



INDUSTRY:
Satellite

CUSTOMER:
SpaceX

TECHNOLOGY:

- BiCMOS technology for RF
- FD-SOI technology
- Leo connectivity
- Panel-level packaging technology
- STM32V8 microcontroller

Powering Starlink global connectivity

For years, the promise of broadband from space sounded like the kind of idea that lived more easily in a strategy deck than in the real world. SpaceX changed that. By building Starlink, the company has turned low Earth orbit satellites into a working communications network, one that now serves more than 12 million users in more than 160 countries. For people in rural areas, on remote job sites, at sea, or far beyond the reach of traditional internet infrastructure, that matters.

Starlink is not just a story about rockets and satellites. It is also a story about engineering precision, manufacturing discipline, and the semiconductor technology needed to make a radically complex system work at scale. That is where ST came in.

Starlink's white terminal looks simple from the outside: plug it in, point it at the sky, and it works. But that simplicity hides a highly complex system behind it. The terminal must maintain a connection with a fast-moving satellite constellation, operate reliably in harsh weather, and be manufactured at very high volumes without sacrificing quality or cost. Few hardware platforms face such demanding requirements.



Our partnership with ST has been instrumental in enabling the scale and performance of Starlink.

Gwynne Shotwell, President and COO at SpaceX



CHALLENGE

- Bring reliable broadband connectivity to homes and businesses worldwide through low Earth orbit satellites
- Design and industrialize highly complex phased-array antennas for consumer use
- Scale production to very high volumes while maintaining performance, quality, and cost competitiveness
- Support future satellite and terminal generations with a long-term technology roadmap

SOLUTION

- Ten years of co-design between SpaceX and ST engineers in France and Italy
- ST BiCMOS technology for high-performing phased-array antennas
- Innovative packaging approach (PLP) enabling high-volume manufacturing
- FD-SOI technology in the STM32V8 MCU for satellite-to-satellite laser links
- STM32, secure elements, and GNSS

IMPACT

- A global broadband platform serving more than 12 million users
- Supported production, and more than 130,000 new subscribers per week
- Enabled delivery of high-speed internet in more than 160 countries
- Created a foundation for future Starlink satellite and terminal generations

A big part of the story is ST's deep expertise in BiCMOS technology, which helps power the high-performance phased-array antennas inside Starlink terminals, thanks to its outstanding RF performance in the K band. Those antennas enable the terminal to track satellites overhead moving at 27,000 km/h and to switch smoothly from one satellite to another, helping achieve an ultra-fast and stable user connection, even in the most remote areas. But performance was only half the challenge. SpaceX also needed a way to build at scale, and ST introduced a radical innovation in packaging for volume and cost efficiency: a new manufacturing platform based on panel-level packaging,

where chips are assembled and processed on a large panel rather than individual wafers. The payoff has been dramatic: a delivery rate of more than 5 million RF chips a day, helping Starlink scale faster than many thought possible. ST's contribution does not stop at the user terminal. It extends all the way into the satellites themselves, which also feature larger phased-array antennas. Starlink also relies on ST's FD-SOI (fully depleted silicon-on-insulator) technology, through the STM32V8 microcontroller, which SpaceX selected for the mini laser systems that link Starlink satellites to one another at extremely high speeds in low Earth orbit.



We are excited to continue this journey with ST, and make high-speed internet available to more people.

Gwynne Shotwell, President and COO at SpaceX

About SpaceX

SpaceX designs, manufactures, and launches advanced rockets and spacecraft. The company operates Starlink, the world's most advanced satellite constellation in low Earth orbit, delivering reliable broadband internet capable of supporting streaming, online gaming, video calls, and more.

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