Top 10 Tips for GaN Success

High-performance gallium nitride on silicon carbide (GaN on SiC) semiconductor technology is making inroads in infrastructure, aerospace, defense, and commercial products. Qorvo® – a pioneer of GaN for high-power RF devices, power amplifiers, transistors, oscillators, switches, and more – strives to deliver high-performance, reliable devices to solve the RF challenges for the world's leading companies. What are the hallmarks of a quality GaN supplier? Read on to learn what to look for.

1 PROVEN DESIGN TOOLS

Nonlinear models, electromagnetic finite element modeling, and stability and loop stability analyses aid in designing best-in-class power and efficiency in high-power MMICs. Qorvo's robust design methodology leads to more first-pass successes and reliable designs.

2 ROBUST POPULATION TESTING

Industry standards allow testing of small samples of GaN products. Although this is usually adequate, Qorvo has fully characterized product failure modes by testing large populations at temperatures of interest over extended times.

3 HIGH MEDIAN TIME TO FAILURE (MTTF)

MTTF estimates a device's lifetime. Suppliers should measure device reliability at a minimum of three temperatures to ensure accurate prediction. All Qorvo GaN products have an MTTF at 200°C extrapolated to much greater than 10^7 hours.

4 NO PRECONDITIONING

Some suppliers add time and cost by requiring a preconditioning or burn-in step before delivery. Qorvo's GaN solutions have maturity in performance, reliability and manufacturing yield data that enables products to ship without preconditioning, confident in delivering high-quality performance every time.

5 JUNCTION TEMPERATURE CHARACTERIZATION

Low-resolution techniques like infrared microscopy may overestimate product life expectancies by underestimating peak junction temperatures. Qorvo's thermal models and finite element analyses are verified with micro-Raman measurement, permitting more accurate temperature and device-life prediction.

6 ACCURATE FAILURE CRITERIA

One common parametric failure criteria is a current drop of 20% of I_{max}. Qorvo sets its I_{max} parametric failure at a 10% drop, ensuring less than 1dB of power degradation over the life of the part.

7 LOW FALLOUT RATES

Reliability is also measured by rates of catastrophic failure or fallout. Less than 0.002% of Qorvo's GaN devices fallout per 1 million hours at 200°C. Also check the expected operating life, T1, T5, and T10, at which 1%, 5%, and 10% of devices, respectively, will have failed based on a large population of devices.

8 PROVEN FIELD PERFORMANCE

Do your GaN supplier's products have a demonstrated track record of reliability in the field? Qorvo's fielded GaN power amplifiers have accumulated more than 65,800,000 device-hours with a field failure rate of less than 0.013% failures per million device-hours.

9 HIGH TOLERANCE FOR ENVIRONMENTAL STRESS

Check for devices that stand up to the highly accelerated stress test. (HAST), which measures device performance after 96 hours at 130°C, 85% relative humidity, and atmospheric pressure up to 4 atm. THB compliance is also a critical measurement.

10 MANUFACTURING READINESS LEVEL

MRL is the Department of Defense's measurement of a supplier's ability to transition a product successfully from the factory to the field based on technology and operational maturity, as well as quality and manufacturing management system maturity. Qorvo was the first GaN supplier to achieve MRL 9.

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