CLAIMS

What is claimed is:

1. An apparatus, comprising:

a coreless substrate;

a ball-grid pad array disposed on a first surface of the coreless substrate;

a die embedded in and integral to the coreless substrate, wherein the die includes an active surface and a backside surface, and wherein the backside surface is exposed through the first surface;

a flip-chip disposed on a second surface that is opposite the first surface;

a wire-bond chip disposed on the second surface;

electrical connections between the die embedded in and integral to the coreless substrate and the flip-chip and wire-bond chip, and wherein all said electrical connections are disposed internal to the coreless substrate.

2. The apparatus of claim 1, wherein the ball-grid pad array includes a plurality of electrical bumps, wherein the plurality of electrical bumps exhibit a first standoff and the backside surface exhibits a second standoff, and wherein the first standoff exceeds the second standoff.

3. The apparatus of claim 1, further including interlayer metallizations that communicate between a metal shielding plane disposed between the first surface and the second surface.

4. The apparatus of claim 1, further including interlayer metallizations that communicate between the first surface and the second surface, and wherein the interlayer metallizations also couple the embedded die to at least one of the first surface and the second surface.

5. The apparatus of claim 1, where the die embedded in and integral to the coreless substrate is a first die, the apparatus further including a second die embedded in and integral to the coreless substrate.

6. The apparatus of claim 1, wherein the at least one device includes a passive device selected from a resistor, a capacitor, a low-pass filter, a high pass filter, a diplexer, a balun, and an inductor.

7. The apparatus of claim 1, wherein the at least one device includes a band-pass filter coupled to a radio-frequency device.

8. The apparatus of claim 1, wherein the at least one device includes a band-

pass filter disposed proximate to and coupled to a radio-frequency device.

9. A method comprising:

assembling at least one embedded die into a coreless, bumpless build-up layer (BBUL-C) substrate, wherein the BBUL-C substrate has a land side and a device-mounting side opposite the land side, wherein the embedded die has an active surface and a backside surface, and wherein the embedded die backside surface is exposed through the land side;

assembling at least one device on the device-mounting side; and

coupling the embedded die to the at least one device, wherein coupling is routed internally to the BBUL-C substrate.

10. The method of claim 9, wherein the embedded die is an embedded first die, the method further including assembling an embedded subsequent die into the BBUL-C substrate.

11. The method of claim 9, wherein the embedded die is an embedded first die, the method further including:

assembling an embedded subsequent die into the BBUL-C substrate, and wherein the embedded subsequent die is assembled entirely internally into the BBUL-C substrate.

12. The method of claim 9, further including assembling the BBUL-C substrate to a foundation substrate.

13. The method of claim 9, wherein assembling at least one device on the device-mounting substrate includes mounting a flip-chip thereupon.

14. The method of claim 9, wherein assembling at least one device on the device-mounting substrate includes mounting a wire-bond chip thereupon.

15. The method of claim 9, wherein assembling at least one device on the device-mounting substrate includes mounting a passive device thereupon.

16. The method of claim 9, wherein assembling at least one device on the device-mounting substrate includes assembling a band-pass filter that is coupled to a radio-frequency device.

17. The method of claim 9, wherein assembling at least one device on the device-mounting substrate includes assembling a band-pass filter that is coupled to and proximate to a radio-frequency device.

18. The method of claim 9, wherein assembling at least one device on the device-mounting substrate includes mounting at least two of a flip-chip, a wire-bond

chip, and a passive device thereupon.

19. The method of claim 9, wherein assembling at least one device on the device-mounting substrate includes mounting at least two of a flip-chip, a wire-bond chip, and a passive device thereupon, the method further including assembling the BBUL-C substrate to a foundation substrate.

20. A computing system, comprising:

a coreless substrate;

a ball-grid array disposed on a first surface of the coreless substrate;

a die embedded in and integral to the coreless substrate; and

at least one device disposed on a second surface that is opposite the first surface, and wherein the at least one device includes a band-pass filter disposed proximate to and coupled to a radio-frequency device; and

a foundation substrate coupled to the coreless substrate.

What is claimed is:

1. An apparatus, comprising:

a coreless substrate;

a ball-grid pad array disposed on a first surface of the coreless substrate;

a die embedded in and integral to the coreless substrate, wherein the die includes an active surface and a backside surface, and wherein the backside surface is exposed through the first surface;

metallizations that communicate through without contacting a metal shielding plane disposed between the first surface and the second surface;

at least one device disposed on a second surface that is opposite the first surface; and

a foundation substrate electrically connected to the ball-grid pad array through a plurality of electrical bumps, wherein the foundation substrate includes a heat sink embedded therein proximate the die backside surface.

2. The apparatus of claim 1, wherein the metallizations also couple the embedded die to at least one of the first surface and the second surface.

3. The apparatus of claim 1, wherein the plurality of electrical bumps exhibit a first standoff and the backside surface exhibits a second standoff, and wherein the first standoff exceeds the second standoff.

4. The apparatus of claim 1, wherein the at least one device includes a flip chip disposed on the second surface and a wire-bond chip also disposed on the second surface.

5. The apparatus of claim 1, where the die embedded in and integral to the coreless substrate is a first die, the apparatus further including a second die embedded in and integral to the coreless substrate.

6. The apparatus of claim 1, where the die embedded in and integral to the coreless substrate is a first die, the apparatus further including a second die embedded in and integral to the coreless substrate, and wherein the second die and the first die are disposed symmetrically along two dimensions with respect to the first surface.

7. The apparatus of claim 1, where the die embedded in and integral to the coreless substrate is a first die, the apparatus further including a second die embedded in and integral to the coreless substrate, and wherein the second die and the first die have an identical form factor.

8. The apparatus of claim 1, where the die embedded in and integral to the coreless substrate is a first die, the apparatus further including a second die embedded in and integral to the coreless substrate, wherein the second die and the first die have an identical form factor, and wherein the second die and the first die have two identical coordinates and a third non-identical coordinate within the coreless substrate.

9. The apparatus of claim 1, further including electrical connections between the die embedded in and integral to the coreless substrate and the at least one device, and wherein all said electrical connections are disposed internal to the coreless substrate.

10. The apparatus of claim 1, further including an over-mold layer that encompasses the at least one device.

11. The apparatus of claim 1, wherein the at least one device includes a passive device selected from a resistor, a capacitor, a low-pass filter a high pass filter, a diplexer, a balun, and an inductor.

12. The apparatus of claim 1, wherein the at least one device includes a band-pass filter coupled to a radio-frequency device.

13. The apparatus of claim 1, wherein the at least one device includes a band-pass filter disposed proximate to and coupled to a radio-frequency device.

14. An apparatus, comprising:

a coreless substrate;

a ball-grid pad array disposed on a first surface of the coreless substrate;

a die embedded in and integral to the coreless substrate, wherein the die includes an active surface and a backside surface, and wherein the backside surface is exposed through the first surface;

metallizations that communicate through without contacting a metal shielding plane disposed between the first surface and the second surface;

a flip-chip disposed on a second surface that is opposite the first surface;

a wire-bond chip disposed on the second surface;

electrical connections formed by the metallizations between the die embedded in and integral to the coreless substrate and the flip-chip and wire-bond chip, and wherein all said electrical connections are disposed internal to the coreless substrate; and

a substrate electrically connected to the ball-grid pad array through a plurality of electrical bumps, wherein the substrate includes a heat sink embedded therein proximate the die backside surface.

15. The apparatus of claim 14, wherein the ball-grid pad array includes a plurality of electrical bumps, wherein the plurality of electrical bumps exhibit a first standoff and the backside surface exhibits a second standoff, and wherein the first standoff exceeds the second standoff.

16. The apparatus of claim 14, wherein the metallizations also couple the embedded die to at least one of the first surface and the second surface.

17. The apparatus of claim 14, where the die embedded in and integral to the coreless substrate is a first die, the apparatus further including a second die embedded in and integral to the coreless substrate.

18. The apparatus of claim 14, wherein the at least one device includes a passive device selected from a resistor, a capacitor, a low-pass filter, a high pass filter, a diplexer, a balun, and an inductor.

19. The apparatus of claim 14, wherein the at least one device includes a band-pass filter coupled to a radio-frequency device.

20. The apparatus of claim 14, wherein the at least one device includes a band-pass filter disposed proximate to and coupled to a radio-frequency device.

21. A method comprising:

assembling at least one embedded die into a coreless, bumpless build-up layer (BBUL-C) substrate, wherein the BBUL-C substrate has a land side and a device-mounting side opposite the land side and metallizations that communicate through without contacting a

metal shielding plane disposed between the land side and the device-mounting side, wherein the embedded die has an active surface and a backside surface, and wherein the embedded die backside surface is exposed through the land side;

assembling at least one device on the device-mounting side; and

coupling the embedded die to the at least one device woth the metallizations, wherein coupling is routed internally to the BBUL-C substrate; and

assembling the BBUL-C substrate to a foundation substrate, wherein the foundation substrate includes a heat sink embedded therein proximate the embedded die backside surface.

22. The method of claim 21, wherein the embedded die is an embedded first die, the method further including assembling an embedded subsequent die into the BBUL-C substrate.

23. The method of claim 21, wherein the embedded die is an embedded first die, the method further including:

assembling an embedded subsequent die into the BBUL-C substrate, and wherein the embedded subsequent die is assembled entirely internally into the BBUL-C substrate.

24. The method of claim 21, wherein assembling at least one device on the device-mounting substrate includes mounting a flip-chip thereupon.

25. The method of claim 21, wherein assembling at least one device on the device-mounting substrate includes mounting a wire-bond chip thereupon.

26. The method of claim 21, wherein assembling at least one device on the device-mounting substrate includes mounting a passive device thereupon.

27. The method of claim 21, wherein assembling at least one device on the device-mounting substrate includes assembling a band-pass filter that is coupled to a radio-frequency device.

28. The method of claim 21, wherein assembling at least one device on the device-mounting substrate includes assembling a band-pass filter that is coupled to and proximate to a radio-frequency device.

29. The method of claim 21, wherein assembling at least one device on the device-mounting substrate includes mounting at least two of a flip-chip, a wire-bond chip, and a passive device thereupon.

30. The method of claim 21, wherein assembling at least one device on the device-mounting substrate includes mounting at least two of a flip-chip, a wire-bond chip, and a passive device thereupon, the method further including assembling the BBUL-C substrate to a foundation substrate.

31. A computing system, comprising:

a coreless substrate;

a ball-grid array disposed on a first surface of the coreless substrate;

a die embedded in and integral to the coreless substrate, wherein the die includes an active surface and a backside surface, and wherein the backside surface is exposed through the first surface;

at least one device disposed on a second surface that is opposite the first surface;

metallizations that communicate through without contacting a metal shielding plane disposed between the first surface and the second surface;

a foundation substrate coupled to the coreless substrate, wherein the foundation substrate includes a heat sink embedded therein proximate the die backside surface.

32. The computing system of claim 31, wherein the at least one device includes a band-pass filter disposed proximate to and coupled to a radio-frequency device.

33. The computing system of claim 31, further including external memory coupled to the embedded die.

34. The computing system of claim 31, wherein the computing system is part of one of a cellular telephone, a pager, a portable computer, a desktop computer, and a two-way radio.