BiTS 2008

Complete Zo=50 ohm Coaxial Spring Probe IC Socket

Tatsumi Watabe
S.E.R. Corporation : Managing Director

1. Overview

IC Test Socket for SHF best performance, SER has realized Complete 50 ohm Characteristic Impedance Coaxial Probe to use for FBGA and CSP Testing. Complete Zo Coaxial Probe, the concept is to do careful design for every portion detail on plungers, barrel, dielectric in coaxial to fit Zo=50 ohm and consider keeping totally stable GND design for PCB, IC and Socket GND. The Complete Zo Coaxial Probe has been confirmed the frequency performance exceeded 20GHz on Transmission Performance. The socket is available for 1.0, 0.8 and 0.5mm pitch.

The base socket is composed of 3 featured concept. (Photo.1)

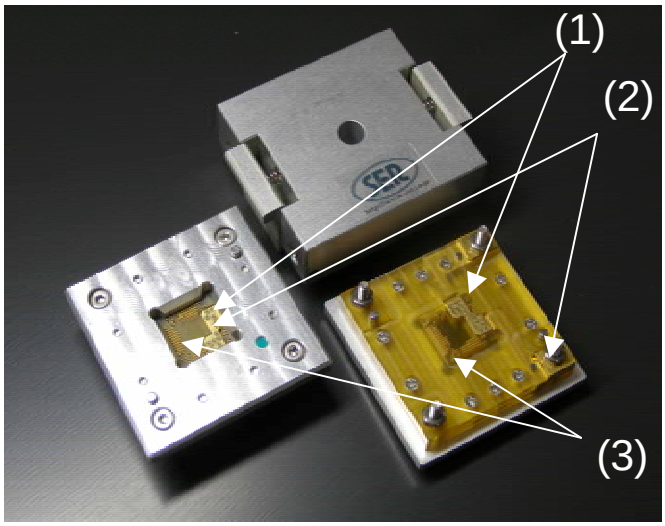

Photo. 1 Complete Zo=50 ohm Coaxial Spring probe IC Socket (0.5mm pitch)

(1) Complete Coaxial Spring Probe Contacts.

(2) Socket GND organize block.

(3) Regular composed Spring Probe block.

Best performance was brought from a combination of combining (1) and (2). It was confirmed by S parameter loop measurement by specialized board and Network Analyzer using like Fig. 3. And total cost saving comes from composing of (3).

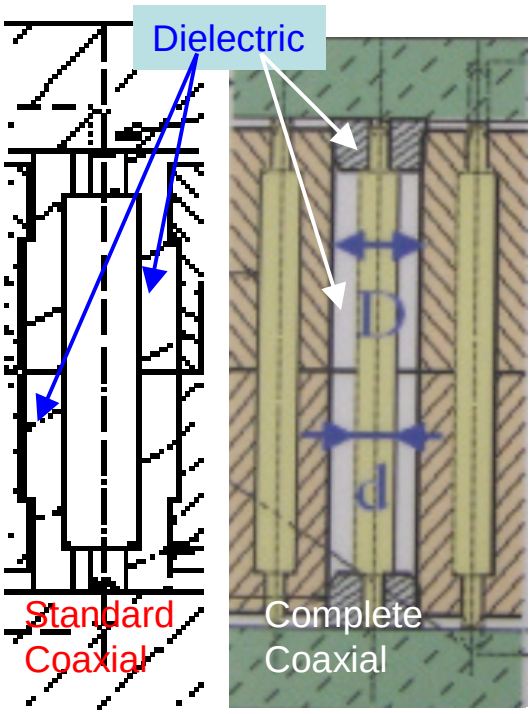

Fig. 1 Coaxial probe

2. Complete Zo Coaxial Probe (1).

Because Characteristic impedance is decided by the equation.

Zo=log(D/d) *138 / √Epsilon (ohm)

All Coaxial probe portion from PCB side (bottom) to IC terminal side (top) is designed to fit in Zo=50 ohm by choosing and adjust Dielectric(Epsilon) and diameter of plunger and barrel.

This example : Coaxial GND diameter is 0.9mm for 1.0mm matrix pitch and 0.41mm for 0.5mm matrix pitch.

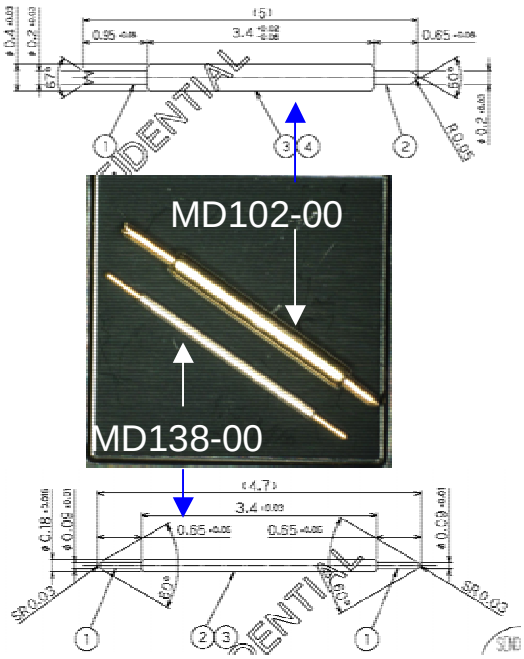

Fig 2. Coaxial core probe.

3. Core probe for coaxial probe(1).

1.0mm (MD102-00) : diameters

Barrel 0.40mm Plunger 0.20mm,

0.5mm (MD138-00) : diameters

Barrel 0.18mm, Plunger 0.18mm

are used (Fig.2). And deferent dielectric are used for plunger portion and barrel portion individually.

4. Coaxial GND is equate PCB GND(2).

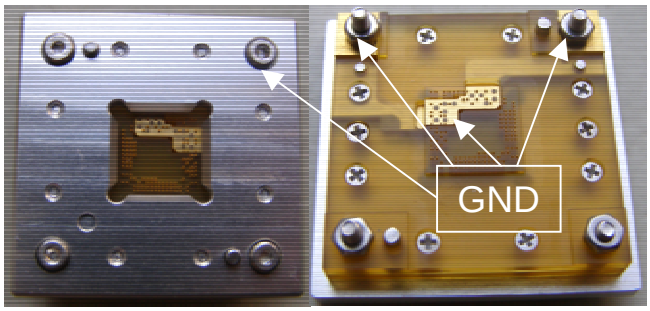

Photo 2. Socket GND organize

It is distinguished high frequency GND (analog GND on this IC socket) to other GND. Metal base is used for the Coaxial GND partially as Socket GND organized to PCB GND . Then IC GND was equalized to PCB GND by this composing.

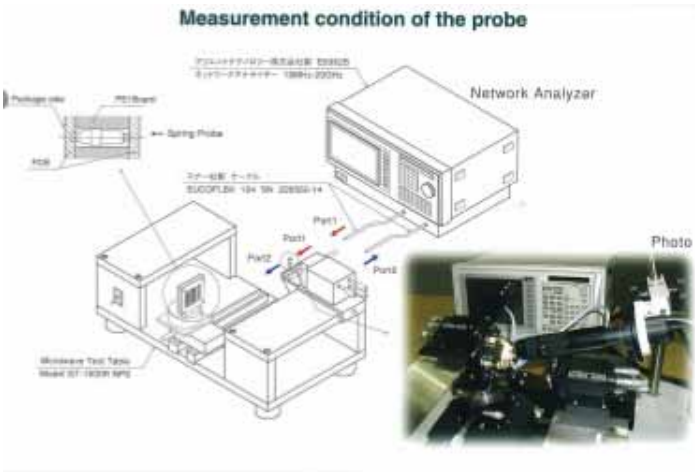

Fig 3. Measurement condition

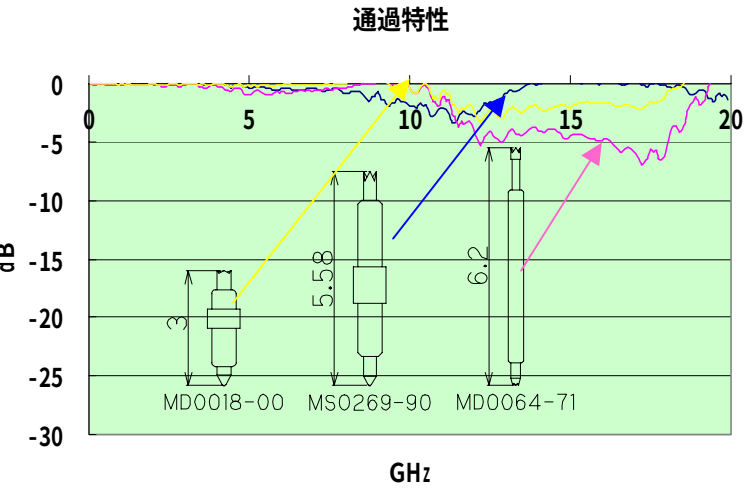

Fig 4. Probe performance restriction

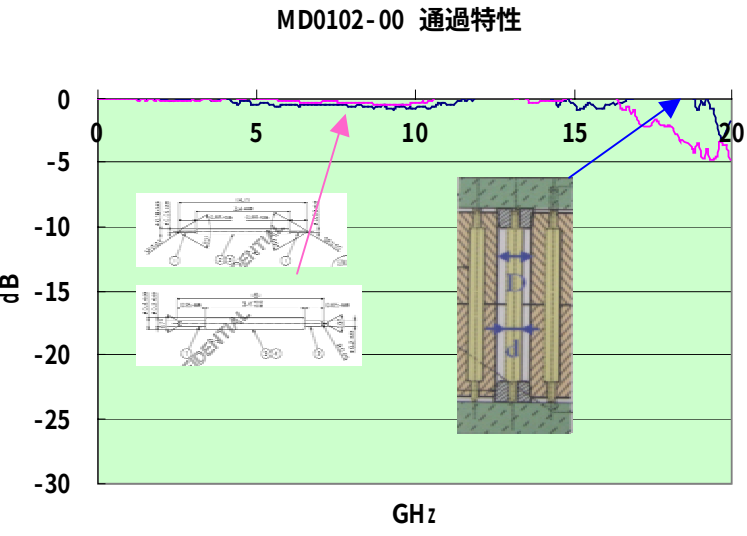

Fig 5. Complete Coaxial Probe Performance

5. Measurement Condition.

High frequency signal source through a Pico Probe touching to the specialized board (characterized to Zo=50 ohm) holding Probe or Coaxial Probe be assembled as same condition of IC base socket. And the signal return to Network Analyzer by **loop test condition. (Fig 3**.)

6. Probe S21 performance.

A probe is designed with flung or resistive belting on its surface has a transmission performance 5 through 7 GHz only (Fig 4.). It is not restricted by probe length like Fig 4. For achieving max. frequency performance, a core probe for coaxial must be more efficient design for SHF performance.

7. Complete Zo=50 ohm Coaxial probe performance.

20 GHz transmission performance was measured. A conditioning of complete Zo coaxial technique with, Socket GND equate technique brought this achievement for both of 1.0 mm and 0.5 mm coaxial probe socket by using MD102-00 and MD138-00 core probe. (Fig 5.)

Best design concept for IC Socket's Probe and GND location is required to be best fitting to IC contact terminal matrix. I think It will be needed more cooperated relationship enhancement between 'socket makers' and user 'IC users' together.