FREQUENTLY ASKED QUESTIONS

Spatium® SSPA Products and Applications

Introduction

This document provides a list of frequently asked questions (FAQ) about our patented Spatium Product Line. This FAQ is to assist potential users in understanding the Solid State Power Amplifier (SSPA) technology, input and output requirements, and a high-level functional description. If this FAQ does not answer your questions, or you have application / platform specific questions, please contact your local FAE or Qorvo sales office. These professionals will arrange to have your questions answered via email or via a customer specific teleconference with the Spatium SSPA engineering team.

Question / Answer

1. What is Spatium?

Spatium is the Qorvo brand name for our family of solid state power amplifiers (SSPAs) that use highly efficient spatial combining. This spatial technology can be used narrow band or wide band over a variety of applications.

2. Can Spatium SSPAs replace Traveling-Wave Tubes (TWT)?

Yes. In most cases, the Spatium SSPA Products are a preferred alternative to using antiquated TWT designs.

3. Are Spatium products more expensive than TWTs?

The initial upfront investment might be slightly higher, the overall SSPA system total cost of ownership (TCO) is far more cost-effective with greater reliability, Mean Time Between Failure (MTBF), lower power supply costs, and ease of repair and maintenance.

4. What kind of applications are Spatium SSPA products best designed for?

Spatium is a high performance SSPA designed to operate in most any conditions and is capable of withstanding harsh environments (temperature, shock, vibration, acceleration) typically seen in defense and aerospace conditions. Commercial and Military applications include, but not limited to radar, electronic warfare (EW), communications, instrumentation, and satellite up/down links.

5. Have Spatium SSPA Products been designed into and used successfully in real-world defense applications?

Yes. Spatium SSPA Products have been deployed on front line applications, flown missions, and performed to design specifications in very harsh environments.

6. Are Spatium Products Commercial Off The Shelf (COTS)?

Yes. Qorvo offers many standard Spatium SSPA Products, used in both commercial and military applications, that are available from our standard product inventory. We also offer customer specific services for those customers requiring specific needs.

7. Can Spatium SSPA Products be purchased through a Distributor?

Yes. Qorvo works with several global distributors who are authorized to stock and ship these commercially available standard products to customers within their regions.

8. Do Spatium SSPA Products require specialized training to operate or maintain?

No. The operation and maintenance of Spatium Products require minimal training, are supported via Qorvo Applications Engineering, and are very reliable to operate.

9. Does Qorvo offer technical support for the Spatium products?

Yes. Qorvo has a dedicated Spatium Applications Engineer, technical support team, and Field Applications Engineers ready to assist and answer your technical questions.

10. Are Spatium Products Space Qualified?

No. While Spatium SSPA products are not Space qualified, several of the SSPAs are designed in to satellite applications and programs today.

11. Are Sample Units available for Spatium Products?

Yes. For qualified customers, a Spatium sample unit will be made available for customers demonstration and/or evaluation purposes. Contact your local Qorvo sales office to inquire about these units.

12. How is linearity defined for SATCOM Spatiums?

Linear Power is defined as max output power at the flange with -30dBc at 1MHz offset for 1MSPS OQPSK (a=0.35) per MIL-STD-188-164b.

13. What happens if a MMIC used on the Spatium blade fails or is degraded?

When a MMIC fails within a Spatium, the combined Output Power is reduced proportionally. The reduction in Output Power may be calculated as follows:

$$(N - F)^2 / N^2$$

where “F” is the number of failed MMIC’s and “N” is the number of MMIC’s used in the Spatium.

14. What connectors can be applied to the Spatium?

The input connector is generally coaxial (SMA, TNC, etc.), and the output connector is coaxial or waveguide. Check the Standard Product Datasheet for exact connector usage.

15. Does Spatium operate in both CW and Pulsed conditions?

Yes. The Spatium is designed to incorporate MMIC HPA's that operate under a full range of duty cycles. All Spatium standard products can operate CW or with pulsed RF input.

16. What is the "fast pulse" feature in the QPB3238 and QPB1111 and how does it work?

The fast pulse feature is a means for designers to design their system in which the RF source remains "on" while pulsing the Spatium SSPA as opposed to pulsing the RF source and leaving the Spatium "on".

17. Under what environmental conditions can Spatium operate?

The Spatium Platform is designed to operate between −40 °C and +71 °C ambient temperature. Use of Sealed and Hermetic Packaging technology allows for the Spatium to be used in High Humidity and wide temperature extreme applications.

18. Do Spatium SSPA products comply with the shock and vibration standards?

Yes. Spatium SSPA products meet or exceed the shock and vibration requirements in both MIL-STD-810 and MIL-STD-901.

19. How are MMIC HPA's attached to the Spatium blade?

MMIC HPA's are attached using either Conductive Epoxy or Solder depending on the application thermal conduction requirements.

20. Can MMIC HPA's be attached to the Blade without a package?

Yes. MMIC HPAs may be attached to a Heat Spreader / Interposer as an alternative to Ceramic or Plastic Encapsulation when it is determined suitable to do so given the application.

21. What voltages do the Spatium operate?

The voltage range for Spatium operation is 6 V to 50 V DC based on the MMIC HPA requirements. Check the Standard Product Datasheet for voltage and power requirements.

22. Do Spatium Products require higher levels of power to operate compared to older technology TWTs?

No. In fact, Spatium SSPA Products require far less power during operation than TWTs. This makes the Spatium SSPA Products safer and more efficient to operate. The typical voltage range for Spatium operation is 6 V to 50 V DC based on the MMIC HPA requirements.

23. How is the Spatium assembly thermally managed?

The standard Spatium platform is provided with Thermal Clamps for conduction cooling. The thermal clamps require customer provided cooling via Air or Liquid plates to maintain a surface temperature of 71 °C on the clamp.

24. Is there AGC or Temperature Compensation in the Spatium?

No. The standard Spatium Platform does not provide Temperature Compensation or AGC. A temperature output can be provided for external monitoring.

25. What materials are used on blades and clamps for thermal transfer?

Based on the MMIC semiconductor base material and thermal dissipation of the MMIC HPAs, either aluminum or copper blades and clamps are utilized to provide the appropriate thermal transfer.

26. Does the Spatium require tuning?

No. The Spatium SSPAs do not require tuning during manufacturing.

27. Is the Spatium reconfigurable or customizable?

Off the shelf standard products are not reconfigurable or customizable. Qorvo offers customer specific services for those customers requiring very specific needs to meet very specific requirements. Contact your local sales office for terms/conditions/NRE if reconfiguration is a requirement.

28. Are the MMIC's field replaceable?

No. The Spatium blade assembly requires specialized factory equipment and techniques to ensure proper operating performance of the Spatium SSPA. Therefore, if a blade was to fail, the Spatium must be returned to Qorvo for blade evaluation, blade testing, system testing, and repair requirements for proper operating performance. Please contact the sales manager or inside sales representative for appropriate RMA number and repair quotation prior to the shipment of a defective unit.

29. What is the warranty?

The Spatium warranty is 1 year from date of shipment on new standard products and 90 days on repaired products.

30. Can Spatium products be exported to other countries (non-ITAR)?

Spatium products are not classified as restricted products under the International Traffic in Arms Regulations (ITAR). Therefore, export is possible with minimal paperwork completed for purchases intended for Non-U.S. destinations. ITAR restrictions generally follow the device restrictions and end application.

31. Is the Spatium RoHS Compliant?

No, the Spatium standard product platform is not RoHS-5 compliant.

32. What frequency bands are supported by the Spatium Product Line?

Today, the Spatium SSPA Product Line supports all frequency bands highlighted in blue below. Future product plans include the V-band above 40GHz. Please visit the Qorvo website for information on each of the standard products that support these bands.

IEEE	NATO
S - 2 to 4 GHz	E - 2 to 3 GHz and F - 3 to 4 GHz
C - 4 to 8 GHz	G - 4 to 6 GHz and H - 6 to 8 GHz
X - 8 to 12 GHz	I - 8 to 10 GHz
K_u- 12 to 18 GHz	J - 10 to 20 GHz
K - 18 to 27 GHz	K - 20 to 40 GHz
K_a - 27 to 40 GHz	
V - 40 to 75 GHz	L - 40 to 60 GHz

33. What is the production lead time for Spatium SSPA products?

The typical lead time is 16 weeks after receipt of order (ARO) and all terms and conditions have been agreed upon by all parties.

Contact Information

For the latest specifications, additional product information, worldwide sales and distribution locations:

Web: www.qorvo.com

Tel: 1-844-890-8163

Email: customer.support@qorvo.com

Important Notice

The information contained in this document and any associated documents is believed to be reliable; however, Qorvo makes no warranties regarding the information and assumes no responsibility or liability whatsoever for the use of said information. All Information is subject to change without notice. Customers should obtain and verify the latest relevant information before placing orders for Qorvo® products. This information or the use thereof does not grant, explicitly, implicitly or otherwise any rights or licenses to any third party with respect to patents or any other intellectual property whether with regard to such information itself or anything described by such information.

DATA SHEET INFORMATION DOES NOT CONSTITUTE A WARRANTY WITH RESPECT TO THE PRODUCTS DESCRIBED HEREIN, AND QORVO HEREBY DISCLAIMS ANY AND ALL WARRANTIES WITH RESPECT TO SUCH PRODUCTS WHETHER EXPRESS OR IMPLIED BY LAW, COURSE OF DEALING, COURSE OF PERFORMANCE, USAGE OF TRADE OR OTHERWISE, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Without limiting the generality of the foregoing, Qorvo® products are not warranted or authorized for use as critical components in medical, life-saving, or life-sustaining applications, or other applications where a failure would reasonably be expected to cause severe personal injury or death. Applications described in the Data Sheet Information are for illustrative purposes only. Customers are responsible for validating that a particular product described in the Data Sheet Information is suitable for use in a particular application.