

Agilent Technologies B4656A FPGA Dynamic Probe for Altera

Data Sheet



The challenge

You rely on the insight a logic analyzer provides to understand the behavior of your FPGA in the context of the surrounding system. Design engineers typically take advantage of the programmability of the FPGA to route internal nodes to a small number of physical pins that a logic analyzer can measure. While this approach is very useful, it has significant limitations.

 Since pins on the FPGA are typically an expensive resource, there are a relatively small number available for debug. This limits internal visibility (i.e. one pin is required for each internal signal to be probed).

Figure 1. FPGA dynamic probe for Altera used in conjunction with an Agilent logic analyzer provides the most effective solution for simple through complex debugging of systems incorporating Altera FPGAs.

- When you need to access different internal signals, you must change your design to route these signals to the available pins. This can be time consuming and can affect the timing of your FPGA design.
- Finally, the process required to map the signal names from your FPGA design to the logic analyzer setup is manual and tedious. When new signals are routed out, you need to manually update these signal names on the logic analyzer, which takes additional time and is a potential source of confusing errors.



Debug Your FPGAs Faster and More Effectively with a Logic Analyzer

FPGA dynamic probe lets you:

View internal activity – With a logic analyzer, you are normally limited to measuring signals at the periphery of the FPGA. With the FPGA dynamic probe, you can now access signals internal to the FPGA. You can measure up to 256 internal signals for each external pin dedicated to debug, unlocking visibility into your design that you never had before.

Make multiple measurements in

seconds – Moving probe points internal to an FPGA used to be time consuming. Now, in less than a second, you can easily measure different sets of internal signals without design changes. FPGA timing stays constant when you select new sets of internal signals for probing.

Leverage the work you did in your design environment – The FPGA

dynamic probe maps internal signal names from your FPGA design tool to your Agilent logic analyzer. Eliminate unintentional mistakes and save hours of time with this automatic setup of signal and bus names on your logic analyzer.



Figure 2. The FPGA dynamic probe requires Altera's Quartus II design software with its logic analyzer interface and Altera programming hardware setup. The Quartus II (ver. 6.0 or higher) logic analyzer interface allows you to create and insert the core for use by the FPGA dynamic probe application on the logic analyzer. This configuration allows you to probe the FPGA pins with the Agilent FPGA dynamic probe software. The FPGA dynamic probe controls which group of internal signals to measure via the Altera programming hardware connected to the JTAG port of the FPGA.



Figure 3. Access up to 256 internal signals for each debug pin. Signal banks all have identical width (1 to 256 signals wide) determined by the number of device pins you devote for debug. Each pin provides sequential access to one signal from every input bank.

A Quick Tour of the Application

Design step 1: Configure the logic analyzer interface file and core parameters

You need to create a logic analyzer interface file with the logic analyzer interface in Quartus II. This file defines the interface that builds a connection between the internal FPGA signals and the logic analyzer. You can then configure the core parameters, which include number of pins, number of signal banks, the type of measurement (state or timing), clock and the power-up state.



Design step 2: Map the logic analyzer interface core outputs to available I/O pins

Use Pin Planner in Quartus II to assign physical pin locations for the logic analyzer interface core.



A Quick Tour of the Application (continued)

Design step 3: Assign logic analyzer interface bank parameters

Assign internal signals to each bank in the logic analyzer interface after you have specified the number of banks to use in the core parameters. Find the signals you want to acquire with the Node Finder and assign them to the banks.

With the logic analyzer interface core fully configured and instantiated into your FPGA design, you're ready to compile your design to create the device programming file (.sof). Then, to make measurements you'll move to the Agilent logic analyzer software.



Activate FPGA dynamic probe for Altera

The FPGA dynamic probe icon allows you to control the logic analyzer interface and set up the logic analyzer for the desired measurements.



A Quick Tour of the Application (continued)

Measurement setup step 1: Establish a connection between the logic analyzer and the logic analyzer interface

The FPGA dynamic probe application establishes a connection between the logic analyzer and the FPGA via a JTAG cable. It also determines what devices are on the JTAG scan chain and lets you pick the one with which you wish to communicate.



Measurement setup step 2: Configure the device and import signal names

If needed, you can configure the device with the SRAM object file (.sof) that includes the logic analyzer interface file. The FPGA dynamic probe application reads a .lai file produced by Quartus II. The names of signals you measure will now automatically appear in the label names on your Agilent logic analyzer.



Measurement setup step 3: Map FPGA pins

Select your probe type and easily provide the information needed for the logic analyzer to automatically track names of signals routed through the logic analyzer interface file.



A Quick Tour of the Application (continued)

Setup complete: Make measurements

Quickly change which signal bank is routed to the logic analyzer. A single mouse click tells the logic analyzer interface core to switch to the newly specified signal bank without any impact to the timing of your design. To make measurements throughout your FPGA, change signal banks as often as needed. With each new selection of a signal bank, FPGA Dynamic Probe updates new signal names from your design to the logic analyzer. User-definable signal bank names make it straight forward to select a part of your design to measure.

auto_lai_0	<u>B</u> un Eye Finder
small_1s10:inst count1(0)	Irim Bus/Signal Names
	Properties
mall_1s10:inst[count2(0)	Selected signal bank:
small_stours(count())	Bank 0
Bank 3	Last selected in core:
	Bank 0

Correlate internal FPGA activity with external measurements

View internal FPGA activity and time-correlate internal FPGA measurements with external events in the surrounding system. FPGA Dynamic Probe unlocks the power of the logic analyzer for system-level debug with FPGAs.



Agilent B4656A Specifications and Characteristics

Supported logic analyzers	
Standalone logic analyzers	1680 Series, 1690 Series, 16800 Series
Modular logic analysis systems	16900 Series with one or more state/timing modules: A single node-locked FPGA dynamic probe license will enable all modules within a 16900 Series system
AXIe-based Logic Analyzer	U4154A
Triggering capabilities	Determined by logic analyzer
Supported Altera FPGA families	All families that the Altera LAI core supports including: Stratix IV GX (where SOF* support is available), Stratix IV, Stratix III, Stratix II, and Stratix; Cyclone IV (where SOF* support is available), Cyclone III, Cyclone II, and Cyclone; Arria II and Arria *SOF is the SRAM Object File (.sof) that is generated in Quartus for a specific device.
Supported Altera cables (required)	Altera USB Blaster or ByteBlaster
Supported probing mechanisms	Soft touch (34-channel and 17-channel), Mictor, Samtec, Flying lead

Logic analyzer interface characteristics	
Number of output signals	User definable: 1 to 256 signals in 1 signal increments
Signal banks	User definable: 1 to 256 banks
Modes	State (synchronous) or timing (asynchronous) mode

Compatible software	
Altera Quartus II 6.0 or greater	1680, 1690, 16800, 16900 Series software version 03.55 or greater

Additional information available via the Internet (www.agilent.com/find/FPGA)

Ordering Information

Ordering options for the Agilent B4656A FPGA dynamic probe for Altera	
Option 010	 Entitlement certificate for perpetual node-locked license CD with application software
Option 020	 Entitlement certificate for perpetual floating license CD with application software

Related Agilent Literature

Publication title	Pub number
Frequently Asked Questions for Agilent B4656A FPGA Dynamic Probe for Altera Data Sheet	5989-5716EN
Agilent Technologies 16900 Series Logic Analysis Systems Color Brochure	5989-0420EN
Agilent Technologies Measurement Modules for the 16900 Series Data Sheet	5989-0422EN
U4154A Logic Analyzer Module Data Sheet	5990-7513EN
Probing Solutions for Agilent Technologies Logic Analyzers Catalog	5966-4632E
Agilent 16800 Series Portable Logic Analyzers Color Brochure	5989-5062EN
Agilent 16800 Series Portable Logic Analyzers Data Sheet	5989-5063EN
Agilent 1680 and 1690 Series Logic Analyzers Data Sheet	5988-2675EN

For the most up-to-date and complete application and product information, please visit our product Web site at www.agilent.com/find/logic

www.agilent.com



www.agilent.com/find/emailupdates Get the latest information on the products and applications you select.



www.axiestandard.org

AdvancedTCA® Extensions for Instrumentation and Test (AXIe) is an open standard that extends the AdvancedTCA® for general purpose and semiconductor test. Agilent is a founding member of the AXIe consortium.

LXI

www.lxistandard.org

LAN eXtensions for Instruments puts the power of Ethernet and the Web inside your test systems. Agilent is a founding member of the LXI consortium.



http://www.pxisa.org

PCI eXtensions for Instrumentation (PXI) modular instrumentation delivers a rugged, PC-based highperformance measurement and automation system.

Agilent Channel Partners

www.agilent.com/find/channelpartners Get the best of both worlds: Agilent's measurement expertise and product breadth, combined with channel partner convenience.



Agilent Advantage Services is committed to your success throughout your equipment's lifetime. We share measurement and service expertise to help you create the products that change our world. To keep you competitive, we continually invest in tools and processes that speed up calibration and repair, reduce your cost of ownership, and move us ahead of your development curve.

www.agilent.com/find/advantageservices



www.agilent.com/quality

For more information on Agilent Technologies' products, applications or services, please contact your local Agilent office. The complete list is available at:

www.agilent.com/find/contactus

Americas

(877) 894 4414
(11) 4197 3500
01800 5064 800
(800) 829 4444

Asia Pacific

Australia	1 800 629 485
China	800 810 0189
Hong Kong	800 938 693
India	1 800 112 929
Japan	0120 (421) 345
Korea	080 769 0800
Malaysia	1 800 888 848
Singapore	1 800 375 8100
Taiwan	0800 047 866
Other AP Countries	(65) 375 8100

Europe & Middle East

-	
Belgium	32 (0) 2 404 93 40
Denmark	45 70 13 15 15
Finland	358 (0) 10 855 2100
France	0825 010 700*
	*0.125 €/minute
Germany	49 (0) 7031 464 6333
Ireland	1890 924 204
Israel	972-3-9288-504/544
Italy	39 02 92 60 8484
Netherlands	31 (0) 20 547 2111
Spain	34 (91) 631 3300
Sweden	0200-88 22 55
United Kinadom	44 (0) 118 9276201

For other unlisted Countries: www.agilent.com/find/contactus Revised: October 14, 2010

Product specifications and descriptions in this document subject to change without notice.

© Agilent Technologies, Inc. 2006, 2011 Printed in USA, March 25, 2011 5989-5595EN

