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# **PI3EQX12908A2 IBIS-AMI Models**

## ***User's Guide***

**Version 1.0**

**May 31, 2019**

# 1 Introduction

This document describes the organization, structure, and proper usage of the PI3EQX12908A2 IBIS-AMI models (compiled and approved for external customer release), hereafter referred to as the “model” for short. The model is intended for use by the PI3EQX12908A2 customers for system-level modeling and verification. This document assumes that you are familiar with the relevant IBIS-AMI modeling specifications.

## 1.1 Charter of the SerDes IBIS-AMI models

The models are designed in accordance with the [IBIS-AMI standard](#) and attempt to model the significant characteristics of most components in the PI3EQX12908A2. The models are not intended to be an exact representation of PI3EQX12908A2 components implemented. Rather, the models seek to provide as high a degree of accuracy as is feasible outside of Spice-based models and simulations.

## 1.2 Is / Is Not Table

The following table describes the features and purposes of the models, as well as the limitations of the models.

**Table 1: Model Is / Is Not Table**

<b>Is</b>	<b>Is Not</b>
Compiled for 64 bit AMI EDA tool that run in Windows platform	Compiled for any other platform (i.e. 32-Linux)
Compliant to IBIS-AMI 5.1	Compliant to a more recent BIRD revisions, if they exist
<i>Model of PI3EQX12908A2 functionality, non-idealities, and performance</i>	<i>Exact representation of implemented components</i>

## 2 About This Release

### 2.1 IBIS-AMI Model Files

Table 2 shows the key IBIS-AMI model files delivered with the model release as part of the compressed archive.

**Table 2: IBIS-AMI files included with the model release**

File Name	Type	Description
PI3EQX12908A2_AMI_users_guide.pdf	PDF	PI3EQX12908A2 AMI model user's guide.
PI3EQX12908A2_Redriver.ibs	IBIS	Top-level IBIS wrapper for the Tx and Rx AMI model
PI3EQX12908A2_Rx.ibs	IBIS	IBIS wrapper for Rx AMI model
PI3EQX12908A2_Rx.ami	AMI	Parameters file for the Rx model as required by the IBIS-AMI standard. This is a text file which is common for all OS/execution platforms.
PI3EQX12908A2_Rx_x64.dll	DLL	Windows 64-bit compiled shared library for the Rx model. This shared library includes the AMI_Init, AMI_GetWave, and AMI_Close functions defined in the IBIS-AMI standard.
PI3EQX12908A2_Tx.ibs	IBIS	IBIS wrapper for the Tx AMI model
PI3EQX12908A2_Tx.ami	AMI	Parameters file for the Tx model as required by the IBIS-AMI standard. This is a text file which is common for all OS/execution platforms.
PI3EQX12908A2_Tx_x64.dll	DLL	Windows 64-bit compiled shared library for the Tx model. This shared library includes the AMI_Init, AMI_GetWave, and AMI_Close functions defined in the IBIS-AMI standard.
PI3EQX12908A2_sample_wrk.7zads		Archieved ADS workspace that contains a simple testbench in ADS.

### 2.2 EQ AMI model specific parameters

PI3EQX12908A2 model consists of receiver and transmitter models. EDA tool is responsible for cascading the receiver to the transmitter to form a redriver to perform signal integrity analysis.

The following tables corresponding to Equalization/Flat-Gain/Output-Swing parameter settings.

**Table 3. Model Specific Parameters for Receiver**

Parameter	Description and Setting
EQ	0 to 15. Control the receiver equalization amount. Please see Table 3.1 for detail.
FG	0 to 3. Control the transmitter flat gain amount. Please see Table 3.2 for detail.
SW	0 to 1. Control the transmitter output swing amount. Please see Table 3.3 for detail.

**Table 3.1 EQ Settings**

EQ	EQ<3:0> PIN LEVEL	EQ Gain at 6GHz (dB)
0	0000 B	2.8
1	0001 B	4
2	0010 B	5
3	0011 B	5.8
4	0100 B	6.4
5	0101 B	7.1
6	0110 B	7.7
7	0111 B	8.2
8	1000 B	8.7
9	1001 B	9.1
10	1010 B	9.5
11	1011 B	9.9
12	1100 B	10.2
13	1101 B	10.5
14	1110 B	10.8
15	1111 B	11.1

**Table 3.2 FG Settings**

FG	FG<1:0> PIN LEVEL	Flat Gain at 6GHz (dB)
0	00 B	-4
1	01 B	-2
2	10 B	0
3	11 B	2

Table 3.3 SW Settings

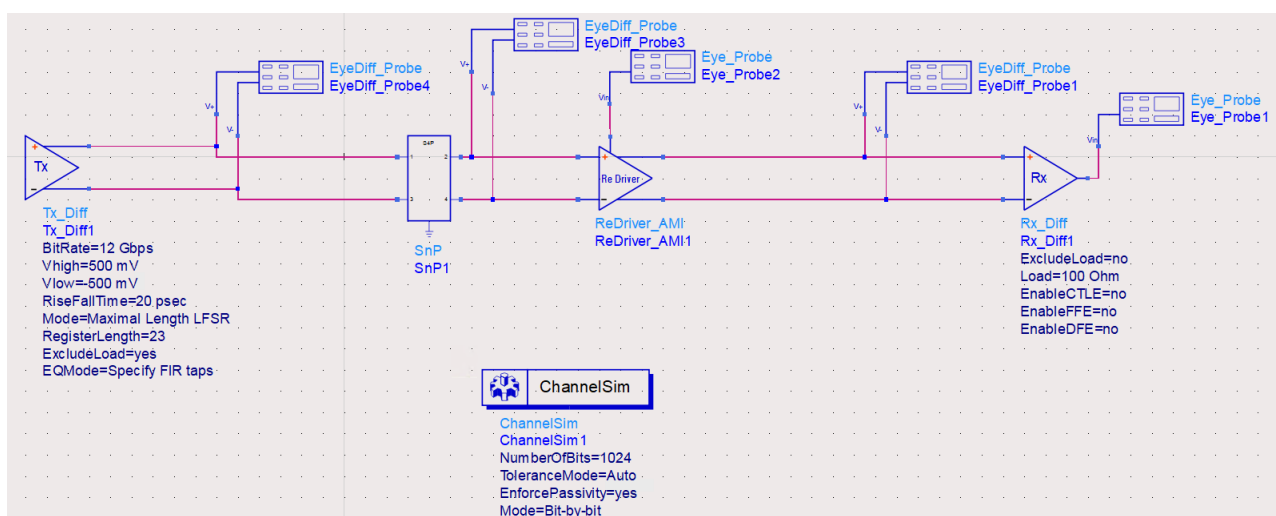
SW	SW<1:0> PIN LEVEL	Output Swing (mVppd)
0	00 B	900
1	01 B	1000

## 2.3 Additional notes on the AMI model

- 1) Only 'Typ' corner is included in this model.
- 2) This model is designed to work properly at up to 12 Gbps.
- 3) For better eye performance observation, traces with proper loss (corresponding to EQ's dB value) should be used in simulation.
- 4) Redriver's output magnitude will be limited if input swing goes too large (e.g. > 1000 mVpp)

## 3 Model Simulation in ADS

Figure 1. Schematic of a system that consists of ideal transmitter, PI3EQX12908A2 redriver, and ideal receiver.



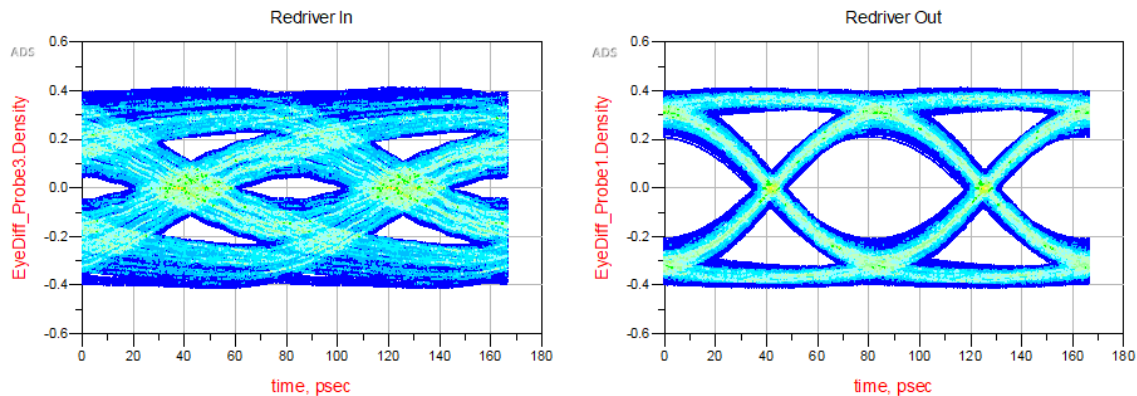


Figure 2. Simulation result of re-driver

## 3.1 Instructions of ADS Software

This section provides an overview of running Diodes IBIS-AMI models using Agilent ADS (Advance Design System) Software. For instructions on how to install the software, please refer to Agilent's Website:

<http://www.home.agilent.com/en/pc-1297113/advanced-design-system-ads>

## 3.2 Import and Run the testbench sample in ADS

- 1) Open ADS, Choose: **File** → **Unarchive Workspace or Project...**
- 2) Select the **PI3EQX12908A2 smple wrk.7zads** file we provided along with the AMI model file.
- 3) Choose a place where the testbench file to be un-archived in.
- 4) Open "**cell\_1: schematic**" of the library in workspace
- 5) Now you can configure and run the the simulation testbench with the AMI model file.

## 4. Revision History

Revision	Date	Description	Edited by	Verified by
RevB	2019/5/31	Initial Release	Chen Xiang	-