Aries

QFP microstrip socket

DC Measurement Results

prepared by

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Objective

The objective of these measurements is to determine the DC performance of an Aries QFP microstrip socket. Measurements are to determine parameters relevant to test applications. Among those are current carrying ability, contact resistance and leakage as a function of voltage.

Methodology

A four terminal (Kelvin) measurement setup is used that includes a computer controlled voltage source capable of delivering 10 A. The voltage developed across the contact is measured with a HP 3456A DMM and yields a V-I record.

Contact resistance testing as a function of displacement is performed in a test fixture with a calibrated LDT linked to the data acquisition system and the same 4 terminal measurement setup as used for the V-I-curve determination.

Leakage testing relies on acquisition of a large number of data points with subsequent averaging to reduce noise as much as possible. In this manner, pA leakage currents can be detected.

Test procedures

During testing drive current is increased in binary steps up to a maximum of 1 A. The dwell time for each current step is 0.5 s for V/I curves.

Setup

For current handling tests, all contacts are grounded except for one.

The QFP microstrip socket is placed into the test setup between two metal plates. Au over Ni plating was applied to the surfaces of the brass plates. A four terminal (Kelvin) measurement setup is used that included a computer controlled current source capable of delivering 10 A. The voltage developed across the contact is recorded at separate terminals with an HP3456A digital voltmeter.

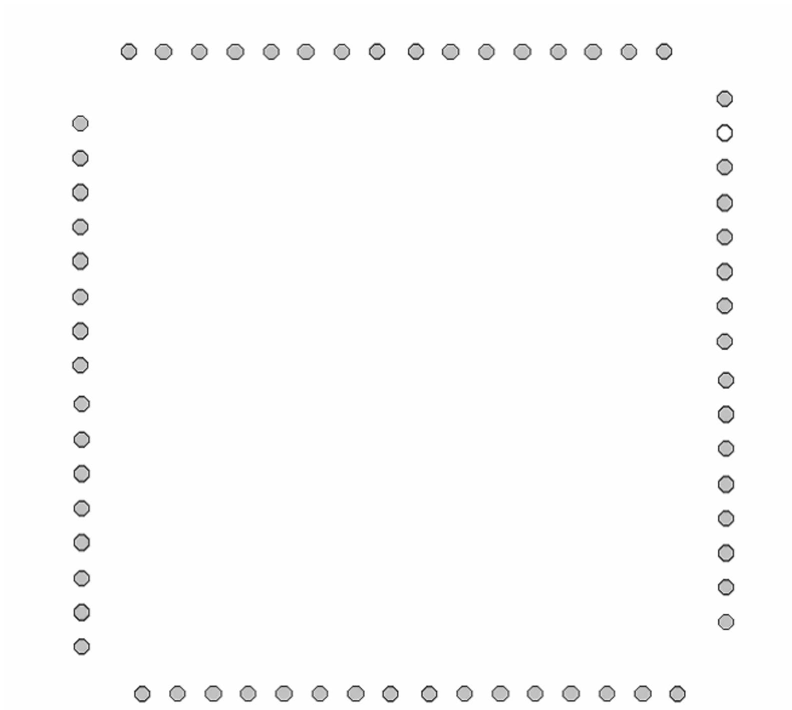

Figure 1 QFP microstrip socket test arrangement; the marked pin is driven

Once the data are available, they are processed to reveal the resistance and power dissipation as a function of drive current.

For leakage measurements the shorting plate on the DUT side is removed and an excitation applied to the connection under test.

The QFP microstrip socket is held in a fixture consisting of insulating material similar to the one shown in Fig. 2:

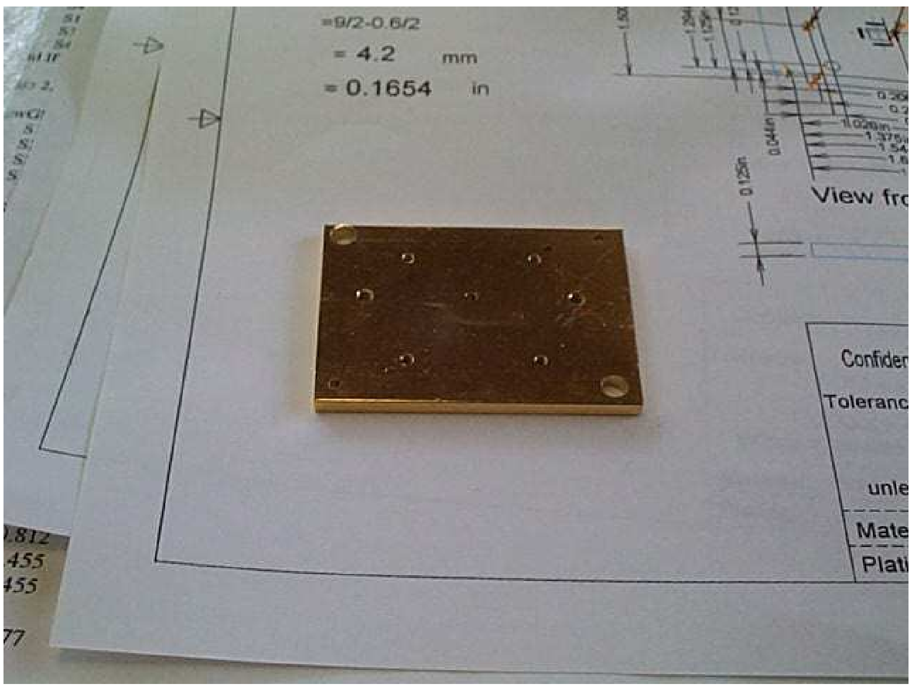

Figure 2 QFP microstrip socket mounting plate example

Leakage testing is performed via computer controlled voltage source and DMM. Voltage is increased in small steps and the associated current is recorded. From these values, resistance is computed.

Sketches of the setups used during testing are shown in Figures 3 and 4 below:

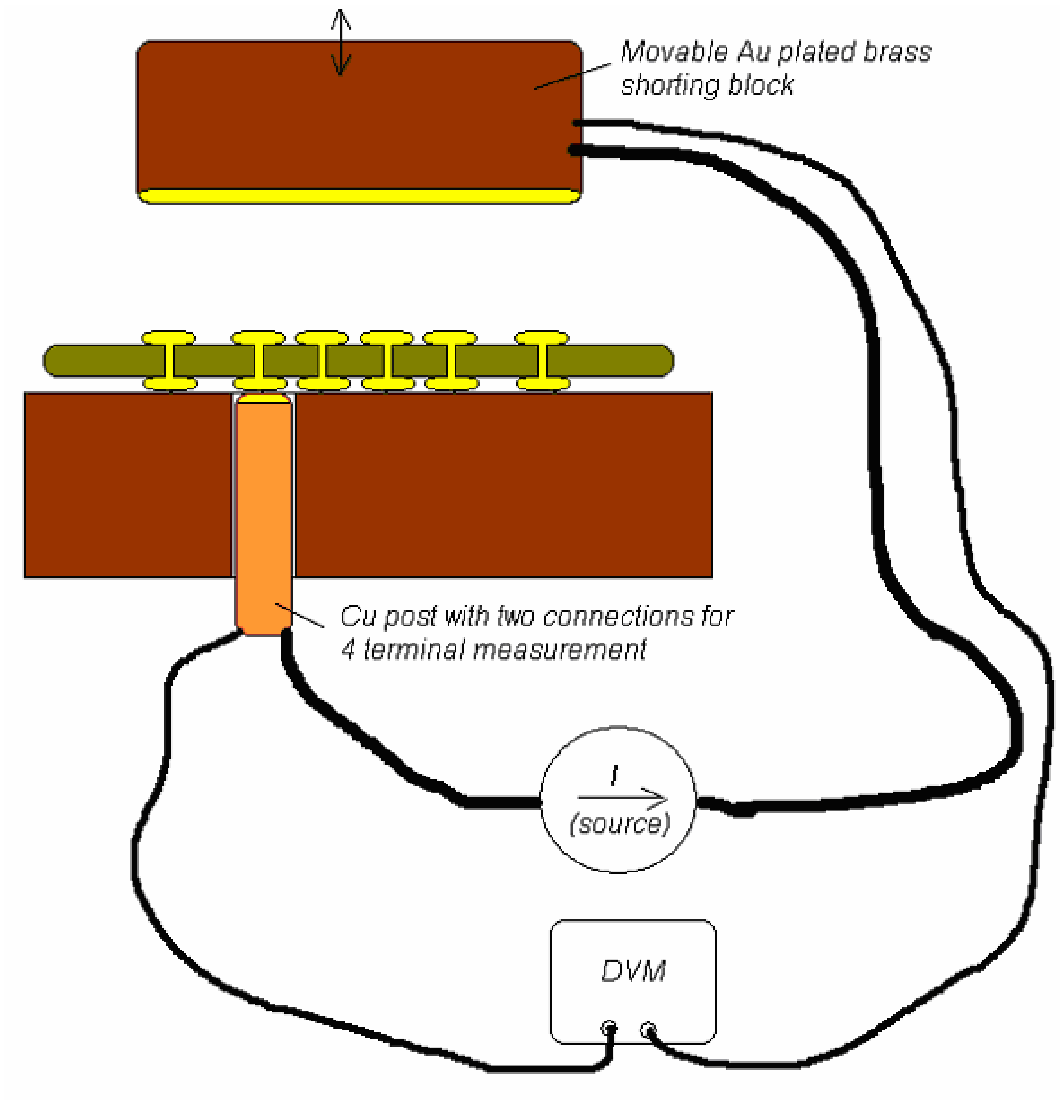

Figure 3 Test setup for 4 terminal (Kelvin) measurements

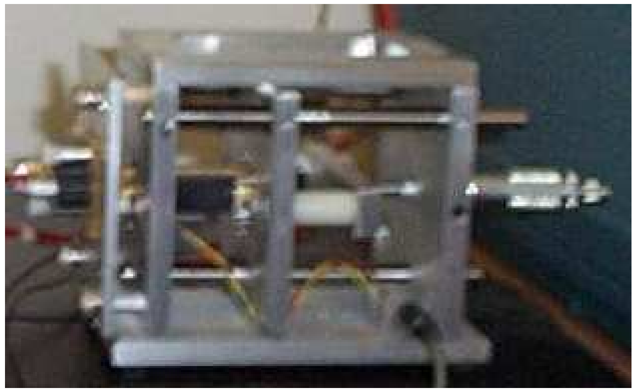

Figure 4 Test station for 4 terminal (Kelvin) measurements

Measurements

Resistance

The resistance as a function of deflection is an important quantity since it testifies to the level of compression required to achieve a valid and stable electrical connection. The observed curve for the Aries QFP microstrip socket is shown below:

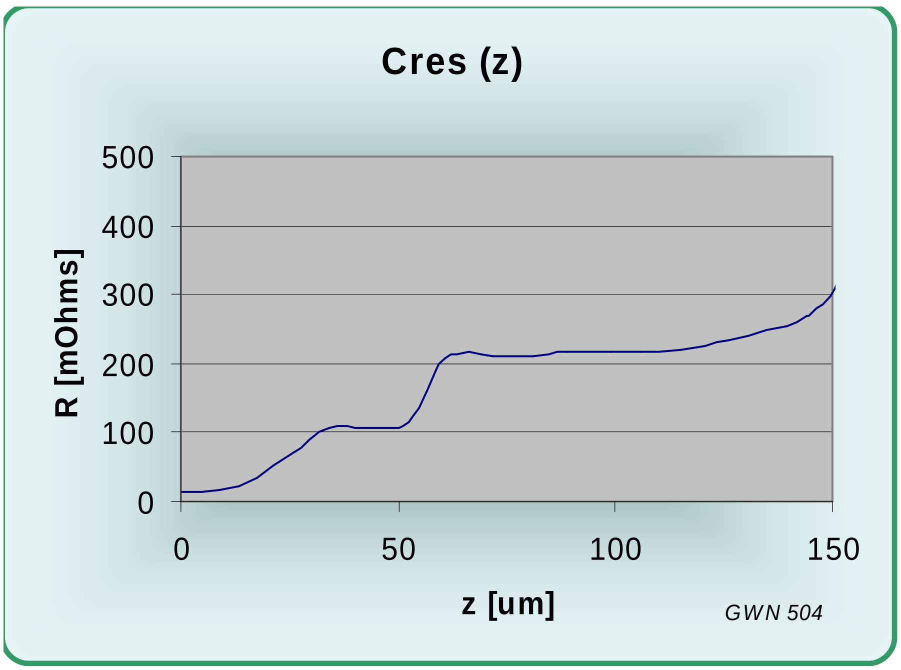

Figure 5 Contact resistance as a function of displacement

This measurement includes the contact resistance at the pads (Cres) and the dc resistance of the contact itself. For this graph, the value z=0 represents the maximum compression in operation, i.e. with the DUT fully inserted. Small up/down variations in the graph are likely the result of a 'stop and go' measurement because of manual actuation of the setup.

Resistance drops as more and more area of the microstrip contactor touches the strip on the 'PCB' (in this case a custom test fixture).

Current carrying capability

The measured current – voltage relationship for the CSP microstrip socket shows a linear slope up to 1A. While the socket is rated to 4A this value was chosen for the measurement with the cycling setup because of a setup limitation. The cycling setup, used for this test in order to remain compatible with other socket tests, lacks a strip underneath the contact. Thus, its resistance is higher than in actual operation. Therefore, a separate measurement was conducted to assess the performance at 4A (see end of this section).

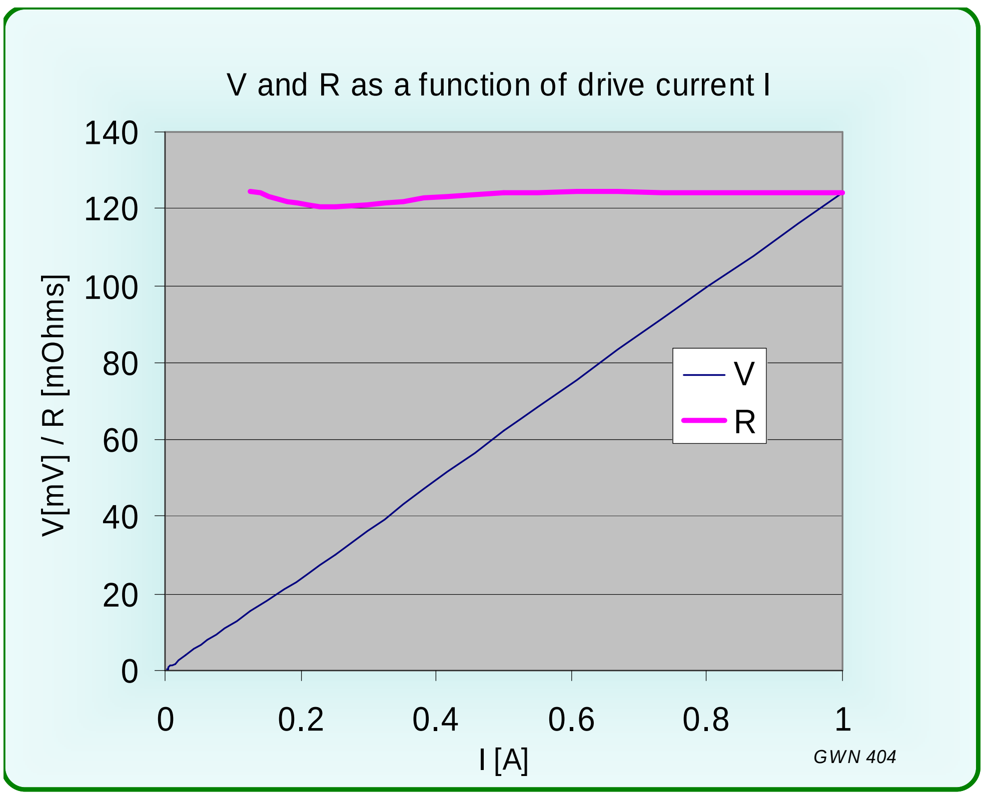

Figure 6 Voltage and resistance as a function of drive current

There are no anomalies in this response.

In lieu of a temperature measurement the power dissipation in the contact is calculated as a function of drive current from the above measurements:

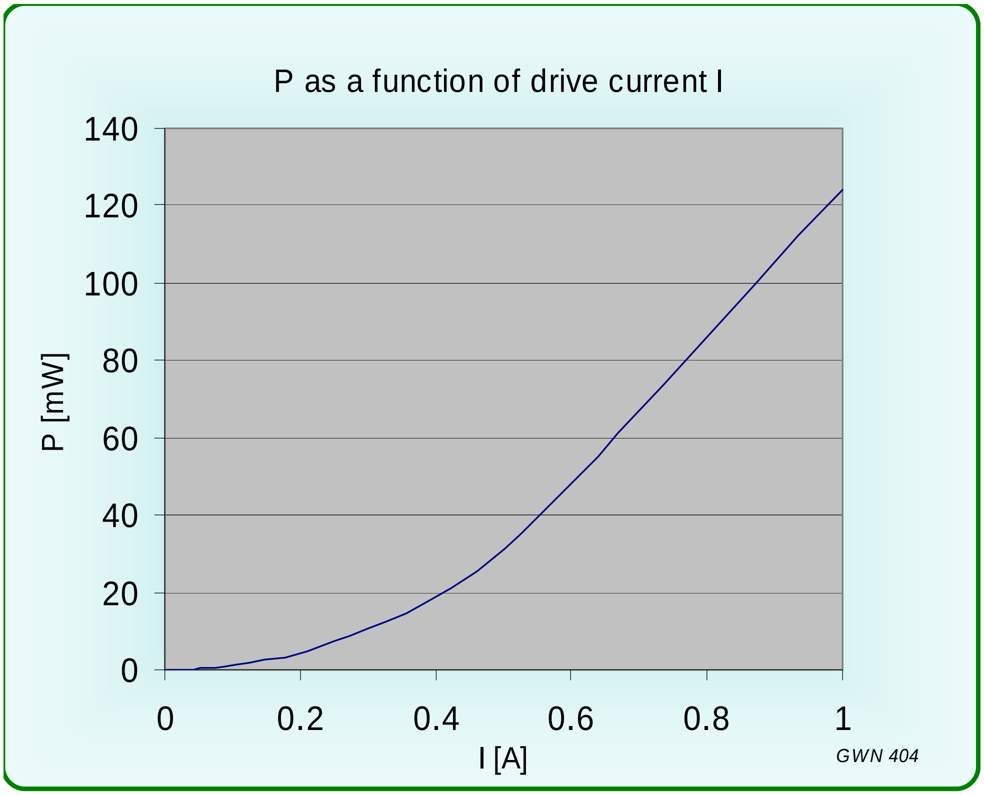

Figure 7 Power dissipation as a function of drive current

The accompanying power dissipation in the connection exceeds 100mW at 0.85A.

To present a more accurate assessment, a modified experiment was conducted, where a strip of conductive 3M Cu tape was installed under the socket. This enabled the entire contactor to touch metal and allowed for an increase of the current to 4A. The resulting response indicated a resistance of 30 milliOhms at 4A.

Leakage current

Any conductive path between contacts can and will cause difficulties for accurate testing of devices with high input impedances. Thus, leakage current was measured as a function of excitation voltage between two adjacent connections:

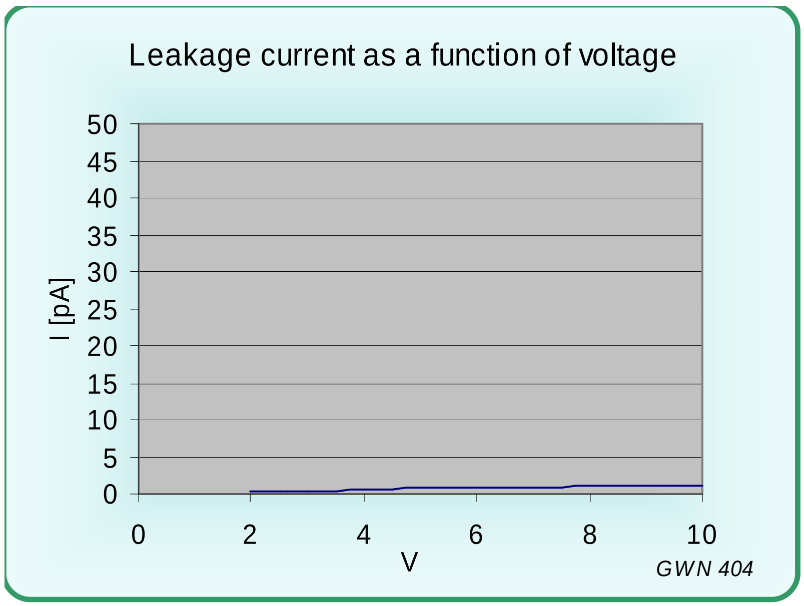

Figure 8 Leakage current as a function of drive voltage

Leakage is very low and is at the system limits.

When computing the corresponding resistance, very large values result:

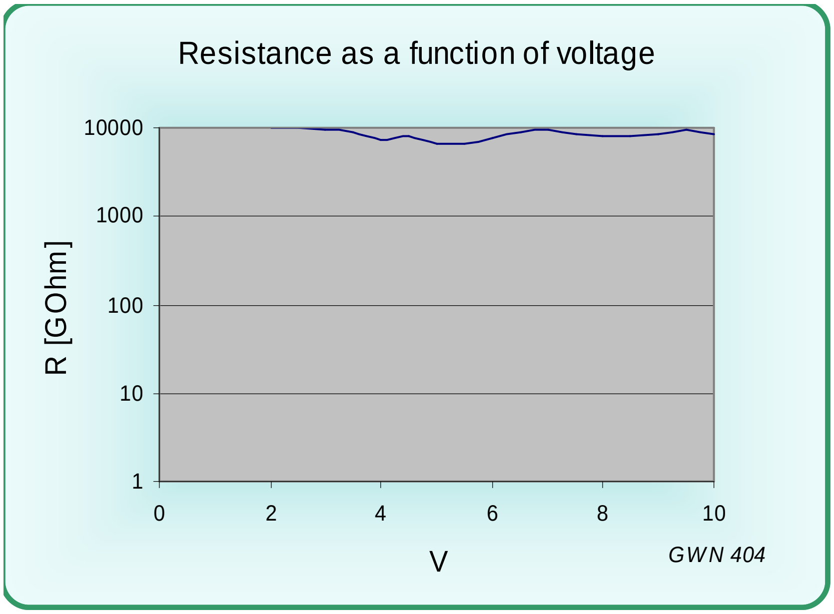

Figure 9 Leakage resistance as a function of drive voltage

The resistance values are at the measurement system limits for all excitation voltages.