3D+
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3D+ uses a stacking technique based on tape-and-reel mounted devices – die or packaged parts. They assemble these in a stack using epoxy encapsulation and expose tab-like connections to the outer vertical walls. The cube is then gold plated and laser scribed to connect the layer connections with the board interface. The board interface can be tailored for leads or BGA. The tape mounting allows KGD testing. Where DRAM is used below, SRAM, SDRAM and Flash can be used as well. This technology accomodates plastic TSOPs or dice.

NASA, ESA and CNES are jointly evaluating the 3D+ technology. Testing on a special evaluation cube which contains strain gauges, temperature sensors, moisture sensors, daisy chained wire bonds and passives is scheduled to be completed in September 2000. CNES has performed moisture resistance testing on 3D+ stacks made with TSOP devices. Some DC leakage current increase was found but believed to be due to the device, not the packaging. Moisture tests on stacks made with dice is planned. See

"Use of Plastic Encapsulated Devices in Space Applications. Do we Need 'Ruggedization'?", M. Billot, C. Val, [*still looking for the publication and date*]

for the report on this testing. Background information about the development of the stacking method can be found in:

"The 3D Interconnection – Applications for Mass Memories and Microprocessors", C. Val and M. Leroy, ISHM '91
"3D Stacking of TSOP Plastic Packages", C. Val, ISHM '92

3D+ does all of the manufacturing on site and outsources the KGD testing. Their standard parts include:

128 Mbit DRAM	Die is IBM 4M x 4 but stack can be configured for 8 bit or 16 bit wide SRAM, SDRAM & Flash can also be used in this package.	0.63” x 0.39” x 0.39”
256 Mbit DRAM	Die is IBM 8M x 8	0.905” x 0.39” x 0.26”
640Mbit DRAM Module	Die is IBM 4M x 4	1.34” x 1.34” x 0.59”
8, 16 & 32 Mbit SRAM	Die are Samsung in various arrangements	0.885” x 0.433” x 0.295”
32 Mbit SRAM		0.61” x 0.385” x 0.364”

A DSP + DRAM module is in development. It will contain the Temic TMS320C31 DSP.