APPLICATION NOTE

Spatium® SSPA Operating Instructions

Spatium SSPA Integrated Bias Card Description, Operation and Control

The current series of Spatium SSPAs come equipped with an integrated bias control card. This card performs the interface function between the prime power supply and the amplifier, provides status monitor signals through a sub-D connector, and also performs housekeeping duties for the amplifier (e.g., driving the required amplifier gate voltages, sequencing application of gate and drain bias, fault detection, providing pulsed drain voltage (if so equipped)).

All integrated bias cards are pre-programmed for standard operating conditions when paired with a given Spatium SSPA. Any change of bias from this condition needs to be evaluated from both an electrical and thermal perspective. Qorvo strongly recommends working with our applications and design engineering teams for proper programming of devices should system needs require.

The interface pin definitions for the bias and interface connectors may be found on the associated SSPA data sheet.

Connections and Spatium SSPA Turn-On

Refer to Figure 1, below, for this section.

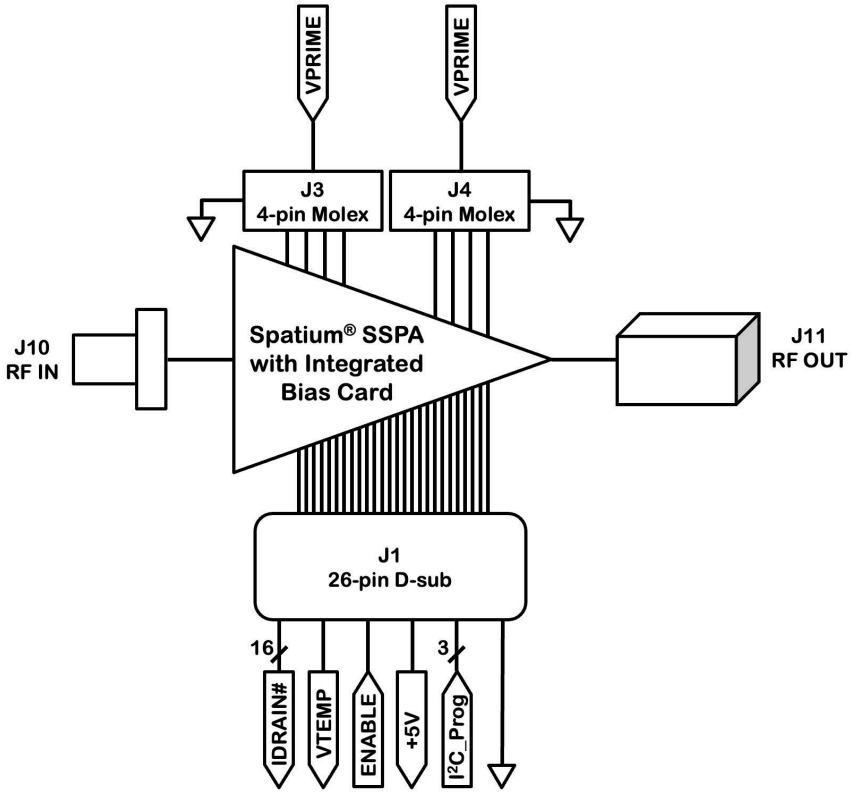

Figure 1. Block diagram of typical Spatium SSPA with integrated bias card (QPB3238N used as reference). Refer to the specific data sheet for that unit's block diagram.

The operating voltage and current requirements of the Spatium SSPA to be tested or operated are available in the specific product's data sheet. The data on the specific SSPA is available from Qorvo.

Detailed Operating Instructions

1. Ensure the Spatium SSPA is properly attached to the required heat sinks (see next section on thermal interface recommendations).
2. Ensure the prime power supply is in the OFF condition before connecting the power cables to the unit.
3. If using a laboratory supply, set the voltage and current limit to the recommended values on the unit's data sheet. Ensure the power supply is set to the required voltage and current limits required for proper operation.
4. With the power supply OFF, connect the two power cables from the prime power supply to the power connectors on the SSPA's bias card (J3 and J4 for QPB3238N, QPB2040N and QPB1111 or J5 and J6 for QPB0220N, QPB0618N, QPB0218N and QPB0206N). Proper pin assignments for the power connectors can be found on the unit's data sheet.
5. Connect the sub-D connector and wiring harness (if needed) to the mating J1 connector of the SSPA's bias card. Note that connection to pins on the sub-D connector are required only if using the ENABLE line for pulsing the drain voltage, monitoring the VTEMP line for temperature sensing, and/or monitoring the drain current for each of the amplifiers in the assembly.
6. Ensure the RF input and output connectors of the Spatium SSPA are properly terminated into 50 ohms. Please follow recommended torque specifications for all RF connections.
7. Ensure the control signals from the controller unit, either a lab computer or the system controller, are ready for use. If operating under pulse conditions (where applicable), ensure the pulse control signal to the ENABLE pin on the sub-D connector is set to the appropriate pulse conditions (+5V positive logic, CMOS compatible). If operating in a CW mode, the ENABLE signal on the sub-D connector may be left floating or tied to +5V (preferred).
8. Apply prime power to the Spatium SSPA by turning the lab supply output ON, or activating the system's power supply.
9. The unit can be enabled/pulsed, and RF power can now be applied to the unit. Note: RF power can be applied with the ENABLE pin set to HIGH or LOW.
10. Turn-off is the reverse of the above steps.

Thermal Interface Recommendations

Typical heat sink mating locations are shown in Figure 2 (QPB3238N shown as a reference); refer to the specific Spatium SSPA data sheet for heat sink mating locations, as these may be different depending on the Spatium unit to be used.

Various heat sinks (finned heat sinks with forced air cooling, liquid-cooled chillers, etc.) may be used with Spatium amplifiers, depending on the power dissipated and the capability of the thermal management system to maintain safe operating temperatures in a given operating environment. (For example, Spatium units are tested at Qorvo by mounting cold plates to the indicated heat sink mating surfaces in Figure 2.) Thermal interface material (e.g., thermal grease, graphite sheet material ,etc.) should be applied between the Spatium SSPA and the heat sinks to ensure minimal thermal resistance at the mating surfaces.

Temperature monitoring shall be performed using the provided VTEMP monitor pin on the sub-D connector. Additional information on using the signal may be obtained in the relevant Spatium SSPA data sheet.

Clamp mounting surface temperatures shall be monitored and maintained between -40°C to +71°C. The clamp mounting surface temperature shall not exceed +71°C. Please refer to the unit's data sheet for clamp temperature limitations over operating conditions. Note: both top and bottom sides of the clamp require cooling. Permanent damage, degradation of performance and reduced life of the equipment may occur.

Additional thermocouples (at least one, preferably more) can be placed as close as possible to the Spatium SSPA clamp surface for additional temperature monitoring (this is especially helpful in a lab environment when evaluating the Spatium SSPA for a particular system application). Figures 3 and 4 show the available hole locations on microwave and millimeter-wave Spatium SSPA clamps in which additional thermocouples may be installed.

Thermocouples can also be placed within the heat sink plates as close to the clamp as possible if mating the thermocouples to the Spatium clamp is not possible in the given application.

Please contact Qorvo applications and design engineering should there be questions on the capability of the thermal management system to be used.

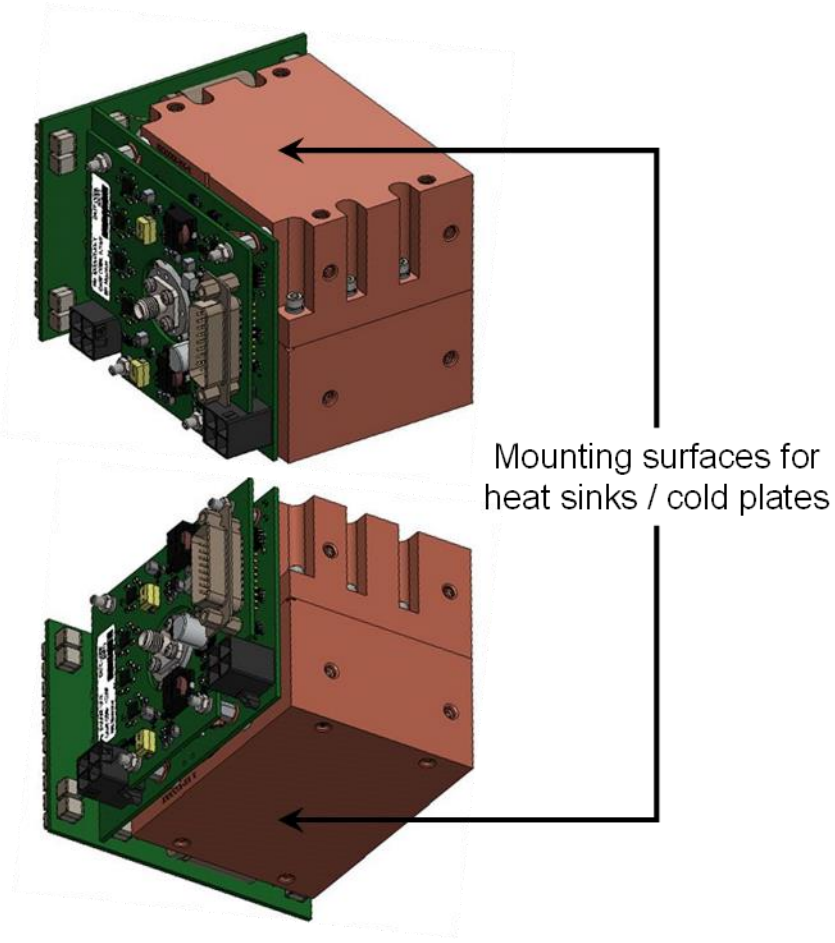

Figure 2. Heat sink mounting locations on typical Spatium clamp surfaces.

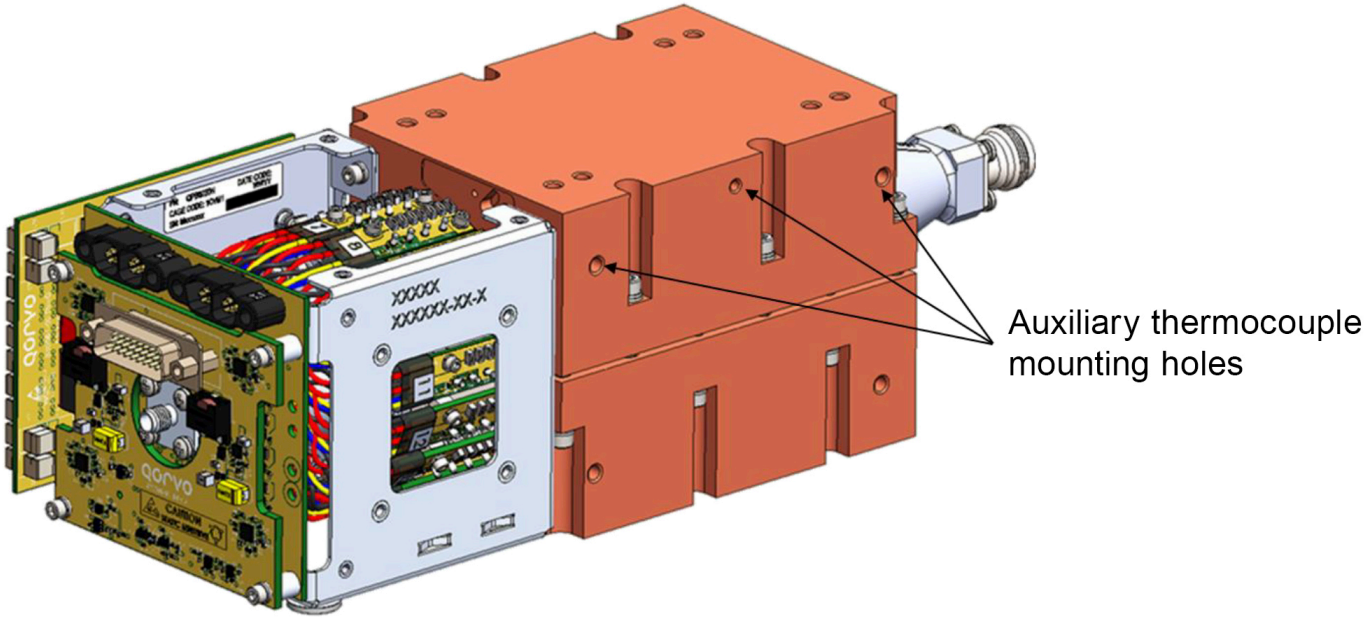

Figure 3. Microwave Spatium SSPA with additional thermocouple location holes (#6-32 UNC) shown.

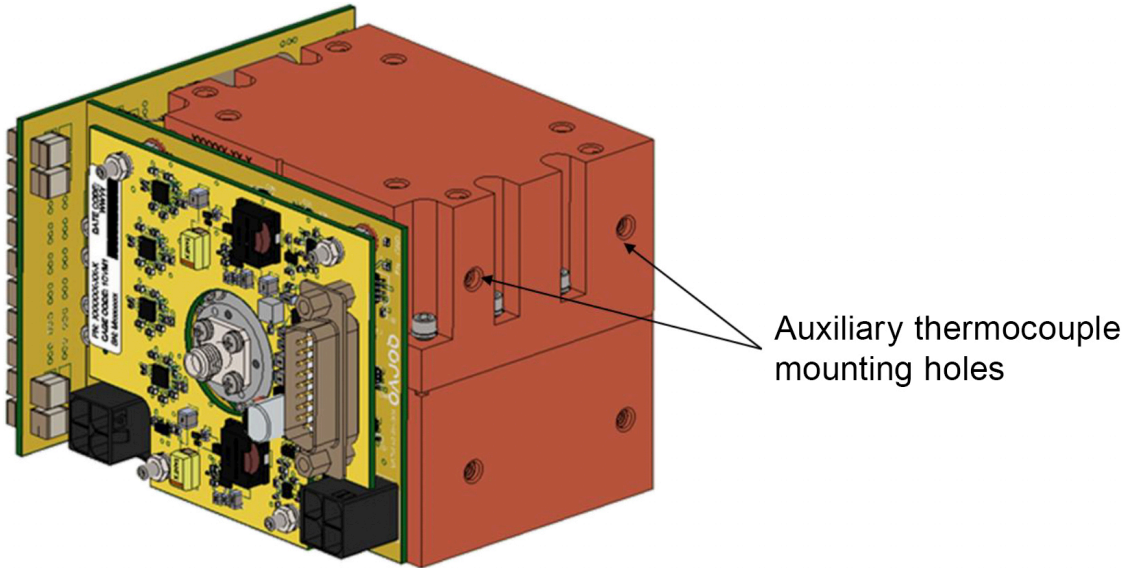

Figure 4. Millimeter-wave Spatium SSPA with additional thermocouple location holes (#6-32 UNC) shown.

Support Data

Qorvo has performance data on all Spatium SSPA units. This data, along with other information to facilitate design in a particular application, is available by request.

Additional Information

For additional information on Spatium SSPAs, please contact Qorvo for general guidelines.

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

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