We want to design some logic that can implement any 2-input Boolean logic expression.

How many possible logic combinations.

$Y_N=F_N(A,B)$

2 inputs, 2^2=4 input combinations, 4^2=16 Possible Functions

$Y_N=F_N(A,B)$

2 inputs, $2^2=4$ input combinations, $4^2=16$ Possible Functions

A	B	Y_0	Y_1	Y_2	Y_3	Y_4	Y_5	…	Y_{15}
0	0								
0	1								
1	0								
1	1								

$Y_N=F_N(A,B)$

2 inputs, $2^2=4$ input combinations, $4^2=16$ Possible Functions

A	B	Y_0	Y_1	Y_2	Y_3	Y_4	Y_5	…	Y_{15}
0	0	0	1	0	1	0	1		1
0	1	0	0	1	1	0	0		1
1	0	0	0	0	0	1	1		1
1	1	0	0	0	0	0	0		1

$Y_N=F_N(A,B)$

2 inputs, $2^2=4$ input combinations, $4^2=16$ Possible Functions

A	B	Y_0	Y_1	Y_2	Y_3	Y_4	Y_5	Y_6	…	Y_{15}
0	0	0	1	0	1	0	1	0		1
0	1	0	0	1	1	0	0	1		1
1	0	0	0	0	0	1	1	1		1
1	1	0	0	0	0	0	0	0		1

$Y_0 = 0$

$Y_1 = /A \cdot /B,$ NOR Gate

$Y_2 = /A \cdot B$

$Y_3 = /A \cdot /B + /A \cdot B = /A$

$Y_4 = A \cdot /B$

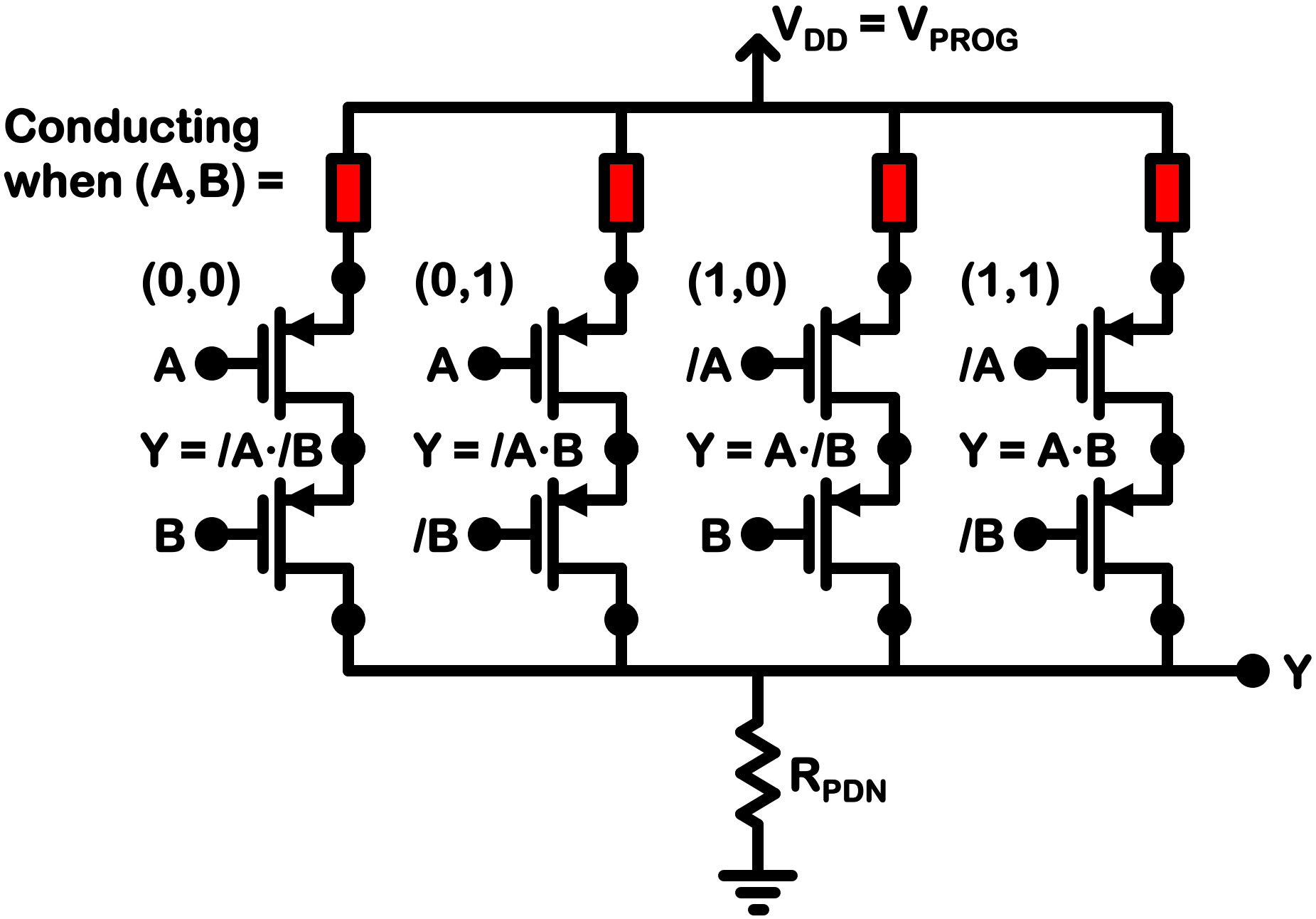
$Y_5 = /A \cdot /B + A \cdot /B = /B$

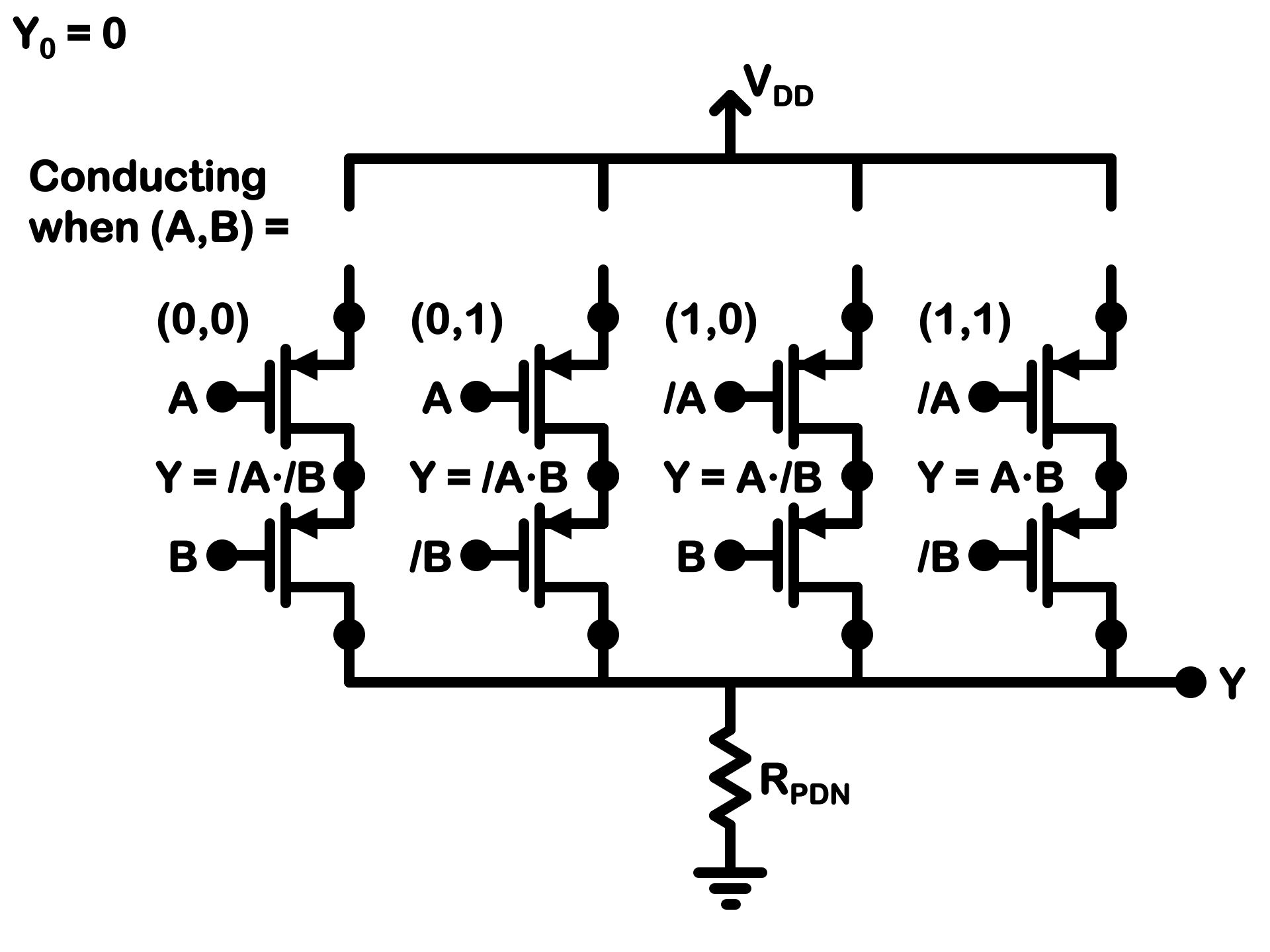
$Y_6 = /A \cdot B + A \cdot /B,$ XOR Gate

…

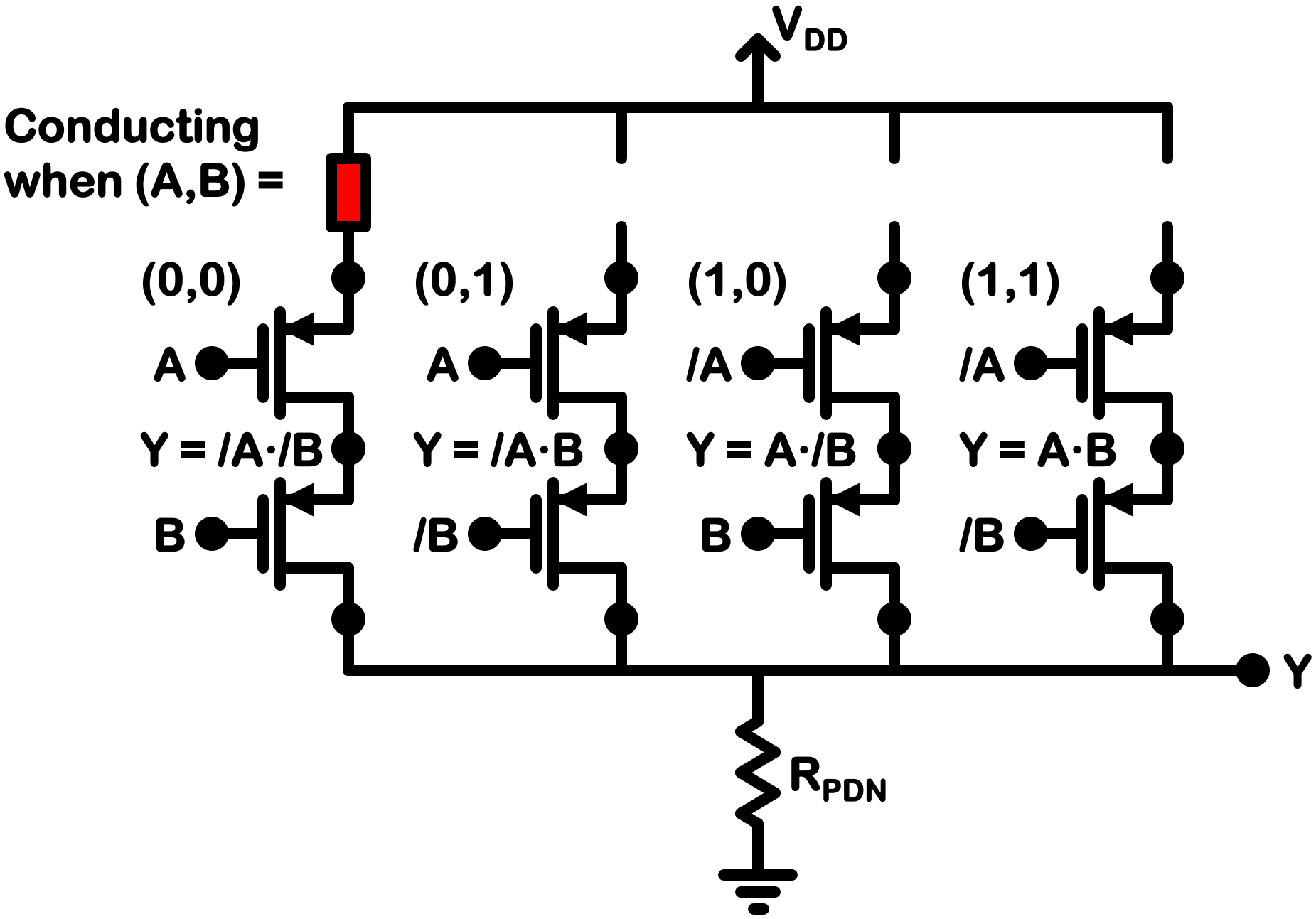
$Y_{15} = /A \cdot /B + /A \cdot B + A \cdot /B + A \cdot B = 1$

Fuse Programmable

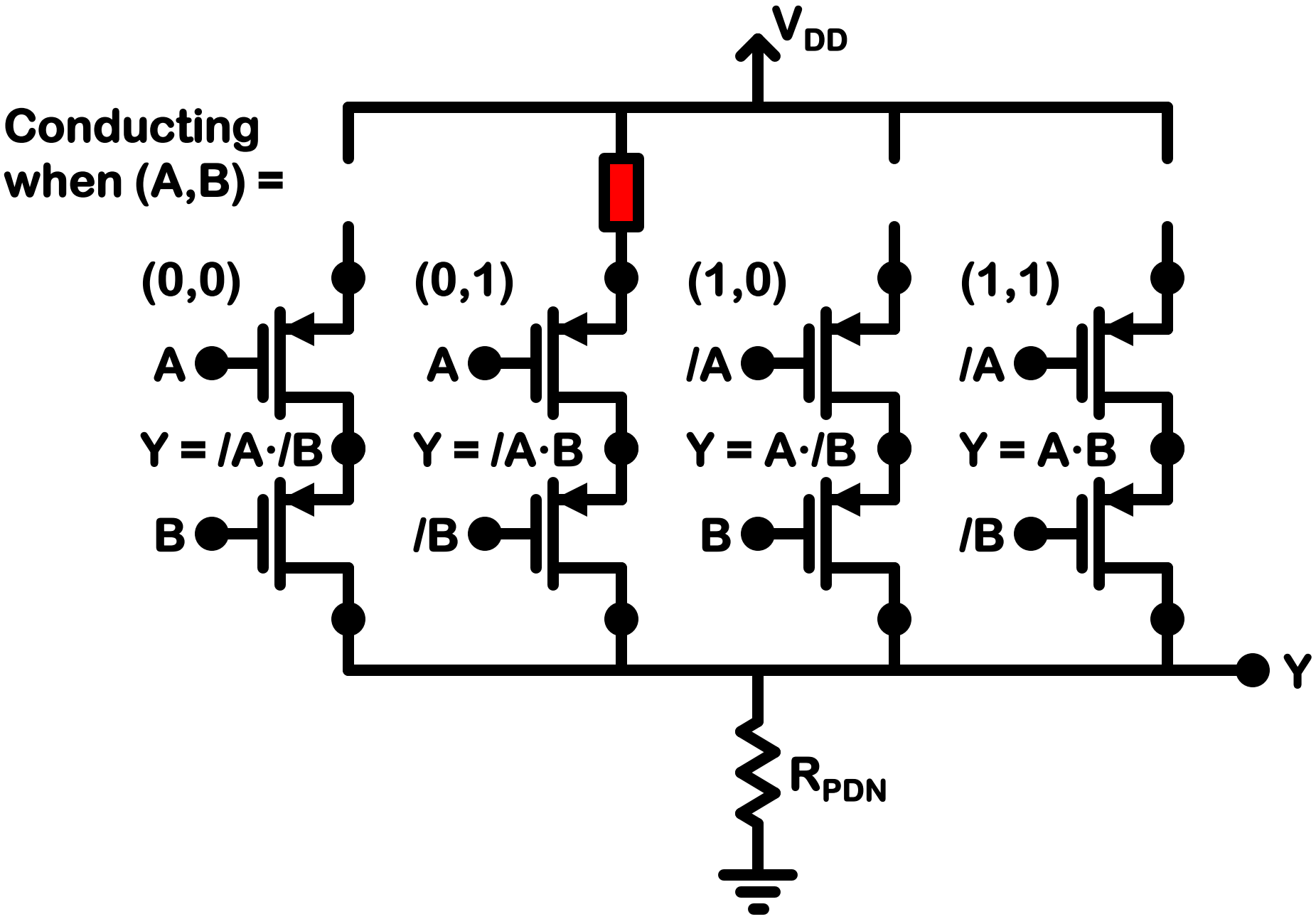



$Y_0 = 0$
V_{DD}
Conducting when (A,B) =
(0,0)
(0,1)
(1,0)
(1,1)
A
A
/A
/A
Y = /A·/B
Y = /A·B
Y = A·/B
Y = A·B
B
/B
B
/B
Y
R_{PDN}

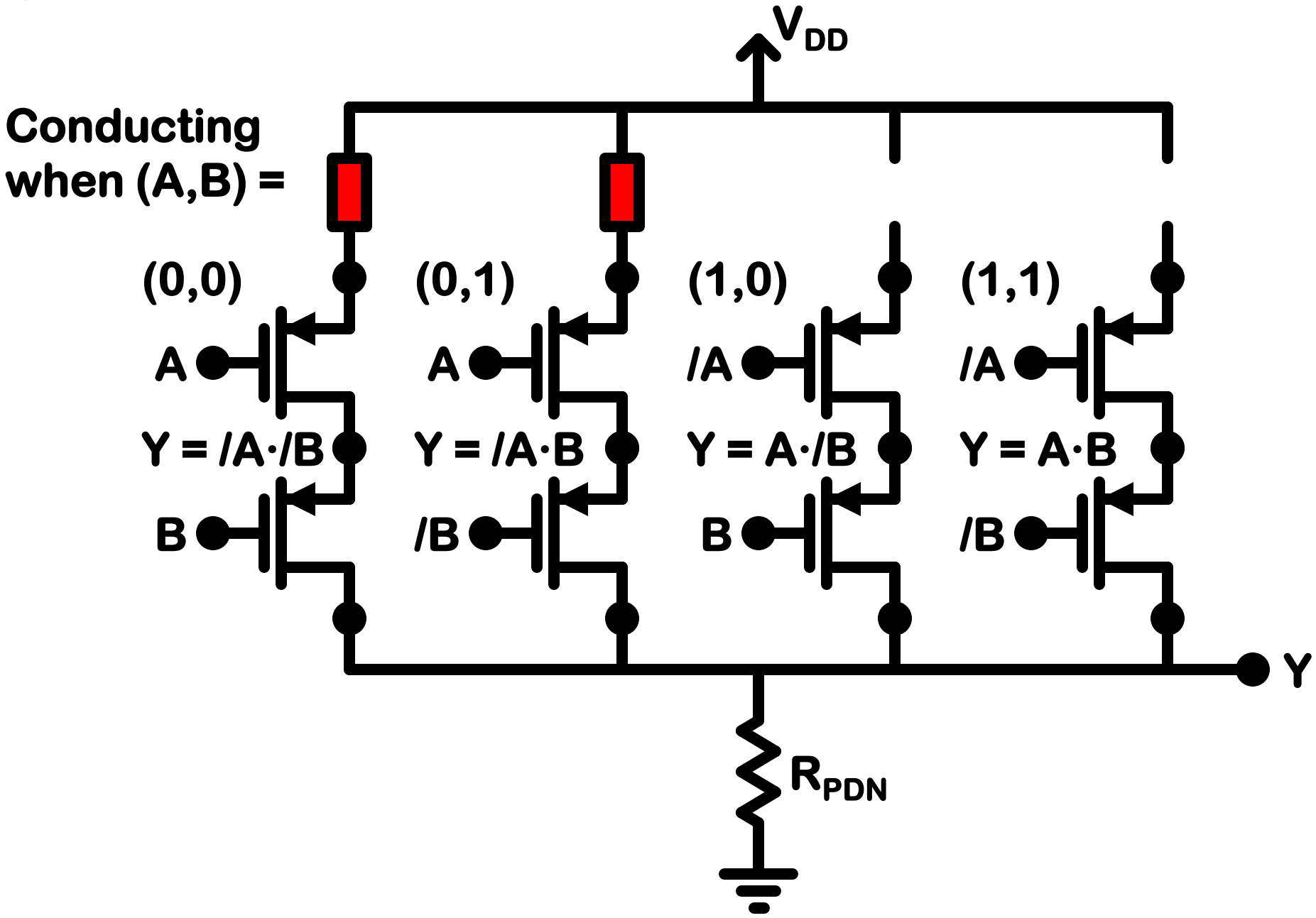
$Y_1 = /A \cdot /B$, express Y in terms of inverted inputs.



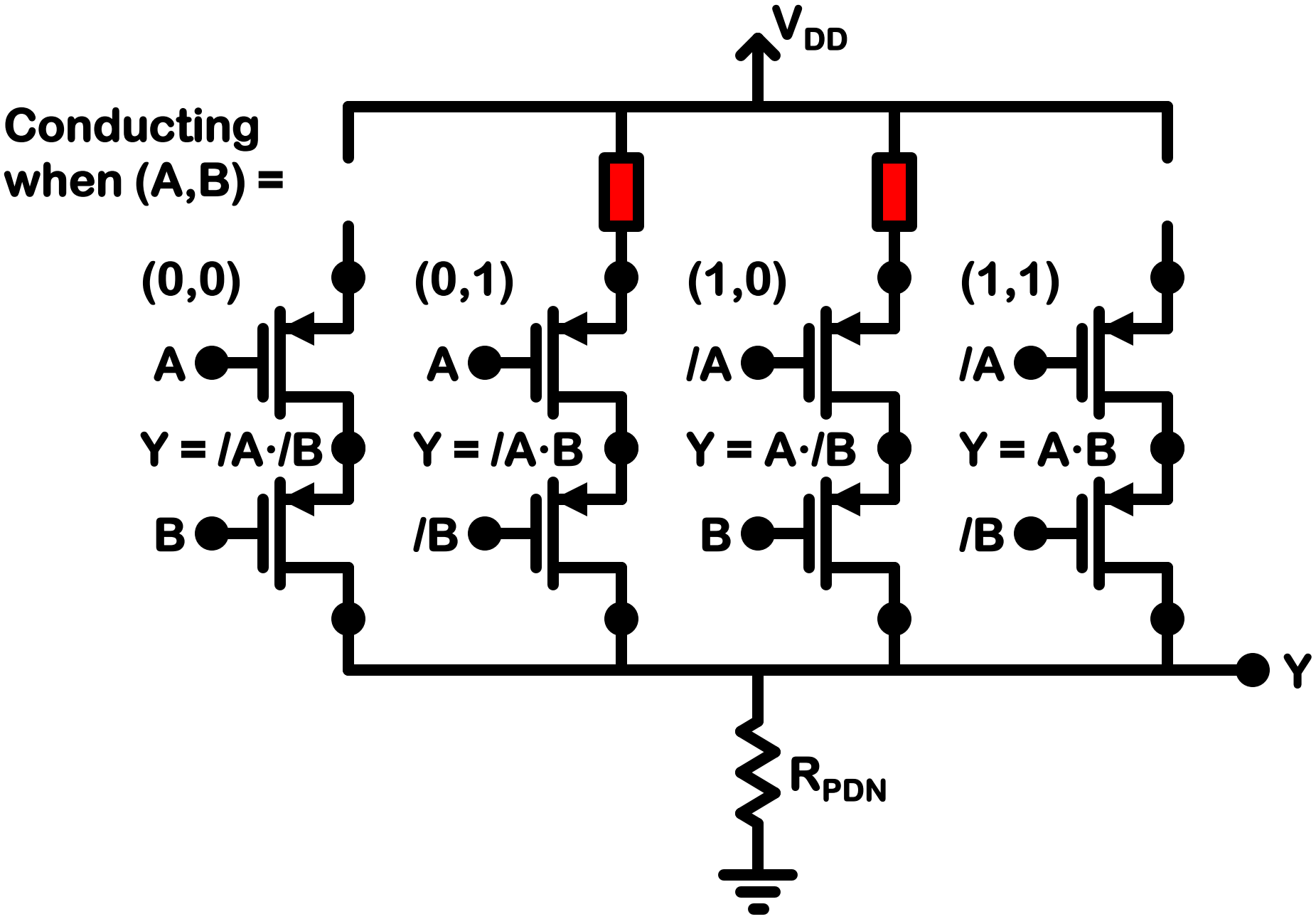
$Y_2 = /A \cdot B$, express Y in terms of inverted inputs.



Y_3 = /A·/B + /A·B, express Y in terms of inverted inputs.



$Y_6 = A \cdot /B + /A \cdot B$, XOR, express Y in terms of inverted inputs.



$Y_N=F_N(A,B)$

2 inputs, $2^2=4$ input combinations, $4^2=16$ Possible Functions

A	B	Y_0	Y_1	Y_2	Y_3	Y_4	Y_5	Y_6	…	Y_{15}
0	0	0	1	0	1	0	1	0		1
0	1	0	0	1	1	0	0	1		1
1	0	0	0	0	0	1	1	1		1
1	1	0	0	0	0	0	0	0		1

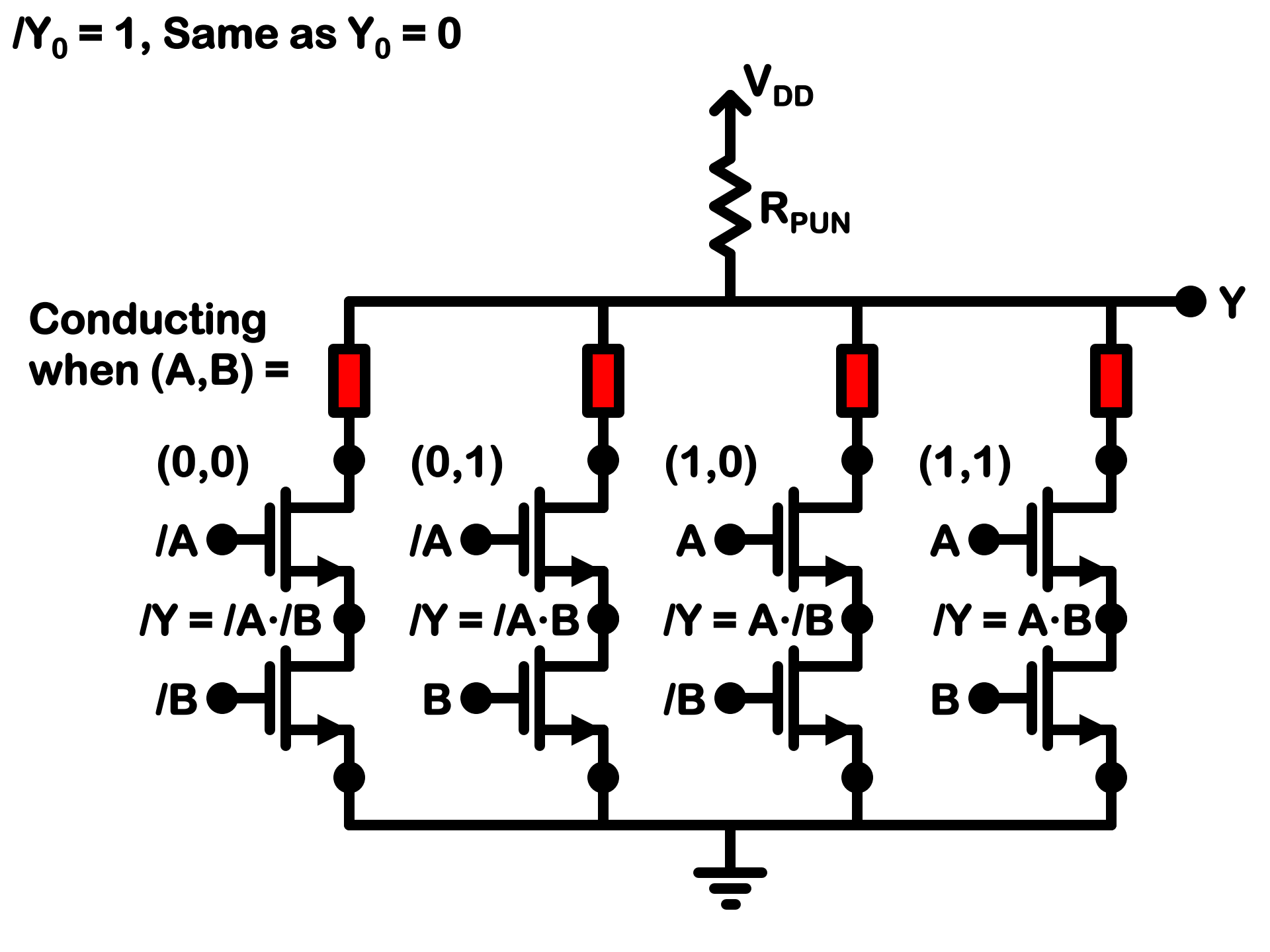
$/Y_0 = /A \cdot /B + /A \cdot B + A \cdot /B + A \cdot B = 1$

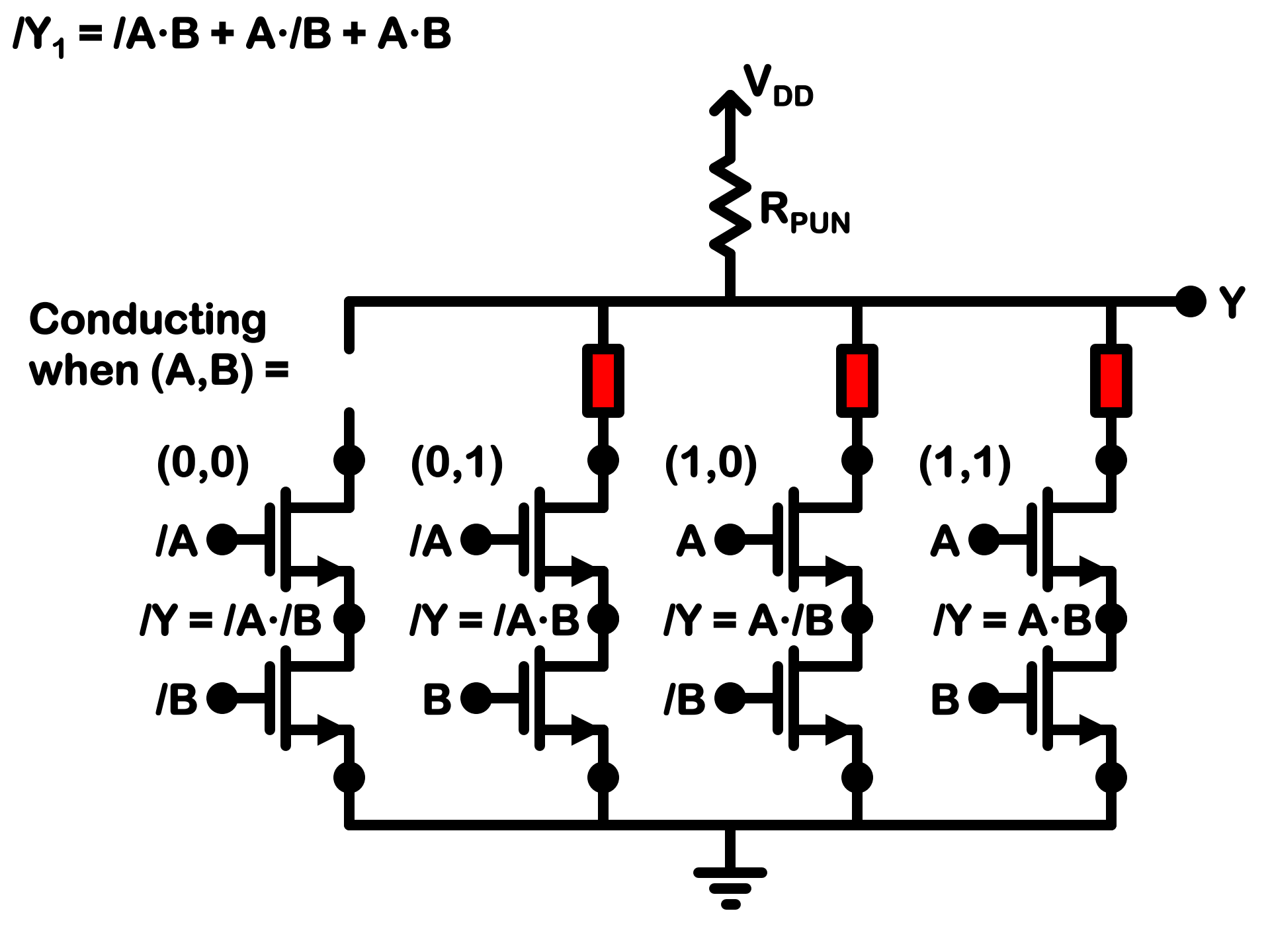
$/Y_1 = /A \cdot B + A \cdot /B + A \cdot B,$ NOR Gate

…

$/Y_6 = /A \cdot /B + A \cdot B$

…


/Y0 = 1, Same as Y0 = 0
VDD
RPUN
Y
Conducting when (A,B) =
(0,0)
(0,1)
(1,0)
(1,1)
/A
/A
A
A
/Y = /A·/B
/Y = /A·B
/Y = A·/B
/Y = A·B
/B
B
/B
B


/Y1 = /A·B + A·/B + A·B
VDD
RPUN
Y
Conducting when (A,B) =
(0,0)
/A
/Y = /A·/B
/B
(0,1)
/A
/Y = /A·B
B
(1,0)
A
/Y = A·/B
/B
(1,1)
A
/Y = A·B
B

$/Y_6 = /A \cdot /B + A \cdot B$