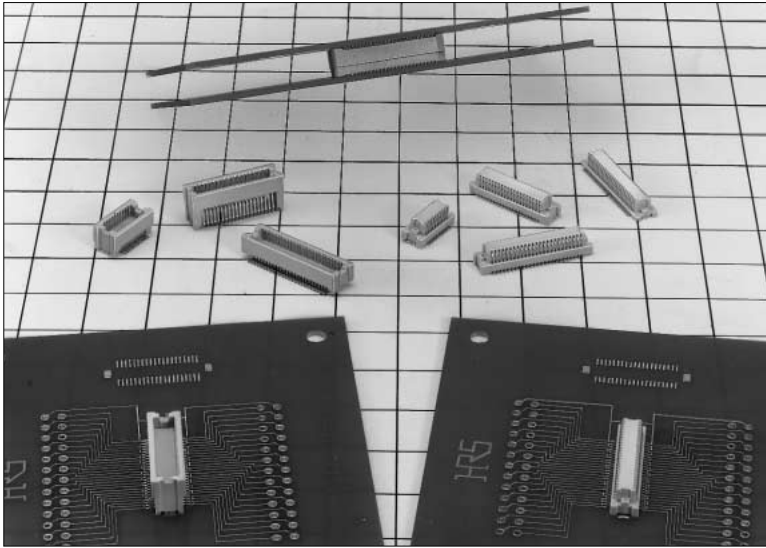


0.65mm Pitch SMT Board to Board Connector

DF15 Series



Corresponding to automatic mounting

The vacuum area is secured the automatic mounting machine for vacuum.

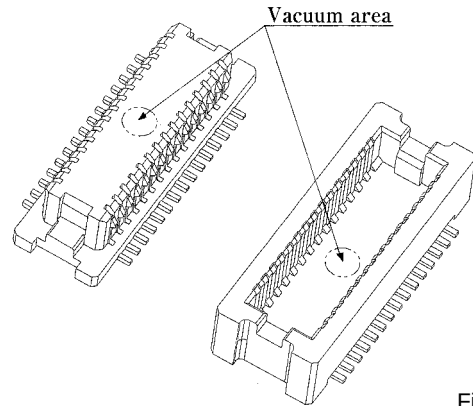


Figure 1

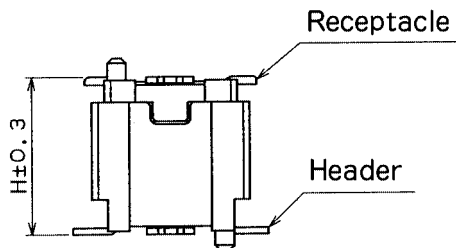
■Features

1. Compatibility of Miniaturization with Service Efficiency

This series considers the service efficiency to set the pitch to 0.65mm, corresponding to the 0.5mm pitch DF12 series. This connector widely covers the definition of the mounting space or the board to board size together with the DF12 series.

2. Broad Variations in Board to Board Size

The board to board size is specified at 1mm step between 4mm and 8mm.



Header/Receptacle	DF15#(0.8)-*DS-0.65V Combinnation with H size	DF15#(1.8)-*DS-0.65V Combinnation with H size
DF15#(3.2)-*DP-0.65V	4	5
DF15#(4.2)-*DP-0.65V	5	6
DF15#(6.2)-*DP-0.65V	7	8

Note1: The stacking height is determined by adding the header and receptacle to the figures followed by the product name DF15#.

Note2: The stacking height (H size) doesn't include the soldering paste thickness.

3. Correspond to Automatic Mounting

The connector has the vacuum area, which enables the automatic mounting by the embossed tape packaging.

4. Metal Fitting Available

The product including the metal fitting to prevent solder peeling is prepared, considering the mounting on FPC.

■Applications

Mobile phone, LCD(Liquid Crystal Display), MO(Optical Disk), Note PC

■Product Specifications

Rating	Current rating : 0.3A	Operating Temperature Range : -35 to +85°C (Note 1.)	Storage Temperature Range : -10 to +60°C (Note 2.)
	Voltage rating : 50V AC	Operating Humidity Range : 40 to 80%	Storage Humidity Range : 40 to 70% (Note 2.)

Item	Specification	Condition
1. Insulation Resistance	500M ohms min.	100V DC
2. Withstanding Voltage	No flashover or insulation breakdown.	150V AC/1 minute
3. Contact Resistance	50m ohms max	100mA
4. Vibration	No electrical discontinuity of 1μs or more	Frequency: 10 to 55 Hz, single amplitude of 0.75 mm, 2 hours in each of the 3 directions.
5. Humidity (Steady state)	Contact resistance: 50m ohms max. Insulation resistance: 250M ohms min.	96 hours at temperature of 40°C and humidity of 90% to 95%
6. Temperature Cycle	Contact resistance : 50m ohms max. Insulation resistance: 500M ohms min.	(-55°C: 30 minutes 5 to 35°C: 10 minutes 85°C: 30 minutes 5 to 35°C: 10 minutes) 5 cycles
7. Operating Life	Contact resistance: 50m ohms max.	50 cycles
8. Resistance to Soldering heat	No deformation of components affecting performance.	Reflow: At the recommended temperature profile Manual soldering: 300°C for 3 seconds

Note 1: Includes temperature rise caused by current flow.

Note 2: The term "storage" refers to products stored for long period of time prior to mounting and use. Operating Temperature Range and Humidity range covers non conducting condition of installed connectors in storage, shipment or during transportation.

■Material

Product	Part	Material	Finish	Remarks
Receptacle	Insulator	Polyamide	Beige	UL94V-0
	Contact	Phosphor copper	Gold plating	————
	Metal fitting	Brass	Solder plating	————
Header	Insulator	Polyamide	Beige	UL94V-0
	Contact	Phosphor copper	Gold plating	————
	Metal fitting	Brass	Solder plating	————

Note: The gold plated product of pin header consists of a contact area of gold plating and lead of solder plating.

■Ordering Information

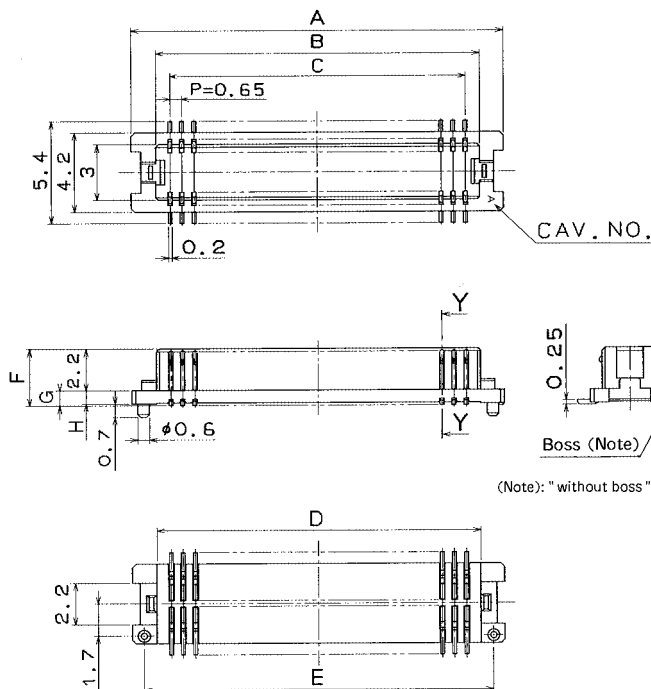
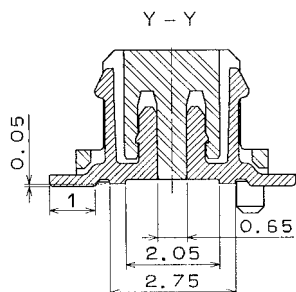
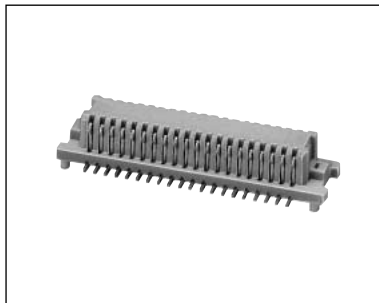
●Receptacle/Header

DF15 # (**) - * DS - 0.65 V (**)

① ② ③ ④ ⑤ ⑥ ⑦ ⑧

① Series Name : DF15			④ Number of Contacts 20, 30, 40, 50	
② Type Symbol			⑤ Connector Type	
			DS : Double-row receptacle	
			DP : Double-row header	
			⑥ Contact Pitch : 0.65mm	
			⑦ Contact type	
③ Product height			V : Straight SMT type	
Receptacle : 0.8, 1.8			⑧ (50) : Tube packaging	
Header : 3.2, 4.2, 6.2			(51) : Embossed tape packaging	

■Receptacle Without metal fitting



(Note): "without boss" indicates the form with no boss.

[Specific No.] -** , (**)

(50) :Gold plating, tube packaging

(51) :Gold plating, embossed tape packaging

●Product Height: 0.8mm product

Unit: mm

Part Number	CL No.	Number of Contacts	A	B	C	D	E	F	G	H	Tube Packaging Quantity(pcs.)	Remarks
DF15A(0.8)-20DS-0.65V(**)	677-0012-4-**-	20	9.85	7.35	5.85	7.35	8.65	3	0.8	0.7	48	Without metal fitting With boss
DF15A(0.8)-30DS-0.65V(**)	677-0013-7-**-	30	13.1	10.6	9.1	10.6	11.9				36	
DF15A(0.8)-40DS-0.65V(**)	677-0014-0-**-	40	16.35	13.85	12.35	13.85	15.15				29	
DF15A(0.8)-50DS-0.65V(**)	677-0015-2-**-	50	19.6	17.1	15.6	17.1	18.4				24	
DF15C(0.8)-20DS-0.65V(**)	677-0032-1-**-	20	9.85	7.35	5.85	7.35	-	3	0.8	0.7	48	Without metal fitting Without boss
DF15C(0.8)-30DS-0.65V(**)	677-0033-4-**-	30	13.1	10.6	9.1	10.6	-				36	
DF15C(0.8)-40DS-0.65V(**)	677-0034-7-**-	40	16.35	13.85	12.35	13.85	-				29	
DF15C(0.8)-50DS-0.65V(**)	677-0035-0-**-	50	19.6	17.1	15.6	17.1	-				24	

●Product Height: 1.8mm Product

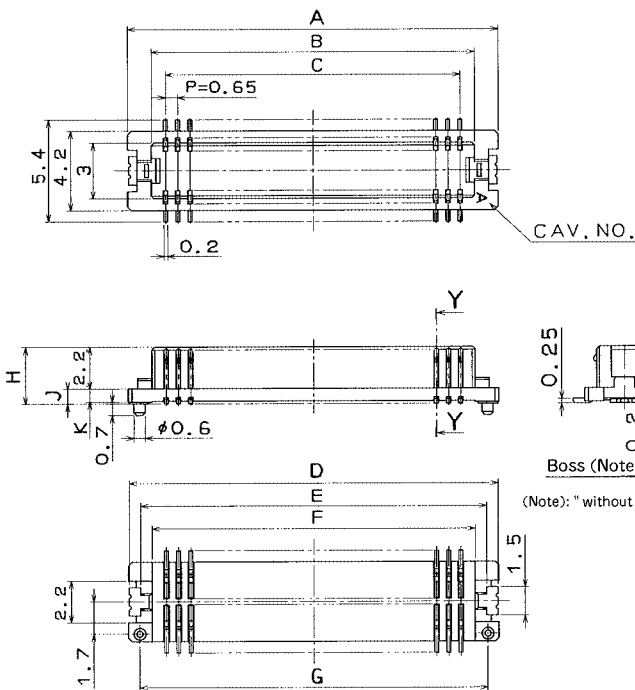
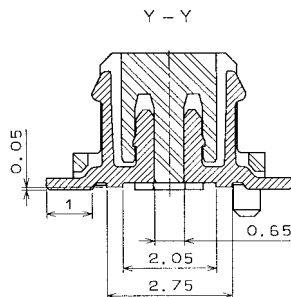
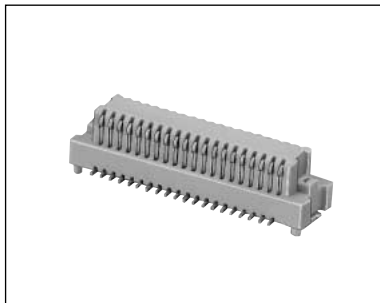
Unit: mm

Part Number	CL No.	Number of Contacts	A	B	C	D	E	F	G	H	Tube Packaging Quantity(pcs.)	Remarks
DF15A(1.8)-20DS-0.65V(**)	677-0052-9-**-	20	9.85	7.35	5.85	7.35	8.65	4	1.8	1.7	48	Without metal fitting With boss
DF15A(1.8)-30DS-0.65V(**)	677-0053-1-**-	30	13.1	10.6	9.1	10.6	11.9				36	
DF15A(1.8)-40DS-0.65V(**)	677-0054-4-**-	40	16.35	13.85	12.35	13.85	15.15				29	
DF15A(1.8)-50DS-0.65V(**)	677-0055-7-**-	50	19.6	17.1	15.6	17.1	18.4				24	
DF15C(1.8)-20DS-0.65V(**)	677-0072-6-**-	20	9.85	7.35	5.85	7.35	-	4	1.8	1.7	48	Without metal fitting Without boss
DF15C(1.8)-30DS-0.65V(**)	677-0073-9-**-	30	13.1	10.6	9.1	10.6	-				36	
DF15C(1.8)-40DS-0.65V(**)	677-0074-1-**-	40	16.35	13.85	12.35	13.85	-				29	
DF15C(1.8)-50DS-0.65V(**)	677-0075-4-**-	50	19.6	17.1	15.6	17.1	-				24	

Note1: Please order the tube packaging product, multiplying the tube packaging number by an integer.

Note2: Please order the embossed tape packaging product per reel. (1000 pcs./reel)

■Receptacle With metal fitting



[Specific No.] -** , (**)

(50) :Gold plating tube packaging

(51) :Gold plating embossed tape packaging

●Product Height: 0.8mm Product

Unit: mm

Part Number	CL No.	Number of Contacts	A	B	C	D	E	F	G	H	J	K	Tube Packaging Quantity(pcs.)	Remarks
DF15 (0.8)-20DS-0.65V(**)	677-0002-0-**	20	9.85	7.35	5.85	9.65	8.45	7.35	8.65	3	0.8	0.7	48	With metal fitting With boss
DF15 (0.8)-30DS-0.65V(**)	677-0003-3-**	30	13.10	10.6	9.1	12.9	11.7	10.6	11.9				36	
DF15 (0.8)-40DS-0.65V(**)	677-0004-6-**	40	16.35	13.85	12.35	16.15	14.95	13.85	15.15				29	
DF15 (0.8)-50DS-0.65V(**)	677-0005-9-**	50	19.60	17.1	15.6	19.4	18.2	17.1	18.4				24	
DF15B(0.8)-20DS-0.65V(**)	677-0022-8-**	20	9.85	7.35	5.85	9.65	8.45	7.35	-	3	0.8	0.7	48	With metal fitting Without boss
DF15B(0.8)-30DS-0.65V(**)	677-0023-0-**	30	13.10	10.6	9.1	12.9	11.7	10.6	-				36	
DF15B(0.8)-40DS-0.65V(**)	677-0024-3-**	40	16.35	13.85	12.35	16.15	14.95	13.85	-				29	
DF15B(0.8)-50DS-0.65V(**)	677-0025-6-**	50	19.60	17.1	15.6	19.4	18.2	17.1	-				24	

●Product Height: 1.8mm Product

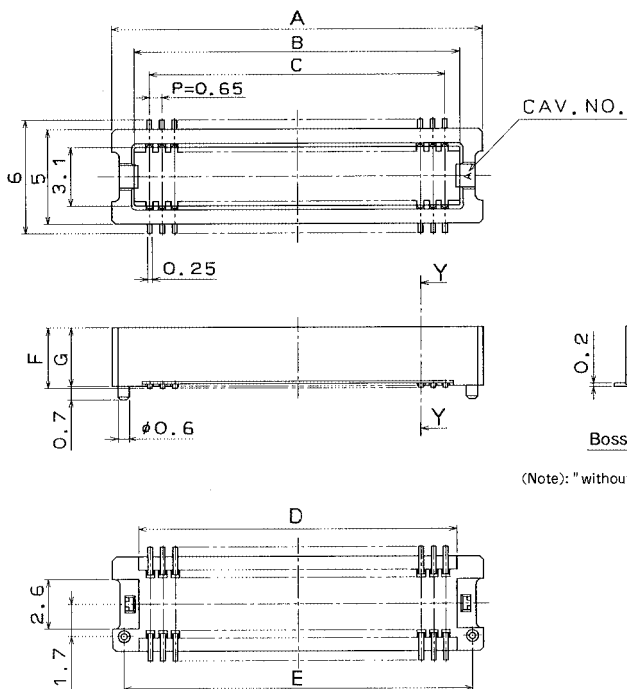
Unit: mm

Part Number	CL No.	Number of Contacts	A	B	C	D	E	F	G	H	J	K	Tube Packaging Quantity(pcs.)	Remarks
DF15 (1.8)-20DS-0.65V(**)	677-0042-5-**	20	9.85	7.35	5.85	9.65	8.45	7.35	8.65	4	1.8	1.7	48	With metal fitting With boss
DF15 (1.8)-30DS-0.65V(**)	677-0043-8-**	30	13.1	10.6	9.1	12.9	11.7	10.6	11.9				36	
DF15 (1.8)-40DS-0.65V(**)	677-0044-0-**	40	16.35	13.85	12.35	16.15	14.95	13.85	15.15				29	
DF15 (1.8)-50DS-0.65V(**)	677-0045-3-**	50	19.6	17.1	15.6	19.4	18.2	17.1	18.4				24	
DF15B(1.8)-20DS-0.65V(**)	677-0062-2-**	20	9.85	7.35	5.85	9.65	8.45	7.35	-	4	1.8	1.7	48	With metal fitting Without boss
DF15B(1.8)-30DS-0.65V(**)	677-0063-5-**	30	13.1	10.6	9.1	12.9	11.7	10.6	-				36	
DF15B(1.8)-40DS-0.65V(**)	677-0064-8-**	40	16.35	13.85	12.35	16.15	14.95	13.85	-				29	
DF15B(1.8)-50DS-0.65V(**)	677-0065-0-**	50	19.6	17.1	15.6	19.4	18.2	17.1	-				24	

Note1: Please order the tube packaging product, by multiplying the packaging quantity by an integer.

Note2: Please order the embossed tape packaging product per reel. (1000 pcs./reel)

Header Without metal fitting



(Note): "without boss" indicates the form with no boss.

[Specific No.] -** , (**)

(50) :Gold plating tube packaging

(51) :Gold plating embossed tape packaging

Product Height: 3.2mm Product

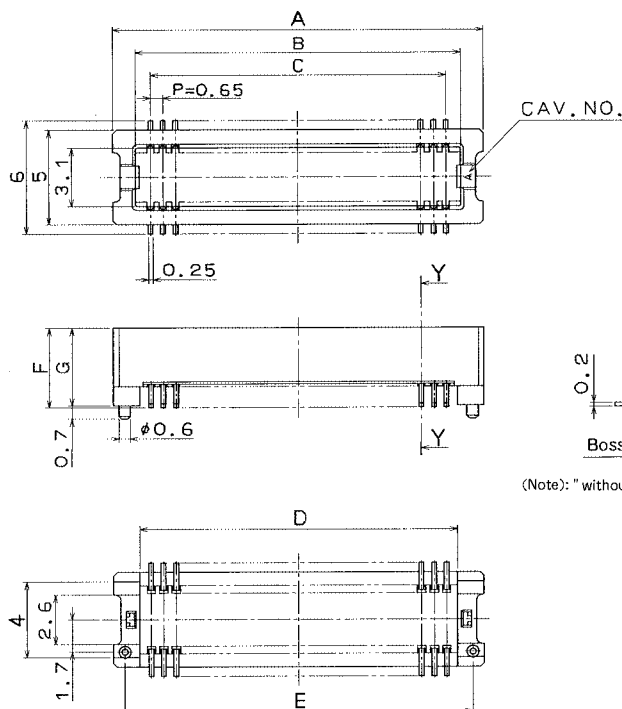
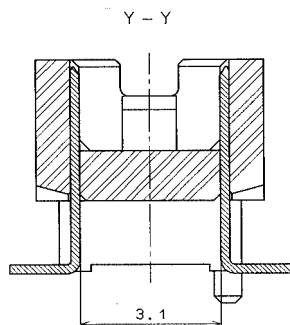
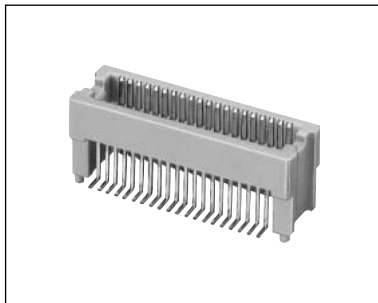
Unit: mm

Part Number	CL No.	Number of Contacts	A	B	C	D	E	F	G	Tube Packaging Quantity(pcs.)	Remarks
DF15A(3.2)-20DP-0.65V(**)	677-0092-3-**-	20	9.85	7.45	5.85	7.05	8.65	3.2	3.1	48	Without metal fitting With boss
DF15A(3.2)-30DP-0.65V(**)	677-0093-6-**-	30	13.1	10.7	9.1	10.3	11.9			36	
DF15A(3.2)-40DP-0.65V(**)	677-0094-9-**-	40	16.35	13.95	12.35	13.55	15.15			29	
DF15A(3.2)-50DP-0.65V(**)	677-0095-1-**-	50	19.6	17.2	15.6	16.8	18.4			24	
DF15C(3.2)-20DP-0.65V(**)	677-0112-9-**-	20	9.85	7.45	5.85	7.05	—	3.2	3.1	48	Without metal fitting Without boss
DF15C(3.2)-30DP-0.65V(**)	677-0113-1-**-	30	13.1	10.7	9.1	10.3	—			36	
DF15C(3.2)-40DP-0.65V(**)	677-0114-4-**-	40	16.35	13.95	12.35	13.55	—			29	
DF15C(3.2)-50DP-0.65V(**)	677-0115-7-**-	50	19.6	17.2	15.6	16.8	—			24	

Note1: Please order the tube packaging product, , by multiplying the packaging quantity by an integer.

Note2: Please order the embossed tape packaging product per reel. (1000 pcs./reel)

Header Without metal fitting



[Specific No.] -*, (* *)
 (50) :Gold plating tube packaging
 (51) :Gold plating embossed tape packaging

●Product Height: 4.2mm Product

Unit: mm

Part Number	CL No.	Number of Contacts	A	B	C	D	E	F	G	Tube Packaging Quantity(pcs.)	Remarks
DF15A(4.2)-20DP-0.65V(**)	677-0132-6-*	20	9.85	7.45	5.85	7.05	8.65	4.2	4.1	48	Without metal fitting With boss
DF15A(4.2)-30DP-0.65V(**)	677-0133-9-*	30	13.1	10.7	9.1	10.3	11.9			36	
DF15A(4.2)-40DP-0.65V(**)	677-0134-1-*	40	16.35	13.95	12.35	13.55	15.15			29	
DF15A(4.2)-50DP-0.65V(**)	677-0135-4-*	50	19.6	17.2	15.6	16.8	18.4			24	
DF15C(4.2)-20DP-0.65V(**)	677-0152-3-*	20	9.85	7.45	5.85	7.05	-	4.2	4.1	48	Without metal fitting Without boss
DF15C(4.2)-30DP-0.65V(**)	677-0153-6-*	30	13.1	10.7	9.1	10.3	-			36	
DF15C(4.2)-40DP-0.65V(**)	677-0154-9-*	40	16.35	13.95	12.35	13.55	-			29	
DF15C(4.2)-50DP-0.65V(**)	677-0155-1-*	50	19.6	17.2	15.6	16.8	-			24	

●Product Height: 6.2mm Product

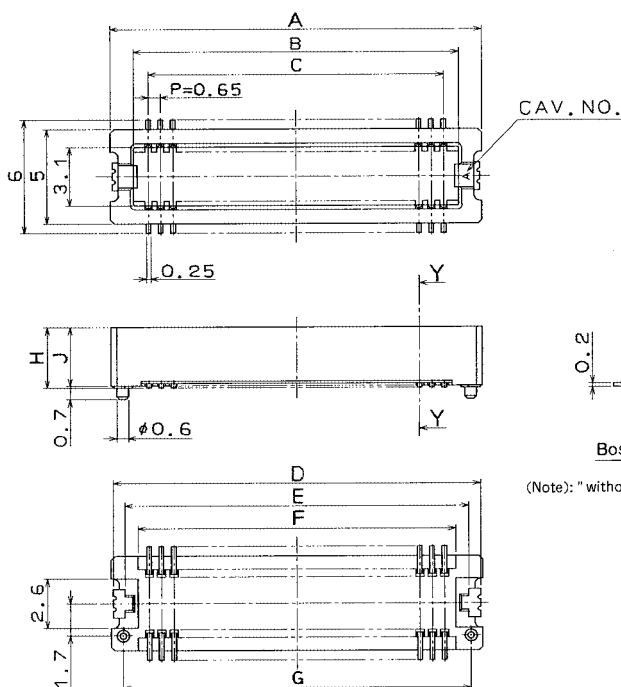
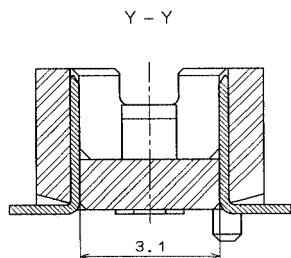
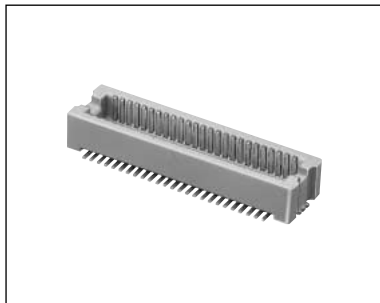
Unit: mm

Part Number	CL No.	Number of Contacts	A	B	C	D	E	F	G	Tube Package Quantity(pcs.)	Remarks
DF15A(6.2)-20DP-0.65V(**)	677-0172-0-*	20	9.85	7.45	5.85	7.05	8.65	6.2	6.1	48	Without metal fitting With boss
DF15A(6.2)-30DP-0.65V(**)	677-0173-3-*	30	13.1	10.7	9.1	10.3	11.9			36	
DF15A(6.2)-40DP-0.65V(**)	677-0174-6-*	40	16.35	13.95	12.35	13.55	15.15			29	
DF15A(6.2)-50DP-0.65V(**)	677-0175-9-*	50	19.6	17.2	15.6	16.8	18.4			24	
DF15C(6.2)-20DP-0.65V(**)	677-0192-8-*	20	9.85	7.45	5.85	7.05	-	6.2	6.1	48	Without metal fitting Without boss
DF15C(6.2)-30DP-0.65V(**)	677-0193-0-*	30	13.1	10.7	9.1	10.3	-			36	
DF15C(6.2)-40DP-0.65V(**)	677-0194-3-*	40	16.35	13.95	12.35	13.55	-			29	
DF15C(6.2)-50DP-0.65V(**)	677-0195-6-*	50	19.6	17.2	15.6	16.8	-			24	

Note1: Please order the tube packaging product, by multiplying the packaging quantity by an integer.

Note2: Please order the embossed tape packaging product per reel. (1000 pcs./reel)

Header With metal fitting



(Note): "without boss" indicates the form with no boss.

[Specific No.] -** , (**)

(50) :Gold plating tube packaging

(51) :Gold plating embossed tape packaging

Product Height: 3.2mm Product

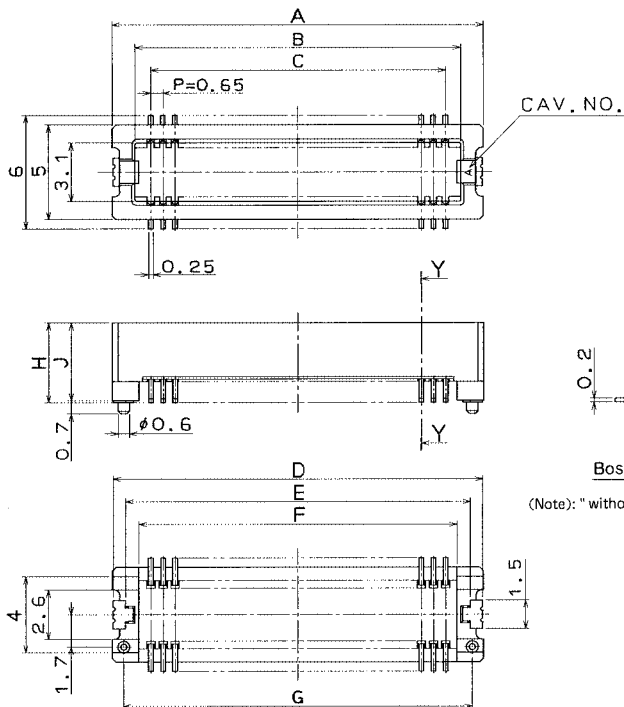
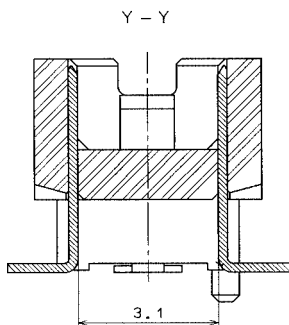
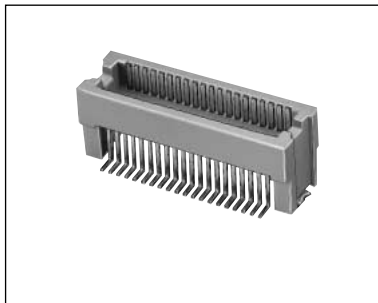
Unit: mm

Part Number	CL No.	Number of Contacts	A	B	C	D	E	F	G	H	J	Tube Packaging Quantity(pcs.)	Remarks
DF15 (3.2)-20DP-0.65V(**)	677-0082-0-**-	20	9.85	7.45	5.85	9.65	8.45	7.05	8.65	3.2	3.1	48	With metal fitting With boss
DF15 (3.2)-30DP-0.65V(**)	677-0083-2-**-	30	13.1	10.7	9.1	12.9	11.7	10.3	11.9			36	
DF15 (3.2)-40DP-0.65V(**)	677-0084-5-**-	40	16.35	13.95	12.35	16.15	14.95	13.55	15.15			29	
DF15 (3.2)-50DP-0.65V(**)	677-0085-8-**-	50	19.6	17.2	15.6	19.4	18.2	16.8	18.4			24	
DF15B(3.2)-20DP-0.65V(**)	677-0102-5-**-	20	9.85	7.45	5.85	9.65	8.45	7.05	-	3.2	3.1	48	With metal fitting Without boss
DF15B(3.2)-30DP-0.65V(**)	677-0103-8-**-	30	13.1	10.7	9.1	12.9	11.7	10.3	-			36	
DF15B(3.2)-40DP-0.65V(**)	677-0104-0-**-	40	16.35	13.95	12.35	16.15	14.95	13.55	-			29	
DF15B(3.2)-50DP-0.65V(**)	677-0105-3-**-	50	19.6	17.2	15.6	19.4	18.2	16.8	-			24	

Note1: Please order the tube packaging product, by multiplying the packaging quantity by an integer.

Note2: Please order the embossed tape packaging product per reel. (1000 pcs./reel)

■Header With metal fitting



(Note): "without boss" indicates the form with no boss.

[Specific No.] -** , (**)

(50) :Gold plating tube packaging

(51) :Gold plating embossed tape packaging

●Product Height: 4.2mm Product

Unit: mm

Part Number	CL No.	Number of Contacts	A	B	C	D	E	F	G	H	J	Tube Packaging Quantity(pcs.)	Remarks
DF15 (4.2)-20DP-0.65V(**)	677-0122-2-**-	20	9.85	7.45	5.85	9.65	8.45	7.05	8.65	4.2	4.1	48	With metal fitting With boss
DF15 (4.2)-30DP-0.65V(**)	677-0123-5-**-	30	13.1	10.7	9.1	12.9	11.7	10.3	11.9			36	
DF15 (4.2)-40DP-0.65V(**)	677-0124-8-**-	40	16.35	13.95	12.35	16.15	14.95	13.55	15.15			29	
DF15 (4.2)-50DP-0.65V(**)	677-0125-0-**-	50	19.6	17.2	15.6	19.4	18.2	16.8	18.4			24	
DF15B(4.2)-20DP-0.65V(**)	677-0142-0-**-	20	9.85	7.45	5.85	9.65	8.45	7.05	-	4.2	4.1	48	With metal fitting Without boss
DF15B(4.2)-30DP-0.65V(**)	677-0143-2-**-	30	13.1	10.7	9.1	12.9	11.7	10.3	-			36	
DF15B(4.2)-40DP-0.65V(**)	677-0144-5-**-	40	16.35	13.95	12.35	16.15	14.95	13.55	-			29	
DF15B(4.2)-50DP-0.65V(**)	677-0145-8-**-	50	19.6	17.2	15.6	19.4	18.2	16.8	-			24	

●Product Height: 6.2mm Product

Unit: mm

Part Number	CL No.	Number of Contacts	A	B	C	D	E	F	G	H	J	Tube Packaging Quantity(pcs.)	Remarks
DF15 (6.2)-20DP-0.65V(**)	677-0162-7-**-	20	9.85	7.45	5.85	9.65	8.45	7.05	8.65	6.2	6.1	48	With metal fitting With boss
DF15 (6.2)-30DP-0.65V(**)	677-0163-0-**-	30	13.1	10.7	9.1	12.9	11.7	10.3	11.9			36	
DF15 (6.2)-40DP-0.65V(**)	677-0164-2-**-	40	16.35	13.95	12.35	16.15	14.95	13.55	15.15			29	
DF15 (6.2)-50DP-0.65V(**)	677-0165-5-**-	50	19.6	17.2	15.6	19.4	18.2	16.8	18.4			24	
DF15B(6.2)-20DP-0.65V(**)	677-0182-4-**-	20	9.85	7.45	5.85	9.65	8.45	7.05	-	6.2	6.1	48	With metal fitting Without boss
DF15B(6.2)-30DP-0.65V(**)	677-0183-7-**-	30	13.1	10.7	9.1	12.9	11.7	10.3	-			36	
DF15B(6.2)-40DP-0.65V(**)	677-0184-0-**-	40	16.35	13.95	12.35	16.15	14.95	13.55	-			29	
DF15B(6.2)-50DP-0.65V(**)	677-0185-2-**-	50	19.6	17.2	15.6	19.4	18.2	16.8	-			24	

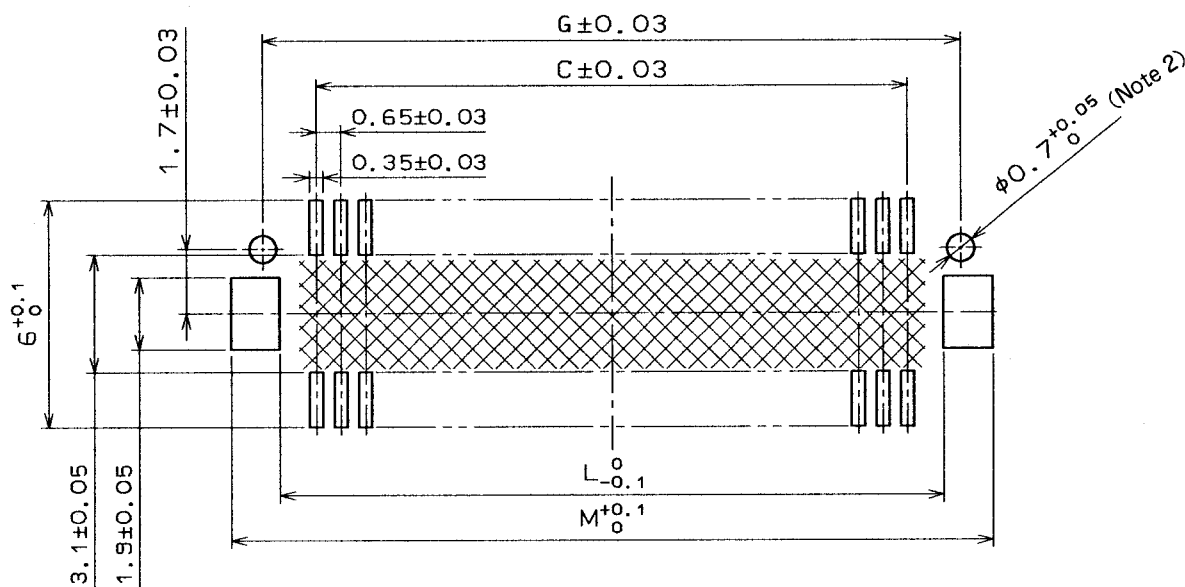
Note1: Please order the tube packaging product, by multiplying the packaging quantity by an integer.

Note2: Please order the embossed tape packaging product per reel. (1000 pcs./reel)

◆Recommended PCB mounting pattern

(Unit: mm)

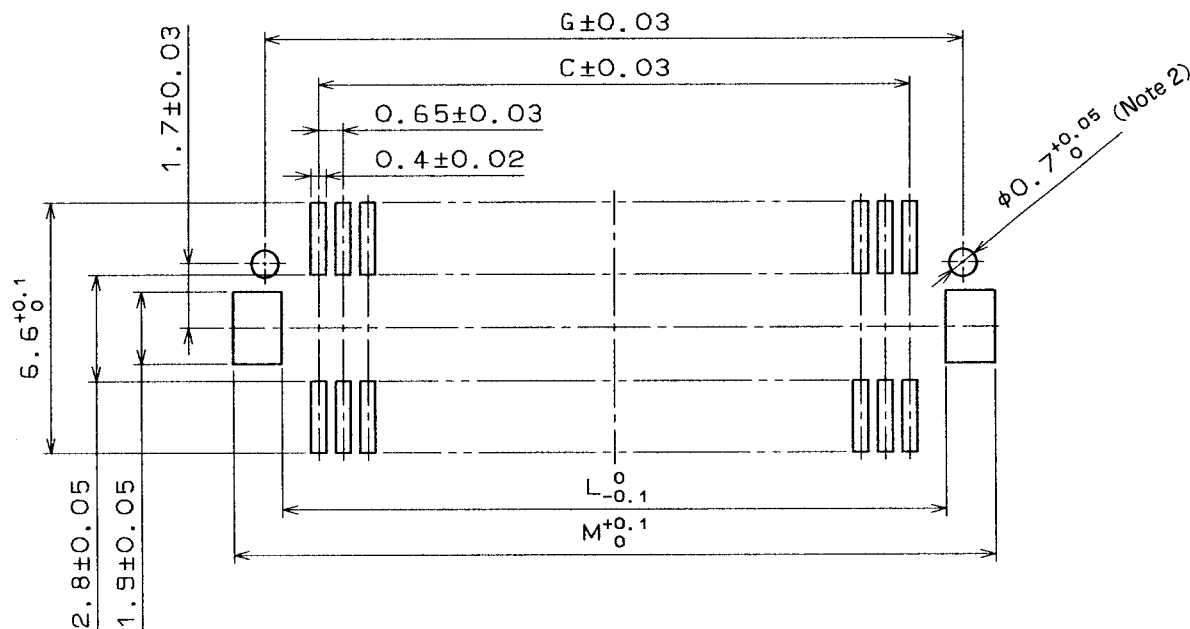
●Receptacle



Note1:  If the pattern is included in the shaded area, and not treated with resist, it could touch the connector contact.

●Header

(Unit: mm)

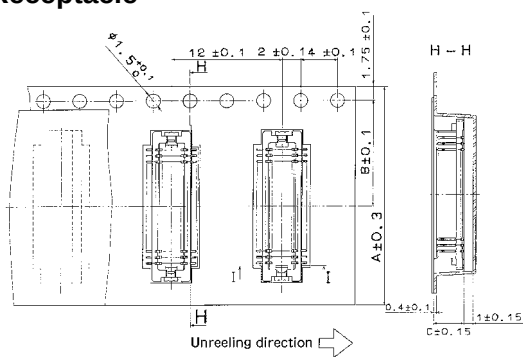


Unit: mm

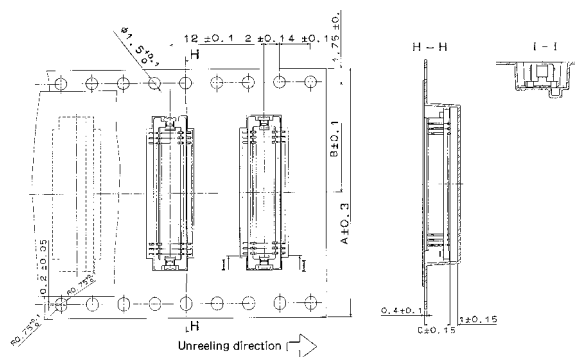
Number of Contacts	C	G	L	M
20	5.85	8.65	7.85	10.25
30	9.1	11.9	11.1	13.5
40	12.35	15.15	14.35	16.75
50	15.6	18.4	17.6	20

◆ Embossed Carrier Tape Dimensions

● Receptacle

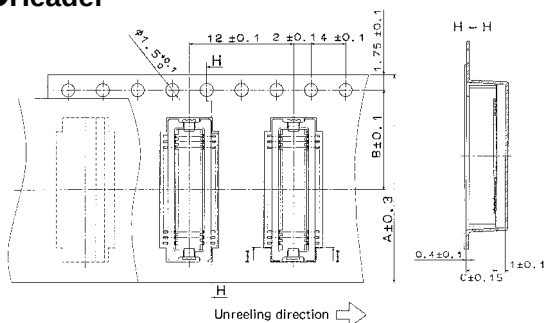


(20, 30, 40 contacts)

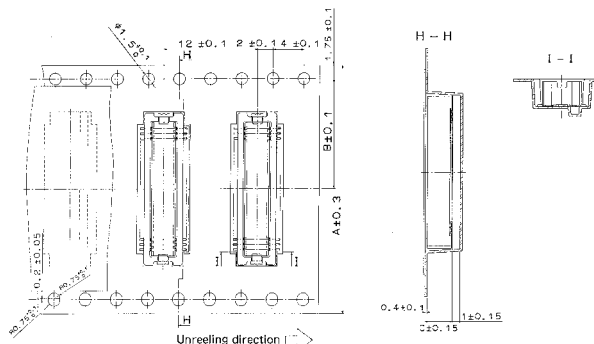


(50 contacts)

● Header

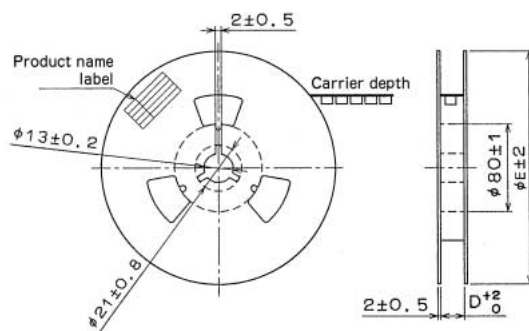


(20, 30, 40 contacts)



(50 contacts)

● Reel Dimensions



Unit:mm

Connector	A	B	C	D	E	Connector	A	B	C	D	E
DF15#(0.8)-20DS-0.65V	16	7.5	3.3	16.4	330	DF15#(3.2)-20DP-0.65V	16	7.5	3.5	16.4	330
DF15#(0.8)-30DS-0.65V	24	11.5	3.3	24.4		DF15#(3.2)-30DP-0.65V	24	11.5	3.5	24.4	
DF15#(0.8)-40DS-0.65V	24	11.5	3.3	24.4		DF15#(3.2)-40DP-0.65V	24	11.5	3.5	24.4	
DF15#(0.8)-50DS-0.65V	32	14.2	3.3	32.4		DF15#(3.2)-50DP-0.65V	32	14.5	3.5	32.4	
DF15#(1.8)-20DS-0.65V	16	7.5	4.3	16.4		DF15#(4.2)-20DP-0.65V	16	7.5	4.5	16.4	
DF15#(1.8)-30DS-0.65V	24	11.5	4.3	24.4		DF15#(4.2)-30DP-0.65V	24	11.5	4.5	24.4	
DF15#(1.8)-40DS-0.65V	24	11.5	4.3	24.4		DF15#(4.2)-40DP-0.65V	24	11.5	4.5	24.4	
DF15#(1.8)-50DS-0.65V	32	14.2	4.3	32.4		DF15#(4.2)-50DP-0.65V	32	14.5	4.5	32.4	
						DF15#(6.2)-20DP-0.65V	16	7.5	6.5	16.4	
						DF15#(6.2)-30DP-0.65V	24	11.5	6.5	24.4	
						DF15#(6.2)-40DP-0.65V	24	11.5	6.5	24.4	
						DF15#(6.2)-50DP-0.65V	32	14.5	6.5	32.4	

◆Precautions for Use

1. Recommended Temperature Profile (SMT)	Note1: Maximum twice action is allowed under the same condition. However, the interval between the first process and second actions must be maintained at the room temperature. Note2: The temperature indicates the board surface temperature in the connector lead area.
2. Recommended Manual Soldering Condition (SMT)	Soldering iron temperature: 290±10°C, Soldering time: Within 2 seconds
3. Recommended Screen Thickness (SMT)	0.15mm
4. Board Warp (SMT)	Max 0.03mm in the connector center area, based on the both connector edges
5. Cleaning Condition	Refer to the "Nylon Connector Use Hand book".
6. Cautions	■The receptacle is designed in a structure where contacts are exposed. Touching it with bare hands would cause contact failure or electrostatic element damage. ■Where no board is mounted, the insertion or extraction will cause damage or deformation in the contacts. ■Avoid retaining the board with the connector only, and fix the board by any other means than the connector. ■Excessive scoop insertion or extraction may result in damage. ■In the manual soldering process, don't carry out the flux coating which will cause a flux blister on the connector. ■The color phase of this product may be slightly different from that of the formed product according to the manufacturing lot. However, the difference doesn't affect the performance.