Ironwood Electronics

SBT 0.5mm Socket

DC Measurement Results

prepared by

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6/21/2006

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Objective

The objective of these measurements is to determine the DC current carrying ability, resistance, and temperature rise during operation.

Methodology

A four terminal (Kelvin) measurement setup is used that includes a computer controlled voltage source as well as a current source capable of delivering 10 A. The voltage developed across the contact is recorded in a Kelvin (four terminal) measurement at separate terminals.

Test procedures

During testing drive current is increased in steps of 50 mA to the maximum value. The dwell time for each current step is 60 seconds.

Setup

For current handling tests, all contacts are isolated except for one. The SBT 0.5mm socket test components are placed 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.

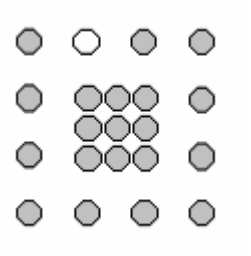
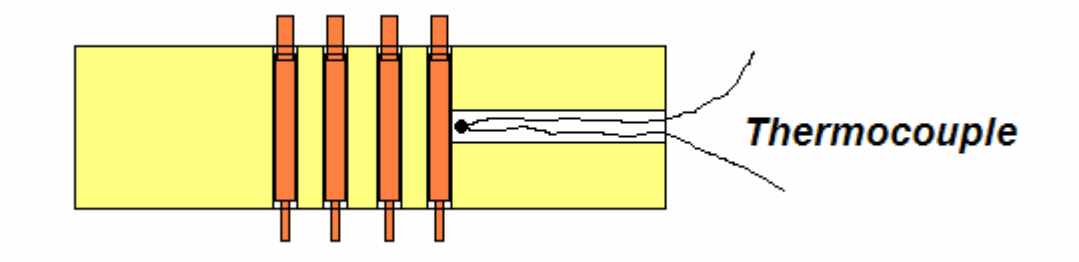


Fig. 1 SBT 0.5mm socket test arrangement

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

A second digital meter records the temperature of a small thermocouple (0.028”) located near the driven pin. The thermocouple’s access location is about in the center of the pin.

The SBT 0.5mm socket is modified to allow thermocouple access and held in a fixture similar to the one shown in Fig. 2:



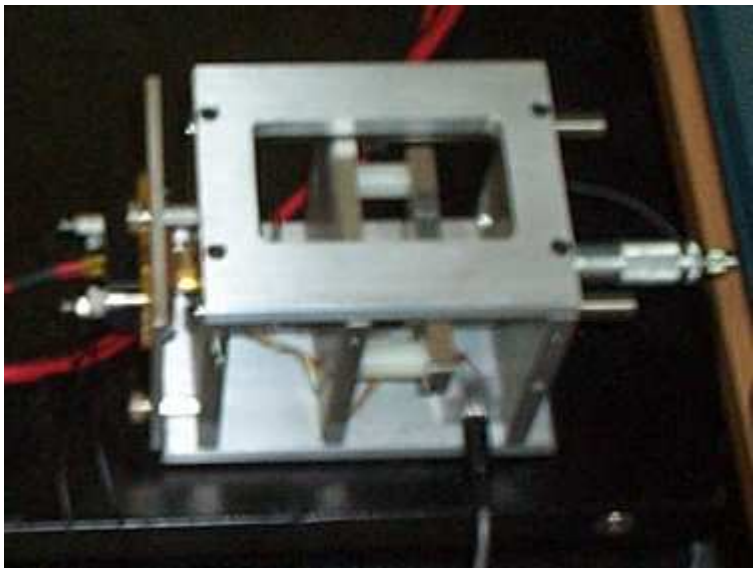


Fig. 2 SBT 0.5mm socket mounting and fixturing example

Measurements

Current carrying capability (socket)

The measured current – voltage relationship for the SBT 0.5mm socket is shown below:

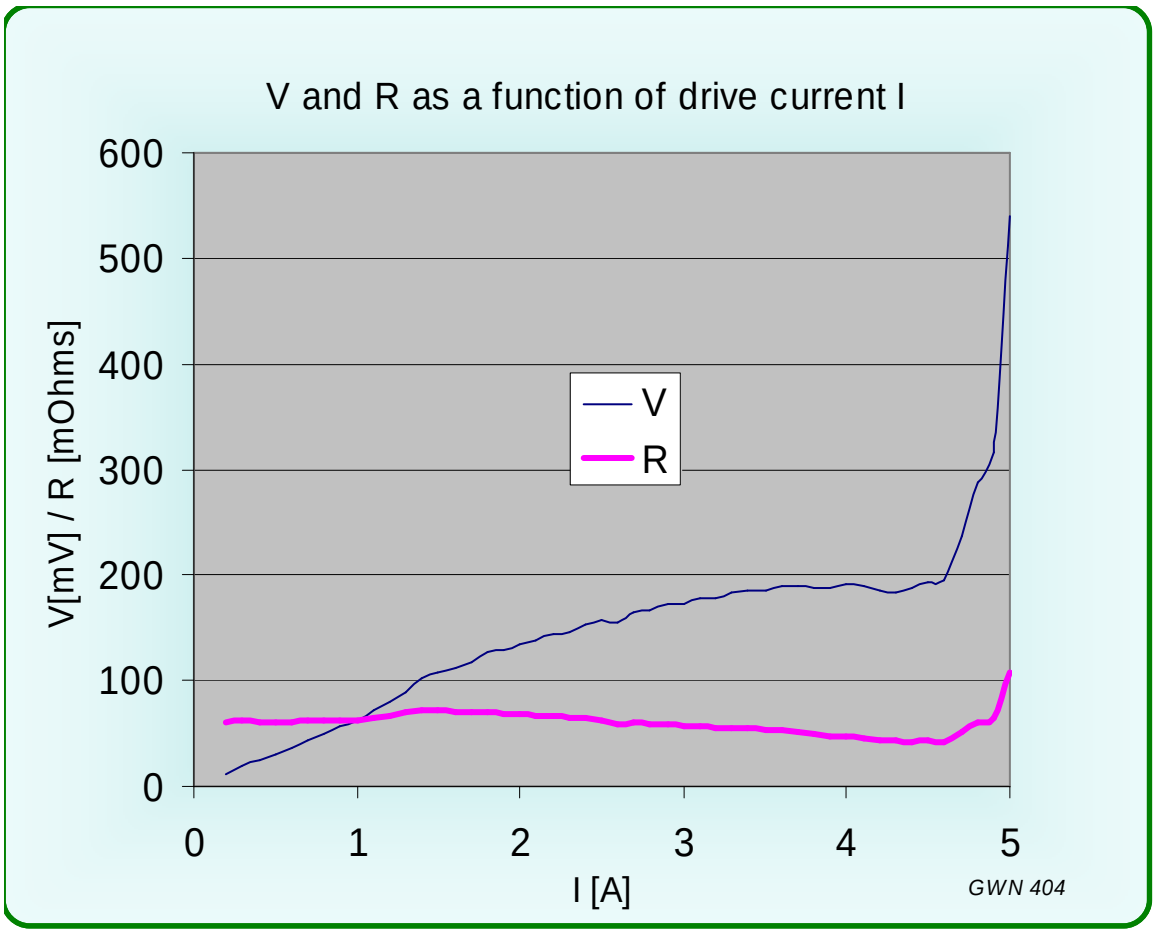


Fig. 3 Voltage and resistance as a function of drive current

Above 4.5A thermal runaway occurs.

The accompanying power dissipation in the connection is computed from applied current and observed voltage:

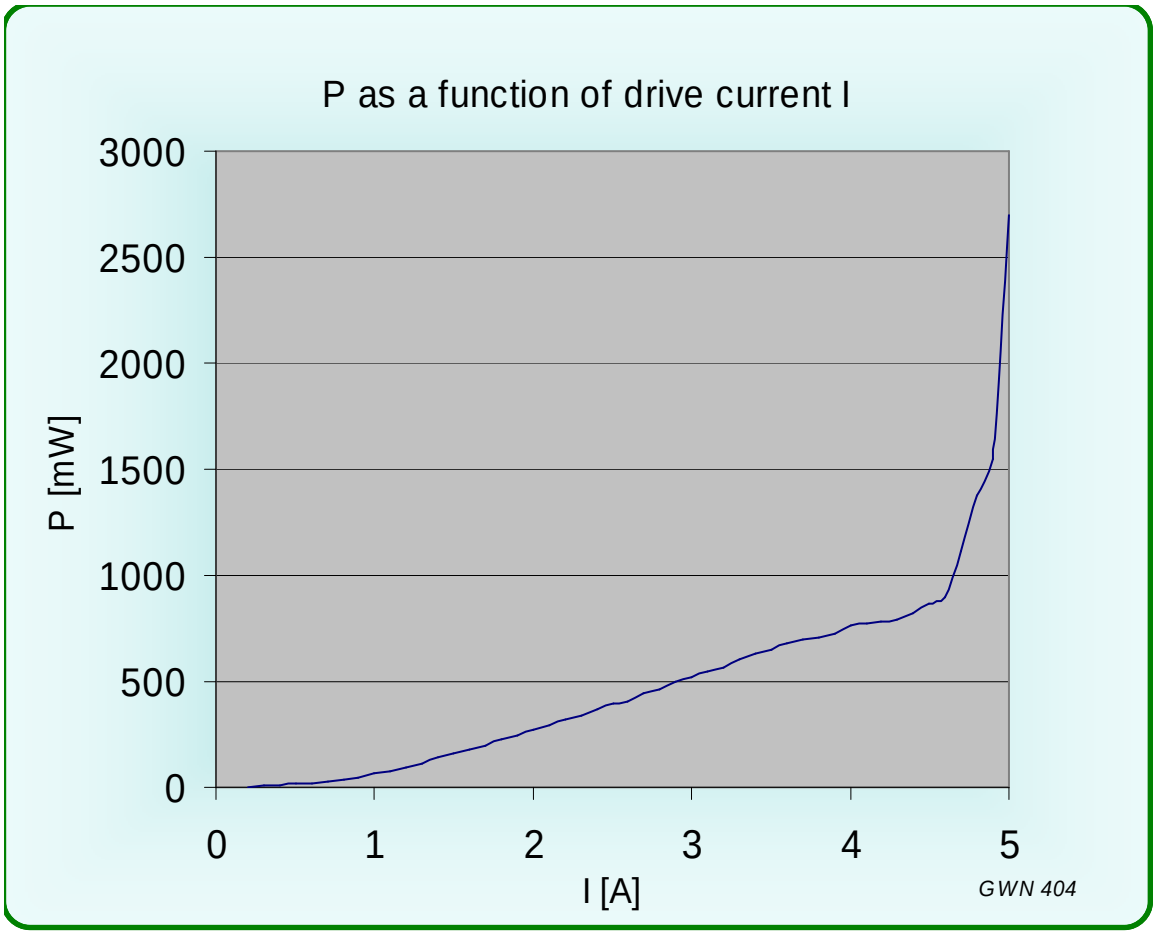


Fig. 4 Power dissipation as a function of drive current

Another important parameter is the temperature rise as a function of drive level. As stated above the temperature rise is measured via thermocouple in proximity with the pin. This implies that temperature readings at the thermocouple will be lower than those at and inside the pin itself.

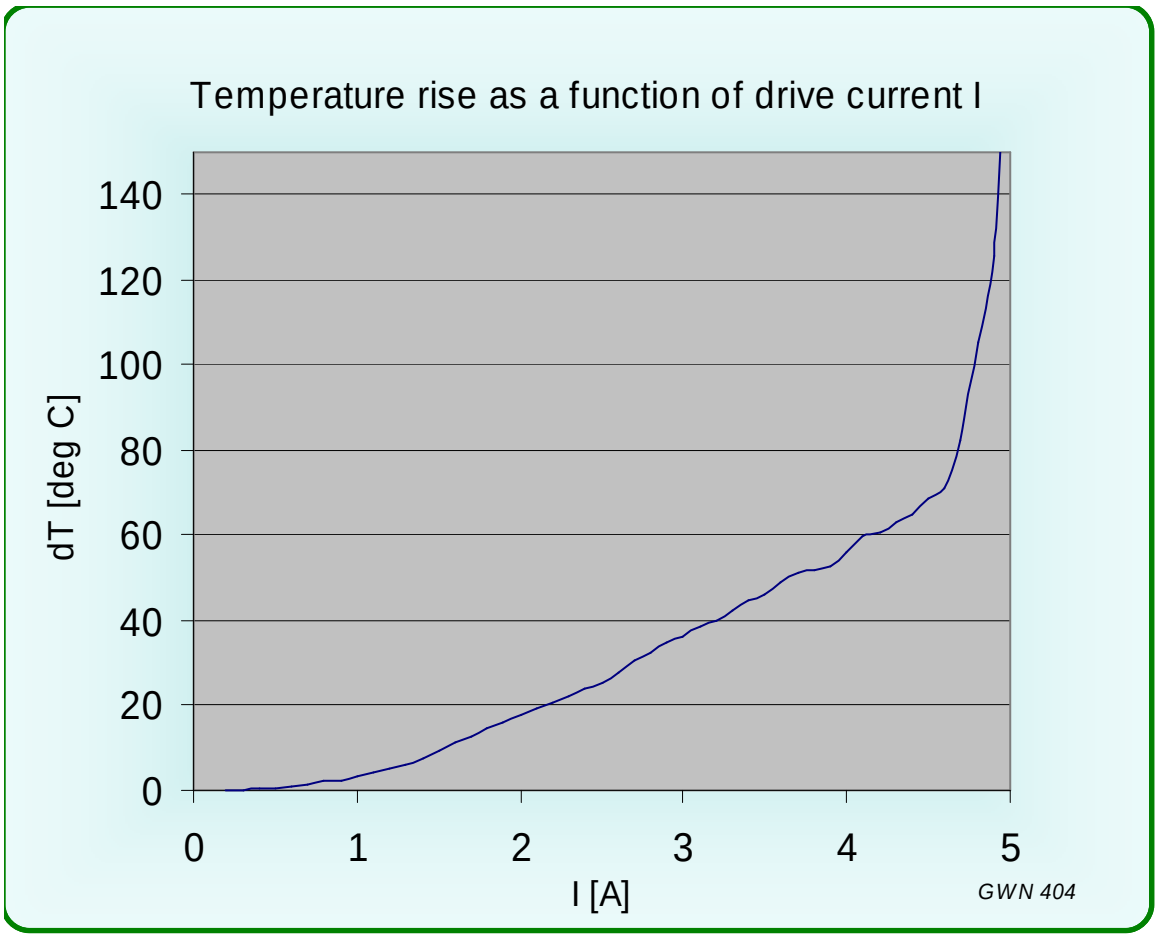
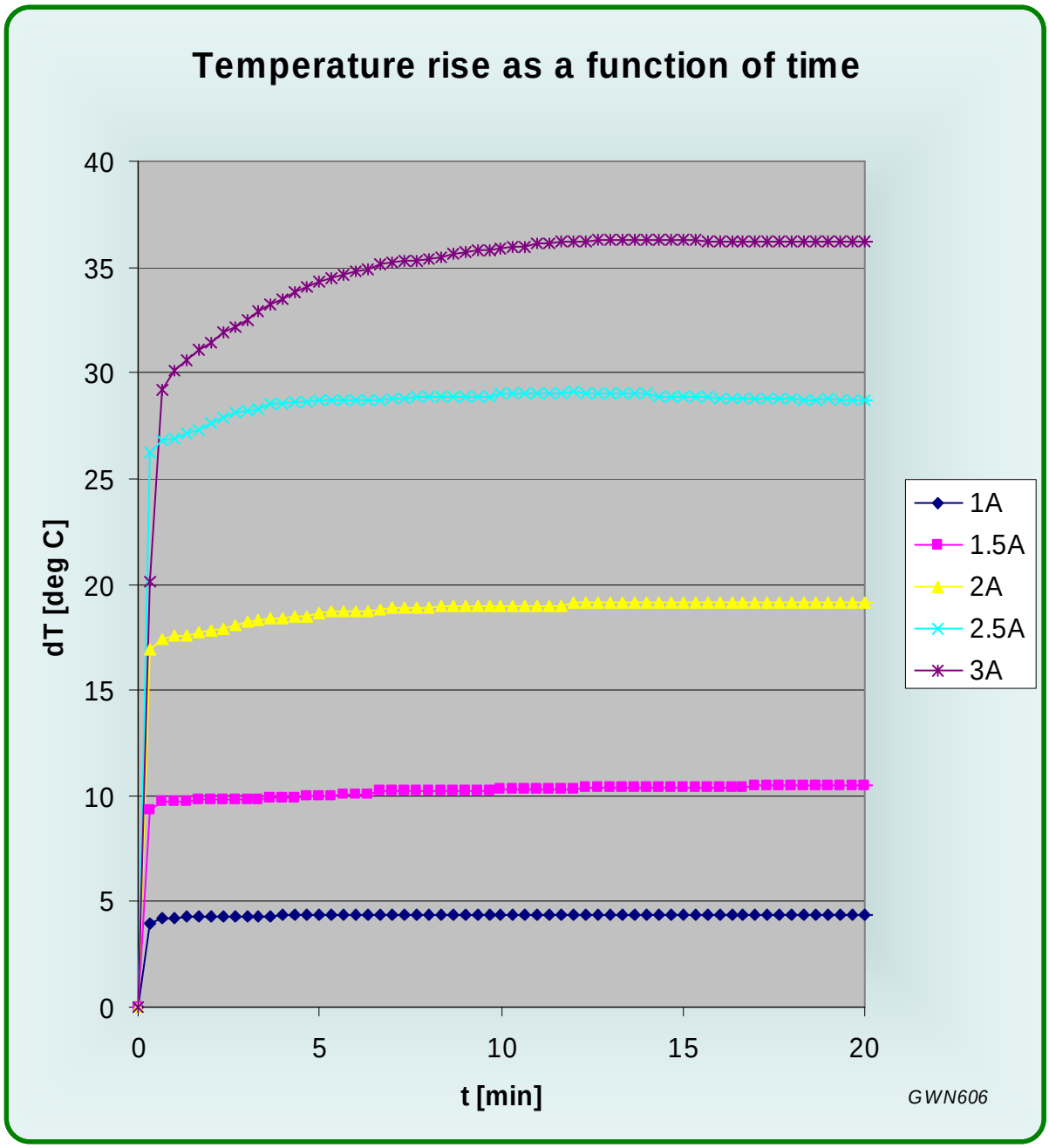


Fig. 5 Temperature rise as a function of drive current

Dwell times during this test are set to 1 minute per data point to let the temperature increase to level off before acquiring the data point. Nevertheless it should be kept in mind that the metal contacts at either end afford excellent heat removal from the contact area. In an environment with lower thermal conductivity the temperature rise during testing and the subsequent resistance increase as well as the current handling may therefore be less than indicated here.

Another set of data was acquired with the drive current held constant and while recording temperature as a function of time. The result is shown in Fig. 6 below:



Because of the low thermal mass of the contact under load the initial temperature rise is very rapid. The slow increase of temperature with time up to about 10 minutes is likely due to gradual warm-up of the surroundings and the metal structures that feed the current to the contact.

Current carrying capability (contact in air)

The measured current – voltage relationship for the SBT 0.5mm socket contact suspended in air between two metal plates is shown below:

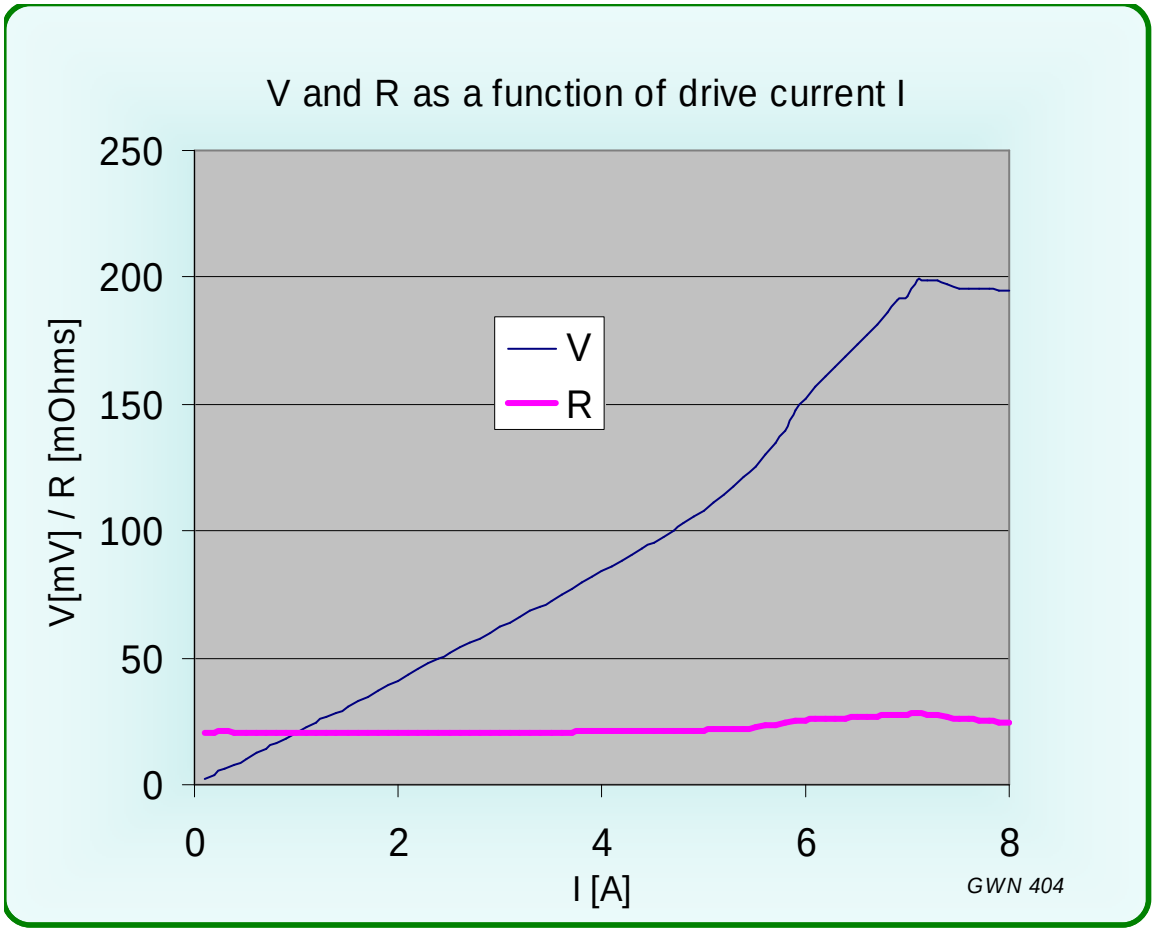


Fig. 6 Voltage and resistance as a function of drive current

Above 7A a nonlinearity developed in the resistance and the test was terminated.

The accompanying power dissipation in the connection is computed from applied current and observed voltage:

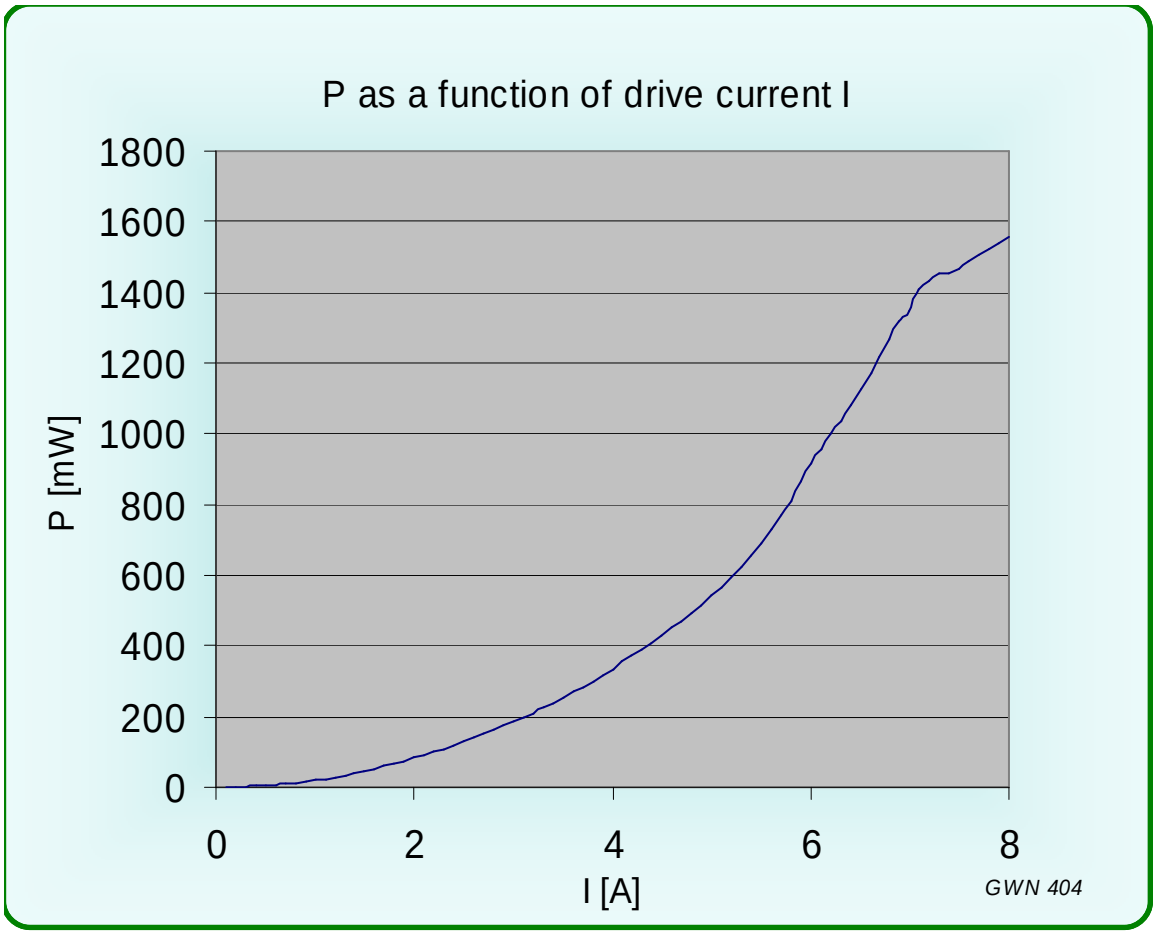


Fig. 7 Power dissipation as a function of drive current

Again, temperature rise is measured via thermocouple in proximity with the contact. This implies that temperature readings at the thermocouple will be lower than those at and inside the contact itself.

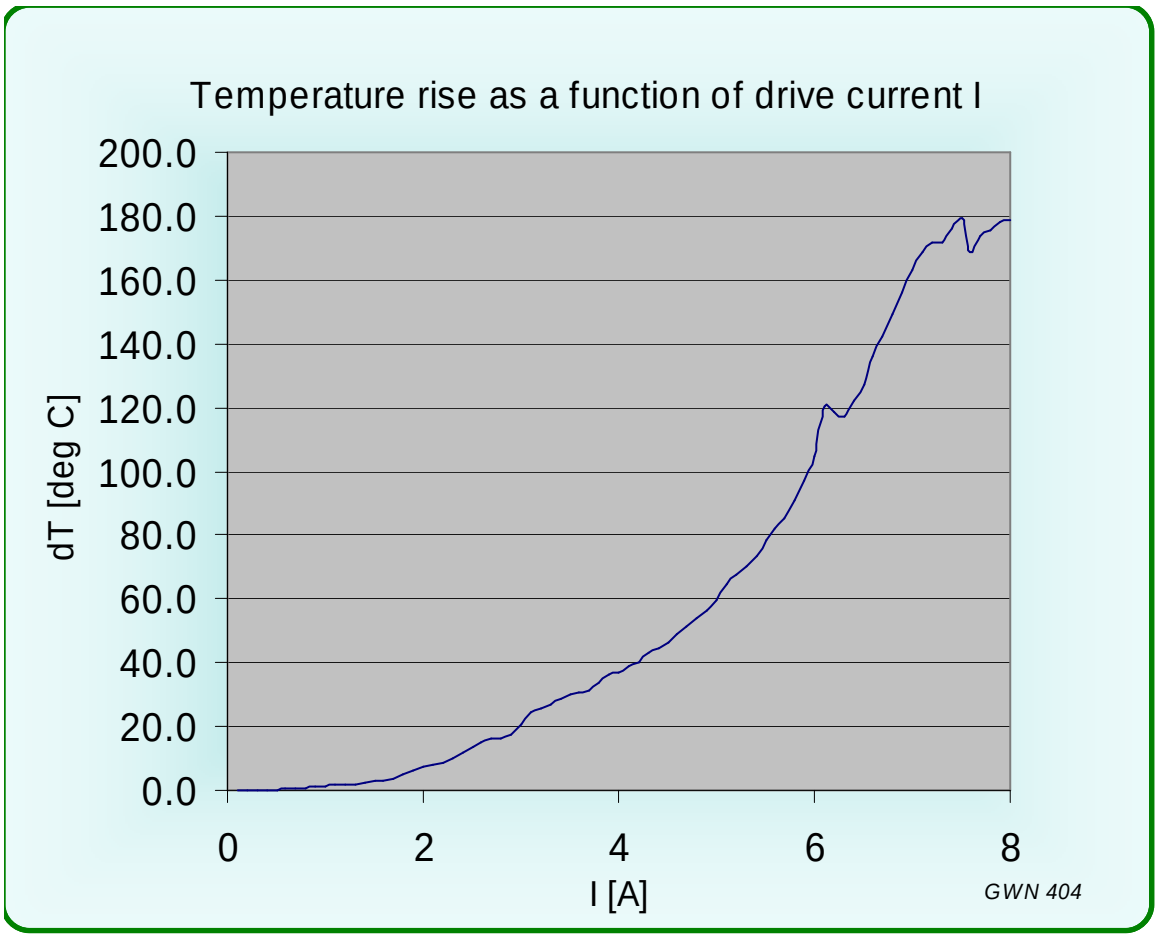


Fig. 8 Temperature rise as a function of drive current