PROTOCOL INSIGHT

Falcon Series
Application Note: DUT Probing Options

Contact Protocol Insight at:

sales@protocolinsight.com
support@protocolinsight.com
www.protocolinsight.com

Contents

Probing Configuration Options

There are several different probing options available for connecting to the device under test (DUT) depending on whether the use model is analyzer only or exerciser/analyzer. These options including solder-down probes, splitters, breakout boards, interposers and high-density connectors.

Analyzer Use Models

Solder-down

Solder-down probes allow for individual connection to each separate transmit-pair and receive-pair of each serial lane, allowing flexibility to connect to any accessible points on the surface of the PCB. Each connection uses a high-impedance electrical probe to minimize perturbation of the M-PHY bus signals, while providing reliable capture of all M-PHY traffic.

Support is provided up to HS-G5 speeds and x1 and x2 link widths. Each individual lane connection is made by using two extender coax cables connecting into flex-tip connectors which each are attached to an individual transmit-pair or receive-pair on the surface of the PCB.

There are four different solder-down probing options:

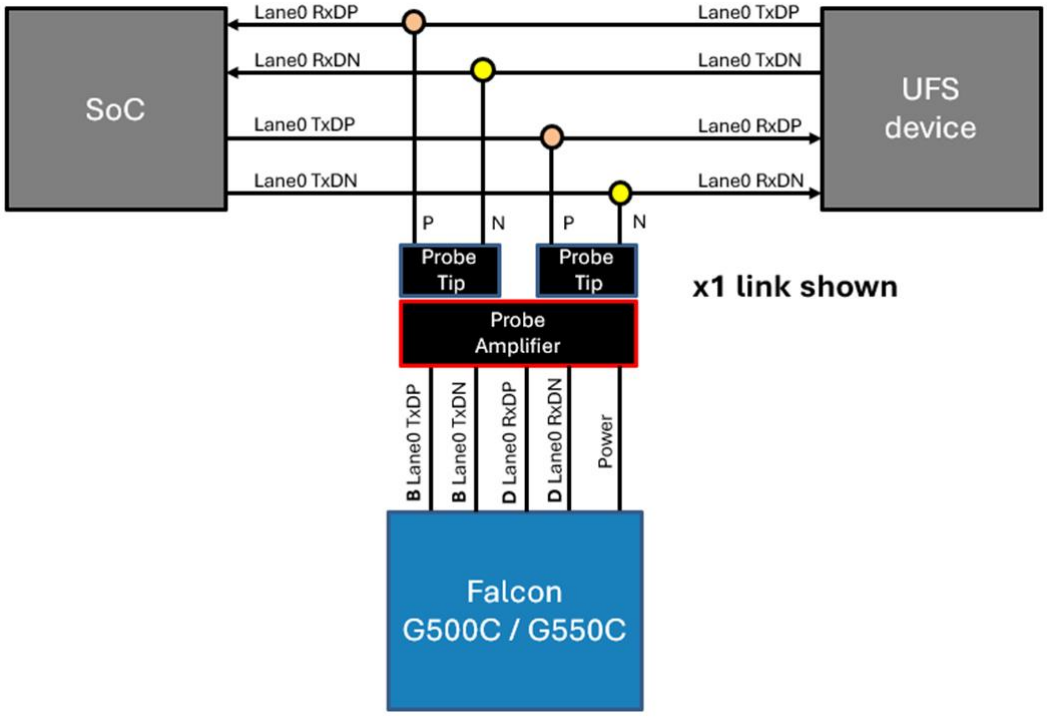
The **FG5PSD2** x2 solder probe supports up to HS-G5 on the Falcon G500C/G550C instruments, and the **FG4PSD2B** x2 Bundle solder probe supports up to HS-G4 for the Falcon B series and Raptor.

For extremely challenging signal integrity environments the **FG4PSD3 Multi-Lead Pod x2 Configuration** can be used in conjunction with the FG4PSD2B x2 Bundle to capture up to HS-G4, only for the Falcon G400 series instruments. The FG4PSD3 adds a multi-lead pod to condition and clean-up the signal from the DUT for successful analyzer capture.

The **FG4PSD2 x2 Bundle** is available for the original Falcon non-B instruments and provides a multi-lead pod, Carlisle cables, solder-down probe tips and a power supply for capture up to HS-G4. only for the Falcon G400 series instruments.

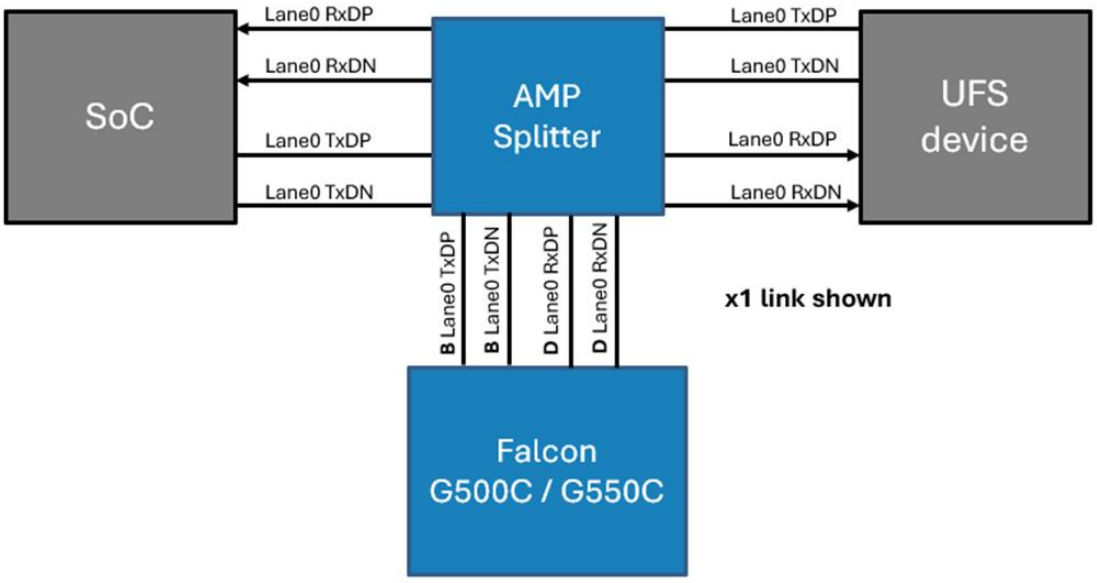
Figure 1 - FG5PSD2 : FG5PSD01E Amplifier

x1 link example



Splitters

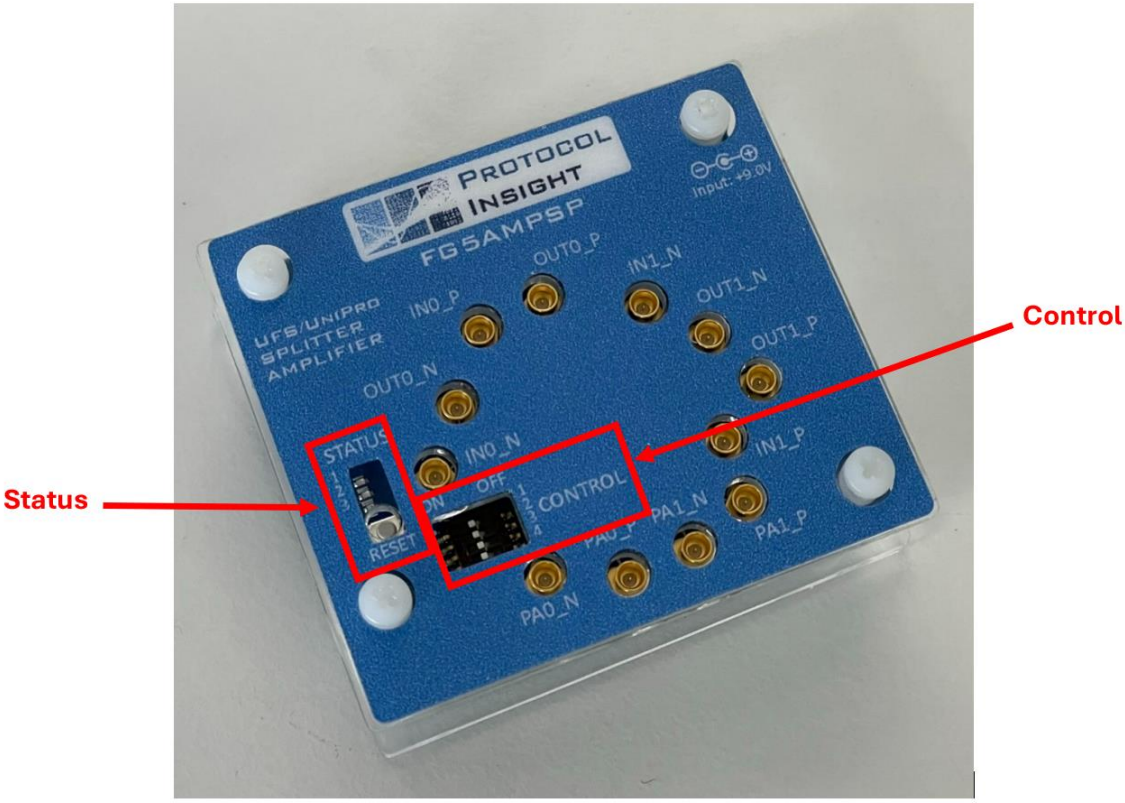
Off-the-shelf power splitters such as the Mini-Circuits DC-18 GHz ZFRSC-183-S+ can be used with standard SMA to SMA cables of ≥18GHz and maximum of 12 inches in length. This configuration is valid for up to HS-G4 rates A/B. Each lane requires four power splitters and 12 SMA cables as shown in this x1 link example:



Amp Splitter Solution for HS-G5 Rate A/B

MIPI M-PHY v5.0 does not have a small amplitude mode. Many PHYs on the market will no longer support the 50/50 splitter configuration used in previous generations to capture host / device traffic on the protocol analyzer (PA). Protocol Insight developed the Amp Splitter board, FG5AMPSP, to provide our customers with another capture option. Each board supports a single sublink; two boards are required to support both a x2 link.

The amp splitter board is a 67/33 splitter solution and the DUT (host / device) receives the 67% split. This improves the signal margin for the DUT by 1.8 dB when compared to a standard off-the-shelf (OTS) splitter. The 33% split path is then amplified before being sent to the PA. The connectors to the DUT and PA are mini-SMP. Below is a picture of the amp splitter board.



Cable Requirements:

- 24 cables are required to support a x2 link.
  - 8 SMP to mini-SMP cables are required for the PA. The PA front panel connectors are SMP.
  - 16 cables are required to connect the DUT (host / device). The amp splitter requires mini-SMP connectors and the connector on the other end of the cable is defined by the customer system (SMP, mini-SMP, etc).
- Cable ordering code for a pair of cables: FG5AMPSP-C12. 1 pair of 12”, phase matched cables; right angle SMP mini to straight SMP.

Interposer Board (aka grypper interposer) for HS-G5 Rate A/B

The HS-G5 Interposer board, FG5AMPGR, board allows developers to tap signals between the Host and DUT and send them to a protocol analyzer using SMP-mini connectors. The UFS device is placed directly on the interposer board in a grypper socket. The interposer can be soldered directly into the customer system, or you can use a dual grypper socket connection. More information on grypper sockets can be found on their website.

The grypper board uses a 66 / 33 resistive divider and provides the "66" side to the Host / DUT. This provides an additional ~ 2 dB of signal for the Host / DUT, compared to a 50 / 50 resistive divider. The "33" side is then amplified and sent to the protocol analyzer. The amplification settings are adjustable.

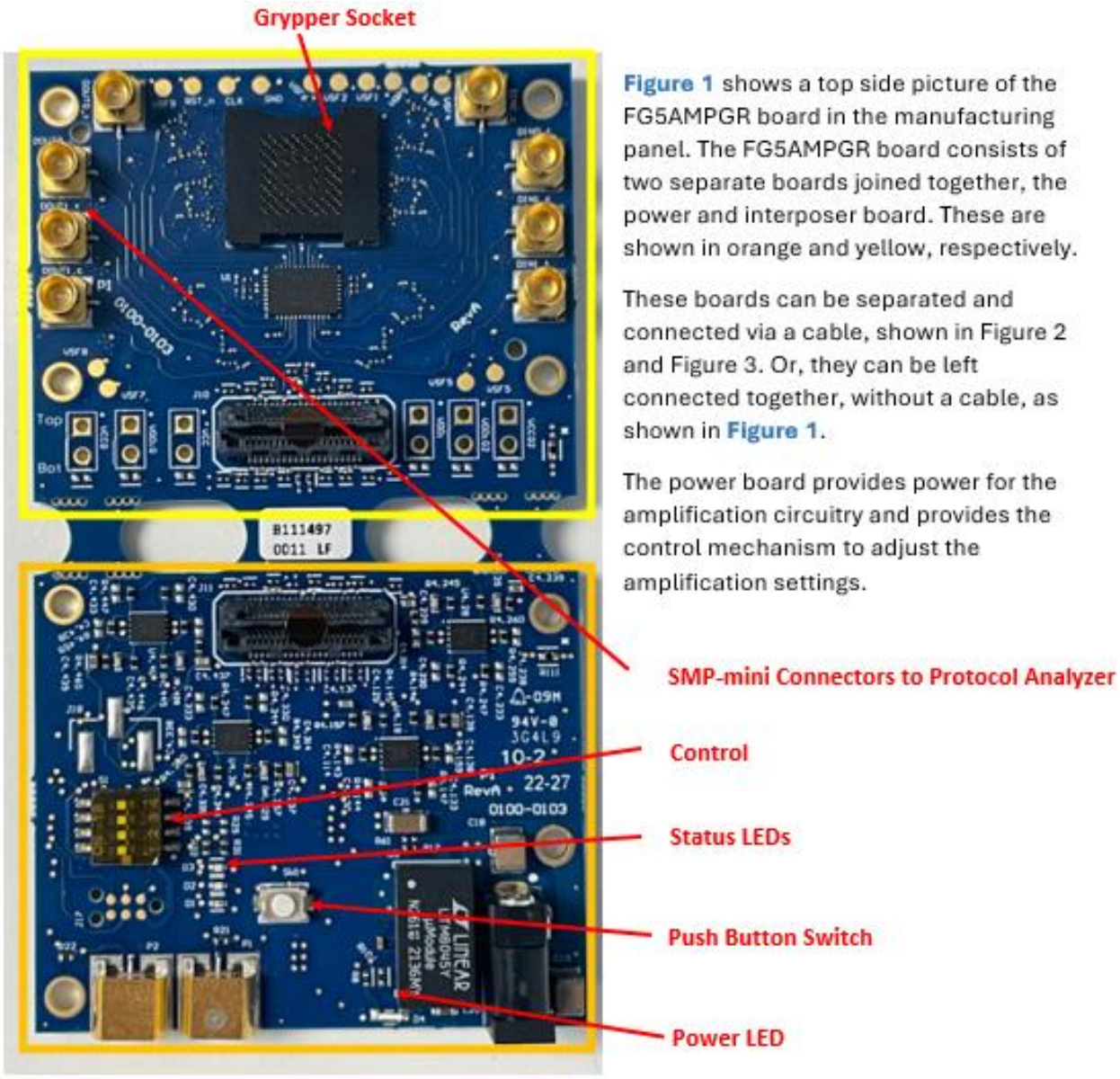


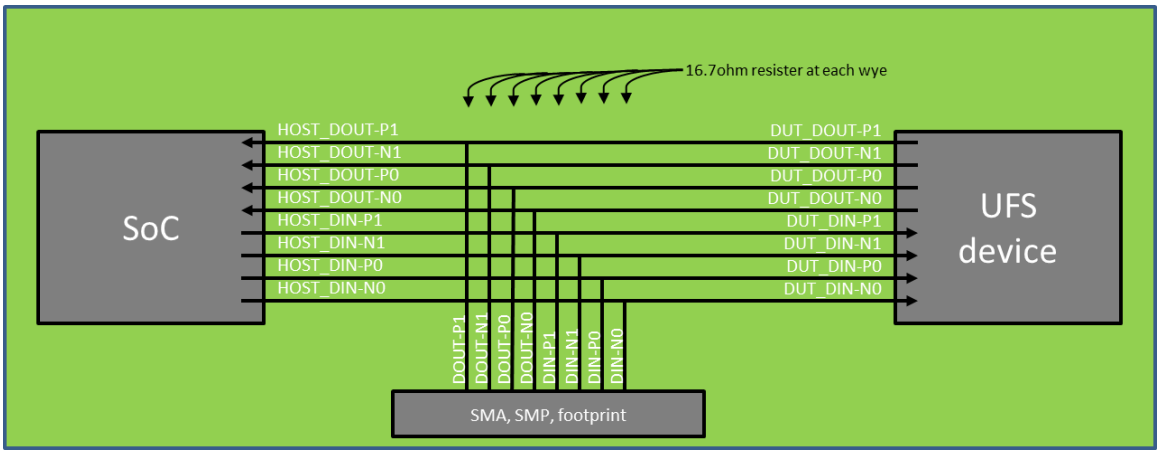
Figure 1 shows a top side picture of the FG5AMPGR board in the manufacturing panel. The FG5AMPGR board consists of two separate boards joined together, the power and interposer board. These are shown in orange and yellow, respectively.

These boards can be separated and connected via a cable, shown in Figure 2 and Figure 3. Or, they can be left connected together, without a cable, as shown in **Figure 1**.

The power board provides power for the amplification circuitry and provides the control mechanism to adjust the amplification settings.

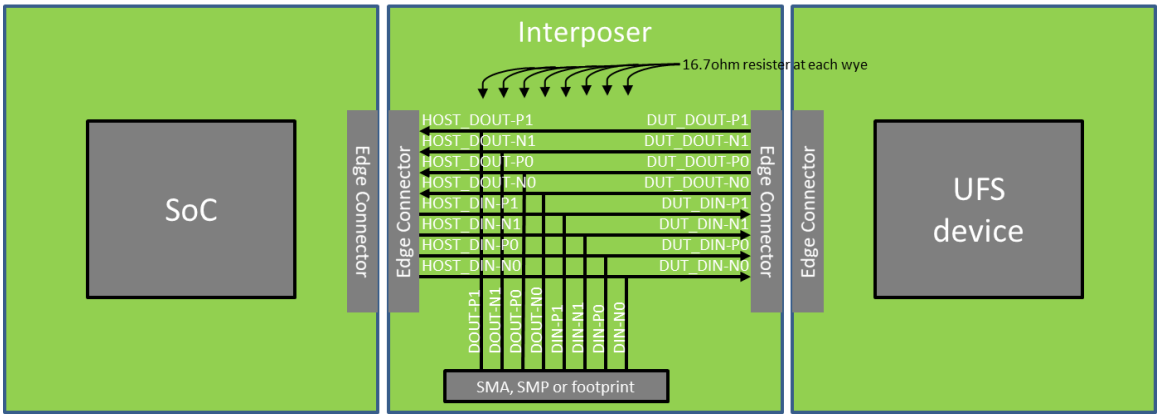
Breakout DUT –HS-G4 and slower

50% split = 16.7Ω ± 1Ω resistor

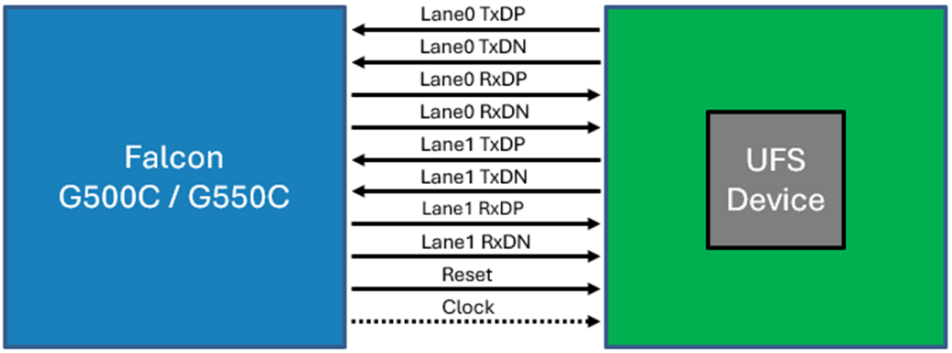


Interposer HS-G4 and slower

50% split = 16.7Ω ± 1Ω resistor



Exerciser Use Model (Direct Connection via SMP)



Cables and connectors

HS-G5

- SMP mini to SMP: ≥40GHz, ≤225mm/9” length, phase-matched
- SMP-to-SMA cables: ≥40GHz, ≤225mm/9” length, phase-matched

HS-G4

- Connector savers: Adapter Coaxial Connector SMP Plug, Male Pin To SMP Jack, Female 50 Ohm
  Amphenol SV Microwave 1112-4012 CONN ADAPT PLUG-JACK SMP 50 OHM ADAPTER COAXIAL CONNECTOR or equivalent
- SMP-to-SMA cables: ≥18GHz, ≤225mm/9” length, phase-matched
  Centric RF C572-086-09B or equivalent
- SMA to SMA cables: ≥18GHz, ≤225mm/9” length, phase-matched
  Centric RF C581-086-09 or equivalent
- Power splitter, DC-18 GHz
  Mini-Circuits ZFRSC-183-S+ or equivalent

Probe Connection

Analyzer Configuration

Note: the labels on the analyzer front panel are from the instrument perspective.

1. Connect the Sublink 0 Rx_1N to TxDN from the device M-Tx lane 1.
2. Connect the Sublink 0 Rx_1P to TxDP from the device M-Tx lane 1.
3. Connect the Sublink 0 Rx_0N to TxDN from the device M-Tx lane 0.
4. Connect the Sublink 0 Rx_0P to TxDP from the device M-Tx lane 0.
5. Connect the Sublink 1 Rx_1N to RxDN from the device M-Rx lane 1.
6. Connect the Sublink 1 Rx_1P to RxDP from the device M-Rx lane 1.
7. Connect the Sublink 1 Rx_0N to RxDN from the device M-Rx lane 0.
8. Connect the Sublink 1 Rx_0P to RxDP from the device M-Rx lane 0.

Exerciser Configuration - Falcon G350/G450/G550 only

Note: the labels on the analyzer front panel are from the instrument perspective.

1. Connect the Sublink 0 Rx_1N to TxDN from the device M-Tx lane 1.
2. Connect the Sublink 0 Rx_1P to TxDP from the device M-Tx lane 1.
3. Connect the Sublink 0 Rx_0N to TxDN from the device M-Tx lane 0.
4. Connect the Sublink 0 Rx_0P to TxDP from the device M-Tx lane 0.
5. Connect the Sublink 1 Tx_1N to RxDN from the device M-Rx lane 1.
6. Connect the Sublink 1 Tx_1P to RxDP from the device M-Rx lane 1.
7. Connect the Sublink 1 Tx_0N to RxDN from the device M-Rx lane 0.
8. Connect the Sublink 1 Tx_0P to RxDP from the device M-Rx lane 0.
9. Connect the UFS RST_N to the DUT reset signal
10. If desired, connect the UFS REF CLK to the DUT ref clock input.

Contact Information

1. For additional information, to request a demonstration or quote, or place an order, please contact your local Protocol Insight representative or sales@protocolinsight.com
2. Support materials and examples files are available at http://www.protocolinsight.com/support-materials/
3. For technical support please contact your local Protocol Insight representative or support@protocolinsight.com