

to battery 2320. In some embodiments, battery 2320 includes one or more conductors 2319 that are used to connect to other components and/or to the other connections to circuit 2330. In other embodiments, terminal 2317 of circuit 2330 is connected directly to terminal 2319 of battery 2320 to form a complete device, and no connection is made to other external devices using terminals 2317, 2318, or 2319. Note that circuit 2330 can include any type of circuitry, for example, as shown in FIGS. 23-26, wiring traces 2332-2337, one or more active or passive devices such as integrated circuit 2340, switches, light sources, LCD displays, photovoltaic cells, etc.

[0243] FIG. 22B shows a block diagram perspective view of an integrated device 2201 implementing circuit 2200 of FIG. 22A having the circuit 2330 built on the battery 2320. According to the present invention, in some embodiments such as shown in FIG. 22B, battery 2320 is deposited or fabricated first (for example, onto a polymer substrate), and later circuit 2330 is deposited or fabricated to a surface of battery 2320. In some embodiments as shown in FIG. 22B, a top surface of the device implementing circuit 2330 includes one or more conductors 2317 that are used to connect to other components and/or to the other connections to battery 2320. In some embodiments, a bottom surface of battery 2320 includes one or more conductors 2319 that are used to connect to other components and/or to the other connections to circuit 2330. In some embodiments, a top surface of battery 2320 (the surface fabricated adjacently to circuit 2330) is partially exposed and includes one or more conductors 2318 that are used to connect to other components and/or to the other connections to circuit 2330. FIG. 23 and FIG. 24A show some examples of devices 2300 and 2400 that are exemplary embodiments of device 2201 of FIG. 22B.

[0244] FIG. 22C shows a block diagram perspective view of an integrated device 2202 implementing circuit 2200 of FIG. 22A having the battery 2320 built on the circuit 2330. According to the present invention, in some embodiments such as shown in FIG. 22C, circuit 2330 is deposited or fabricated first (for example, an integrated circuit chip built onto a silicon substrate), and later battery 2320 is deposited or fabricated to a surface of battery 2320. In some embodiments as shown in FIG. 22B, a top surface of the device implementing circuit 2330 is left partially exposed and includes one or more conductors 2317 that are used to connect to other components and/or to the other connections to battery 2320. In some embodiments, a top surface of battery 2320 includes one or more conductors 2319 that are used to connect to other components and/or to the other connections to circuit 2330. In some embodiments, a top surface of circuit 2330 (the surface fabricated adjacently to battery 2320) is partially exposed and includes one or more conductors 2318 that are used to connect to other components and/or to the other connections to circuit 2330. FIG. 25A and FIG. 26A show some examples of devices 2500 and 2600 that are exemplary embodiments of device 2202 of FIG. 22C.

[0245] FIG. 22D shows a schematic circuit 2205 of an embodiment of an integrated battery 2320 and circuit 2330 each having separate, electrically isolated terminals. Such embodiments are substantially identical to the embodiments of FIGS. 22A, 22B, and 22C, except that an insulator

between terminal 2318 of the battery 2320 and terminal 2316 of the circuit 2330 keeps these electrically separate.

[0246] FIG. 22E shows a block diagram perspective view of an integrated device 2206 implementing circuit 2205 of FIG. 22D having the circuit built on the battery. Such embodiments are substantially identical to the embodiments of FIG. 22B except that an insulator 2331 is deposited on battery 2320 before the rest of circuit 2330 is deposited or fabricated. In some embodiments, a portion of the top surface of battery 2320 is left partially exposed and includes one or more conductors 2318 that are used to connect to other components and/or to the other connections to circuit 2330. In some embodiments, a portion of the top surface of insulator layer 2331 is coated with a conductor and is left partially exposed and includes one or more conductors 2316 from circuit 2330 that are used to connect to other components and/or to the other connections to battery 2320.

[0247] FIG. 22F shows a block diagram perspective view of an integrated device 2207 implementing circuit 2205 of FIG. 22D having the battery 2320 built on but insulated from the circuit 2330. Such embodiments are substantially identical to the embodiments of FIG. 22C except that an insulator 2331 is deposited on circuit 2330 before the rest of battery 2320 is deposited or fabricated. In some embodiments, a portion of the top surface of circuit 2330 is left partially exposed and includes two or more conductors 2316 and 2317 that are used to connect to other components and/or to the other connections to battery 2320. In some embodiments, a portion of the top surface of insulator layer 2331 is coated with a conductor and is left partially exposed and includes one or more conductors 2318 from battery 2320 that are used to connect to other components and/or to the other connections to circuit 2330.

[0248] FIG. 22G shows a block diagram perspective view of an integrated device 2207 implementing circuit 2200 of FIG. 22A having the battery 2320 and the circuit 2330 built side-by-side on a substrate 2310. In some embodiments, a pattern of conductive areas or traces is deposited on substrate 2310, and the successive layer(s) of battery 2320 and circuit 2330 are then deposited. In some embodiments, circuit 2330 consists only of these conductive traces. In other embodiments, one or more of the process steps or deposited layers of battery 2320 and circuit 2330 are common, and thus performed at substantially the same time for both circuit 2330 and battery 2320, thus increasing the reliability, speed and yield of fabrication and lowering the cost of fabrication. In the embodiment shown, trace 2318 is deposited on substrate 2310 and forms a common bottom electrical connection for both circuit 2330 and battery 2320. Other aspects of FIG. 22G can be understood by reference to FIGS. 22A-22C.

[0249] FIG. 22H shows a block diagram perspective view of an integrated device 2208 implementing circuit 2205 of FIG. 22D having the battery 2320 and the circuit 2330 built side-by-side on a substrate 2310. This embodiment is substantially identical to that of FIG. 22G, except that separate traces are provided for signals 2316 and 2318.

[0250] FIG. 23 shows a perspective view of an embodiment 2300 of the present invention having a battery 2320 overlaid with circuitry. In some embodiments, substrate 2310 is a conductor such as a thin sheet of metal, and is overlaid with an insulator layer 2312, and then the bottom