

Embedded Active Components and Integrated Passives: *Technologies & Markets*

Publication date: October 2007

The introduction of embedded active components and integrated passives may be the most significant development in the electronics industry since the introduction of microvia technology. What applications are driving demand? Which companies are using the technologies? Is the infrastructure sufficiently developed? The new analysis from TechSearch International provides answers to these questions and more.

The report includes both embedded active and passive devices in IC packages, modules, and printed circuit boards. It details the differences between formed and placed components and provides insight into the drivers for the adoption of each technology. Trends in each of the segments are described including processes, roadmaps, material and equipment issues, thermal and electrical issues, test, reliability, applications, and market growth. Alternatives to embedding in laminate substrates are reviewed. Implementation of embedded actives and passives will impact the entire supply chain. The report can help you position your company to take advantage of new market opportunities.

Executive Summary

1 Introduction

- 1.1 Definitions
- 1.2 iNEMI
- 1.3 Standards
- 1.4 Competing Technical Solutions
 - 1.4.1 Ceramic Substrates with Embedded Passives
 - 1.4.2 Thin Film Substrates with Integrated Passives (AT&T Process, Intarsia, NXP, STATSChipPAC, STMicroelectronics, Murata's SyChip)
- 1.5 Current Industry Needs
 - 1.5.1 iNEMI Roadmap
 - 1.5.2 Jisso Roadmap

2 Embedded Components

- 2.1 History
 - 2.1.1 Placed Discrete Components
 - 2.1.2 Embedded Active Components
- 2.2 Drivers for Embedded Components
- 2.3 Advantages and Disadvantages
- 2.4 Company Activities (GE, Casio, CMK, Clover Electronics, Freescale Semiconductor, Fujikura, DNP, Dyconex, Hiding Dies Project, Ibsiden, Imbera, Infineon, ITRI, Georgia Tech, Murata, NEC Toppan Circuit Solutions, Renesas, Samsung Electro-Mechanics, SHIFT Project, Sony, Taiyo Yuden, 3D Plus, YKC)

3 Embedded Formed Passives

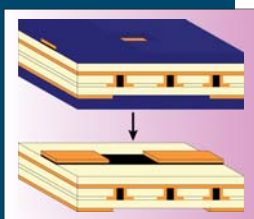
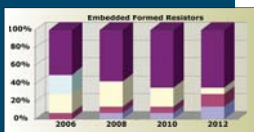
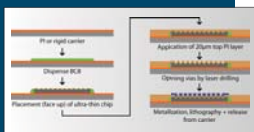
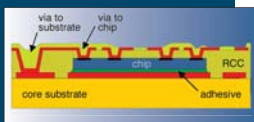
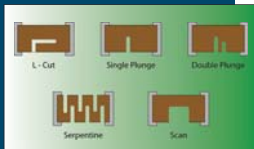
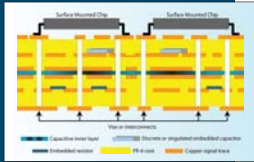
- 3.1 Embedded Decoupling Capacitance Consortium
- 3.2 AEPT Consortium
- 3.3 Economic and Environmental Factors
- 3.4 E/CIT
- 3.5 Formed Passive Components
 - 3.5.1 Formed Resistors (Asahi Chemical Research Laboratory, Ohmega, Ticer, Endicott Interconnect)
 - 3.5.2 Formed Capacitors (ZBC®, FaradFlex®, 3M C-Ply, Jacket Micro Devices, Hitachi MMI, Interra™ Embedded Capacitance Materials, Motorola Mezzanine, Endicott Interconnect, Other Thin Film Solutions)
 - 3.5.3 Combination Resistor and Capacitor Materials
 - 3.5.4 Laser Trimming

4 Infrastructure

- 4.1 Design, Modeling, and Simulation
 - Mentor Graphics, Zuken, SavanSys
- 4.2 Assembly Equipment and Services
- 4.3 Fabricators

5 Embedded Technology Markets

- 5.1 Embedded Active and Discrete Passive Components



4801 Spicewood Springs Road • Suite 150
Austin, Texas 78759
Tel: 512-372-8887 • Fax: 512-372-8889
tsi@techsearchinc.com • www.techsearchinc.com

Embedded Active Components and Integrated Passives: *Technologies & Markets*

5.1.1 Embedded Actives

5.1.2 Thin Film Substrates with Embedded Passives

5.2 Markets for Formed Resistors, Embedded Capacitors and Formed Embedded Components

Partial List of Figures

- Modules with embedded discretets.
- Embedded component hierarchy.
- Component embedding options.
- Small chip components.
- Average number of resistors in cell phones.
- PCB fabricators using embedded components.
- PCB fabricators using formed embedded components.
- Substrate fabricators using embedded components.
- Substrate fabricators using formed embedded components.
- Embedded die with dielectric layer on top.
- Intel BBUL package cross section.
- GE "Chips First" process.
- Casio's EWLP module.
- Clover's embedded die in PCB.
- Freescale RCP process and example.
- Product roadmap for RCP technology.
- Development roadmap for embedded technology.
- Hiding Dies process for embedding active components.
- Hiding Dies reliability test vehicle.
- Smart card module with embedded die.
- Filled vias for thermal management of RF power amplifier.
- Cost model for Hiding Dies technology.
- Cost profile of embedded die module.
- Packaging cost and module yield versus number of die.
- Ibsiden's embedded WLP.
- Third generation IMB manufacturing process.
- 50µm IC embedded in 150µm core.
- Signal attenuation passing through IMB vs. COB.
- IMB thermal via test structures.
- Embedded IC component in motherboard and POP package.
- Embedded chip capacitor and embedded LEDs.
- Infineon's molded reconfigured wafer process.
- Chip stacked and embedded process flow.
- Chip-last embedded actives and passives.
- One-Seg D-TV tuner module.
- Tuner module with embedded die.
- PoP with embedded IC.
- Multilayer flex with embedded components.
- A flex circuit package produced with HiCoFlex process.
- Thin film resistors in HiCoFlex.
- Flip chip in flex (FCF) process flow.
- Overview of UTCP process flow.
- Buildup of polyimide based RF structures.
- Sony digital tuner module.
- DC-DC converter with embedded passives.
- Double LCP substrate process.
- Polymer thick-film formed resistor process.
- Thin-film formed resistor process.
- Close up of resistors produced on a 46cm x 51cm panel.
- Power dissipation of PTF resistors.
- Processing alternatives for Interra PTF resistors.
- Ohmega-Ply formation and core lamination.
- Ohmega-Ply embedded resistors.
- TCR power density versus resistor area.
- TCR resistors.
- M-Pass additively plated resistor technology.
- Formed discrete capacitor.
- Cross-sectional view of ZBC material.
- FaradFlex embedded capacitance offerings.
- Capacitor formation using resin coated foil.
- Cross-section view of capacitor formed by build-up process.
- Impedance profile of BC and FaradFlex materials.
- Radiated noise versus frequency of various BC materials.
- Manufacturing of 3M C-Ply.

Fax to 512-372-8889 or Email to tsi@techsearchinc.com

Name: _____

Position: _____

Company: _____

Ship to Address: _____

Email: _____

Telephone: _____

Fax: _____

Bill to Address: _____

Purchase Order Number: _____

AMEX, Visa, MC, JCB: _____ Exp. Date: _____

Report Price: \$ 4,995.00

Additional Copies (\$500 each): \$ _____

Shipping & Handling: \$ _____ (\$25 pdf, \$30 Domestic-UPS 2nd day; \$35 International-US Global Priority)

Total Amount: \$ _____