Application Note
Document version: 2 — April 2024

Quick Start Guide
Example DS125BR800 Agilent ADS Project

Version 2
April 2024

Table of Contents

1 Document Revision History

Revision	Editor	Comment	Date
1	Casey Morrison	Initial creation of Quick Start Guide for example ADS project.	10-Nov-2012
2	Lucas Wolter	Updated for public release.	29-April-2024

2 Overview

This document is a Quick Start Guide for a custom Agilent ADS project using the DS125BR800 Buffer Repeater in a generic channel topology. Table 1 below lists pertinent information related to the delivered project.

Table 1: Quick Start Guide related information

Item	Value/Comment
IBIS-AMI Simulator	*Agilent ADS*
IBIS-AMI Simulator version	*2011.10*. TI strongly recommends updating to version 2011.10 or later to enable certain features such as retimer simulations. Earlier versions of ADS do not support all of the model functionalities and will produce erroneous simulation results
TI device models included	*DS125BR800 Buffer Repeater*
Other device models included	*None*. When interfacing to the DS125BR800, only generic TX/RX models were used. Customer will need to replace these with other vendors' models if desired.
Project names	• *Agilent_ADS_2011.10.7zap*: ADS project using the DS125BR800 Repeater.
Supported platforms	• 32-bit Windows • 64-bit Windows • 64-bit Linux

The topology implemented in the example project matches Figure 1 below. There are two main parts to this topology:

1. Link between a generic TX (pattern generator) and the DS125BR800 Repeater.
2. Link between the DS125BR800 Repeater and a generic RX (scope).

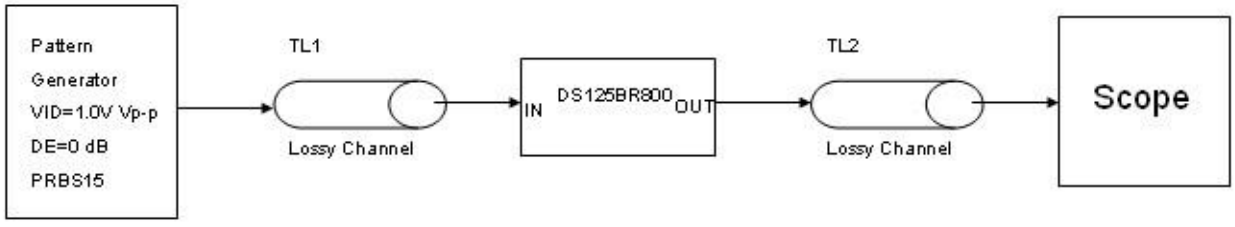


Figure 1: Link topology for the DS125BR800 example project

3 Project Quick Start Guide

The DS125BR800 example project included in this distribution contains two schematics, as shown in Figure 2:

- ***ASIC_TX_to_DS125BR800***: Link between a Generic ASIC TX model and the DS125BR800 Repeater. Contains a generic TX model *which should be replaced by the ASIC vendor's TX model*, a generic FR4 trace model *which should be replaced by actual channel*, and the DS125BR800 RX model.

- ***DS125BR800_TX_to_ASIC_RX***: Link between the DS125BR800 Repeater and a generic receiver through a PCB board trace. Contains the DS125BR800 TX model, a generic FR4 trace model *which should be replaced by the actual channel*, and a generic RX model to represent an ASIC RX *which should be replaced by the ASIC vendor's RX model*.

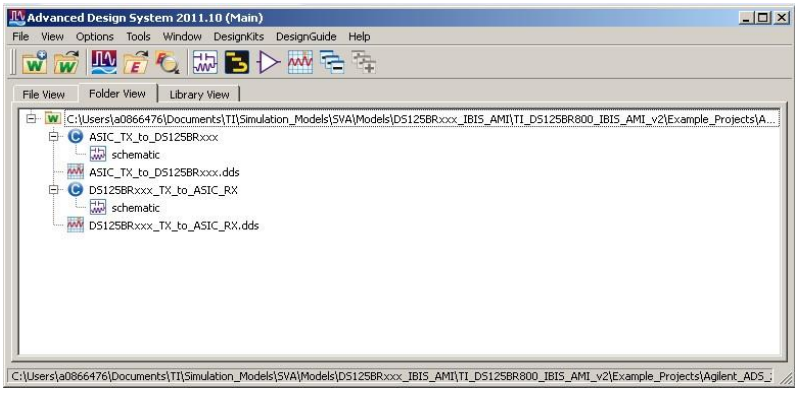


Figure 2: ADS main window showing the available schematics

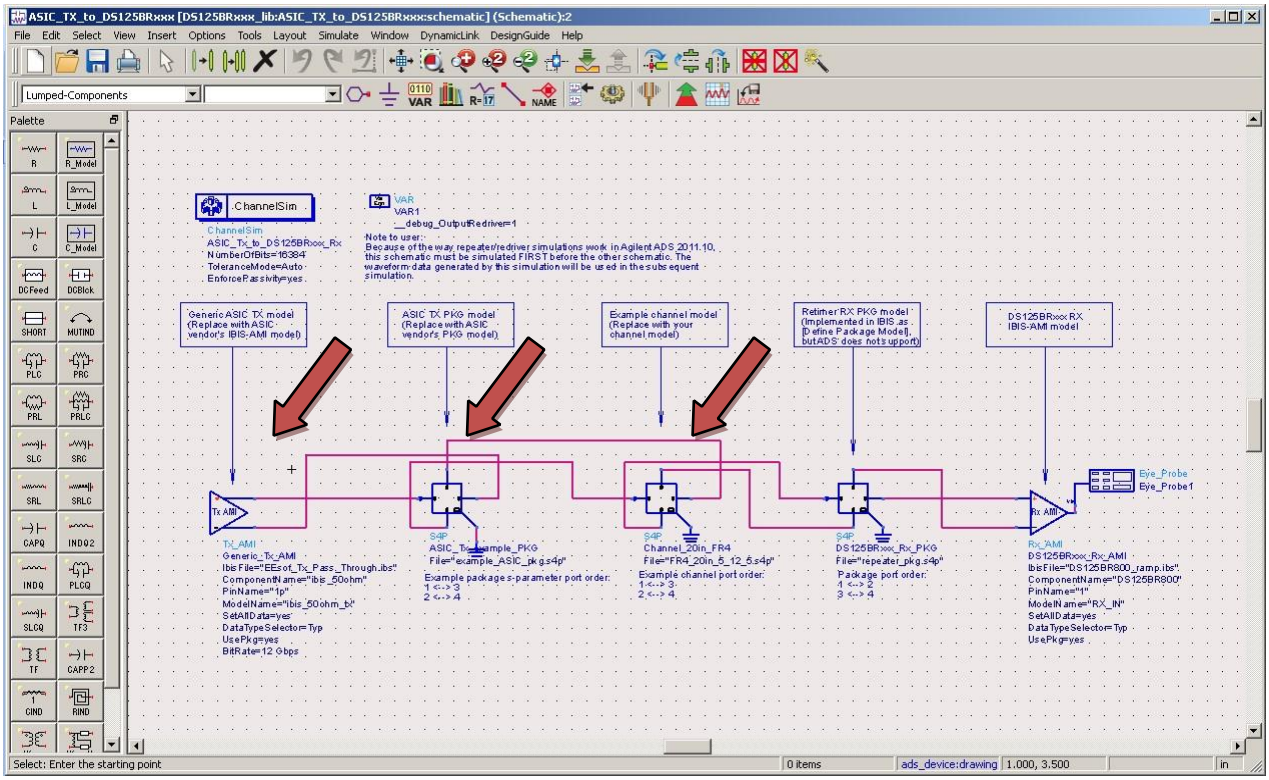
Between these two schematics the full link described in Figure 1 can be simulated and analyzed. The recommended procedure for simulating the enclosed example project is as follows:

1. Open the project. From the main ADS control window, select "File > Unarchive Workspace or Project", then browse to the project file provided with this release: Agilent_ADS_201110.7zap. ADS will ask you to name the project and specify where you want it to be placed.

2. Open the ASIC_TX_to_DS125BR800 schematic and replace the generic TX IBISAMI model with the desired ASIC vendor TX model. This can be done by double clicking on the TX_AMI model. Browse to and select the desired IBIS model to replace the generic TX model that is currently instantiated in the schematic. Note that this generic TX model does not contain any de-emphasis or amplitude control and is solely for the purpose of completing the simulation setup.

3. Replace the generic TX package model with the package model supplied by the ASIC TX vendor. Do this by double-clicking on the TX package s-parameter block and selecting the new s-parameter file. Note that the example ASIC TX package used in this schematic has a port ordering such that port 1 goes to port 3 and port 2 goes to port 4. If the package model supplied by the ASIC TX vendor has a different port ordering, then the schematic hook-up will need to be edited to make sure the signal propagates through the package and into the channel correctly.

4. Replace the generic FR4 trace model with your system's channel.



button.

Figure 3: ASIC TX to DS125BR800 schematic (user should replace the items with arrows pointing to them)

5. Simulate the ASIC_TX_to_DS125BR800 schematic by clicking on the As the schematic is simulating ADS will display the simulation progress. Before simulating you can adjust the DS125BR800's equalizer settings by double-clicking on the DS125BR800 model and going to the AMI parameters tab. The EQ_Level AMI parameter controls the CTLE setting. There are 16 integer settings (0 through 15) for the equalizer which correspond to the 16 combinations of CTLE settings shown in Table 2 of the DS125BR800 datasheet. Changing the EQ boost setting will have an effect on the output jitter/amplitude of the DS125BR800.

6. Once the simulation completes, the plot window will appear. To plot the resulting post-equalized eye, click on the  button and click again in the blank area to drop down a plot axis.

7. When the plot is inserted, the “Plot Traces & Attributes” window will open up. Select “Density” and then clock on “>>Add>>”. Click “OK” to plot the eye.

8. The eye plot will appear in the plot window, as shown in Figure 4. Note that this is a plot of the eye as it appears after the DS125BR800’s equalization, but before the TX de-emphasis and VOD is applied.

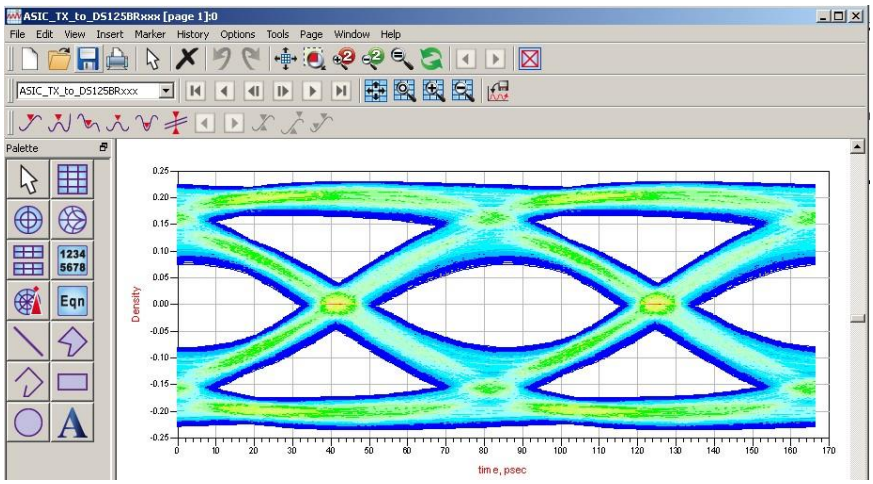


Figure 4: Eye plot for ASIC TX to DS125BR800 RX link

9. Once the ASIC TX to DS125BR800 link has been simulated you can then open the DS125BR800_TX_to_ASIC_RX schematic and replace the generic RX IBISAMI model with the desired ASIC vendor RX model. This can be done by doubleclicking on the RX_AMI model. Browse to and select the desired IBIS model to replace the generic RX model that is currently instantiated in the schematic. *Note that the generic RX model included in this project does not contain any equalization.*

10. Replace the generic RX package model with the package model supplied by the ASIC RX vendor. Do this by double-clicking on the RX package s-parameter block and selecting the new s-parameter file. Note that the example ASIC RX package used in this schematic has a port ordering such that port 1 goes to port 3 and port 2 goes to port 4. If the package model supplied by the ASIC RX vendor has a different port ordering, then the schematic hook-up will need to be edited to make sure the signal propagates through the package and into the channel correctly.

11. Replace the generic FR4 trace model with your system’s channel.

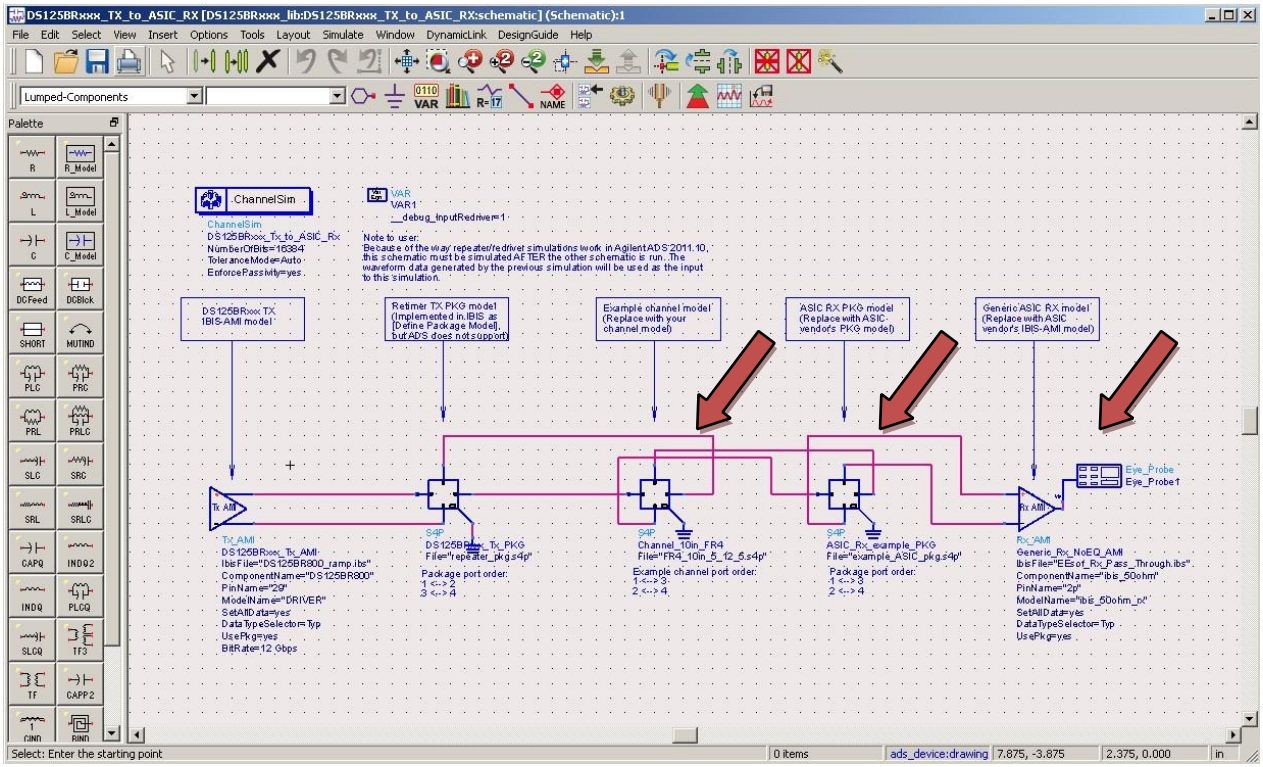


Figure 5: DS125BR800 to ASIC RX schematic (user should replace the items with arrows pointing to them)

12. Once the simulation completes, plot the eye (a.k.a. Density). Figure 6 shows an example eye plot at the output of the channel. The quality of the eye generated in this second simulation will be affected by:

a. The CTLE setting (EQ_Level) applied in the first simulation

b. The output drive level (VOD_Level) applied in the second simulation

c. The output de-emphasis level (DE_Level) applied in the second simulation.

The DS125BR800's TX parameters are controllable via the model-specific AMI parameters VOD_Level and DE_Level. Refer to the model user's guide (TI_DS125BR800_AMI_model_User_Guide.pdf) for details on these parameters. The model-specific parameters are accessible by double-clicking on the TX_AMI model and selecting the AMI tab, as shown in Figure 7.

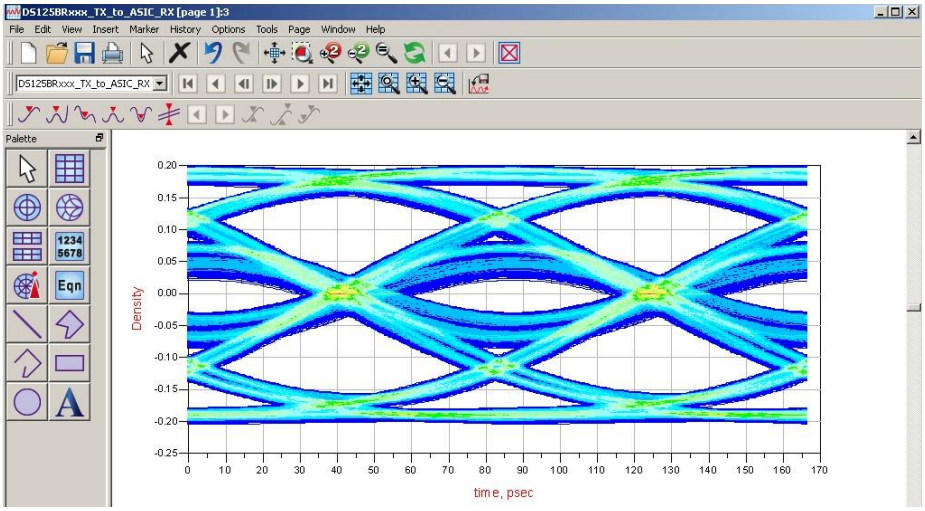


Figure 6: Example eye plot for DS125BR800 TX to ASIC RX input

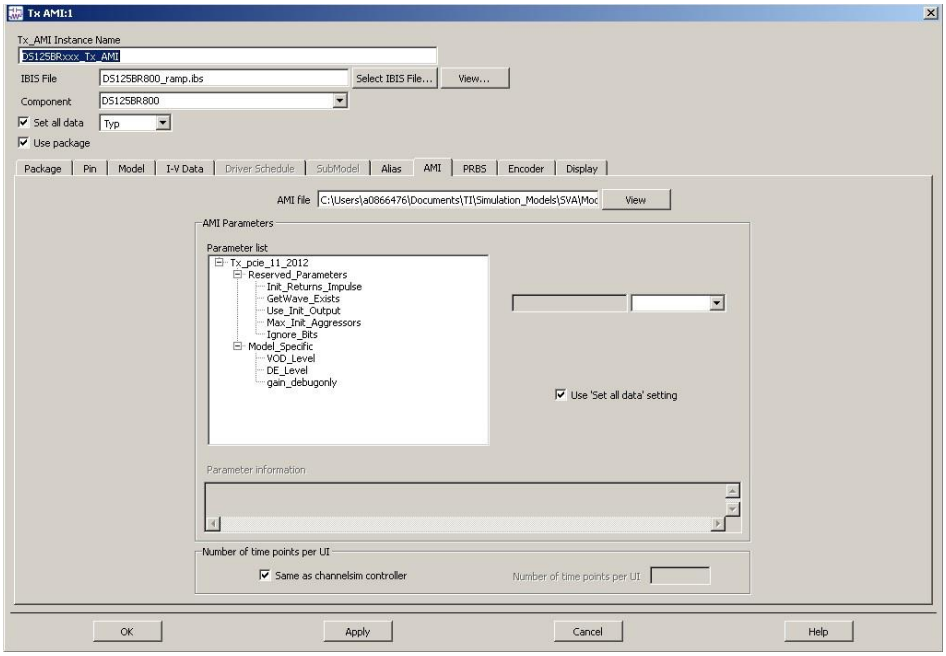


Figure 7: Edit the DS125BR800 TX parameters if desired

4 Suggestions and Tips

Simulations involving a configurable transmitter model and a configurable receiver model (especially if they originate from different IC vendors) often involve running multiple iterations in an attempt to identify the best settings. Here are some general tips for optimizing your simulations:

- ASIC TX to DS125BR800 Repeater direction
    - The following model-specific parameters will affect the eye shape: ASIC TX output amplitude, ASIC TX de-emphasis setting, DS125BR800 EQ boost setting (EQ_Level), and DS125BR800 limit mode setting (Limit).
    - Generally speaking, an amplitude setting of 0.8V to 1.2V on the ASIC TX should be adequate for most channels.
    - The ASIC TX de-emphasis and DS125BR800 EQ boost settings may need to be co-optimized. In general, fixing the ASIC TX de-emphasis to a small negative value (i.e. -2dB to -4dB) or a value of zero will be adequate for the DS125BR800's robust equalizer.
    - Minimizing the jitter at the output of the DS125BR800 will improve the farend eye.
    - For applications which involve link training (i.e. SAS-3 and 10GBASE-KR), the DS125BR800 must operate in a non-limiting mode so that the far-end Tx FIR coefficients can pass through the Repeater during link training. Set Limit=0 for such applications. If link training is not used in the application, set Limit=1.
- DS125BR800 Repeater to ASIC RX direction
    - The following model-specific parameters will affect the eye shape: DS125BR800 VOD_Level and DS125BR800 DE_Level.