How to test PowerBand fixtures?

TriQuint's new PowerBand™* device family delivers high power performance across an exceptionally wide bandwidth while maintaining very high efficiency.

Figure 1. Picture of the T1P2701012-SP Evaluation Board.

Testing Environment

PowerBand fixtures are designed to be used in a 50-Ω environment. The input and output tapers rely on this assumption for optimal broadband performance. Figure 1 shows the measured broadband reflection coefficient presented to the amplifier input and output ports in TriQuint's setup.

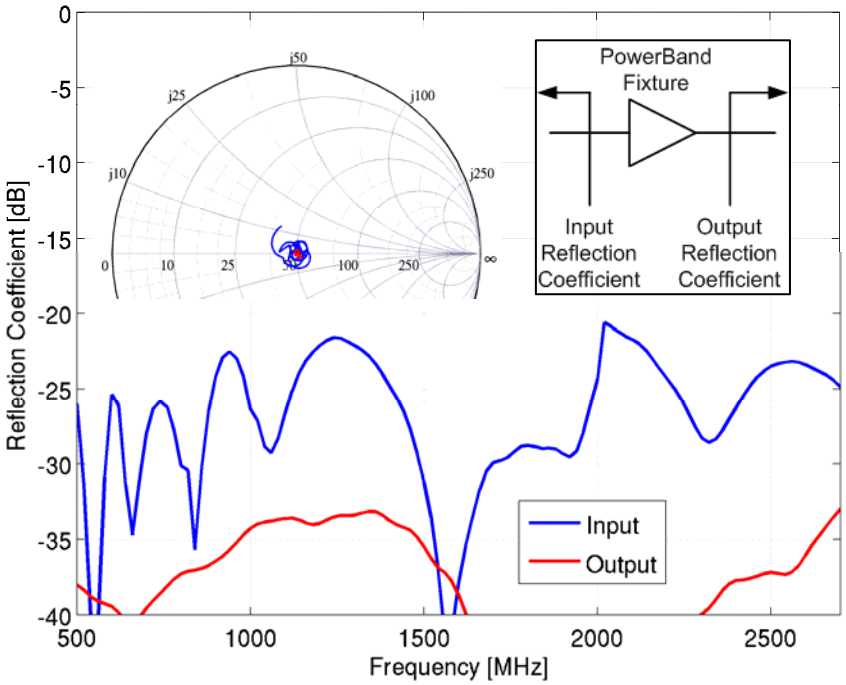

Figure 2. Input and output reflection coefficient of testing environment.

Biasing the T1P2701012-SP

The T1P2701012-SP is a POWERBAND discrete pHEMT, depletion mode, RF Power transistor designed to operate from 500MHz to 3GHz in wideband circuits.

To turn ON the board please follow the following steps.

1. Terminate the fixture's input and output ports in a 50-Ω environment.

2. Connect DC cables.

3. Apply -1.7V to the gate-source DC port (white-to-black banana connectors). The white connector should be at -1.7V. Feel free to use a DC Voltage meter to probe the applied voltage (You can probe right on top of the input tapered) Apply 12V to the drain-source DC port (red-to-black banana). Probe with a DC voltage meter to be sure the correct potential is being applied.

5. Slowly start increasing the gate-to-source voltage from -1.7V to approximately, -1V. You can use this voltage to control the amount of DC drain-to-source current. The fixture is optimized for a drain-to-source current of 200mA. If you reach -1V and no DC drain-to-source current is not consumed, the back of the transistor package might not be making good contact with the ground or the transistor is dead.

A simple way to test if the transistor is properly grounded is to put some thermal grease in the back of the transistor and sit it in the fixture pocket. Remove the part and look to see if there is thermal grease in the bottom of the pocket. Some fixtures include a piece of indium foil to raise the fixture pocket where the transistor sits to make a good DC contact. If indium foil is used, thermal grease is not needed. The functionality of the RF transistor can be tested by measuring input and output DC resistances with a multimeter. The gate-to-source DC resistance should be in the order of 3MΩ, while the drain-to-source DC resistance should be in the order of 0.4Ω. When measuring the DC resistance the transistor should be properly mounted. Remove all DC connections from the fixture and measure the impedance from the input and output transmission lines to ground.

6. Now that the fixture is properly biased you can apply RF power. Figure 2 shows measured P_{1dB} and Gain vs Frequency for this fixture. Please notice the amount of input power (Pout-Gain) needed to reach P_{1dB} varies with frequency and for this particular input power the amplifier is already compressed by 1dB. The recommended operating input power should be less than the value obtained from Pout-Gain. If testing with an amplitude modulated signal then the input power should approximately be Pout-Gain-PAR.

*pHEMT transistors are sensitive to ESD, follow proper precautions when handling these parts.

RF Performance

Figure shows measured typical performance for frequency range, 500MHz to 2700MHz. As shown in the figure, the T1P2701012-SP eval board can deliver 10W (+40dBm) of output power over this range.

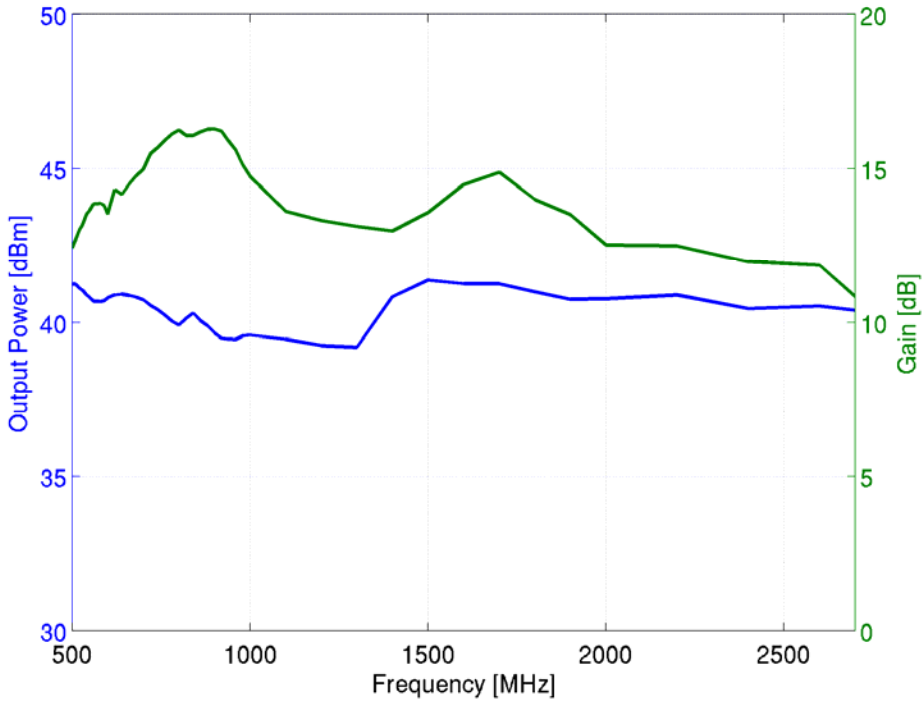

Figure 2. Measured P_{1dB} and Gain vs. frequency for the T1P2701012-SP.