Look into IBIS buffer curves

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Outlines

- Buffer Structures
- Buffer Curves in IBIS
- HIGH, LOW, OPEN States
- Loadlines
- Relationship between V-I and V-T Curves
- On-Die Termination using IBIS Submodel
- Conclusions
Basic I/O Buffer Structure

Output / Driver 输出

- Pull-up Device
- Diodes

Input / Receiver 输入

- Pull-down Device
- Pad Capacitance
IBIS Buffer Structure

All curve data are independent with own voltage references

- **PU** – Pullup
- **PD** – Pulldown
- **PC** – Power Clamp
- **GC** – Ground Clamp
V-I Curves in IBIS model

IBIS V-I Curves

Current(μA)

Voltage(V)

-3.60

-1.80

0

1

2

3

-1.80

0

1.80

3.60

Reference @ 0 v

Reference @ 1.8 v

PullUp@Typ@1.800000V

PowerClamp@Typ@1.800000V

PullDown@Typ@0.000000V

GroundClamp@Typ@0.000000V

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IBIS V-I Curves using the same reference voltages

All Curves Reference @ 0 v
IBIS V-I Curves @ High, Low, Open

IBIS Curves @ High, Low, Open

Current(nA)

-500

Voltage(V)

-1.50

OPEN@Typ@0.0V

HIGH@Typ@0.0V

LOV@Typ@0.0V
IBIS Curves @ High, Low, Open (Details)
Loadline Crossing

IBIS Curves @ High, Low, Open

Current(I) vs. Voltage(V)

IBIS V-T Curves, V_fiure @ 1.8 V & 0 V

Time(ns)

X1
X2
X3
X4

OPEN@0.0V
HIGH@0.0V
LOW@0.0V

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The IBIS Curves to check

- Individual V-I Curves
- Combined V-I Curves
- V-T Curves
Individual V-I Curves

It is NECESSARY to check the curves with the SAME reference voltage
Combined V-I Curves

These are the curves that simulator uses.
HIGH, LOW, OPEN

Shown for I/O Buffer. Other types may not have all the states
V-T Curves

Insure the timing related FACT
On-die terminations using IBIS Submodel

V-I Curves using Submodel

- Driving case only

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Conclusions

- IBIS buffer curves are individual and using different reference voltage points
- It is necessary to convert all the curves using the same reference voltage points for checking
- Combined curves for HIGH, LOW, OPEN states are important for validations
- Make sure your V-I and V-T curves are correlated with loadlines
- On-die termination using Submodel needs to be considered for IBIS validations
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