Thick photoresists are used to fabricate systems-on-chip such as MEMs, microfluidics, and biochips. Three-dimensional structure is exposed in these resists by one-photon multilayer deposit/expose/develop cycles or two-photon direct write. Here we introduce a scanning one photon direct write tool that exposes the entire resist thickness in one pass to create complex 3D structure at orders-of-magnitude greater rate than existing techniques. As it is scanned at fixed height above the resist, the objective lens projects light from a DMD spatial light modulator into a pixelated high NA light cone that continuously changes as the lens moves. Each voxel of the photoresist receives an integrated dose from hundreds of different light cones, exceeding the threshold dose inside a desired 3D volume while remaining below threshold in the design exterior. The set of light cones required to expose any object is found by numerically solving an inverse problem. In comparison to the currently used multilayer approach, this method exposes a single thick layer of photoresist in a single pass of the objective lens and is thus much higher speed, has no layering artifacts, and can create a larger range of structures including overhangs and discontinuous elements.