



## **Introduction**

### **Purpose**

- To Introduce the MS-162A series connectors.

### **Objective**

- To explain features and benefits.

### **Content**

### **Learning time**

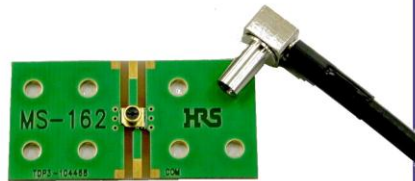
Welcome to the Hirose MS-162A product training module. This tutorial will introduce the MS-162A series and explain its features and benefits.



## Overview

1. Small size: 2.48 x 3.1 x 3.5 mm  
Occupied mounting area: 3.5 x 4.0 mm
2. Light weight: 0.043 g
3. Durability: 12,000 cycles
4. High electrical performance up to 10 GHz
5. Environment-friendly design
6. Satisfies RoHS requirements
7. Wide self-alignment: +/-0.5mm

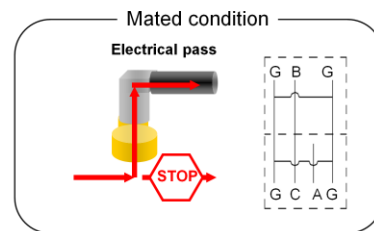
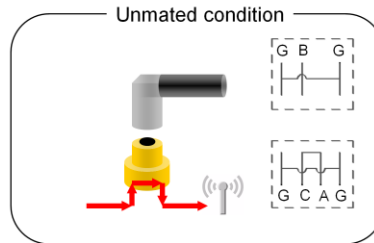
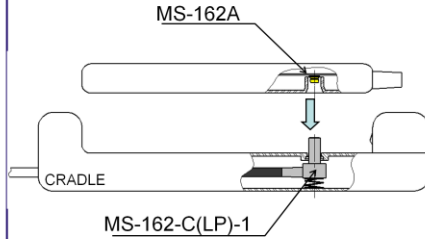
**Low Profile**  
**2.48 mm**  
**(2.5 mm Max.)**



MS-162A Series is a RF coaxial switch for interface applications on portable terminals and for board testing. This low profile, light weight connector achieves low loss and high durability reflecting the needs of portable terminals with requirements up to 10 GHz such as for UWB. The MS-162A series is environmentally conscious and uses beryllium-free and halogen-free materials. It is RoHS compliant.

## Re-direction of the Antenna Circuit

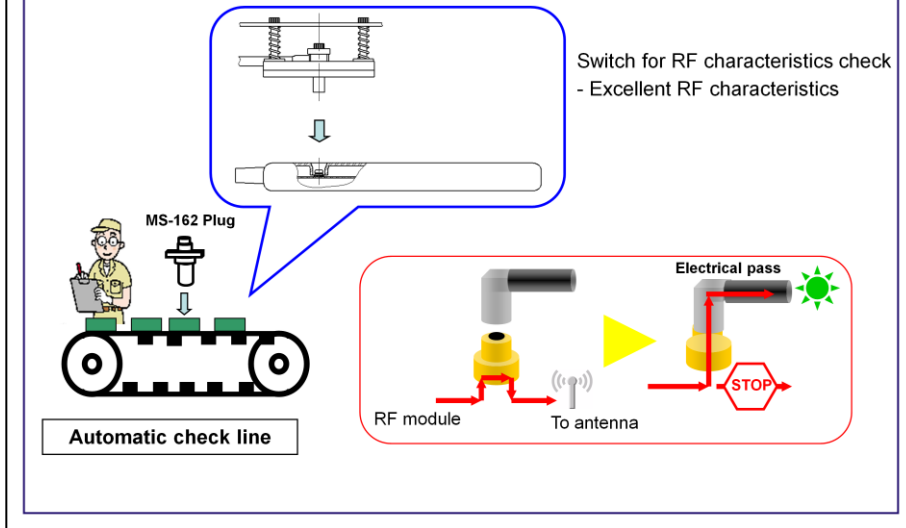
-Mounting image on mobile phone-



※Drawing above is only an example of mounting and may differ from actual design.

This coaxial switch has the ability to re-direct the antenna circuit in a device. There are times when a weak antenna signal occurs due to physical barriers. Typically this happens when using a wireless LAN indoors and the MS-162A becomes very effective in overcoming this problem. This can be accomplished by simply connecting to a external antenna. When the primary device is plugged into the external antenna, the connector automatically switches the device's internal antenna signal/circuit to the external antenna. When the device is un-mated it switches back to the devices internal antenna.

## Automatic Check on RF Circuit

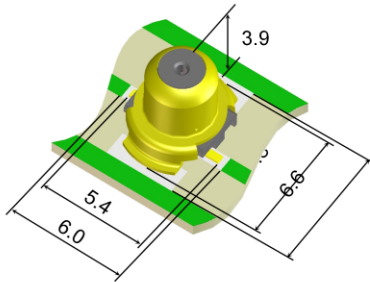


The MS-162A can also be used as a test point in checking the RF characteristics of a device. The device would be placed on a conveyer line system and as the device comes under the test probe, the probe comes down and makes contact with the MS-162A receptacle mounted on the device. If the signal passes through the test probe, the device is “passed” and the next device is brought up to test. If the device does not pass inspection, it can be pulled off the line for additional inspection. The MS-162A can make this test very simple and quick, along with significantly improving manufacturing productivity and the overall quality to the end user.

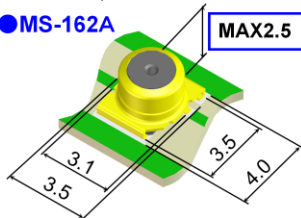


## Space Saving and Low Profile

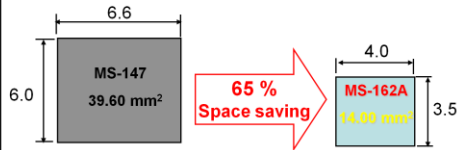
### ● MS-147 (Conventional Type)



### ● MS-162A



#### <<Occupied mounting area>>



#### <<Height>>

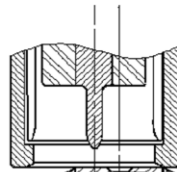


#### <<Weight>>

0.11 g **60% down** 0.043 g

Note: All dimensions in millimeters.

With today's compact devices, the MS-162A saves valuable PCB space and room in small, portable devices. Using Hirose's MS-147 series as a comparison, the MS-162A has reduced its PCB footprint by 65% and its weight by 60%. The MS162A has a 2.5 mm max profile and 3.1 x 3.5 mm footprint.

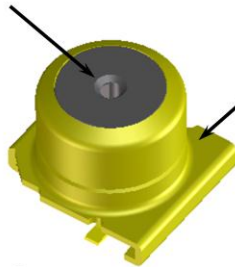
**Wide Self Alignment****MAX.  $\pm 0.5$  mm****MS-162-HRMJ-1  
(Plug)****MS-162A  
(Receptacle)****Absorbs max +/- 0.5 misalignment.**

The plug side of the MS-162A features a generous self-alignment tolerance of +/- 0.5mm. This allows the plug to “guide” itself into the proper position to interface with the receptacle during test procedures and actual service instances.

## Environmentally-friendly Design

### ① Halogen-free material

Environment- friendly material for the insulator.



### ② Beryllium free material

Beryllium free material for high performance of spring contact.

### ③ RoHS compliant

All components and materials comply with the requirements of the EU Directive 2002/95/EC.

### ④ Plastic for the reel

Polystyrene reel and tape are used in place of paper products.

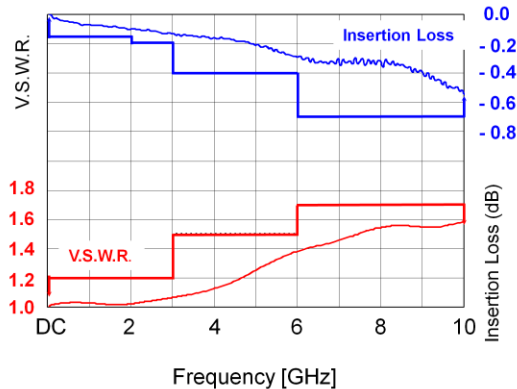
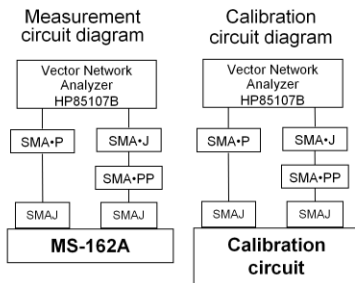


Hirose is an environmentally aware company and the material selection for the MS-162A is no exception. In addition to meeting RoHS compliant directives, the MS-162A uses beryllium free copper alloy for springs and the insulator material is made halogen free by using a LCP (Liquid Crystal Polymer) material that does not contain bromide, which is typically used as a flame retardant. A plastic, polystyrene reel is used to eliminate the need for a paper/cardboard reel.

## Insertion Loss & V.S.W.R. (Typical Data)

Normally Closed (Unmated condition)

### Test Circuits



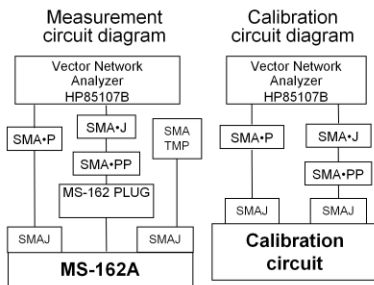
Performance is the key to any connector. The next three slides will illustrate the signal performance of the MS-162A. Two components need to be examined to determine the performance; Insertion loss and VSWR (voltage standing wave ratio). Insertion loss is the amount of signal energy remaining at the end of the run. The closer the insertion loss is to 0, the better. The VSWR measures how much of the signal gets reflected back. The closer the VSWR is to 1, the better. This slide shows the performance of the switch in the unmated condition, passing a signal from one trace on the PCB, through the MS-162A receptacle and back onto the PCB.. As can be seen, there is an extremely low loss of -0.15dB and VSRW of no more than 1.2 at a frequency of 2 GHz. Even at 10 GHz, the VSWR is no more than 1.7 and the insertion loss is no more than -0.7 dB.



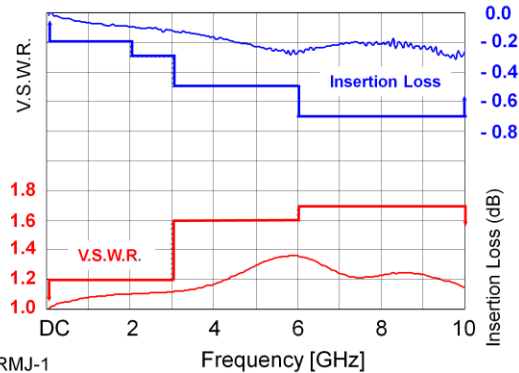
## Insertion Loss & V.S.W.R. (Typical Data)

Normally Open (Mated condition\*)

### Test Circuits



\*Tested in the mated condition with MS-162-HRMJ-1

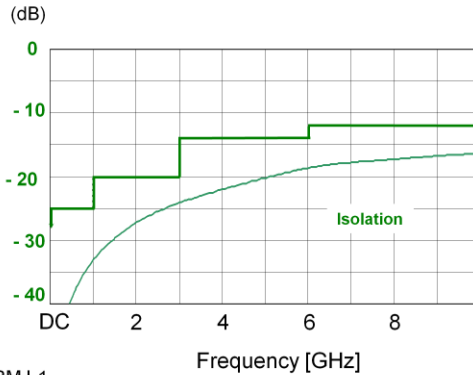
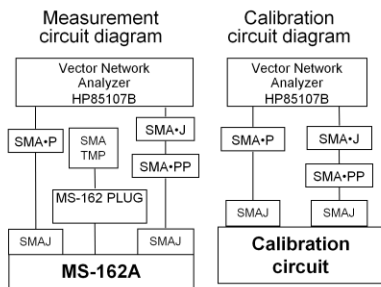


The previous slide showed the MS-162A in the un-mated condition. This slide shows the connectors in the mated condition with the signal going from the PCB trace to the plug side of the MS-162A. At 2 GHz, the insertion loss is no more than -0.2 dB and a VSWR on no more than 1.2. Operating at 10 GHz, the loss is still no more than -0.4 dB with a VSWR below 1.4.

## Isolation (Typical Data)

Normally Open (Mated condition\*)

### Test Circuits

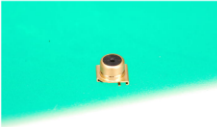


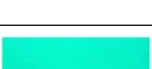



\*Tested in the mated condition with MS-162-HRMJ-1

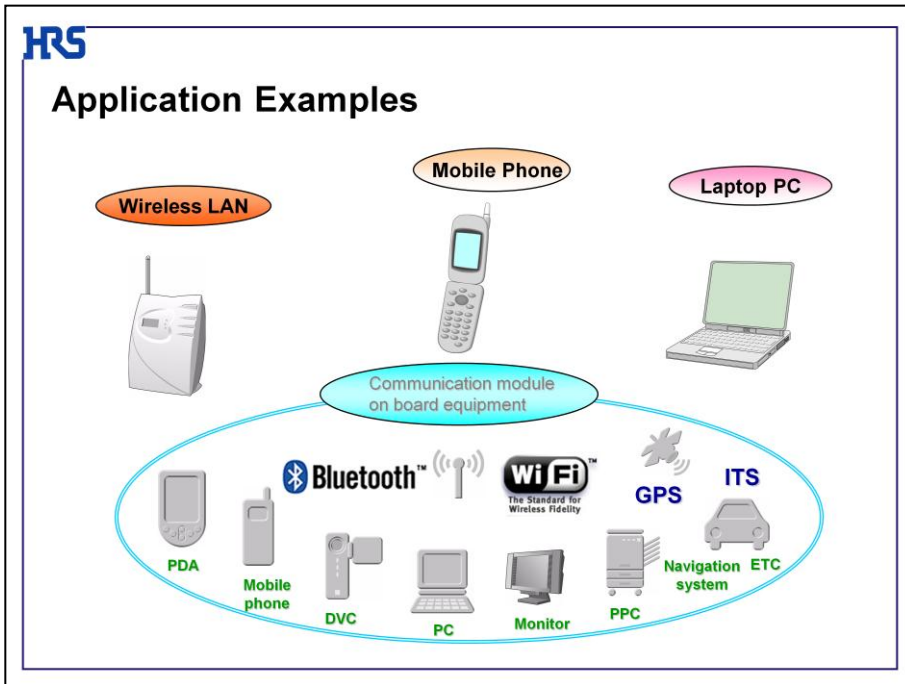
Isolation is also important. Isolation is the amount of the signal going from the one PCB trace to the other PCB trace when in the mated condition. The lower the number, the better. The graph shows high isolation performance -20 dB or greater at 2 GHz and 12dB or greater at 10 GHz. This indicates the very good switching characteristics of the MS-162A as a coaxial switch.



### MS-162A Series Product Variations

Description / Hirose Part Number	Product
<p>① <u>Receptacle</u></p> <p>MS-162A * MS-162A(01) **</p> <p>*Tape &amp; Reel packaging 3,000pcs/Reel **Bag packaging 100pcs/Bag</p>	
<p>② <u>Plug</u></p> <p>MS-162-C(LP)-1</p> <p>Plug Cable Assembly (350mm length)</p> <p>MS-162 Plug-SMA Jack      MS162L1-HRMJ-15W350 MS-162 Plug-SMA Plug      MS162L1-HRMP-15W350</p>	  
<p>③ <u>SMA Adaptor</u></p> <p>MS-162-HRMJ-1</p>	

In addition to the basic receptacles and plugs, Hirose also offers cabled plug assemblies with SMA connectors installed. There is also a SMA adaptor that can be attached to a SAM cable.



Due to the wide spread use of wireless technology and the number of devices that use that technology, the MS-162A should be considered as an indispensable connector in their design. From test to interface roles, the MS-162A has applications in wireless LAN, mobile phones, laptop PCs and other wireless hand held portable devices.



## Specifications

### Material and Finish

COMPONENT	MATERIAL	FINISH
Shell	Brass	Gold plating
Insulator	LCP	Black UL94V-0
Spring contact	Copper Alloy	Gold plating
Fixed contact	Phosphor bronze	Gold plating

### Product Performance

Operating temperature range	-40 to + 85 °C
Power	4 W
Frequency range	DC to 10 GHz

	Unmated condition	Mated condition*
V.S.W.R.	1.2 Max. (50 MHz to 3 GHz) 1.5 Max. (3 GHz to 6 GHz) 1.7 Max. (6 GHz to 10 GHz)	1.2 Max. (50 MHz to 3 GHz) 1.5 Max. (3 GHz to 6 GHz) 1.7 Max. (6 GHz to 10 GHz)
Insertion Loss	0.15 dB Max. (50 MHz to 2 GHz) 0.2 dB Max. (2 GHz to 3 GHz) 0.4 dB Max. (3 GHz to 6 GHz) 0.7 dB Max. (6 GHz to 10 GHz)	0.2 dB Max. (50 MHz to 2 GHz) 0.3 dB Max. (2 GHz to 3 GHz) 0.5 dB Max. (3 GHz to 6 GHz) 0.7 dB Max. (6 GHz to 10 GHz)
Isolation*	-	25 dB Min. (50 MHz to 1 GHz) 20 dB Min. (1 GHz to 3 GHz) 14 dB Min. (3 GHz to 6 GHz) 12 dB Min. (6 GHz to 10 GHz)

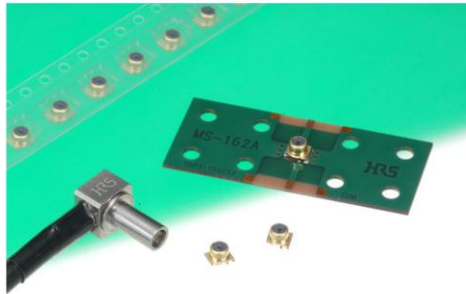
This product satisfies RoHS requirements.

\*Tested in the mated condition with MS-162-HRMJ-1

The chart on this slide shows the typical MS-162A materials and finishes and various specifications pertaining to general operating conditions and performance test results.



## Module Summary



Hirose's MS-162A series offer:

- Space-saving & light weight
- High electrical performance up to 10 GHz
- Environment-friendly design

In summary, Hirose's MS-162A series is a RF coaxial switch for interface of portable terminals and for microwave board test applications. It achieves the requirement for a low profile, light weight connector with low loss and high performance characteristics reflecting the advanced technology of today's portable terminals and devices. The series is also constructed with the environment in mind by using beryllium and halogen free components as well as meeting the RoHS directives.