



ABSTRACT

This document provides an IBIS-AMI model reference for the TDP0604 HDMI 2.0 redriver. It contains detailed information related to the TDP0604 IBIS-AMI model. The intended audience includes engineers working on signal integrity simulations.

It is recommended that the reader be familiar with the [TDP0604 6-Gbps, DC or AC-Coupled to HDMI™ 2.0 Level Shifter Hybrid Redriver Data Sheet](#). This document and all other collateral data related to the TDP0604 redriver (application notes, programming guides, models, and so forth) are available to download from TI website. Alternatively, contact your local Texas Instruments field sales representative.

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1 Overview

This document is an IBIS-AMI Model User's Guide for the TDP0604 HDMI2.0 redriver. [Table 1-1](#) lists pertinent information related to the model.

Table 1-1. Model Information

Item	Value / Comment
TI Device	TDP0604
IBIS Model Version	Compliant to IBIS Version 6.0
Supported Platforms	<ul style="list-style-type: none"> 64-Bit Windows 64-bit Linux
Process	Nominal process
Temperature	Room temperature (25°C)
Supply	Nominal supply (3.3V)
VOD support	Dx_VOD = 1, 3, 5
TERM support	TERM = 0, 1, 3
6G Slew rate support	SLEW_6G = 3, 4, 5
3G Slew rate	SLEW_3G = 2, 3, 4
DC Gain Support	GLOBAL_DCG = 2
EQ support	Dx_EQ: 0 through 15

Table 1-2. IBIS-AMI Files

File Name	Description
TDP0604.ibis	Top-level IBIS wrapper
RX_Signal_path.ami	Parameters file for complete TDP0604 model as required by the IBIS-AMI standard. This is a text file that is common for all OS/execution platforms.
Redriver_Signal_Path_x64.so	Linux 64-bit compiled shared object library for the TDP0604 model. This shared library includes the AMI_Init, AMI_GetWave,
Thru.ami	Parameters file for the "tx model" as required by the IBIS-AMI standard. This file is needed to complete the redriver component
Thru_x64.dll	Windows 64-bit compiled shared library for the "TX model". This file is needed to complete the redriver component.
Thru_x64.so	Linux 64-bit compiled shared library for the "TX model". This file is needed to complete the redriver component.
rx_term.s4p	Input termination and package. Captures the input reflection and coupling between input differential pair.
tx_term_NT.s4p	TX driver open termination and package. Use in HDMI1.4 when datarates are <= 1.65Gbps.
tx_term_300.s4p	TX driver 300-Ω differential termination and package. Use in HDMI 1.4 when datarates are > 1.65Gbps
tx_term_100.s4p	TX driver 100-Ω differential termination and package. Use in HDMI2.0 datarates.
tdp0604_IBIS_AMI_wrk.7zads	ADS archive of a sample test bench for the different modes of operation.

2 Model Parameters

Figure 2-1 shows input and output AMI parameters in Keysight's ADS tool. Note that all reserved parameters should not be adjusted.

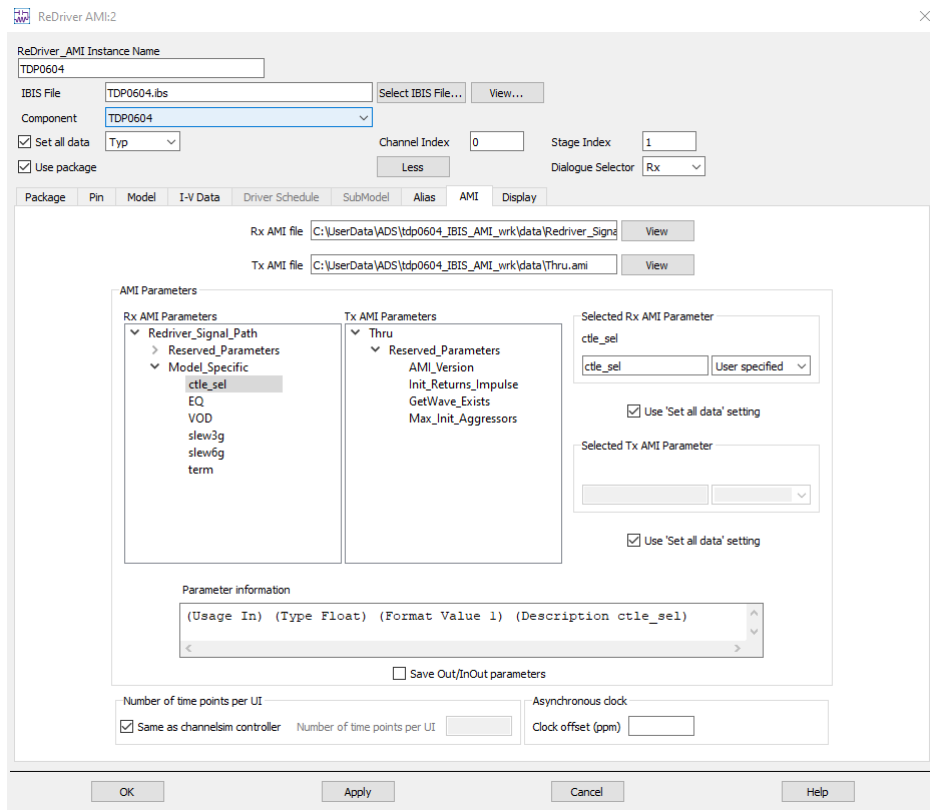


Figure 2-1. Device Specific IBIS-AMI Parameters in ADS Tool

Table 2-1 defines TDP0604 IBIS-AMI model parameters.

Table 2-1. Model Parameters

Model Parameter	Description
ctle_sel	CTLE selection: 0: 3G CTLE 1: 6G CTLE
EQ	EQ control: 0 is lowest and 15 is highest
VOD	VOD control: 1: limited at -10% 2: Limited 1000mV 3: Limited + 10%
slew3g	HDMI 1.4 Slew rate control: 2: slower 3: default slew rate 4: Faster slew rate
slew6g	HDMI 2.0 Slew rate control control: 3: slower 4: default slew rate 5: faster slew rate
term	TX termination control: 0: No termination 1: 300-ohm termination 3: 100-ohm termination

3 S-Parameter Models

Table 3-1 describes provided S-parameter models.

Table 3-1. S-Parameter Model Information

Item	Description
RX_term.s4p	A nominal model of TDP0604 package and termination on the receiver pins.
TX_term_NT.s4p	A nominal model of TDP0604 package and termination on the transmitter pins. Termination is set to no termination for this model. Use for HDMI1.4 at datarates \leq 1.65Gbps
TX_term_300.s4p	A nominal model of TDP0604 package and termination on the transmitter pins. Termination is set to 300-ohms for this model. Use for HDMI1.4 at datarates $>$ 1.65Gbps
TX_term_100.s4p	A nominal model of TDP0604 package and termination on the transmitter pins. Termination is set to 100-ohms for this model. Use for HDMI 2.0.
TUSB1XXX_Cables_halftrace.s4p	Post-channel SDD21 of -1.5dB at 3 GHz
TUSB1XXX_Cables_6mil8in_halftrace.s4p	Pre-channel SDD21 of -5.9dB at 3 GHz
HDMI1p4_testcases.csv	CSV file for test cases used in HDMI1.4 simulation.
HDMI2p0_testcases.csv	CSV file for test cases used in HDMI2.0 simulation
sweep_EQ.csv	CSV file for all EQ settings.

Note that all provided s-parameter models have the port assignments as (1->2, 3->4).

4 Model Verification

The functionality and accuracy of the model is optimized for transmission channels with up to 12 dB of attenuation at the Nyquist frequency. The CTLE function in this model must be set manually using the model parameters defined in Table 2-1.

4.1 Simulation Setup

Figure 4-1 is an example simulation setup. It consists of ideal Tx and Rx models, lossy channels, and the TDP0604 IBIS-AMI model.

The 6 Gbps source is an ideal Tx_Diff model available in ADS's Signal Integrity - Common Components palette. As the model is based on voltage sources, the series resistors are added to mimic the desired source output impedance and establish desired output amplitude.

The TDP0604 model consists of AMI IBIS-AMI model and RX_term and TX_term S-parameter models representing the device package and internal termination. The model parameter may be easily adjusted using the TDP0604 VAR EQN function.

An ideal Rx_Diff is also included. It is available in ADS's Signal Integrity - Common Components palette.

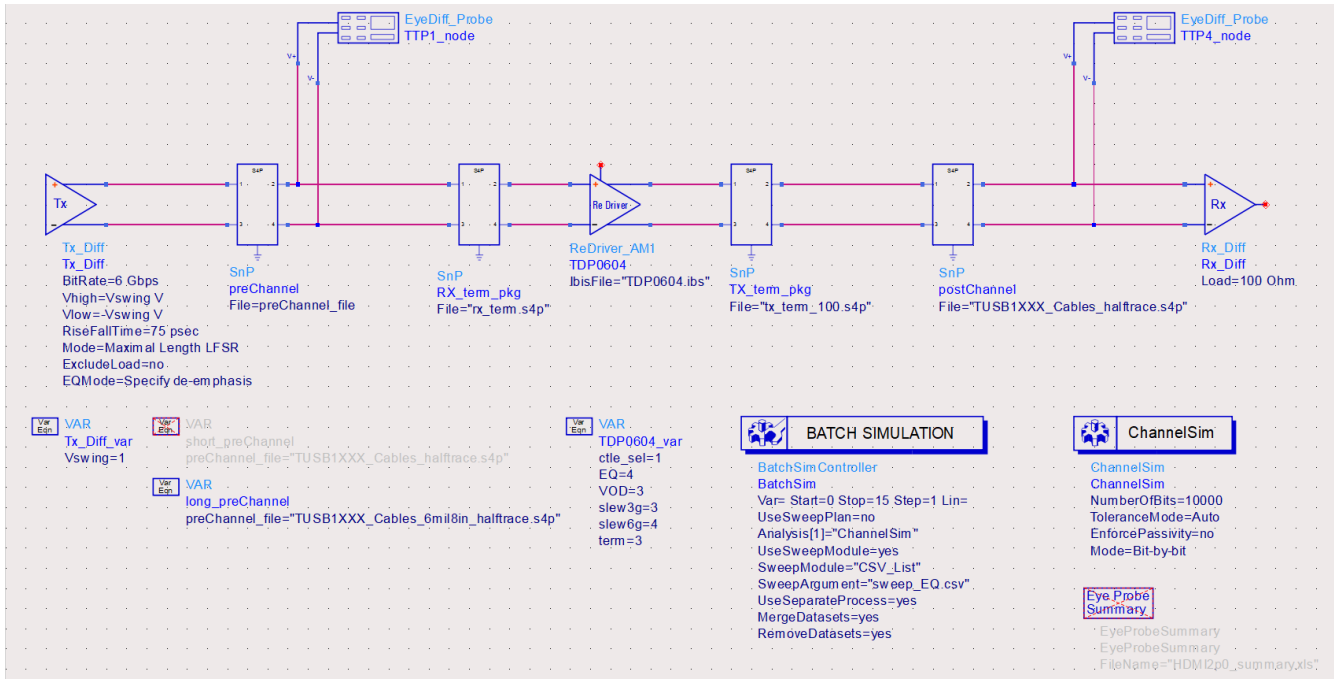


Figure 4-1. ADS Simulation Setup

4.2 Simulation Results and Bench Correlation

Figure 4-2 shows simulation results and corresponding bench measurements of the setup described in Figure 4-1.

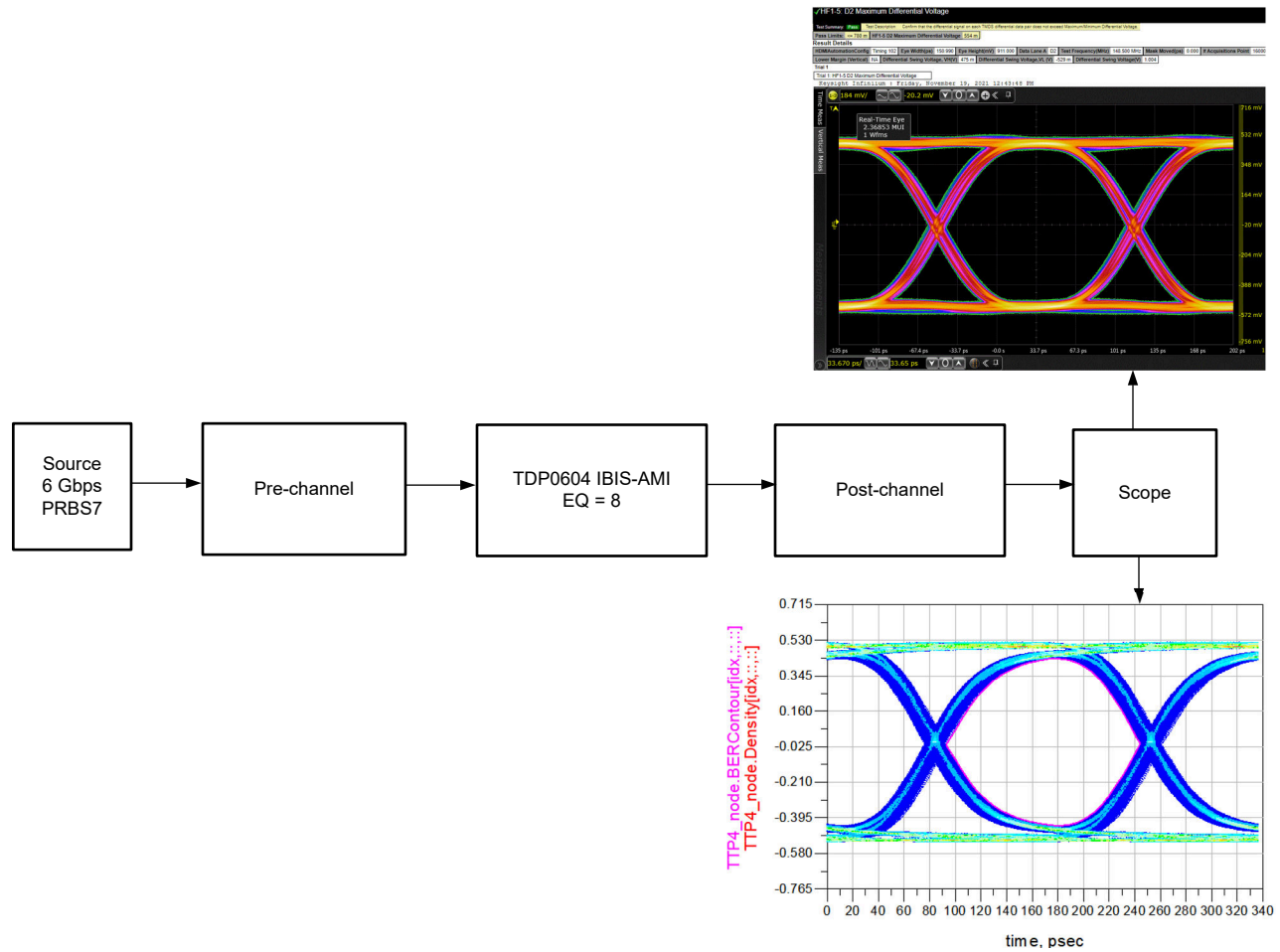


Figure 4-2. Simulation Results and Bench Correlation

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