Four Point Probe Method – Van der Pauw Method

→ One of the most common approaches for measuring Sheet or Surface conductivity is the Van der Pauw method.

Principle.

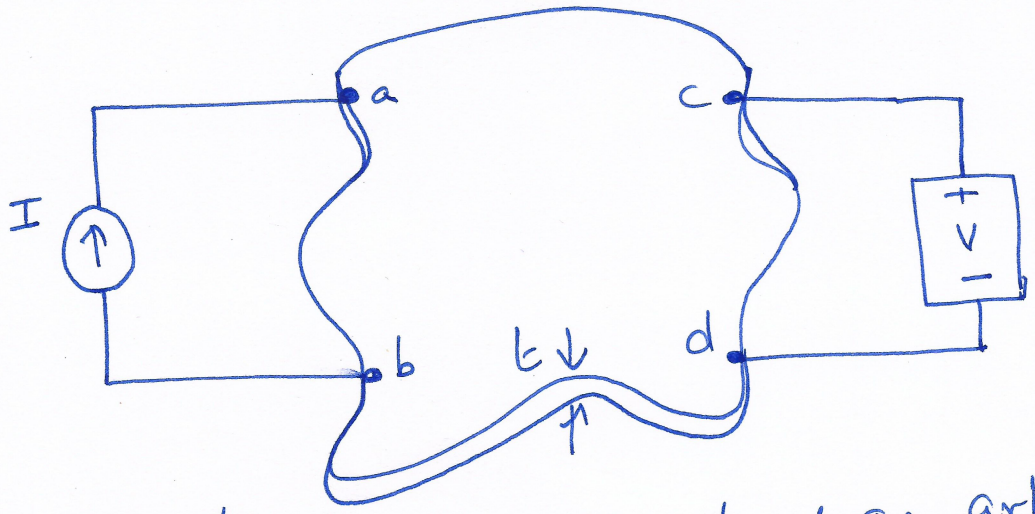
→ The current is driven between a pair of probes or connections and the voltage is measured across the two.

→ The Van der Pauw method can measure resistivity of small, arbitrarily shaped layers where the four contacts are typically placed around the periphery of the sample.

Experiment

→ The Van der Pauw method can determine the resistivity of small, arbitrarily shaped layers and generally requires less surface area than the four point probe method.

→ It is often used in integrated circuit processing.



Van der Pauw measurement of an arbitrarily shaped sample uses a known current and a high-impedance voltmeter.

→ The method considers four small contacts placed around the periphery of a homogenous, uniform thickness "t" sample,

→ The resistance $R_{ab,cd}$ is determined by driving a current from point "a" to "b" and measuring the voltage from point "c" to "d"

$$R_{ab,cd} = \frac{|V_c - V_d|}{|I_{ab}|}$$

→ The resistivity is given as,

$$\rho = \frac{\pi t}{\ln 2} \frac{R_{ab,cd} + R_{bc,da}}{2} F$$

→ For the case of a material with a uniform thickness, homogenous film with identical contacts, $F=1$, then

$$\rho = \frac{\pi t}{\ln 2} R_{ab,cd} = 4.532\, t\, R_{ab,cd}$$

→ In Van der Pauw measurements, it is common to calculate resistivity from two sets of measurements ($R_{ab,cd}$ and $R_{bc,da}$). For uniform samples with good contacts, the same result should be measured.