This paper introduces an improved differential evolution (DE) algorithm for robust layout synthesis of microelectromechanical system components subject to inherent geometric uncertainties. A case study of the layout synthesis of a combdriven microresonator shows that the approach proposed in this paper can lead to design results that meet the target performance and are less sensitive to geometric uncertainties than the typical designs. It is also demonstrated that the algorithm proposed in this paper cannot only obtain better results than the standard DE algorithm but also outperform some other state-of-art algorithms in constrained optimization.