

Keysight Technologies

# FSI-60112 Packet Analysis Probe for PCI Express®

For use with Keysight 16800 Series Portable Logic Analyzers

Data Sheet



# Introduction

The Keysight Technologies, Inc. FSI-60112 PCI Express® packet analysis probe provides a mechanical, electrical and software interface between your PCI Express bus and an Keysight logic analyzer. The probe provides quick and reliable connections to your system under test and has internal termination networks that minimize the effects of loading and reflections on your PCI Express bus during probing. The protocol decode software decodes and displays incoming data on your logic analyzer to make it easy for you to debug your design problems.

## Features

- Non-intrusive probing of PCI Express slots and chip-to-chip links in embedded system using unique soft touch connectorless probing technology
- Configurations for a variety of link widths: x4, x2, x1
- Support for PCI Express at full frequency (2.5+ GT/s)
- Logic analysis triggering and decoding of PCI Express buses at the packet level with Packet Viewer and Transaction Viewer software
- Decode for pre-defined and user-defined packet setups
- Support for all PCI Express modes: squelch, link training, TLP, DLLP, 10b/8b, spread spectrum clock, and scrambled data
- Designed for use with Keysight 16800 Series logic analyzer

Note:  
PCI Express specifications are issued by PCI-SIG.

## Complete System

Use a 16800 Series portable logic analyzer with the FSI-60112 analysis probe in your development lab for design and functional validation of PCI Express devices, add-in cards, system and chip-to-chip architectures. The analysis probe provides low-intrusion probing of the bus, PCI Express packet analysis and packet triggering to help you pinpoint your problem areas quickly. The FSI-60112 supports data scrambling, spread-spectrum clocking and flexible lane widths so you can make sure your design is consistent with PCI Express standards. A variety of probing options make it easy for you to connect to your device.

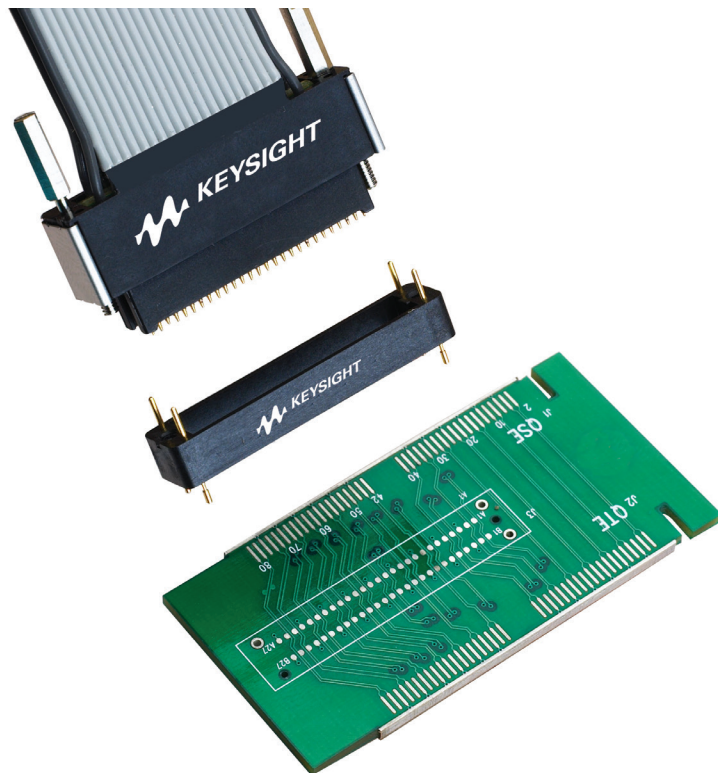


Figure 1. Ensure non-intrusive connection to an embedded system with a midbus probe using soft touch connectorless probing technology.

## Probe Connections

Three types of probe connections are available for the FSI-60112 so you can connect the probe with chip-to-chip, chip-to-slot and slot-to-slot PCI Express architectures. When you are doing point-to-point analysis between chips, it is important to physically probe the traces between them. The midbus probes with soft touch connectorless probing technology overcomes this challenge with the lowest impedance loading in the industry. For designs with a card edge slot, interposing probe solutions are available, and where there is no card edge slot or midbus footprint, there is a flying lead set for reliable data capture at full bus speed.

### FSI-60112 analysis probe

The FSI-60112 is capable of probing at a serial data rate of 2.5 Gb/s – it's the speed of standard PCI Express bus so you can be confident your bus works at PCI Express speeds. The probe monitors two directions of x1, x2 and x4 links and recognizes up to 24 bytes of each packet header so you can accurately capture the packet of interest. The probe is designed to handle a single, unidirectional link, or a bidirectional link and each may have a different reference clock.

Key features include:

- Spread-spectrum clocking
- Supports for ordered sets, TLP, DLLP and electrical idle
- Fast training sequence (without extension bit) synchronization in 14 to 16 FTS
- Jitter specification (valid data eye) – 140 ps (0.65 unit interval)



Figure 2. Use the slot connection with a low-impedance interposer for designs with a card edge slot.



Figure 3. A flying lead set lets you probe signals individually.

## Protocol Decode Software

The analysis probe, which includes protocol decode software for 16800 Series logic analyzers, acquires serial data, converts it to parallel form, recognizes and filters packets, and clocks the information into the analyzer. Data sent to the logic analyzer includes:

- Captured data (8 or 10 bit representation)
- Packet type and state information
- Packet recognizers and error indicators

This data is processed by the protocol decoder for display of packets, transactions and errors. You have the choice of viewing the packet decode data with either the Transaction Viewer tool or the Packet Viewer tool. Although the probe hardware has the ability to filter and trigger, the software interface provides bits arranged to support the use of logic-analyzer-based trigger functions, even on packet-based data. The decoder detects packet types and checks packet delimiters (minimal protocol checking).

### Packet Viewer software

Packet Viewer software is a powerful tool for easy analysis of protocol traffic. Packet viewer provides bidirectional information in a single display. Packet viewer allows packet-to-packet comparisons and detailed information on each lane, header format and payload.

### Transaction Viewer software

Transaction Viewer software runs on the logic analyzer to graphically display bus transactions. Start in high-level summary view to quickly scan transactions. Then use the drill-down feature to expose lower-level details of transactions or interest.

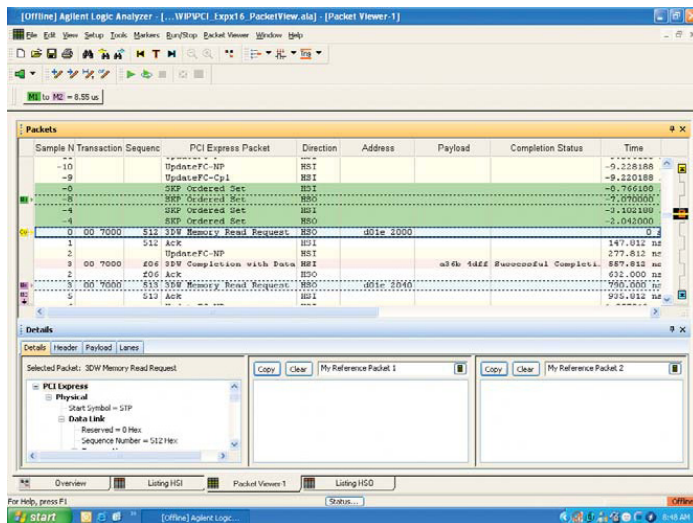


Figure 4. Packet Viewer – see packet and lane decode in an intuitive format.

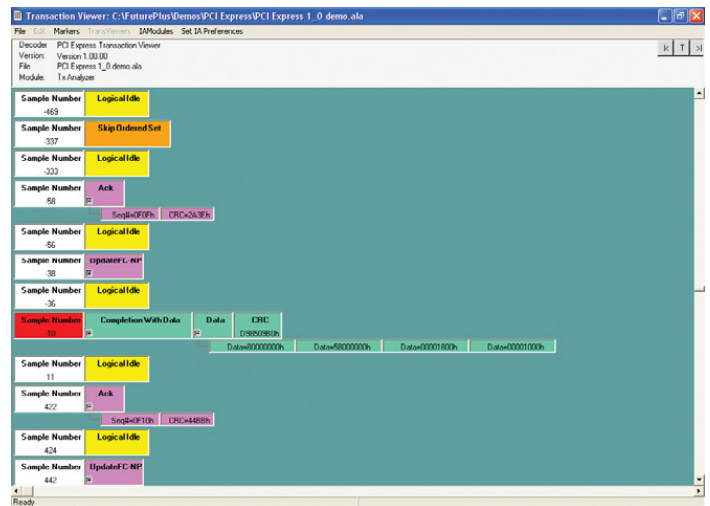


Figure 5. Transaction Viewer – a new way to view bus transactions.

## Configuration Guides

### Configuration guide for 16800 Series logic analyzers

Bidirectional x1, x2 or x4 lane width

Product	Description	Quantity
FSI-60112	PCI Express packet analysis probe	1
One of the following 16800 Series logic analyzers:		
– 16804A	136-channel logic analyzer	1
– 16806A	204-channel logic analyzer	1
One of the following connectors:		
– N4221A	Midbus connector	1
– FSI-60115	Half-size midbus connector	1
– N4225A	x4 slot connector	1
– N4227A	x1 slot connector	1
– FSI-60116	Flying lead set	1

### Configuration guide for 16900 Series logic analyzers

Bidirectional x1, x2 and x4 lane width

Product	Description	Quantity
FSI-60112	PCI Express packet analysis probe	1
One of the following 16900 Series logic analyzers:		
– 16900A	6-slot mainframe requires external display	1
– 16902A	6-slot mainframe with built-in touch display	1
– 16903A	3-slot mainframe with built-in touch display	1
One of the following modules:		
– 16910A	102-channel 4 GHz timing, 250 MHz state logic analysis module	2
– 16911A	68-channel 4 GHz timing, 250 MHz state logic analysis module	2
– 16950A	68-channel 4 GHz timing, 600 MHz state logic analysis module	2
One of the following connectors:		
– N4221A	Midbus connector	1
– FSI-60115	Half-size midbus connector	1
– N4225A	x4 slot connector	1
– N4227A	x1 slot connector	1
– FSI-60116	Flying lead set	1

## Ordering Information

Model number	Product
FSI-60112	PCI Express analysis probe
N4221A	Midbus connector cable set using soft touch technology
N4225A	PCI Express x4 slot connector cable set
N4227A	PCI Express x1 slot connector cable set
FSI-60115	PCI Express half-size midbus connector cable set using soft touch technology
FSI-60116	PCI Express flying lead cable set

## General Information

The following are not specifications, but are typical operating characteristics of FSI-60112. If the product is used in a manner not specified by the manufacturer, then the protection provided by the equipment may become impaired.

Power requirements	100 to 240 VAC, 2 amps
Environmental temperature	Non-operating: -40 to +75 °C Operating: 20 to 30 °C
Altitude	Operating: 46000 m Non-Operating: 153000 m
Humidity	Up to 80% relative humidity. Avoid sudden, extreme temperature changes which would cause condensation on the FSI-60112 module

## Related Literature

Publication title	Publication number
16800 Series Portable Logic Analyzers - Brochure	5989-5062EN
16900 Series Logic Analysis Systems - Brochure	5989-0420EN

## Product Web Site

For the most up-to-date and complete application and product information, please visit our product website at:  
[www.keysight.com/find/la\\_pciexpress](http://www.keysight.com/find/la_pciexpress)

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