CLAIMS

1. An integrated optoelectronic device comprising:

a semiconductor substrate;

a diode structure formed above the substrate, the diode structure comprising a bottom diode strip and, formed on top of the bottom diode strip, a layered diode mesa comprising an intrinsic-type layer and a top diode layer;

a first electrical connection contacting the top diode layer of the diode mesa, the first electrical connection connected to a first electrical node of an electronic circuit; and

second and third electrical connections contacting the bottom diode strip on opposite respective sides of the diode mesa, the second electrical connection connected to a second electrical node of the electronic circuit and the third electrical connection connected to a third electrical node of the electronic circuit.

2. The device of claim 1, wherein the electronic circuit is operatively to apply a heater bias voltage between the second and third nodes and a reverse bias voltage across the diode structure corresponding to a non-zero average of a voltage between the first node and the second node and a voltage between the first node and the third node.

3. The device of claim 1, wherein the electronic circuit is operatively to further apply an RF signal voltage at the first node.

4. The device of claim 1, wherein the substrate is a semiconductor-on-insulator (SOI) substrate, the device further comprising a waveguide formed in a device layer of the SOI substrate underneath the diode structure.

5. The device of claim 4, wherein the diode structure is made of a compound semiconductor material, the waveguide and diode mesa collectively forming a heterogeneous optical waveguide structure.

6. The device of claim 5, wherein the waveguide is made of silicon and the diode structure is made of a III-V material.

7. The device of claim 4, further comprising at least one of one or more thermal isolation channels formed in the device layer on both sides of the diode mesa or a thermally isolating etched region formed in a handle of the SOI substrate underneath the diode structure.

8. The device of claim 1, wherein the device is an electro-absorption modulator.

9. An integrated optoelectronic device comprising:

a semiconductor-on-insulator (SOI) substrate;

a heterogeneous optical waveguide structure comprising a waveguide formed in a device layer of the SOI substrate and a layered compound-semiconductor structure formed above the waveguide, the compound-semiconductor structure comprising a doped bottom strip and, formed on top of the doped bottom strip, a layered mesa comprising an intrinsic-type layer and a doped top layer;

a first electrical connection contacting the doped top layer of the layered mesa, the first electrical connection connected to a first electrical node;

one or more second electrical connections contacting the doped bottom strip, the one or more second electrical connections connected to a second electrical node; and

third and fourth electrical connections contacting the device layer of the SOI substrate on opposite respective sides of the waveguide, the third and fourth electrical connections being connected to third and fourth electrical nodes, respectively.

10. The device of claim 9, wherein the layered compound-semiconductor structure is a diode structure.

11. The device of claim 10, wherein the first and second electrical nodes are part of a first electronic circuit that is operatively to apply a reverse bias voltage across the diode structure between the first and second nodes, and wherein the third and fourth electrical nodes are part of a

second electronic circuit that is operatively to apply a heater bias voltage between the third and fourth nodes.

12. The device of claim 9, further comprising at least one of one or more thermal isolation channels formed in the device layer on both sides of the waveguide and mesa or a thermally isolating etched region formed in a handle of the SOI substrate underneath the heterogeneous optical waveguide structure.

13. The device of claim 9, wherein the waveguide is made of silicon and the diode structure is made of a III-V material.

14. The device of claim 9, wherein the third and fourth electrical connections are spaced apart along an axis of the waveguide.

15. The device of claim 9, wherein the device is an electro-absorption modulator.