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*Help*

**JTAG Maps**

1149.1

...We are boundary-scan.®

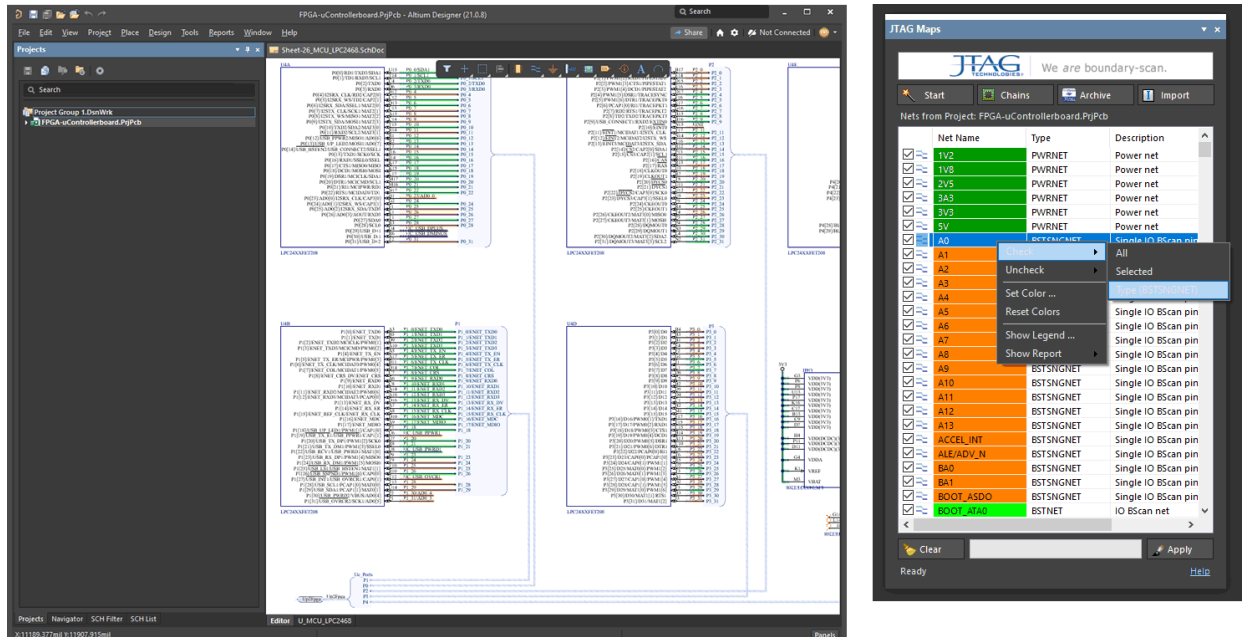
Version 2021-03



# Introduction

JTAG Maps assesses and visualizes the Bscan accessibility of a design based on the information available in an Altium Designer development project. The software processes the information and produces a list with nets, which can be made visible.

Below is an example of JTAG Maps and nets made visible in the schematics.



The nets are divided in categories, i.e. TAP Nets, Power Nets, Bscan access nets etc. Each category has its own color, thus visualizing the extent to which a design has Bscan access. Furthermore, the Bscan chain, which has been implemented in the design, can be made visible.

Board designers can then decide, based on the presented Bscan accessibility, to improve that aspect of the design, thus greatly improving its structural testability when the PCBs are manufactured later during production.

## IMSG Import Option

An IMSG file is created with JTAG Technologies software and is, among others, used to visualize the testability of a design. It is possible to visualize this testability in the schematics in the Altium environment. The IMSG option is explained in a separate section, called [Import IMSG Files](#).

# Requirements and Recommendations

## System

In order to be able to use JTAG Maps, the following system requirement must be met:

- Altium Designer Version 18 or higher with JTAG Maps option available.

JTAG Maps uses the following software, which will be installed with the program:

- .NET Framework 4.0.
- Visual C++ Runtime Libraries for Visual Studio 2012 (Redistributable) (x86).

## JTAG Maps Plus

JTAG Maps Plus has the following requirement additional to JTAG Maps:

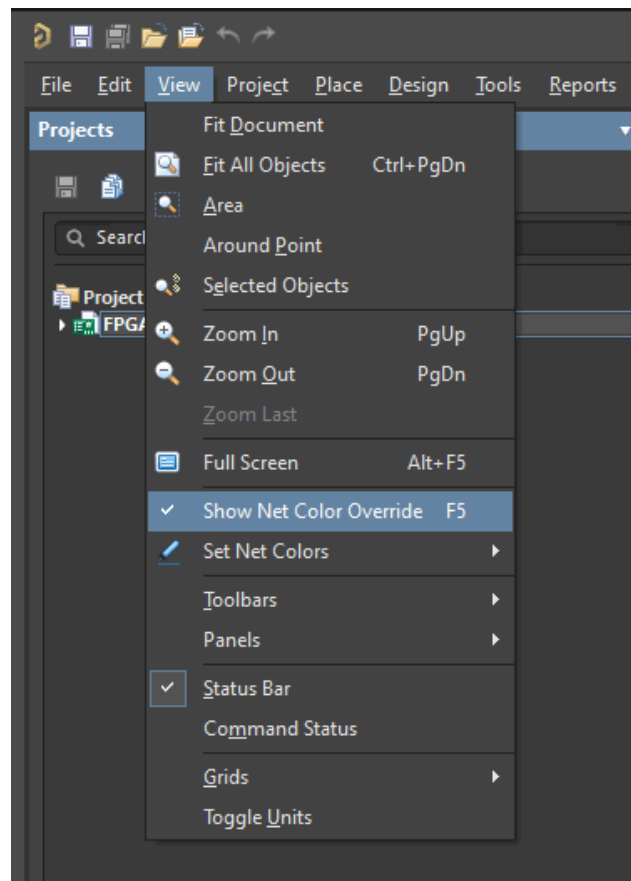
- IMSG File containing testability information to be viewed in the schematics.

## BSDL Files

BSDL Files are NOT required but highly recommended because they improve the quality of the information to be viewed in the schematics.

## Color Overrides

For optimum coloring capability select the option "Show Net Color Override (F5)" in the "View Menu" in the toolbar in Altium Designer (shown below).



# Procedures

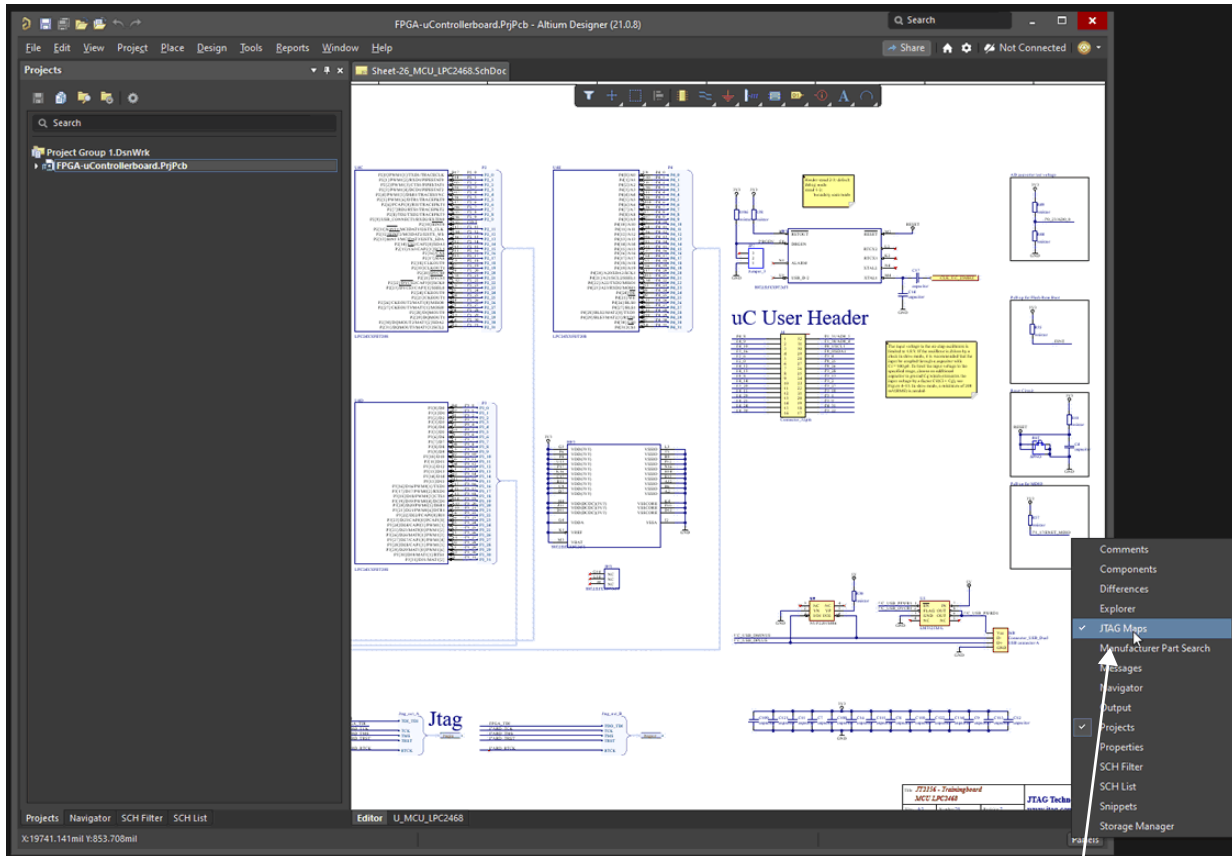
To use JTAG Maps take the following steps:

- [Start JTAG Maps](#)
- [Get a License](#)
- [Analyse the Design](#)
- [Generate the Map](#)
- [View the Nets](#)
- [Create a Report](#)
- [View the Bscan Chain](#)
- [Archive Option](#)

**NOTE:** A separate section [Import IMMSG Files](#) explains the use of IMMSG files.

# Start JTAG Maps

With a project loaded in the Altium Designer environment select “Panels” and choose JTAG Maps as shown below.



Click to Start JTAG Maps

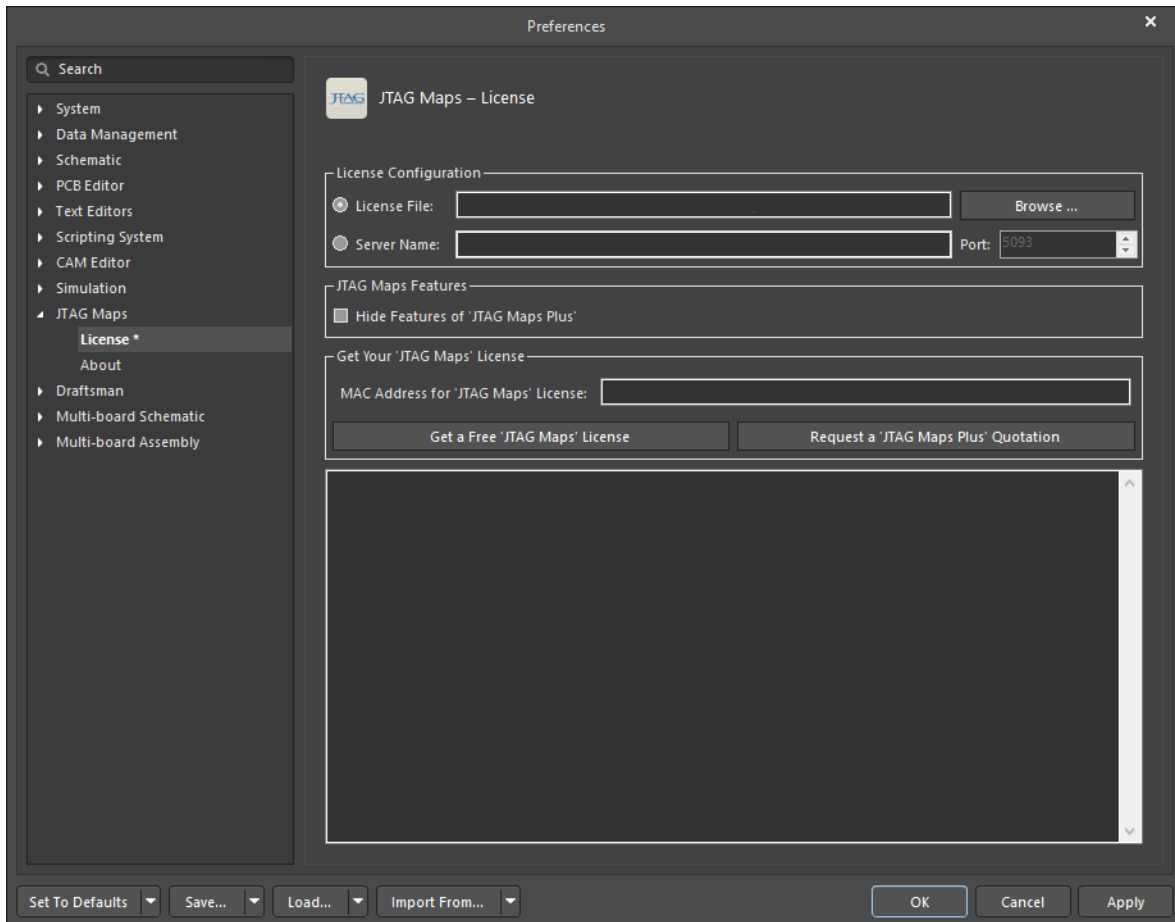
The JTAG Maps environment is loaded as a separate window in the Altium environment.



# Get a License

If not already available, the first step is to acquire a license. Take the following steps:

- Select the menu option “DXP > Preferences”.
- Go to the item “JTAG Maps” and select “License” (shown below).



- Choose between the two License options. The free license allows you to view nets in your Altium Designer schematics. The JTAG Maps Plus license also allows you to import JTAG Technologies IMMSG files for viewing in your schematics.

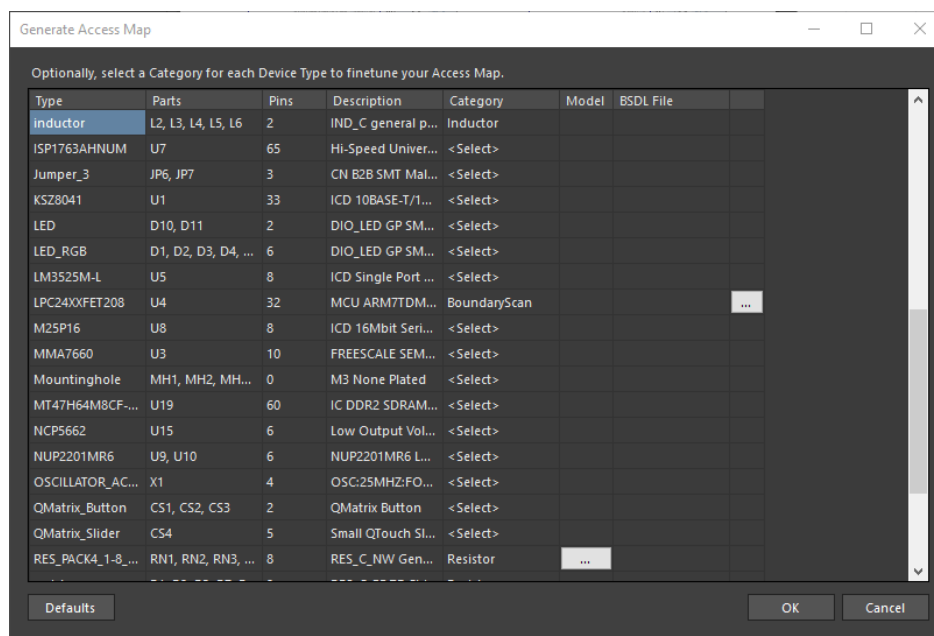
**NOTE:** Check the option “Hide Features of ‘JTAG Maps Plus’” to only have the free JTAG Maps functionality on display in the interface.

After you have obtained a license, browse to its location, click “Apply/OK” and restart Altium Designer to activate it. For server licenses, specify the server details to activate the license mechanism. With the license in order, proceed as explained in the following sections.



# Analyse the Design

The first step is to analyse the design information in the loaded project to produce a list with devices. Click the “Start button” to create an initial list. An example is shown below:



The produced list includes the devices in the design, classified by type, parts of that type and a short description. Devices can be further assigned to each of the categories included in the table below.

Category	Description
BoundaryScan	Used to identify Bscan devices. All pins are considered to be linkage (full I/O), unless otherwise specified. This category is automatically assigned by the software. The software infers the TAP, PWR and GND pins from the netlist and assigns the connected nets these values. All other pins are assigned BSTNET or BSTSNGNET. Furthermore, additional information such as IR Register length will not be available.  If you have a BSD File, the pin definitions are read from the file. Please read the section <a href="#">BSD File</a> for more information.
Connector	Used to identify connectors, which are handled as fully inactive devices. However, nets connected to a connector, are seen as “Possibly scanable”, even when they are not directly scanable.
Connection	Used to specify the connection scheme of jumpers, zero Ohm resistors, fuses, active buffers, switches etc. All pins are considered to be inactive. It is possible to specify individual pin-pin connections per device, or per device type. Please read the section <a href="#">Pin to Pin Connections</a> for more information.
Parallel	Used to identify external devices which are considered fully scanable. All pins are considered Parallel I/O, unless otherwise specified.

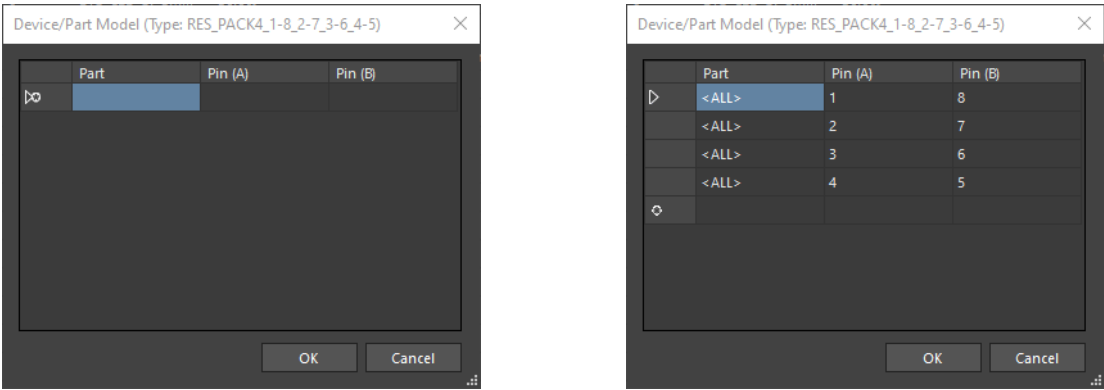
Resistor	Used to identify resistors. Series resistors are handled as fully transparent, while Pull resistors are seen as an Open. This category is automatically assigned by the software. Only if the resistor has more than two pins, it is needed to specify the individual pin-pin connections, similar to Category "Connection". Please read the section <a href="#">Pin to Pin Connections</a> for more information.
Resonator	Used to identify resonators, which are handled as fully inactive devices.
Inductor	Used to identify inductors, which are handled as fully transparent, if the device has two pins. Only if the inductor has more than two pins, it is needed to specify the individual pin-pin connections, similar to Category "Connection". Please read the section <a href="#">Pin to Pin Connections</a> for more information
Capacitor	Used to identify capacitors, which are handled as fully inactive devices. This category is automatically assigned by the software.

Assigning Device Types is not mandatory, but the quality of the information to be visualized is greatly improved by an accurate and complete assignment.

With the assignments to your satisfaction, please continue with the following section.

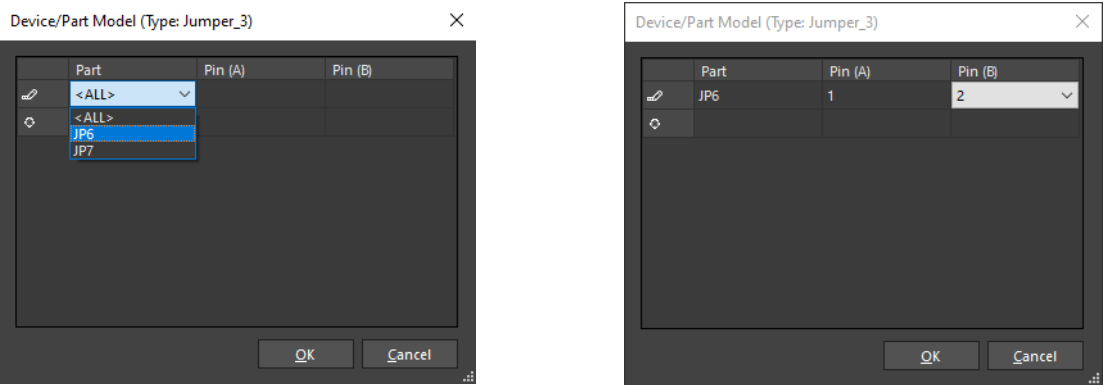
### Pin to Pin Connections

For resistor packs and connections, pin to pin relations can be specified. Click on the icon following a resistor pack or capacitor array for the following dialog.



Click in the dialog to access the functionality. You can specify the pin to pin relation for an individual part or for all parts in one go as is shown in the example above for an 8 pin resistor pack.

For connections the specification will likely not be for all parts of that type. The example below shows a connection for a 3p jumper, where two pins are used.

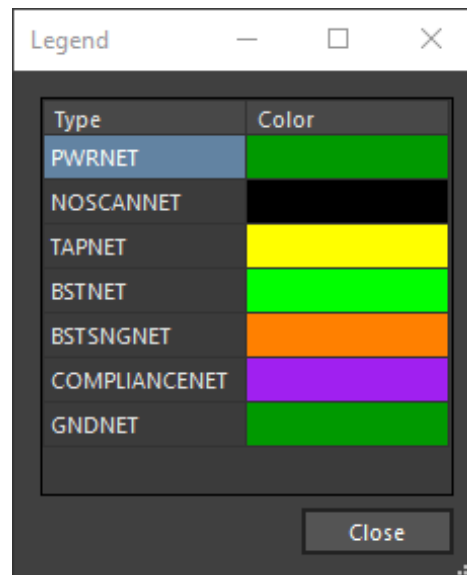
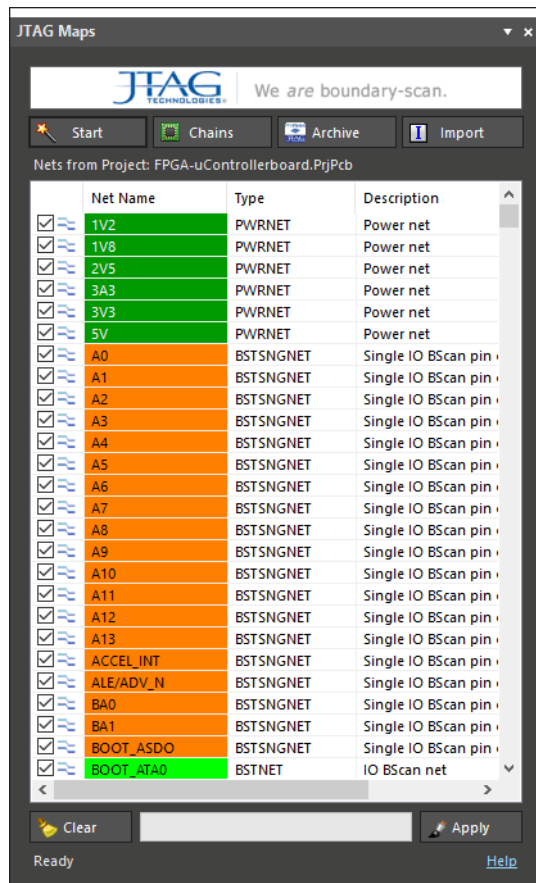


## BSDL Files

BSDL Files are not mandatory. However, without BSDL files all pins of the device are assumed full Bscan I/O, unless otherwise specified. Furthermore, additional information such as IR Register length will not be available.

## Generate the Map

In the “Generate Access Map” dialog click “OK” to produce a list with nets like the one shown below. The example is shown together with a legend for the default colors that are used.



The legend only displays the categories which are actually present in the list.

Based on the available information, i.e. the list with net names and the device properties determined by their category, the nets are put in a color coded list in the JTAG Maps working environment. Each color signifies a type of access, via Bscan, which is available for that net. Right click in the list and select the option “Set Color...” to change the default color into a custom one.

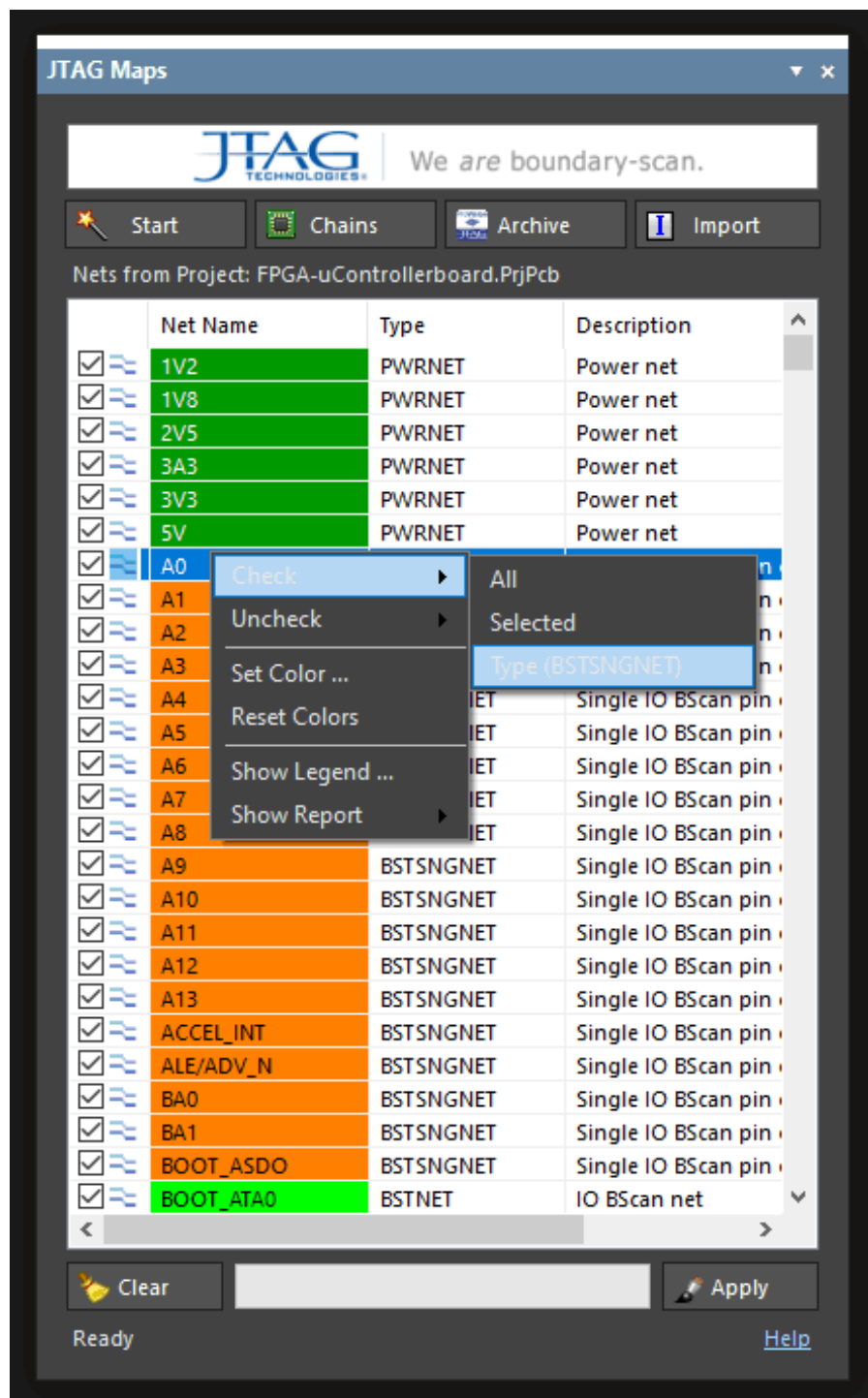
## Net Categories

The following categories are distinguished.

PWRNET	Power Nets
GNDNET	Ground nets.
PARNET	<p>Nets connected to, for example, connectors, i.e. accessible via external hardware such as a DIOS.</p> <p>A net cannot be a PARNET if any of the following pins is connected to this net:</p> <ul style="list-style-type: none"><li>• Bscan</li><li>• Specified ICT</li><li>• Specified Flying probe</li><li>• TAP</li><li>• Compliance</li><li>• Power of ground</li></ul>
NOSCANNET	Nets that have no Boundary-scan access.
TAPNET	Nets carrying the TAP signals.
BSTNET	Nets that are accessible via Boundary-scan; These nets are not necessarily always directly connected to Bscan Devices.
BSTSNGNET	Nets that have only one Boundary-scan pin connected to them. In this state these nets cannot be used for the execution of Boundary-scan applications. However, by connecting a DIOS to these nets, it may be possible to use them during a test or programming action.
COMPLIANCENET	Nets that are connected to the compliance pin of a Bscan device.

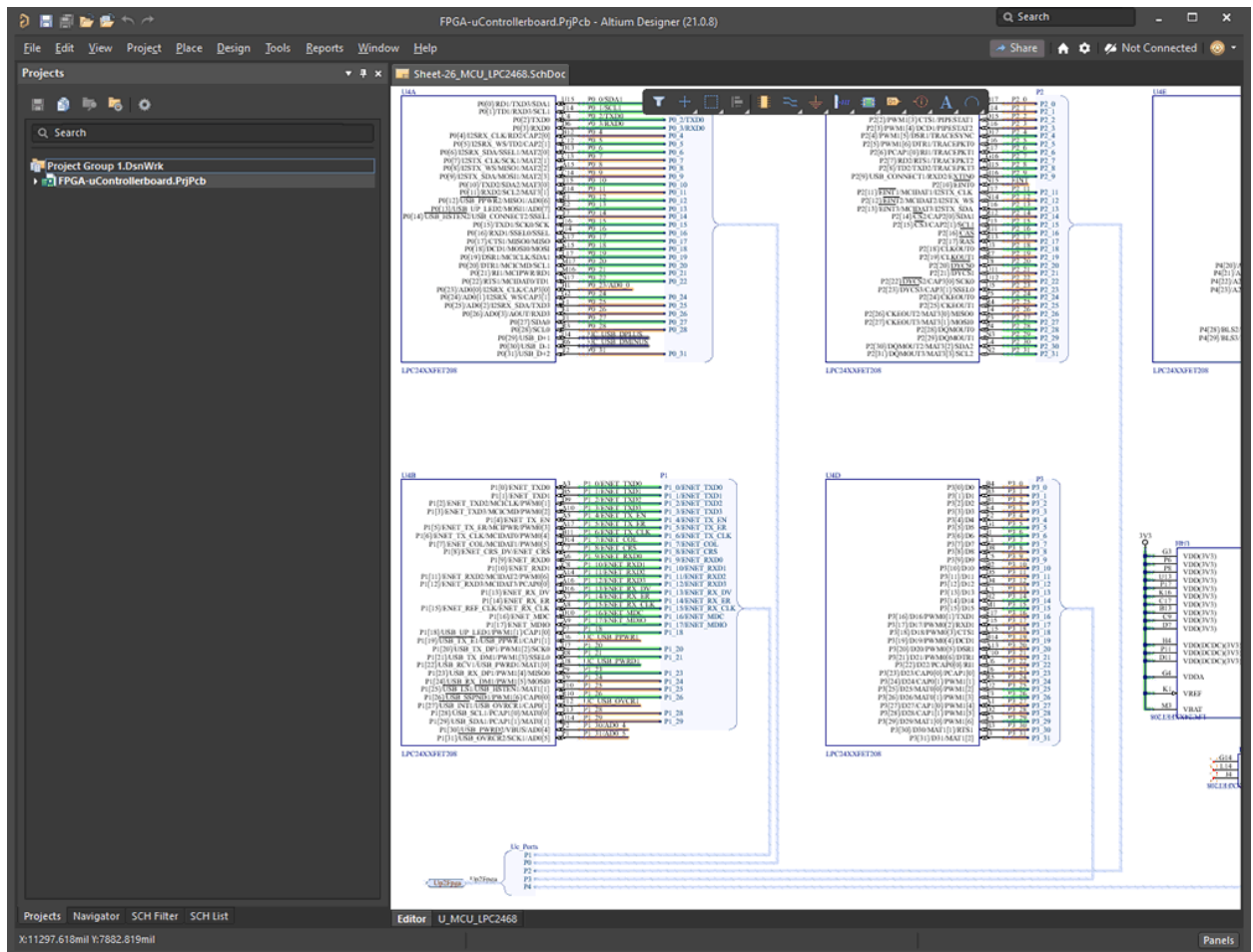
## View the Nets

Right click in the list for a menu with options:



Use the check/uncheck option to select which nets are to be visualized in the schematics.

Assume in this example that we want to view all nets of the type BSTNET. Right click on a BSTNET and select the option "Check > Type (BSTNET)", Next, click "Apply" to view these nets in your schematics (shown on the following page).



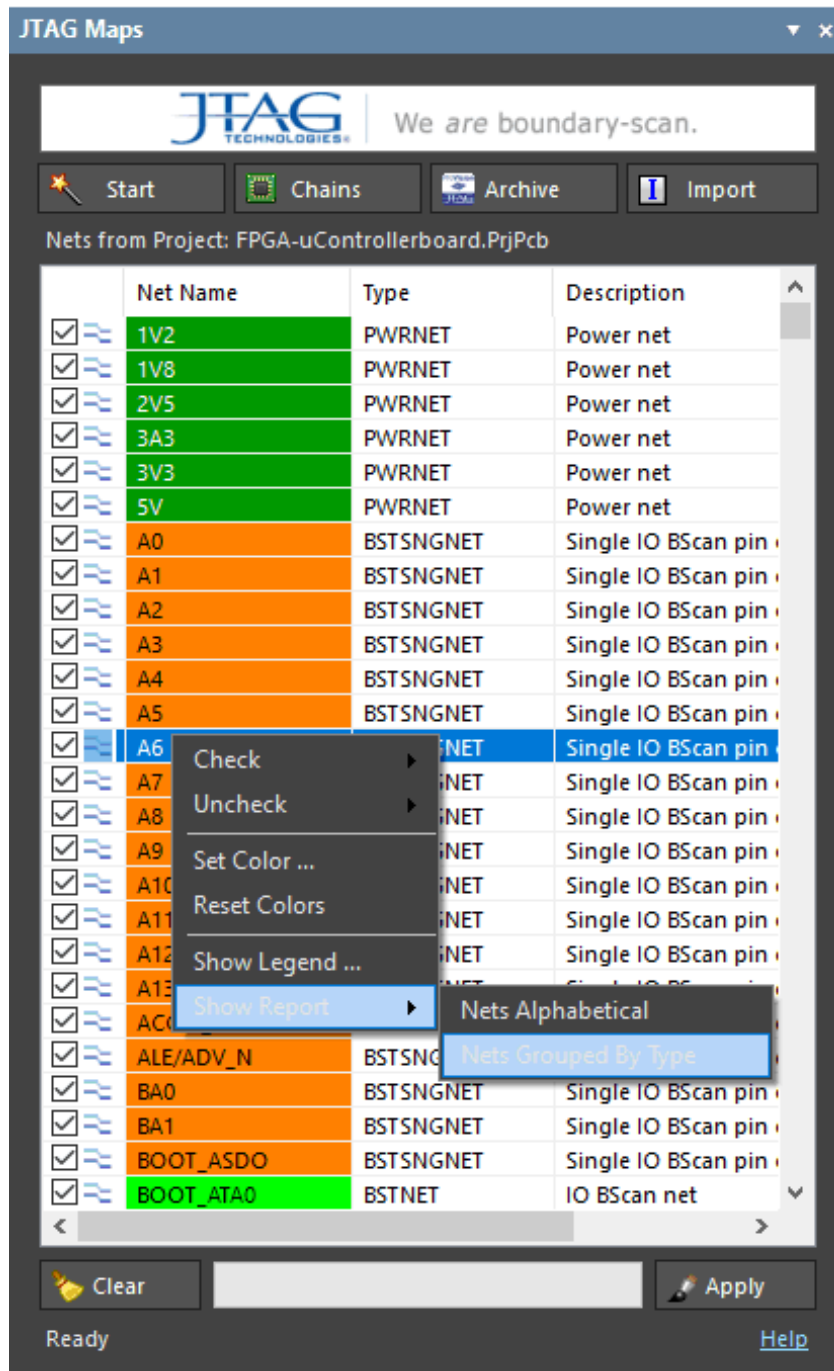
The selected nets are shown in green, because that is the color which has been assigned to these nets. You can choose to view:

- one selected net
- multiple selected nets
- all nets of the type you have selected
- all nets

Use the “Clear” button to clean the view of the selected nets in the schematics.

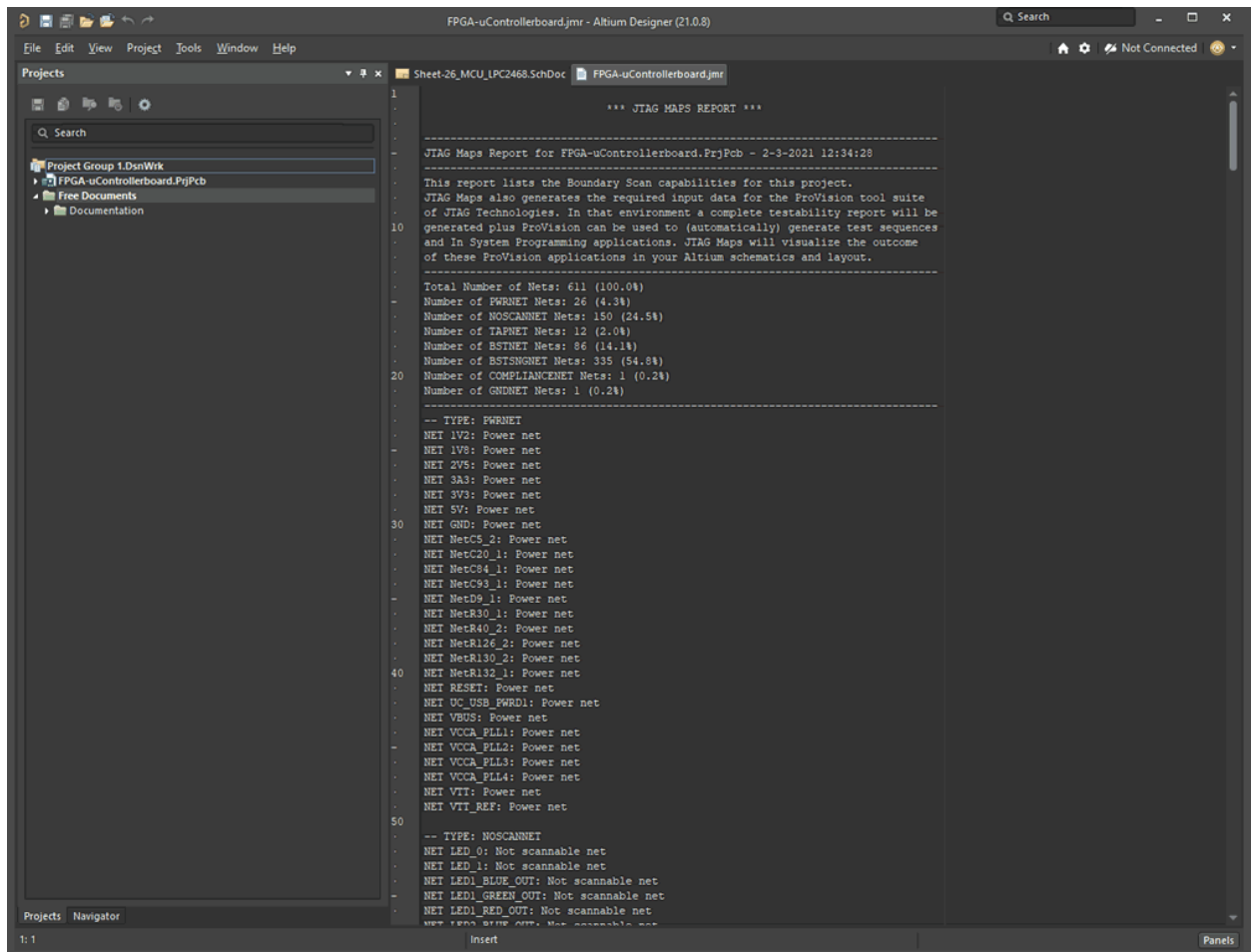
## Create a Report

In addition to viewing the selected nets in the schematics a report can be created including an overview of the nets in your design. Right click in the list again and choose between the two available report options:



The report on the following page is an example of a report with nets grouped per type.

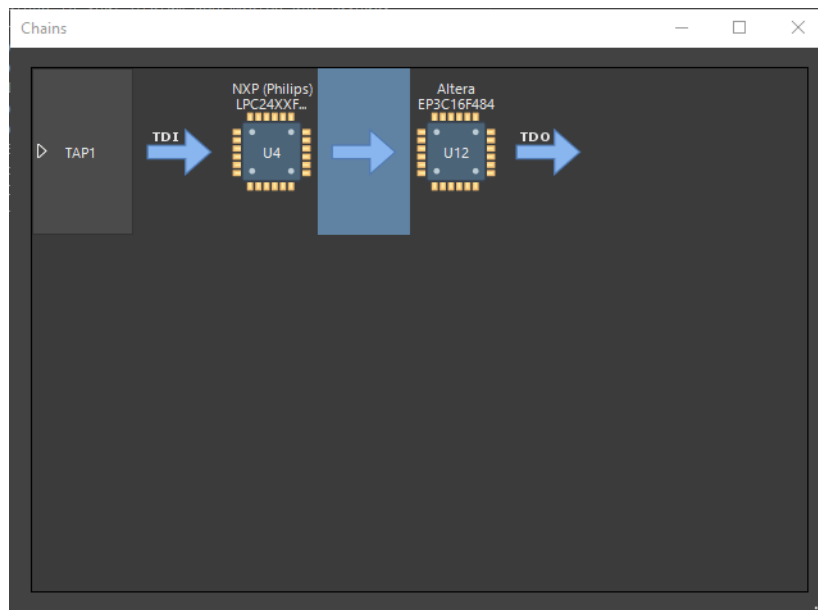




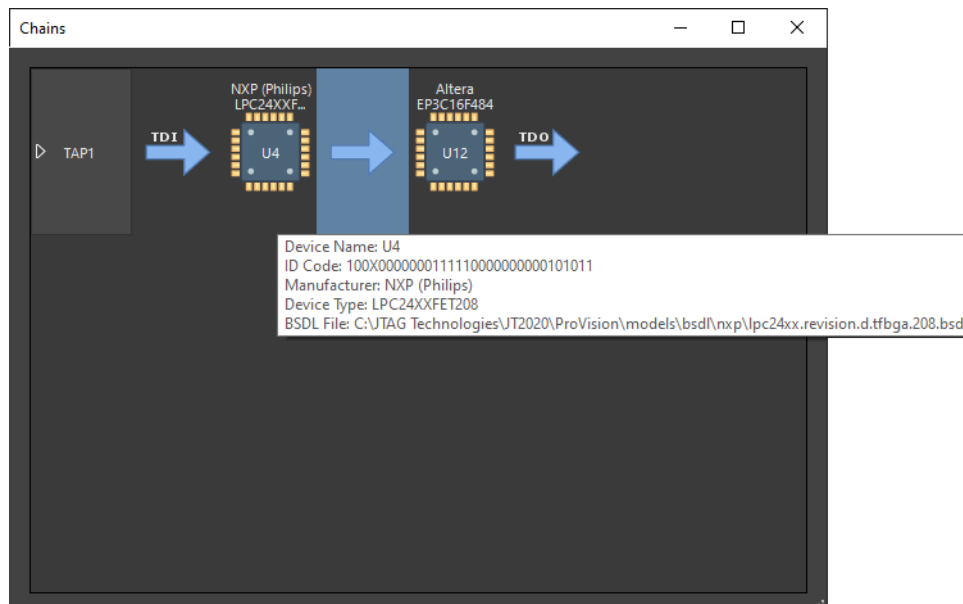
The report starts with a summary of all nets in the design, followed by each net type and a list of nets of that type.

## View the Bscan Chain

A second function of JTAG Maps is to find all Bscan chains, which have been implemented in the design. Click the button “Chains” to have a graphical representation of the detected chain(s) on display. If BSDL files have been assigned, information additional to the TDI-TDO path, such as the name of the device and IR register length will be available too.



**NOTE:** Hover over a device for a tool tip with more information.



The TAP order is based on the available information, which means that in some cases the chosen order will be random.

## Archive Option

After you have finished working with JTAG Maps, use the archive option to create an archive to be used in combination with JTAG Technologies Bscan application development and execution platform "JTAG ProVision". In this environment use the Fault Coverage utility to create an IMMSG file with the testability of the design. This IMMSG file can then again be viewed in the schematics using JTAG Maps Plus (see next section).

Click the "Archive" button to create a JTAG ProVision Archive (.jta).

### Importing an Archive in JTAG ProVision.

- Start ProVision (At least required is CD23, SP1).
- In the welcome screen select the option "Open an existing Archive". If ProVision has already been started use the option Project > Guide... to open the welcome screen.
- Click Finish to start the extraction procedure.
- Select or create a folder to extract the files to. All files in the archive will be extracted to the exact same relative folder structure they had when they were archived.

After you have successfully imported an archive and saved it as a project, take the steps below to fill the project with model information:

- Doubleclick on "Device Types" in the Resources view to start the Device Type Manager
- In the Assign Models dialog select the option "Auto Detect"
- In the AutoDetect Models dialog select the option "Clear and reassign all Device Types" in combination with any of the available Detection modes.
- Click "OK" to start the auto detect routine. If required, repeat this step with other detection modes. In this case make sure that the option "Clear and reassign all Device Types" is NOT selected.
- If required, use the browse and find options to assign models.
- Finally, when satisfied with the assigned models, save the project.

### *Testability Report*

The next step can be the creation of a Testability Report based on the situation created with the above procedure. This report can be in a number of standard formats (html, txt, csv), but also in JTAG Technologies IMMSG format. The IMMSG file can be used in JTAG Maps Plus to view the testability in the Altium Designer environment. Please refer to the section [Import IMMSG Files](#) for more information about this topic

# Import IMMSG Files

IMMSG files are created in JTAG Technologies application development and execution platform JTAG ProVision. Use JTAG Maps to visualize the IMMSG information in your schematics or simply to create a report based on the information in the file.

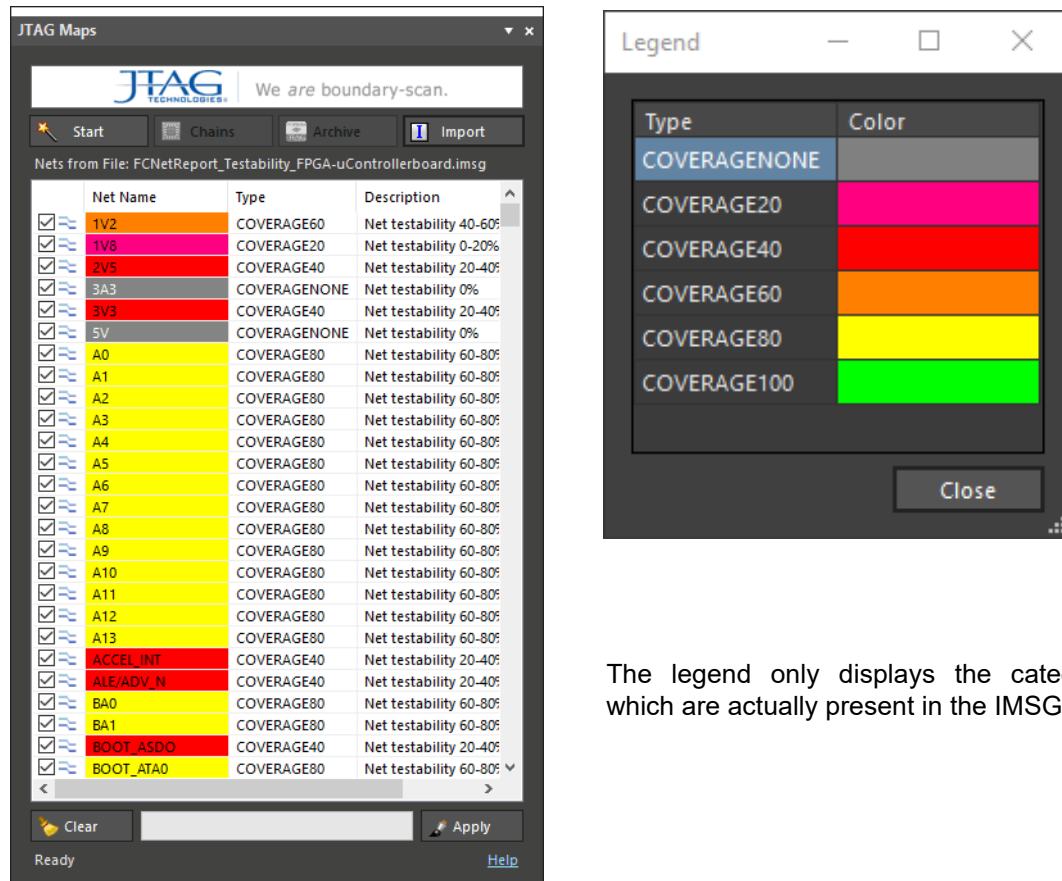
**NOTE:** The IMMSG viewing software is separately licensed. Please refer to the section [Get a License](#) for more information.

To import IMMSG Files take the following steps:

- [Load the IMMSG File](#)
- [View the IMMSG File](#)
- [Create a Report](#)

## Load the IMMSG File

Get started with JTAG Maps in the Altium environment as explained in the section [Start JTAG Maps](#). In JTAG Maps select the option “Import” and browse to an IMMSG file to have it imported in JTAG Maps.



The legend only displays the categories which are actually present in the IMMSG file.

The nets in the IMMSG file are listed using default colors depending on the category to which they belong. Right click in the list and select the option “Set Color...” to change the default color into a custom one.

## Net Categories








The following categories are distinguished.

COVERAGENONE	No Boundary-scan Access
COVERAGE20	Nets that have between 0% and 20% Boundary-scan access.
COVERAGE40	Nets that have between 20% and 40% Boundary-scan access.
COVERAGE60	Nets that have between 40% and 60% Boundary-scan access.
COVERAGE80	Nets that have between 60% and 80% Boundary-scan access.
COVERAGE100	Nets that have between 80% and 100% Boundary-scan access.

# Pin Percentage Information

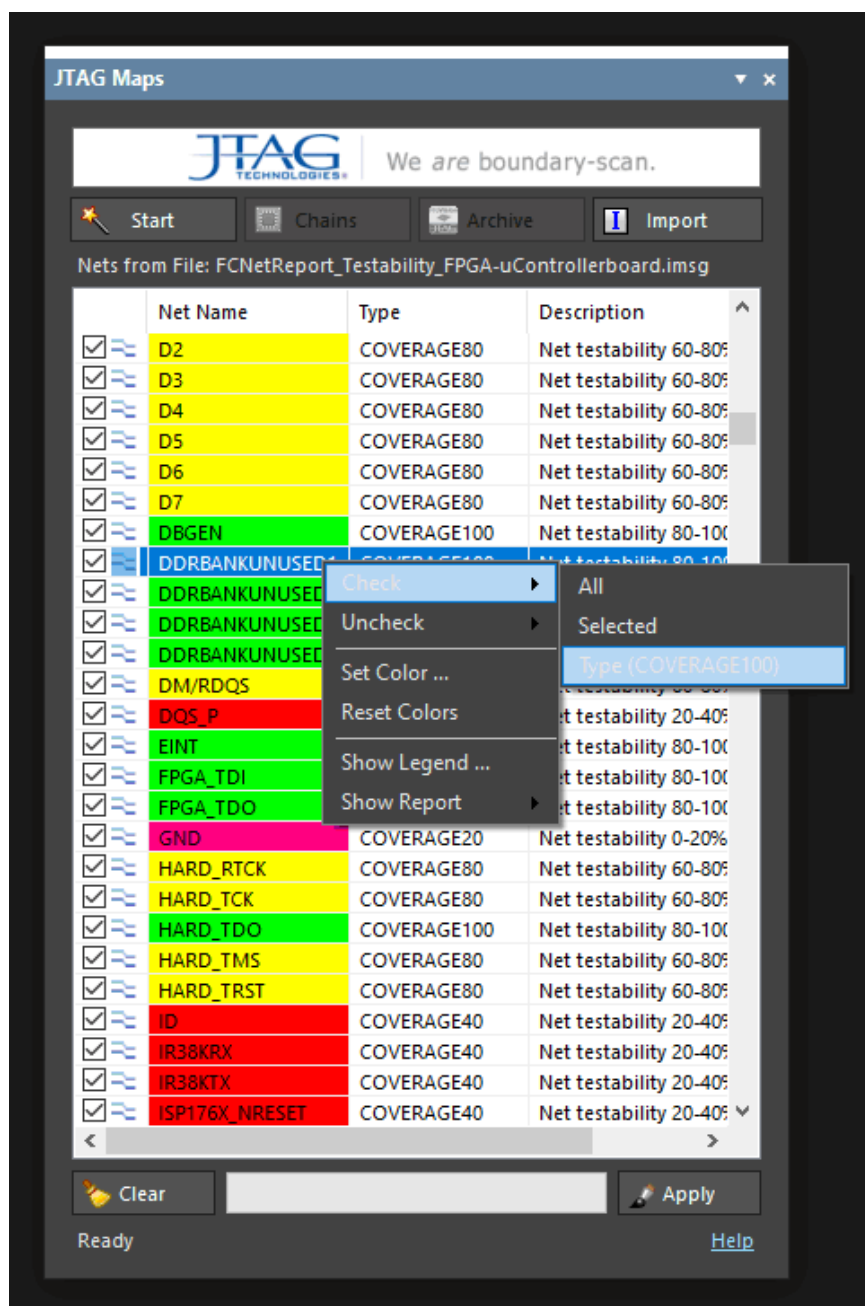
The net testability is calculated by determining the weighted sum of pins in a net with the following formula:  $\sum PIN\%/n$ . For example:  $(50 + 100 + 100 + 0 + 50)/5 = 60\%$ . A pin can either be 0% (no sense and no drive), 50% (sense or drive 1 or 0) or 100% (sense and drive 1 and 0) accessible.

Hover over the symbol left from a net to have percentages appear in a tool tip, showing which of the pins in a net are accessible and which are not.

<input checked="" type="checkbox"/>		A13	COVERAGE80	Net testability 60-80%
<input checked="" type="checkbox"/>		ACCFI_INT	COVERAGE40	Net testability 20-40%
<input checked="" type="checkbox"/>		Pins from Net: A13 RN7 - 5 : 100% U12 - A3 : 100% U19 - L8 : 0%		
<input checked="" type="checkbox"/>			COVERAGE80	Net testability 60-80%
<input checked="" type="checkbox"/>			COVERAGE80	Net testability 60-80%
<input checked="" type="checkbox"/>		BOOT_ASDO	COVERAGE40	Net testability 20-40%
<input checked="" type="checkbox"/>		BOOT_ATA0	COVERAGE80	Net testability 60-80%

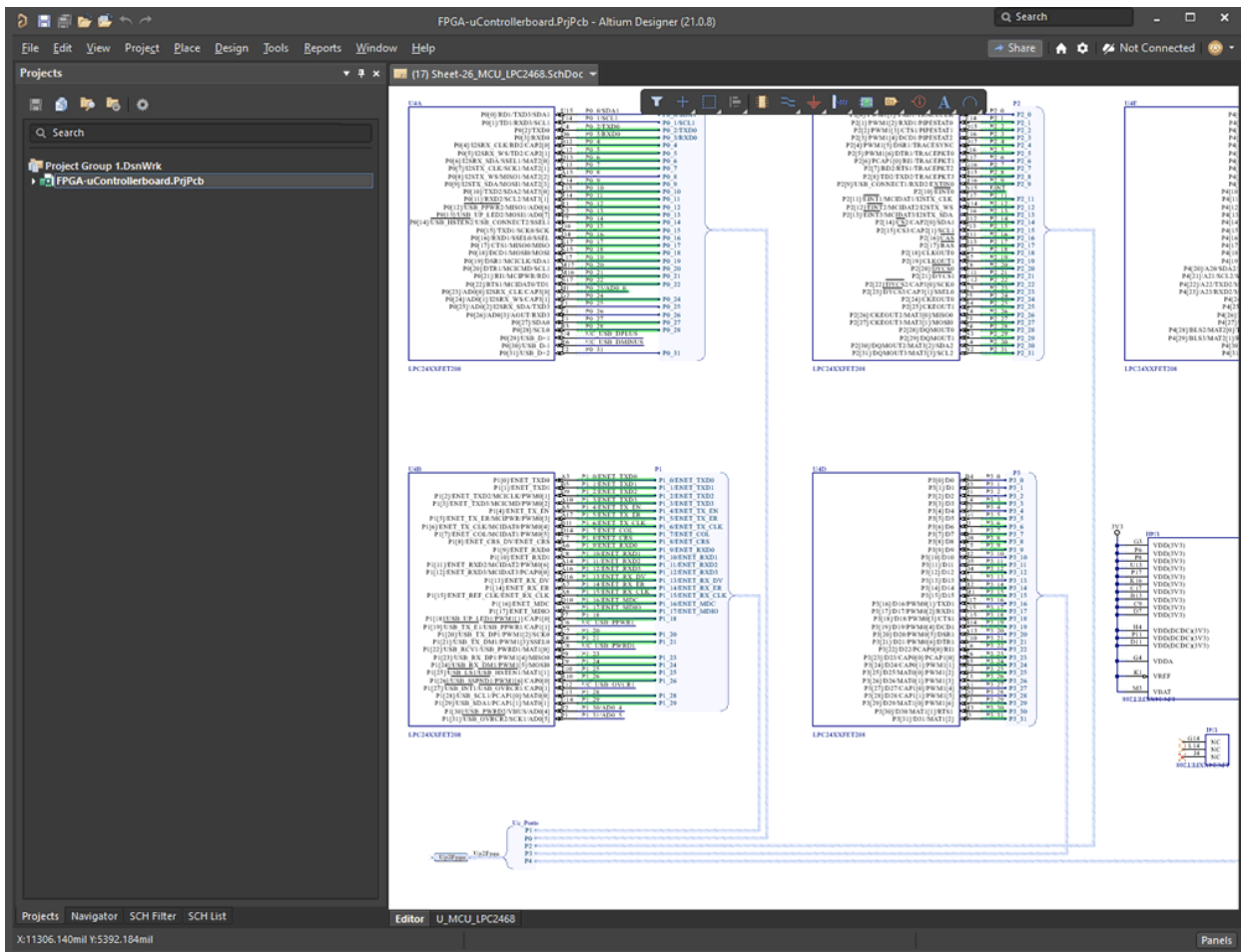
## View the IMSG File

Rightclick in the list for a menu with viewing options.



Use the check/uncheck option to select which nets are to be visualized in the schematics.

Assume in this example that we want to view all nets of the type COVERAGE100. Right click on a COVERAGE100 net and select the option "Check > Type (COVERAGE100)". Next, click "Apply" to view these nets in your schematics (shown on the following page).



The selected nets are shown in green, because that is the color which has been assigned to these nets. You can choose to view:

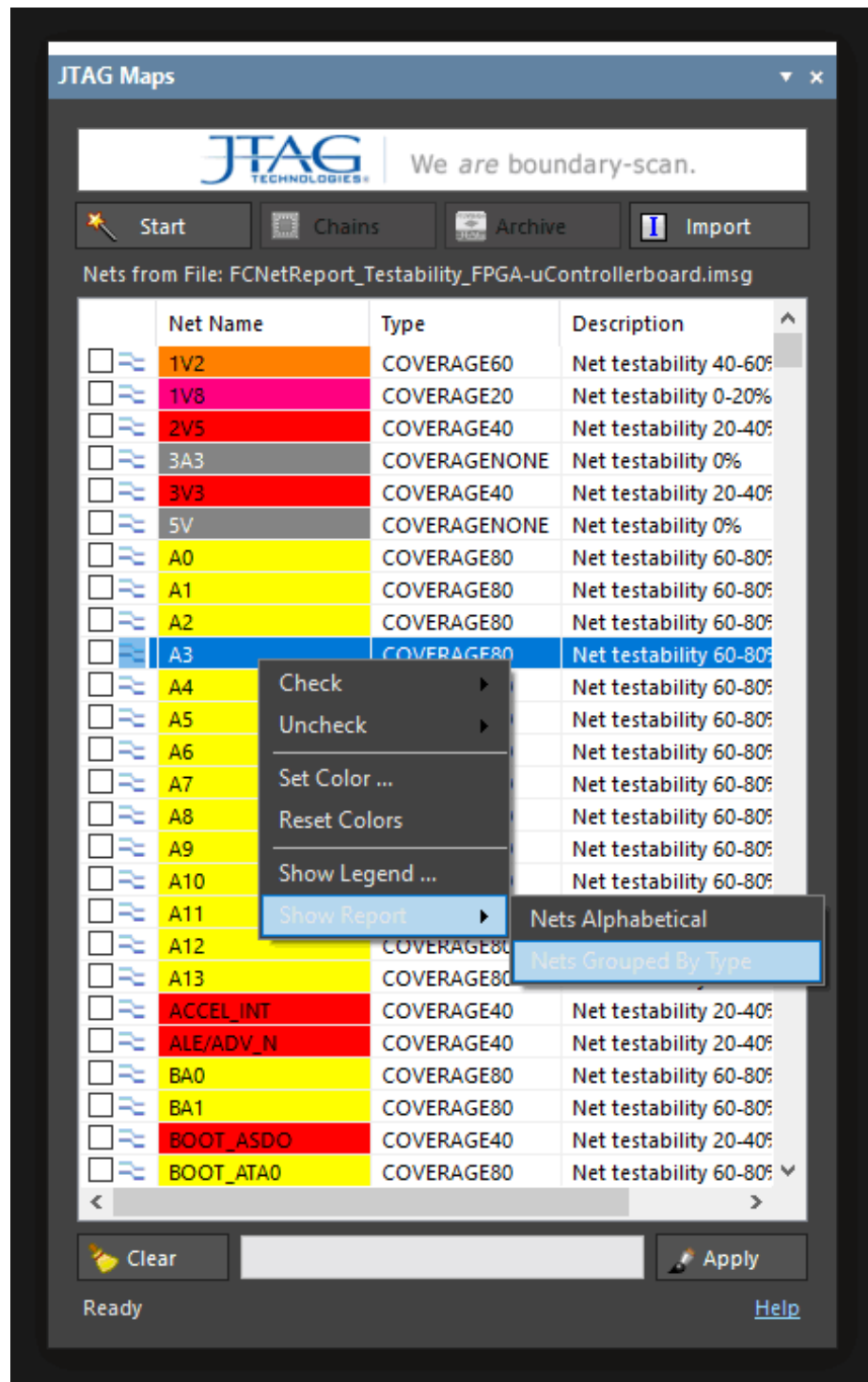
- one selected net
- multiple selected nets
- all nets of the type you have selected
- all nets

Use the “Clear” button to clean the view of the selected nets in the schematics.

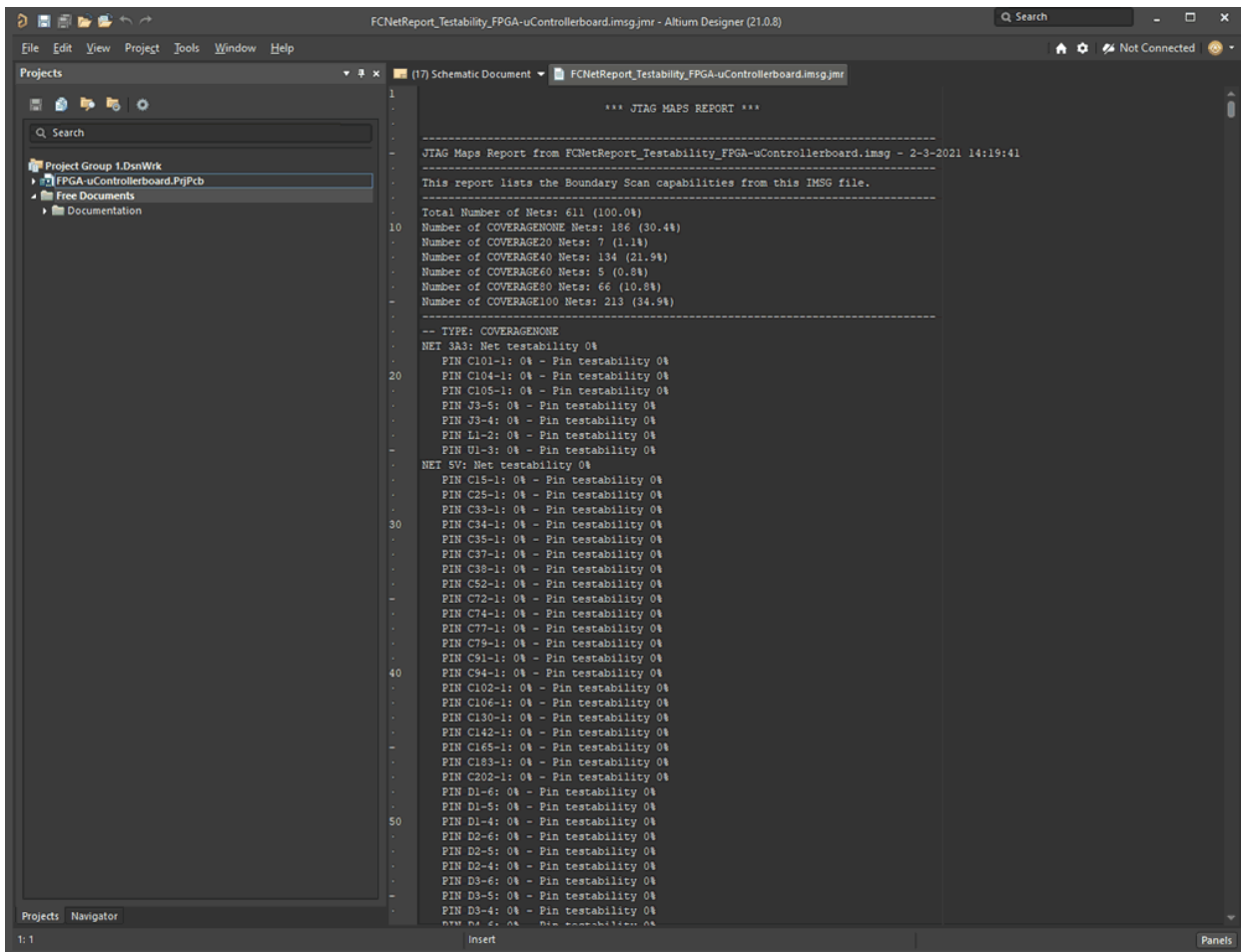


## Create a Report

In addition to viewing the selected nets in the schematics a report can be created including an overview of the nets in the IMSG file. Right click in the list again and choose between the two available report options:



The report on the following page is an example of a report with nets grouped per type.



The report starts with a summary of all nets in the file, followed by each net type and a list of nets of that type.