The present paper presents the design method of resistors for monolithic integrated circuits. The following elements have been considered during the analysis:

1. Gaussian distribution of impurities in diffusion layers.
2. Lattice and impurity scattering are of crucial significance in transport phenomena.
3. The fact of incomplete impurity ionization at higher impurities concentration and the dependence of ionization range from temperature.

The dependence of $R_{D,ld}$ product from impurity surface concentration and temperature after taking into account the previously accepted assumption has been calculated by means of a computer from derived expression:

$$R_{D,ld} = \frac{1}{2q \int \mu(n,T) n(T,z) dz}$$   \(1\)

Figure 1 presents the temperature sensitivity of diffusion resistors as a function of $R_{D,ld}$. 

![Graphs showing temperature sensitivity of diffusion resistors](image-url)
The other problem is a change of diffusion layer resistivity during the drive-in process.

The starting point analysis was the assumption that the impurity charge which occurs in the diffusion layer in silicon, is reduced by the impurity charge, which has came into the oxide in the course of oxidation.

The number of impurities getting into oxide is decreasing during the oxidation time. Concentration of impurities in oxide is:

\[ N_{SiO_2} = \frac{N^o}{\sqrt{\frac{Dt}{D_i^2} + 1}} = \frac{N^o}{\sqrt{\frac{D^*z^2}{E_{SiO_2}^2} + 1}} /2/ \]

Parameter \( k \) contains the segregation coefficient \( m = \frac{N^o}{N_{SiO_2}} \) and \( \frac{N^o}{N_{SiO_2}} \) rate which slightly increase with the oxidation speed. Parameter \( k \) is a weak function of \( \frac{T}{D} \). In this analysis \( k \) constans was assumed which was measured experimentaly. Such proceeding can be simply taken from the fact that various segregation coefficients were published by various authors.

The charge of impurities on oxide by integration of \( /2/ \) is as follows:

\[ Q_{SiO_2} = k, N^o, L_d, \sqrt{\frac{D}{D_i}} \text{ arsh } \frac{L_d}{L_d}, /3/ \]

Finally the correction factor is expressed by the relation:

\[ g_\alpha = 1 - K \sqrt{\frac{D}{D_i}} \text{ arsh } \frac{L_d}{L_d} = 1 - K \sqrt{\frac{D}{D_i}} \text{ arsh } \sqrt{\frac{D}{D_i}} \frac{K}{L_d}, /4/ \]

The correction factor resulting from the change of effective carrier mobilities is:

\[ g_\mu = \left( \frac{L_d}{L_d} + 1 \right)^{0.12} = \left( \sqrt{\frac{D^*z^2}{E_{SiO_2}^2} + 1} \right)^{0.12}, /5/ \]