Aries

Kapton QFP socket

DC Measurement Results

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Objective

The objective of these measurements is to determine the DC performance of an Aries Kapton QFP 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

For Cres testing the DUT plate is brought forward until electrical contact is registered. This corresponds to a large z value. Displacement is then adjusted until the nominal DUT position is reached. This position corresponds to z = 0.

During I-V testing drive current is increased in binary steps up to the maximum allowable level. The dwell time for each current step is 0.5 s for V/I curves. Once the data are available, they are processed to reveal the resistance and power dissipation as a function of drive current.

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.

Setup

For all tests, all contacts are grounded except for one:

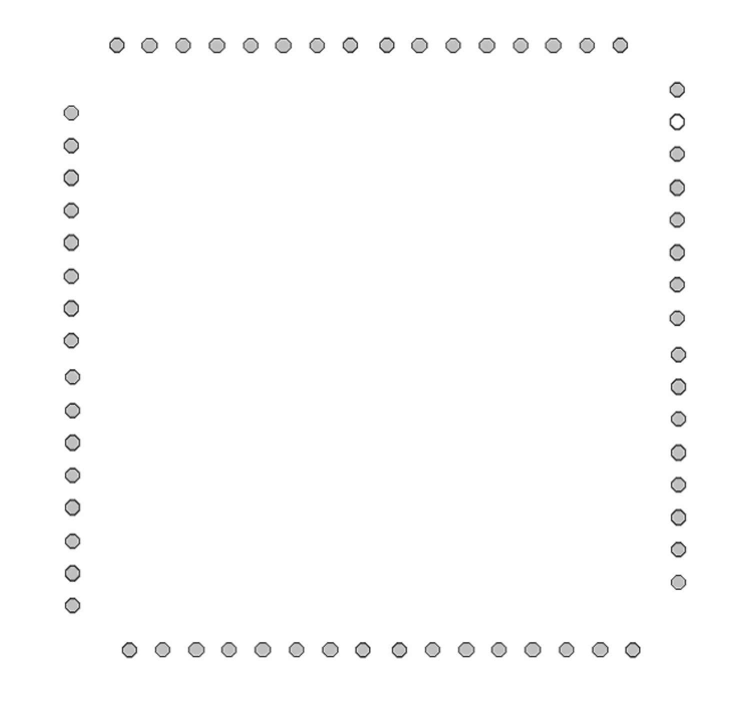

Figure 1 Kapton QFP socket test arrangement; the marked pin is driven

The Kapton QFP socket is mounted on a plate as shown in Fig. 2 and tested in a setup similar to the one shown in Fig. 4:

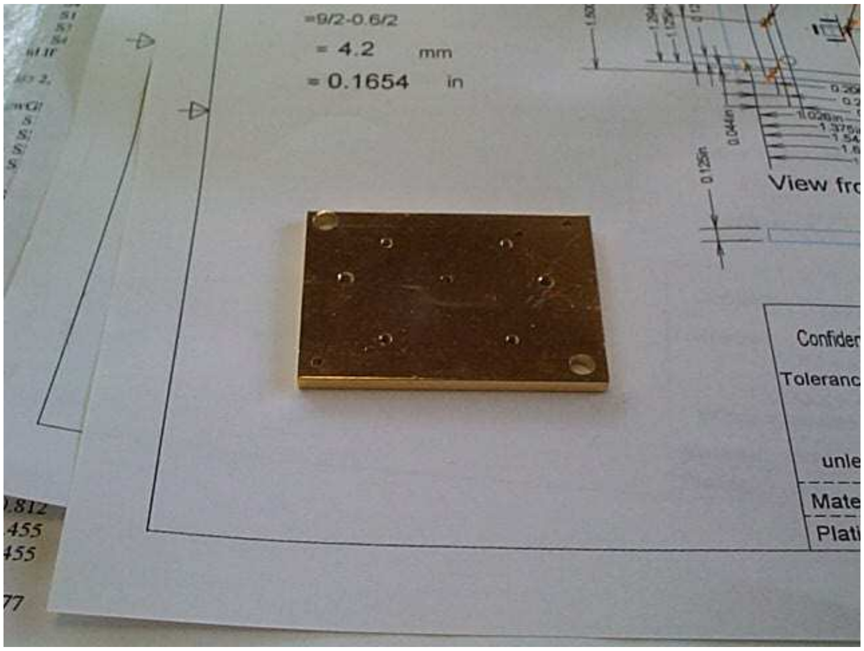

Figure 2 Kapton QFP socket mounting plate example

Au over Ni plating was applied to the surfaces of the brass plate. Material type and thickness specifications were identical to those used for PCBs.

The current/voltage probe consists of a copper post with suitably shaped surface. This surface is Ni and Au plated. The post has two connections, thus allowing for a four terminal measurement with very low residual resistance (about 1 milliOhm).

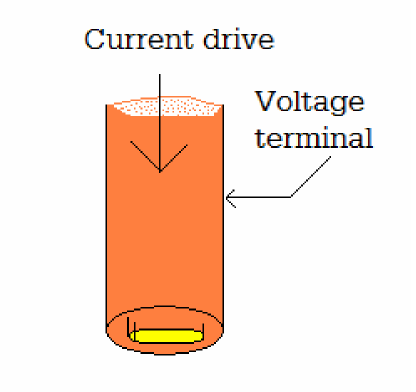

Figure 3 Current drive probe

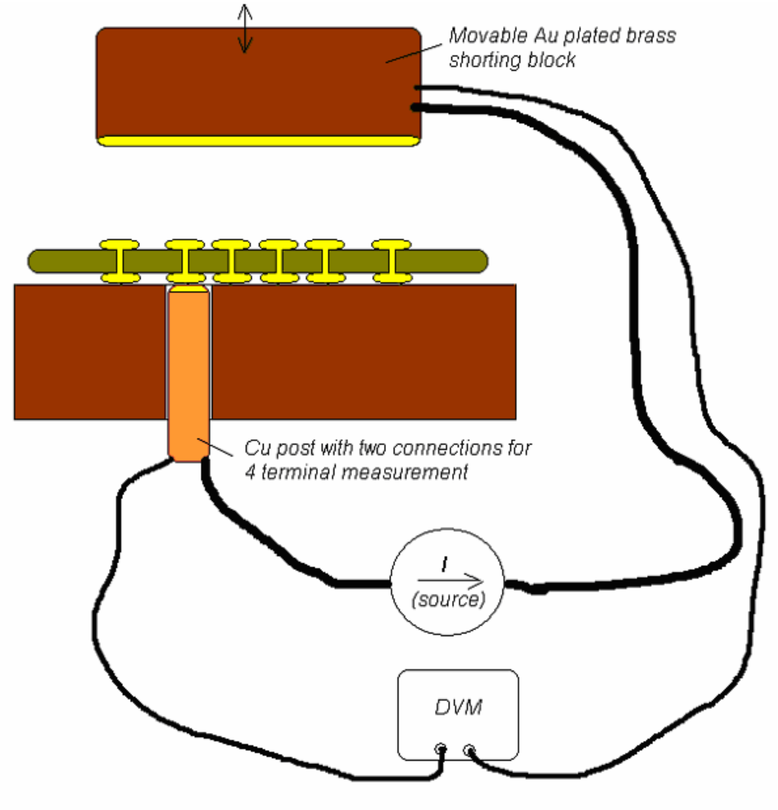

Figure 4 Test setup for 4 terminal (Kelvin) measurements

The socket with its plate is mounted in a test stand with XYZ adjustment capability:

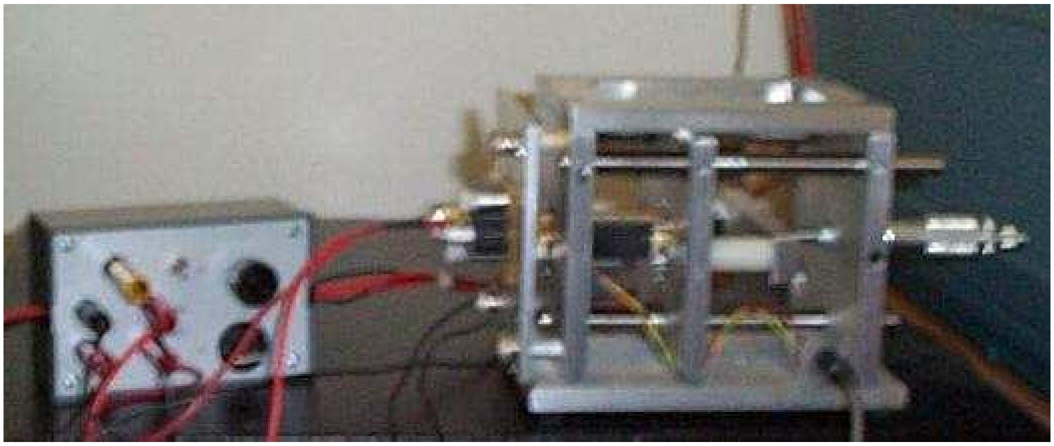

Figure 5 Test stand

This setup has a micrometer screw that allows repeatable adjustments in the Z direction. Also included is a transducer that converts Z position to an electrical signal for the data acquisition.

For resistance and current handling tests, all contacts are grounded except for one. The socket is then placed into the test setup. A brass plunger shaped like an actual test IC is pressed against the contacts on the DUT side of the socket. Au over Ni plating was applied to the surface of the plunger. 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. Once the data are available, they are processed to reveal the resistance and power dissipation as a function of drive current.

The same setup is used for contact resistance measurements. In this case, connections are made only to an HP3456A DMM. It is operated in 4 wire mode for this measurement. A precision linear potentiometer serves as a distance transducer. Its resistance is recorded by a second HP3456A DMM.

For leakage measurements an excitation is applied to the test probe. The DUT side of the socket is left open circuited. Leakage testing is performed via computer controlled voltage source (10V max.) and HP 3456A DMM.

Measurements

Resistance

The resistance as a function of deflection is an important quantity since it testifies to the minimum compression required to achieve a valid and stable electrical connection. It also gives a measure of placement accuracy and force application for the handler.

The observed curve for the Aries Kapton QFP socket is shown below:

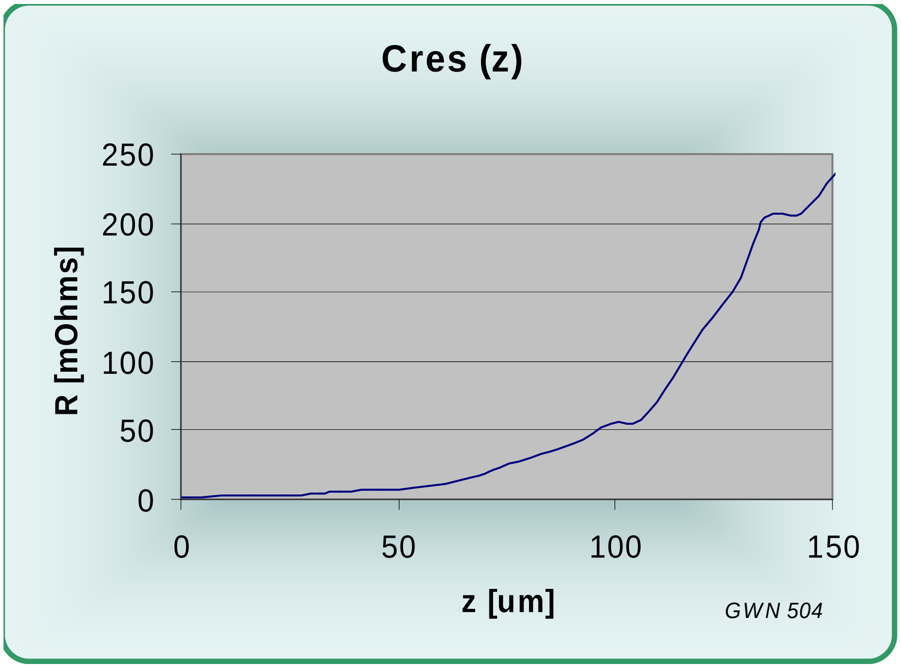

Figure 6 Contact resistance as a function of displacement

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.

Current carrying capability

The measured current – voltage relationship for the Kapton QFP socket shows a linear slope:

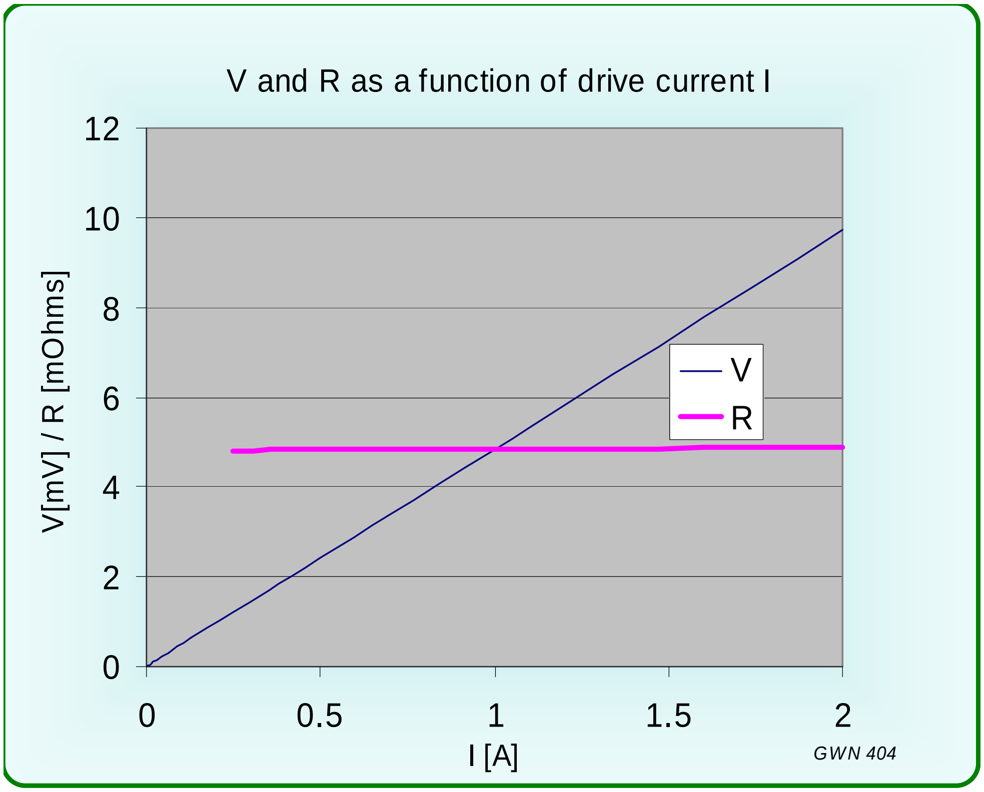

Figure 7 Voltage and resistance as a function of drive current

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:

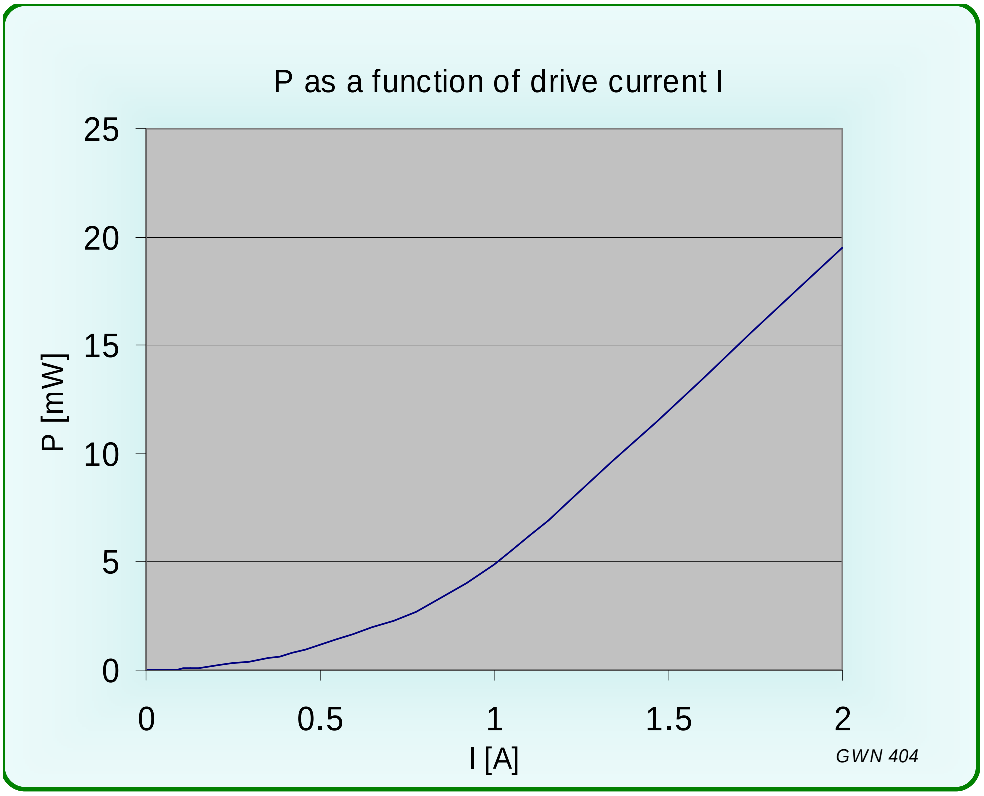

Figure 8 Power dissipation as a function of drive current

The accompanying power dissipation in the connection never exceeds 100mW.

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:

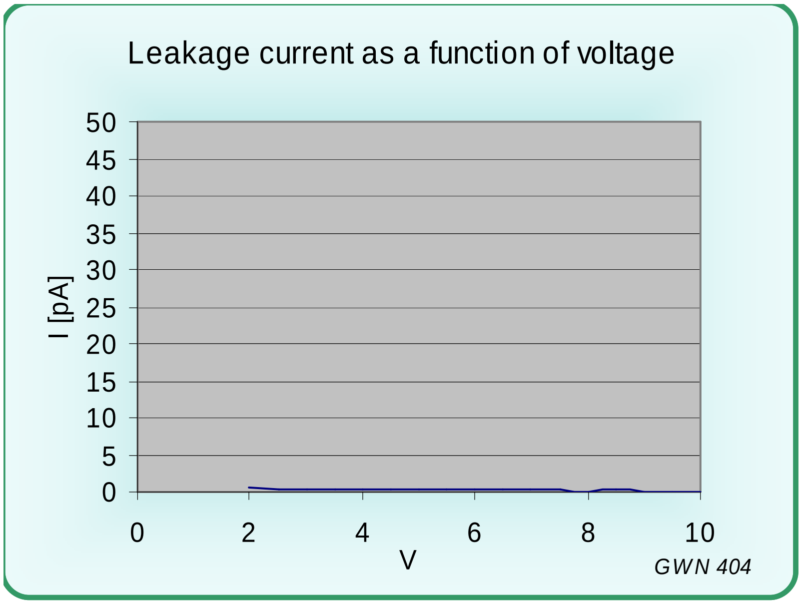

Figure 9 Leakage current as a function of drive voltage

Leakage is very low and is at the system limits.

When computing the corresponding resistance, very large values result:

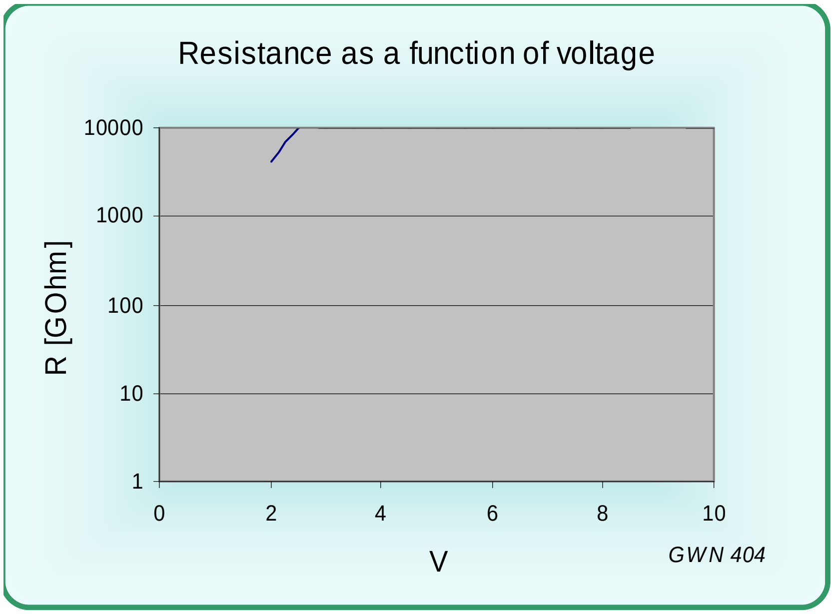

Figure 10 Leakage resistance as a function of drive voltage

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