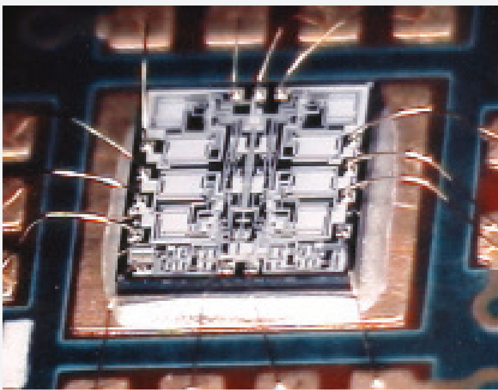
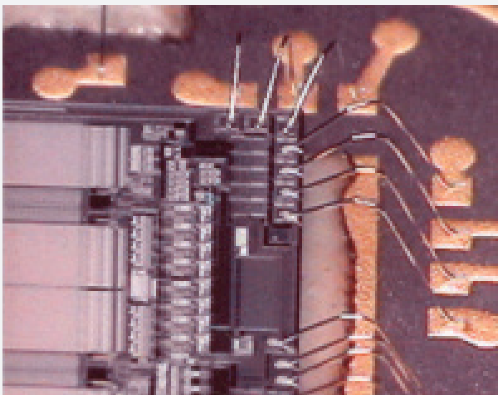
NEOTech

Collaborative Engineering for Microelectronic Circuit Miniaturization in Satellite Applications

Chip-on-Board (CoB) Examples





Background and Challenge

An OEM building and launching geostationary communications satellites needed to design and build a series of new control and telemetry modules for their new satellite system. The new modules needed to fit in a compact physical space while achieving very demanding performance. This required a more miniature electronic package technology versus earlier generations of satellites.

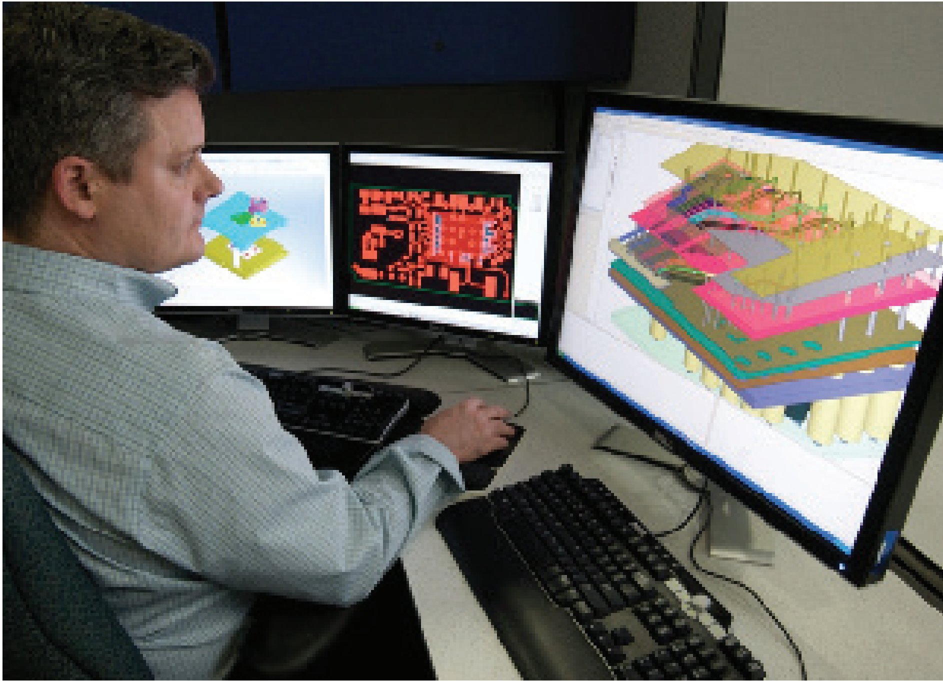
The Solution

NEO Tech was chosen to be the design and manufacturing partner of control and telemetry electronic modules due their experience building mission critical and high reliability microelectronic circuits using chip-on-board (CoB) technology.

Control Boards

Control boards, whose function is to control the transponders (the receive and transmit modules i.e. the guts of the satellite) were designed, based on customer schematics and requirements. Each satellite has a number of transponders (up to 96+) and the operation of each one is managed by a control board.

The NEO Tech design of the control boards starts with a customer supplied schematic and a desired form factor. NEO Tech designed the control board as Chip-on-Board (CoB) technology assembly. This technology combines standard surface mount technology with microelectronic assembly. In this CoB technology the standard packaged semiconductor parts are replaced with the same device in die (bare silicon chip) form. The die or chip is connected to the traces on the PCB using wire bonding technology i.e. connecting the small I/O pads on the chip to the PCB using small 0.001” gold wires. This effectively eliminates one level of interconnect (soldering of the package leads) and thus have the added benefit of increasing the reliability of the assembly. The main benefit is the reduction in



surface area required by the CoB technology assembly. The gain in packaging density allows our customer to decrease the size of the electronics and save weight, an important factor in any payload launched into space.

The control boards are built by NEO Tech using Chip-on-Board technology.

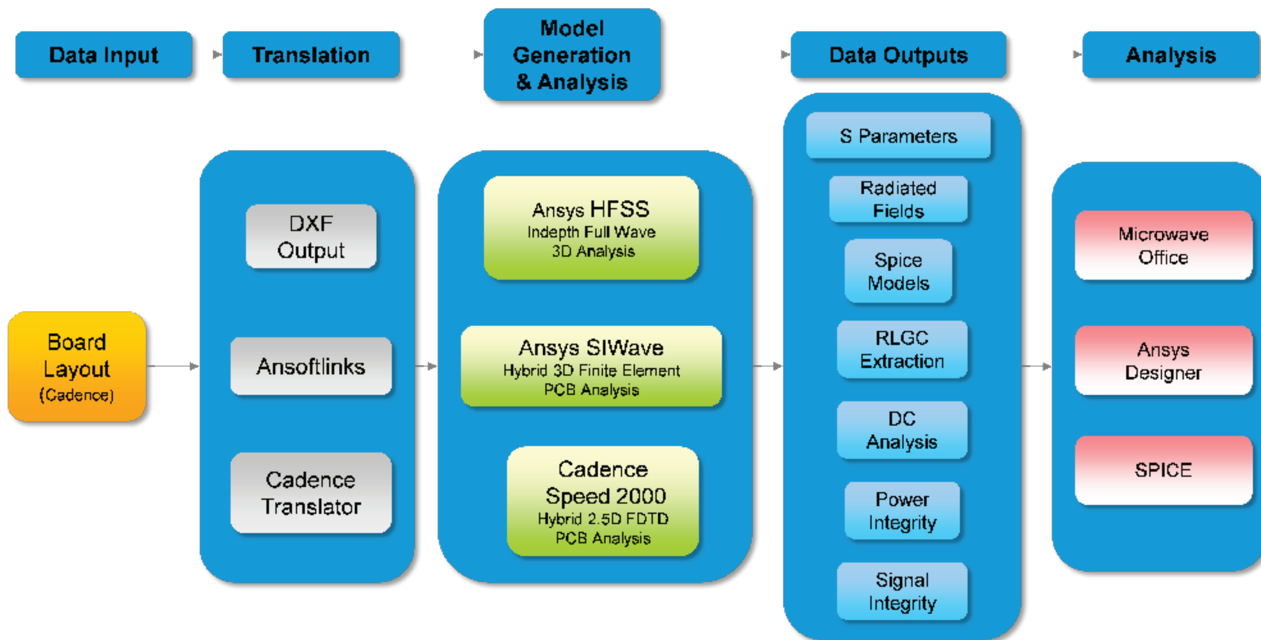
Telemetry Modules

Telemetry modules are part of the control systems for the satellite. There are a number of these modules in a satellite. These modules check the status and functionality of various subsystems and can measure vital status information about the satellite and its payload. Examples of this are system voltages, currents, temperature etc. NEO Tech designed and developed several standard telemetry modules based on our customer's schematic diagrams. The design activity included the mechanical design of the housing and the layout and analysis of the PCBA's. As in the control board design, the technology chosen was Chip-on-Board technology. Again this technology provided us with higher packaging density and lower mass. This reduced both the system size and mass, vital for achieving the OEM's requirements.

Simulation and Validation for Advanced RF Microelectronics

NEO Tech engineers utilize state of the art tools (Ansys HFSS, SI Wave and Microwave Office) for 3D electromagnetic field simulation when designing these products to ensure they meet the stringent signal integrity demanded by these high-frequency and high-speed applications. NEO Tech Engineers use these tools as a specialized design platform for power integrity, signal integrity and EMI analysis of IC packages and PCBs. With this we can help model, simulate and validate high-speed channels and complete power delivery systems typical in miniaturized control and telemetry module electronics.

Successful design of microelectronic space control boards and telemetry modules of geostationary communication satellites require power integrity, signal integrity and thermal integrity co-analysis. NEO Tech engineers handle the complexity of interconnect design from die-to-die across ICs, packages, connectors and boards, by utilizing these powerful toolsets. With advanced RF and signal integrity simulation we can help our customers understand the performance of high-speed electronic products long before building a prototype in hardware. This approach enables NEO Tech to achieve a faster time to market, reduced costs and improved system performance of their microelectronic products.



Conclusion

Through close collaboration with our customer and implementing high density microelectronic packaging technology, NEO Tech designed, fabricated and tested high reliability modules for use in geostationary satellites. The technology and the assembly skills of our employees allowed the customer to achieve lower system mass and high system reliability.

To find out more about NEO Tech's services, contact the company at 9340 Owensmouth Ave., Chatsworth, CA 91311; 818.495.8617; E-mail: info@neotech.com; Web site: www.neotech.com.