

pybis2spice

An IBIS to SPICE Conversion tool written in Python

Examples

<https://github.com/kamratia1/pybis2spice>

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This document provides example waveforms of LTSpice simulations for various ibis files converted into SPICE subcircuit models.

The converted SPICE models and simulation files shown in the examples can be found at:

<https://github.com/kamratia1/pybis2spice/examples>

Given that IBIS files are not permitted for redistribution, the IBIS models are not provided within the examples, however, links to the websites where these can be freely downloaded are provided in this document.

Under no circumstance shall the author have any liability for any loss or damage of any kind incurred as a result of the use or reliance on any information provided in this document.

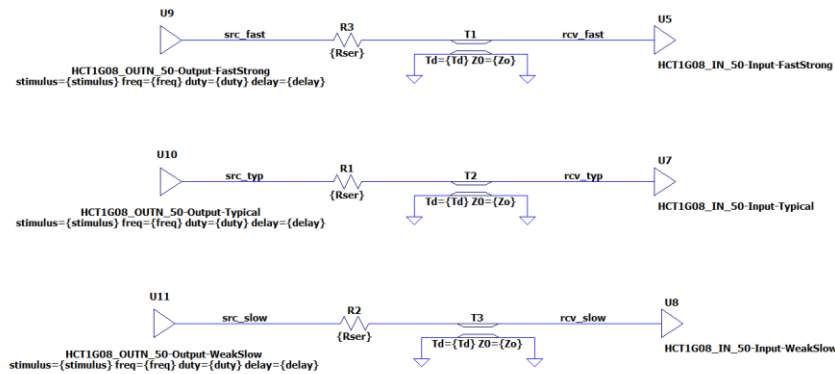
NXP Semiconductors 74HCT1G08

Component: 74HCT1G08_GV

Model Type: Output and Input

Models: HCTG108_OUTN_50 and HCTG108_IN_50

IBIS model Download Link: <https://assets.nexperia.com/documents/ibis-model/hct1g08.ibs>



Transmission Line Properties

Rser - Series Termination resistor value
Td - Transmission line delay
Zo - Characteristic impedance

.step param Rser list 0.1 39

.param Td = 2n

.param Zo = 51

Waveform Stimulus

.param stimulus = 1

.param freq = 20Meg

.param duty = 0.5

.param delay=0

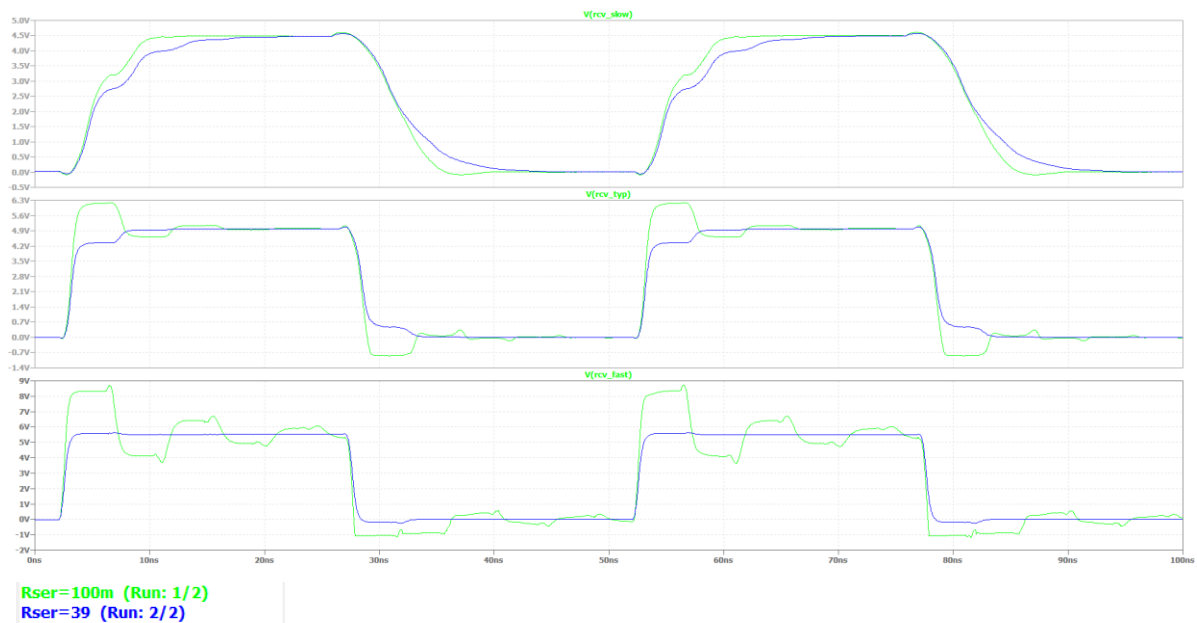
Stimulus Options

- * 1 - Oscillate at given freq and duty
- * 2 - Inverted Oscillate at given freq and duty
- * 3 - Rising Edge with delay
- * 4 - Falling Edge with delay
- * 5 - Stuck High
- * 6 - Stuck Low
- * 7 - HighZ (if 3-State output)

Transient Simulation parameters

.tran 0 100n 0 10p

Waveforms with stimulus of 20MHz oscillation observing the receiver at the slow, typical, and fast corners. 2 conditions simulated: series resistor value of 0.1Ω (Green) and 39Ω (Blue)



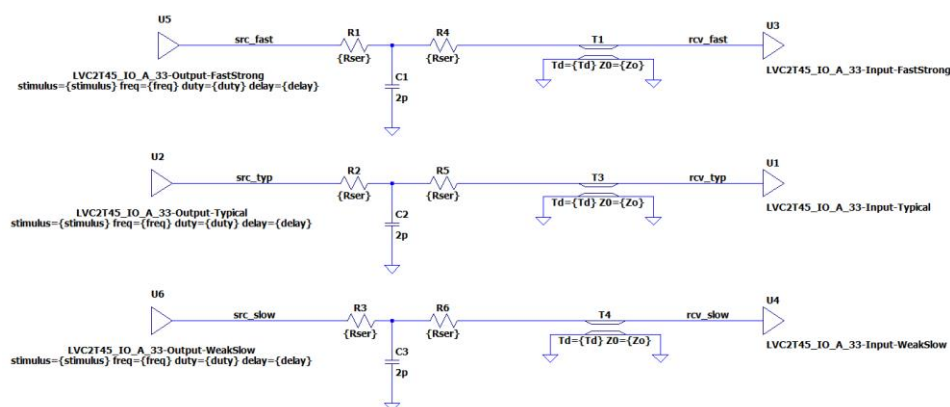
Texas Instruments SN74LVC2T45

Component: LVC2T45_DCT

Model Type: I/O

Models: LVC2T45_IO_A_33

IBIS model Download Link: <https://www.ti.com/lit/zip/scem409>



Transmission Line Properties

Rser - Series Termination resistor value
Td - Transmission line delay
Zo - Characteristic impedance

.param Rser = 18

.param Td = 5n

.param Zo = 50

Waveform Stimulus

.param stimulus = 1

.param freq = 10Meg

.param duty = 0.5

.param delay = 20n

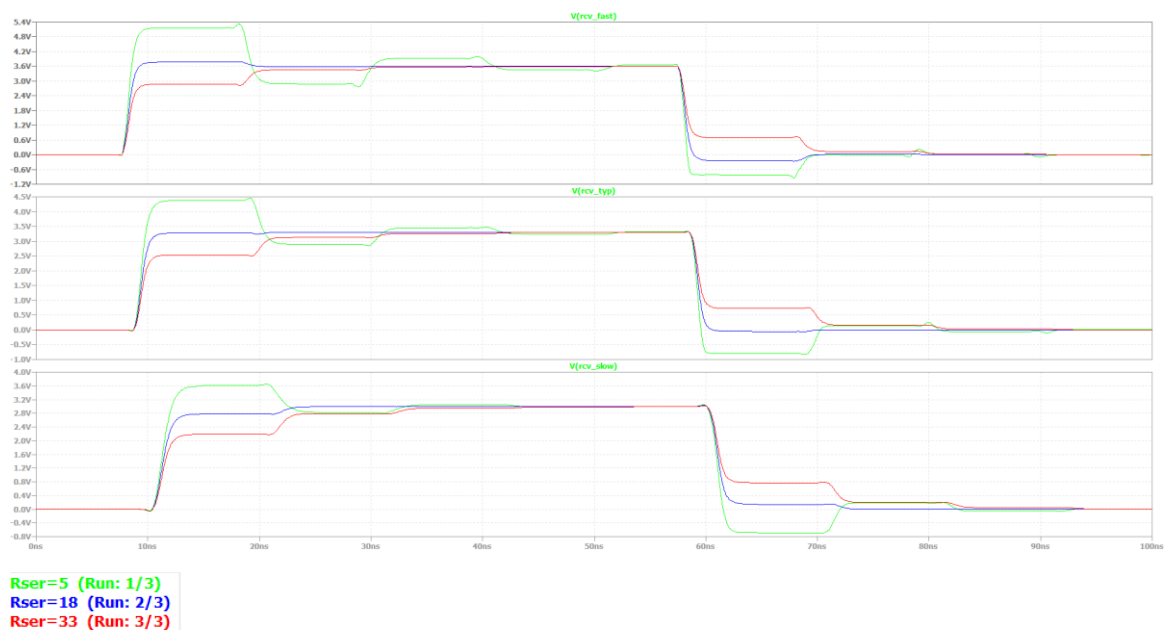
Stimulus Options

- * 1 - Oscillate at given freq and duty
- * 2 - Inverted Oscillate at given freq and duty
- * 3 - Rising Edge with delay
- * 4 - Falling Edge with delay
- * 5 - Stuck High
- * 6 - Stuck Low
- * 7 - HighZ (if 3-State output)

Transient Simulation parameters

.tran 0 100n 0 2p

Waveforms with 10MHz oscillation stimulus observing the receiver at the slow, typical, and fast corners. 3 x RCR source termination conditions simulated: series resistor value of 1Ω (Green), 18Ω (Blue) and 22Ω (Red)



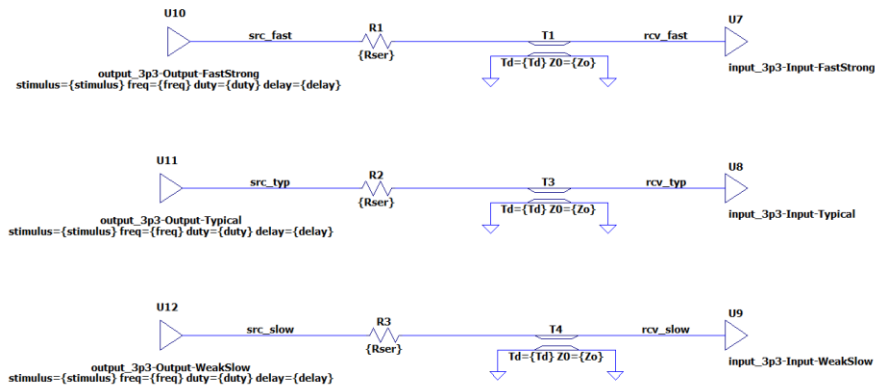
Texas Instruments SN74LV1T34

Component: SN74LV1T34DBV

Model Type: 3-state and Input

Models: output_3p3 and input_3p3

IBIS model Download Link: <https://www.ti.com/lit/zip/sclm119>



Transmission Line Properties

Rser - Series Termination resistor value
Td - Transmission line delay
Zo - Characteristic impedance

.step param Rser list 18 27 33

.param Td = 5n

.param Zo = 50

Waveform Stimulus

.param stimulus = 1

.param freq = 10Meg

.param duty = 0.5

.param delay = 20n

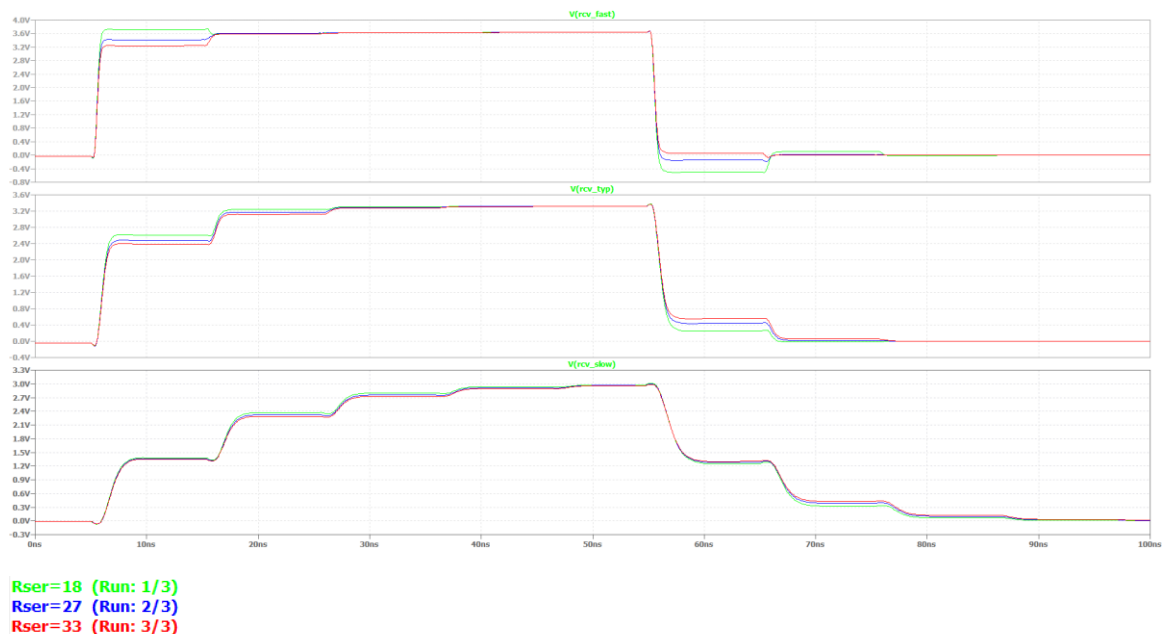
Stimulus Options

- * 1 - Oscillate at given freq and duty
- * 2 - Inverted Oscillate at given freq and duty
- * 3 - Rising Edge with delay
- * 4 - Falling Edge with delay
- * 5 - Stuck High
- * 6 - Stuck Low
- * 7 - HighZ (if 3-State output)

Transient Simulation parameters

.tran 0 100n 0 10p

Waveforms with 10MHz oscillation stimulus observing the receiver at the slow, typical, and fast corners. 3 x series source termination conditions simulated: resistor value of 18Ω (Green), 27Ω (Blue) and 33Ω (Red)



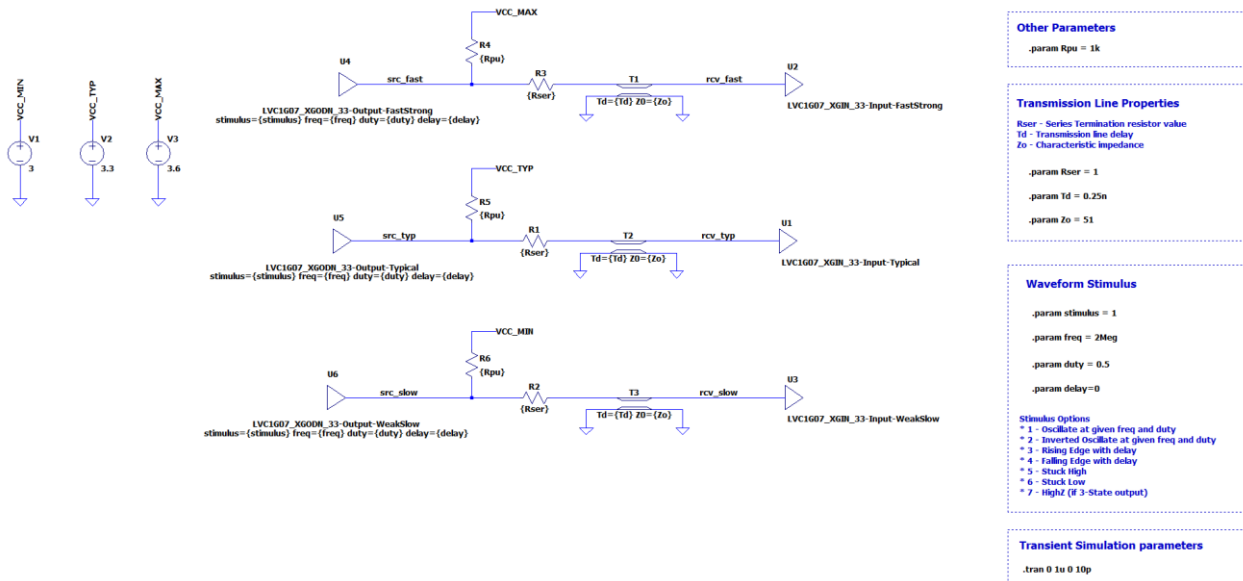
Nexperia LVC1G07 (Open Drain)

Component: 74LVC1G07_GF

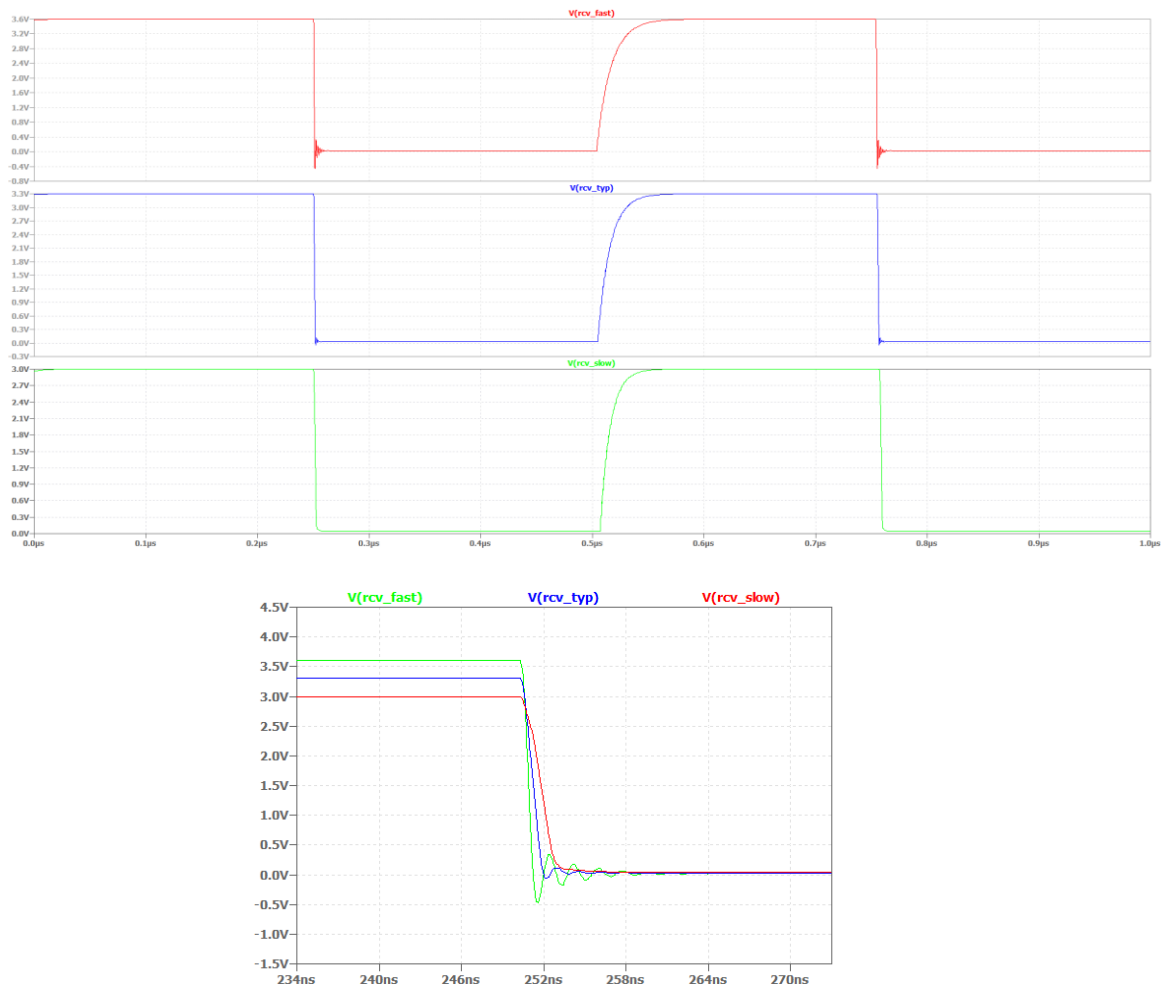
Model Type: Open Drain and Input

Models: LVC1G07_XGODN_33 and LVC1G07_XGIN_33

IBIS model Download Link: <https://assets.nexperia.com/documents/ibis-model/lvc1g07.ibs>



Waveforms with 2MHz oscillation stimulus observing the receiver at the slow, typical, and fast corners with 1k Ω pullup and 1 Ω series termination. A zoomed in view of the falling edge is also shown to provide additional detail. Propagation delay of transmission line is set to 0.25ns to simulate a shorter PCB trace (approx. 4cm)



Nexperia LVC1G07 (Crosstalk Example)

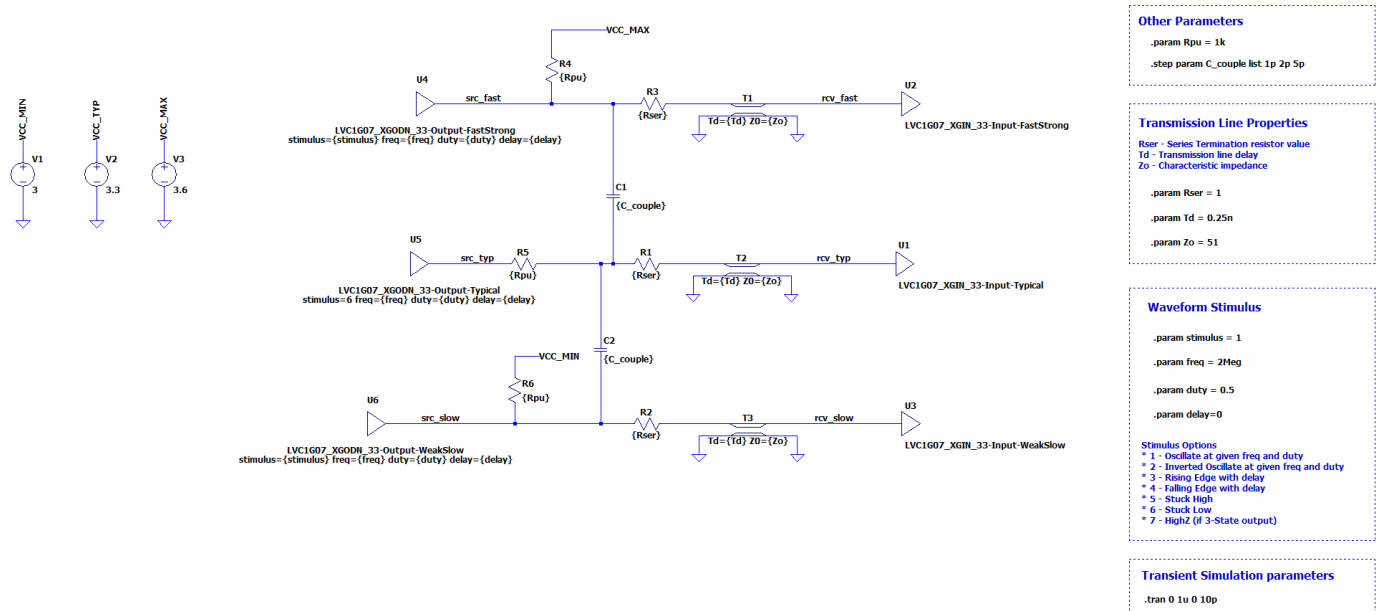
Component: 74LVC1G07_GF

Model Type: Open Drain and Input

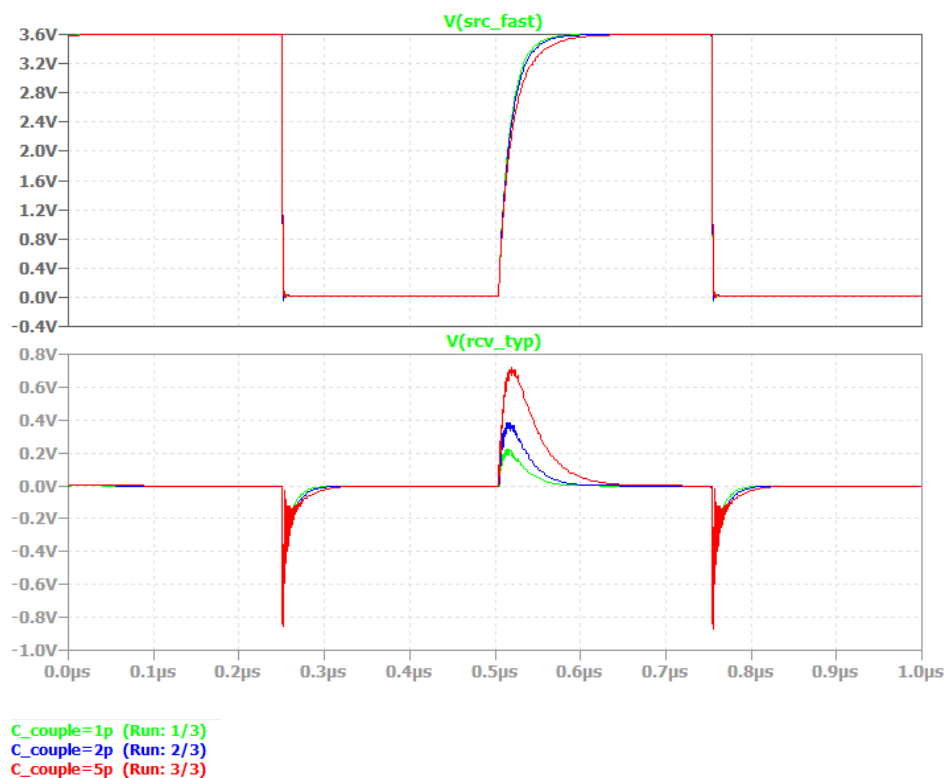
Models: LVC1G07_XGODN_33 and LVC1G07_XGIN_33

IBIS model Download Link: <https://assets.nexperia.com/documents/ibis-model/lvc1g07.ibs>

This example shows how one can evaluate the cross-talk performance between capacitively coupled lines.



The simulation is setup with the U5 set to a LOW logic level and its interconnecting line is capacitively coupled with 2 adjacent lines driven with a fast waveform. The pullup resistor for the open-drain output is set at 1k Ω and capacitive coupling is varied between 1pF (Green), 2pF (Blue) and 5pF (Red). The waveform is measured at U1 i.e. the receiver that should be seeing a digital LOW.



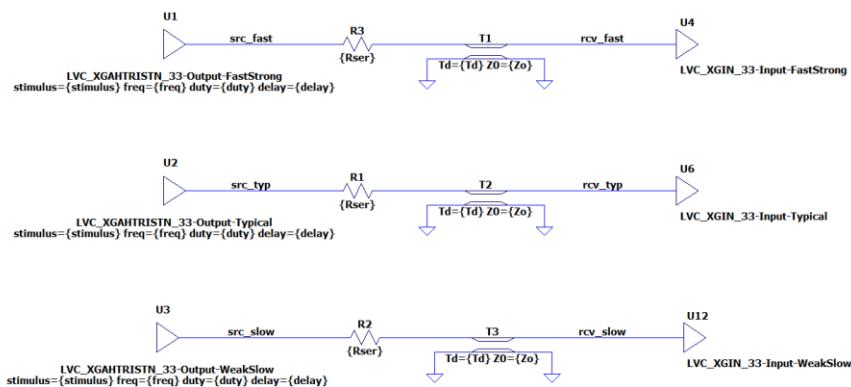
Nexperia 74LVC2G126

Component: 74LVC2G126_DC

Model Type: Open Drain and Input

Models: LVC_XGAHTRISTN_33 and LVC_XGIN_33

IBIS model Download Link: <https://assets.nexperia.com/documents/ibis-model/lvc2g126.ibs>



Transmission Line Properties

Rser - Series Termination resistor value
Td - Transmission line delay
Zo - Characteristic impedance

.step param Rser list 0.1 39

.param Td = 2n

.param Zo = 51

Waveform Stimulus

.param stimulus = 1

.param freq = 20Meg

.param duty = 0.5

.param delay=0

Stimulus Options

- * 1 - Oscillate at given freq and duty
- * 2 - Inverted Oscillate at given freq and duty
- * 3 - Rising Edge with delay
- * 4 - Falling Edge with delay
- * 5 - Stuck High
- * 6 - Stuck Low
- * 7 - HighZ (if 3-State output)

Transient Simulation parameters

.tran 0 100n 0 5p

Waveforms with stimulus of 20MHz oscillation observing the receiver at the slow, typical, and fast corners. 2 conditions simulated: series resistors value of 0.1Ω (Green) and 39Ω (Blue)



Rser=100m (Run: 1/2)

Rser=39 (Run: 2/2)

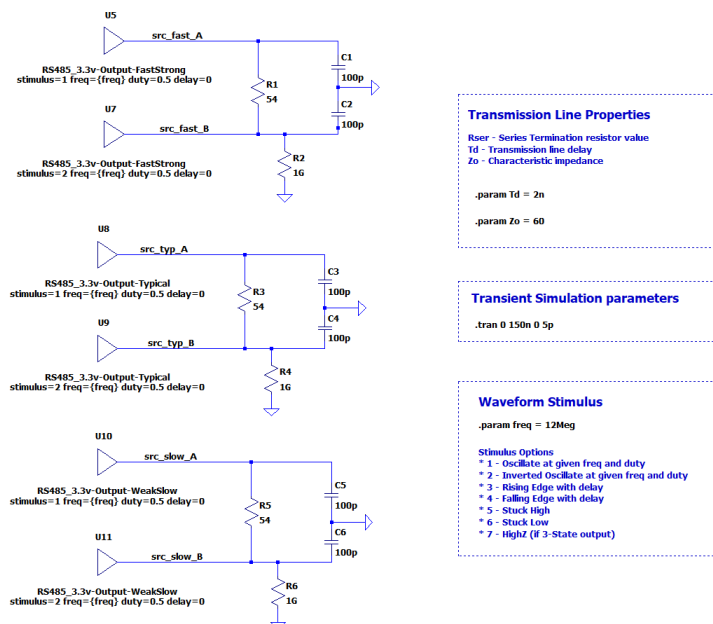
Analog Devices LTC2879

Component: LTC2879X

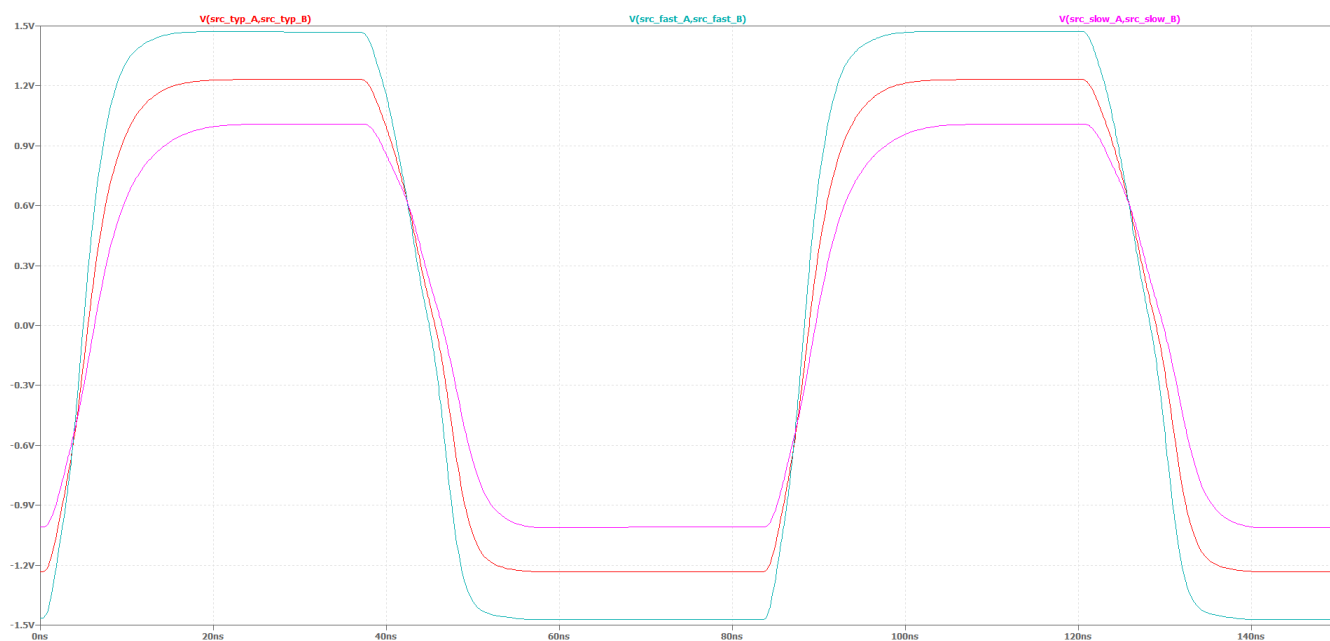
Model Type: 3-state and Input

Models: out_3.3v and LVC_XGIN_33

IBIS model Download Link: <https://www.analog.com/en/license/ibis-models?mediaPath=media/en/simulation-models/ibis-models/ltc2879x.ibs&modelType=ibis-models>



Waveforms for RS485 circuit for driver timing measurement. The 1GΩ resistor is added to provide a DC path to ground at the output to prevent simulation errors.



STMicroelectronics STM32G031

Component: stm32g031_041_ufqfn28

Model Type: I/O

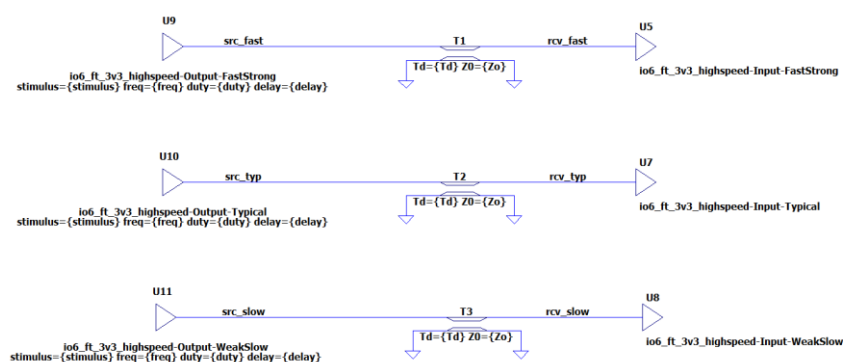
Models: io6_ft_3v3_highspeed

IBIS model Download Link: https://www.st.com/resource/en/ibis_model/stm32g0_ibis.zip

Note: Warnings are created within the Subcircuit file due to the parasitic components in the model being set to 0-values. This is because the package parasitics are associated with each pin and not the model. This is a limitation of this conversion tool. Consequently, the converted SPICE model will resort to using default package parasitic values as given by the WARNING message.

```
WARNINGS within the SPICE subcircuit file:
* WARNING: Could not parse the C_pkg so has been set to a nominal of 0.1pF
* WARNING: Could not parse the L_pkg so has been set to a nominal of 1nF
* WARNING: Could not parse the R_pkg so has been set to a nominal of 0.01ohm
```

These can be set manually within the SPICE subcircuit model if the user wishes.



Transmission Line Properties

Rser - Series Termination resistor value
Td - Transmission line delay
Zo - Characteristic impedance

.param Td = 2n

.param Zo = 51

Waveform Stimulus

.param stimulus = 1

.param freq = 32Meg

.param duty = 0.5

.param delay = 0

Stimulus Options

- * 1 - Oscillate at given freq and duty
- * 2 - Inverted Oscillate at given freq and duty
- * 3 - Rising Edge with delay
- * 4 - Falling Edge with delay
- * 5 - Stuck High
- * 6 - Stuck Low
- * 7 - HighZ (if 3-State output)

Transient Simulation parameters

.tran 0 100n 0 5p

Waveforms with stimulus of 32MHz oscillation observing the receiver at the slow, typical, and fast corners. There is no series termination resistor.

