CLAIMS

1. A method of fabricating a composite semiconductor structure, the method comprising:

providing a substrate;

providing a photonic die, the photonic die comprising III-V material;

aligning the photonic die with the substrate;

joining the substrate and the photonic die to form a composite substrate; and

processing the composite substrate to form a feature on the photonic die, wherein:

the processing the composite substrate is performed after joining the substrate and the photonic die;

the feature on the photonic die is a stripe region; and

the stripe region is an optical waveguide.

2. The method of fabricating the composite semiconductor structure as recited in claim 1, wherein the processing the composite substrate further includes forming an electrical interconnect on the photonic die.

3. The method of fabricating the composite semiconductor structure as recited in claim 1, further comprising using an alignment tolerance of approximately ±10 μm for aligning the photonic die with the substrate.

4. The method of fabricating the composite semiconductor structure as recited in claim 1, wherein the processing the composite substrate further forms an optical waveguide on the substrate.

5. The method of fabricating the composite semiconductor structure as recited in claim 1, the method further comprising growing epitaxial layers on the photonic die after joining the substrate and the photonic die to form the composite substrate.

6. The method of fabricating the composite semiconductor structure as recited in claim 1, the method further comprising:

providing an assembly substrate having a base layer and a device layer;

mounting the photonic die on a predetermined portion of the assembly substrate;

aligning the assembly substrate with the substrate to align the photonic die with the substrate; and

removing at least the base layer of the assembly substrate from the composite substrate after the photonic die and the substrate are joined.

7. The method of fabricating the composite semiconductor structure as recited in claim 1, wherein:

the photonic die is a first photonic die; and

the method further comprises:

providing a second photonic die;

mounting the first photonic die and the second photonic die on an assembly substrate; and

aligning the assembly substrate with the substrate.

8. The method of fabricating the composite semiconductor structure as recited in claim 1, wherein the substrate comprises a silicon-on-insulator (SOI) substrate.

9. The method of fabricating the composite semiconductor structure as recited in claim 1, wherein the substrate comprises silicon-based devices.