NEWS

Latest 3D Power Packaging Report Focuses on Passives and Substrates as Enabling Technologies

New report is the first extensive study to address the challenges in implementing embedded passives in 3D power packaging to create significantly higher power densities

MENDHAM, NJ—October 5, 2018—The Power Sources Manufacturers Association (PSMA) Packaging Committee announces the publication of its latest report titled, "3D Power Packaging with Focus on Embedded Passive Component and Substrate Technologies." This is the third in a series of reports focused on using embedded substrate technology for building power sources. It is the first extensive study of embeddable passive components both available and in development for use in the power path of power sources. The report contains extensive research and product illustrations geared to an audience of technology executives and design engineers.

Miniaturization of passive components without compromising their power handling and efficiency and their integration with actives has always been a key focus for power packaging. There is also an increasing trend to vertical or 3D package integration to address the performance issues by eliminating parasitics from interconnections. Embedding gives lowest package inductance and enables co-integration of power systems and drivers in a single package with direct interconnection between gate driver circuits and switches with shortest interconnection length. This has become even more important with the rapid emergence of wide bandgap power switching devices. This, however, leads to several process integration and reliability challenges that need to be systematically addressed.

Georgia Tech Packaging Research Center, under contract from PSMA systematically surveyed the recent advances in passives, active embedding and 3D passive-active integration to generate this report, with emphasis on 3D power packaging enabled by advances in passive components and embedding of actives in power packages. A detailed literature study was conducted on key advances in embedded passive technologies and related topics. Emerging nanomaterials, processes and technologies are described in detail for inductors, capacitors and resistors. Nanostructured materials provide additional degrees of freedoms in enhancing the properties to improve the performance metrics such as volumetric density and efficiency of the components. Key enabling building-blocks are described for each technology. The manufacturing challenges are also highlighted in advancing the components to improve performance. Industry leaders were surveyed to get the recent technology advances in each category. Roadmaps are projected for passive component advances and active embedding technologies.

The trends and roadmaps in 3D power packaging are also described in three categories: low power (1-100 W), medium power (100-1000 W) and high power (10-100 kW). Integration in each category is classified into lead-frame-based, substrate-embedding based and traditional ceramic substrates. Active embedding with panel-scale substrate manufacturing is also reviewed in detail. Recent innovations in substrate materials and associated reliability challenges such as via cracking, dielectric cracking or electric breakdown are highlighted. Advances in die-attach solutions with sintered nanocopper are reviewed, highlighting the evolution of low-stress sintered copper-based die-attach solutions.

Co-chairs of the PSMA Packaging Committee, Ernie Parker of Crane Aerospace & Electronics and Brian Narveson of Narveson Consulting, described the report as "the first comprehensive document to discuss the challenges companies will face to implement embedded passives in 3D power packaging to create the significantly higher power densities.

The PSMA report on 3D packaging was provided free of charge to PSMA Regular and Associate Company members. Additional copies may be purchased at the member price of $290. PSMA Affiliate members may also purchase the report for $290. The report is available to non-members for purchase on the PSMA website (www.psma.com) for the price of $3,490.

About PSMA

PSMA is a non-profit professional organization with the two-fold objective of enhancing the stature and reputation of its members and their products and improving their technological power sources knowledge. Its aim is to educate the electronics industry, academia, government and industry communities as to the applications and importance of all types of power sources and conversion devices.

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