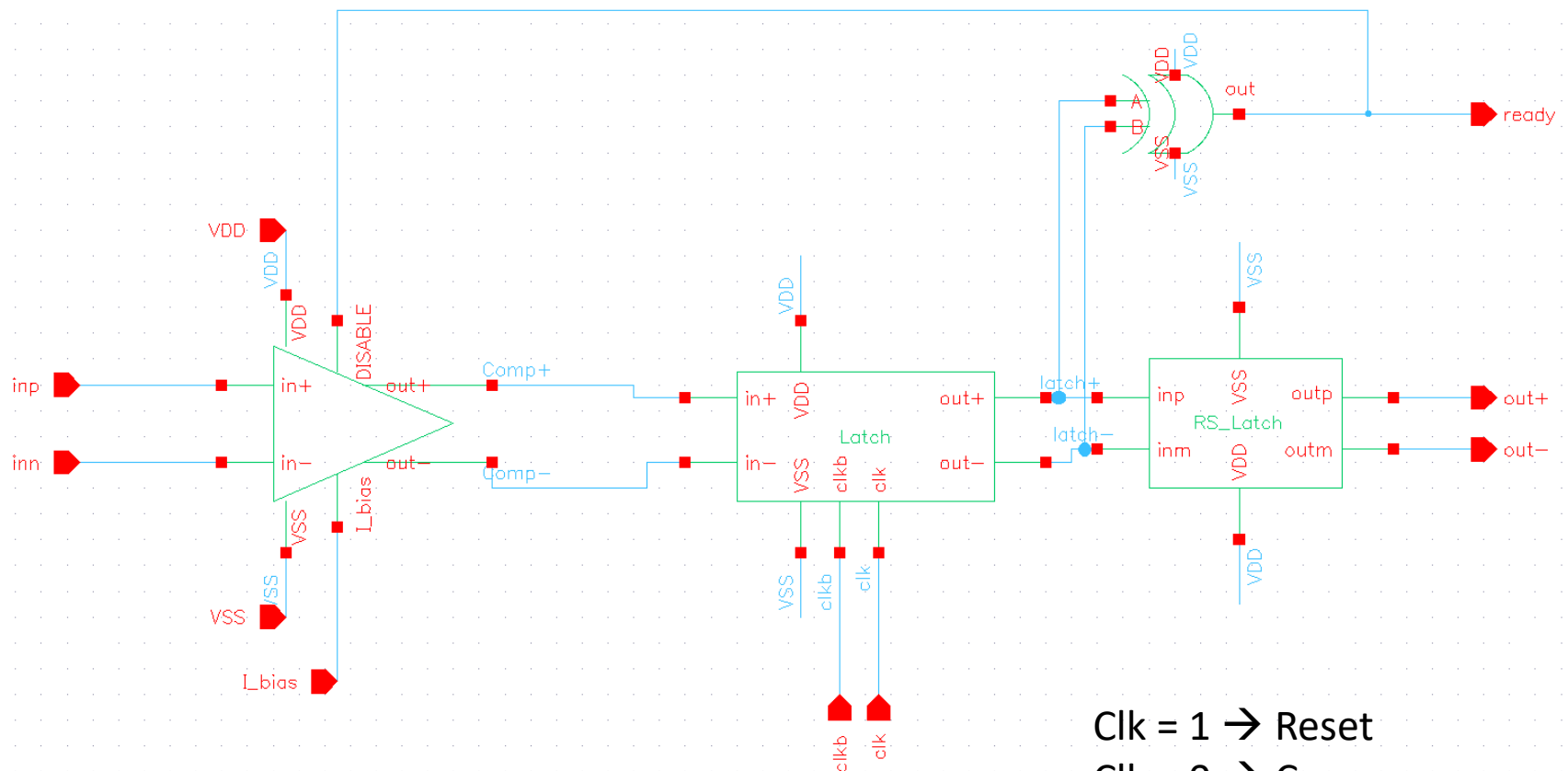


Dynamic Comparator for Asynchronous SAR ADC

MUHAMMAD ALDACHER

4/16/2020

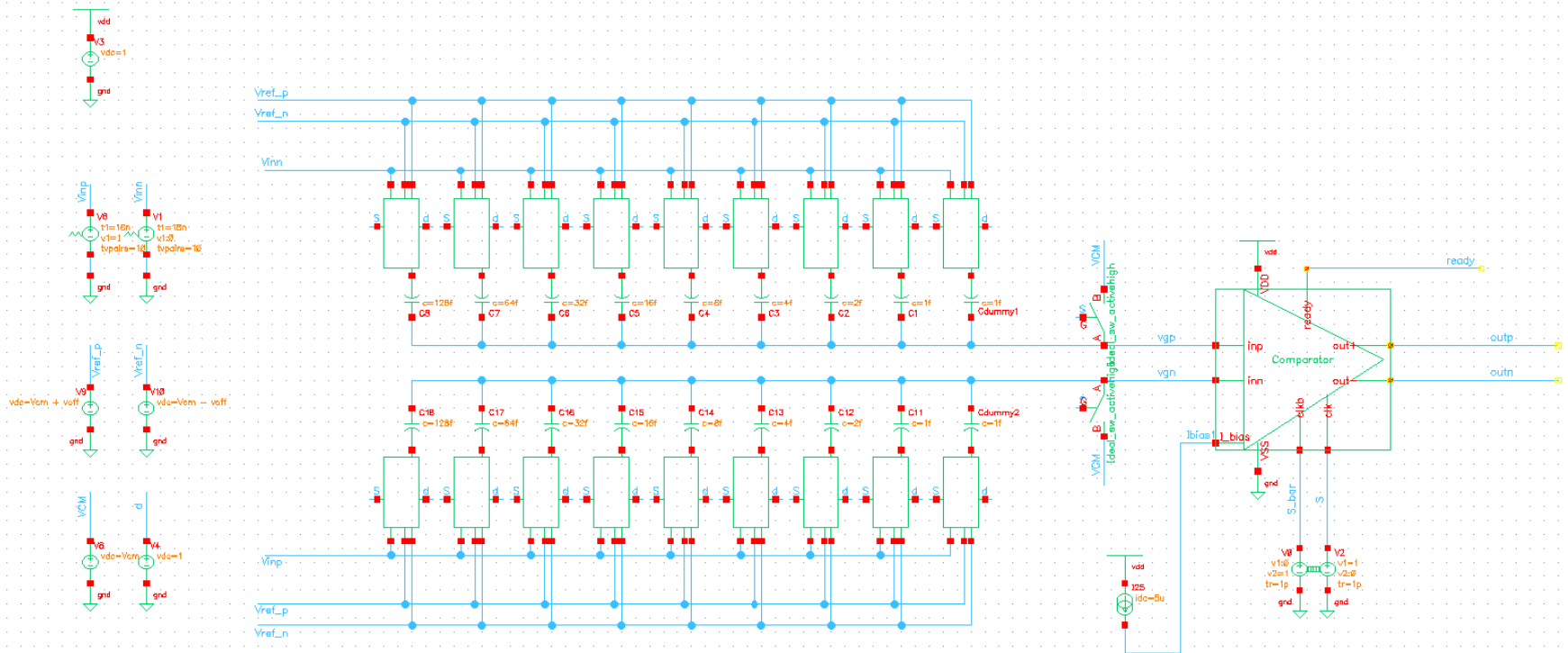
Block Diagram



Clk = 1 → Reset
 Clk = 0 → Compare

Testbench & Simulations

Testbench



Testbench (parameters)

ADE L (20) - SAR_Comparator tb_comp2 schematic

Launch Session Setup Analyses Variables Outputs Simulation Results Tools Calibre Help

27

Design Variables

Name	Value
1 freq_clk	400M
2 Ron	1m
3 Vcm	500m
4 vin	1m
5 voff	0
6 Mcx	10
7 Mc	40
8 Mn	40
9 Mp	2
10 Mp_s	1
11 Cap_inv	1f
12 Mp_tail	10
13 Mp_inv	10
14 Mn_inv	10
15 Mn_tail	10
16 Ntg_lth	15
17 SR_inp_inv	1
18 SR_inn_inv	4
19 SR_nmos	10
20 SR_outp_inv	5
21 SR_outn_inv	5
22 xor_inv_p	1
23 xor_inv_n	4

> Results in /home/muhammad/simulation/tb_...

Analyses

Type	Enable	Arguments
1 tran	<input checked="" type="checkbox"/>	0 100n

Outputs

Name/Signal/Expr	Value	Plot	Save	Save Options
1 S		<input type="checkbox"/>	<input type="checkbox"/>	allv
2 S_bar		<input type="checkbox"/>	<input type="checkbox"/>	allv
3 vgp		<input type="checkbox"/>	<input type="checkbox"/>	allv
4 vgn		<input type="checkbox"/>	<input type="checkbox"/>	allv
5 Vinp		<input type="checkbox"/>	<input type="checkbox"/>	allv
6 Vinn		<input type="checkbox"/>	<input type="checkbox"/>	allv
7 outp		<input type="checkbox"/>	<input type="checkbox"/>	allv
8 outn		<input type="checkbox"/>	<input type="checkbox"/>	allv
9 Vref_p		<input type="checkbox"/>	<input type="checkbox"/>	allv
10 Vref_n		<input type="checkbox"/>	<input type="checkbox"/>	allv
11 I0/Comp+		<input type="checkbox"/>	<input type="checkbox"/>	allv
12 I0/Comp-		<input type="checkbox"/>	<input type="checkbox"/>	allv
13 I0/latch+		<input type="checkbox"/>	<input type="checkbox"/>	allv
14 I0/latch-		<input type="checkbox"/>	<input type="checkbox"/>	allv
15 AverageCurrent	-24.2347u	<input checked="" type="checkbox"/>	<input type="checkbox"/>	allv
16 ready		<input type="checkbox"/>	<input type="checkbox"/>	allv

Plot after simulation: Auto Plotting mode: Replace

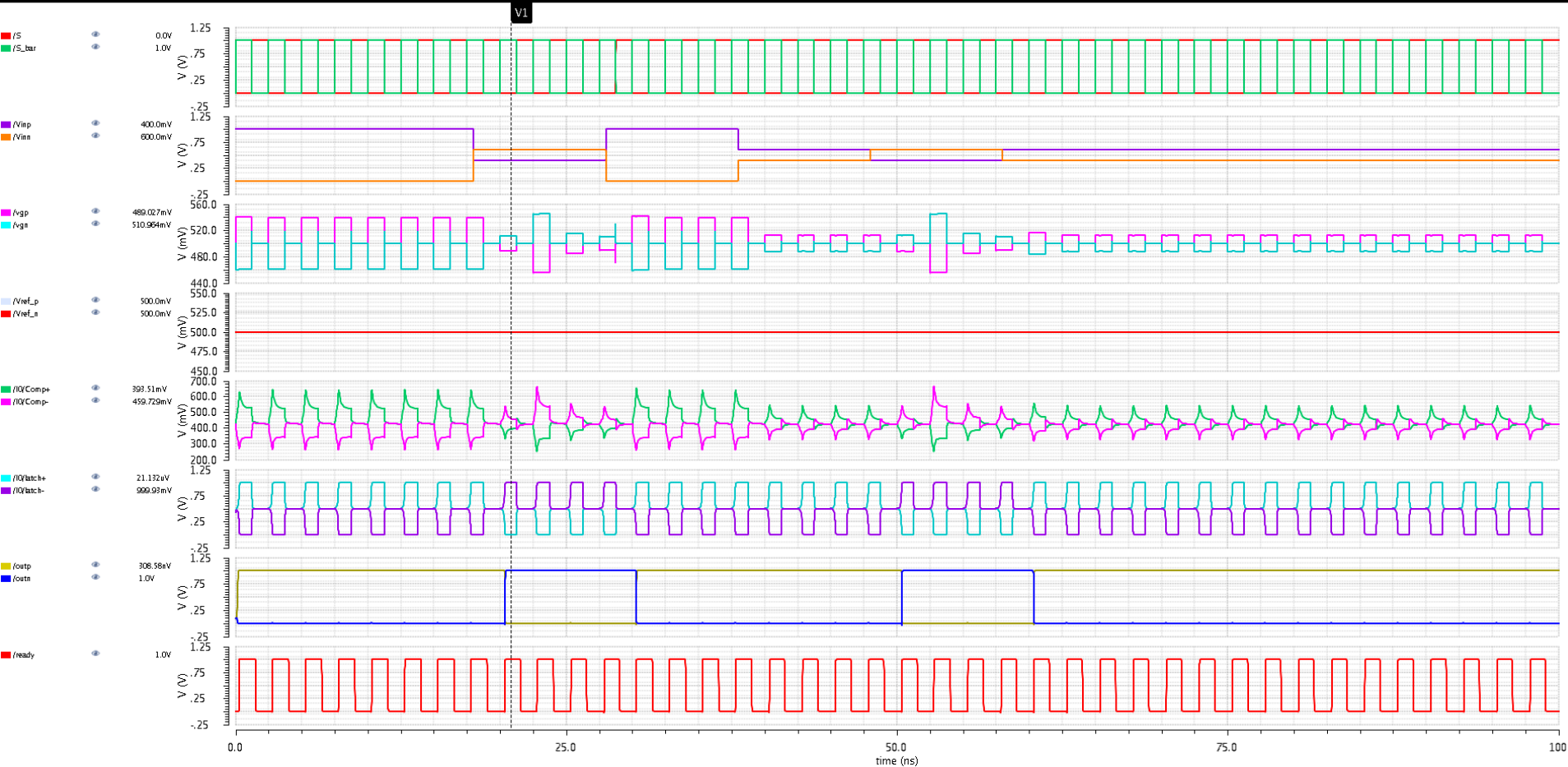
181(489) Stop Status: Ready T=27 C Simulator: spectre State: state1

Overdrive test

Diff Vin_min = 2 x 100 mV

Transient Response

Sun Apr 19 15:45:01 2020

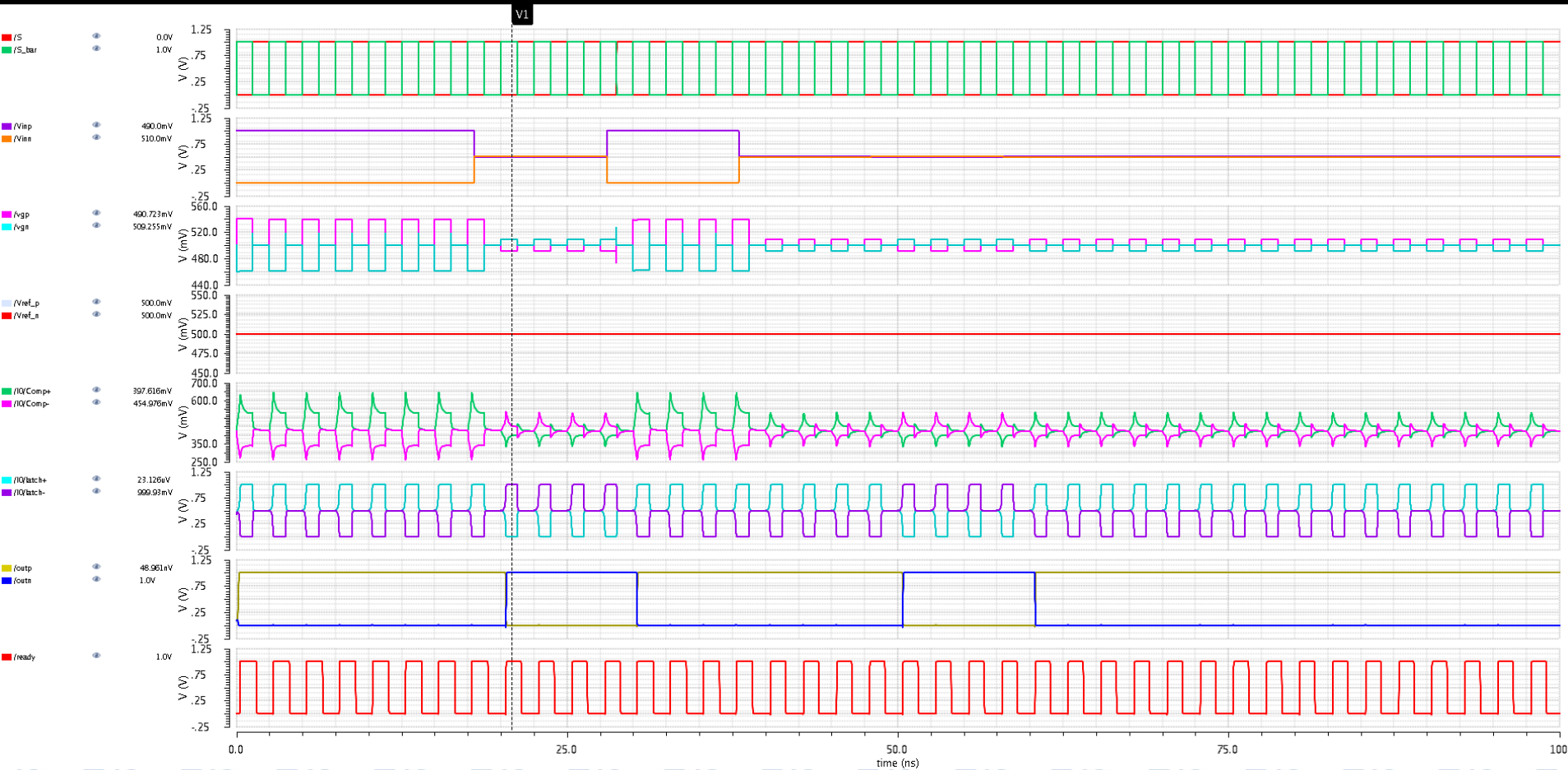


Overdrive test

Diff Vin_min = 2 x 10 mV

Transient Response

Sun Apr 19 15:47:00 2020

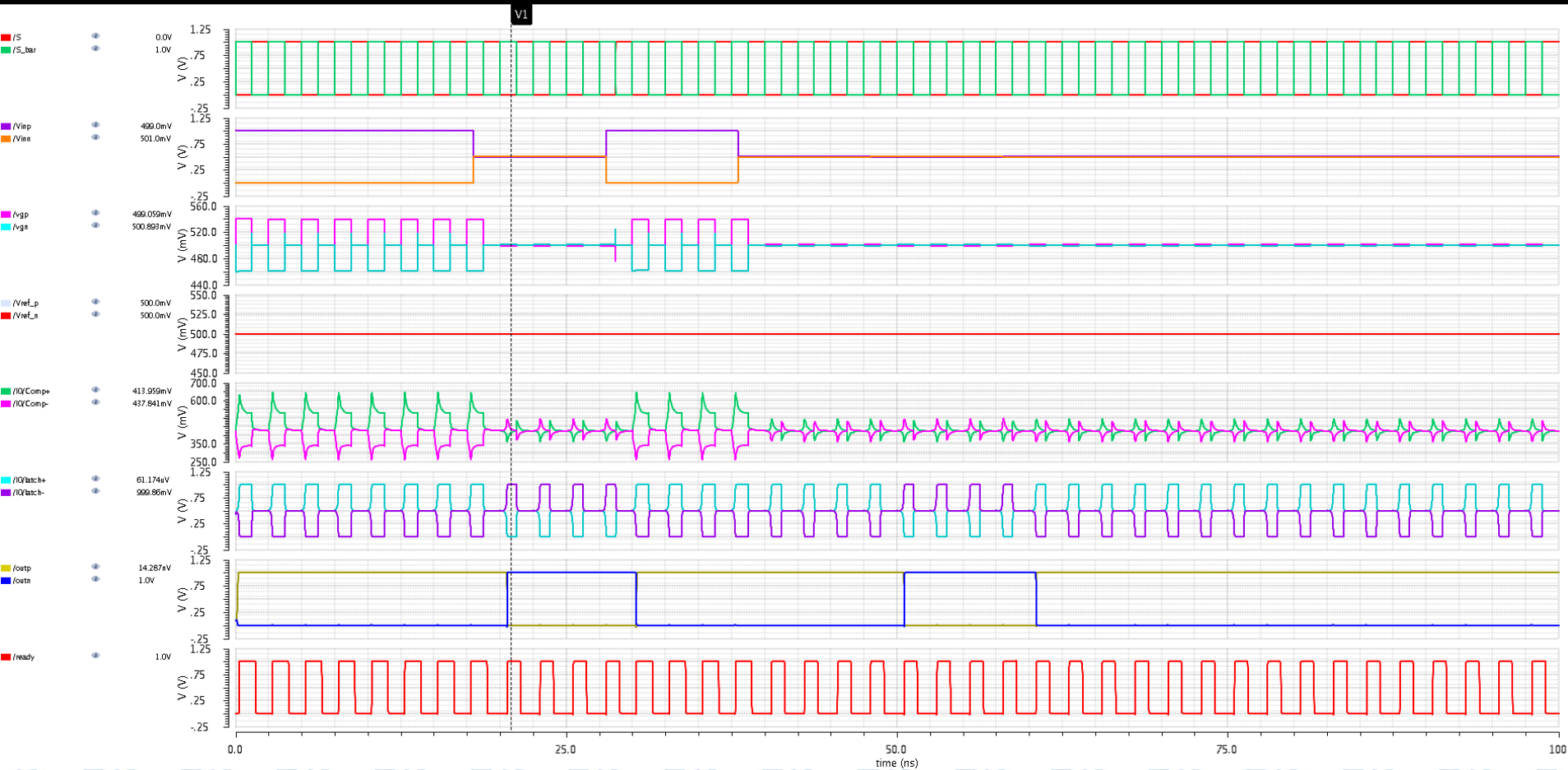


Overdrive test

Diff Vin_min = 2 x 1 mV
(Smallest Resolution)

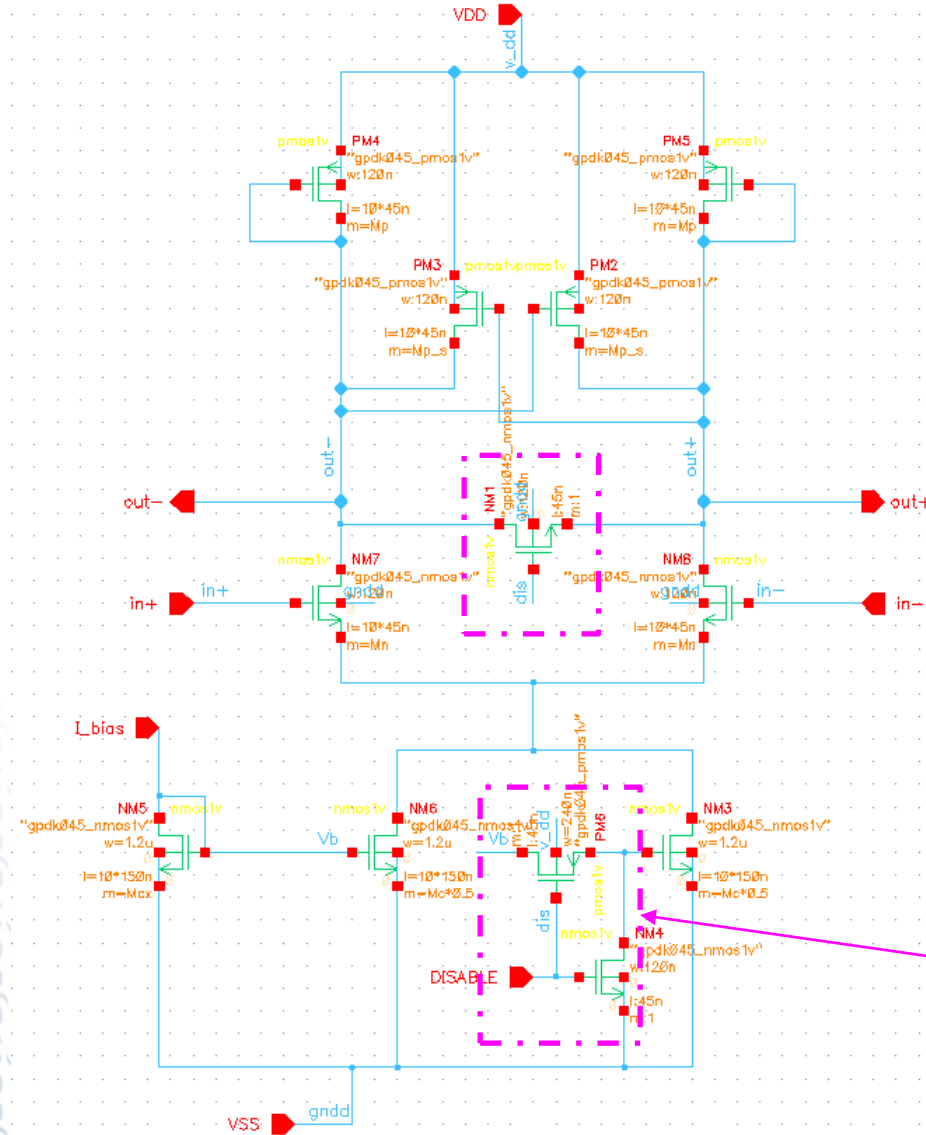
Transient Response

Sun Apr 19 15:47:52 2020



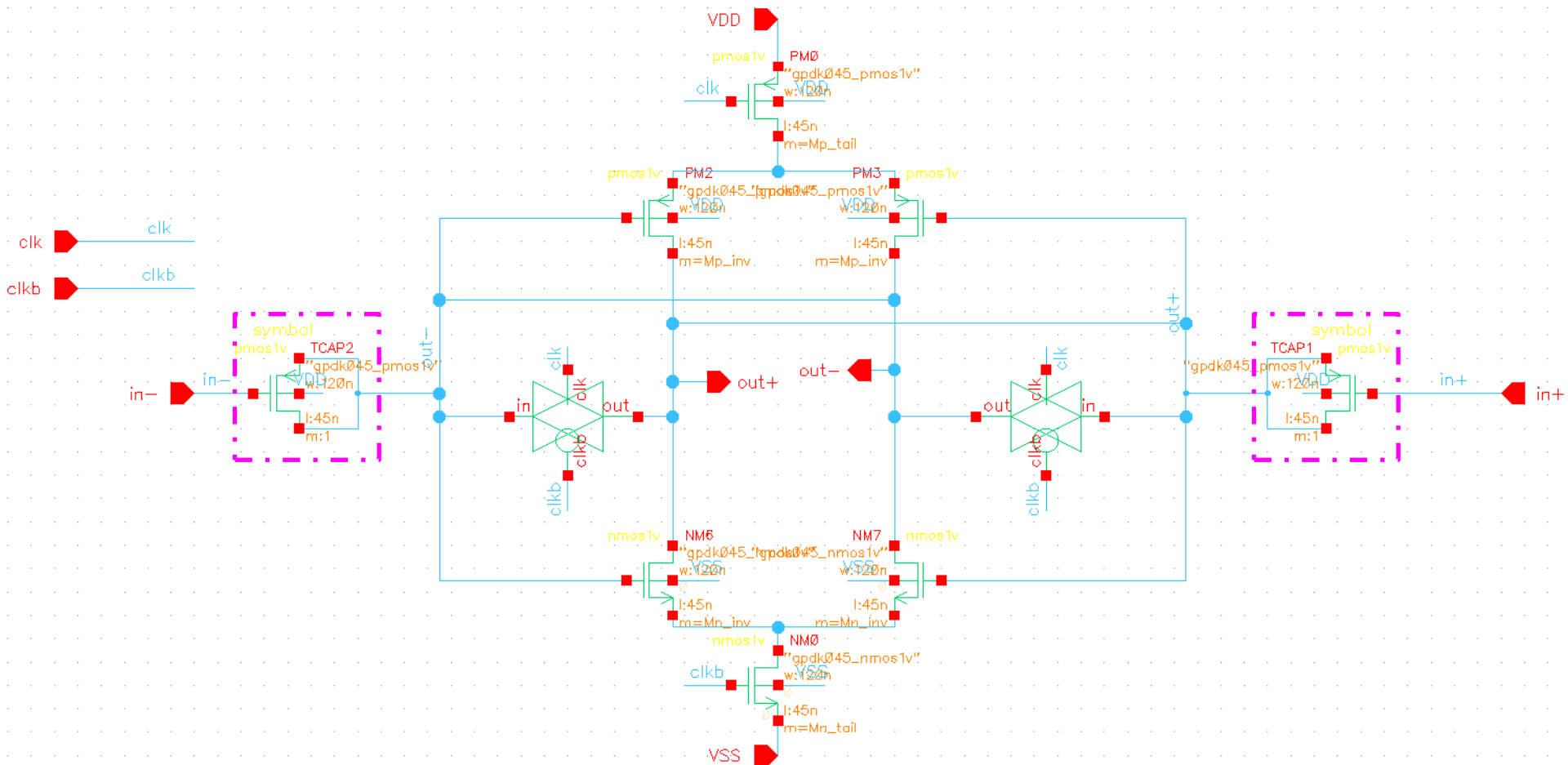
Modifications

1) Preamp:



*For Partial turn-off

2) Regenerative Latch:



Testbench (parameters)

ADE L (28) - SAR_Ideal_Asynchronous tb_comp_dac schematic

Launch Session Setup Analyses Variables Outputs Simulation Results Tools Calibre Help cadence

27

Design Variables

Name	Value
1 freq_clk	400M
2 Ron	1m
3 Vcm	500m
4 vin	1m
5 voff	0
6 Mcx	10
7 Mc	54
8 Mn	42
9 Mp	2
10 Mp_s	1
11 Cap_inv	10f
12 Mp_tail	20
13 Mp_inv	4
14 Mn_inv	4
15 Mn_tail	20
16 Ntg_lth	6
17 SR_inp_inv	1
18 SR_inn_inv	4
19 SR_nmos	10
20 SR_outp_inv	5
21 SR_outn_inv	5
22 xor_inv_p	1
23 xor_inv_n	4

Analyses

Type	Enable	Arguments
1 tran	<input checked="" type="checkbox"/>	0 100n

Outputs

Name/Signal/Expr	Value	Plot	Save	Save Options
1 S		<input type="checkbox"/>	<input type="checkbox"/>	allv
2 S_bar		<input type="checkbox"/>	<input type="checkbox"/>	allv
3 vgp		<input type="checkbox"/>	<input type="checkbox"/>	allv
4 vgn		<input type="checkbox"/>	<input type="checkbox"/>	allv
5 Vinp		<input type="checkbox"/>	<input type="checkbox"/>	allv
6 Vinn		<input type="checkbox"/>	<input type="checkbox"/>	allv
7 outp		<input type="checkbox"/>	<input type="checkbox"/>	allv
8 outn		<input type="checkbox"/>	<input type="checkbox"/>	allv
9 Vref_p		<input type="checkbox"/>	<input type="checkbox"/>	allv
10 Vref_n		<input type="checkbox"/>	<input type="checkbox"/>	allv
11 I0/Comp+		<input type="checkbox"/>	<input type="checkbox"/>	allv
12 I0/Comp-		<input type="checkbox"/>	<input type="checkbox"/>	allv
13 I0/latch+		<input type="checkbox"/>	<input type="checkbox"/>	allv
14 I0/latch-		<input type="checkbox"/>	<input type="checkbox"/>	allv
15 AverageCurrent	-22.015u	<input checked="" type="checkbox"/>	<input type="checkbox"/>	allv
16 ready		<input type="checkbox"/>	<input type="checkbox"/>	allv

> Results in /home/muhammad/simulation/

Plot after simulation: Auto Plotting mode: Replace

226(573) Choose Design ... Status: Ready T=27 C Simulator: spectre State: state1

Removed



Overdrive test

Diff Vin_min = 2 x 1 mV
(Smallest Resolution)

Transient Response

Sun Apr 26 13:50:18 2020

