Дано:

$T = 300\,K$

$d_0 = 20$ нм

$U_б = 0\,В$

$\varphi_{мз} = 0{,}1\,В$

$S_з = 1\,мм^2$

$N_{зз} = 10^{11}$

$N_б = 10 \cdot 10^{15}$

$\varepsilon_0 = 3{,}9 \approx 4$

$U_{пор.} - ?$

$$C_{ox} = \frac{\varepsilon_0 \varepsilon_{ox}}{d_{ox}} = \frac{4 \cdot 8{,}85 \cdot 10^{-14}}{10 \cdot 10^{-7}} = 3{,}54 \cdot 10^{-7}\ \frac{Ф}{см^2}$$

$$\varphi_F = \frac{k_б \cdot T}{q} \ln \frac{N_б}{n_i} = \frac{1{,}38 \cdot 10^{-23} \cdot 300}{1{,}6 \cdot 10^{-19}} \ln \frac{10 \cdot 10^{15}}{1{,}5 \cdot 10^{10}} =$$

0.8466368563480918 В

$$U_{пор.} = \varphi_{мз} - \frac{q N_{зз}}{C_{ox}} - 2\varphi_F - \frac{\sqrt{2 q \varepsilon_0 \varepsilon_s N_б}}{C_{ox}} \cdot \sqrt{2|\varphi_F|} =$$

$=$ -94.370740089151

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