



NEO TECH QUICK REFERENCE DESIGN GUIDE #8

Cofired Laminated Ceramic Technology

Over the years ceramic interconnect technology has grown. Originally, thick film material screen printed on a ceramic substrate was an incredible innovation to package high density applications. The microelectronics industry has come a long way. Thick film, thin film, photo-patterned thick film, plated copper on ceramic, High Temperature Cofired Ceramic (HTCC) and Low Temperature Cofired Ceramic (LTCC) are the evolution of ceramic interconnect technology.

HTCC and LTCC have captured the spotlight in a technology base that is constantly responding to device and system level demands for higher performance and higher density applications. It is the package of the future because it eliminates the need for a metal package and in some cases the substrate.

The process to manufacture both HTCC and LTCC are identical, except for the firing temperature of the laminate. The LTCC fires at a lower temperature as the name implies, approximately 850° to 1000° C compared to 1600° C for HTCC.

The manufacturing process to build an HTCC or LTCC product is as follows:

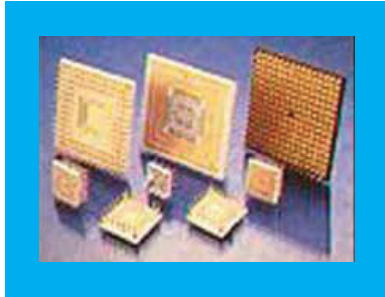
- The product starts as green ceramic tape.
- The tape is cast to the approximate size and thickness.
- The cast tape is cut to size.
- The tape is then die punched to insert device and via holes.
- The via holes are filled with conductive thick film material.
- The layer is then screen printed exactly like thick film.
- The various layers are laminated together in a press.
- The individual parts are shaped.
- The entire unit is cofired in a furnace, similar to thick film.
- The fired part is nickel plated.
- I/O Pins are brazed on the edges, if the part requires pins.
- The final part is nickel/gold plated

The part is now complete.

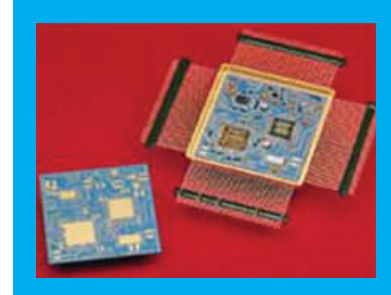


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Examples of HTCC and LTCC multi-chip modules (MCM), multiple layers and high pin count.



HTCC



LTCC

All is not roses with HTCC and LTCC ceramic interconnect technology. The process has problem areas.

They are:

1. Hard to control tolerances caused by high shrinkage in processing.
2. A high dielectric constant of 9.5.
3. A modest thermal conductivity of Al_2O_3 (27 W/mK @ 25° C)

Although HTCC and LTCC look the same, LTCC is gaining popularity, especially for RF/microwave applications. The most common use of LTCC is to provide embedded inductors, capacitors and resistors for functional substrates. In addition, the LTCC becomes the finished package that can be hermetically sealed, Glop Top sealed or a lid can be soldered or epoxy cured in place.

BGA (Ball Grid Array) and MCM-L packages also use LTCC designs.

To evaluate how an LTCC or HTCC package may benefit your program, call us today. We will be happy to discuss your application.