

# 2mm Pitch, Multi Functional Connector System (Floating [Board-to-Board], Swing-Lock [Wire-to-Board], Short-Circuit Pin)

## DF59 Series



### ■ Features

#### ● Common to all series

#### 1. High Operating Temperature

DF59's are rated at temperatures up to 105 °C.

#### ● DF59

#### 2. Swing Lock Structure (Wire-to-Board)

The DF59 features a "swing-lock" mechanism that employs both a positive and friction lock. This helps to prevent accidental unmating by severe wiring and mechanical stress.

#### 3. Short-Circuit Pin

The Short-Circuit Pin allows the termination of an open circuit. Typically used at the end of a series of connected circuit boards.

#### 4. Multi Function Design

The DF59 has the ability to function as either a Board-to-Wire or Board-to-Board System. The PCB mounted receptacle is designed to mate with the W-to-B, B-to-B, and Short Circuit Pin connectors. This multi function ability allows versatility while keeping connectors to a minimum.

#### 5. Contact Design

The terminal design features two-point contact to ensure a highly reliable connection.

#### 6. Common Applicator

Crimping can be performed using the applicator (AP105-DF11-22S) for the existing series DF11-22S C F(A), by replacing the die with the one for DF59 series.

\* For crimping quality standards and crimping conditions, crimping needs to be performed in accordance with the specific conditions of DF59-22PCFA.

#### ● Common to DF59/59S/59SN

#### 7. Floating Structure (Board-to-Board)

The Board-to-Board connector can be used to connect two PCB together in a co-planar arrangement and features a "Stress free contact" that floats  $\pm 0.5\text{mm}$  in the X, Y and Z dimensions.

#### 8. Space Savings

The DF59 series offers high performance in a compact, space saving design; featuring a 2mm pitch and coupled with a mated height of only 2.48mm with AWG#22 cable. The single position floating plugs DF59S and DF59SN are specifically designed to save space, and can be mounted in high density applications.

#### 9. Robust locking structure on DF59M (W-to-B Connection)

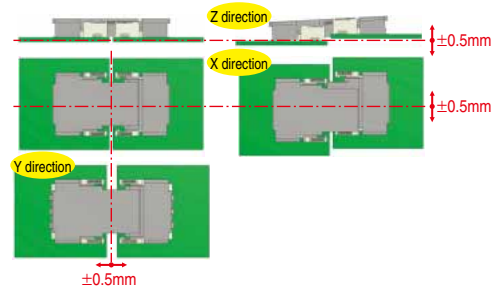
The lock mechanism on compact DF59M provides 16N horizontal lock strength. (Fig.4)

#### 10. Standardization of PCB layout

The DF59S/SN type is used on board-to-board connections, and the DF59M type is intended for wire-to-board connections. Although they have different receptacles, the PCB mounting pattern can be used for these two types. Different combinations of these connectors can be used in the same system with a common PCB. This allows for standardization of PCB. (Fig.5)

(Note) Each stencil mask is necessary

#### DF59 floating amount $\pm 0.5\text{mm}$ (X, Y, Z directions)



#### DF59S/SN floating amount

$\pm 0.5\text{mm}$ (X, Y direction),  $\pm 0.2\text{mm}$ (Z direction)

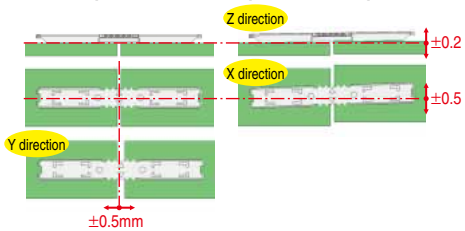


Fig.1

#### ◆ Swing-Lock Structure (Board-to-Wire Type)

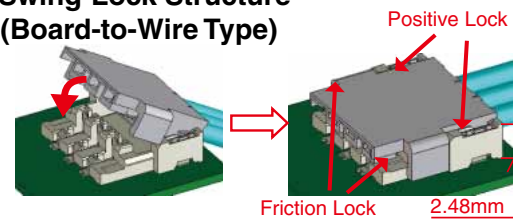


Fig.2

#### ◆ Short-Circuit Pin

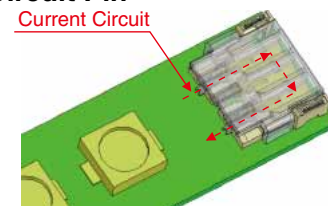


Fig.3

#### ◆ W-to-B structure (DF59M)

Clear tactile click and high locking strength achieved by the robust locking mechanism  
Mating force : 16N min. (in a horizontal direction)



Fig.4

#### ◆ Standardization of PCB pattern

DF59S/SN type and DF59M type can be used in the same system by using a common PCB.



Fig.5

## Product Specifications

Ratings	Current rating	DF59/S/SN	3A	Operating Temperature : -40 to 105°C (Note 1) Operating Humidity Range : 20 to 80%
		DF59M	6A (22 AWG), 5A (24 AWG) 4A (26 AWG), 3A (28 AWG)	
	Voltage rating	DF59/S/SN	AC/DC 230V (Note 3)	Storage Temperature Range : -10 to 60°C (Note 2) Storage Humidity Range : 40 to 70% (Note 2)
		DF59M	AC/DC 350V (Note 3)	

Items	Specifications		Conditions
1.Contact resistance	DF59-*P-2FC/SP DF59S/SN	50mΩ min.	Under 6V DC, must be measured by 100mA (DC or 1000Hz)
	DF59M-1S-H	45mΩ min.	
	DF59-*P-2C	30mΩ min.	
2.Vibration	No electrical discontinuity over 1μs.		Frequency 10 to 55Hz, single amplitude 0.75mm, 3 directions, 10 cycles each
3.Shock	No electrical discontinuity over 1μs.		Acceleration 490 m/s <sup>2</sup> , 11ms; duration, sine half-wave 3 cycles in each of the 3 axis.
4.Humidity		■Contact resistance	Temperature 40 ± 2°C, humidity 90 to 95%, left for 96 hours
	DF59-*P-2FC/SP DF59S/SN	50mΩ min.	
	DF59M	45mΩ min.	
	DF59-*P-2C	30mΩ min.	
5.Temperature cycle		■Contact resistance	(-55°C: 30 min. → 5-35°C: 2 to 3 min. → 85°C: 30 min. → 5-35°C: 2 to 3 min.) 5 cycles
	DF59-*P-2FC/SP DF59S/SN	50mΩ min.	
	DF59M	45mΩ min.	
	DF59-*P-2C	30mΩ min.	
6. Operating Life		■Contact resistance	■Number of insertion and withdrawal force
	DF59-*P-2FC/SP	50mΩ min.	30 times
	DF59-*P-2FC/SP DF59S/SN		10 times
	DF59M	45mΩ min.	20 times
	DF59-*P-2C	30mΩ min.	10 times
7.Resistance to soldering heat	No melting of resin which affect the performance.		Reflow : Depends on recommended temperature profile. Hand soldering : Soldering iron temperature 350 ± 10°C, 3 sec.

Note 1 : Including 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 and humidity range covers connectors after installation, storage, shipment or during transportation.

Note 3 : The rated voltage is the applied voltage when connectors are mounted parallel to each other on the PCB with a distance of 1.6mm or more between them. Hirose recommends his mounting distance.

This mounting distance is required in order to prevent creepage between the printed wiring to maintain an effective voltage of 300V, according to IEC 60664 and JIS C 60664 standards.

## Materials / Finish

Items	Parts	Materials	Treatment	UL Specification	
Receptacle	DF59	Insulator	LCP	Natural	UL94V-0
	DF59S	Contact	Phosphor bronze	Gold plated	_____
				Tin plated	
DF59M		Copper Alloy			
Floating plug	DF59	Insulator	PBT	White	UL94V-0
		Contact	Brass	Gold plated	_____
	DF59S	Insulator	LCP	Natural	UL94V-0
		Contact	Brass	Tin plated	_____
	DF59SN	Insulator	LCP	Natural	UL94V-0
Crimp contact	DF59M	Contact	Brass	Tin plated	_____
		Copper Alloy			
Short pin	Insulator	PBT	White	UL94V-0	
	Contact	Brass	Gold plated	_____	
Crimp case	Insulator	PBT	White	UL94V-0	
Crimp contact	Contact	Phosphor bronze	Gold plated	_____	

## Ordering Information

Please refer to the ordering information below for each connector type

### ● Receptacle

**DF** **59** **#** - **\*** **S** - **\*** **V**

①      ②      ③                      ④      ⑤                      ⑥      ⑦

① Series Name : DF	⑥ Pitch None : Single contact type 2 : Standard 2mm (4mm : Without the central contact)
② Series No. : 59	
③ None : Standard S : B-to-B type M : W-to-B type	⑦ Termination form V : SMT straight type (B-to-B type) H : SMT right angle type (W-to-B type)
④ Number of contacts : 1, 2, 3, 4	
⑤ Type of connector S : Receptacle	

### ● Plug

**DF** **59** **#** - **\*** **P** - **\*** **FC**

①      ②      ③                      ④      ⑤                      ⑥      ⑦

① Series Name : DF	⑤ Type of connector P : Plug
② Series No. : 59	
③ None : Standard S : Single contact type SN : Single contact slim type	⑥ Pitch 2 : DF59 : 2mm (4mm : Without the central contact) None : DF59S/SN/M
④ Number of contacts DF59 : 2, 3, 4 DF59S/SN : 1	
⑦ Termination form FC : Floating	

### ● Short-Circuit pin

**DF** **59** - **\*** **P** - **2** **SP**

①      ②                      ③      ④                      ⑤      ⑥

① Series Name : DF	⑤ Pitch : 2mm
② Series No. : 59	
③ Number of contacts : 2, 3, 4	⑥ Termination form SP : Short Pin
④ Type of connector P : Plug	

### ● Crimp Socket

**DF** **59** - **\*** **P** - **2** **C**

①      ②                      ③      ④                      ⑤      ⑥

① Series Name : DF	⑤ Pitch : 2mm
② Series No. : 59	
③ Number of contacts : 2, 3, 4	⑥ Termination form C : Crimp case
④ Type of connector P : Plug	

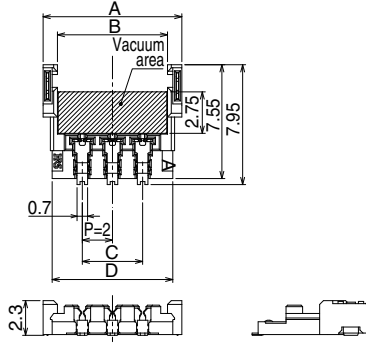
### ● Contact (W-to-B)

**DF** **59** **M** - **2224** **PCF**

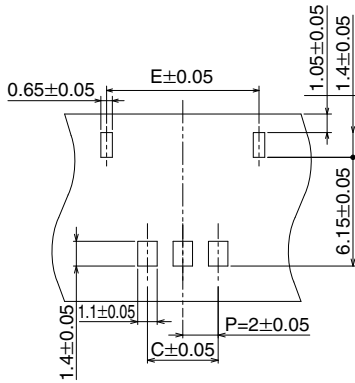
①      ②      ③                      ④                      ⑤

① Series Name : DF	⑤ Form Type/Package Type/Plating type PCFA : Plug crimping contact-Reel contact-Gold plating PCA : Plug crimping contact-Bulk contact-Gold plating PCF : Plug crimping contact-Reel contact-Tin plating PC : Plug crimping contact-Bulk contact-Tin plating
② Series No. : 59	
③ None : Standard M : Single contact type (W-to-B M=micro)	
④ Applicable Wire 22 : 22 AWG 2224 : 22 to 24 AWG 2628 : 26 to 28 AWG	

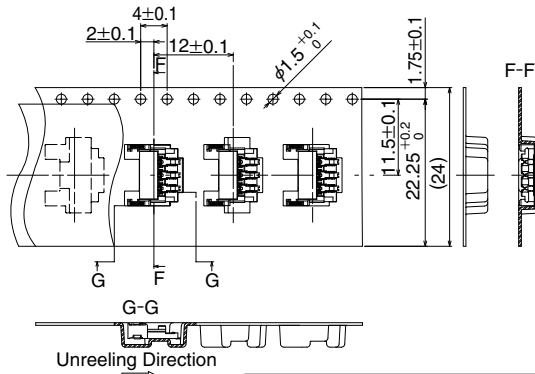
## ■ Straight Receptacle (SMT)



### ● Recommended PCB Dimensions (t=1.6mm)



### ● Packaging Dimensions



[Specification No.]  
(51) : Gold plating, emboss packaging

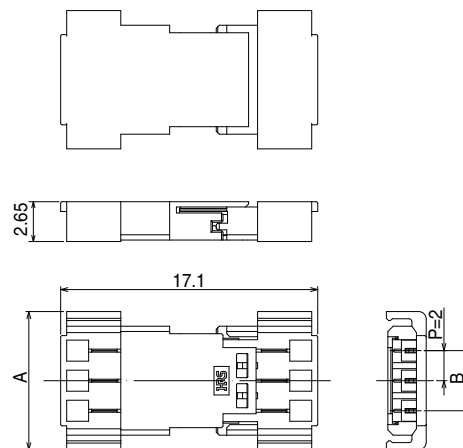
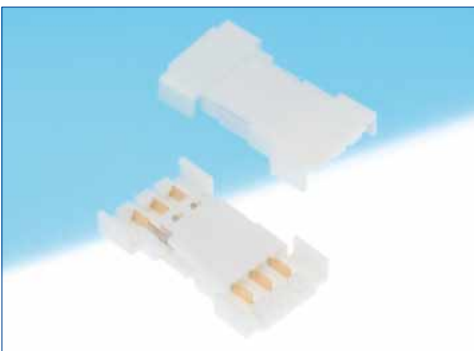
Unit : mm

Part No.	HRS No.	No. of contacts	A	B	C	D	E
DF59-2S-2V(51)	667-0001-0 51	2	7.2	5.3	2.0	6.0	6.62
DF59-3S-2V(51)	667-0002-3 51	3	9.2	7.3	4.0	8.0	8.62
DF59-4S-2V(51)	667-0003-6 51	4	11.2	9.3	6.0	10.0	10.62
DF59-2S-4V(51)	667-0021-8 51	2*	9.2	7.3	4.0	8.0	8.62

\* DF59-2S-4V(51) is made by removing the middle pin of DF59-3S-2V(51) at the factory.

Note : Please order in full reel quantities. (2,000 pcs/reel)

## ■ Floating Plug



[Specification No.]  
(50) : Gold plating, tray packaging

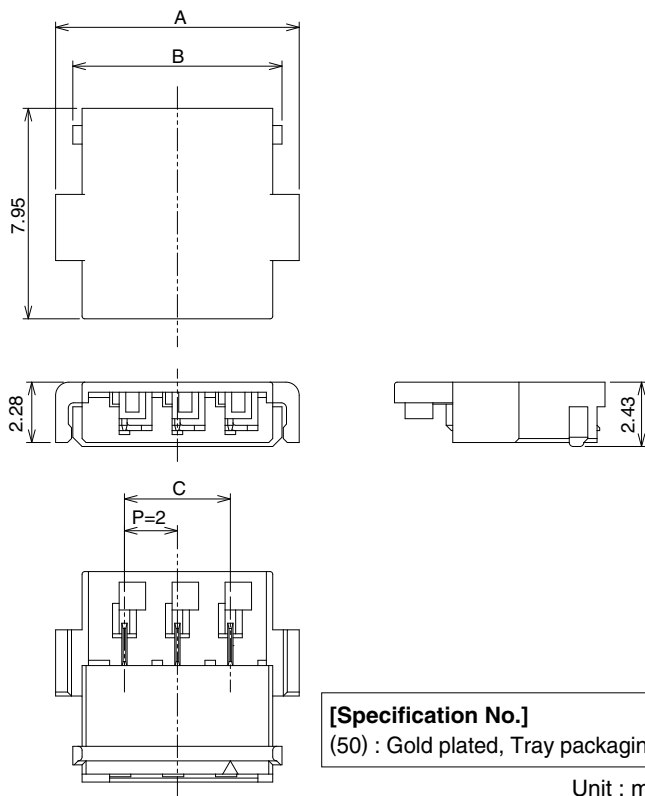
Unit : mm

Part No.	HRS No.	No. of contacts	A	B	Packaged Quantity/Tray
DF59-2P-2FC(50)	667-0006-4 50	2	7.2	2.0	50
DF59-3P-2FC(50)	667-0007-7 50	3	9.2	4.0	
DF59-4P-2FC(50)	667-0008-0 50	4	11.2	6.0	
DF59-2P-4FC(50)	667-0020-5 50	2*	9.2	4.0	

\* DF59-2P-4FC(50) is made by removing the middle pin of DF59-3P-2FC(50) at the factory.

Note : Please order in full tray quantities. (50 pcs/tray)

### Short-Circuit Pin



**[Specification No.]**  
(50) : Gold plated, Tray packaging

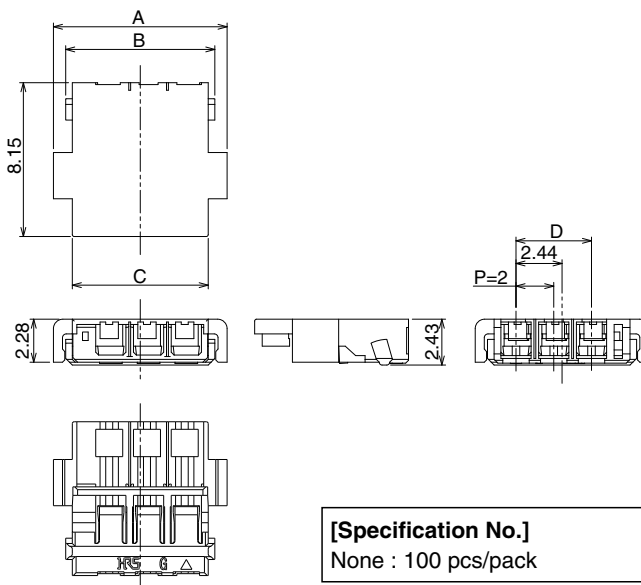
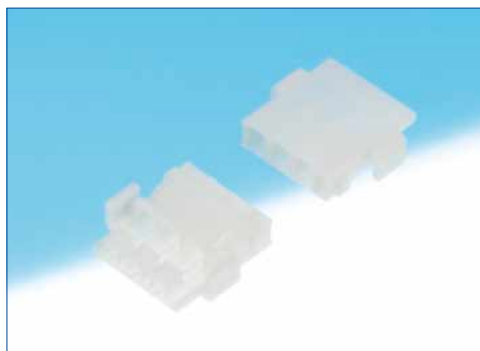
Unit : mm

Part No.	HRS No.	No. of contacts	A	B	C	Packaged Quantity/Tray
DF59-2P-2SP(50)	667-0017-0 50	2	7.2	5.9	2.0	100
DF59-3P-2SP(50)	667-0018-3 50	3	9.2	7.9	4.0	
DF59-4P-2SP(50)	667-0046-9 50	4	11.2	9.9	6.0	

Note : Please order in full tray quantities.

Note : For 4 pos. type contact No.1 and 2, No.3 and 4 are connected respectively.

### Crimp Socket



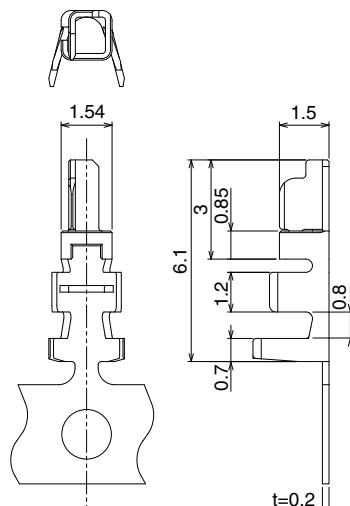
**[Specification No.]**  
None : 100 pcs/pack

Unit : mm

Part No.	HRS No.	No. of contacts	A	B	C	D
DF59-2P-2C	667-0011-4 00	2	7.2	5.9	5.2	2.0
DF59-3P-2C	667-0012-7 00	3	9.2	7.9	7.2	4.0
DF59-4P-2C	667-0013-0 00	4	11.2	9.9	9.2	6.0

Note : Please order in full pack quantities. (100 pcs/pack)

## ■ Crimp contact



Part No.	HRS No.	Packaging	Quantity	Treatment
DF59-22PCFA	667-0016-8 00	Reel contact (Note 1)	10,000 contacts / reel	Gold plated
DF59-22PCA	667-0022-0 00	Bulk contact (Note 2)	100 contacts / pack	

Note 1 : Please order reel contacts by full reel quantities. (10,000 pcs/reel)

Note 2 : Please order loose piece contacts in full pack. (100 pcs/pack)

### ● Applicable Wire (Tin plated soft copper wire)

Conductor Size (Wire Constitution)	Jacket Diameter
22 AWG (17 /φ0.16mm)	UL1061 (φ1.26mm)
	UL3265 (φ1.38mm)

### ● Recommended Wire

UL1061, UL3265

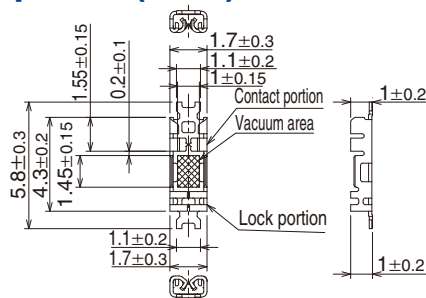
### ● Strip Length

1.7 to 2.3mm

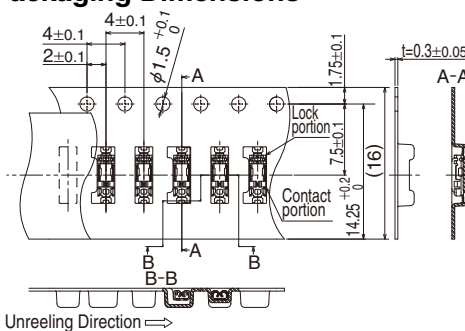
Note : Please contact your nearest Hirose Sales Representative for information regarding compatible wire Remarks: Please consult with our sales representative when using wires other than applicable wire.

Note : The strip length is a reference value. Please make adjustments so finished crimps will meet the specified values. Refer to the crimping quality standards (ATAD-H0504) for details.

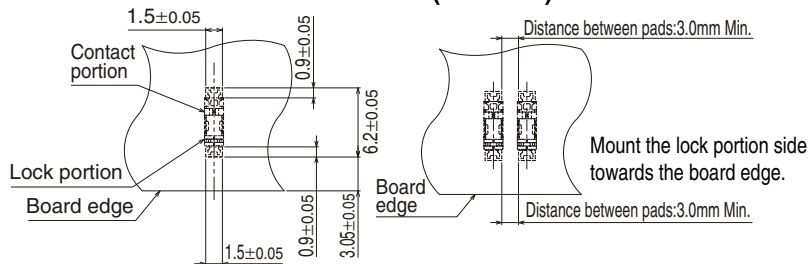
## Single Contact Type Straight Receptacle (SMT)



### ●Packaging Dimensions



### ●Recommended PCB Dimensions (t=1.6mm)

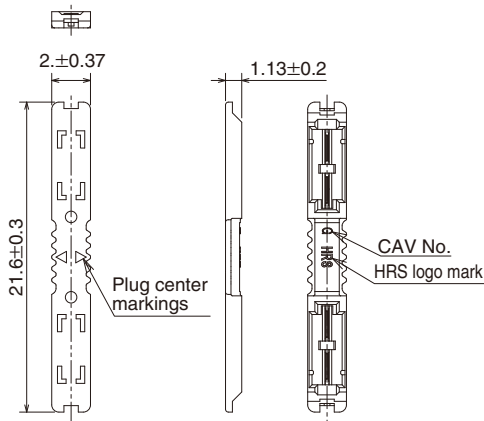


Part No.	HRS No.
DF59S-1S-V(21)	667-0024-6 21

[Specification No.]  
(21) : Tin plating, emboss packaging

Note : Please order in full reel quantities. (10,000 pcs/reel)

## Single Contact Type Floating Plug

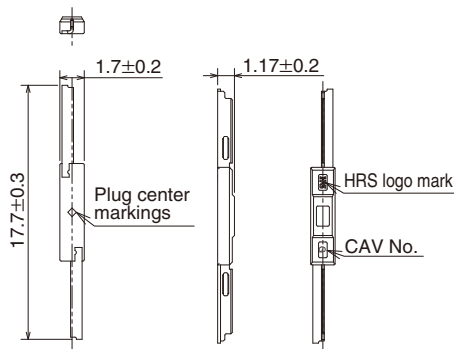


Part No.	HRS No.
DF59S-1P-FC(21)	667-0023-3 21

[Specification No.]  
(21) : Tin plating, emboss packaging

Note : Please order in full reel quantities. (10,000 pcs/reel)

## Single Contact Slim Type Floating Plug



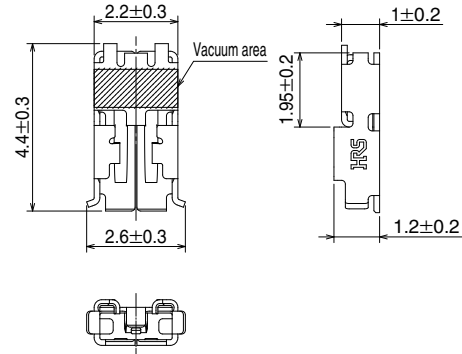
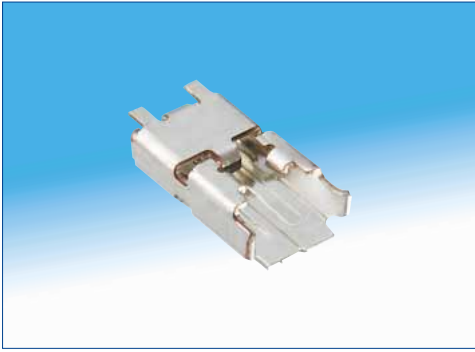
Part No.	HRS No.
DF59SN-1P-FC(21)	667-0028-7 21

[Specification No.]  
(21) : Tin plating, emboss packaging

Note : Please order in full reel quantities. (10,000 pcs/reel)

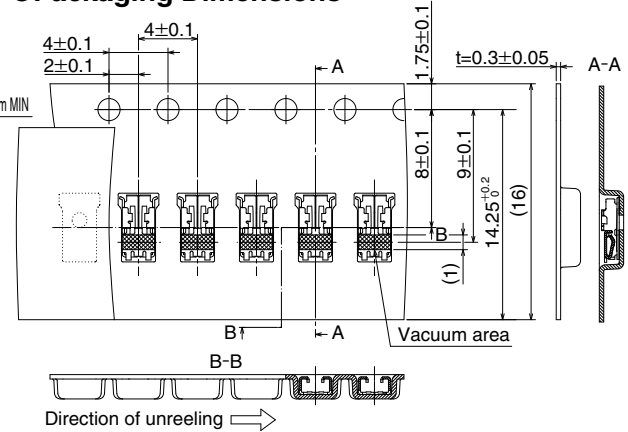
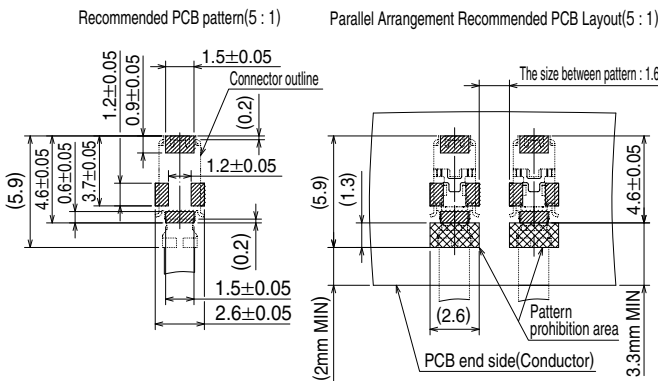
Note : Use the special (DF59SN-1P-FC/IN-TOOL) tool for connector insertion.

## Single Contact Type Right Angle Receptacle (SMT)



### Recommended PCB Dimensions (t=1.6mm)

### Packaging Dimensions



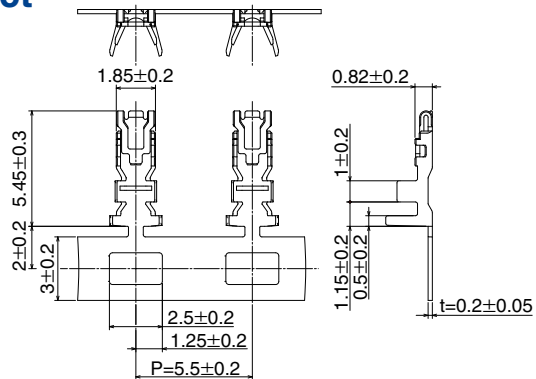
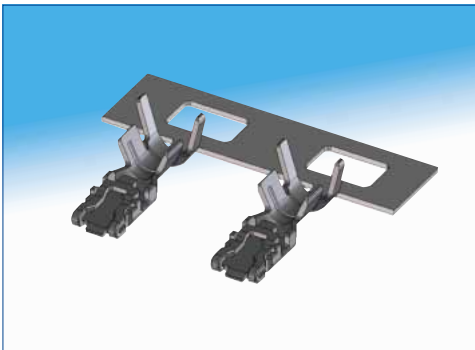
Part No.	HRS No.
DF59M-1S-H(21)	667-0041-5 21

[Specification No.]  
(21) : Tin plating, emboss packaging

Note 1 : Please order in full reel quantities. (10,000 pcs/reel)

Note 2 : This connector is designed to mate with Crimp contact of DF59M only. (P.8)

## Single Contact Type Crimp Contact



Part No.	HRS No.	Applicable Wire				By Type	Quantity	Treatment
		Recommended Wire	Jacket Diameter	Conductor Size	Wire Constitution			
DF59M-2224PCF	667-0042-8 00	UL10368	φ1.11 to 1.26mm	22 AWG	17/φ0.16mm	Reel contact (Note 1)	10,000/reel	Tin plated
DF59M-2224PC	667-0044-3 00			24 AWG	11/φ0.16mm	Bulk contact (Note 2)	100/pack	
DF59M-2628PCF	667-0043-0 00		φ0.88 to 0.98mm	26 AWG	7/φ0.16mm	Reel contact (Note 1)	10,000/reel	
				28 AWG	7/φ0.17mm	Bulk contact (Note 2)	100/pack	
DF59M-2628PC	667-0045-6 00		φ0.98mm	26 AWG	7/φ0.16mm	Bulk contact (Note 2)	100/pack	
				28 AWG	7/φ0.17mm			

Note 1 : Please order reel contacts by full reel quantities. (10,000 pcs/reel)

Note 2 : Please order loose piece contacts in full pack. (100 pcs/pack)

Note 3 : Please consult with our sales representative when using wires other than applicable wire.

Note 4 : The strip length is a reference value. Please make adjustments so finished crimps will meet the specified values.

Refer to the crimping quality standards (ATAD-H0778) for details.



## ◆Applicable Crimping Tool

Types	Part No.	HRS No.	Applicable Contact	Remarks
Applicator	AP105-DF59-22P	901-4619-8 00	DF59-22PCFA	
	AP105-DF59M-2224P	901-4638-2	DF59M-2224PCF	(Note 2) Manufactured by Japan Automatic Machine Co., Ltd.
	DHS887200H-UP	—		
	AP105-DF59M-2628P	901-4639-5	DF59M-2628PCF	(Note 2) Manufactured by Japan Automatic Machine Co., Ltd.
	DHS887300H-UP	—		
Press Unit	CM-105	901-0005-4 00	-	
Hand Tool	HT801/DF59-22P	901-4619-8 00	DF59-22PCA ※UL1061 AWG#22 Only	
	HT801/DF59M-2224P	550-0420-3	DF59M-2224PC ※UL10368 AWG#22, 24 Only	
	HT801/DF59M-2628P	550-0421-6	DF59M-2628PC ※UL10368 AWG#26, 28 Only	
Hand Tool (W-to-B)	DF-C-PO(B)	550-0179-2 00	DF59-22PCFA DF59-22PCA	
	DF-C-PO(A)	550-0170-8 00	DF59M Series	
Extraction Tool (B-to-B)	DF59SN-1P-FC/IN-TOOL	667-0040-2 00	DF59SN-1P-FC	

Note 1 : Customers are strongly encouraged to utilize HRS application tooling or tooling created by a Hirose tooling partner.

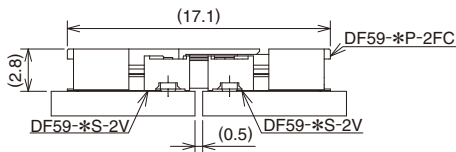
Hirose assumes no liability for customers using tooling from non-recognized sources.

Note 2 : Please contact Japan Automatic Machine Co., Ltd. (hereinafter J.A.M.) through their website regarding crimping issues when using applicators manufactured by J.A.M. URL <http://www.jam-net.co.jp>

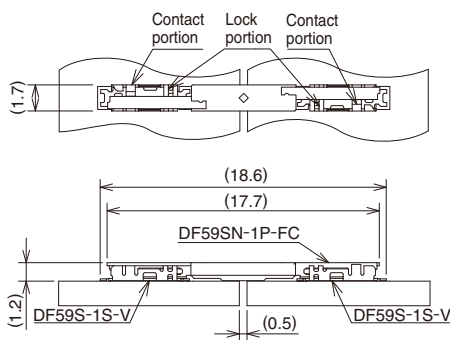
## ◆Mating Dimensions

### ●Board-to-board connection (floating plug)

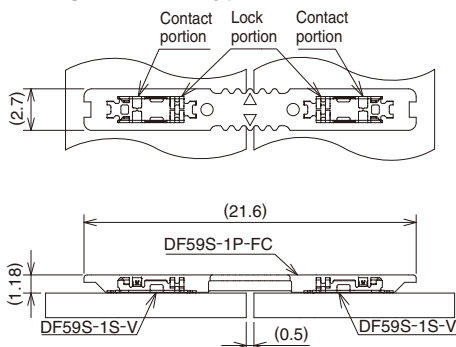
[Standard]



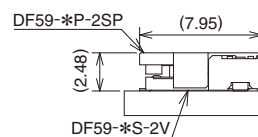
[Single contact slim type]



[Single contact type]

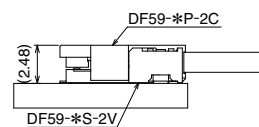


### ●Short-circuit pin connection



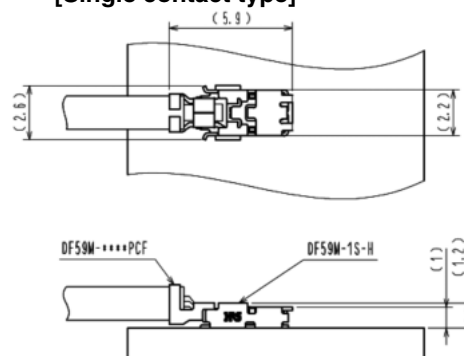
### ●Wire-to-Board Mated condition

[Standard]

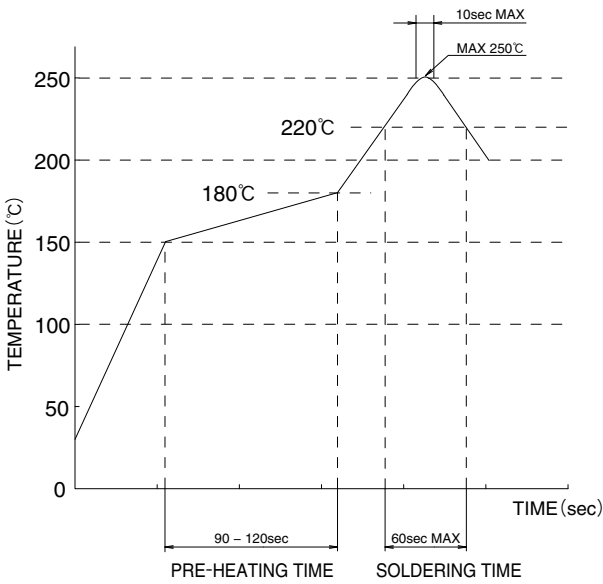


### ●Wire-to-Board connection

[Single contact type]



## Operating Precautions

<p>1. Recommended Temperature Profile (Lead-free soldering possible)</p>	 <p><b>[Applicable Conditions]</b></p> <ol style="list-style-type: none"> <li>1. Peak Temperature : MAX 250°C</li> <li>2. Heated Area : 220°C or above, within 60 sec.</li> <li>3. Pre-heating Area : 150 to 180°C, 90 to 120 sec.</li> <li>4. Number of Times : within 2 times</li> </ol> <p>*Measured at contact lead area Please be noted that the reflow condition may vary depending on soldering paste type, manufacturer of soldering material, board size, as well as conditions of other mounting materials. (*1) Above temperature profile is our recommended value.</p>
<p>2. Recommended Hand Solder Conditions</p>	<p>Soldering iron temperature : 350 ± 10°C, soldering time : within 3 seconds</p>
<p>3. Recommended Screen Thickness, Open Ratio (Pattern Area Ratio)</p>	<p>Thickness 0.1mm, Open ratio : 100%</p>
<p>4. Warpage of PC board</p>	<p>Maximum of 0.02mm at the connector center, with both ends of the connector as reference points.</p>
<p>5. Cleaning Condition</p>	<p>Cleaning with IPA is possible. (Cleaning is not recommended. In case of cleaning, please evaluate if it causes a decrease in the performance which includes mechanical operation and environmental resistance.)</p>
<p>6. Precautions</p>	<ul style="list-style-type: none"> <li>■ When inserting crimp-type (solderless) terminals to crimping (solderless) sockets, to maintain reliable performance, please do not insert obliquely.</li> <li>■ DO NOT mate/un-mate a non-terminated plug with a non-mounted receptacles. This may lead to damage or deformation of the contacts.</li> <li>■ Please note that pulling on the wires or cable during un-mating may cause damage.</li> <li>■ DO NOT apply flux to the contact terminals when hand soldering the receptacle to the board. Flux can wick into the electrical contact areas and may lead to connection failures.</li> <li>■ Slight discoloration on the insulating materials will not affect form, fit or function of the connectors.</li> <li>■ Please refer to the following for the points for proper handling regarding mating/unmating operations.             <ul style="list-style-type: none"> <li>“DF59 Insertion and Removal Manual”</li> <li>“DF59S Insertion and Removal Manual” ATAD-H0651</li> <li>“DF59SN Insertion and Removal Manual” ATAD-H0719</li> <li>“DF59M Operation manual” ATAD-H0779</li> </ul> </li> </ul>

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**USA:**

**HIROSE ELECTRIC (U.S.A.), INC. HEADQUARTERS**

2300 Warrenville Road, Suite 150,  
Downers Grove, IL 60515  
Phone : +1-630-282-6700  
<http://www.hirose.com/us/>

**USA:**

**HIROSE ELECTRIC (U.S.A.), INC. SAN JOSE OFFICE**

2841 Junction Ave, Suite 200  
San Jose, CA. 95134  
Phone : +1-408-253-9640  
Fax : +1-408-253-9641  
<http://www.hirose.com/us/>

**USA:**

**HIROSE ELECTRIC (U.S.A.), INC. DETROIT OFFICE (AUTOMOTIVE)**

17197 N. Laurel Park Drive, Suite 253,  
Livonia, MI 48152  
Phone : +1-734-542-9963  
Fax : +1-734-542-9964  
<http://www.hirose.com/us/>

**THE NETHERLANDS:**

**HIROSE ELECTRIC EUROPE B.V.**

Hogehillweg #8 1101 CC Amsterdam Z-O  
Phone : +31-20-6557460  
Fax : +31-20-6557469  
<http://www.hirose.com/eu/>

**GERMANY:**

**HIROSE ELECTRIC EUROPE B.V. GERMAN BRANCH**

Herzog-Carl-Strasse 4 D-73760 Ostfildern  
(Scharnhauser Park)  
Phone : +49-711-4560-02-1  
Fax : +49-711-4560-02-299  
<http://www.hirose.com/eu/>

**GERMANY:**

**HIROSE ELECTRIC EUROPE B.V. NUERNBERG OFFICE**

Neumeyerstrasse 22-26, 90411 Nurnberg  
Phone : +49-911 32 68 89 63  
Fax : +49-911 32 68 89 69  
<http://www.hirose.com/eu/>

**GERMANY:**

**HIROSE ELECTRIC EUROPE B.V. HANOVER OFFICE**

Bayernstr. 3, Haus C 30855 Langenhagen, Germany  
Phone : +49-511 97 82 61 30  
Fax : +49-511 97 82 61 35  
<http://www.hirose.com/eu/>

**FRANCE:**

**HIROSE ELECTRIC EUROPE B.V. PARIS OFFICE**

Regus La Garenne Colombes, Place de La Belgique,  
71 Boulevard National La Garenne Colombes, 92250, France  
Phone : +33 (0) 1 7082 3170  
Fax : +33 (1) 7082 3101  
<http://www.hirose.com/eu/>

**UNITED KINGDOM:**

**HIROSE ELECTRIC EUROPE BV (UK BRANCH)**

4 Newton Court, Kelvin Drive, Knowlhill,  
Milton Keynes, MK5 8NH  
Phone : +44-1908 202050  
Fax : +44-1908 202058  
<http://www.hirose.com/eu/>

**CHINA:**

**HIROSE ELECTRIC (SHANGHAI) CO., LTD.**

1601, Henderson Metropolitan, NO.300, East Nanjing  
Road, Huangpu District, Shanghai, China 200001  
Phone : +86-21-6391-3355  
Fax : +86-21-6391-3335  
<http://www.hirose.com/cn/>

**CHINA:**

**HIROSE ELECTRIC (SHANGHAI) CO.,LTD. BEIJING BRANCH**

A1001, Ocean International Center, Building 56# East 4th  
Ring Middle Road, ChaoYang District, Beijing, 100025  
Phone : +86-10-5165-9332  
Fax : +86-10-5908-1381  
<http://www.hirose.com/cn/>

**CHINA:**

**HIROSE ELECTRIC TECHNOLOGIES (SHENZHEN) CO., LTD.**

Room 09-13, 19/F, Office Tower Shun Hing Square, Di Wang Commercial Centre,  
5002 Shen Nan Dong Road, Shenzhen City, Guangdong Province, 518008  
Phone : +86-755-8207-0851  
Fax : +86-755-8207-0873  
<http://www.hirose.com/cn/>

**HONG KONG:**

**HIROSE ELECTRIC HONGKONG TRADING CO., LTD.**

Room 1001, West Wing, Tsim Sha Tsui Centre, 66  
Mody Road, Tsim Sha Tsui East, Kowloon, Hong Kong  
Phone : +852-2803-5338  
Fax : +852-2591-6560  
<http://www.hirose.com/hk/>

**TAIWAN:**

**HIROSE ELECTRIC TAIWAN CO., LTD.**

103 8F, No.87, Zhengzhou Rd., Taipei  
Phone : +886-2-2555-7377  
Fax : +886-2-2555-7350  
<http://www.hirose.com/tw/>

**KOREA:**

**HIROSE KOREA CO., LTD.**

250, Huimanggongwon-ro, Siheung-si,  
Gyeonggi-do, Korea, 429-849  
Phone : +82-31-496-7000,7124  
Fax : +82-31-496-7100  
<http://www.hirose.co.kr/>

**SINGAPORE:**

**HIROSE ELECTRIC SINGAPORE PTE. LTD.**

10 Anson Road #26-16, International Plaza  
079903, Singapore  
Phone : +65-6324-6113  
Fax : +65-6324-6123  
<http://www.hirose.com/sg/>

**INDIA:**

**HIROSE ELECTRIC SINGAPORE PTE. LTD. DELHI LIAISON OFFICE**

Office NO.519, Regus-Green Boulevard, Level5, Tower C,  
Sec62, Plot B-9A, Block B, Noida, 201301, Uttar Pradesh, India  
Phone : +91-12-660-8018  
Fax : +91-120-4804949  
<http://www.hirose.com/sg/>

**INDIA:**

**HIROSE ELECTRIC SINGAPORE PTE. LTD. BANGALORE LIAISON OFFICE**

Unit No-403, 4th Floor, No-84, Barton Centre, Mahatma  
Gandhi (MG) Road, Bangalore 560 001, Karnataka, India  
Phone : +91-80-4120 1907  
Fax : +91-80-4120 9908  
<http://www.hirose.com/sg/>

**MALAYSIA:**

**PENANG REPRESENTATIVE OFFICE**

1-21-01, Suntech @ Penang Cybercity (1164), Lintang  
Mayang Pasir 3,11950, Bayan Baru, Penang, Malaysia.  
Phone : +604-619-2564  
Fax : +604-619-2574  
<http://www.hirose.com/sg/>

**THAILAND:**

**BANGKOK OFFICE (REPRESENTATIVE OFFICE)**

Unit 4703, 47th FL., 1 Empire Tower, South Sathorn  
Road, Yannawa, Sathorn, Bangkok 10120 Thailand  
Phone : +66-2-686-1255  
Fax : +66-2-686-3433  
<http://www.hirose.com/sg/>



**HIROSE ELECTRIC CO.,LTD.**

2-6-3,Nakagawa Chuoh,Tsuzuki-Ku,Yokohama-Shi 224-8540,JAPAN  
TEL: +81-45-620-3526 Fax: +81-45-591-3726  
<http://www.hirose.com>  
<http://www.hirose-connectors.com>