SMD Test Fixture IM9100

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***Abstract*—The SMD Test Fixture IM9100, which is used by LCR meters and other measuring instruments, is the first fixture of its kind in the world to be able to measure compact surface mount devices (SMDs) using four terminals. This paper introduces the products functionality, features, architecture, and other characteristics.**

I. INTRODUCTION

As smartphones and computers have moved toward increasingly small and lightweight designs in recent years, electronic components such as capacitors and inductors have also become more compact. The most commonly used size in the year 2014 is the 1005 (1.0 mm × 0.5 mm) size, but usage of the 0603 (0.6 mm × 0.3 mm) and 0402 (0.4 mm × 0.2 mm) sizes are increasing, and the 0603 size is poised to become the most commonly used after several years. Measuring the characteristics of compact electronic components such as these with an LCR meter, impedance analyzer, or other circuit component measuring instrument requires a fixture that can establish electrical contact with the target component's fine-pitch electrodes. At the same time, high-precision measurement is increasingly required due to the rising precision of electronic components. Hioki developed the IM9100 to meet these needs.

II. OVERVIEW

The IM9100 is a test fixture for compact SMDs in the 0402, 0603, and 1005 sizes. It uses separate measurement units for different sizes and is designed so that compact SMDs can be easily positioned for measurement. It is also designed to ensure electrical contact with compact SMD electrodes using four terminals to enable high-precision measurement while reducing the effects of contact resistance.

III. FEATURES

The IM9100 offers the following features:

1) Easy placement of compact SMDs

The IM9100 incorporates a guide groove for aligning samples on the measurement unit. Samples placed in this groove can be moved along it to reach the sample clamping area. Thanks to this design, even compact, 0402-size SMDs can be easily positioned for testing.

2) High-precision, four-terminal measurement

Each measurement unit is designed to ensure electrical contact with the target SMD's electrodes using four terminals, allowing the effects of contact resistance between probes and sample electrodes to be minimized. The IM9100 is the world's first fixture to enable four-terminal measurement of compact, 0402-size SMDs.

Appearance of the IM9100

3) High-stability measurement with variable contact pressure

By allowing the amount of downward pressure on the sample to be adjusted, the IM9100 ensures reliable electrical contact with the sample's electrodes.

4) Support for bottom electrodes

Since the IM9100 probes samples from the bottom, it can accommodate SMDs with either side or bottom electrodes.

IV. ARCHITECTURE

The IM9100's measurement method comprises the following steps: positioning the sample in the measurement unit, which consists of a sample clamping area; clamping the sample from above with the pusher tip pin; and measuring the sample by establishing electrical contact between the probes and the sample's electrodes from the bottom. (See Fig. 1.)

Architecturally, the IM9100 can be broadly divided into a test head unit and a pusher unit, the structure and operation of which are described below.

A. Test Head Unit

The test head unit consists of a sample clamping sub-unit, which clamps the sample in the measurement unit, and a probe sub-unit, which establishes electrical contact between the IM9100's probes and the sample's electrodes from the bottom.

1) Sample clamping sub-unit

The sample clamping sub-unit incorporates a guide groove designed for a specific sample width. The sample's orientation is adjusted by placing it in the guide groove, which leads to the square hole (see Fig. 2). During short correction, guide pins are used to allow the short fixture to be aligned.

2) Probe sub-unit

The probe sub-unit incorporates probes of various sizes that have been positioned in rows so that they can be operated at once.

When the probe up/down operation knob is rotated, a shaft that is attached to the knob rotates, and an eccentric cam attached to the shaft converts the rotational motion into up/down movement that is conveyed to a movable probe plate. The probes that establish an electrical connection with the sample are affixed to the movable probe plate and move up and down in response to the knob's rotational motion. During measurement, the probes move up to establish an electrical connection with the sample's electrodes (see Fig. 3).

B. Pusher Unit

As illustrated in Fig. 4, the pusher unit lowers a pusher tip pin to apply pressure to the sample that is clamped in the designated position on the test head based on the movement of the pusher traverser mechanism.

Up and down movement of the pusher tip pin is accomplished by converting the rotational motion of the probe up/down operation knob into up and down movement by means of an eccentric cam. The load applied to the pusher tip pin is applied by return springs, and the amount of downward pressure can be adjusted with the thrust adjusting screw.

When a sample is being positioned on, or removed from, the test head unit, the pusher moves from the measurement position to its retracted position on the left edge. The mechanism is designed so that the pusher cannot be slid sideways if the pusher tip pin is in the lowered position to prevent damage due to inadvertent operation of the tip pin.

V. CONCLUSION

The IM9100 is a fixture that can measure compact SMDs with four terminals. Hioki expects it to find broad use in the development and production of the compact SMDs that will enter into common use in the future.

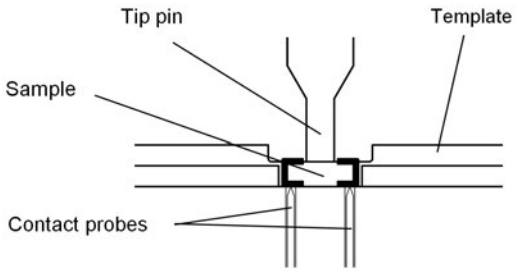

Fig. 1. Sample Electrode and Probes

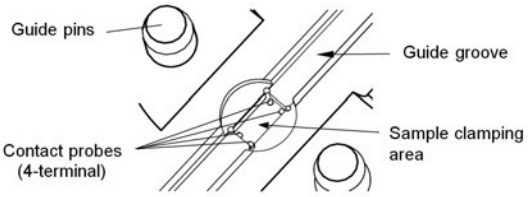

Fig. 2. Sample Clamping Sub-unit

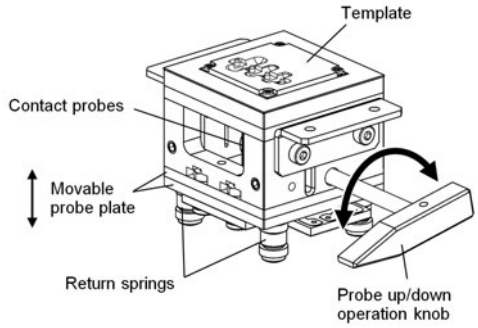

Fig. 3. Test Head Unit

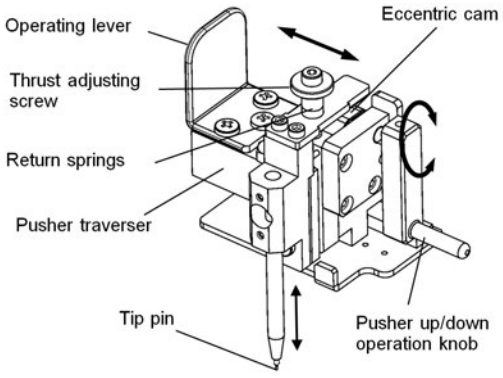

Fig. 4. Pusher Unit

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