DAC38J84 IBIS-AMI Models

User's Guide

Version 00.01.00
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Disclaimer

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1 Introduction

This document describes the organization, structure, and proper usage of the TI DAC38J84 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 DAC38J84 design team and by DAC38J84 customers for system-level modeling and verification. This document assumes that you are familiar with the relevant IBIS-AMI modeling specifications.

1.1 Formatting Conventions

The help readability, various formatting conventions are used throughout this document:

- Hyperlinks to material within and outside this document are marked in blue.
- Courier font is used for `file names`, `code`, `variables`, `structures`, `parameters`, and `terminal commands`.

1.2 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 DAC38J84. The models are not intended to be an exact representation of DAC38J84 components implemented. Rather, the models seek to provide as high a degree of accuracy as is feasible outside of Spice-based models and simulations.

1.3 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

Is	Is Not
Compiled for 32-bit AMI EDA tool that run in Windows platform	Compiled for any other platform (i.e. 32- or 64-bit Linux)
Compliant to IBIS-AMI 5.0	Compliant to a more recent BIRD revisions, if they exist
Model of DAC38J84 functionality, non-idealities, and performance	Exact representation of implemented components

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
DAC38J84_AMI_users_guide.pdf	PDF	TI DAC38J84 AMI model user's guide.
DAC38J84.ibs	IBIS	Top-level IBIS wrapper for the Tx and Rx AMI model.
DAC38J84_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.
DAC38J84_Tx.dll	DLL	Windows 32-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.
DAC38J84_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.
DAC38J84_Rx.dll	DLL	Windows 32-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.
rincewind_40nm_rw3_txdac_n_0p90_1p50_027_nomR.s4p rincewind_40nm_rw3_txdac_s_1p10_1p98_125_minR.s4p rincewind_40nm_rw3_txdac_w_0p79_1p33_125_maxR.s4p	S4P	Analog impairment for transmitter model for 3 corners
ADS demo project	ZIP	DAC38J84_wrk

2.2 TX and RX AMI model specific parameters

The following settings correspond to the following values for this model.

Table 3. Model Specific Parameters for Transmitter

Pre	0 = 0% 1 = -2.5% 2 = -5.0% 3 = -7.5%	4 = -10.0% 5 = -12.5% 6 = -15.0% 7 = -17.5%
Swing	0 = 795mV 1 = 830mV 2 = 870mV 3 = 905mV 4 = 940mV 5 = 975mV 6 = 1010mV 7 = 1045mV	8 = 1080mV 9 = 1110mV 10 = 1145mV 11 = 1175mV 12 = 1200mV 13 = 1230mV 14 = 1255mV 15 = 1275mV
pst1	0 = 0% 1 = 2.5% 2 = 5.0% 3 = 7.5% 4 = 10.0% 5 = 12.5% 6 = 15.0% 7 = 17.5% 8 = 20.0% 9 = 22.5% 10 = 25.0% 11 = 27.5% 12 = 30.0% 13 = 32.5% 14 = 35.0% 15 = 37.5%	16 = 0% 17 = -2.5% 18 = -5.0% 19 = -7.5% 20 = -10.0% 21 = -12.5% 22 = -15.0% 23 = -17.5% 24 = -20.0% 25 = -22.5% 26 = -25.0% 27 = -27.5% 28 = -30.0% 29 = -32.5% 30 = -35.0% 31 = -37.5%

Table 4. Model Specific parameters for Receiver

CDR_Threshold (Tracking Rate)	0 = 313 ppm 1 = 607 ppm 2 = 723 ppm 3 = 868 ppm 4 = 96 ppm 5 = 289 ppm 6 = 434 ppm 7 = 13 ppm
anlg_eql_gaincode	-1 (Adapt) or 0:15 Rx Analog equalizer gaincode. The default value is set to -1 (Adapt) which lets the analog equalizer adapt to the optimal setting (both gaincode & zerocode). If the user chooses any value between 0 and 15, then the equalizer will NOT adapt and the chosen gain code value will be applied. 0 is Max Equalization and 15 is No Equalization.
anlg_eql_zerocode	0:7 0 is Max Zero Frequency (365MHz) and 7 is Min (50MHz) Zero Frequency. Default value is 0. Ignored if anlg_eql_gaincode = -1 (Adapt)
anlg_eql_gainboost	0,1 0 is gain boost turned off and 1 is gain boost turned on. Default value is 0.
corner	0 Nominal Corner 1 Fast Corner 2 Slow Corner

3 Model Simulation

This section guides the user through the simulation of the IBIS-AMI model.

a. SamplesPerBit is ideally set to 48 as the CDR has 48 interpolators. User can compromise the accuracy for the speed by reducing the SamplesPerBit. However, it is recommened to set the SamplesPerBit greater or equal to 16 bit.

b. Minimum Ignore Bits should be set to equal or larger than 1000000 bits to give adequate time for CDR and DFE and other adaptation loops to reach their steady states.

3.1 ADS 2013.06 User's Guide

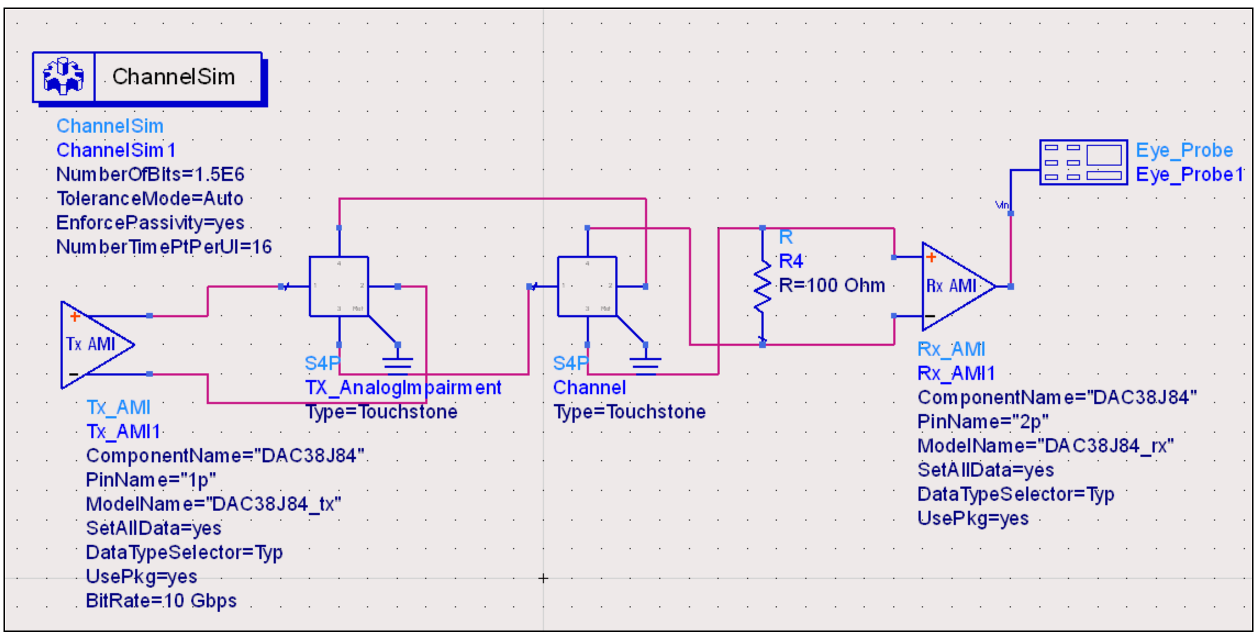
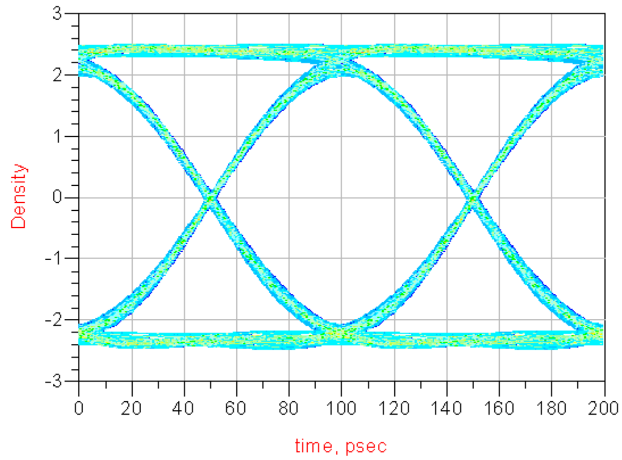


Figure 1. Schematic for ADS



measurement	Summary
Level1	2.207
Level0	-2.205
LevelMean	0.001
Amplitude	4.413
Height	3.754
HeightDB	5.745
Width	9.750E-11
SNR	16.759
RiseTime	4.471E-11
FallTime	4.541E-11
JitterPP	2.500E-12
JitterRMS	6.498E-13
WidthAtBER	9.600E-11
HeightAtBER	4.056
CrossingLevel	-0.031

Figure 2. Eye Diagram & Summary chart in ADS (Tx Settings: pre1=0; post1=0; swing=0 Rx Settings: CDR_Threshold=0; anlg_eql_gaincode=0; anlg_eql_zerocode =0; anlg_eql_gainboost =0; corner=0)

4 ADS Simulation Setup Guide

4.1 Introduction

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

4.2 Creating a new workspace

1. To create a new workspace in ADS, goto File -> New -> Workspace
2. Follow the new workspace wizard to create a new workspace
3. Enter the Project Name as 'DAC38J84_wrk'
4. Instanciate a new schematic from the created workspace
5. Name the cell as 'cell_1' selecting the library as 'DAC38J84_lib'
6. You can follow the wizard or manually place parts to create your required test bench

4.3 Schematic Creation

1. To insert any part in ADS schematic, goto Insert -> Component -> Component Library
2. Use search box to search for your required components and drag them to schematic
3. Search for Tx_AMI, Rx_AMI to insert Transmitter and Receiver IBIS-AMI Models
4. Insert S data blocks to link S4P files for Analog Impairments and differencial channels. Connect ground to the reference node.
5. Use ChannelSim component to create the required simulation envinorment
6. Insert eye probe to view the eye diagram, waveform and other measurements post simulation.
7. Create the schematic as shown in Figure 1 above

4.4 Importing IBIS and AMI files

1. To import the ibis files in ADS, double Tx_AMI or Rx_AMI components on the schematic, and browse for the respective IBIS files
2. User can view details of IBIS model from various information tabs after selecting the IBIS files for transmitter and receiver
3. ADS automatically links the *.ami and *.dll files associated with the *.ibs files

4.5 Importing S-Parameter models

1. To import the S-parameter files, double click S4P block and browse for the required .s4p files to instantiate into the schematic.
2. Repeat this method for all S4P blocks to import various .s4p files
3. Rearrange the wiring between Tx_AMI, S4P blocks and Rx_AMI components to match the required port order w.r.t .sp4 file

4.6 Simulation Settings

1. To access the simulation settings double click ChannelSim block.
2. User can change various simulation setting and parameters according to his need
3. Use help option to get detail understanding of varius parameters
4. To run the simulation, goto simuate -> Simulate
5. Refer to simulation status popup for various simulation warnings and errors during simulation

4.7 Simulation Results

1. Before running simulation, check for appropriate properties in eye probe for correct results
2. Set the data rate in parameters tab to the simulation bit rate as set in Tx_AMI's PRBS tab
3. In measurements tab, include all the required measurement options required to be recorded

4. In the popup after simulation, insert rectangular plot from palette panel and link density measurement to view the eye diagram. Refer Figure 2.

5. Use list from palette panel and link various other measurements in view in textual format