We analyze minimizers of the Lawrence-Doniach energy for layered superconductors occupying a bounded cylinder, $\Omega \times [0,L]$, in $\mathbb{R}^3$, where $\Omega$ is a simply connected bounded Lipschitz domain in $\mathbb{R}^2$. For an applied magnetic field $\vec{H}_{ex} = h_{ex}\vec{e}_3$ that is perpendicular to the layers where $|\ln \epsilon| << h_{ex} << \epsilon^{-2}$, we prove an asymptotic formula for the minimum Lawrence-Doniach energy as $\epsilon$ and the interlayer distance $s$ tend to zero. Under appropriate assumptions on $\epsilon$ versus $s$, we establish comparison results between the minimum energies of the Lawrence-Doniach and the 3D anisotropic Ginzburg-Landau models. (Received September 24, 2012)