CLAIMS

1. An apparatus, comprising:

a substrate having a first surface and a second surface opposite the first surface of the substrate;

a photonic integrated circuit (PIC) coupled to the substrate and having a first surface, wherein the first surface of the substrate is proximate the first surface of the PIC and the second surface of the substrate is distal the first surface of the PIC;

a lid, contacting the first surface of the substrate;

a fiber holder disposed on the lid and covering at least partially the PIC, such that the lid is disposed between the fiber holder and the PIC; and

an optical fiber coupled to the PIC and in contact with the fiber holder.

2. The apparatus according to claim 1, wherein a portion of the optical fiber is coiled around the fiber holder.

3. The apparatus according to claim 2, wherein the PIC comprises a second surface opposite the first surface of the PIC, and wherein the portion of the optical fiber is coiled around the fiber holder within a plane that is substantially parallel to the second surface of the PIC.

4. The apparatus according to claim 1, wherein the optical fiber is edge-coupled to the PIC.

5. The apparatus according to claim 1, further comprising an electronic integrated circuit disposed on the first surface of the substrate.

6. The apparatus according to claim 1, further comprising a circuit board on which the substrate in mounted.

7. The apparatus according to claim 6, wherein the substrate is electrically connected to the circuit board through a ball grid array.

8. The apparatus according to claim 1, wherein the fiber holder is made of copper.

9. The apparatus according to claim 1, further comprising an interposer having a first surface proximate the first surface of the substrate and a second surface opposite the first surface of the interposer and proximate the first surface of the PIC.

10. The apparatus according to claim 1, further comprising a fiber assembly containing a groove on which the optical fiber is disposed.

11. The apparatus according to claim 10, further comprising a thermal pad contacting the fiber assembly.

12. An apparatus, comprising:

a substrate having a first surface and a second surface opposite the first surface of the substrate;

a photonic integrated circuit (PIC) coupled to the substrate and having a first surface, wherein the first surface of the substrate is proximate the first surface of the PIC and the second surface of the substrate is distal the first surface of the PIC;

a lid, contacting the first surface of the substrate and at least partially covering the PIC, exhibiting at least one retaining feature; and

an optical fiber coupled to the PIC and in contact with the retaining feature of the lid.

13. The apparatus of claim 12, wherein the retaining feature comprises a groove in the lid.

14. The apparatus of claim 12, wherein the retaining feature comprises a fiber channel.

15. The apparatus of claim 12, wherein the lid is formed of a thermally conductive material.

16. The apparatus of claim 12, further comprising a thermal material in contact with the lid and the PIC.