

What is Claimed:

1. A transaction card comprising:
a non-plastic core having first and second faces and a core thickness therebetween, and an opening in the first face;
5 embedded electronics disposed in the opening, the embedded electronics comprising at least a printed circuit board and an active or passive power source;
a fill layer in contact with the embedded electronics, disposed in portions of the opening not occupied by the embedded electronics;
one or more layers disposed over the fill layer.
- 10 2. The transaction card of claim 1, wherein the one or more layers comprises a polymer layer and a magnetic stripe.
3. The transaction card of claim 1, wherein the one or more layers comprises a laser reactive layer.
4. The transaction card of claim 1, wherein the embedded
15 electronics further comprise a display and a processor configured to generate a dynamic security code on the display.
5. The transaction card of claim 1, wherein the core further comprises a pocket extending from the opening and having a pocket bottom with a depth less than the core thickness, a through-hole that connects the second face to the
20 bottom of the pocket, contacts disposed in the through-hole configured to be read by a card reader, and an integrated circuit module connected to the contacts.
6. The transaction card of claim 1, wherein the core has a coating on the second face and printed indicia on the coating.
7. The transaction card of claim 1, further comprising indicia
25 formed on at least one of the one or more layers disposed over the fill layer.
8. The transaction card of claim 7, wherein the indicia comprises printed indicia, laser formed indicia, or a combination thereof.
9. The transaction card of claim 1, wherein the non-plastic core comprises metal, and the non-plastic core further comprises a pocket extending from
30 the opening which has a pocket bottom with a depth less than the core thickness, and the card further comprises an EMI shielding layer disposed in the void between the embedded electronics and the pocket bottom.
10. The transaction card of claim 9, wherein the EMI shielding layer comprises ferrite.
- 35 11. The transaction card of claim 1, wherein the non-plastic core comprises ceramic.

12. The transaction card of claim 1, wherein the fill layer comprises a cured resin.

13. The transaction card of claim 1, wherein the fill layer is confined to the opening.

5 14. The transaction card of claim 1, wherein the fill layer extends across the first face of the non-plastic core.

15. The transaction card of claim 1, wherein the fill layer comprises a transfer tape adhesive.

16. The transaction card of claim 1, wherein the fill layer comprises
10 a polymer having a flowable state at a predetermined lamination temperature.

17. A process for making a transaction card defined by a plurality of layers, the process comprising the steps of:

providing a first portion of the card, the first portion comprising a non-plastic core having first and second faces and a core thickness therebetween;

15 forming an opening in the core, the opening defined through the first face;

disposing embedded electronics, comprising at least a printed circuit board and a battery, in the opening;

providing a second portion of the card;

20 providing a fill disposed in portions of the opening not occupied by the embedded electronics and attaching the first portion of the card to the second portion of the card.

18. The process of claim 17, wherein the steps of providing the fill and attaching the first portion to the second portion of the card comprises the substeps
25 of:

applying a first component of a resin to the first portion of the card in contact with the first face and the embedded electronics;

applying a second component of the resin in contact with the second portion of the card;

30 assembling the first component and the second component together with the first component of the resin and the second component of the resin in contact with one another;

curing the resin.

19. The process of claim 17, wherein the resin comprises a two part
35 epoxy in which the first component of the resin is different from the second component of the resin.

20. The process of claim 17, wherein the step of curing the resin comprises curing the resin by ultraviolet light, humidity or heating.

21. The process of claim 17, wherein the step of curing the resin comprises curing the resin in a vacuum press.

5 22. The process of claim 17, wherein the steps of providing the fill and attaching the first portion to the second portions of the card comprises the substeps of:

providing a transfer tape comprising unsupported adhesive disposed between a first release layer and a second release layer;

10 removing the first release layer and attaching the adhesive to one of (i) the second portion of the card, and (ii) the first face and the embedded electronics; and

removing the second release layer and attaching the adhesive to the other of (i) the second portion of the card, and (ii) the first face and the embedded
15 electronics.

23. The process of claim 17, wherein the steps of providing the fill and attaching the first portion to the second portions of the card comprises the substeps of:

laminating the first portion to the second portion in a lamination process
20 at a temperature above room temperature, wherein the fill comprises a portion of a flowable polymer layer disposed in the second portion, wherein the flowable polymer layer is flowable at the lamination temperature.

24. The process of claim 17, wherein the steps of providing the fill and attaching the first portion to the second portions of the card comprises the
25 substeps of:

applying a resin at least in a portion of the opening, wherein the resin does not extend beyond the opening; and
curing the resin.

25. The process of claim 24, further comprising laminating at least
30 one sheet over the resin and the first portion of the card.

26. The process of claim 17, further comprising tacking the electronics in the opening before disposing the fill in the opening.

27. The process of claim 17, wherein the core comprises a coating on the second face, further comprising applying printed indicia to the coating.

35 28. The process of claim 17, wherein the second portion comprises a plurality of layers.

29. The process of claim 28, wherein the plurality of layers comprises a polymer layer, a magnetic stripe and a laser reactive layer.

30. The process of claim 17, further comprising forming indicia on the second portion.

5 31. The process of claim 30, wherein the step of forming the indicia comprises printing the indicia.

32. The process of claim 31, wherein the plurality of layers of the second portion comprises a clear polymer layer, comprising printing the indicia on the clear polymer layer.

10 33. The process of claim 31, wherein the plurality of layers of the second portion comprises a laser reactive layer and the step of forming the indicia comprises exposing the laser reactive layer to a laser.

34. The process of claim 29, wherein the step of providing the second portion comprises pre-laminating the plurality of layers together prior to
15 applying the resin.

35. The process of claim 34, wherein the plurality of layers of the second portion comprise a carrier substrate having one adhesive side and one non-adhesive side, a clear polymer layer, a magnetic stripe, and a laser reactive layer, the step of pre-laminating the second portion comprising contacting the adhesive side of
20 the carrier substrate to one side of the clear polymer layer and laminating the laser reactive layer to the clear polymer layer.

36. The process of claim 34, wherein the forming step comprises forming a pocket extending from the opening and having a pocket bottom with a depth less than the core thickness.

25 37. The process of claim 36, wherein the core comprises metal, and the process further comprises disposing a layer of ferrite between the embedded electronics and the pocket bottom.

38. The process of claim 17, wherein the core comprises metal, and the process further comprises disposing a coating over a surface of the metal that
30 enables printing on the coated metal surface.

39. The process of claim 17, wherein the core comprises ceramic.

40. The process of claim 17, further comprising forming a through-hole in the core, disposing contacts in the through-hole, and electrically connecting the contacts to an integrated circuit module.

35 41. The process of claim 40, wherein the process of forming the through-hole is performed prior to the step of assembling the first component and the second component together.

42. The process of claim 17, wherein the transaction card has a first area defined by a first length and a first width, and the process comprises assembling the plurality of layers that define the card as a composite comprising a plurality of sheets, each sheet defining one of the plurality of layers and having a second area
5 larger than the first area by a factor greater than two, wherein the process further comprises cutting the transaction card and one or more other transaction cards from the composite.

43. The process of claim 42, further comprising personalizing each card after cutting the card from the composite.

10 44. The process of claim 17, wherein the steps of providing the fill and attaching the first portion to the second portion of the card comprises the substeps of:

applying a first resin in the opening of the card and over the embedded electronics;

15 curing the first resin;

applying a first component of a second resin to the first portion of the card in contact with the first face and the embedded electronics;

applying a second component of the second resin in contact with the second portion of the card;

20 assembling the first component and the second component together with the first component of the second resin and the second component of the second resin in contact with one another; and

curing the second resin.

45. A transaction card comprising:
25 a non-plastic core having first and second faces, a core thickness therebetween, and an opening;
embedded electronics disposed in the opening; and
one or more layers disposed over the non-plastic core and the embedded electronics.

30 46. The transaction card of claim 45 further comprising a dual interface (DI) chip either mounted or embedded in the non-plastic core.

47. The transaction card of claim 45, wherein the one of more layers comprises a layer of glass or fiber reinforced epoxy laminate sheet material.

35 48. The transaction card of claim 45, wherein the non-plastic core comprises metal.

49. The transaction card of claim 45, further comprising adhesive mounted between the core layer and the one or more layers.

50. The transaction card of claim 49, wherein the adhesive is a laminating adhesive.

51. The transaction card of claim 45, further comprising a magnetic stripe either mounted on or embedded within one of the one or more layers.

5 52. The transaction card of claim 45, wherein one or more layers are mounted to the first face of the non-plastic core, and one or more layers are mounted to the second face of the non-plastic core.

53. The transaction card of claim 45, wherein the embedded electronics comprise either a display or an indicator, and the one or more layers are transparent, such that the display or indicator is visible from an exterior of the transaction card.

54. A process for making a transaction card defined by a plurality of layers, the process comprising the steps of:

forming an opening in a non-plastic core layer having first and second faces and a core thickness therebetween in the core;

disposing embedded electronics at least partially in the opening; and

disposing one or more layers over the non-plastic core layer and the embedded electronics.

55. The process of claim 54 further comprising the step of mounting a dual interface (DI) chip to the non-plastic core.

56. The process of claim 54, wherein the step of disposing one or more layers over the non-plastic core layer comprises disposing one or more layers over each face of the non-plastic core layer.

57. The process of claim 54 further comprising the step of hot laminating one of the one or more layers to the first face of the card using heat, pressure or both heat and pressure.

58. The process of claim 57, wherein the step of disposing embedded electronics in the opening of the non-plastic core layer is performed after the step of laminating.

59. The process of claim 58 further comprising the step of cold laminating one of the one or more layers to the second face of the card, wherein the cold laminating step is performed after the step of disposing embedded electronics in the opening of the non-plastic core layer.

60. The process of claim 59, wherein the cold laminating step comprises vacuum, adhesive or both vacuum and adhesive.

61. The process of claim 54, wherein the embedded electronics comprise either a display or an indicator, and the one or more layers are transparent, such that the display or indicator is visible from an exterior of the transaction card.

62. A transaction card comprising:
5 a non-plastic core having first and second faces, a core thickness therebetween, and an opening;
a printed circuit board having an antenna that is substantially aligned with the opening in the non-plastic core; and
an insert disposed in the opening and positioned over the antenna.
10 63. The transaction card of claim 62, wherein the insert is composed of plastic.

64. The transaction card of claim 62, wherein the non-plastic core is composed of a polymer, a metal or a ceramic.

65. The transaction card of claim 62 further comprising additional
15 components on the printed circuit board and additional openings in the non-plastic core, wherein the additional components are respectively either positioned in or aligned with the additional openings.

66. The transaction card of claim 62, wherein maximum outer
lengthwise and widthwise dimensions of the non-plastic core and the printed circuit
20 board are substantially equal.