Insulating barrier

Superconductor 1

Cooper pairs are in state
$\psi_1(t) = \sqrt{n_1(t)}e^{i\phi_1(t)}$

Superconductor 2

Cooper pairs are in state
$\psi_2(t) = \sqrt{n_2(t)}e^{i\phi_2(t)}$

Potential difference $-U_J$