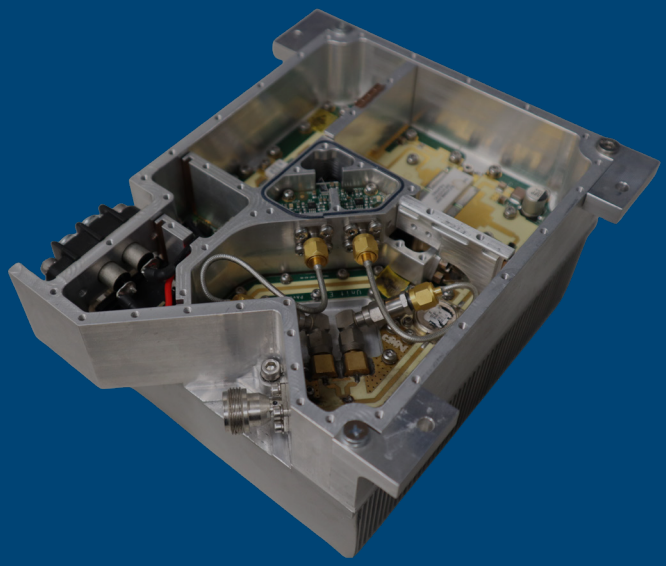
E·REON

The Power In Radio Electronics

Celebrating 10 years of RF & Microwave innovation in the Nether-lands.

2025-2026



CASE STUDY

AMPLIFIER DESIGNS

Engineered by E-REON B.V using Ampleon devices

Prepared For:

OPEN DISTRIBUTION

E-REON B.V.

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CONTENTS

HPA with Ampleon Devices 2025

This document highlights a selection of our developments with Ampleon high-power RF transistors. It represents only part of our work: many additional projects and design achievements cannot be presented here due to customer confidentiality agreements. The examples included nevertheless demonstrate the depth of our capabilities — from mounting techniques and thermal management to ruggedness, validation, and production repeatability.

WELCOME

Welcome to our Amplifier Design Case Study Booklet. In 2025 we celebrate 10 years of engineering innovation in the Netherlands, supporting companies across aerospace, defense, telecommunications, and industrial markets. Over the past decade, E-REON B.V. has delivered solutions that combine advanced RF & Microwave expertise with mechanical and analog electronic integration.

This document highlights a selection of amplifier designs created by E-REON B.V. using Ampleon devices. These projects demonstrate not only the technical performance of Ampleon's products but also our capabilities in system design, integration, and reliable manufacturing. We invite you to explore these case studies and discover how our engineering can support your future projects.

ABOUT US

E-REON B.V. is an independent engineering company based in the Netherlands, specializing in RF, microwave, and mmWave design. Over the past decade, we have grown from a small technical team into a trusted partner for organizations in aerospace, defense, telecommunications, and industrial markets. Our work brings together advanced RF engineering, system-level design, and supporting mechanical expertise to deliver innovative amplifier solutions and integrated RF systems. We believe that true innovation happens through collaboration. By working closely with leading semiconductor and technology providers, we transform state-of-the-art components into complete solutions tailored to customer needs. From concept and simulation, to prototyping, testing, and production, our goal is to provide reliable, high-performance designs that help our partners succeed.

01

Our Expertise

We combine RF and Microwave engineering, advanced electronics, and system-level design to deliver innovative RF and microwave solutions. Our experience spans amplifier architectures, Hybrid RF systems, and demanding applications.

02

Our Approach

Partnership is at the core of our work. By collaborating with technology providers and customers, we transform cutting-edge components into complete solutions: tailored, tested, and ready to perform in real-world environments.

OUR JOURNEY

E-REON B.V. was founded on a personal conviction: that advanced RF and microwave engineering could be transformed from complex theory into practical solutions with real-world impact. What started as a single engineer's determination to push boundaries has, through persistence and long hours of experimentation, grown into a company recognized for its innovation and reliability. The journey was never just about technology — it was about building something meaningful step by step. From designing and testing prototypes on the bench to negotiating contracts and forging partnerships, every stage demanded resilience and vision. Over the years, that effort turned into collaborations across aerospace, defense, telecommunications, and industrial markets. Each milestone represents not only technical achievement but also the ability to listen, adapt, and deliver, proving that two people's vision can evolve into a trusted partner for some of the most demanding industries.

Vision & Persistence

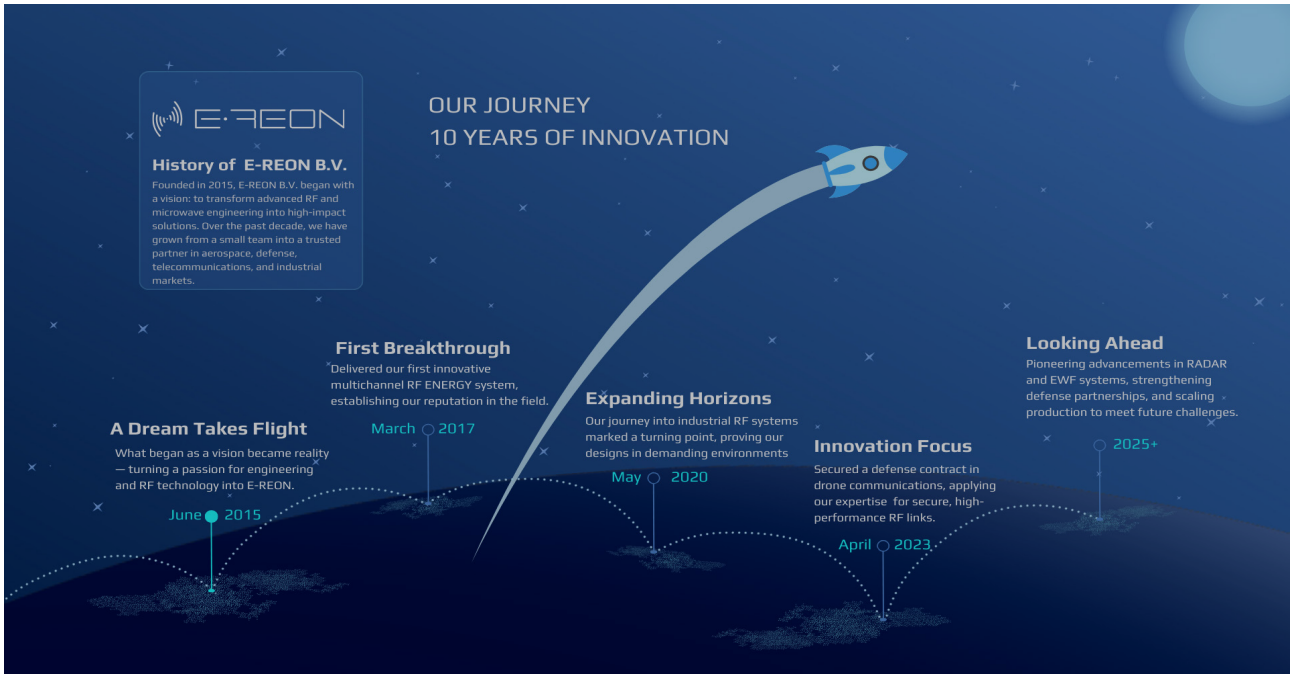
Every project starts with a clear vision. Turning ideas into reality requires persistence, the courage to explore, and the discipline to follow through. This mindset has guided us from day one.

Innovation Through Engineering

From prototypes to full-scale systems, development is where creativity meets discipline. By combining RF expertise, advanced electronics, and mechanical design, we transform challenges into working solutions.

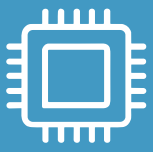
Trust & Partnerships

Engineering is about more than circuits — it is about trust. By listening to our partners and protecting what matters, we build collaborations that last and solutions that stand strong in real-world environments.



OUR SERVICE

At E-REON B.V., we bring together the full spectrum of RF, microwave, and electronic design expertise — from analog circuits and power supplies to complex multichannel systems and mechanical integration. Our strength lies not only in technical depth but in how we work: side by side with your engineers, speaking the same technical language, and ensuring that every requirement is fully understood. Whether the need is feasibility studies, prototype development, testing, or complete system delivery, we provide the services and experience to turn concepts into reliable, real-world solutions.



RF & Microwave Design

We design RF and microwave circuits covering the full chain, from LNAs, filters, and mixers to high-power amplifiers and combiners. Our expertise includes impedance matching, stability analysis, and harmonic balance simulations. Using tools such as ADS and CST, we optimize both circuit and EM performance, ensuring reproducibility .

Power & Analog Electronics

We design dedicated circuits for powering and controlling RF hardware — from bias networks and sequencers to adaptive supplies for GaN and LDMOS devices. Stable, low-noise, and reliable performance along with custom embedded firmware ensures amplifiers and multichannel systems operate at their best.

System Integration

We combine RF hardware, power electronics, mechanics, and firmware into complete deployable systems. From thermal design and housings to external environment interfaces, we ensure all elements work seamlessly together. Our experience extends from prototypes to ruggedized platforms for demanding environments.

Prototyping & Testing

Every design and assembly follows rigorous processes, from component traceability to thermal and RF validation. Our workflow aligns with aerospace and defense standards, ensuring solutions that are consistent, reliable, and ready for critical applications.

HOW WE WORK

01 Requirement Analysis & Specification

At E-REON, we become an extension of your engineering team. By working side by side with your experts, we capture the full scope of your needs and translate them into precise technical specifications. This ensures that every challenge is understood from the start and every solution is built on a solid foundation.

02 Design & Simulation

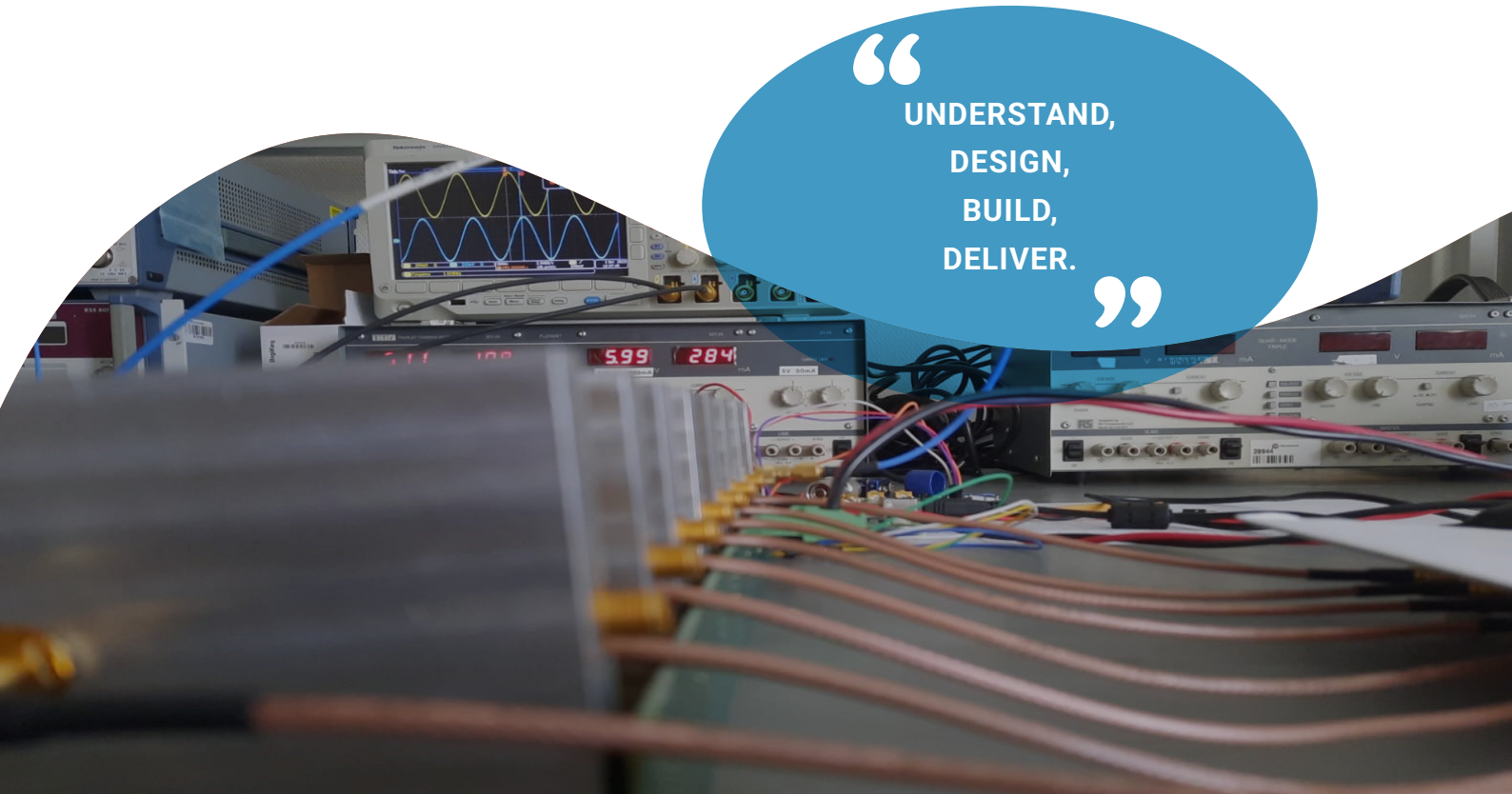
Once the requirements are clear, our team develops detailed designs supported by advanced simulations. From RF circuits and analog control to system-level behavior, we validate concepts early to reduce risks and ensure performance before moving to hardware.

03 Prototyping & Testing

We build and evaluate prototypes with the same care as final systems. With extensive experience in dedicated RF and microwave assembly we ensure designs are realized to the highest standard. Each prototype is tested in detail, from RF measurements to thermal validation, giving both teams the confidence to move forward with proven results.

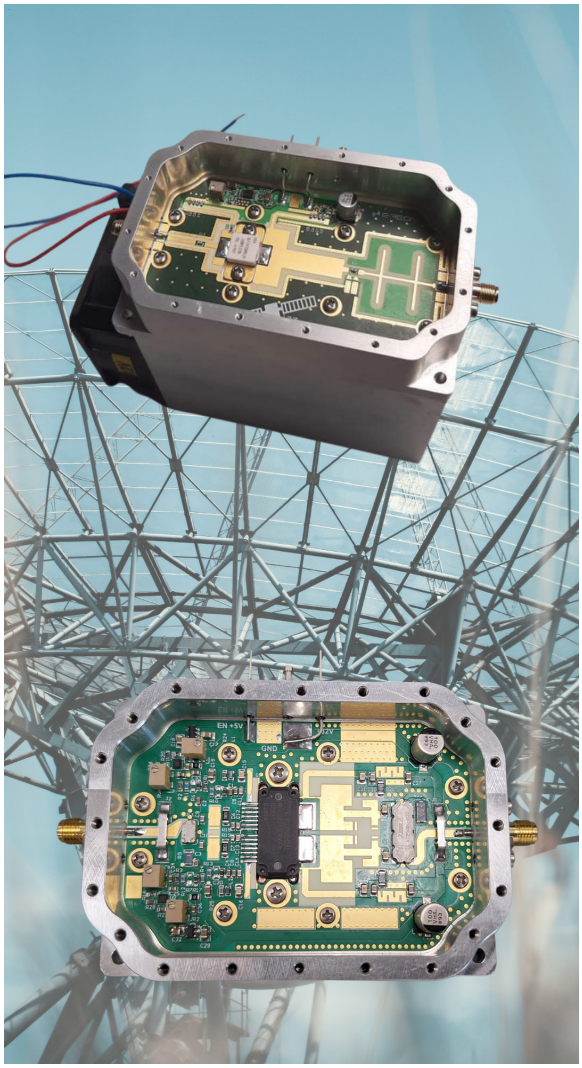
04 Delivery & Support

We deliver fully tested systems together with a complete Technical Data Package (TDP), ensuring every design is traceable, reproducible, and ready for qualification. Beyond delivery, we remain engaged with your engineers, offering technical support and lifecycle guidance to guarantee long-term reliability in the field.



ISM RADIO LINKS

E-REON B.V. developed a family of compact 2.4–2.5 GHz amplifier modules based on Ampleon's BLF2425M9L30 (30 W) and BLM2425M7S60P (60 W). By focusing on robustness, thermal performance, and simple integration, OSCAR modules became trusted building blocks across industries. Their long production track record and adaptability confirm them as reference platforms for RF amplification in both civil and public safety domains.



Description

The OSCAR 30 integrates a carefully designed output filter, ensuring spectral purity for both communications and industrial ISM-band use. Its proven architecture has already delivered over 1000 units in the field, with zero design-related failures. Building on this success, the OSCAR 60 doubles the available output power while keeping the same form factor making it a natural upgrade path for higher-power applications.

- Designed around Ampleon ceramic LDMOS devices for rugged and stable operation
- Integrated output filter on OSCAR 30 for clean spectral performance
- Field-proven reliability with units deployed worldwide

Outcome

Originally developed to support Es'hail-2 satellite ground stations, OSCAR modules quickly found broader use as booster amplifiers in RF test labs and communication links, in dual-mode cavity setups for RF heating and material testing and in countermeasure and jammer systems requiring reliability and fast deployment.

Applications

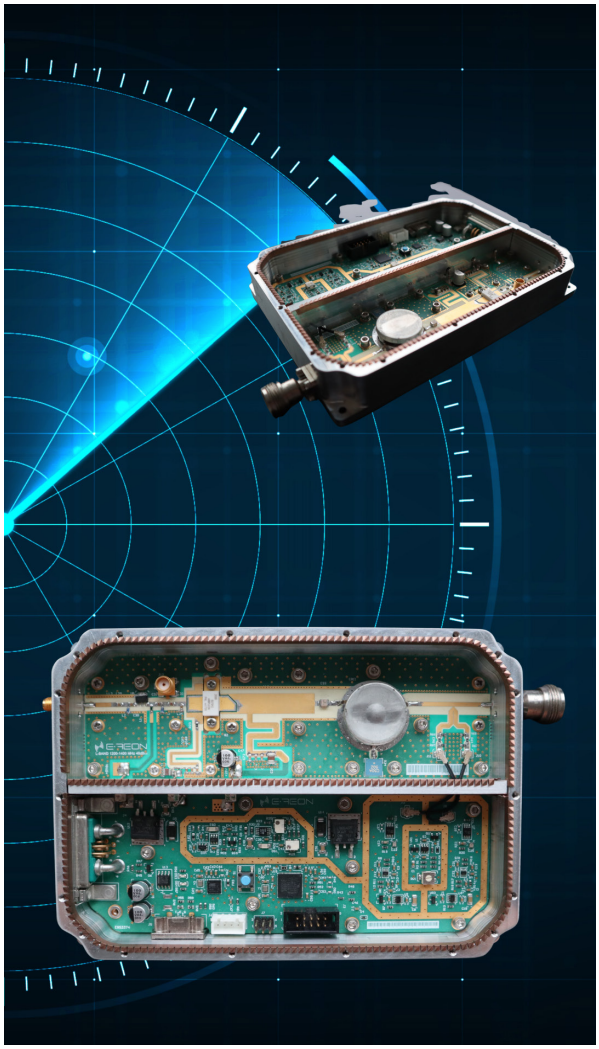
Satellite ground stations, RF heating, countermeasures.

RF Device

BLF2425M9L30
BLM2425M7S60P

RADAR TEST MODULE

This 40 W hybrid RF amplifier was built around Ampleon's BLF642 LDMOS transistor, optimized for the frequencies within the L-band. Designed for laboratory use in radar receiver testing, the module integrates both RF and digital domains in a single rugged housing.



Description

The Radar Test Module integrates a robust L-band power stage with an embedded microcontroller and measurement circuitry. It delivers reliable 40 W performance across the IFF band. Forward and reflected power monitoring is fully built in, enabling precise evaluation of radar receiver behavior under realistic operating conditions. Data can be logged and retrieved via the digital interface.

- Ampleon BLF642 LDMOS – 32 V device optimized for L-band, ensuring rugged and reliable 40 W output
- Integrated directional couplers – FW/RFL power sensing for precise performance characterization under realistic conditions
- Embedded microcontroller subsystem – manages status reporting, logging, and user access, making test results retraceable and campaigns repeatable

Outcome

Originally intended as a lab tool for radar receiver evaluation, the module provided an efficient way to generate and characterize test signals while simultaneously collecting measurement data. This hybrid approach reduced bench complexity and improved repeatability in verification campaigns. RF amplification +diagnostic in one unit made it a precursor to smart amplifiers combining power stages with digital control.

Applications

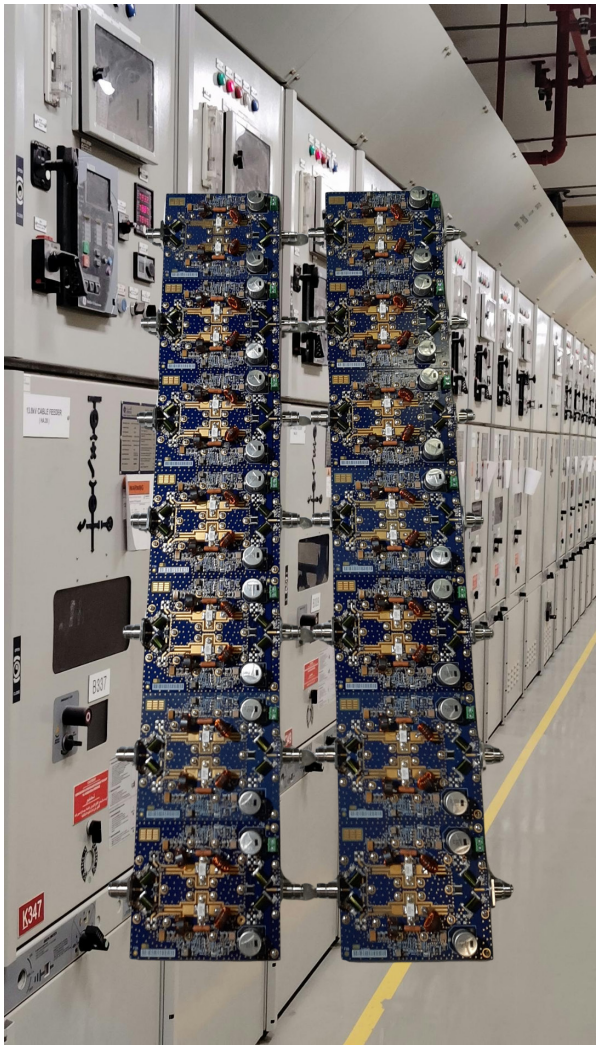
IFF Interogators, L-BAND RADAR emulator, RADAR decoys

RF Device

BLF642

HF RF ENERGY PALLET

From lab concept to industrial power stage — a compact pallet driving next-generation RF energy systems.



Description

The HF pallet integrates LDMOS transistors in parallel, delivering a significantly higher CW output power than a single device while preserving broadband performance across the 1.6–50 MHz HF spectrum. The pallet combines broadband impedance matching and a compact layout to ensure stable performance even under severe load mismatches. This makes it an ideal platform for scaling industrial solutions

- Parallel ART35FE topology for scalable HF power output with robust 50 V LDMOS devices
- Broadband impedance matching ensures efficiency and stability across the HF spectrum
- Thermally optimized pallet — copper baseplate and compact design support continuous high-power operation

Outcome

The HF RF Energy Pallet transforms proven ART35FE devices into a scalable platform for high-power RF generation. By combining efficiency, ruggedness, and continuous-duty performance, it enables breakthrough applications in plasma processing, industrial heating, and scientific research — setting the stage for the next wave of RF energy innovation.

Applications

Plasma generation and CVD processing induction heating and dielectric demonstrators, Scientific Research

RF Device

ART35FE

1.3 GHZ DRIVER

High-efficiency 700 W RF power stage at 1.3 GHz, combining CW and pulsed performance for accelerators and advanced radar systems.(FMCW)

Description

This power stage delivers 700 W at ~1.3 GHz using only LDMOS final stage. Built for accelerator facilities, it emphasizes pulse fidelity, phase stability, and long-term reliability. The module integrates overtemperature protection, fast fault sensing, and thermal design sized for high duty cycles in 24/7 operation.

- Accelerator-grade pulse quality – tight amplitude and phase stability with low droop and fast rise/fall shaping.
- Cost-efficient power brick – designed as a rugged, modular building block that lowers system cost without compromising reliability.
- Thermally optimized with direct attachment on the heatsink and internal copper heat spreader with serviceable fans..

Outcome

By leveraging the Ampleon BLF13H9L750P LDMOS, this module delivers reliable 700 W output in both CW and pulsed modes. Originally designed for linear accelerator drivers, it also proved ideal for FMCW radar systems requiring clean spectrum. As a cost-efficient power brick, it provides facilities and system builders with a compact, scalable, and serviceable solution for demanding L-band applications.

Applications

LINAC, FMCW, Pulsed RADAR.

RF Device

BLF13H9L750P

433 MHZ GEN

E-REON B.V. developed a high-power 433 MHz RF generator for industrial drying applications. Based on multiple Ampleon 433 MHz LDMOS pallets combined into a single output, the system delivers scalable power in the ISM band. Designed for robust operation in harsh industrial environments, it addresses unique challenges in combining, thermal stability, phase coherence, and system control.

Overview

- Multi-pallet amplifier system at 433 MHz ISM.
- Scalable output for industrial drying and heating.
- Designed for continuous operation in harsh environments

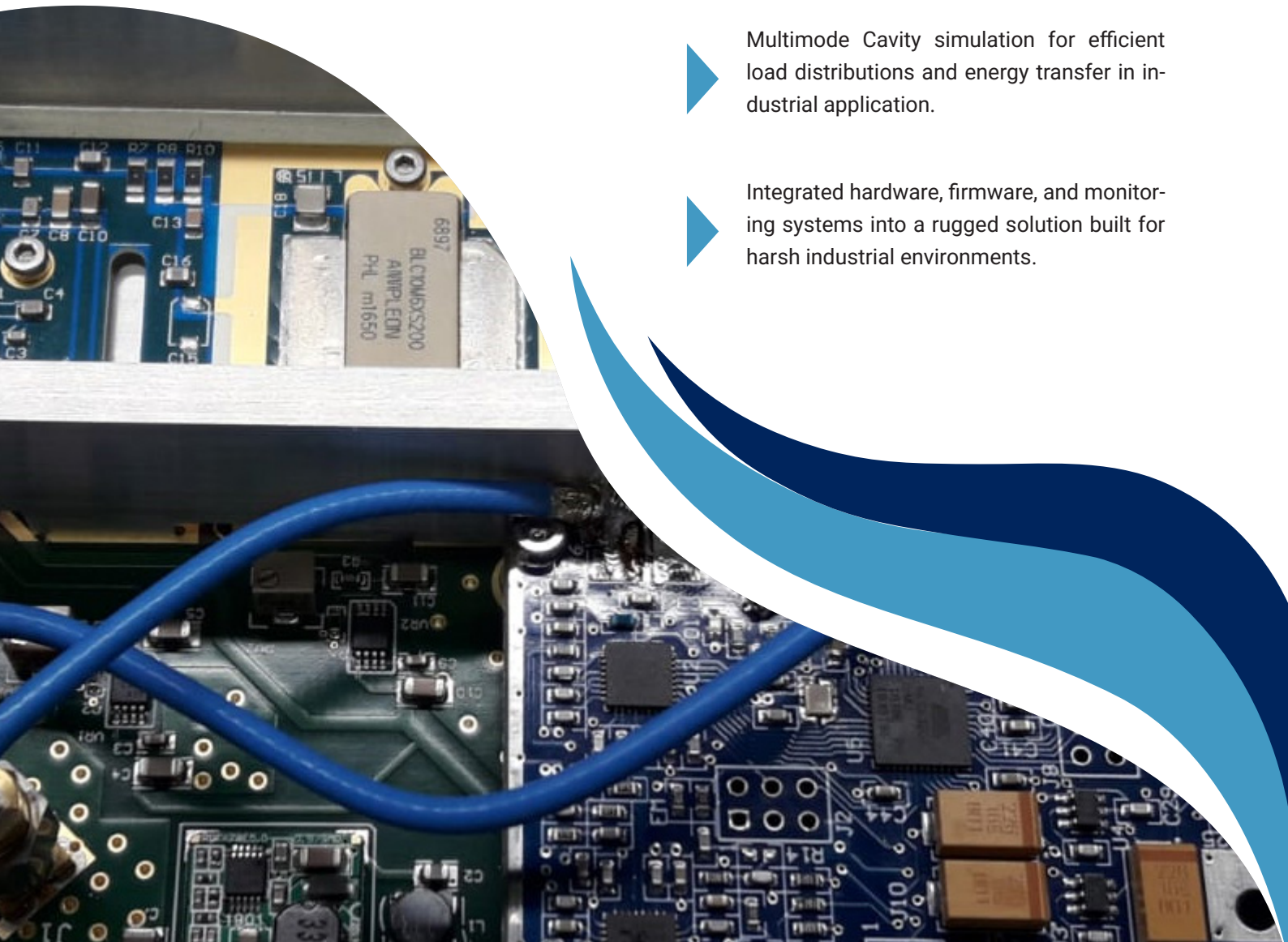
01 Develop custom RF combines to ensure reliable operation under high VSWR

02 Provide real time diagnostics, precise frequency control and FW/RFL monitor.

Description

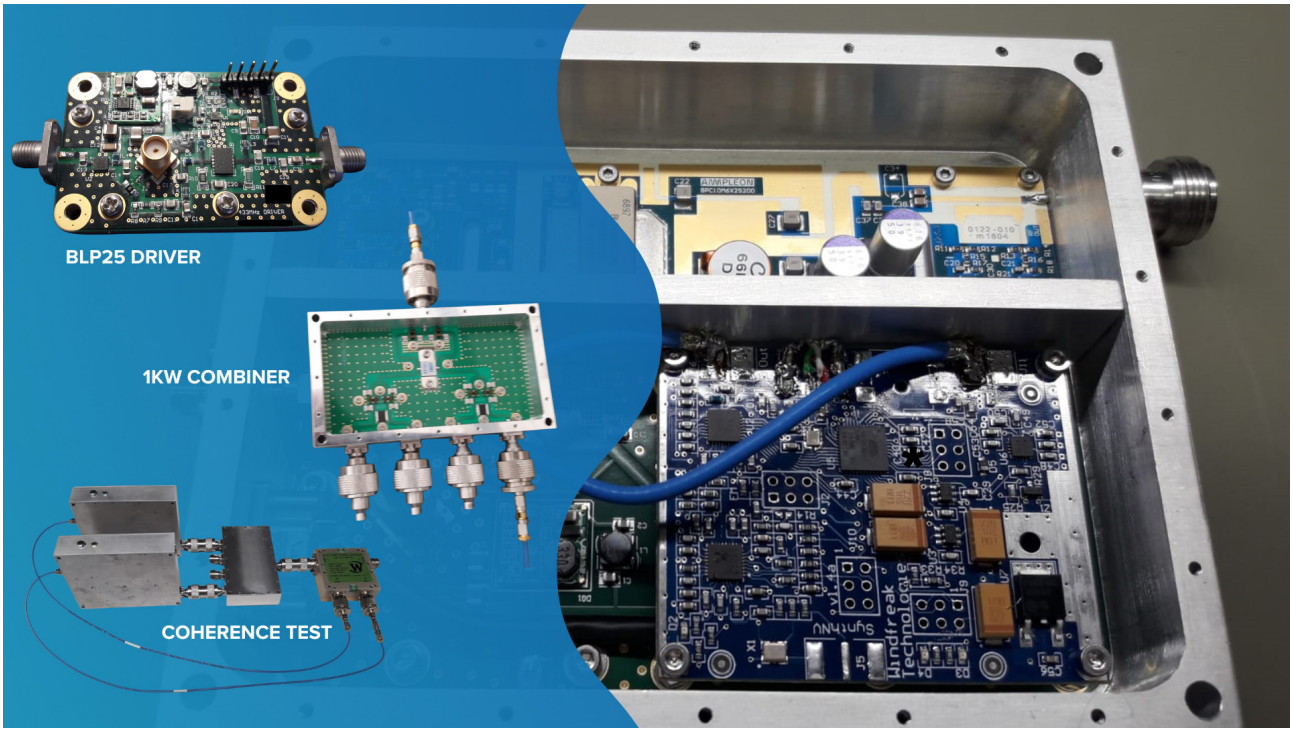
This project pushed the limits of RF system design by addressing the complexity of scaling multiple 433 MHz amplifier pallets into a reliable industrial generator. Through custom combiners, multimode cavity simulation, and advanced monitoring via Ethernet, the result is a scalable high-power field -ready source.

- Phase Sync to ensure coherence between multiple amplifier modules to deliver stable combined output.
- Multimode Cavity simulation for efficient load distributions and energy transfer in industrial application.
- Integrated hardware, firmware, and monitoring systems into a rugged solution built for harsh industrial environments.



Benefit

Using Ampleon RF pallets instead of discrete transistor line-ups eliminates the need for complex board design, transistor matching, and RF validation at device level. Each pallet is already optimized, assembled, and tested with integrated FW/RFL couplers, giving a proven starting point with fewer risks. This allows us, as integrators, to focus on the higher-level challenges — combining, phase coherence, control, and thermal management — ultimately delivering faster time-to-system.



Final Result

The system successfully demonstrated continuous, stable operation under industrial load conditions, confirming thermal stability, phase coherence, and robustness against high VSWR events. Long-duration testing validated its readiness for 24/7 deployment in demanding environments. Beyond delivering a working solution, the project also provided valuable knowledge gains: deeper understanding of multimode cavity behavior, insights into synchronizing multiple RF modules, and experience in Ethernet-based monitoring and diagnostics. These intakes strengthen our know-how and lay the foundation for faster, more efficient development cycles in future high-power RF systems.

- This project deepened our expertise in multimode cavity behavior, high-power RF module synchronization, and Ethernet-based monitoring/control. These insights now serve as a reference framework for future large-scale RF heating and drying systems.

- By validating both the design and the integration process, we created a scalable platform for next-generation RF industrial generators. The lessons learned ensure shorter development cycles, reduced risks, and a proven path toward higher power levels and broader applications.

KLYSTRON DRIVER

At 2.856 GHz, klystron drivers must meet extremely tight requirements for pulse fidelity, phase stability, and long-term reliability. Our design, based on a modular 400 W RF pallet architecture, serves both medical LINAC and high-energy physics applications. By combining robust hardware with precise monitoring and protection, the system addresses the unique challenges of dose accuracy in medical systems and beam coherence in particle accelerators.

Project Overview

Development of a modular 400 W S-band amplifier brick at 2.856 GHz with scalable architecture to combine multiple bricks for higher klystron drive power and meet stringent medical requirments.

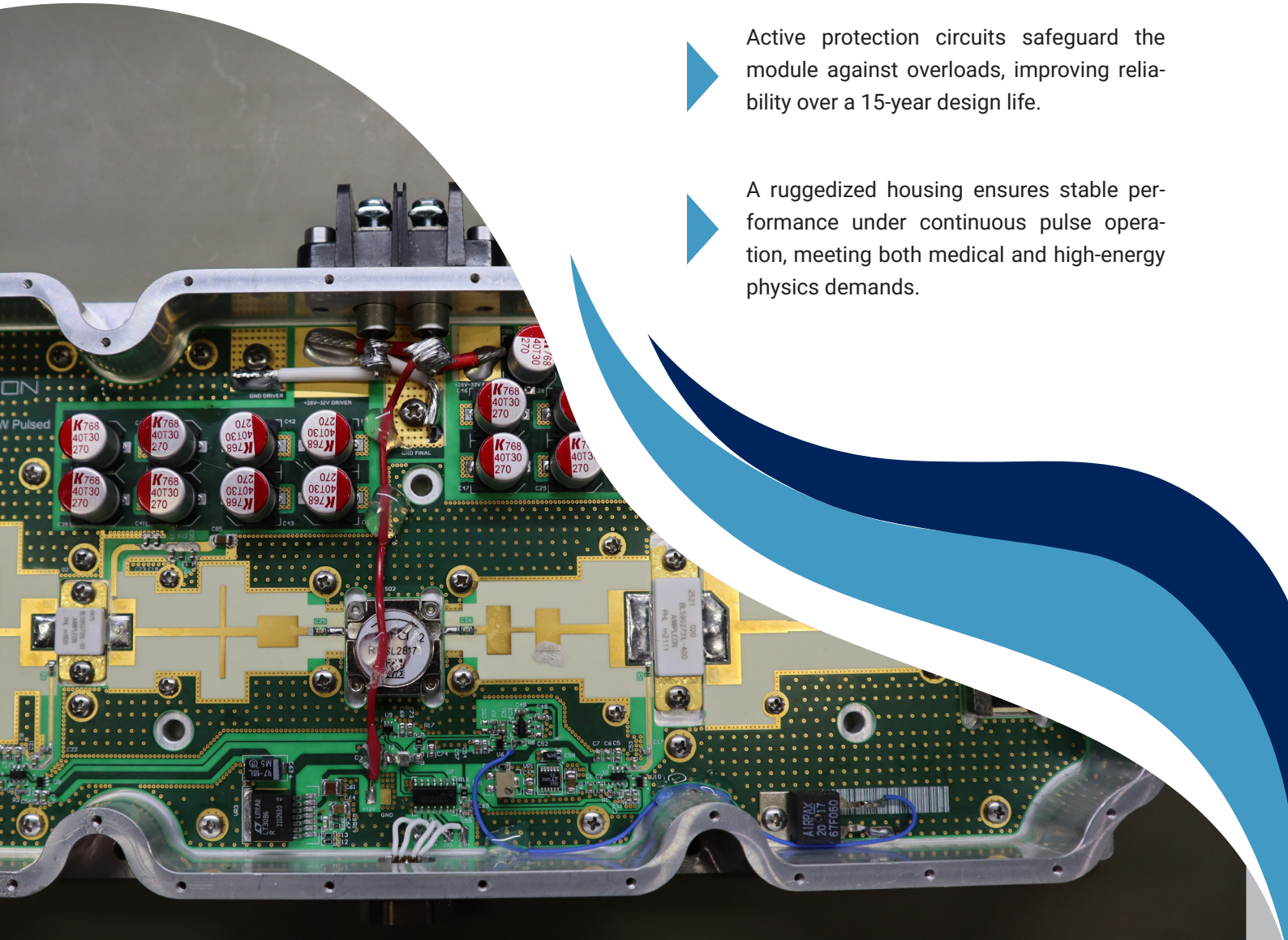
01 Ensure consistent pulse shape and minimal pulse-to-pulse phase drift.

02 Provide reliable 15 year operation with real-time protection and robustness.

Project Description

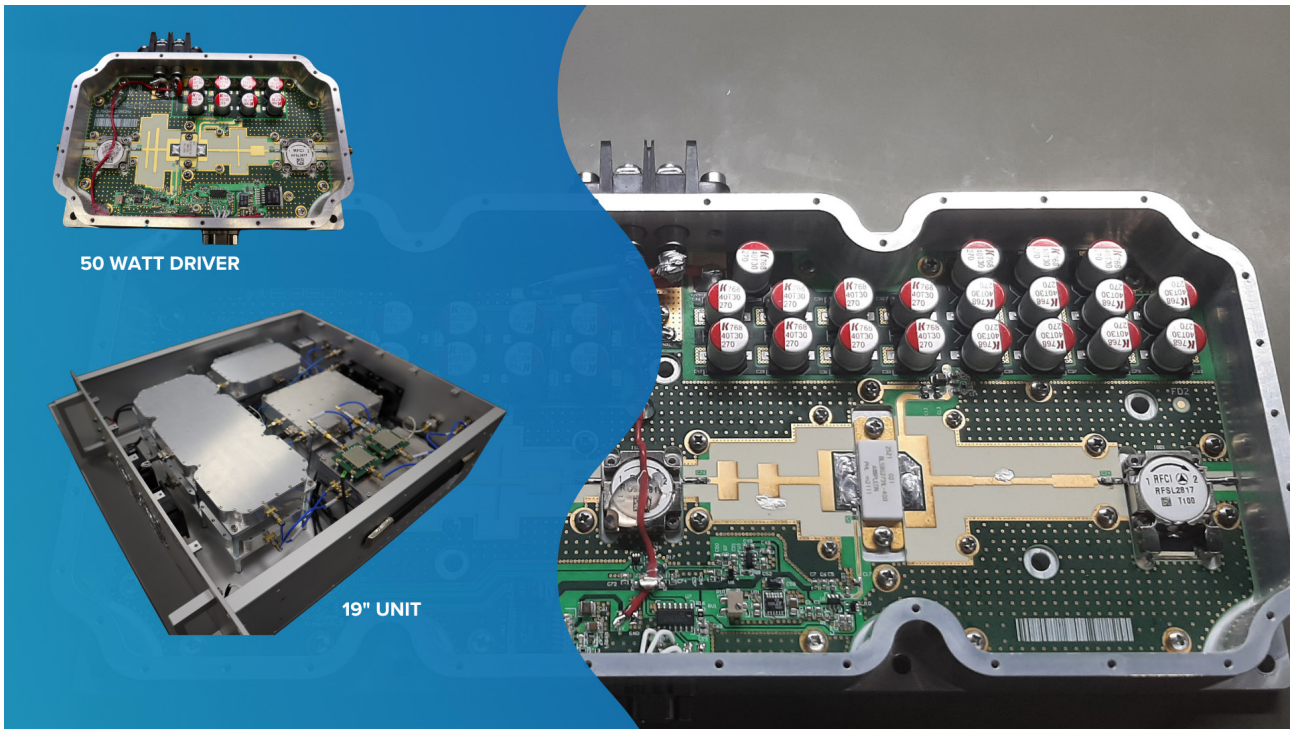
The amplifier brick is engineered to directly overcome the critical challenges of klystron driver systems, ensuring stable, long-term operation. It combines advanced RF design with robust protection and mechanical integration, allowing the system to deliver consistent performance over many years of demanding use.

- Carefully designed RF matching networks combined with circulators minimize reflections and preserves pulse shape.
- Active protection circuits safeguard the module against overloads, improving reliability over a 15-year design life.
- A ruggedized housing ensures stable performance under continuous pulse operation, meeting both medical and high-energy physics demands.



Benefit

The klystron driver builds on Ampleon's BLS9G2735L-50 (driver) and BLS9G2731L-400 (final stage) LDMOS devices, optimized for pulsed S-band operation at 2.856 GHz. This combination offers excellent gain distribution, ruggedness against mismatches, and high efficiency under demanding medical and high-energy physics conditions. LDMOS technology ensures long-term stability, thermal robustness, and repeatable performance across thousands of operating hours. In addition, Ampleon provides a strong ecosystem of application notes, reference boards, and validated ADS models, enabling accurate simulations and rapid design convergence.



Final Result

The klystron driver module successfully demonstrated stable 400 W pulsed operation at 2.856 GHz, with excellent pulse fidelity, minimal phase drift, and robust performance under mismatch conditions. Long-term testing confirmed stability and thermal robustness, validating the design for both medical LINAC and high-energy physics accelerator environments. Beyond proving the hardware, the development also yielded valuable know-how in optimizing LDMOS line-ups, circulator integration in each point of the line up, and matching networks — knowledge that strengthens future system developments.

- Demonstrated Performance with stable 400 W pulsed output at 2.856 GHz and excellent pulse fidelity. The minimal pulse-to-pulse phase drift, even under mismatch conditions.Along with long-duration thermal cycling confirmed robustness for accelerator environments.

- Design insights and knowledge gained with optimized LDMOS line-ups (BLS9G2735L-50 and BLS-9G2731L-400) for high efficiency and effective use of circulators and matching networks to preserve pulse integrity. Another lesson was on synchronization and modular combination of multiple bricks.

HIGH-POWER RF CHALLENGES

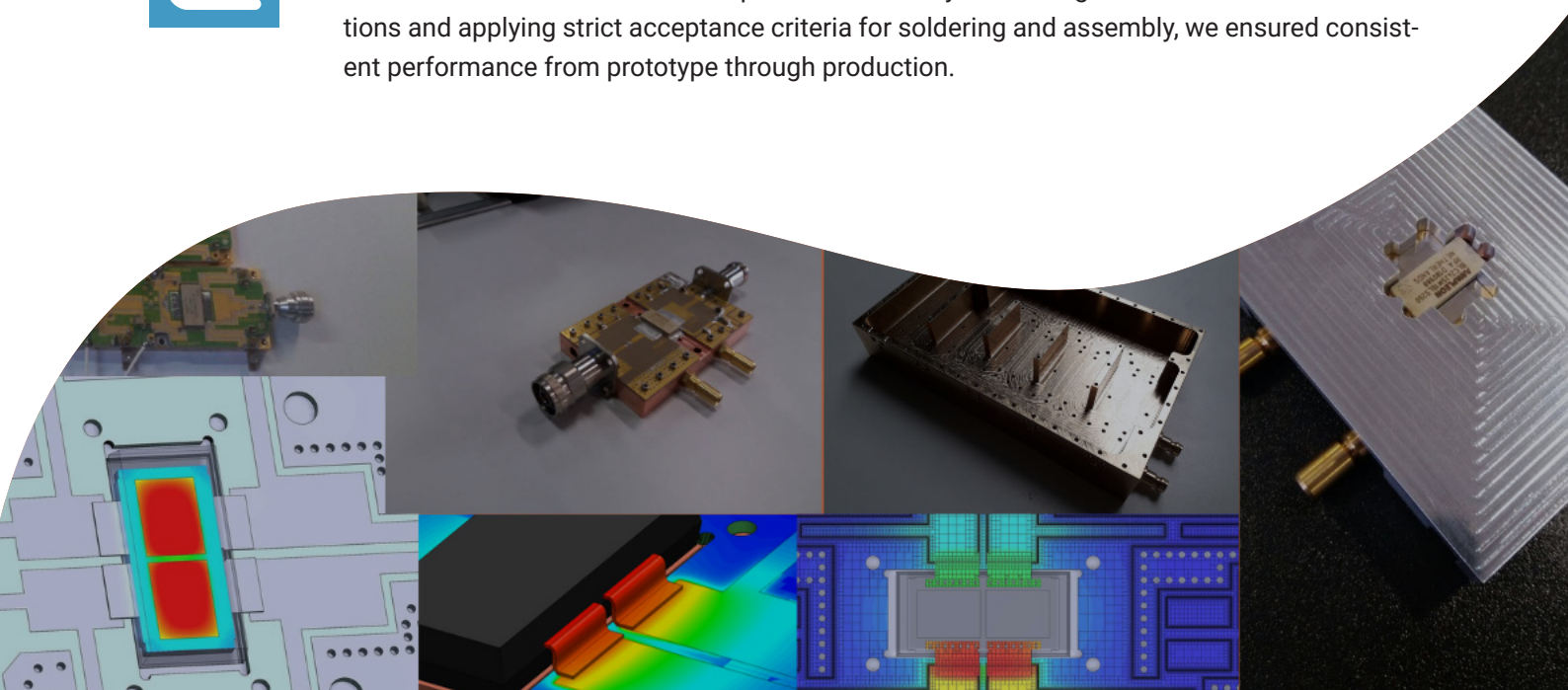
High-power RF with solid state HPA's brings challenges that go far beyond circuit theory. The solder-attach process, thermal interface quality, device biasing, and RF stability all decide whether a design can reach its rated power and survive real conditions. We pair device-level thermal modeling with pallet-level mismatch testing and close the loop with measurement so simulation turns into repeatable hardware. Ampleon provides a complete ecosystem of support: detailed application notes and mounting guidelines that shape our soldering practices and mechanical assembly, as well as validated large-signal device models and reference pallet designs that speed up impedance matching, stability verification, and overall design convergence.

High-power RF transistors demand precise solder attach for long-term reliability. Even small voids, uneven solder thickness, or incorrect torque during mounting can create hot spots and reduce device lifetime. Following Ampleon's mounting guidelines, we optimized our vapor-phase profiles, controlled solder preform thickness, and validated flatness requirements to achieve repeatable, void-free assembly.

Managing heat is critical for high-power RF devices. Using Ampleon's published thermal resistance (R_th) and impedance (Z_th) data, we built detailed device-level CFD simulations that matched infrared camera measurements on real pallets. This allowed us to predict hot spots, optimize copper thickness, and validate custom liquid-cooled housings before committing to hardware.

High-power RF transistors must remain stable under demanding conditions such as load mismatch, pulsed operation, and broadband excitations. With extensive pallet-level testing with controlled mismatch we designed amplifiers that withstand severe mismatch without failure.

Turning simulations into reliable hardware requires rigorous measurement and repeatability. Using Ampleon's reference pallet layouts we built test platforms to validate gain, efficiency, and thermal behavior across multiple assemblies. By correlating measured data with simulations and applying strict acceptance criteria for soldering and assembly, we ensured consistent performance from prototype through production.



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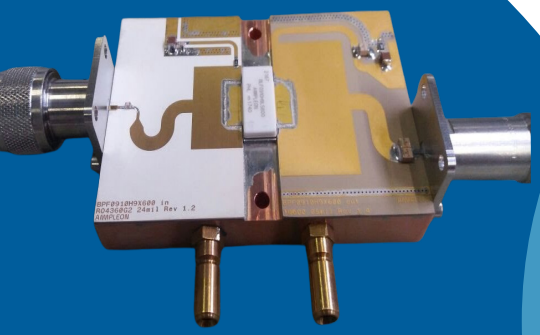

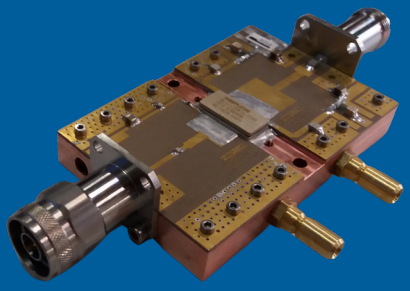

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