

Solving the RF Tradeoffs Defining the Next Generation of Drones

Today's drones are required to fly farther, carry more, withstand harsher RF environments, and deliver better overall performance, all while maintaining the same or smaller form factors. But every advancement introduces a new RF tradeoff. The companies that resolve these tradeoffs through intelligent design and high-performance components will define the next generation of autonomous systems.



The State of the RF Market

As drones continue to expand into autonomous, mission-critical applications, demand is rising for the RF systems that enable these missions by providing command-and-control, data transmission, and geolocation. The global drone communications market is projected to grow from \$2.67 billion in 2025 to \$4.09 billion by 2030,¹ underscoring RF's central role in the next generation of drone design.

Range vs. Signal Integrity: Maintaining Clarity Over Long Distances

Extending a drone's communication range usually means pushing more power through the transmit chain. However, driving an amplifier too hard can corrupt the signal. The fix is a smarter front end, comprising components such as Qorvo's beamforming ICs, high-efficiency GaAs and GaN amplifiers, and high-selectivity BAW filters that aim, amplify, and filter signals, simultaneously improving range and signal integrity.

Long-range missions also require longer flights, but the direct ground-to-drone link carrying C2, payload, and telemetry degrades as the signal weakens with distance. Pairing Qorvo's wideband GaN-on-SiC amplifiers on the transmit end with low-noise amplifiers on the receive side can extend communication range while preserving signal integrity and managing thermal load.



Capability vs. SWaP: Doing More with Less

The sensors, AI processors, and payloads that enable modern drones add weight, draw power and take up space. Incorporating these components without compromising a drone's compact form factor requires efficiency and integration elsewhere. By utilizing proven RF components, designers can meet rapid design requirements with off-the-shelf solutions, freeing more of the drone's SWaP budget for mission capability.



Mission Flexibility vs. Design Complexity: A Drone of All Trades

Supporting multiple missions with different spectrum requirements on a single drone has traditionally meant adding dedicated hardware for each frequency and waveform, multiplying design complexity. Software-defined radios provide multiple bands and modes from a single reconfigurable platform. Pairing such platforms with broadband amplifiers, programmable components, and switches from Qorvo's RF portfolio creates a UAV that can adapt across missions without swapping hardware.

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¹ <https://www.marketsandmarkets.com/PressReleases/drone-communication.asp>