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## **IBIS/HSPICE Model Quality Report**

Design ID: **Y64A**

Description: **64Mb - x8, x16, x32 SDRAM**

Marketing device name(s): **MT48LC8M8A2TG, MT48LC4M16A2TG, MT48LC8M8A2BB, MT48LC4M16A2BG, MT48LC2M32B2TG, MT48LC2M32B2B5, MT48LC4M16A2Y64A, MT48LC4M16A2Y64A, MT48LC2M32B2Y64A**

Valid speed grades: **SDRAM-100, 133, 143, 166 MHz**

Zip filename: **y64a\_ibis.zip**

IBIS filename: **y64a.ibs, y64a\_at.ibs, y64a\_it.ibs** File rev: **2.0**

HSpice filename: **y64a\_hspice.zip** File rev: **2.0**

EBD filename (if applicable): **N/A** File rev: **N/A**

Die rev: **J**

Date: **September 28, 2011**

Datasheet Link (from micron.com): go to <http://www.micron.com/my.html> and search columns for y64a

E-mail [modelsupport@micron.com](mailto:modelsupport@micron.com) for questions regarding Quality Report.

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### **Device Parameters**

VDDQ – Slow: **3.0** Typical: **3.3** Fast: **3.6**

VDD – Slow: **3.0** Typical: **3.3** Fast: **3.6**

Junction Temperature (Commercial) - Slow: **85C** Typical: **50C** Fast: **0C**

Junction Temperature (Industrial) - Slow: **95C** Typical: **50C** Fast: **-40C**

Junction Temperature (Automotive) - Slow: **110C** Typical: **50C** Fast: **-40C**

VDDQ/VSSQ Decoupling Capacitance: **3.571nF**

Included in HSPICE DQ/DQS models? **YES** Amount per DQ/DQS model: **111.59pF**

VDDQ/VSSQ Decoupling Capacitance Series Resistance: **11.77 Ohms**

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### **IBIS Quality Summary**

1. ☒ Include the IBIS Quality Specification 2.0 Overall IBIS Quality level. For details on IBIS Quality, reference the quality specification and quality checklist on IBIS quality webpage [http://www.eda.org/pub/ibis/quality\\_wip/](http://www.eda.org/pub/ibis/quality_wip/).

Overall IBIS Quality Level: **3MS**

Exceptions: **0**

2. ☒ Include the filename of the IBIS Quality Checklist that accompanies this report.

Filename: **y64a\_ibis\_quality\_2.0\_checklist.xls**

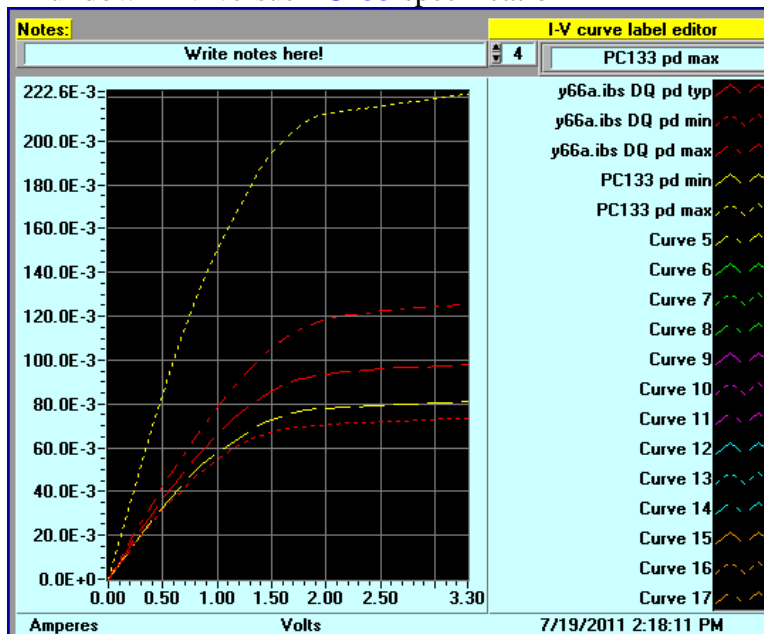
## IBIS MODEL Correlation

### Datasheet Correlation

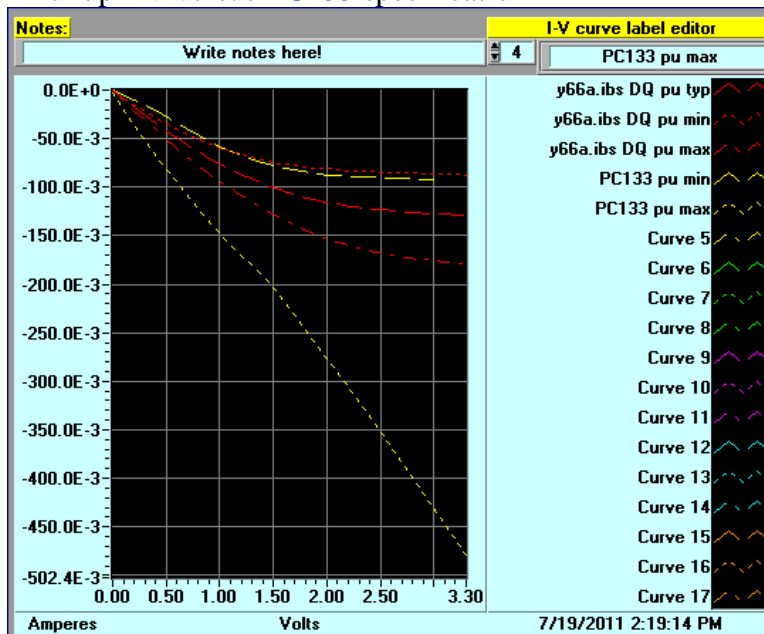
1. ☒ For Output or I/O model compare datasheet IOH/IOL data with IBIS pullup/pulldown data. <sup>1</sup>

a. Model name: **DQ**

i. Pulldown I-V versus **PC133** specification



ii. Pullup I-V versus **PC133** specification



2. ☒ Compare C\_comp with datasheet Input C. Provide C\_comp comparison table for all models and for all package combinations (i.e. x4, x8 and x16).

Component name: **MT48LC8M8A2BB (60-ball FBGA)**

		IBIS		Datasheet	
		min	max	min	max
<b>DQ</b>	C_comp	3.72	4.02	NA	NA
	C_package	0.72	1.26	NA	NA
	C_total	4.44	5.28	3.00	6.00
<b>INPUT</b>	C_comp	2.15	2.35	NA	NA
	C_package	0.67	1.08	NA	NA
	C_total	2.82	3.43	1.50	3.80
<b>CLK</b>	C_comp	2.23	2.43	NA	NA
	C_package	0.83	0.83	NA	NA
	C_total	3.06	3.26	1.50	3.50
<b>DM</b>	C_comp	2.58	2.78	NA	NA
	C_package	0.72	0.72	NA	NA
	C_total	3.29	3.49	1.50	3.80

Component name: **MT48LC4M16A2BG (54-ball VFBGA)**

		IBIS		Datasheet	
		min	max	min	max
<b>DQ</b>	C_comp	3.72	4.02	NA	NA
	C_package	0.63	1.09	NA	NA
	C_total	4.35	5.12	3.00	6.00
<b>INPUT</b>	C_comp	2.15	2.35	NA	NA
	C_package	0.65	1.01	NA	NA
	C_total	2.80	3.35	1.50	3.80
<b>CLK</b>	C_comp	2.23	2.43	NA	NA
	C_package	0.74	0.74	NA	NA
	C_total	2.97	3.17	1.50	3.50
<b>DM</b>	C_comp	2.58	2.78	NA	NA
	C_package	0.68	0.91	NA	NA
	C_total	3.25	3.69	1.50	3.80

Component name: **MT48LC2M32B2B5 (90-ball VFBGA)**

		IBIS		Datasheet	
		min	max	min	max
<b>DQ</b>	C_comp	3.72	4.02	NA	NA
	C_package	0.48	0.92	NA	NA
	C_total	4.20	4.94	3.00	6.00
<b>INPUT</b>	C_comp	2.15	2.35	NA	NA
	C_package	0.29	0.62	NA	NA
	C_total	2.44	2.97	1.50	3.80
<b>CLK</b>	C_comp	2.23	2.43	NA	NA
	C_package	0.33	0.33	NA	NA
	C_total	2.56	2.76	1.50	3.50
<b>DM</b>	C_comp	2.58	2.78	NA	NA
	C_package	0.35	0.55	NA	NA
	C_total	2.93	3.33	1.50	3.80

Component name: **MT48LC8M8A2TG (54-pin TSOP)**

		IBIS		Datasheet	
		min	max	min	max
<b>DQ</b>	C_comp	3.72	4.02	NA	NA
	C_package	0.41	0.78	NA	NA
	C_total	4.13	4.80	4.00	6.00
<b>INPUT</b>	C_comp	2.15	2.35	NA	NA
	C_package	0.63	0.94	NA	NA
	C_total	2.78	3.29	2.50	3.80
<b>CLK</b>	C_comp	2.23	2.43	NA	NA
	C_package	0.68	0.68	NA	NA
	C_total	2.91	3.11	2.50	3.50
<b>DM</b>	C_comp	2.58	2.78	NA	NA
	C_package	0.63	0.63	NA	NA
	C_total	3.21	3.41	2.50	3.80

Component name: **MT48LC4M16A2TG (54-pin TSOP)**

		IBIS		Datasheet	
		min	max	min	max
<b>DQ</b>	C_comp	3.72	4.02	NA	NA
	C_package	0.41	0.78	NA	NA
	C_total	4.13	4.80	4.00	6.00
<b>INPUT</b>	C_comp	2.15	2.35	NA	NA
	C_package	0.63	0.94	NA	NA
	C_total	2.78	3.29	2.50	3.80
<b>CLK</b>	C_comp	2.23	2.43	NA	NA
	C_package	0.68	0.68	NA	NA
	C_total	2.91	3.11	2.50	3.50
<b>DM</b>	C_comp	2.58	2.78	NA	NA
	C_package	0.58	0.63	NA	NA
	C_total	3.15	3.41	2.50	3.80

Component name: **MT48LC2M32B2TG (86-pin TSOP)**

		IBIS		Datasheet	
		min	max	min	max
<b>DQ</b>	C_comp	3.72	4.02	NA	NA
	C_package	0.45	1.06	NA	NA
	C_total	4.18	5.08	4.00	6.00
<b>INPUT</b>	C_comp	2.15	2.35	NA	NA
	C_package	0.43	0.51	NA	NA
	C_total	2.58	2.85	2.50	3.80
<b>CLK</b>	C_comp	2.23	2.43	NA	NA
	C_package	0.59	0.59	NA	NA
	C_total	2.82	3.02	2.50	3.50
<b>DM</b>	C_comp	2.58	2.78	NA	NA
	C_package	0.60	0.73	NA	NA
	C_total	3.17	3.50	2.50	3.80

3. ☐ If slew rate specifications (rise/fall slew) are available from the datasheet, complete HSpice simulations to generate slew rate data and provide a comparison table.

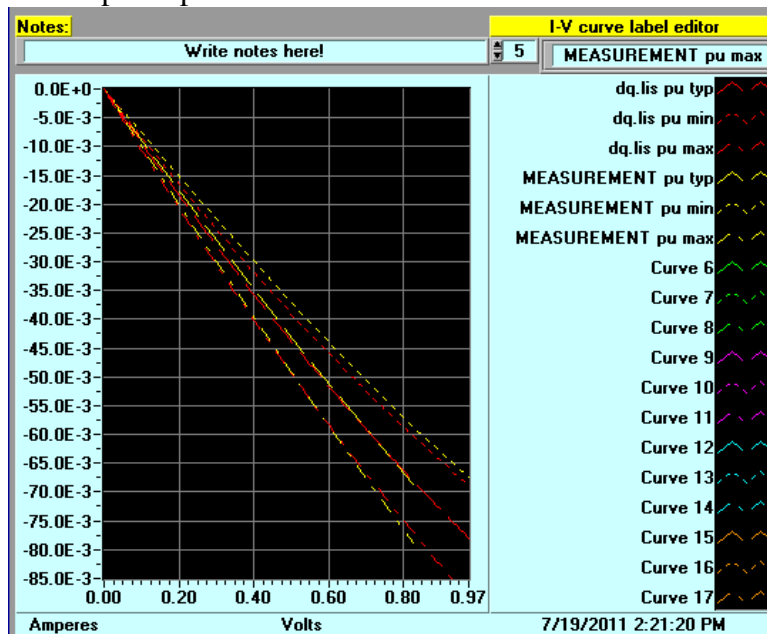
**Not Available**

4. ☐ Compare ODT data with datasheet.

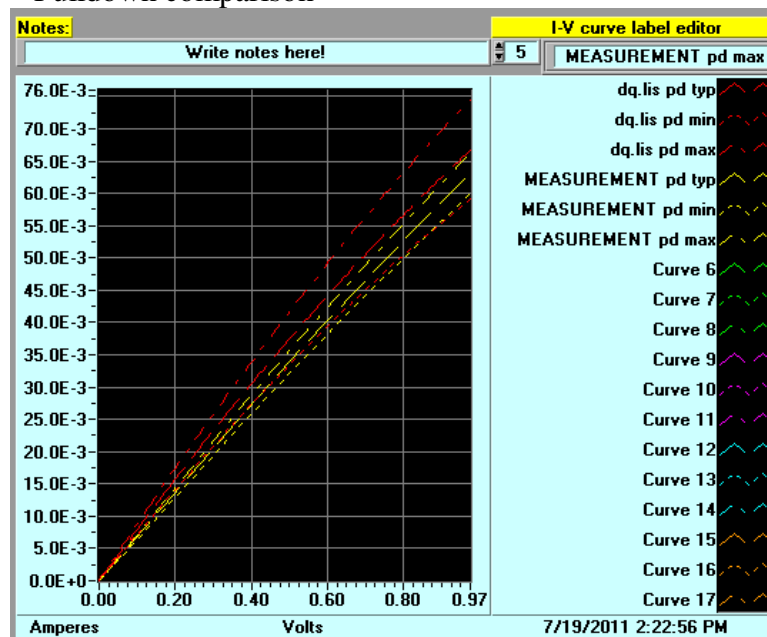
**Not Applicable**

## Measurement Correlation

1. ☒ For Output or I/O models compare measured IOH/IOL data with IBIS pullup/pulldown data. If the measurement conditions are different than the IBIS conditions, run HSpice simulations using the same measurement conditions such as VCC, temperature, and process. Include measurement conditions in the pullup/pulldown images.<sup>2</sup>
  - a. Model name: **DQ (measurement range 0-0.975V)**
    - i. Pullup comparison



- ii. Pulldown comparison



2. ☒ Compare C\_comp with measured C\_comp. Provide C\_comp comparison table for all models and for all package combinations (i.e x4, x8 and x16).

Component name: **MT48LC8M8A2BB (60-ball FBGA)**

		IBIS			Measured		
		min	typ	max	min	typ	max
<b>DQ</b>	C_comp	3.72	3.87	4.02	NA	NA	NA
	C_package	0.72	1.06	1.26	NA	NA	NA
	C_total	4.44	4.93	5.28	4.55	4.93	5.40
<b>INPUT</b>	C_comp	2.15	2.25	2.35	NA	NA	NA
	C_package	0.67	0.93	1.08	NA	NA	NA
	C_total	2.82	3.17	3.43	2.75	3.17	3.43
<b>CLK</b>	C_comp	2.23	2.33	2.43	NA	NA	NA
	C_package	0.83	0.83	0.83	NA	NA	NA
	C_total	3.06	3.16	3.26	3.09	3.16	3.20
<b>DM</b>	C_comp	2.58	2.68	2.78	NA	NA	NA
	C_package	0.72	0.72	0.72	NA	NA	NA
	C_total	3.29	3.39	3.49	3.34	3.39	3.43

Component name: **MT48LC4M16A2BG (54-ball VFBGA)**

		IBIS			Measured		
		min	typ	max	min	typ	max
<b>DQ</b>	C_comp	3.72	3.87	4.02	NA	NA	NA
	C_package	0.63	0.87	1.09	NA	NA	NA
	C_total	4.35	4.74	5.12	4.30	4.76	5.14
<b>INPUT</b>	C_comp	2.15	2.25	2.35	NA	NA	NA
	C_package	0.65	0.80	1.01	NA	NA	NA
	C_total	2.80	3.04	3.35	2.82	3.02	3.31
<b>CLK</b>	C_comp	2.23	2.33	2.43	NA	NA	NA
	C_package	0.74	0.74	0.74	NA	NA	NA
	C_total	2.97	3.07	3.17	2.93	2.98	3.01
<b>DM</b>	C_comp	2.58	2.68	2.78	NA	NA	NA
	C_package	0.68	0.80	0.91	NA	NA	NA
	C_total	3.25	3.47	3.69	3.29	3.47	3.62

Component name: **MT48LC2M32B2B5 (90-ball VFBGA)**

		IBIS			Measured		
		min	typ	max	min	typ	max
<b>DQ</b>	C_comp	3.72	3.87	4.02	NA	NA	NA
	C_package	0.48	0.69	0.91	NA	NA	NA
	C_total	4.20	4.56	4.94	4.30	4.51	4.94
<b>INPUT</b>	C_comp	2.15	2.25	2.35	NA	NA	NA
	C_package	0.29	0.46	0.62	NA	NA	NA
	C_total	2.44	2.71	2.97	2.47	2.70	3.02
<b>CLK</b>	C_comp	2.23	2.33	2.43	NA	NA	NA
	C_package	0.33	0.33	0.33	NA	NA	NA
	C_total	2.56	2.66	2.76	2.52	2.54	2.56
<b>DM</b>	C_comp	2.58	2.68	2.78	NA	NA	NA
	C_package	0.35	0.45	0.55	NA	NA	NA
	C_total	2.93	3.12	3.33	2.89	3.05	3.30

Component name: **MT48LC4M16A2TG (54-pin TSOP)**

		IBIS			Measured		
		min	typ	max	min	typ	max
<b>DQ</b>	C_comp	3.72	3.87	4.02	NA	NA	NA
	C_package	0.41	0.59	0.78	NA	NA	NA
	C_total	4.13	4.46	4.80	4.15	4.47	4.99
<b>INPUT</b>	C_comp	2.15	2.25	2.35	NA	NA	NA
	C_package	0.63	0.79	0.94	NA	NA	NA
	C_total	2.78	3.03	3.29	2.60	3.11	3.43
<b>CLK</b>	C_comp	2.23	2.33	2.43	NA	NA	NA
	C_package	0.68	0.68	0.68	NA	NA	NA
	C_total	2.91	3.01	3.11	2.78	2.90	3.01
<b>DM</b>	C_comp	2.58	2.68	2.78	NA	NA	NA
	C_package	0.58	0.61	0.63	NA	NA	NA
	C_total	3.15	3.28	3.41	3.04	3.20	3.33



Component name: **MT48LC2M32B2TG (86-pin TSOP)**

		IBIS			Measured		
		min	typ	max	min	typ	max
<b>DQ</b>	C_comp	3.72	3.87	4.02	NA	NA	NA
	C_package	0.45	0.70	1.06	NA	NA	NA
	C_total	4.18	4.57	5.08	4.34	4.66	5.09
<b>INPUT</b>	C_comp	2.15	2.25	2.35	NA	NA	NA
	C_package	0.43	0.46	0.51	NA	NA	NA
	C_total	2.58	2.71	2.85	2.65	2.72	2.82
<b>CLK</b>	C_comp	2.23	2.33	2.43	NA	NA	NA
	C_package	0.59	0.59	0.59	NA	NA	NA
	C_total	2.82	2.92	3.02	2.74	2.77	2.78
<b>DM</b>	C_comp	2.58	2.68	2.78	NA	NA	NA
	C_package	0.60	0.63	0.73	NA	NA	NA
	C_total	3.17	3.31	3.50	0.60	0.63	0.73

3. ☐ If measured clamp current data is available provide an IBIS and measurement comparison for all models.

**Not Available**

4. ☐ If slew rate data (rise/fall slew) is available from measurements, complete HSpice simulations to generate slew rate data and provide a comparison table.

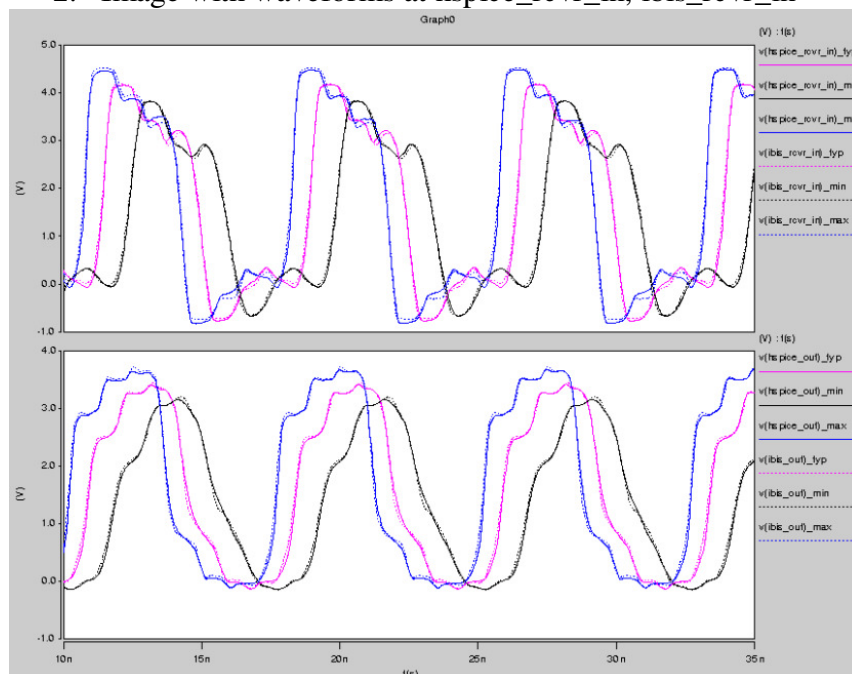
**Not Available**

### **IBIS vs HSPICE Correlation**

1. ☒ For all Output or I/O models, run HSpice transient simulations using encrypted netlists and the IBIS model (b-element).
  - a. ☒ Use the setup and node naming conventions shown below for the IBIS and HSpice deck file (.sp file). Update the setup diagram if it is different. Indicate the version of HSPICE simulator used for simulations: **2008.09**
  - b. ☒ Run simulations for all corners cases and at maximum allowable speed grade

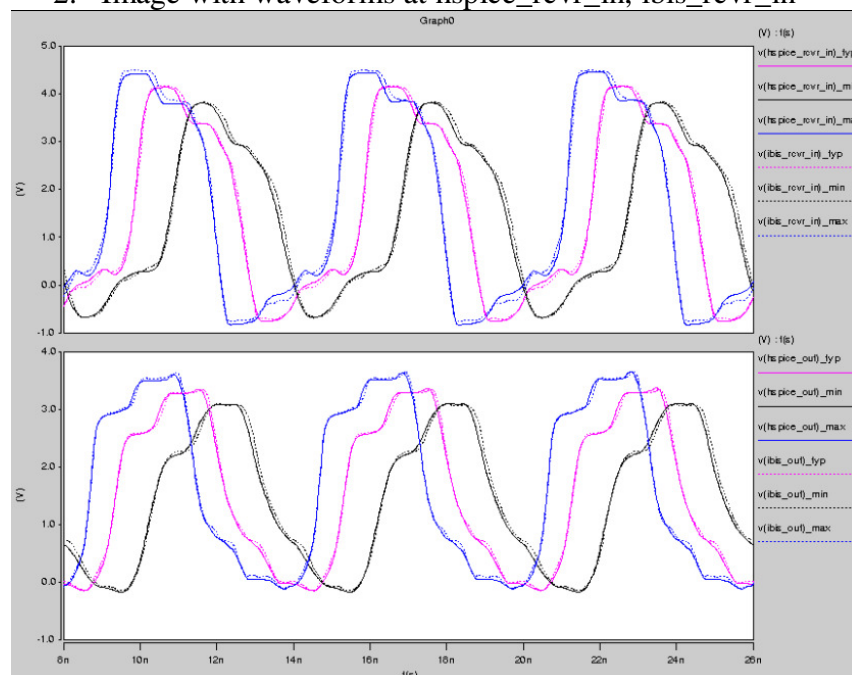
i. DQ driving DQ at 133MHz

1. Image with waveforms at hspice\_out, ibis\_out
2. Image with waveforms at hspice\_rcvr\_in, ibis\_rcvr\_in

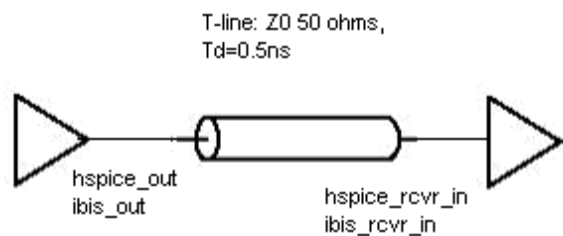


ii. DQ driving DQ at 167MHz

1. Image with waveforms at hspice\_out, ibis\_out
2. Image with waveforms at hspice\_rcvr\_in, ibis\_rcvr\_in



## Setup



## Comments:

1. IBIS pullup/pulldown data are the same for Y66A, Y65A, and Y64A.
2. Model vs. Measurement data for DQ's are the same for Y66A, Y65A, and Y64A.

## Document Revision History

Rev 1.0 - Date 12/13/2010

- a. IBIS revision 1.0
- b. HSpice revision 1.0

Rev 2.0 - Date 09/28/2011

- a. IBIS revision 2.0
- b. HSpice revision 2.0