Keysight Technologies
Configuring Boundary Scan Chains on Keysight x1149 Boundary Scan Analyzer

Application Note

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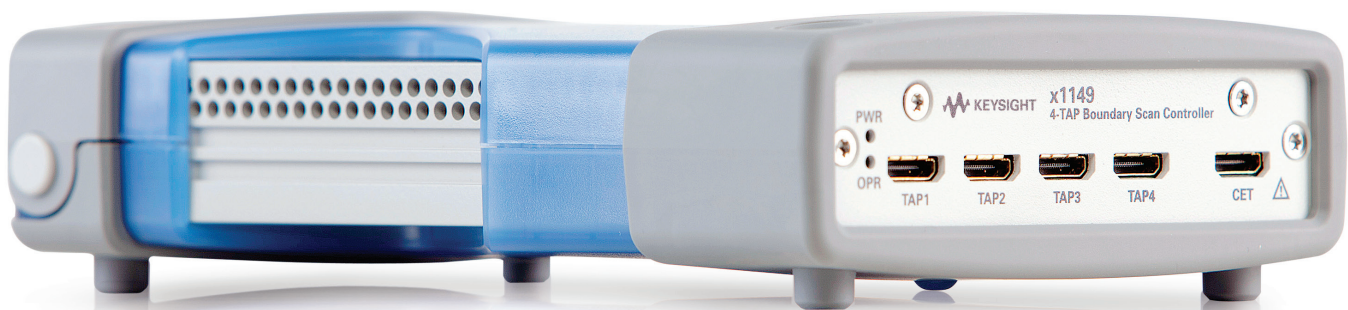
Introduction

A boundary scan chain consists of two or more boundary scan integrated circuit (IC) devices where the test data output (TDO) of the first boundary scan device in the chain is connected to the test data input (TDI) of the second boundary scan device to form a chain. The test mode select (TMS) and test clock input (TCK) signals are common for all the boundary scan devices in a chain. See Figure 1.
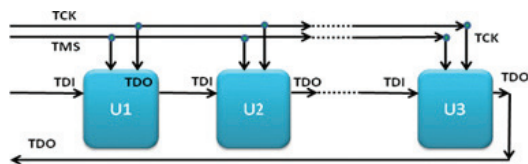

Figure 1. A boundary scan chain

The Keysight Technologies, Inc. x1149 boundary scan software analyzes the circuit board netlist and the boundary scan description language (BSDL) of the boundary scan device, to detect the chain connections. The boundary scan chain is the key in maximizing the boundary scan test coverage of the board.

Engineers who use typical benchtop boundary scan tools today need knowledge of the board to define the chain. This is a time-consuming process as engineering time is needed to manually define the connection of the printed circuit board boundary scan chain before the software can detect the boundary scan chain.

This application note provides the procedure for configuring the boundary scan chain of a board.

1. Input file

– The preferred input file for the Keysight x1149 boundary scan analyzer software is the Keysight i3070 board file, or a CAD file (see Table 1 for CAD format list).

Table 1. List of supported CAD formats

	CAD Format
1	Accel
2	Cadence (ascii)
3	Cadence (netlist)
4	FATF
5	Gencad
6	IPC
7	Mentor (Neutral)
8	ODB++ (tgz)
9	PCAD
10	Power PCB (Pads)
11	Protel
12	Telesis
13	Zuken (CR5000)
14	Zuken (CR5000-1)

– Bill of material (BOM) in csv format is also supported to define the part number and value of the devices tested during boundary scan test. The part number of the boundary scan device, as well as those for non-boundary scan digital devices are important for the Keysight x1149 software to correctly identify the BSDL and libraries needed to generate the boundary scan chain and test.

2. Loading the input file (i3070 board file)

Note: CAD data is also translated into board file.

- Click Process Outline > Define Boards. A Board List tab will appear.
- Click Add.
- Type the board name and abbreviation if there are multiple boards.
- Select the board name.
- Click Import.
- Select the file type Keysight Board or CAD.

Figure 2. Board import

- Select the location of the board file to be imported to, as well as the library and BSDL folder.

Figure 3. Selecting the board file location

2. Loading the input file (i3070 board file) (continued)

Note: CAD data is also translated into board file.

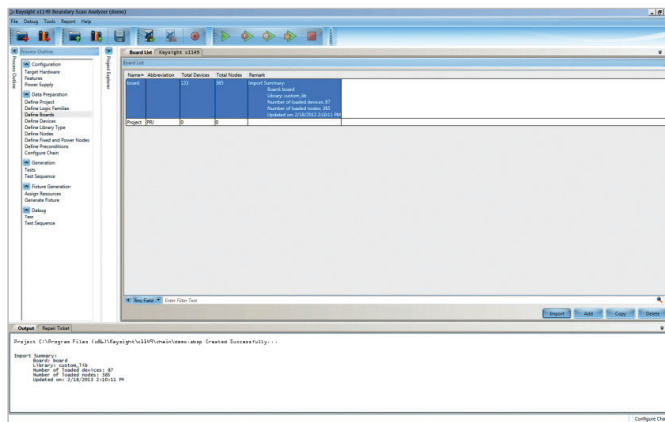– Select board type and folder that contains the BSDL and libraries.
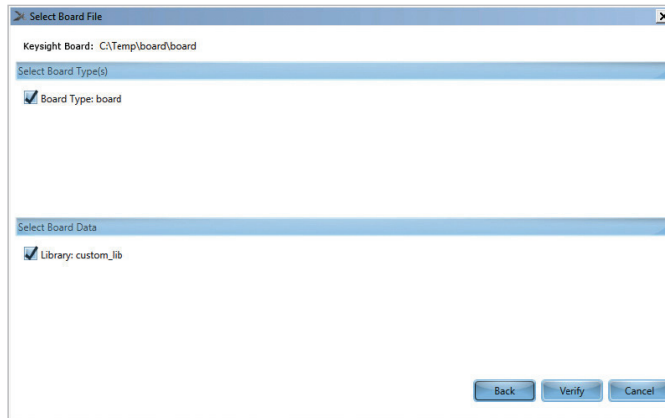
Figure 4: Select the board type and the board data (BSDL/library folder)

– Board file loaded and the BSDL/Libraries.

Figure 5. Board file uploaded, including the BSDL/libraries
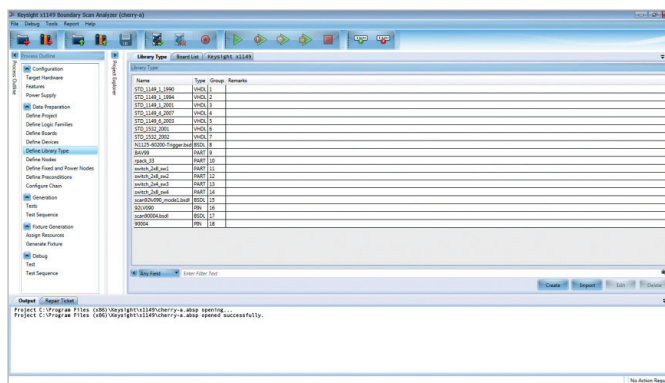
3. Part number definition and assignment of the BSDL file and libraries

– The part number that matches the BSDL and libraries in the database will be assigned automatically.
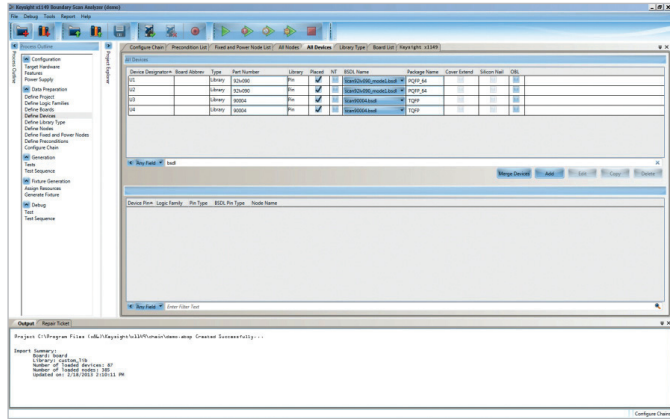

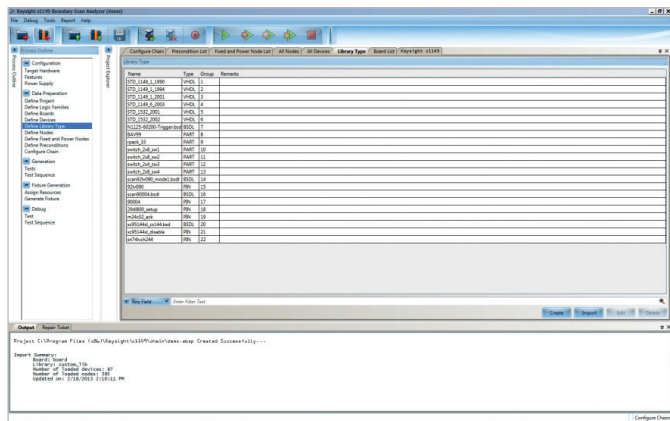Figure 6. Device list with BSDL and library assigned

Figure 7. Libraries, including BSDL, part description and digital libraries, loaded into the database

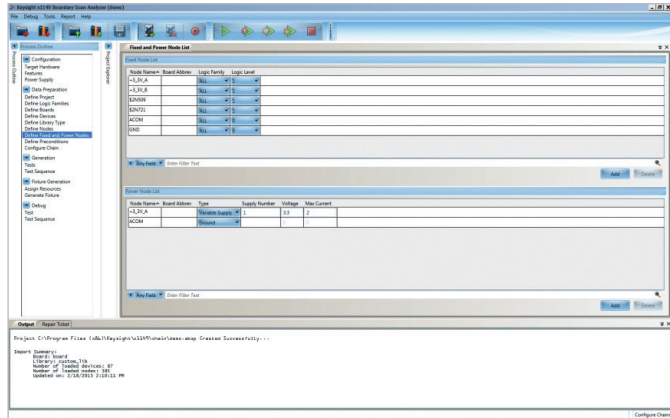## 4. Fixed node assignment

– Define the fixed and ground nodes.

Figure 6. Defining the fixed and ground node

5. Chain configuration
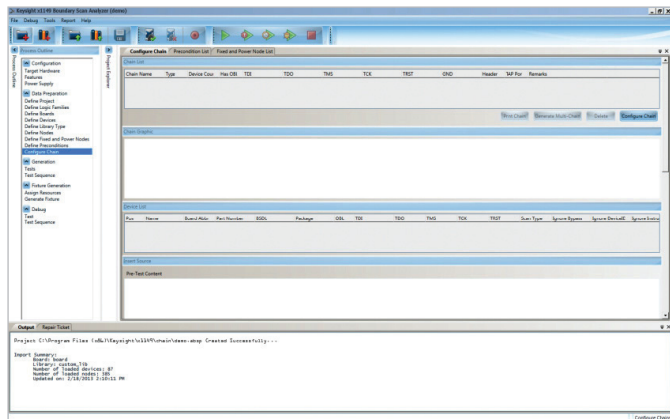
– Click **Process Outline > Configure Chain**.

Figure 7. Configuring the chain

6. The Keysight x1149 identifies the chains in the board

- Click **Next**.
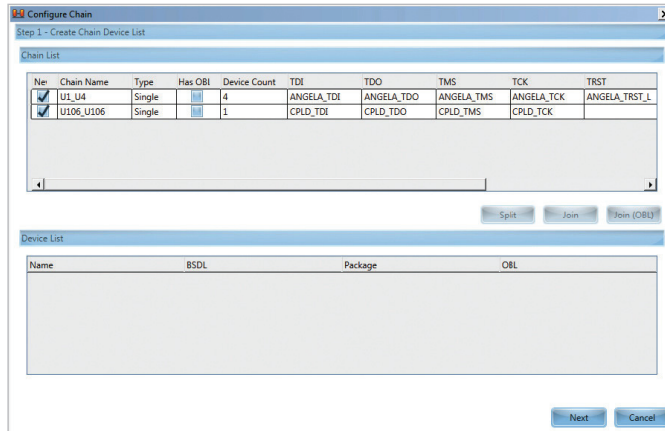- Select the chains that will be used by the Keysight x1149 for test generation.
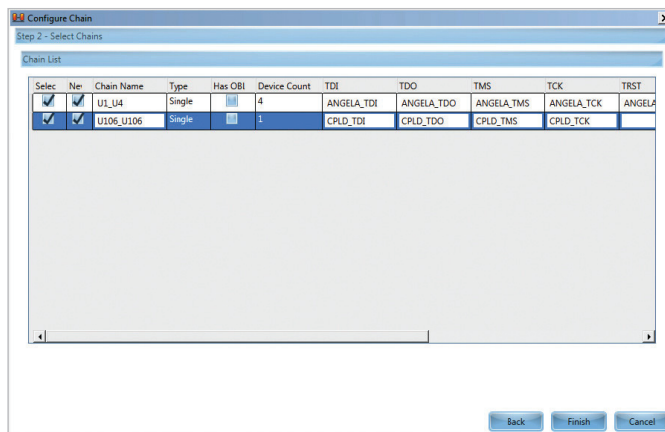

Figure 8. Boundary scan chains

Figure 9. Select the boundary scan chains

7. Configured boundary scan chains with the following information

– Chain list
    – Chain type (single or multi)
    – Number of boundary scan device in a chain
    – Node names: TCK,TMS,TDI,TDO and TRST
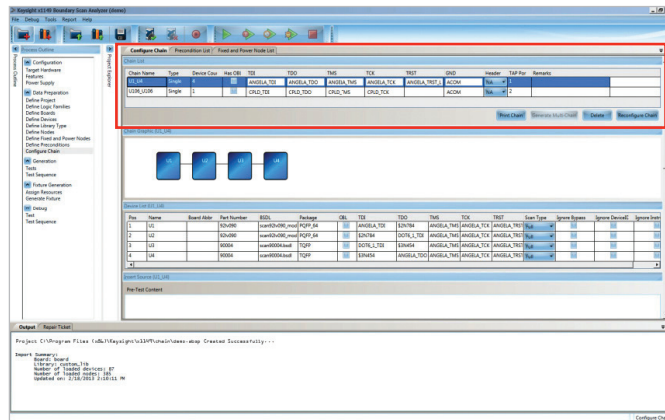   – Header
    – TAP port

Figure 10: Chain list information

– Chain graphic
    – Each device will show TAP nodes and device pin when the mouse icon is placed over the device
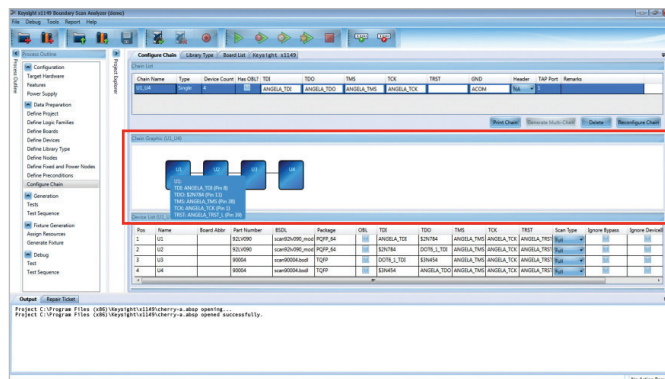

Figure 11. Chain graphic with TAP information

7. Configured boundary scan chains with the following information (continued)

- Device List shows the following:
  - Device position in the chain
  - Device name
  - Board abbreviation
  - Device part number
  - BSDL file used for the device
  - Package define in the BSDL
  - Check if the device is an on-board linker (OBL)
  - Device TAP information (TDI,TDO,TMS,TCK and TRST)
  - Scan type (full or TAP only)
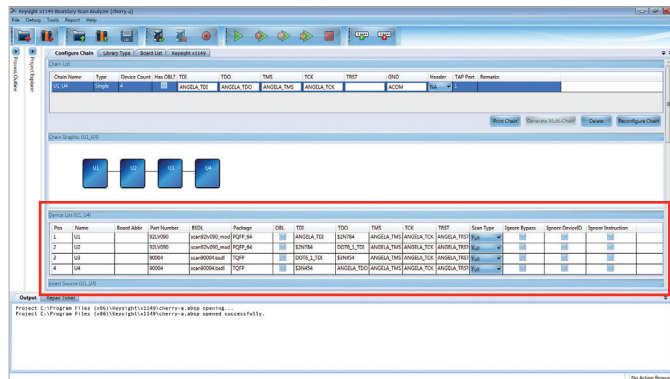 - Ignore (Bypass, DeviceID and Instruction)

Figure 11. Device list information

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