

DESCRIPTION

PROJECTION OPTICAL SYSTEM, EXPOSURE APPARATUS, AND EXPOSURE METHOD

ABSTRACT

An immersion projection optical system that prevents leakage of a liquid (immersion liquid) into the optical
5 system and maintains satisfactory imaging capability. The projection optical system of the present invention is a projection optical system that projects a reduced image of a first plane onto a second plane through a liquid. The projection optical system includes an interface optical lens
10 (Lb) having a side towards the first plane that contacts a gas and a side towards the second plane that contacts the liquid. The interface optical element includes a light entering surface (Lba), which has a convex shape facing towards the first plane, and a groove (Gr), which is formed
15 to surround an effective region in a light emitting surface of the interface optical element.