ETHzürich

VLSI 5: DESIGN OF A STANDARD-CELL LIBRARY

SPRING SEMESTER 2025

Project Report

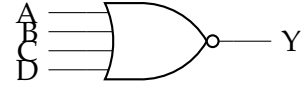Student: **Marco Ferroni**

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Library: EZ130_8T v1

NOR4

Function

Nor of 4 inputs

$$Y = \overline{A + B + C + D}$$

Dimensions

Cell	Height [μm]	Width [μm]
NOR4X1	3.36	2.94
NOR4X2	3.36	2.94

Input pin capacitance

Cell	Capacitance [pF]			
	A	B	C	D
NOR4X1	0.0016	0.0017	0.0017	0.0017
NOR4X2	0.0032	0.0032	0.0033	0.0033

Delay

Cell	Rising delay [ns]				Falling delay [ns]			
	A→Y	B→Y	C→Y	D→Y	A→Y	B→Y	C→Y	D→Y
NOR4X1	0.8152	0.8217	0.8253	0.8047	0.4155	0.4115	0.4054	0.3966
NOR4X2	0.7932	0.8030	0.8111	0.7965	0.4012	0.3971	0.3914	0.3840

Internal dynamic energy

Cell	Rising energy [pJ]				Falling energy [pJ]			
	A→Y	B→Y	C→Y	D→Y	A→Y	B→Y	C→Y	D→Y
NOR4X1	0.0068	0.0058	0.0048	0.0039	0.0003	0.0001	0.0000	-0.0001
NOR4X2	0.0126	0.0108	0.0090	0.0074	0.0005	0.0002	0.0000	-0.0002

Leakage power

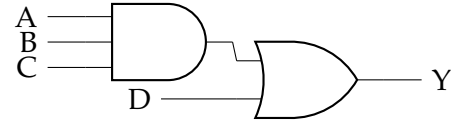| Cell	Leakage [nW]
NOR4X1	0.0325
NOR4X2	0.0812

AO31

Function

A 3-input AND followed by a 2-input OR.

$$Y = A \cdot B \cdot C + D$$

Dimensions

Cell	Height [μm]	Width [μm]
AO31X1	3.36	3.36
AO31X2	3.36	3.36

Input pin capacitance

Cell	Capacitance [pF]			
	A	B	C	D
AO31X1	0.0016	0.0015	0.0015	0.0016
AO31X2	0.0016	0.0015	0.0015	0.0016

Delay

Cell	Rising delay [ns]				Falling delay [ns]			
	A→Y	B→Y	C→Y	D→Y	A→Y	B→Y	C→Y	D→Y
AO31X1	0.4408	0.4526	0.4465	0.3595	0.3782	0.4001	0.4182	0.4024
AO31X2	0.4905	0.4983	0.4880	0.3900	0.4205	0.4400	0.4562	0.4482

Internal dynamic energy

Cell	Rising energy [pJ]				Falling energy [pJ]			
	A→Y	B→Y	C→Y	D→Y	A→Y	B→Y	C→Y	D→Y
AO31X1	0.0025	0.0023	0.0023	0.0023	0.0064	0.0072	0.0081	0.0066
AO31X2	0.0047	0.0045	0.0045	0.0044	0.0084	0.0092	0.0101	0.0086

Leakage power

Cell	Leakage [nW]
AO31X1	0.0699
AO31X2	0.0971

XNOR3

Function

XNOR of 3 inputs

$$Y = \overline{A \oplus B \oplus C}$$
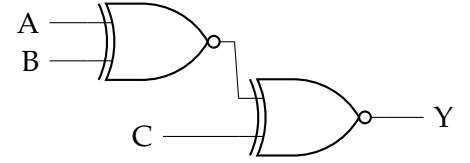
Dimensions

Cell	Height [μm]	Width [μm]
XNORX1	3.36	6.3
XNORX2	3.36	6.3

Input pin capacitance

Cell	Capacitance [pF]		
	A	B	C
XNOR3X1	0.0016	0.0032	0.0032
XNOR3X2	0.0016	0.0032	0.0032

Delay

Cell	Rising delay [ns]			Falling delay [ns]		
	A→Y	B→Y	C→Y	A→Y	B→Y	C→Y
XNOR3X1	0.5479	0.4918	0.3607	0.5625	0.5309	0.3804
XNOR3X2	0.5792	0.5270	0.4097	0.5978	0.5741	0.4427

Internal dynamic energy

Cell	Rising energy [pJ]			Falling energy [pJ]		
	A→Y	B→Y	C→Y	A→Y	B→Y	C→Y
XNOR3X1	0.0119	0.0116	0.0085	0.0134	0.0113	0.0078
XNOR3X2	0.0141	0.0138	0.0107	0.0155	0.0134	0.0097

Leakage power

Cell	Leakage [nW]
XNOR3X1	0.1888
XNOR3X2	0.2170