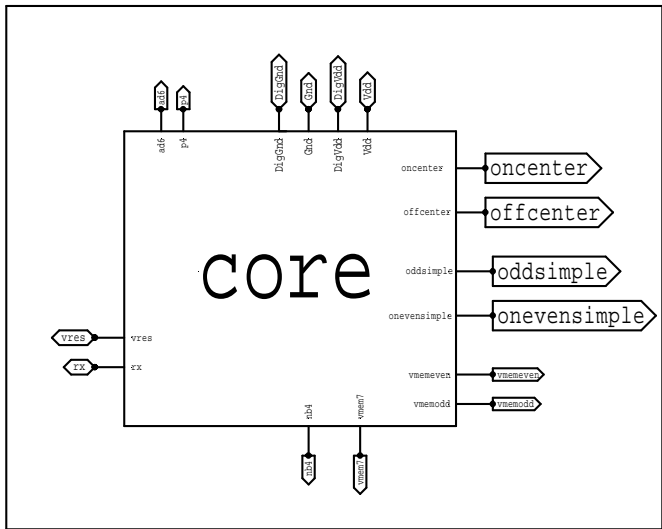


gnd's capped to short at next level up



Use cell "x" to extract whole chip
 friend22 - the physiologist's friend

| | |
|--|--------------------------------|
| Module:chip | Created:Aug 23, 1998 17:40:08 |
| Info:Physiologists friend -- physiology helper | Modified:Sep 16, 2002 17:00:32 |
| Author:INI neuromorphic design class/elisabetta chicca/ telluride avLSI tutorial | |
| File:\\zig\home\tobi\chips\friend22\friend22 | |

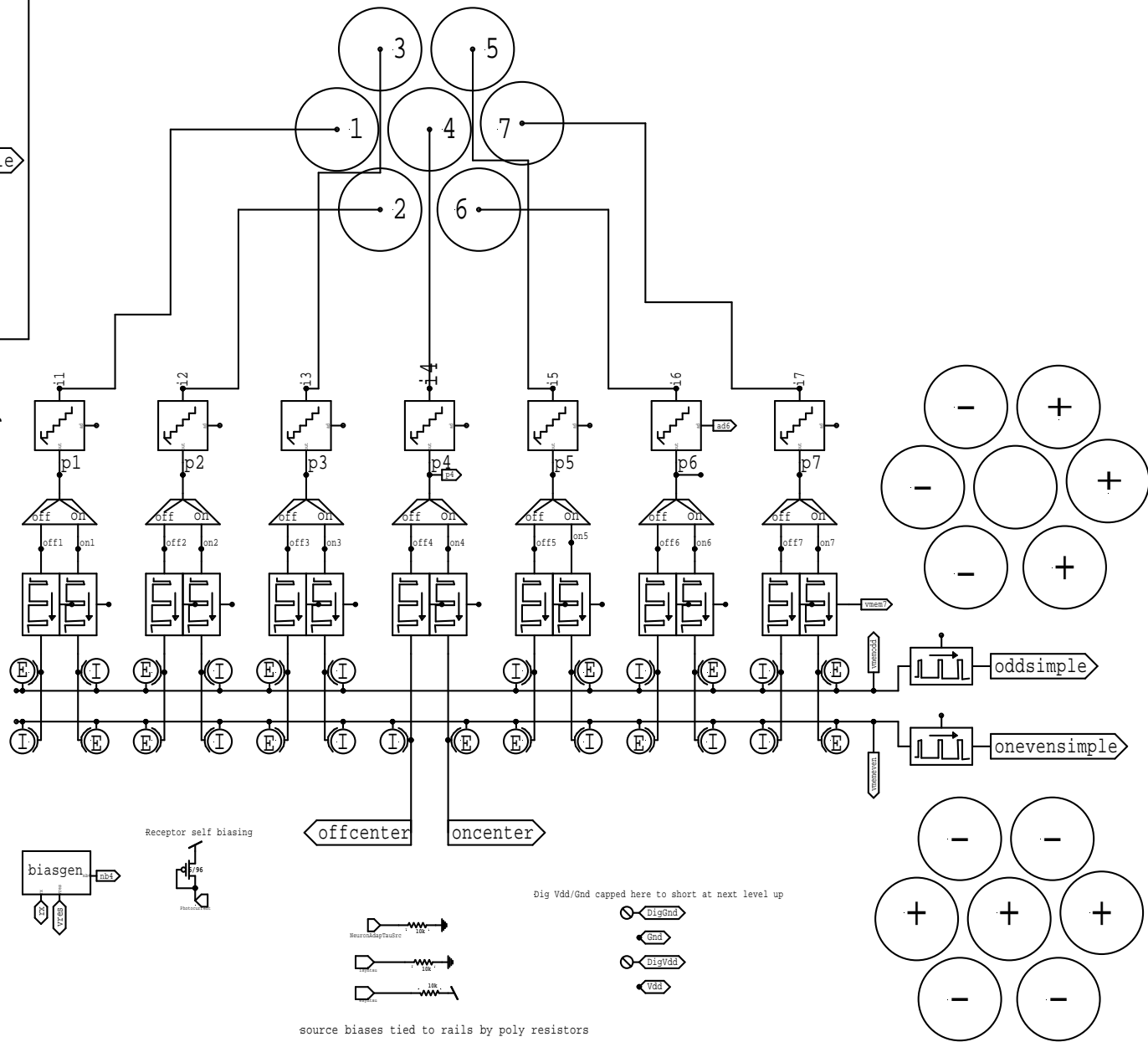


photoreceptor

bipolar

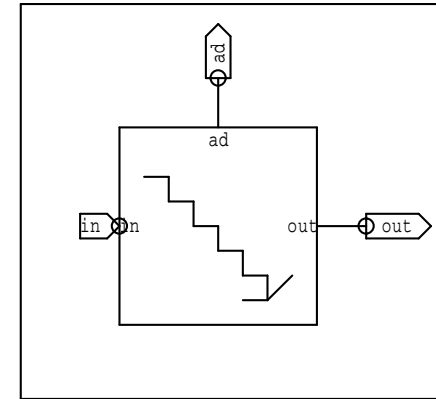
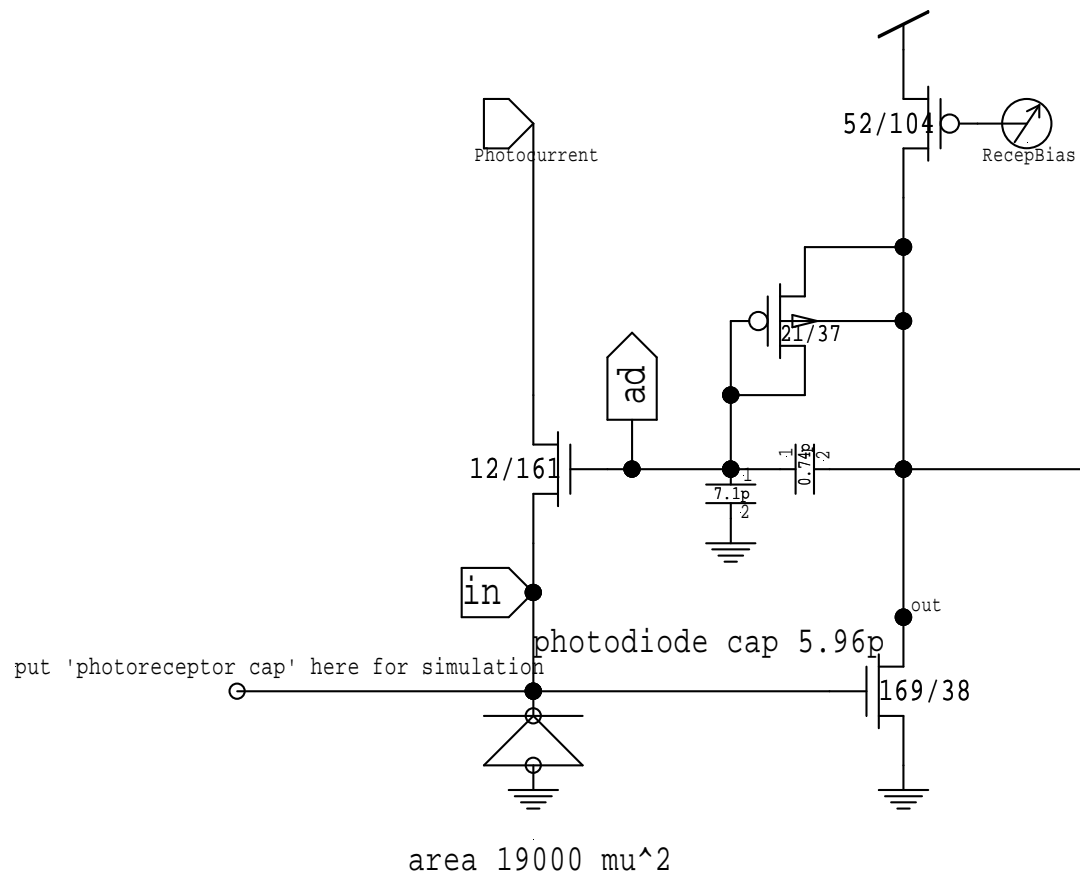
soma

esyn/isyn synapses

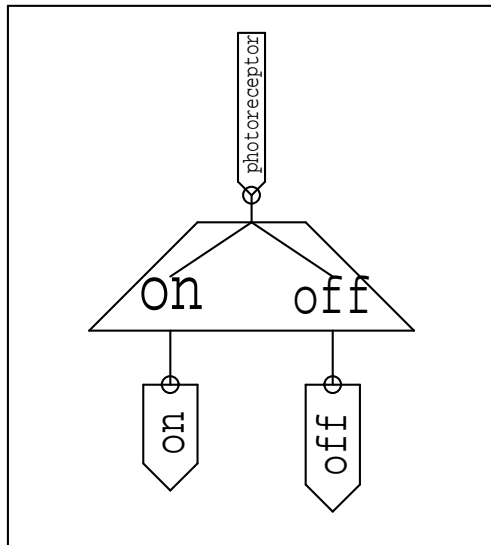
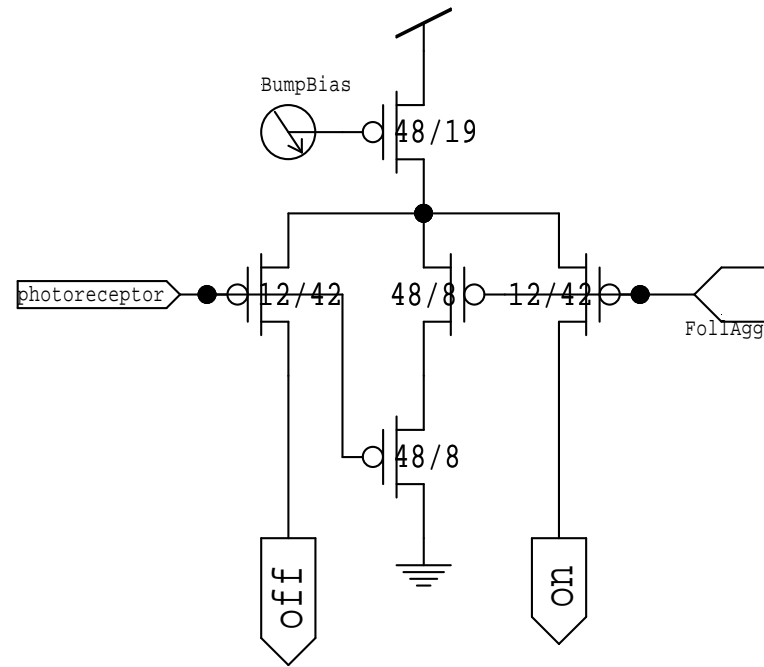
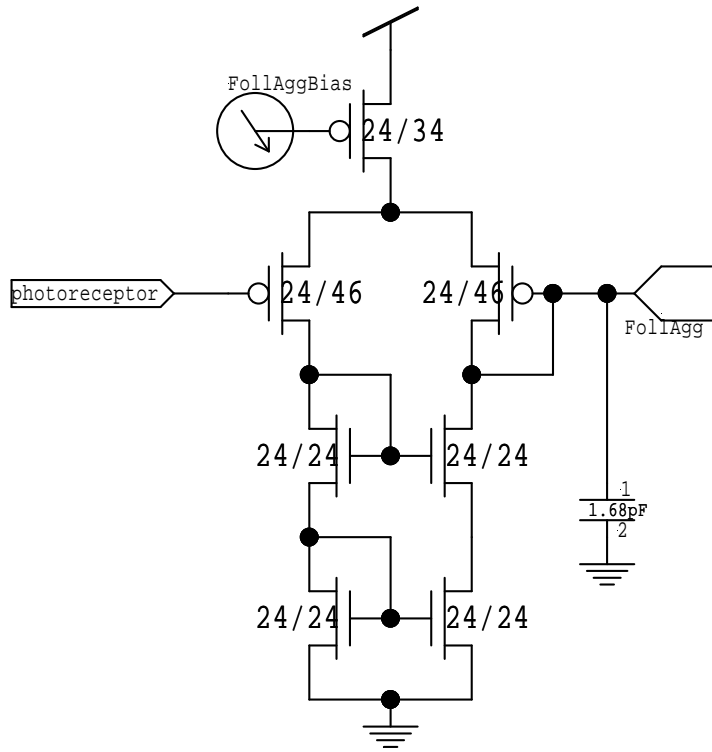


| | |
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| author=2[author] | width=2[width] |
| title=2[title] | width=2[width] |

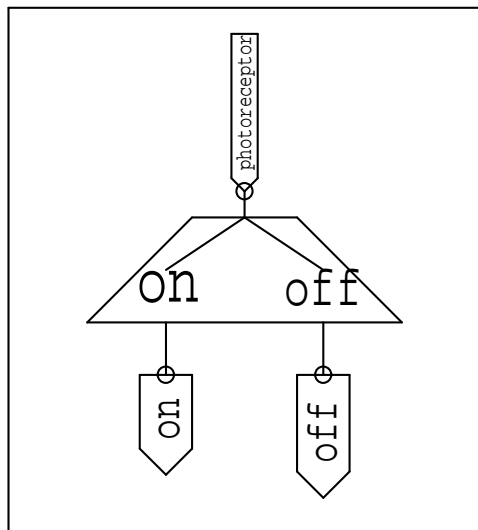
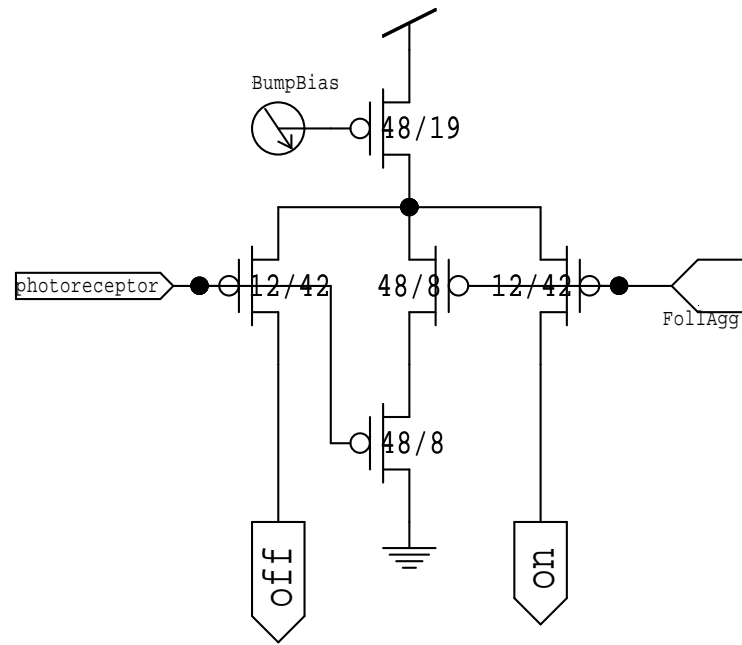
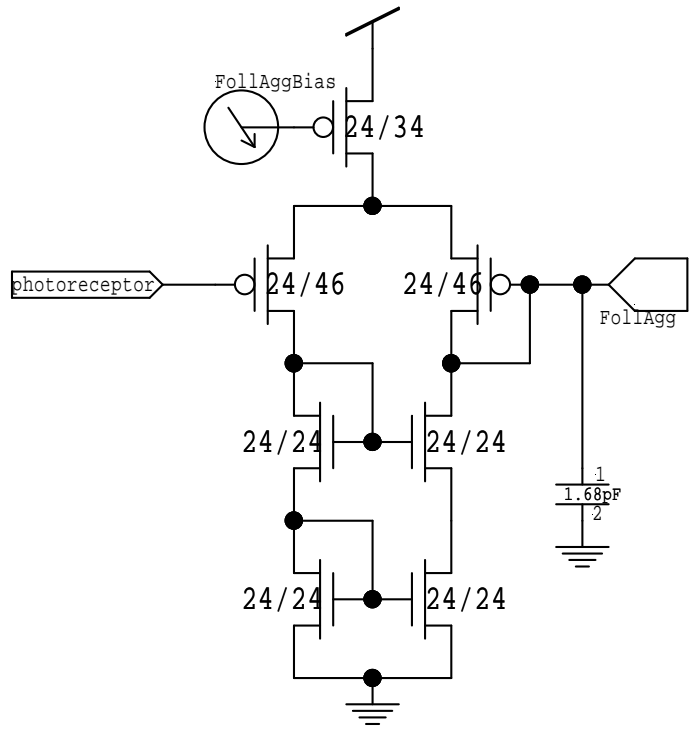
source biases tied to rails by poly resistors



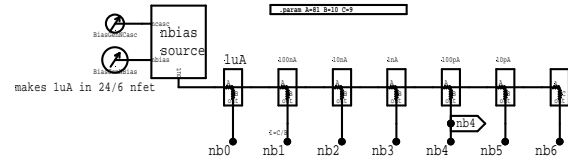
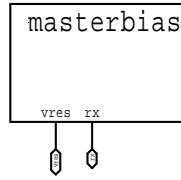
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| Module:photoreceptor | Created:Jul 31, 1998 06:57:36 |
| | Modified:Sep 16, 2002 14:07:58 |
| Info:photoreceptor | |
| Author:tobi | |
| File:\\zig\home\tobi\chips\friend22\friend22 | |



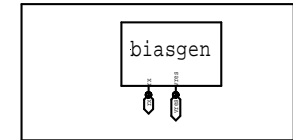
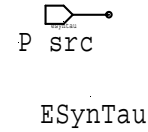
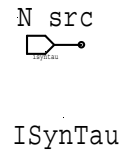
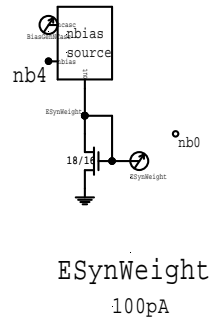
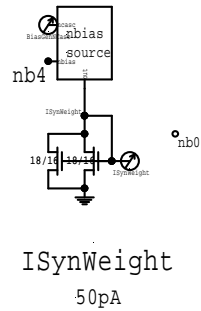
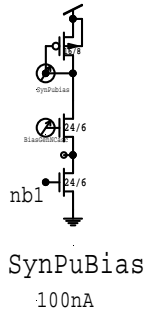
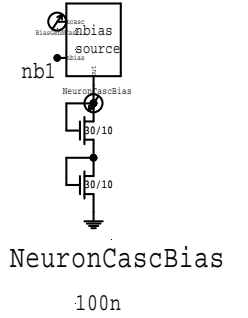
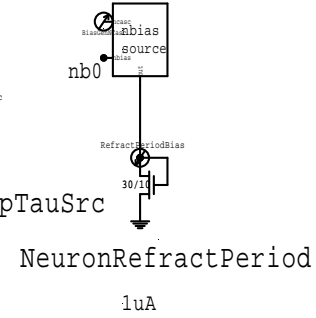
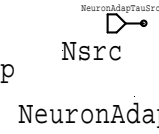
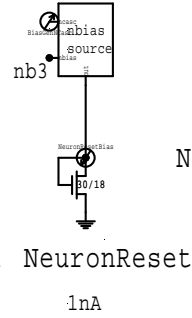
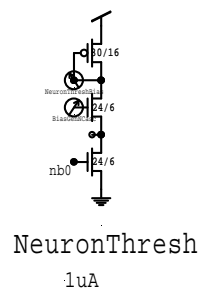
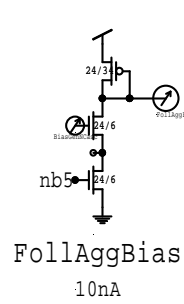
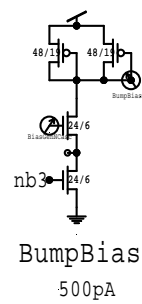
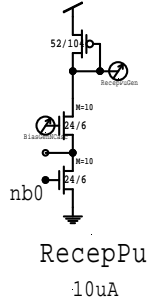
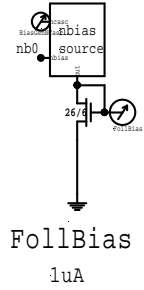
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|--|-------------------------------|
| Module:bipolar | Created:Jul 7, 2000 10:27:43 |
| | Modified:Oct 1, 2001 07:15:08 |
| Info:bioplar cell layer, takes output from photoreceptor and <input type="checkbox"/> and makes on/off currents <input type="checkbox"/> | |
| Author:INI | |
| File:\\Zig\home\tobi\chips\friend22\friend22 | |



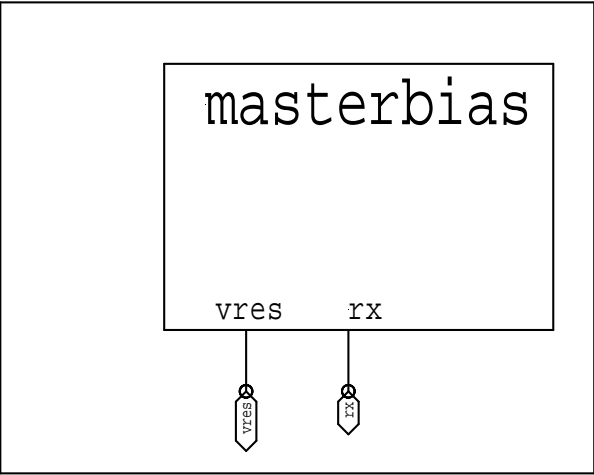
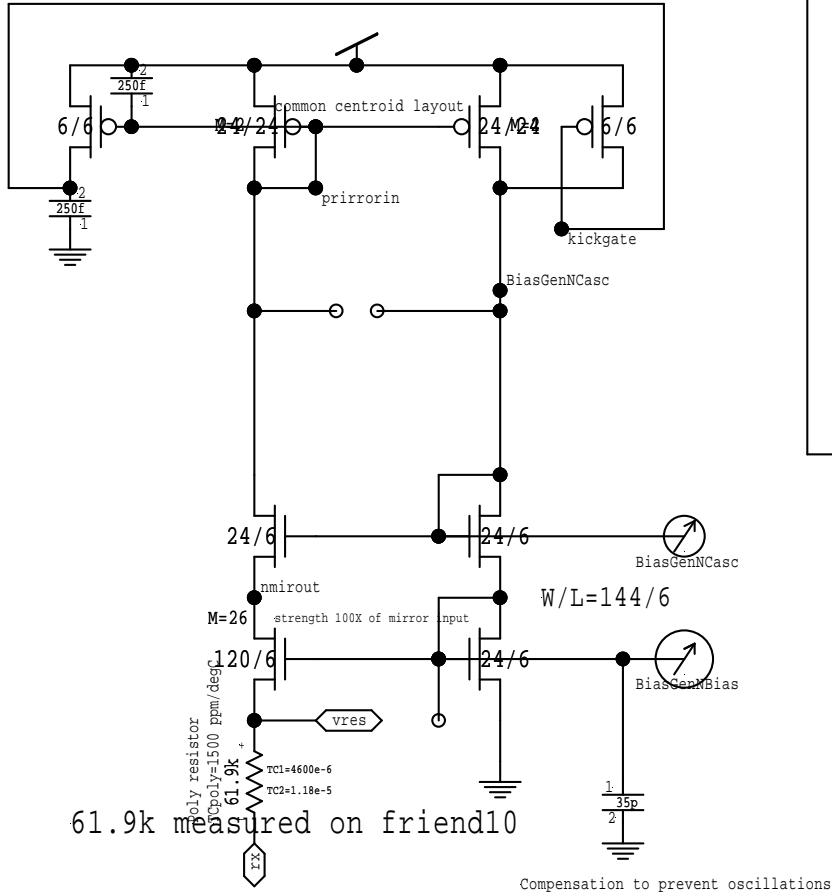
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| Module: \${Module} | Created: \${Created} |
| | Modified: \${Modified} |
| Info: \${Info} | |
| Author: \${Author} | |
| File: \${File} | |



$I_{i+1}/I_i = R \rightarrow B/A = R/(1-R)^2 ; C = B(1-R)$
 So if you want R=0.1, you get A=81, B=10, C=9 for instance



| Module: [Module] | Created: [Created] |
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| Info: [Info] | Modified: [Modified] |
| Author: [Author] | |
| File: [File] | |



61.9k measured on friend10

$$R_{int} * T_{Cint} = -R_{ext} * T_{Cext}$$

Compensation to prevent oscillations

Bias current, Strong inversion: $I = (2/\beta) * (L/W) * (1/R^2)$
 $R = \sqrt{((2*L)/(I*\beta*W))}$
 Weak inversion: $I = \ln(W/L \text{ ratio}) * U_t/R$
 $R = \ln(W/L \text{ ratio}) * U_t/I$
 $\ln(W/L \text{ ratio}) = 3.075$

$\beta = \mu * C_{ox} / 2$ (this is MOSIS K')
 1.6um AMI $\beta_N = 38.3 \mu S/V$ $\beta_P = 11.5 \mu S/V$
 1.6um AMI $R_{poly} = 36 \text{ ohm/sq}$

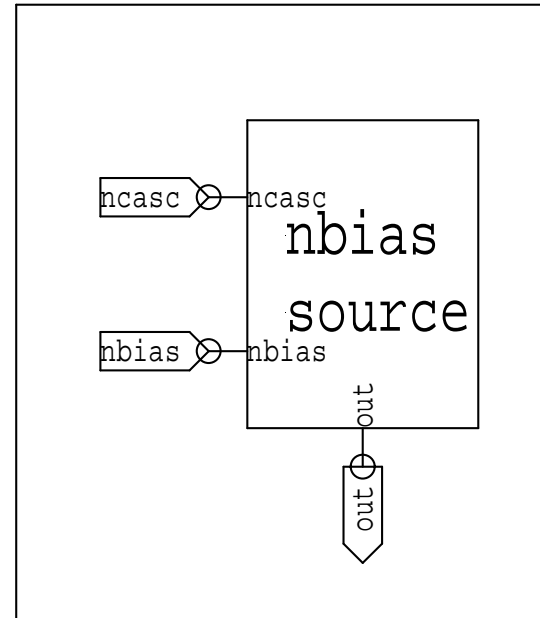
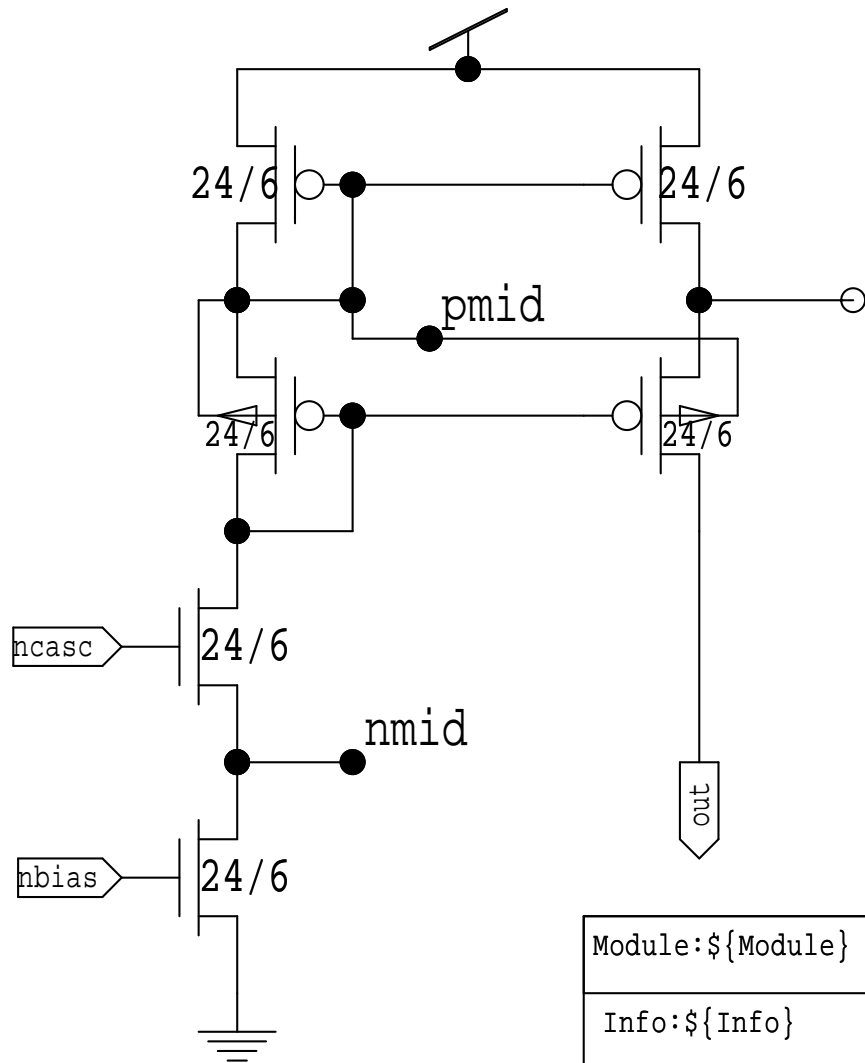
AMI 1.6um, $I_{master} = 10 \mu A \Rightarrow R_{tot} = 14.75 \text{ kohm}$ ($R_{poly} = 1.47 \text{ kohm}$, $R_x = 13 \text{ kohm}$)
 AMI 1.6um, $I_{master} = 10 \mu A \Rightarrow R_{tot} = 7.68 \text{ kohm}$ ($R_{poly} = 768 \text{ kohm}$, $R_x = 6.9 \text{ kohm}$)

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| Module: \${Module} | Created: \${Created} |
| | Modified: \${Modified} |
| Info: \${Info} | |
| Author: \${Author} | |
| File: \${File} | |

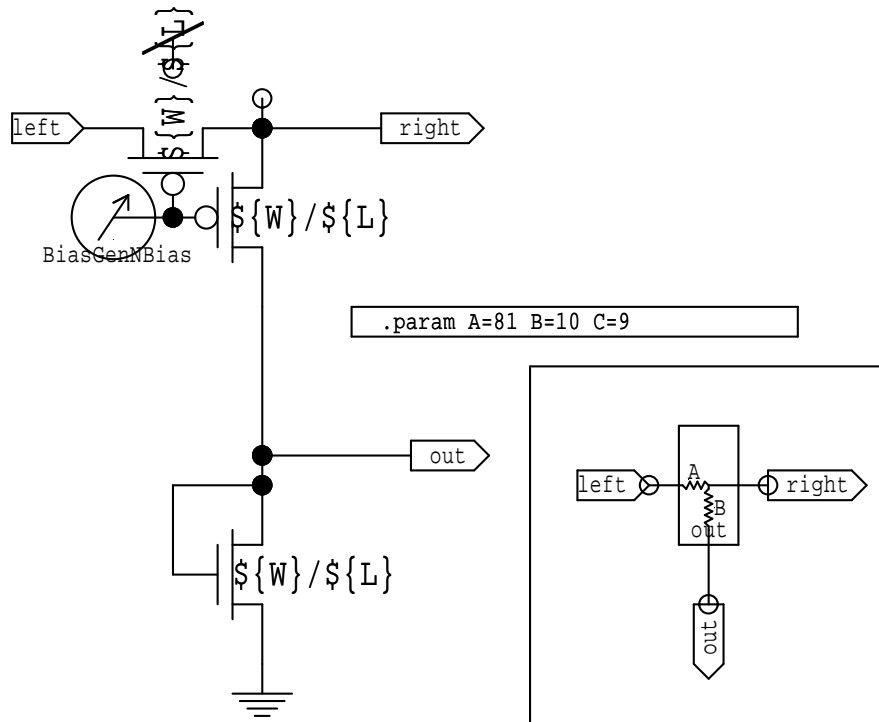
strong inversion

Use matlab biasgen.m to compute resistance values

$$I = (1/R^2) * ((M2-M1)^2 / (M1*M2^2 + M1^2*M2 + 2*(M1*M2)^{1.5}))$$



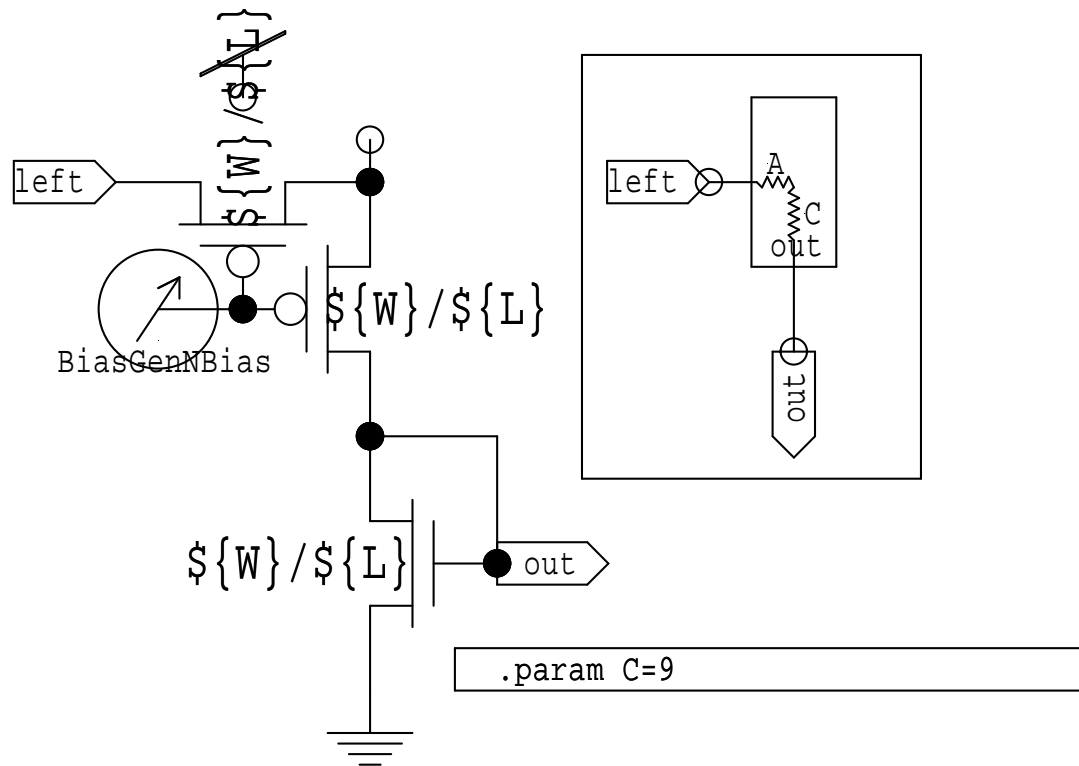
| | |
|--------------------|------------------------|
| Module: \${Module} | Created: \${Created} |
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| File: \${File} | |



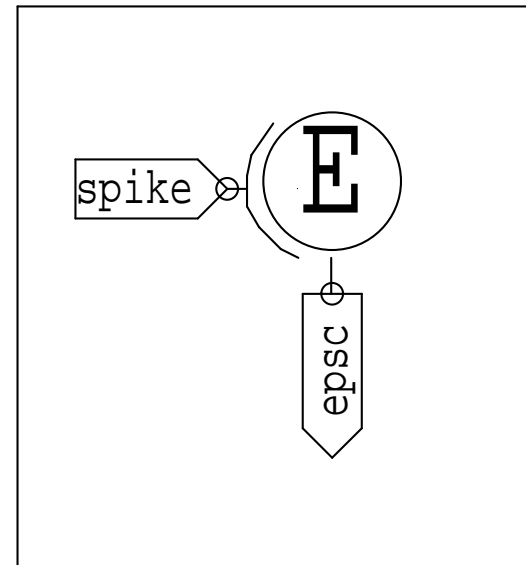
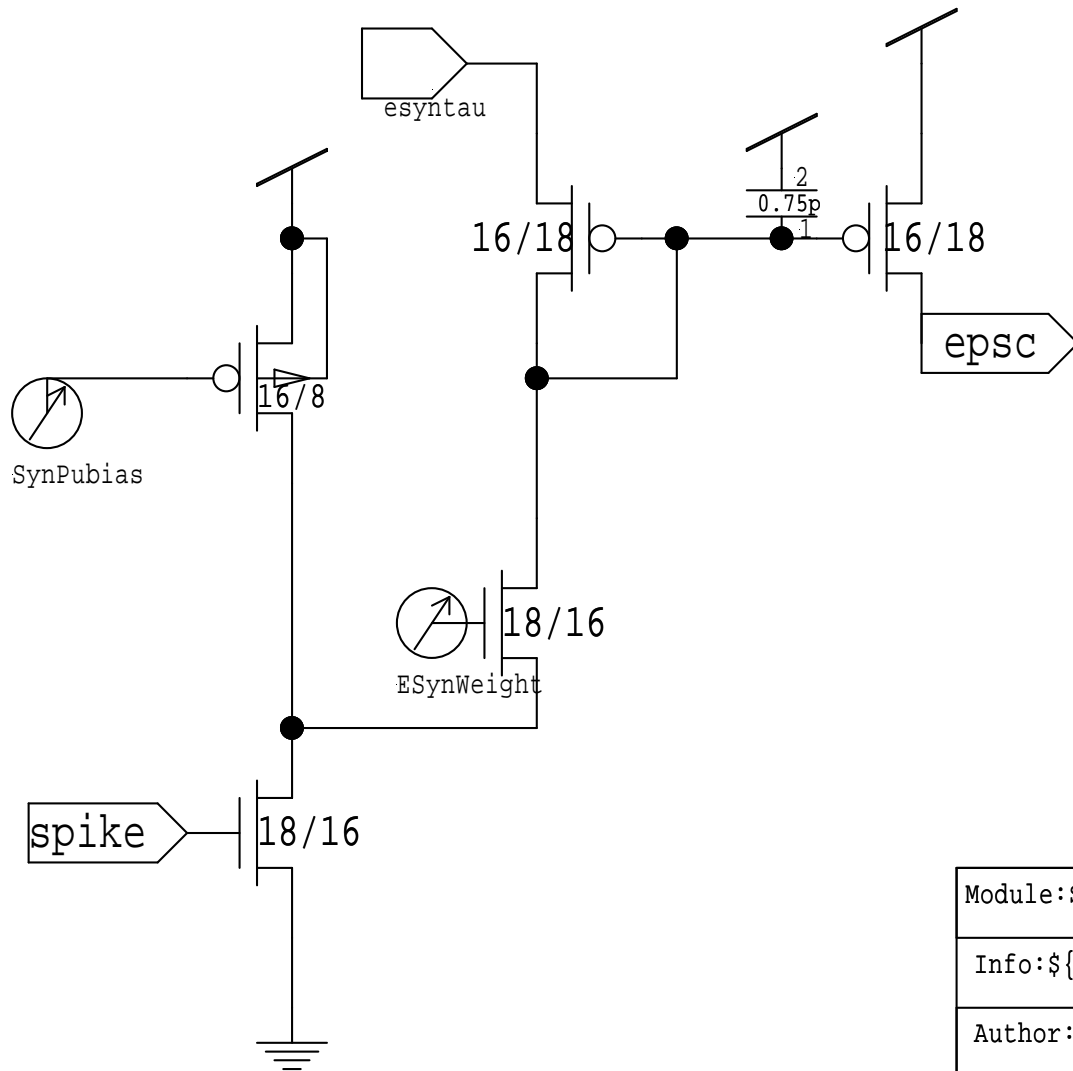
$$I_{i+1}/I_i = R \rightarrow B/A = R/(1-R)^2 ; C = B(1-R)$$

So if you want $R=0.1$, you get $A=81$, $B=10$, $C=9$ for instance

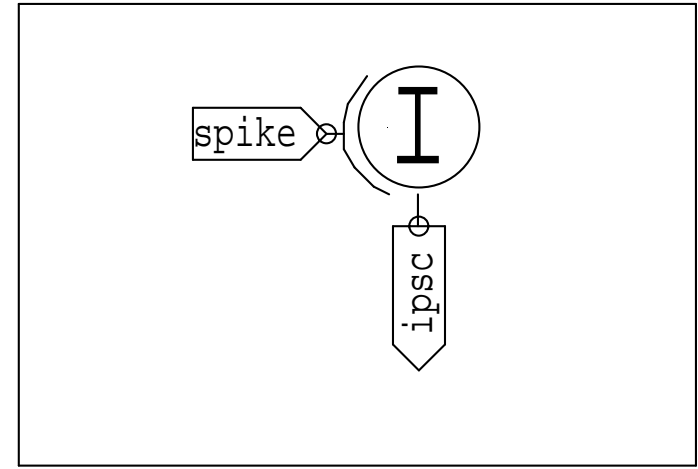
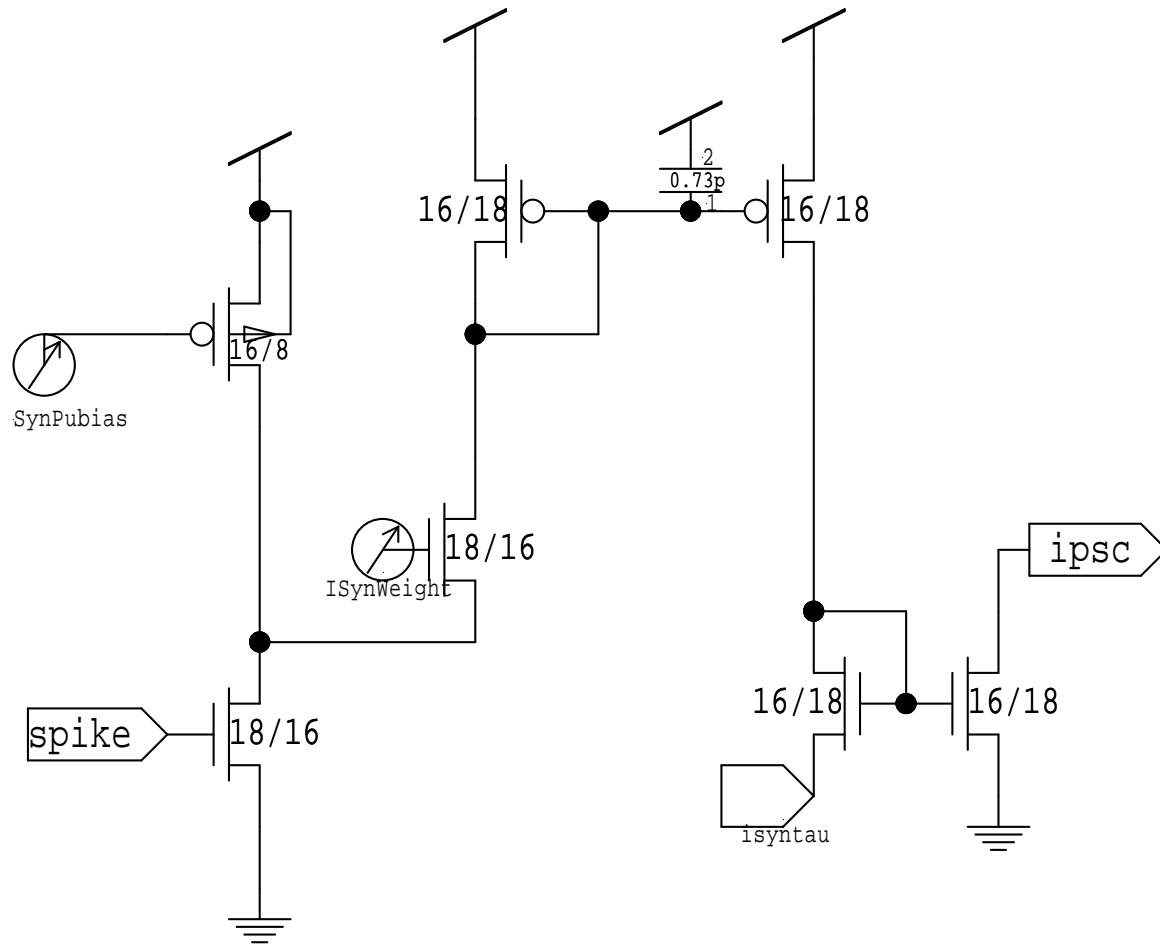
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| Module: \${Module} | Created: \${Created} Modified: \${Modified} |
| Info: \${Info} | |
| Author: \${Author} | |
| File: \${File} | |



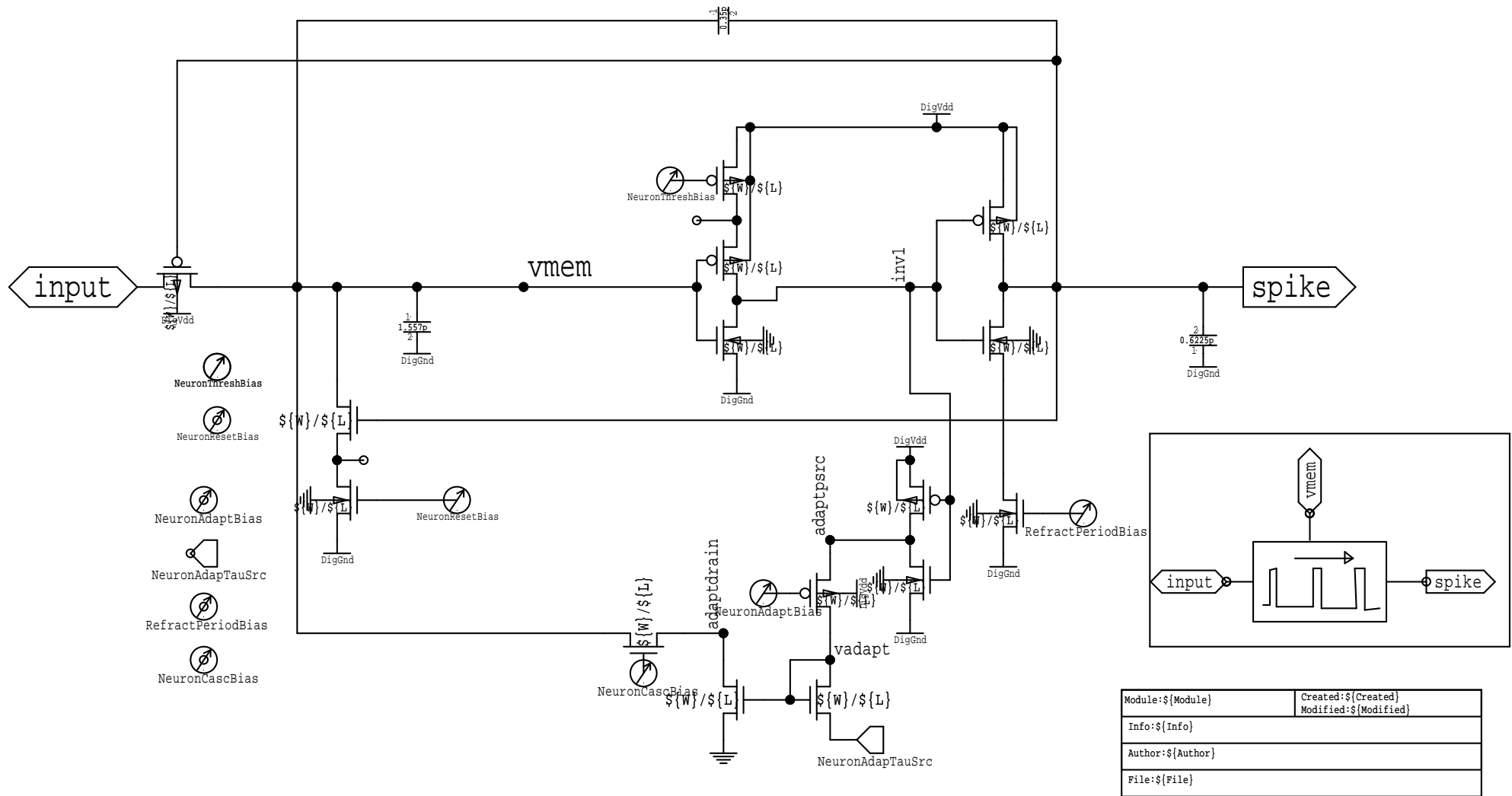
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| Info: $\{\text{Info}\}$ | |
| Author: $\{\text{Author}\}$ | |
| File: $\{\text{File}\}$ | |

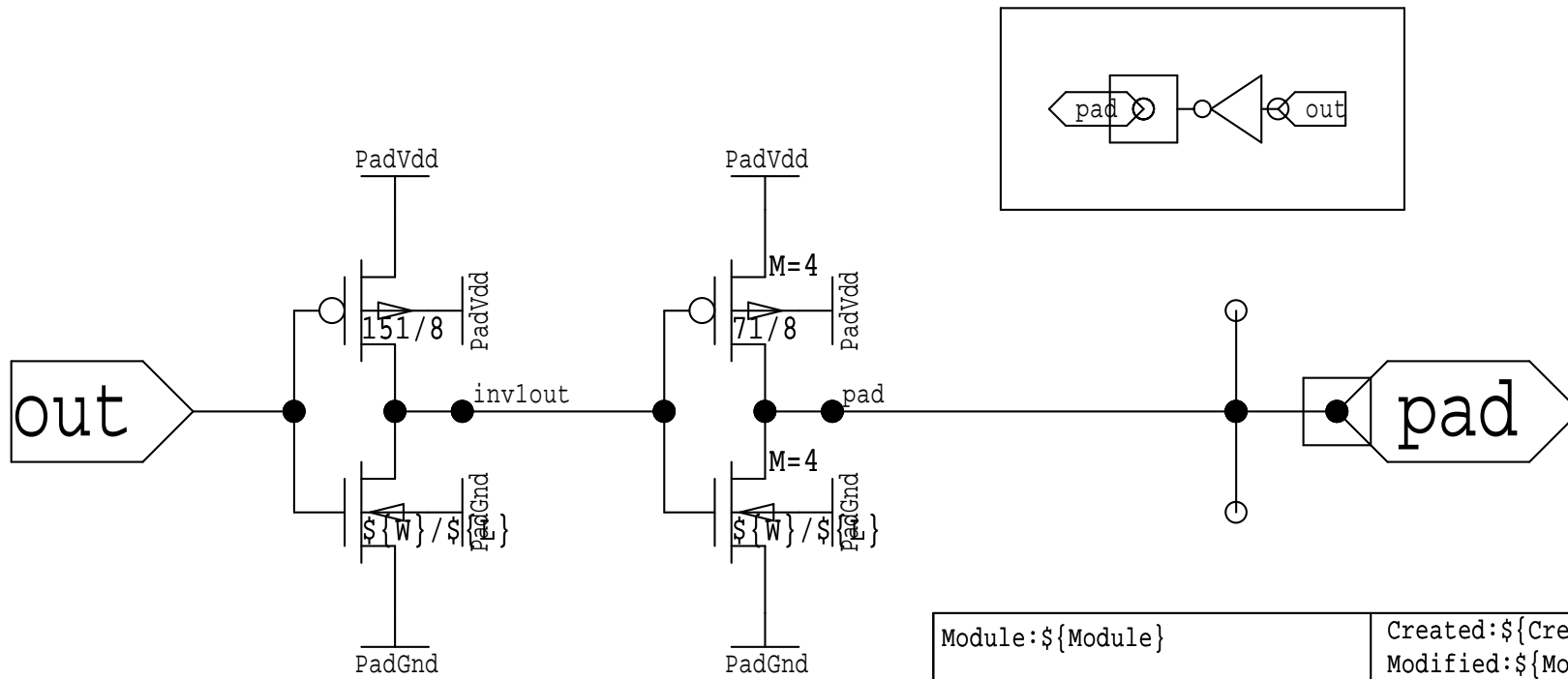


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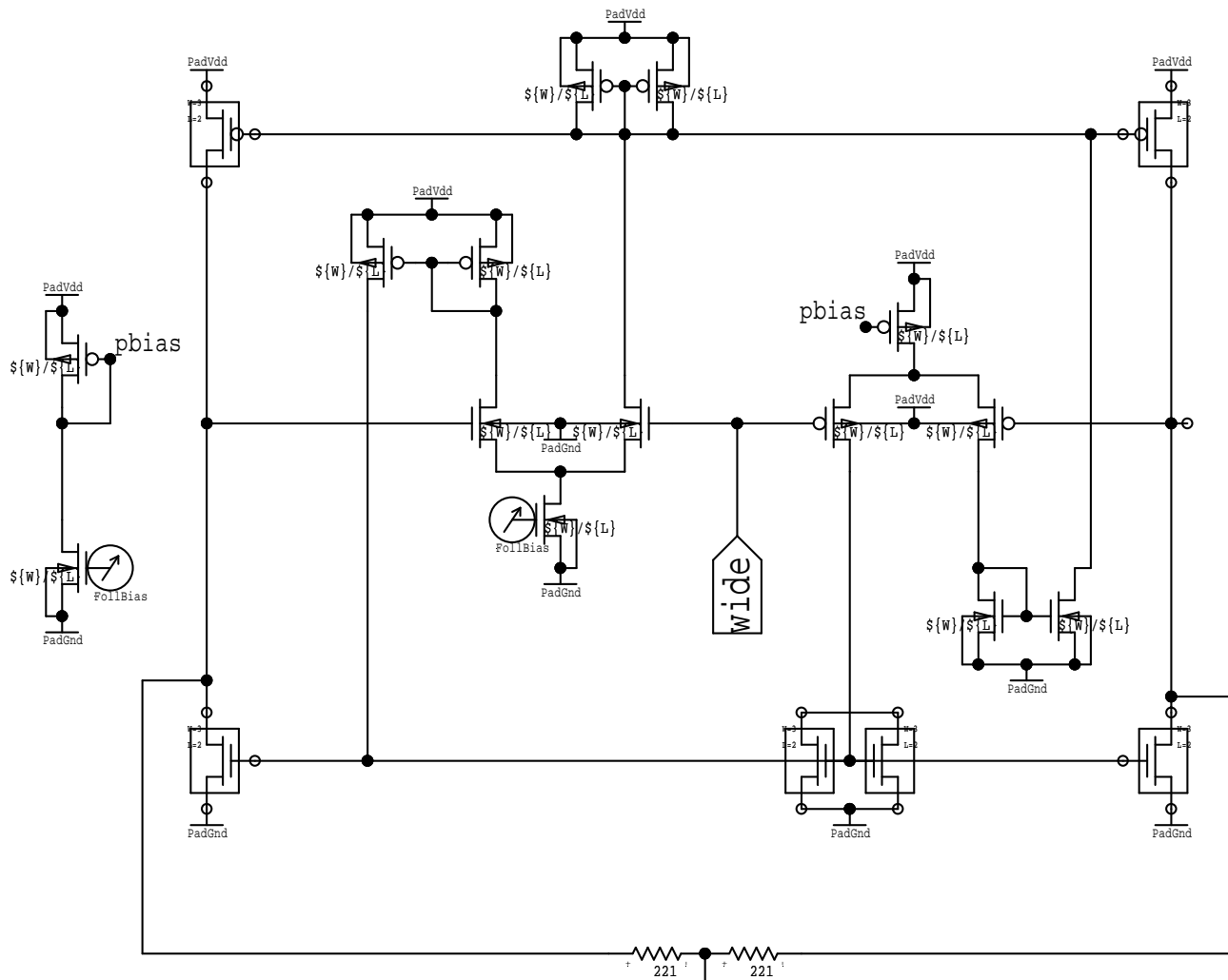


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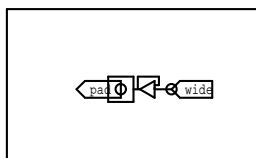




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| Module: \${Module} | Created: \${Created} |
| | Modified: \${Modified} |
| Info: \${Info} | |
| Author: \${Author} | |
| File: \${File} | |



FETs with boxes are not extracted, they are placholders



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| Module: \${Module} | Created: \${Created} |
| Info: \${Info} | Modified: \${Modified} |
| Author: \${Author} | |
| File: \${File} | |