News Release

November 19, 2018 – Nevada City, California – New Venture Research (NVR) announces the publication of its latest market research report, the "*Advanced IC Packaging Technologies, Materials, and Markets - 2018 Edition*."

More than ever before, IC packaging technology is being challenged by two distinct, yet closely linked product trends. On the one hand, consumers demand more powerful electronics products – from computers to tablets to smartphones – that provide more features and greater functionality; on the other hand, they want their products to be smaller and more lightweight and ergonomic. Meeting this demand requires manufacturers to develop advanced IC packages that combine devices with smaller form factors and ever-greater silicon integration.

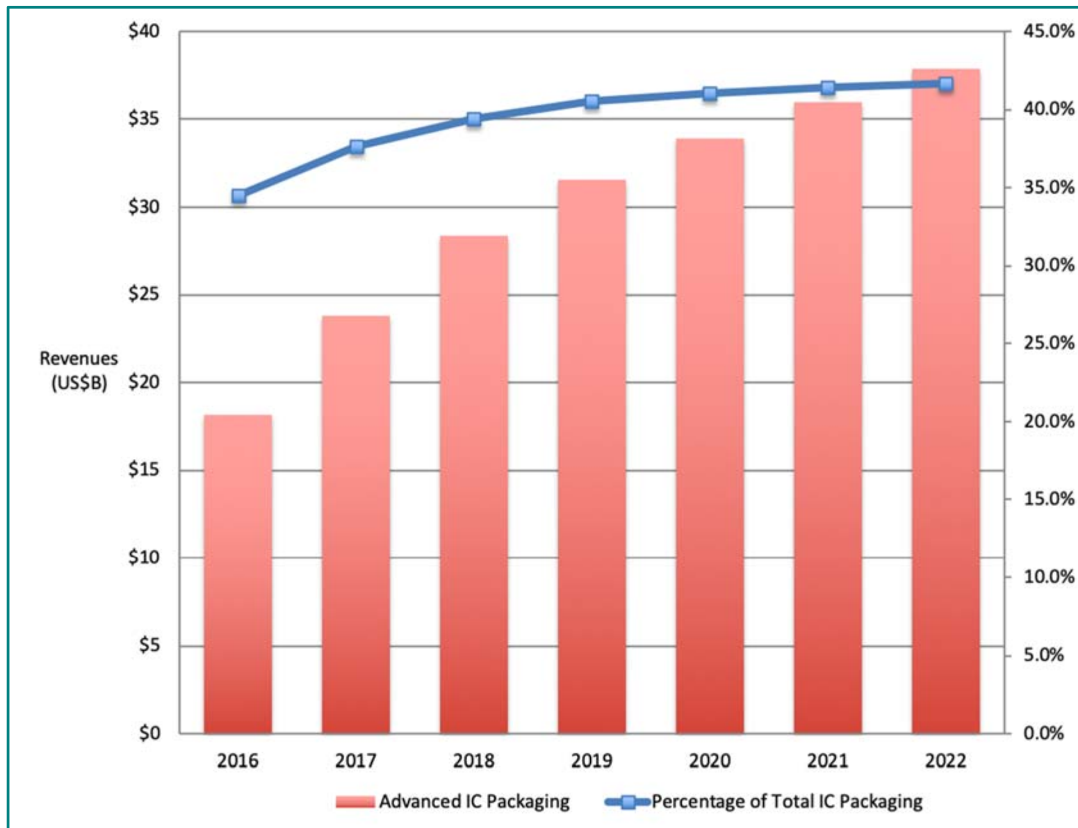
This new strategic report from NVR provides a comprehensive analysis of the latest advanced technologies in IC packaging, assembly techniques and materials. The report explores the important trends in multichip packaging, including vertically stacked packages – TSOP, FBGA, QFN and WLP – and complex system-in-package (SiP) solutions: multichip modules (MCMs), package-in-packages (PiPs) and package-on-packages (PoPs). Also discussed are advances in substrate materials and technology that embed passive and active components directly into the substrate, helping SiPs to pack more complexity into the same or smaller packages.

Other advanced packages covered in this report include fan-out wafer level packages (FOWLPs), the currently the fastest growing segment of the IC packaging market. Similarly, a new generation of multi-row quad flat-pack, no lead packages (MRQFNs) have nearly doubled the I/O capacity of traditional QFNs and greatly expanded their target applications. In addition to specific types of IC packages, the analysis in this report digs deeper into the interconnection methods and ~~the~~ materials used in assembling packages. Interconnection topics include:

- New advances in wire bonding techniques and the metal materials used in the process
- How flip chip assembly is enabling manufacturers to improve on everything from assembly cycle times to thermal dissipation and the all-important package size
- The role of through-silicon vias (TSVs) in 2.5D and 3D packaging technologies

Advanced IC packaging products still make up a relatively small share of the total annual shipments of IC packages, but because they are more complex and therefore more expensive, the advanced packaging market segment generates a much greater share of revenues. The figure below shows revenues for advanced packaging for 2016

and 2017, as well as NVR's forecast for the market through 2022. In 2017, revenues totaled nearly $24 billion, which was more than a third of the revenues generated by the worldwide IC packaging market. By 2022, that share is expected to rise to nearly 42 percent, based on annual revenues of almost $38 billion. Between 2017 and 2022, the compound annual growth rate (CAGR) for the advanced packaging market will be 9.7 percent.



MCPs (multichip packages) are by definition densely packed and highly integrated chips, and are useful in a wide range of applications. MCPs are working their way in increasing numbers into cellular telephones, base stations, PDAs, MP3 players, camcorders, digital video recorders, digital cameras, notebook computers, PCs, Internet routers and switches, servers and workstations, and more. They are also key products for specialized medical applications, where companies are looking for highly miniaturized packages that can be used for insertion into the body, such as cochlear hearing aids.

The next table summarizes the application markets that are expected to utilize MCPs for the years 2016 through 2022. The rapid spread of smartphones across the globe has made these devices among the most dominant of all electronics products. Yet, significant number of applications are being used for other mobile devices, in particular tablets. Moreover, transportation applications are a significant market segment and are growing almost as rapidly as cell phones. This expansion is driven largely by mobile applications, to enable greater safety and convenience—features that require an expanding number of sensors and monitoring devices throughout the ecosystem. Medical needs include imaging, diagnostics, monitoring and surgical applications. Even greater applications involve aerospace/defense navigation, weapons and surveillance.

Multichip Packaging Unit Shipments by Application		
	2022 Rank	**CAGR**
Package Units (M)		
Cellular Phones	1	12.7%
Automotive/Aerospace	2	11.9%
Medical/Industrial	3	10.8%
Servers / Workstations	4	10.4%
Internet Routers/Switches/Controllers	5	9.4%
Laptop and Notebook Computers	6	8.6%
Wireless Base Stations	7	7.3%
Tablets and PDAs	8	6.8%
Set-top Boxes/DVRs	9	6.7%
Digital Cameras	10	5.1%
Camcorders	11	4.4%
Desktop PCs	12	3.4%
MP3/MP4 Players	13	-0.3%
Other	n/a	9.8%
Total Multichip Packages	**18,560.3**	**10.1%**

The report concludes with profiles of 21 leading packaging companies. In addition to an overview of each company and their advanced IC packaging products, the profiles describe some of their most important solutions and contributions to this rapidly changing market arena.

The *Advanced IC Packaging Technologies, Materials and Markets – 2018 Edition,* is the latest in a 20+ year-long tradition of providing in-depth and accurate analysis of IC packaging markets. It is 315 pages in length and provides a detailed analysis, insight and commentary on a critical technology that contributes to the very existence of the modern electronics marketplace. For more information please contact Karen Williams at kwilliams@newventureresearch.com/, Tel: (408) 244-1100, or visit NVR's website at www.newventureresearch.com/ .