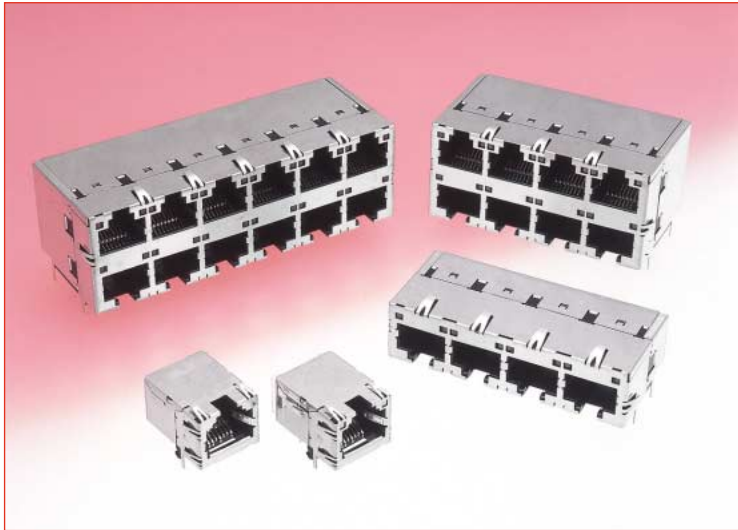


# Modular Jack Connectors for High-Speed LAN Transmission

## TM21R Series



### ■ Features

#### 1. Supports High-Speed LAN Transmission

Meets requirements of TIA/EIA-568-B data wiring standard. Single port configuration meeting CAT5e and multiple port configuration meeting CAT5 transmission performance.

As such, these products fully support Gigabit Ethernet (1000BASE-T) and Fast Ethernet (100BASE-TX) high-speed LAN transmission.

#### 2. Built-in Optical Indicators

Optical indicators are integral part of the connectors saving space on customer's board.

Compared with LED type indicators, they do not emit any electrical noise.

#### 3. EMI protection

Metal shield covers the outer surfaces of the connectors assuring complete protection against electromagnetic interference.

Built-in multiple shield and ground contacts assure reliable connection with the mounting panel as well as with the mating connector.

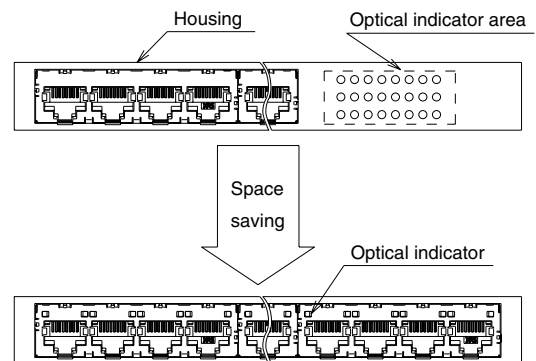
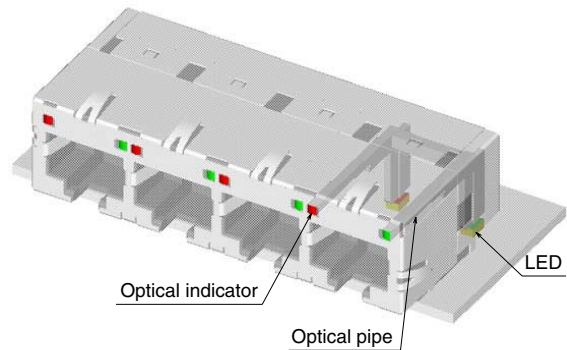
#### 4. FCC Standards

Meets requirements of FCC Title 47, Part 68, Subpart F.

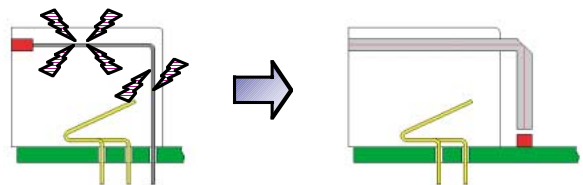
### ■ Applications

Telecom Hubs, Routers, Bridges and ATM Transmission Equipment, Ethernet Switches and Networking Equipment, Test and Measurement Equipment, Medical Diagnostic Equipment.

### Built-in Optical Indicators



One additional TM21 multi-port jack can be mounted in the space previously occupied by LEDs.



Built-in LED type  
(Possibility of  
electromagnetic noise  
emission and  
interference.)

Built-in Optical pipe  
type  
(No electromagnetic  
noise emission.)

## ■Product Specifications

|         |                         |  |
|---------|-------------------------|--|
| Ratings | Current rating 1A       | Operating temperature range-25°C to +80°C (Note) |
|         | Voltage rating 125 V AC |  |

| Item  | Specification  | Conditions   |
|---|--|--|
| 1.Insulation resistance                                       | 100 M ohms min   | 100 V DC   |
| 2.Dielectric Withstanding Voltage (between adjacent contacts) | No flashover or insulation breakdown   | 500 V AC / one minute  |
| 3.Withstanding voltage (between contact and shield)           | No flashover or insulation breakdown   | 1500 V AC / one minute   |
| 4.Contact resistance  | 230 m ohms max.  | 100mA DC   |
| 5.Vibration   | No electrical discontinuity of 5 ms or more<br>Contact resistance: 250m ohms max.  | Frequency: 10 to 55 Hz, single amplitude of 0.75 mm, 2 hours / 3 axis  |
| 6.Shock   | No electrical discontinuity of 5ms or more<br>Contact resistance: 250m ohms max.   | Acceleration of 490 m/s <sup>2</sup> , 11 ms duration, sine half-wave waveform, 3 cycles in each of the 3 axis |
| 7.Durability (mating/unmating)                                | Contact resistance: 250m ohms max.   | 200 cycles   |
| 8.Temperature cycle   | Contact resistance: 250 m ohms max.<br>Insulation resistance: 100 M ohms min.  | (Temperature: -55°C→+5°C to +35°C→+85°C→+5°C to +35°C<br>Duration: 30 → 5 → 30 → 5 (Minutes)<br>5 cycles       |
| 9.Humidity  | Contact resistance: 250 m ohms max.<br>Insulation resistance: 1 M ohms min. (High humidity)<br>Insulation resistance: 10 M ohms min. (Dry state) | 500 hours at temperature of 40°C and humidity of 90% to 95%  |
| 10.Salt Spray   | Contact resistance: 250 m ohms max.  | Exposed to density 5% salt water for 48 hours  |

Note :Includes temperature rise caused by current flow.

## ■Materials

| Part         | Material       | Finish   | Remarks |
|--------------|----------------|--|---------|
| Insulator    | PBT            | Color: Black   | UL94V-0 |
| Contact      | Copper alloy   | Contact area: Gold plating<br>Termination area: Solder plating | —       |
| Optical pipe | Poly carbonate | Color: Clear   | —       |
| Shield       | Copper alloy   | Tin plating  | —       |

## ■Ordering information

### ●Jacks

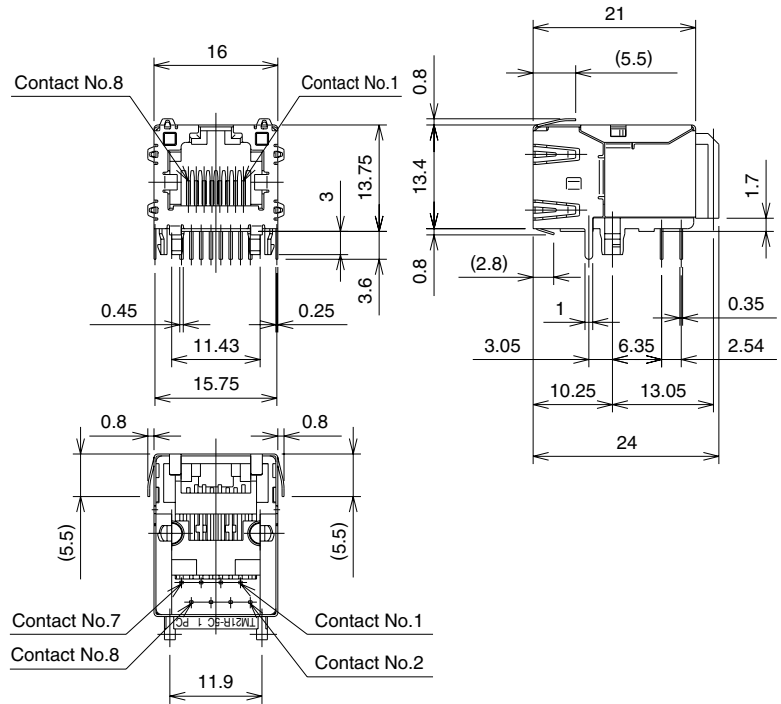
**TM21 R - 5 A - 32 32 D - LP**

① ② ③ ④ ⑤ ⑥ ⑦ ⑧

|                                      |   |
|--------------------------------------|---|
| <b>q</b> Series Name                 | TM21  |
| <b>w</b> Connector type              | R : Jack  |
| <b>e</b> Jack type number            | 5 : PCB Right-angle through hole type   |
| <b>r</b> Jack performance level code | A : CAT5 (Single row, multi-port)<br>B : CAT5 (Double row, multi port)<br>C : Supports CAT5e (Single port)        |
| <b>t</b> Jack opening code           | 8 : 8 contacts<br>32 : 8 contacts /4 ports<br>48 : 8 contact/6 ports  |
| <b>y</b> Number of inserted contacts | 8 : 8 contact<br>32 : 8 contact inserted in 4 ports=32 contacts<br>48 : 8 contact inserted in 6 ports=48 contacts |
| <b>u</b> Number of rows              | Blank: Single row<br>D: Double row  |
| <b>i</b> Optical pipe                | LP: With optical pipe inserted<br>Blank: Without optical pipe   |

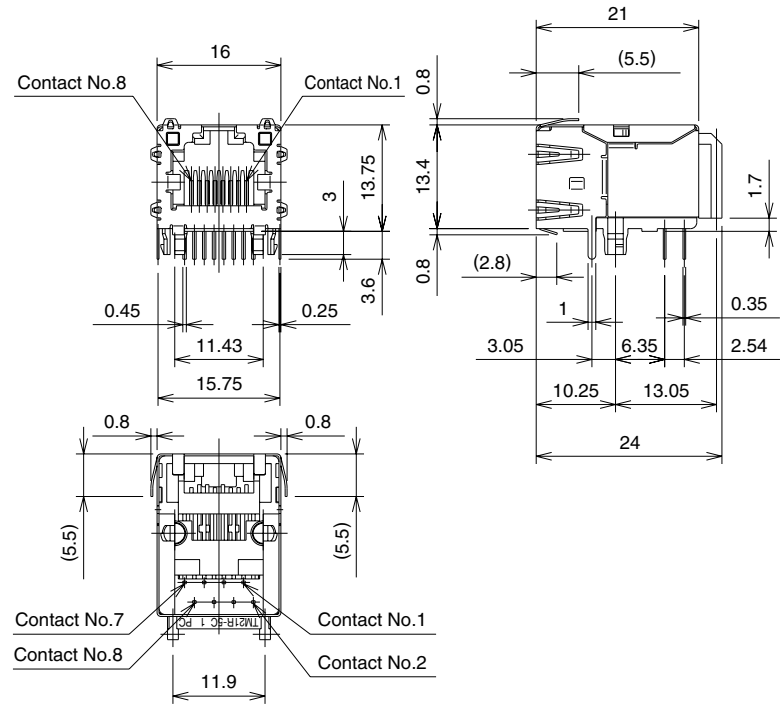
## ■Modular Jack Connectors Supporting CAT5e

### ●Single Port With Built-in Optical Pipe



| Part Number    | CL No.     |
|----------------|------------|
| TM21R-5C-88-LP | 222-2892-0 |

### ●Single Port Without Optical Pipe

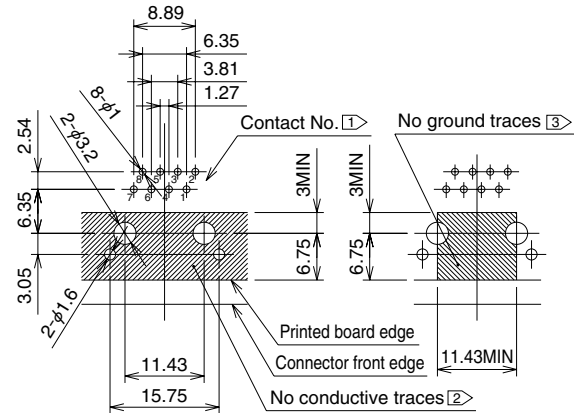
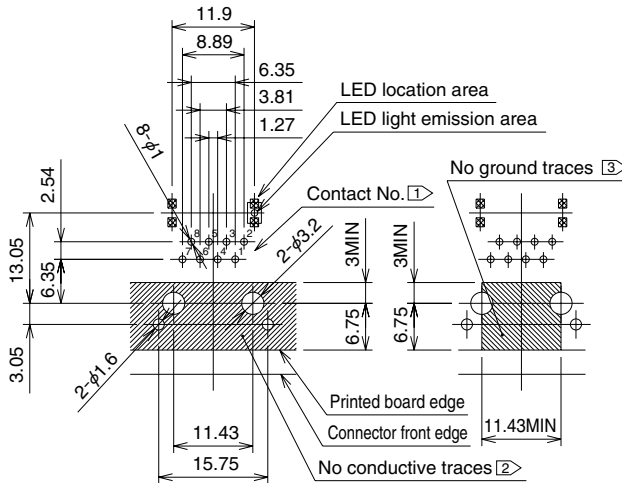


| Part Number | CL No.     |
|-------------|------------|
| TM21R-5C-88 | 222-2893-2 |

## ◆ Recommended PCB mounting patterns

### ● With Built-in Optical Pipe

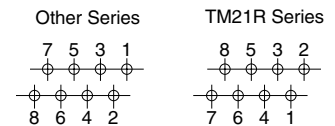
### ● Without Optical Pipe



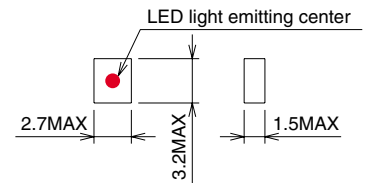
### \*Recommendations for PCB Design

- 1 The contact arrangement differs between the contact area side and Printed board side. (1,2,3,4,5,6,7,8 on the contact area side → 2,1,3,4,5,6,8,7 on the printed board side)
- 2 Areas indicated should be free of conductive traces.
- 3 Area indicated should be free of ground traces.
- 4 Recommended board thickness: 1.6mm.
- 5 To assure that the indicator light pipes operates correctly the LED's must be installed directly on the PCB, within recommended dimensions and with light emitting center in upward direction. Contact applicable manufacturer for LED specification.

#### 1 PCB mounting pattern

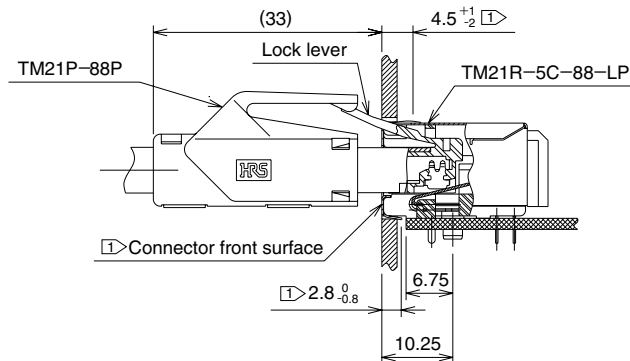
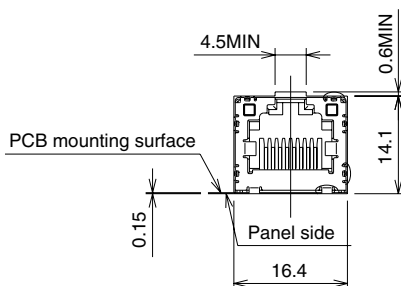


#### 5 Suggested LEDs



## ◆ Panel Cutout

### ● For Both Types, With and Without Built-in Optical Pipe

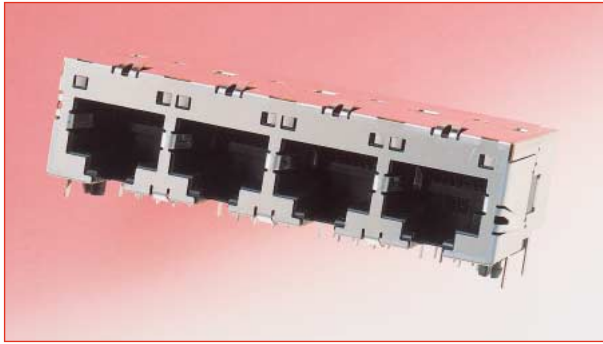


### \*Recommendations for Panel Design

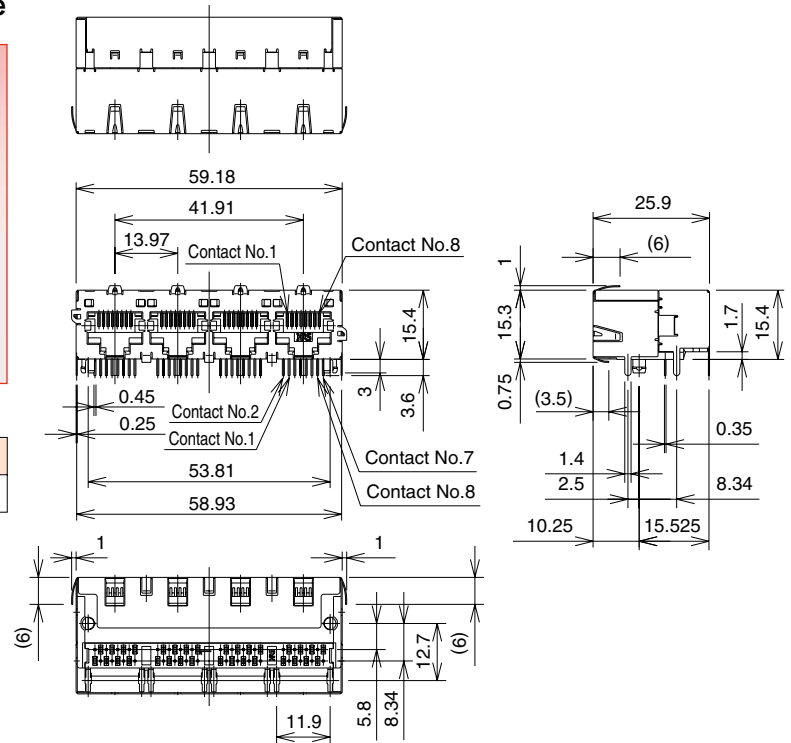
- 1 The shield contacts should connect with the panel cut-out on all sides.

## Modular Receptacles Supporting CAT5

### Single row/ multiple ports, with Built-in Optical Pipe

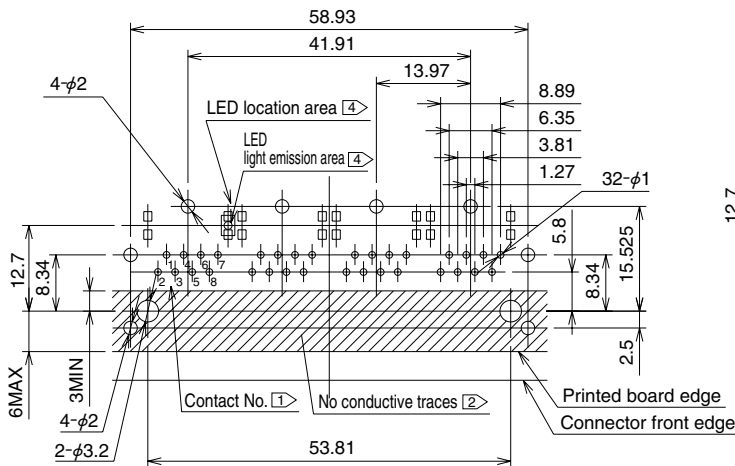


| Part Number      | CL No.     |
|------------------|------------|
| TM21R-5A-3232-LP | 222-2873-5 |

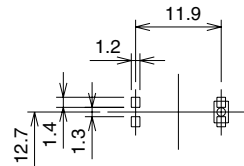


### Recommended PCB mounting patterns

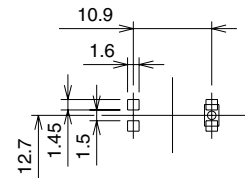
#### LED Mount Area Dimensions



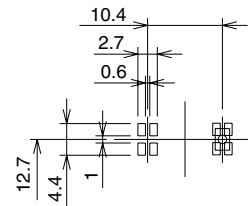
#### CL-220 Series



#### SML-010 Series



#### SML-020 Series



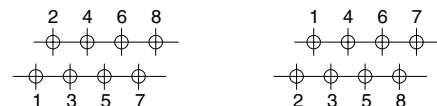
### \*Recommendations for PCB Design

- The contact arrangement differs between the contact area side and Printed board side. (1,2,3,4,5,6,7,8 on the contact area side → 2,1,3,4,5,6,8,7 on the printed board side)
- Areas indicated should be free of conductive traces.
- Recommended board thickness: 1.6mm.
- To assure that the indicator light pipe operates correctly the LED's must be installed directly on the PCB, within recommended dimensions and with light emitting center in upward direction. Contact applicable manufacturer for LED specification.

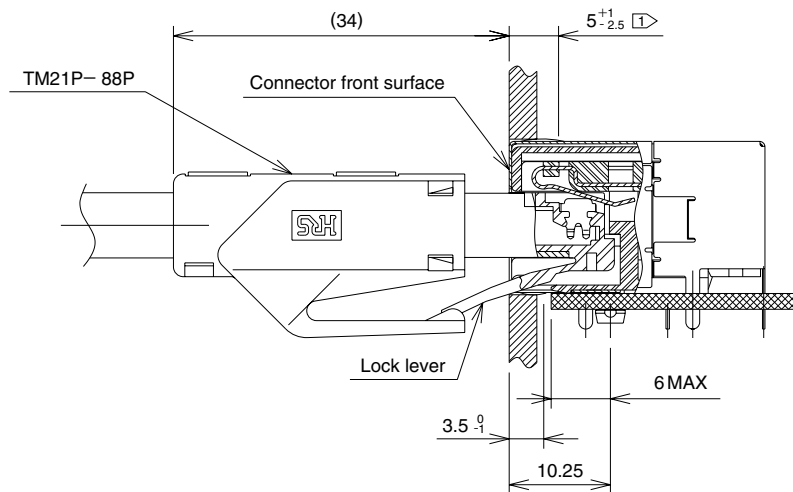
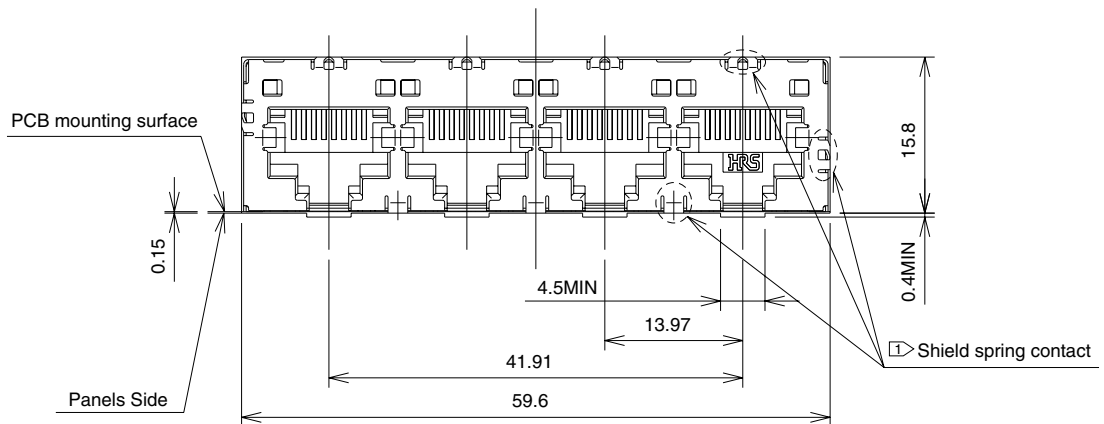
### 4 Suggested LEDs

| Series Name | Manufacturer                  |
|-------------|-------------------------------|
| CL-220      | Citizen Electronics Co., Ltd. |
| SML-010     | Rohm Co., LTD                 |
| SML-020     | Rohm Co., LTD                 |

### 1 PCB mounting pattern



## ◆ Recommended Panel Cutout



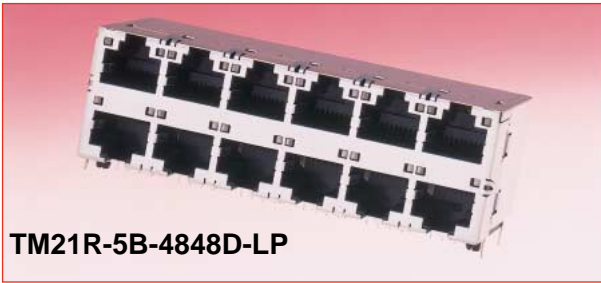
### \*Recommendations for Panel Design

- 1 The shield contacts should connect with the panel cut-out on all sides.

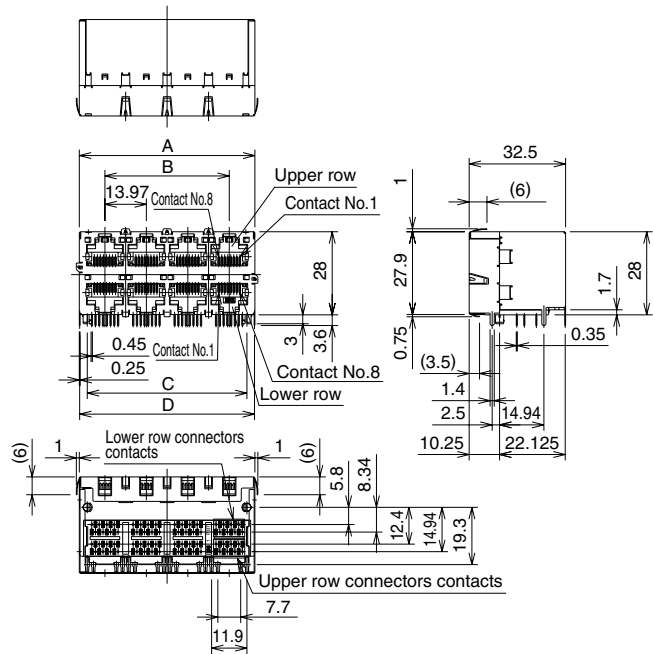
●Double row / multiple port, with Built-in Optical Pipe



TM21R-5B-3232D-LP

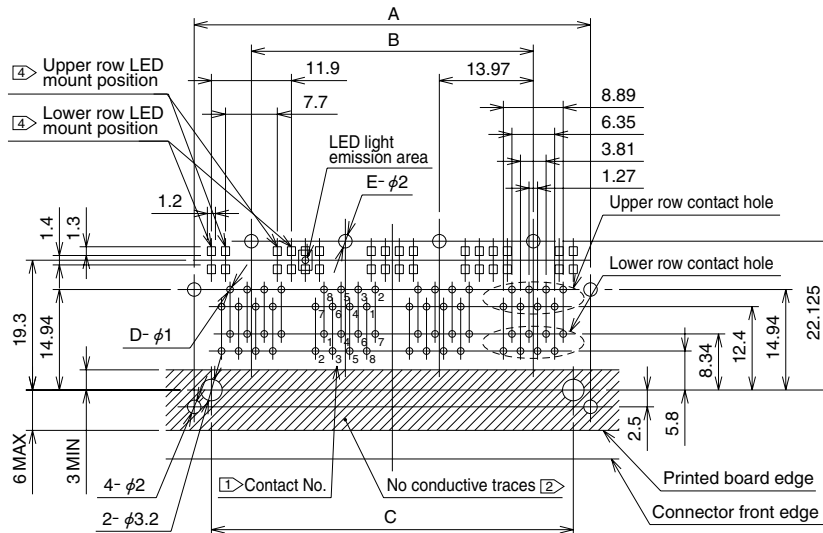


TM21R-5B-4848D-LP



| Part Number       | CL No.     | A     | B     | C     | D     |
|-------------------|------------|-------|-------|-------|-------|
| TM21R-5B-3232D-LP | 222-2879-1 | 59.18 | 41.91 | 53.81 | 58.93 |
| TM21R-5B-4848D-LP | 222-2885-4 | 87.12 | 69.85 | 81.75 | 86.87 |

◆Recommended PCB mounting pattern

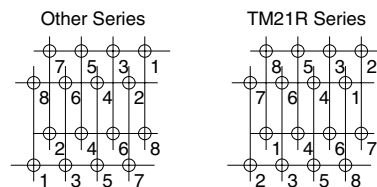


| Part Number       | CL No.     | A     | B     | C     | D  | E |
|-------------------|------------|-------|-------|-------|----|---|
| TM21R-5B-3232D-LP | 222-2879-1 | 58.93 | 41.91 | 53.81 | 64 | 4 |
| TM21R-5B-4848D-LP | 222-2885-4 | 86.87 | 69.85 | 81.75 | 96 | 6 |

\*Recommendations for PCB Design

- 1 The contact arrangement differs between the contact area side and Printed board side. (1,2,3,4,5,6,7,8 on the contact area side → 2,1,3,4,5,6,8,7 on the printed board side)
- 2 Areas indicated should be free of conductive traces.
- 3 Recommended board thickness: 1.6mm.
- 4 To assure that the indicator light pipes operates correctly the LED's must be installed directly on the PCB, within recommended dimensions and with light emitting center in upward direction. Contact applicable manufacturer for LED specification.

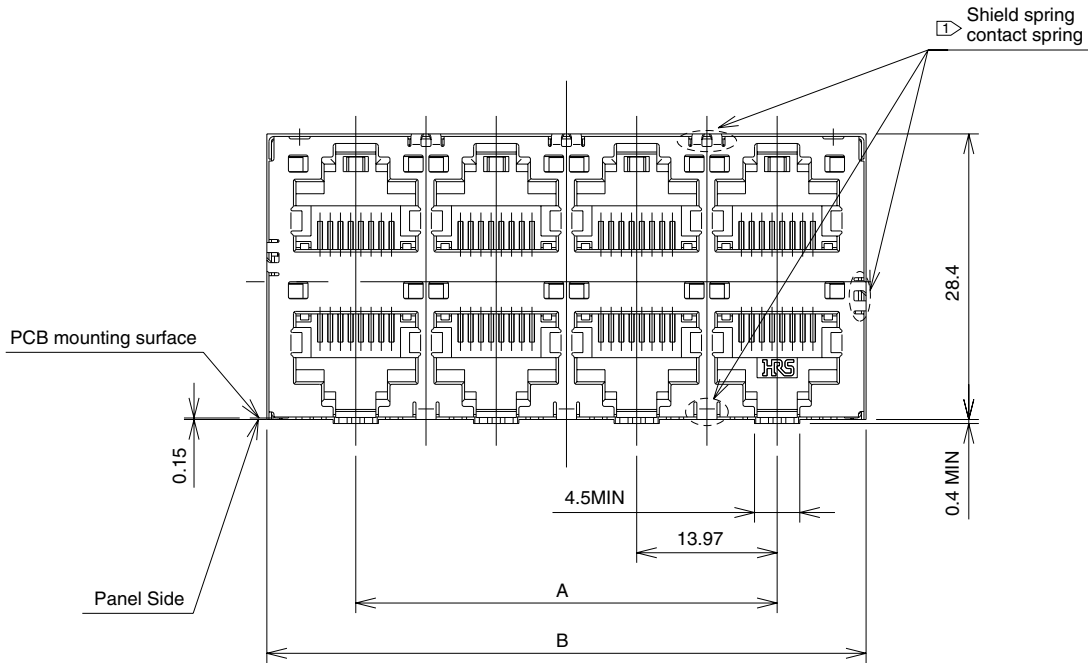
1 PCB mounting pattern



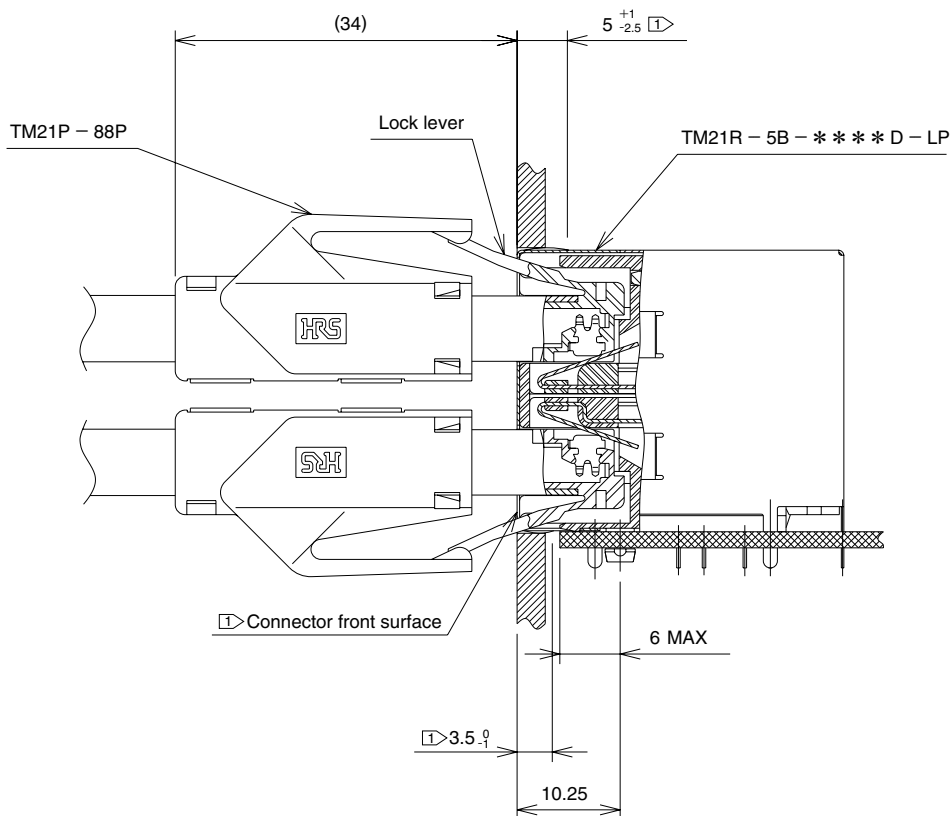
4 Suggested LEDs

| Series Name | Manufacturer                  |
|-------------|-------------------------------|
| CL-220      | Citizen Electronics Co., Ltd. |

## ◆ Panes Cutout



| Part Number       | CL No.     | A     | B     |
|-------------------|------------|-------|-------|
| TM21R-5B-3232D-LP | 222-2879-1 | 41.91 | 59.6  |
| TM21R-5B-4848D-LP | 222-2885-4 | 69.85 | 87.54 |



### \*Recommendations for Panel Design

1 The shield contacts should connect with the panel cut-out on all sides.



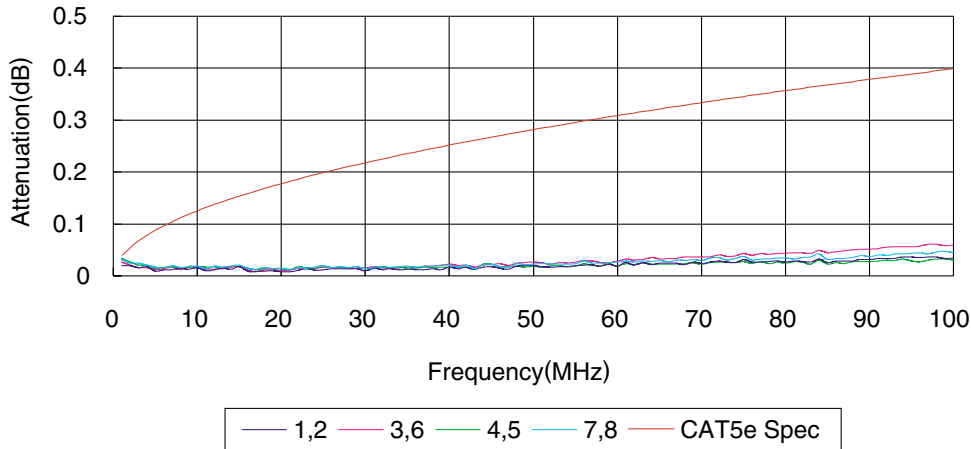
## ◆ Technical Documentation CAT5e Transmission Characteristics Data

Representative values of the various transmission characteristics data for fully mated receptacle (TM21R-5C-88-LP) and plug (TM21P-88P).

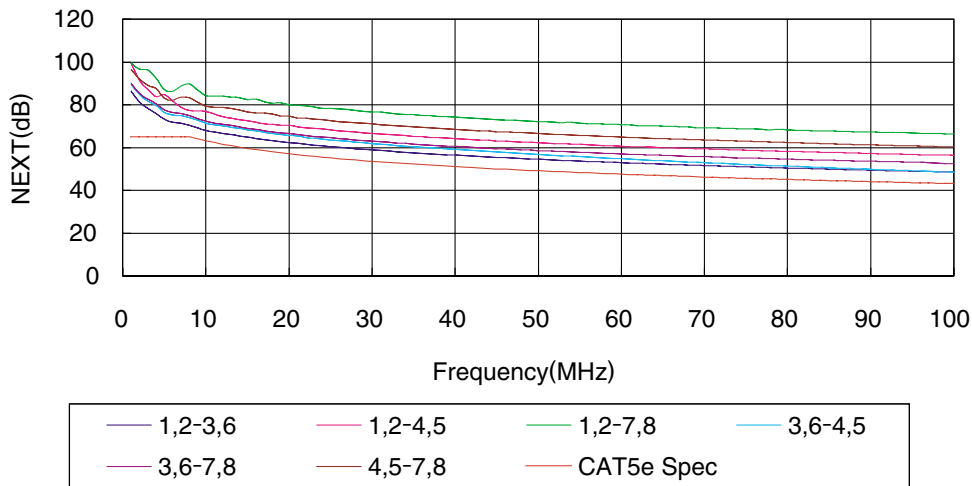
All plugs in the TM21R-5C Series that were manufactured based on the De-embedded method of the TIA/EIA-568-B.2 standard and meet performance requirements of CAT5e single transmission.

Note: These data are for the listed connector combination. Inquire with your Hirose Electric account representative about other combinations.

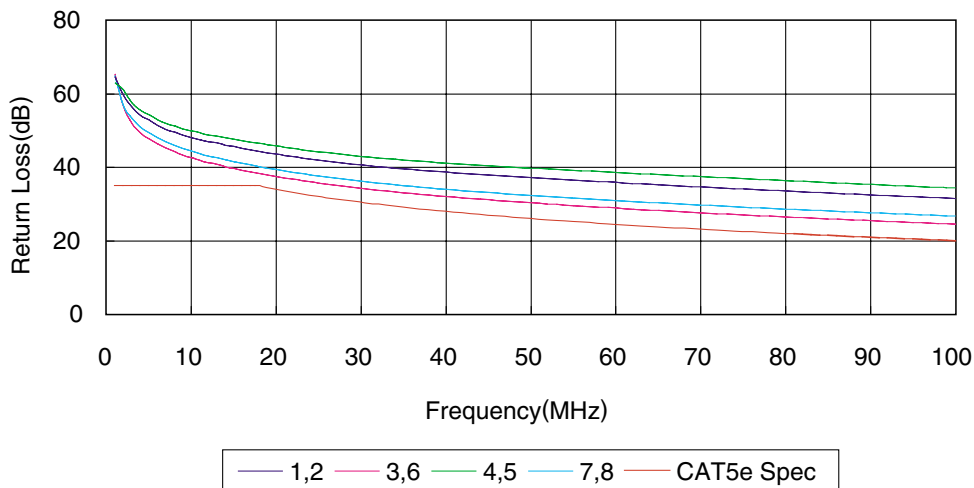
### ● Signal Attenuation



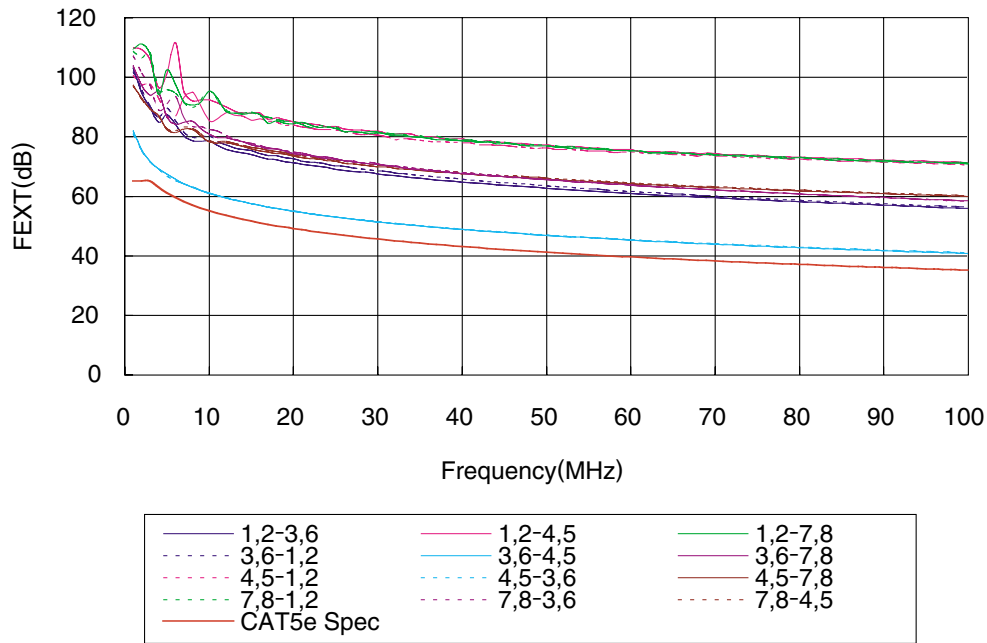
### ● Near-End Crosstalk (NEXT) Data



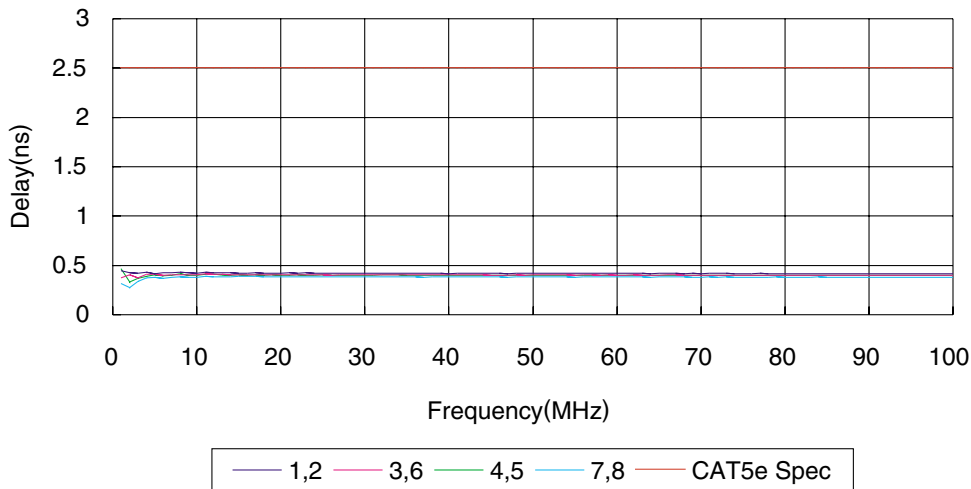
### ● Return Loss



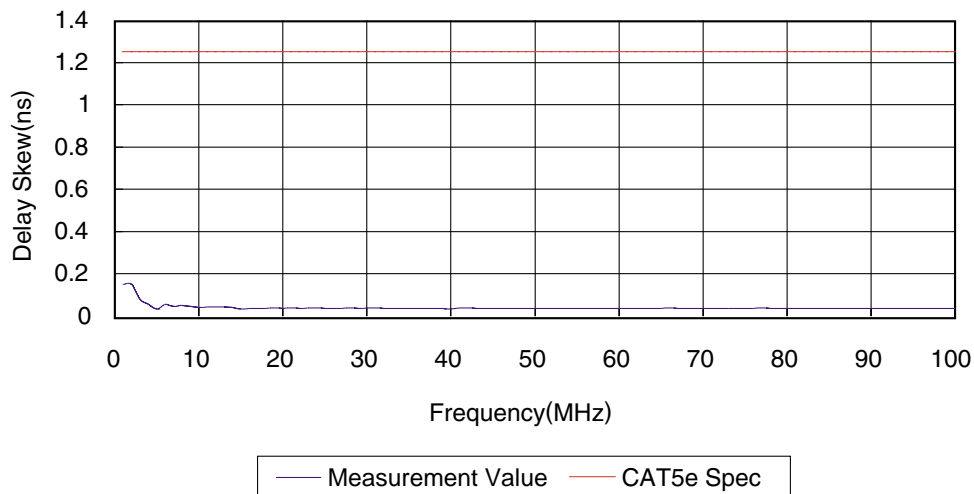
### ● Far-End Crosstalk (FEXT)



### ● Propagation Delay



### ● Propagation Delay (Delay Skew)



## ◆ Reference Documentation

### ● CAT6 Certification Received

Only the high quality plugs in the TM21R-5C Series (based on the De-embedded method of the TIA/EIA-568-B.2 standard) clear CAT6 single transmission performance. A certificate was issued by the GHMT, independent European testing company.

# Certificate

**Customer:** Hirose Electric GmbH  
Zeppelinstraße 42  
D-73760 Ostfildern

**Description:** **HIROSE TM21R-5C-88**

**Applied standards:** TIA/EIA-568-B.2-1 (Addendum No.1 to TIA/EIA-568-B.2)  
SP-3727 TIA/EIA Draft Standard (August 24, 2001 – Draft 9a)  
Transmission Performance Specifications for 4-Pair 100Ω Category 6 Cabling

**Comments:** The test results which were determined in the course of the measurement refer to the submitted specimen. Any future technical modifications of the component are subject to the responsibility of the manufacturer.  
Up to a bandwidth of 250 MHz, the specimen, a RJ45-jack, meet the limits of the specified standards and regulations.

This Certificate refers to the comprehensive test report, no. **863/01**, from **20 November 2001** and shall only be applicable in conjunction with the test report.

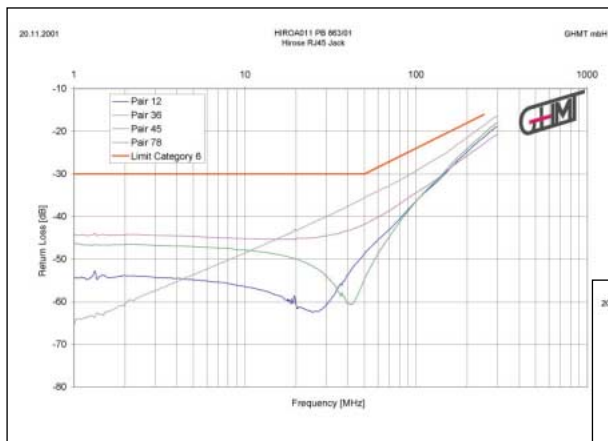
Bexbach, 20 November 2001

  
Dipl.-Ing. Frank Streibert  
(general manager)

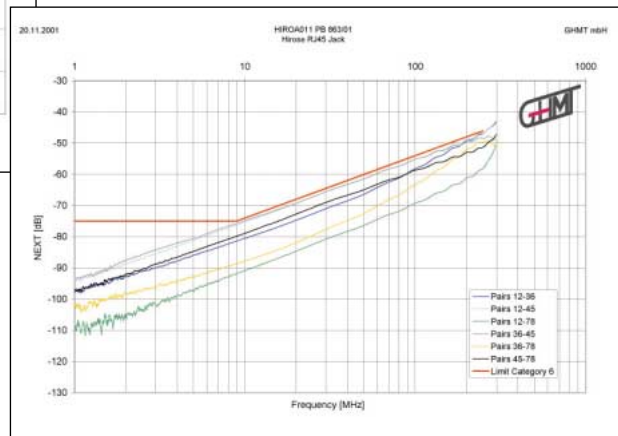
  
GHMT mbH  
In der Kolling 13  
D-66450 Bexbach  
Phone: +49 (0) 69 29 / 92 28 - 0  
Fax: +49 (0) 69 29 / 92 29 - 99  
E-Mail: info@ghmt.de  
http://www.ghmt.de

Gesellschaft für Hochfrequenz - Meßtechnik mbH

Certificate of Acceptance



↑ Return Loss



NEXT →

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2688 Westhills Court, Simi Valley, CA 93065-6235  
 Phone : 1 805 522 7958  
 Fax : 1 805 522 3217  
<http://www.hirose.com>

**UNITED KINGDOM:****HIROSE ELECTRIC UK LTD.**

Crownhill Business Centre 22 Vincent Avenue  
 Crownhill, Milton Keynes MK8 OAB  
 Phone : 44 1908 305400  
 Fax : 44 1908 305401  
<http://www.hirose.co.uk>

**HONG KONG:****HIROSE ELECTRIC CO., LTD.**

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 Tsui East, Kowloon  
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 Fax : 852 2591 6560

**EUROPE BRANCH:****HIROSE ELECTRIC CO., LTD.**

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 Schiphol-Rijk, The Netherlands  
 Phone : 31 20 6557 460  
 Fax : 31 20 6557 469  
<http://hiroseeurope.com>

**KOREA:****HIROSE KOREA CO., LTD.**

(#2NA311, Shihwa Industrial Complex),  
 1261-10, Jeoungwhang-Dong, Shihung-City, Kyunggi-Do  
 Phone : 82 31 496 7000,7124  
 Fax : 82 31 496 7101  
<http://www.hirose.co.kr>

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No.28 Lane 247 Sec. 2 Yen Ping N,Rd.Taipei  
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**CHINA:****HIROSE ELECTRIC CO., LTD.**

10F, No.06, Shanghai Times Square office Tower,  
 93. Huai Hai Zhong Road, Luwan Shanghai  
 Phone : 86 21 6391 0011  
 Fax : 86 21 6391 0101

**SINGAPORE:****HIROSE ELECTRIC CO., LTD.**

10 Anson Road #34-13 International Plaza 079903  
 Phone : 65 6324 6113  
 Fax : 65 6324 6123



**HRS**

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## HIROSE ELECTRIC CO., LTD.

5-23, OSAKI 5-CHOME, SHINAGAWA-KU, TOKYO 141-8587, JAPAN  
 PHONE: 81-3-3491-9741, FAX: 81-3-3493-2933

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