Ironwood Electronics

SM Interposer

DC Measurement Results

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Objective

The objective of these measurements is to determine the DC performance of a Ironwood Electronics SM interposer. Measurements are to determine current carrying ability.

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. A 4 terminal setup (Kelvin measurement) setup is used and the DMM is operated in compensated mode to remove the effects of thermo-electric voltages due to dissimilar metals.

For the current handling tests the temperature rise in the center of the contact is measured with a 0.003” diameter thermocouple as drive current levels are gradually increased.

Setup

The SM interposer is installed in a small block which is mounted on an Au covered brass base plate (see Fig.1 and 2).

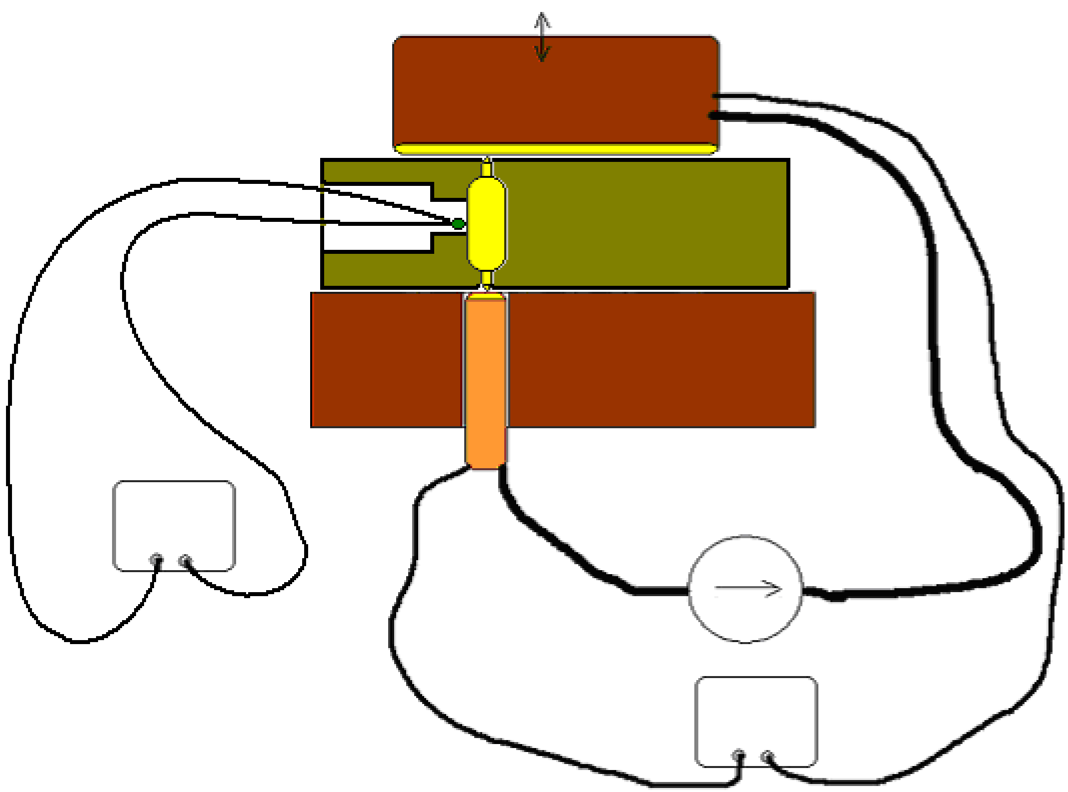

Figure 1 Test setup

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). It should be kept in mind that in this setup the contact presses against two surfaces that are very well heat sunk.

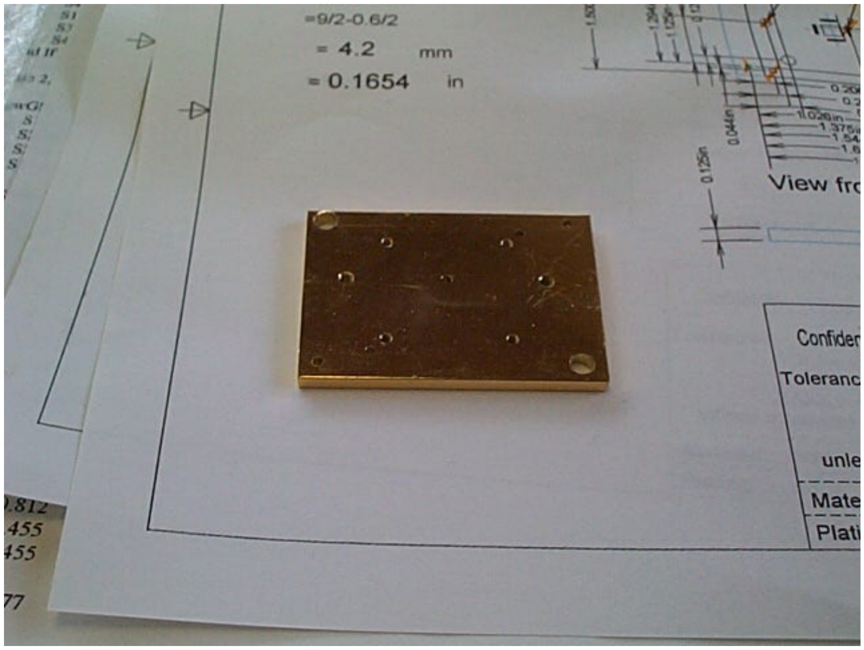

Figure 2 SM interposer mounting plate example

Au over Ni plating was applied to all metal surfaces. Material type and thickness specifications were identical to those used for PCBs.

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

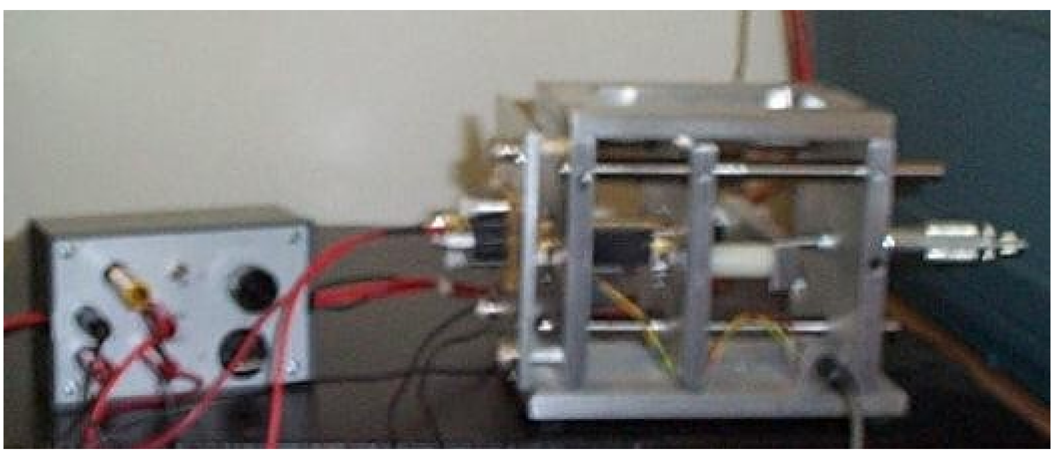

Figure 3 Test stand

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.

Test procedures

During I-V testing, the z value is adjusted to nominal operating position and drive current is increased in steps of 0.05 A up to the maximum tolerable level. The dwell time for each current step is 1 s for V/I curves. Once the data are available, they are processed to reveal the resistance, power dissipation and temperature as a function of drive current.

Pulse load testing is performed by providing a current pulse of 0.3 seconds length followed by a pause long enough to facilitate 10% and 1% duty cycles. Current levels are ramped to the maximum value and temperature rise determined is determined at each step. The current handling capability is then determined for the allowable temperature rise.

The thermal response time constant is a result of determining both rise and fall-times and averaging the two values.

Measurements

Current carrying capability

The measured current–voltage relationship of a Ironwood Electronics SM interposer is recorded for gradually increasing drive current:

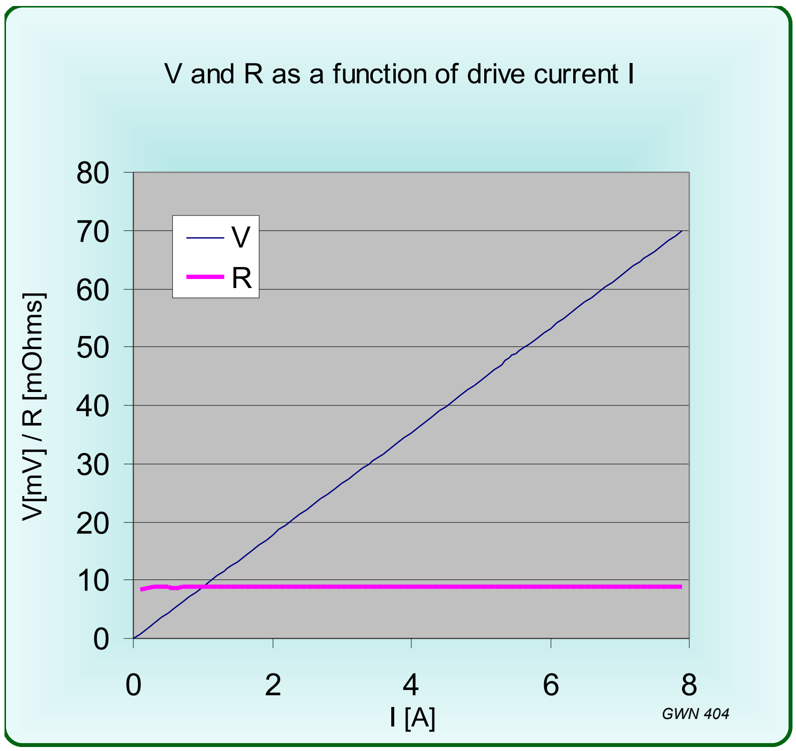

Figure 4 Voltage and resistance as a function of drive current

There are no aberrations in the response. A small change of resistance occurs at high drive levels.

Of interest is also the power dissipation in the contact:

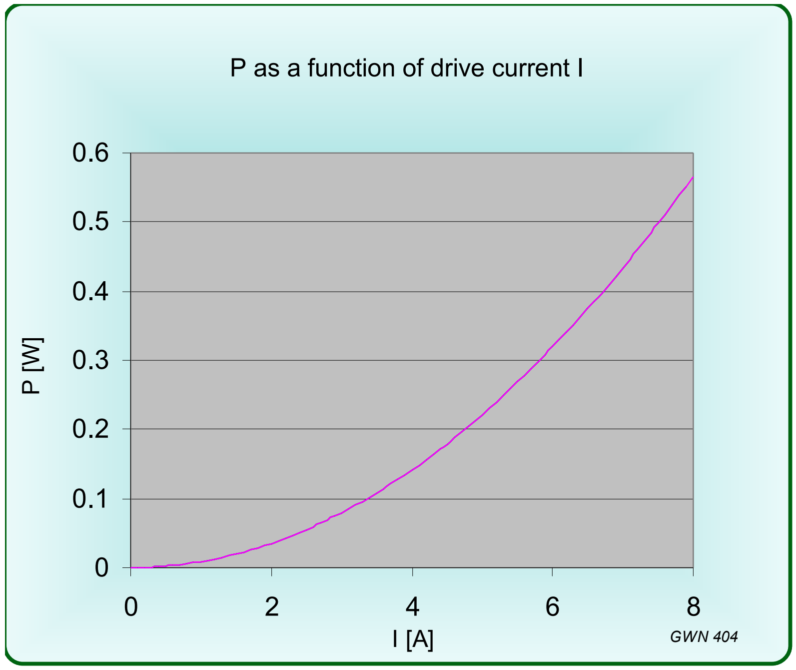

Figure 5 Power dissipation as a function of drive current

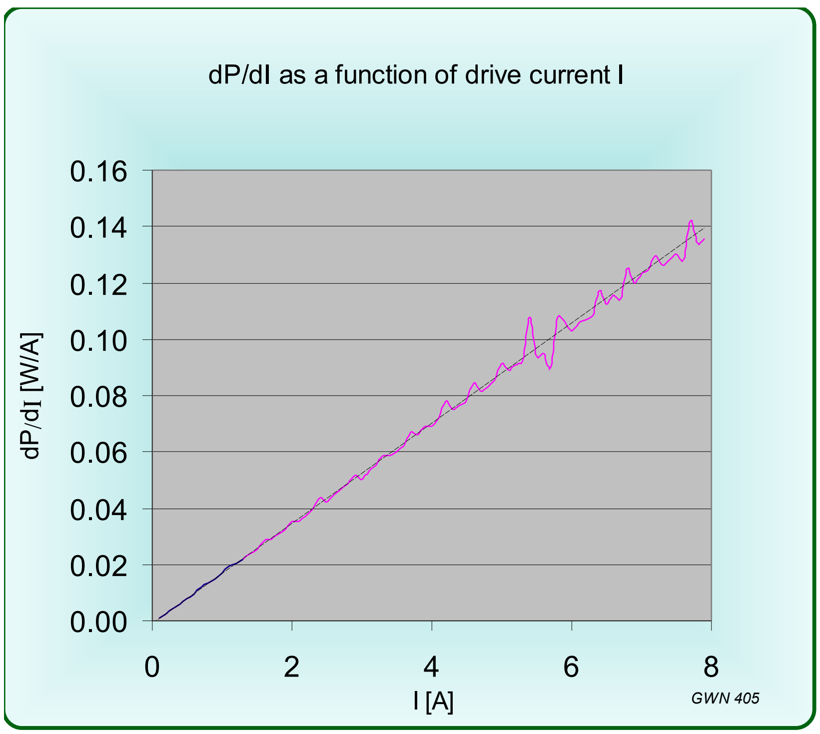

Figure 6 Derivative power dissipation as a function of drive current

Power dissipation follows a square law up to a current value of 8 A.

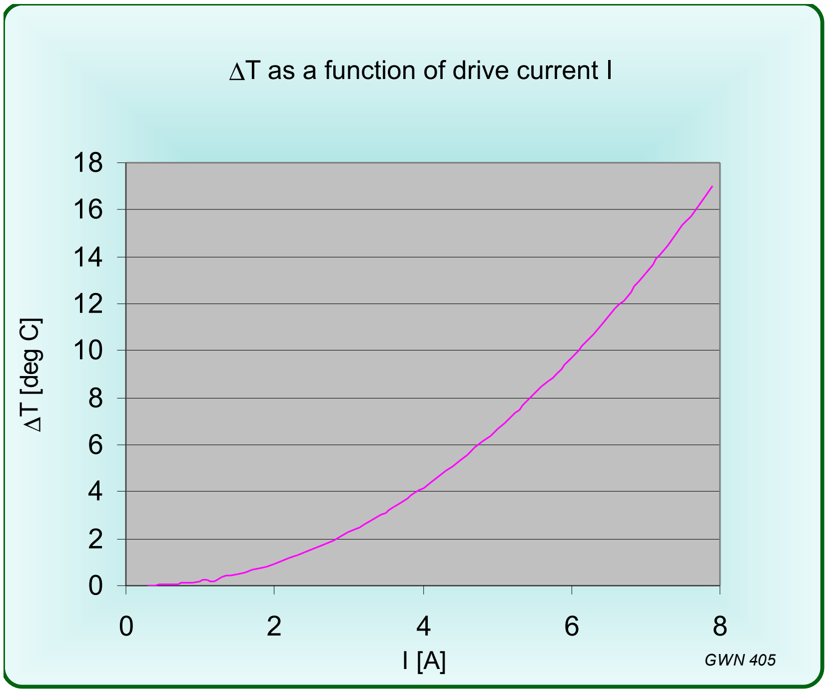

Figure 7 Temperature rise as a function of drive current

The temperature rise above ambient temperature increases as drive currents increase. At 8.5 A that value has reached 20 degrees C.

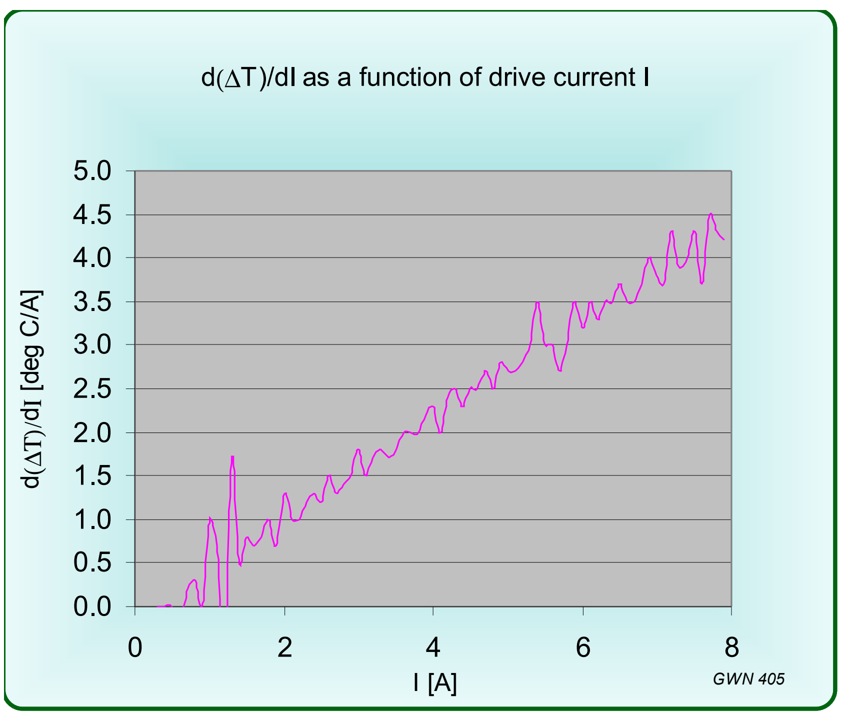

Figure 8 Derivative temperature rise as a function of drive current

Pulse testing

During pulse testing current is turned on for 0.3 seconds and then set to zero for the remainder of the cycle time (3 seconds for 10% and 30 seconds for 1%). As peak current increases so does the temperature rise. Because of the thermal response time of the contact, it does not, however, reach the full temperature value as in DC testing. Hence the current carrying capability is higher under pulse conditions.

A graph shows temperature rise as a function of drive and duty cycle:

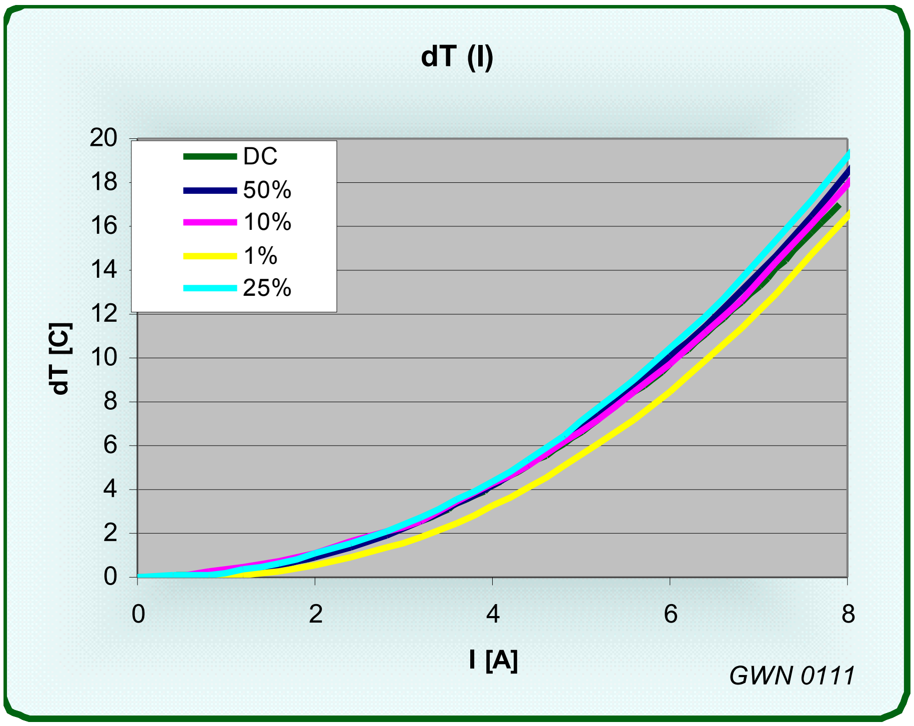

Figure 9 Temperature rise as a function of drive current

The difference between the duty cycles is small since contact temperature between pulses drops to almost ambient even for a 50% duty cycle. Cause for this is the relatively short contact length and low thermal mass together with heat sinking of the contact at either end. It results in a 50 msec thermal time constant, which is short compared to the 0.6 second cycle time for the 50% case. The 50 ms time constant reached here is at the resolution limit for the equipment.

The resulting maximum currents are as follows:

	DC	50%	25%	10%	1%	
Imax	7.82	8.31	8.15	8.42	8.73	A