A numerical calculation was performed to simulate electron acceleration as a result of interaction with a femtosecond laser pulse of a relativistic intensity of $5 \cdot 10^{18} \frac{W}{cm^2}$ with a plasma gradient corresponding to the controlled preplasma layer created on the surface of a solid-state target by an additional nanosecond laser pulse. The numerical calculation was executed in two modes: “without ionization” and “with ionization”. Along with this, various variants of electron acceleration were simulated in case of a laser pulse passes through a region with a different set of plasma gradients. The data obtained as a result of modeling was visualized. The resulting electron energies under optimal conditions reach more than 10 MeV. As a result, the effect of ionization on electron acceleration was estimated, and the optimal parameters of the angle of incidence and the initial distribution for these processes were estimated. The main mechanism of electron acceleration is confirmed - an increase in the intensity of a laser pulse due to self-focusing, generation of a plasma wave due to stimulated parametric scattering, and the production of hot electrons during the decay of this wave. The optimal parameters of the plasma gradient are found for electron acceleration when a pulse passes through a plasma region.