

FAB\$ and LAB\$

Mini-Circuits' Deer Park Technology Center: 95 GHz and Rising



Mini-Circuits has long been known for its commanding portfolio of RF/microwave components. Historically, most have been below 6 GHz. Over the last decade or so, that's expanded with many products reaching 18 GHz and some as high as 40 GHz. With commercial and defense applications pushing into the mmWave bands, Mini-Circuits is responding by extending the frequency coverage of its products even higher.

To do so, the company transformed the second floor of its Deer Park, Long Island, shipping facility into a state-of-the-art design and manufacturing center dedicated to high frequency connectorized products. Completed this spring (2022), the 10,000 square-foot, Class 100k cleanroom houses a team of designers, manufacturing staff and an assembly and test line for production. The line also prototypes chip-and-wire products for the other Mini-Circuits' product lines.

The design team at Deer Park is equipped with a complete suite of software tools for developing new products, including system analysis, RF circuit simulation, full-wave electromagnetic analysis, thermal and structural analysis. Specialized software is used for digital circuit design and software development.

The 3,500 square-foot assembly area contains epoxy die attach (using paste and film epoxies), ribbon and wire bonding (both wedge and ball with various sizes of gold wire) and micro soldering. To ensure tight feedback, process development, process verification and quality assurance are performed in the same assembly area, which has bond pull, die shear and high magnification microscopes for inspection.

RF testing encompasses small- and large-signal measurements over temperature to 110 GHz, from noise figure to additive phase noise, to third-order intercept.

Mini-Circuits' proprietary test software archives and analyzes the data. Burn-in is performed at Deer Park, while more extensive environmental testing used for qualification—temperature shock, vibration and mechanical shock and others—are performed at the facility in Brooklyn.

With a mix of new recruits and staff from other Mini-Circuits' sites, the team at Deer Park reflects the company's diversity of talent and its family culture: commitment, accountability and a willingness to challenge each other. Engineers feel responsible for the performance and manufacturability of their products. If there's a problem on the manufacturing line, they step up to help solve it.

The products designed and manufactured at the Deer Park Technology Center comprise the full range of circuits, from amplifiers to switches, variable attenuators, equalizers and other supporting products. Released catalog products extend to 95 GHz, with 110 GHz designs being developed. All the current products have coaxial interfaces—2.92, 2.4, 1.8 or 1 mm connectors—with waveguide versions on the roadmap.

The ZVA-50953X+ is a good example of the portfolio. It's a wideband amplifier with 1 mm coaxial connectors that spans 45 to 95 GHz and provides 15 to 16 dB gain, 14 dBm output power at 1 dB compression and 17 dBm saturated output power. The amplifier is biased with a single supply between 10 and 15 V and typically draws 140 mA.

You'll find these Mini-Circuits products in the lab and in the field. The customers using them are enabling the evolution of commercial communications and other applications: 5G networks in the FR2 bands, 60 GHz fixed wireless access, E-Band for high data rate links and, soon, 6G research at D-Band.

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