In the current paper, the effect of an inclined slotted plate-fin mini-channel heat sink with triangular pins on laminar convection heat transfer and fluid flow was numerically investigated using a conjugate heat transfer model. To optimize the hydro-thermal performance of the heat sink, a parametric study on the geometric design of the slots and pins were carried out. The study was performed by varying the height of the inclined slot, the angle of the slot, and the position of the pin with respect to slot leading edge. The Reynolds number was ranged from 100 to 1600. The CFD results showed that the full height slot with an inclination angle of 55° enhanced the Nusselt number and the hydrothermal performance factor (JF) up to 1.5 and 1.43, respectively, in comparison with the simple mini-heat sink. Moreover, the Nusselt number and JF factor of the heat sink with using both slots and pins outperformed the straight channel by about 1.84 and 1.54, respectively.