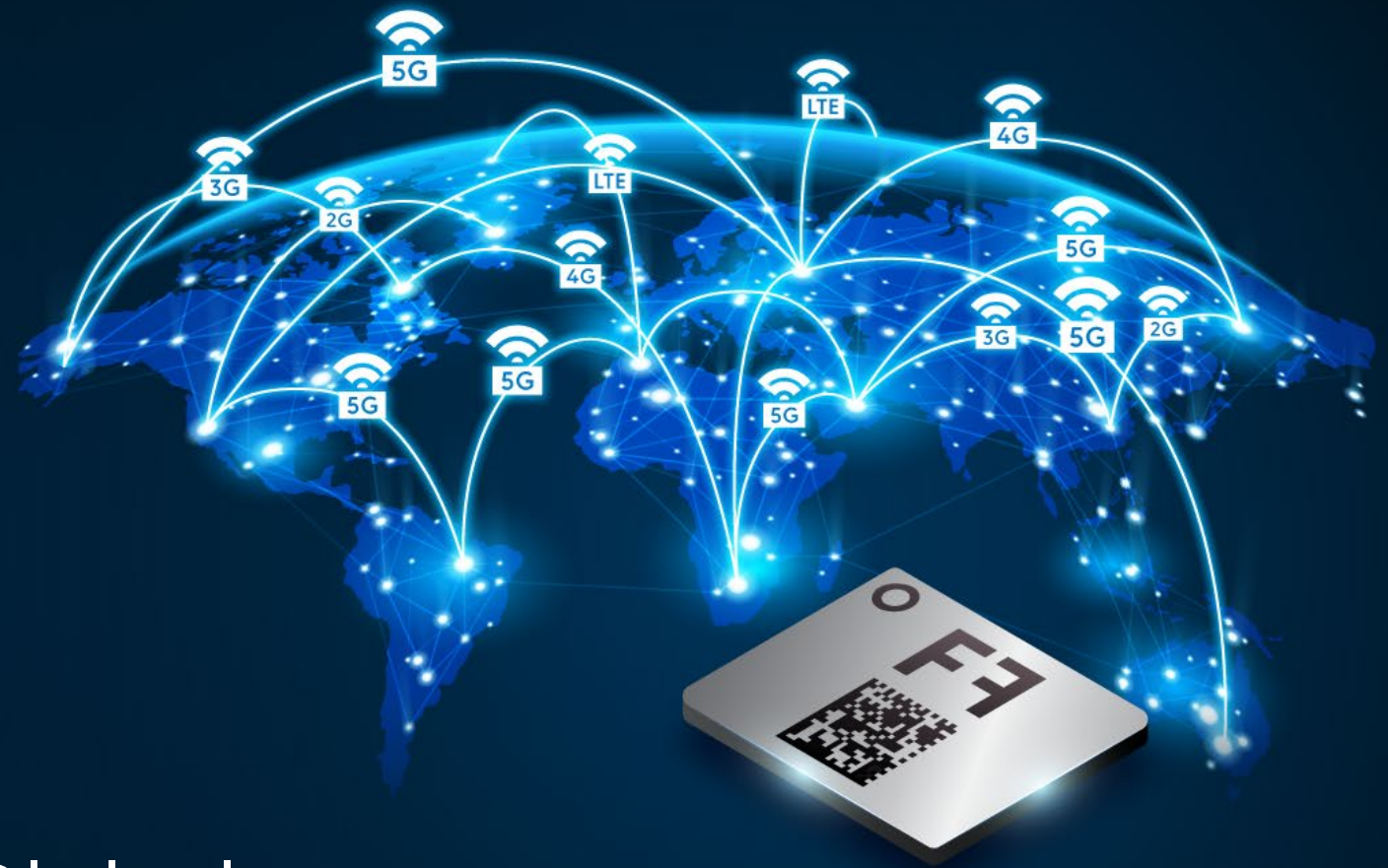




Forefront RF
Simplifying Global
Connectivity

Contents

Designed for a connected world	3
Why Wireless Design Needs a New Approach	4
Our Innovation	5
Technology Overview	6
Forefront RF Advantage	8
Use Cases	9
Improving Manufacturing Sustainability	10
About Forefront RF	11

Designed for a connected world

The continued growth of smartphones, wearables, IoT devices and satellite-enabled services is driving demand for products that can operate seamlessly across multiple regions, networks and wireless standards. For manufacturers, delivering this level of global compatibility typically requires multiple hardware variants and more complex supply chains, increasing costs and extending development cycles.

Meeting these demands with conventional RF architectures is becoming increasingly difficult. Supporting a growing number of frequency bands and regional requirements often results in larger RF front-ends, increased hardware complexity and reduced design flexibility. At Forefront RF, we are pioneering the world's first fully tunable RF front-end architecture, transforming how wireless connectivity is designed, built and scaled.

Our technology helps manufacturers overcome the challenges of global connectivity by reducing complexity and enabling more adaptable products. Guided by our vision to empower anyone to treat global connectivity as a commodity, we are helping shape the future of wireless communications.



Why Wireless Design Needs a New Approach

Worldwide data usage is growing at an unprecedented rate. With IoT coming to fruition and 5G now mainstream, the demand for always-on connectivity is intensifying.

This surge in data volumes is pushing mobile network operators (MNOs) to acquire more spectrum and radio frequency (RF) bands to meet demand for ultrafast uplink/downlink speeds. This increase, together with evolving communications standards, is creating significant size and complexity challenges in current mobile radio front-ends. Today's RF components (filters, duplexers, etc.) are locked to specific frequency bands. As more channels are introduced, the amount of hardware needed at device level goes up, expanding the PCB footprint and complicating design.

Since the 3G standard was first introduced, the RF band count has increased tenfold. Moreover, with frequency bands varying according to geographical location, mobile device manufacturers must build regional models of the same product.

Increasing the component count to accommodate the growing number of RF bands and device variants is resulting in continued growth in mobile front-end module size. Forefront RF is delivering a new approach, where expanding band coverage is not paired with any size increases.



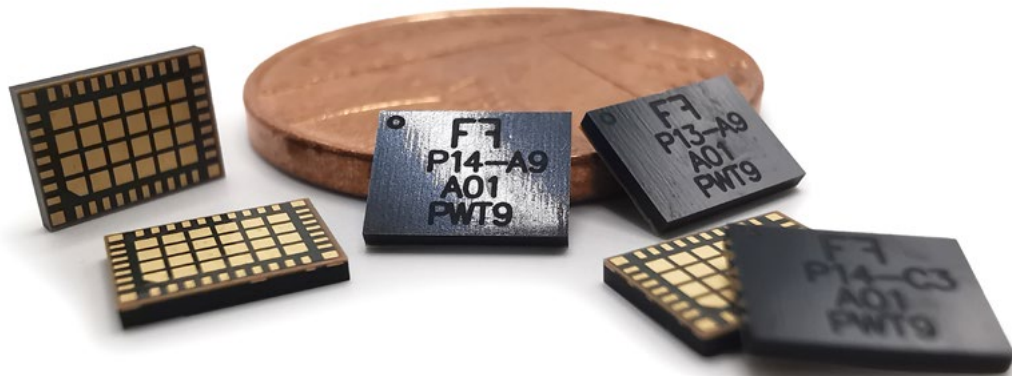
Our Innovation

Forefront RF is pioneering a smarter approach to the size and complexity challenges in mobile radio front-ends to meet the demands of an increasingly dynamic wireless landscape.

Central to this is our patented Foretune™ technology which works by combining tunable filters with self-interference cancellation. This is similar to how active noise cancellation works in headsets to neutralise background noise but over a wide range of mobile RF frequencies.

Our innovation replaces all fixed frequency duplex filters and other discrete components with a multiband front-end module (FEM) that dynamically self-configures according to available frequency bands.

Aimed at 4G and 5G applications, our FEM enables significant size reductions in mobile radio front-end whilst increasing the number of supported frequency bands. Moreover, the greater the number of bands needed, the greater the space saving, making it particularly appealing to small form factor devices such as cellular enabled smartwatches where conventional front-end architectures are becoming increasingly impractical.



With nearly £25 million in funding raised to date, including a £16 million Series A investment round, Forefront RF is on track to launch its first-generation product - FFM51010 - to the fast growing cellular-enabled smartwatch market.

Technology Overview

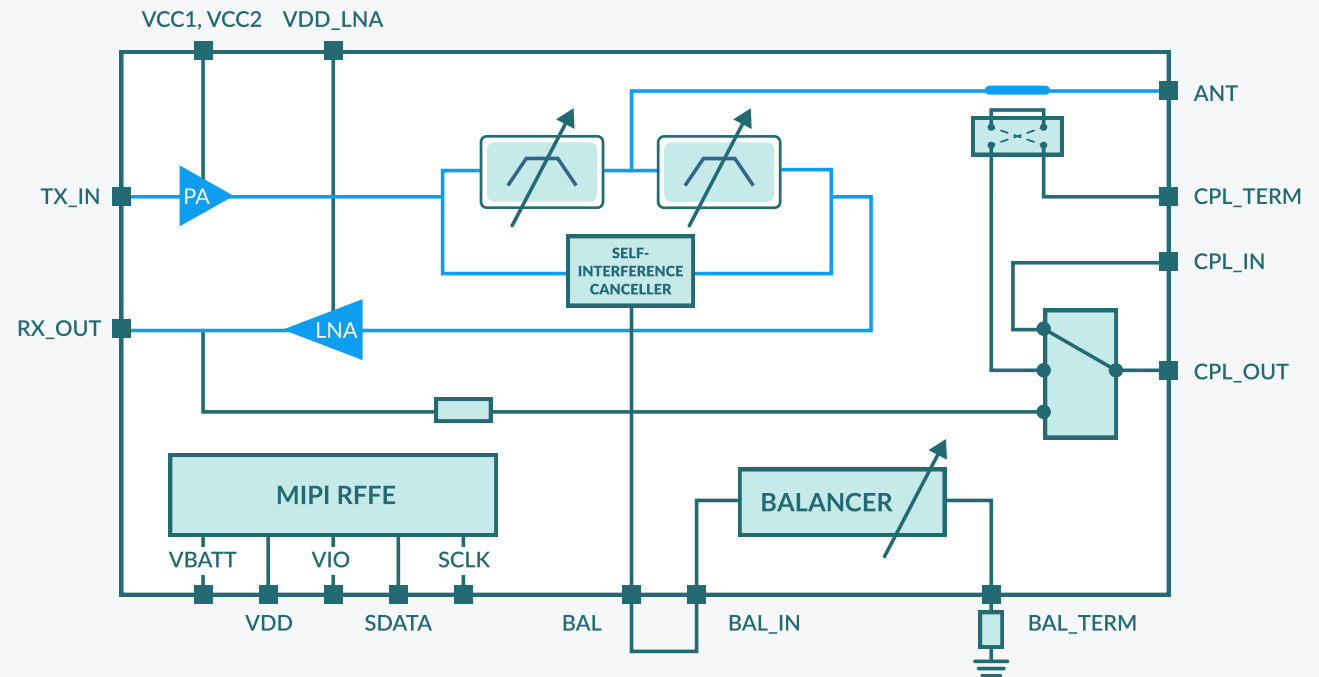
Forefront RF's multiband mobile radio front-end module (FFM51010) is based on the company's proprietary Foretune™ technology and comprises:

- Multi-node power amplifier
- Low noise amplifier
- Bi-directional coupler
- Tunable filter
- Adaptive signal cancellation

Key features include

- Compact LGA-type module:
6.0 x 4.5 x 0.75mm
- Supports all frequency bands between
612 and 960 MHz
- No external duplexers required
- Single MIPI RFFE v3.0
- Integrated antenna-port bi-directional
RF Coupler

Functional Block Diagram



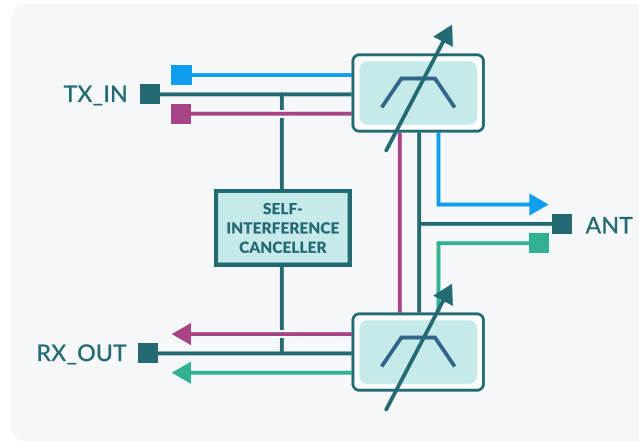
Applications

FFM51010 is suitable for the following wireless enabled devices comprising a single antenna

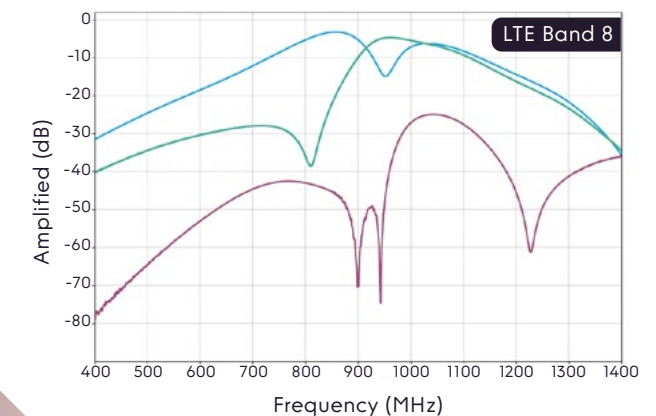
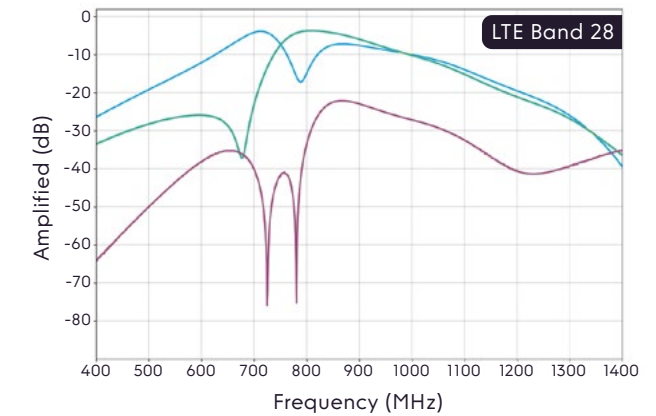
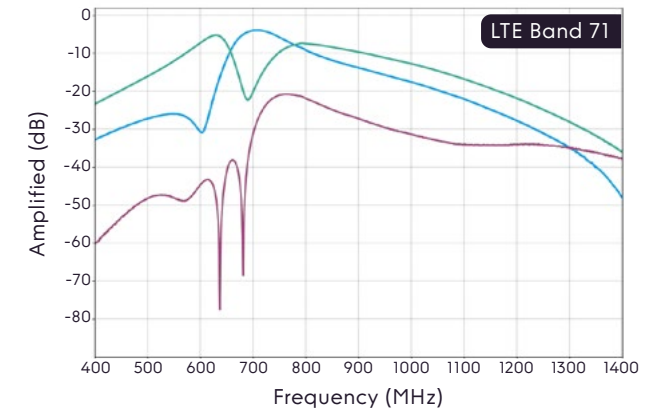
- 4G, 5G
- 5G RedCap Mobile Devices
- Wearables
- UE Power Class 3
- Cat-1bis

Working principle

Foretune™ technology combines tunable transmit and receive filters with feedforward self-interference cancellation. These filters connect the transmitter and receiver to a shared antenna whilst providing tunability over a wide range of frequency bands. However, filtering alone cannot fully isolate the receiver from the transmitter's signals and noise. To address this, a feedforward self-interference canceller operates in parallel, suppressing transmitter leakage and noise. This combined approach delivers the transmit-to-receive isolation necessary to meet stringent performance specifications and industry standards.



- Transmit output to Antenna - Insertion Loss
- Antenna to Receiver input - Insertion Loss
- Transmit to Receive Isolation



Forefront RF Advantage



Simplified mobile radio front-end designs

Reducing the complexity in RFFE architectures increases performance and reliability



Less PCB space

Empowering OEMs to incorporate third-party technologies for competitive differentiation



Streamlined supply chain

Fewer components overall mean less waste, slicker processes and higher profit margins



Reduced manufacturing costs

By mitigating the need for multiple product variants



Sustainable

Fewer components and greater frequency band support helps keep overproduction and CO₂ emissions in checks



Multiband capabilities

Supports all RF bands in the low band category



Use Cases



Cellular-Enabled Smartwatches

The cellular-enabled smartwatch market is expanding rapidly, driven by the shift toward fully standalone wearable devices that support independent calling, messaging, health monitoring, safety services, and location tracking. As these products evolve, designers face the challenge of delivering reliable, multi-band global cellular connectivity within extremely tight constraints on size, power consumption, and antenna performance.

Forefront RF addresses these challenges with its reconfigurable, software-defined RF front-end architecture, enabling a compact, single-module solution that dynamically adapts across frequency bands. This approach supports a single global hardware design, eliminating the need for multiple regional variants and enables a streamlined development flow for global smartwatch platforms.

The result is faster development cycles, reduced certification and supply chain complexity, and a more scalable path to delivering globally connected wearable products such as smartwatches.



Internet of Things (IoT)

IoT is driving rapid growth in wireless connectivity across industrial, enterprise, and consumer applications—from asset tracking to smart metering, remote monitoring, and connected mobility platforms such as e-scooters. These products must operate across a fragmented landscape of LTE, LTE-M, and emerging 5G RedCap standards, each with different trade-offs in power, bandwidth, cost, and coverage.

At the same time, device manufacturers face increasing pressure to support multiple regional frequency bands, maintain efficiency within tight size and power constraints, and ensure long-term viability as network technologies continue to evolve. Forefront RF addresses these challenges with a compact, reconfigurable RF front-end architecture that enables scalable, multi-band operation from a single module.

By reducing component count and eliminating the need for band-specific designs, this approach supports a unified global hardware platform, simplifying development, certification, and deployment across diverse IoT applications.

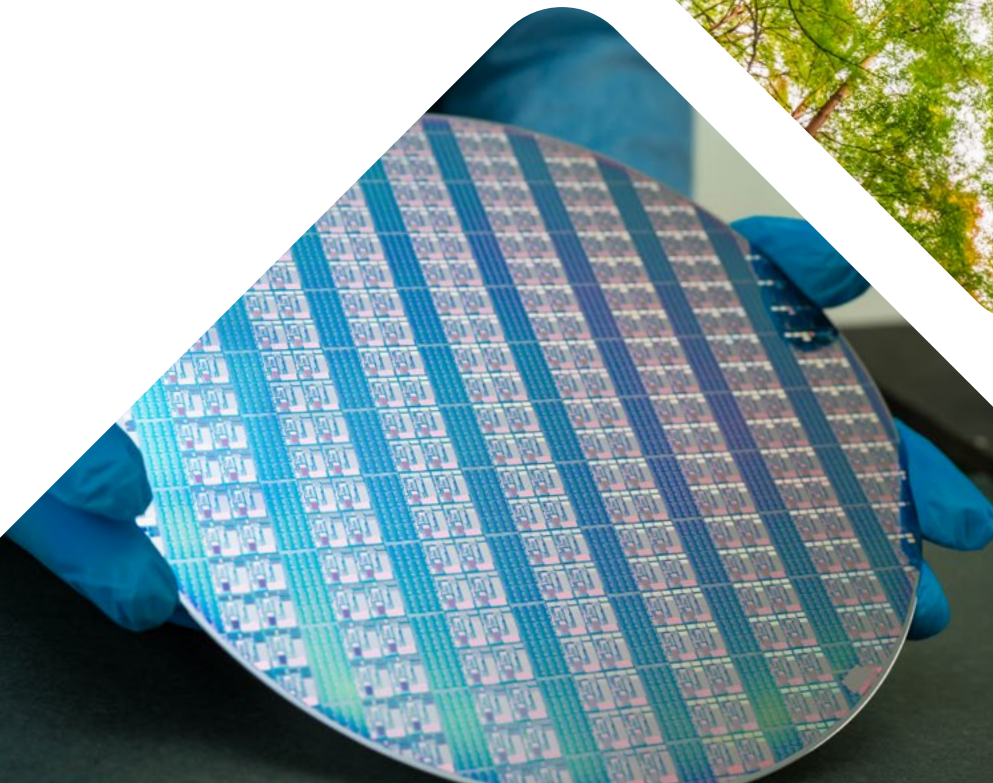
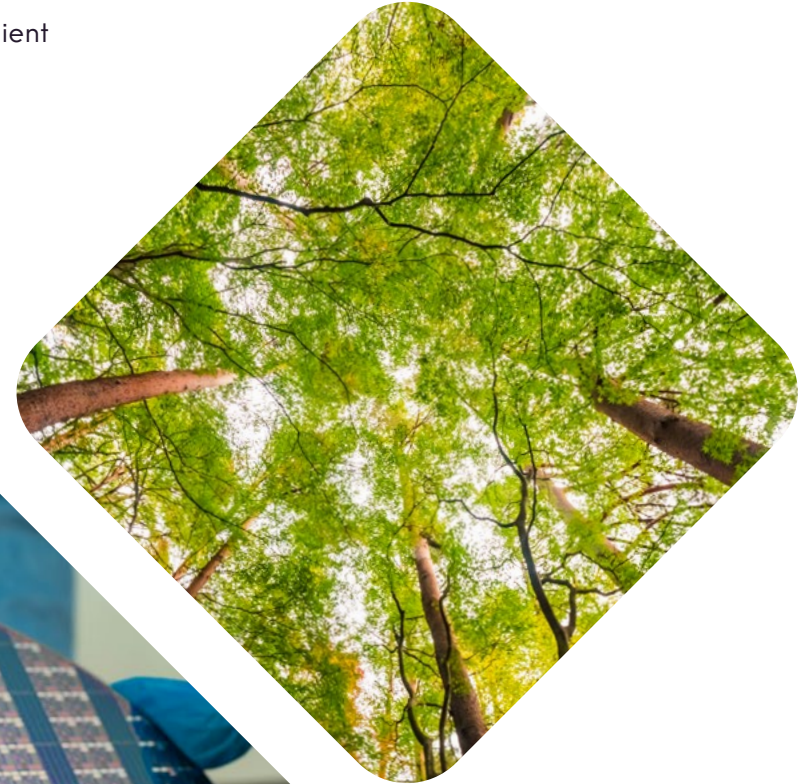
Improving Manufacturing Sustainability

A key challenge in mobile device manufacturing is overproduction. This is often caused by the non-unified allocation of global frequency bands, which drives the need for multiple front-end module variants.

As spectrum requirement evolve, demand forecasting becomes more challenging. More SKUs are required per device model, leading to overproduction, surplus inventory, and increased supply chain waste.

Powered by Foretune™ FFM51010 helps manufacturers adopt globally compatible designs, addressing the limitations of conventional filters and duplexers. This in turn helps them to implement practical and measurable sustainability strategies, supporting global CSR initiatives.

By minimizing hardware variants, companies can streamline supply chain and procurement through simplified BOMs, leading to more efficient production lines and improved forecasting accuracy. As a result, they are better placed to play their part in contributing to a greener future for the industry.



About Forefront RF

Founded in 2020, Forefront RF is a fabless semiconductor company on a mission to transform the way multiband smartphones, wearables and other connected devices are designed.

Based on award winning academic research, Forefront RF is developing a ground-breaking technology that reduces printed circuit board space whilst increasing the number of supported frequency bands. With the mobile phone and adjacent markets embracing miniaturization, Forefront RF's next generation solution empowers OEMs and ODMs to incorporate a range of advanced features into their designs while reducing the overall cost and size of the end-product. The company is headquartered in Cambridge UK with a subsidiary office in the Netherlands.



For more
information visit
www.forefronttrf.com



The Jeffreys Building
St Johns Innovation Park
Cowley Road
Cambridge
CB4 0DS, UK
www.forefronttrf.com