Pre-amplifier

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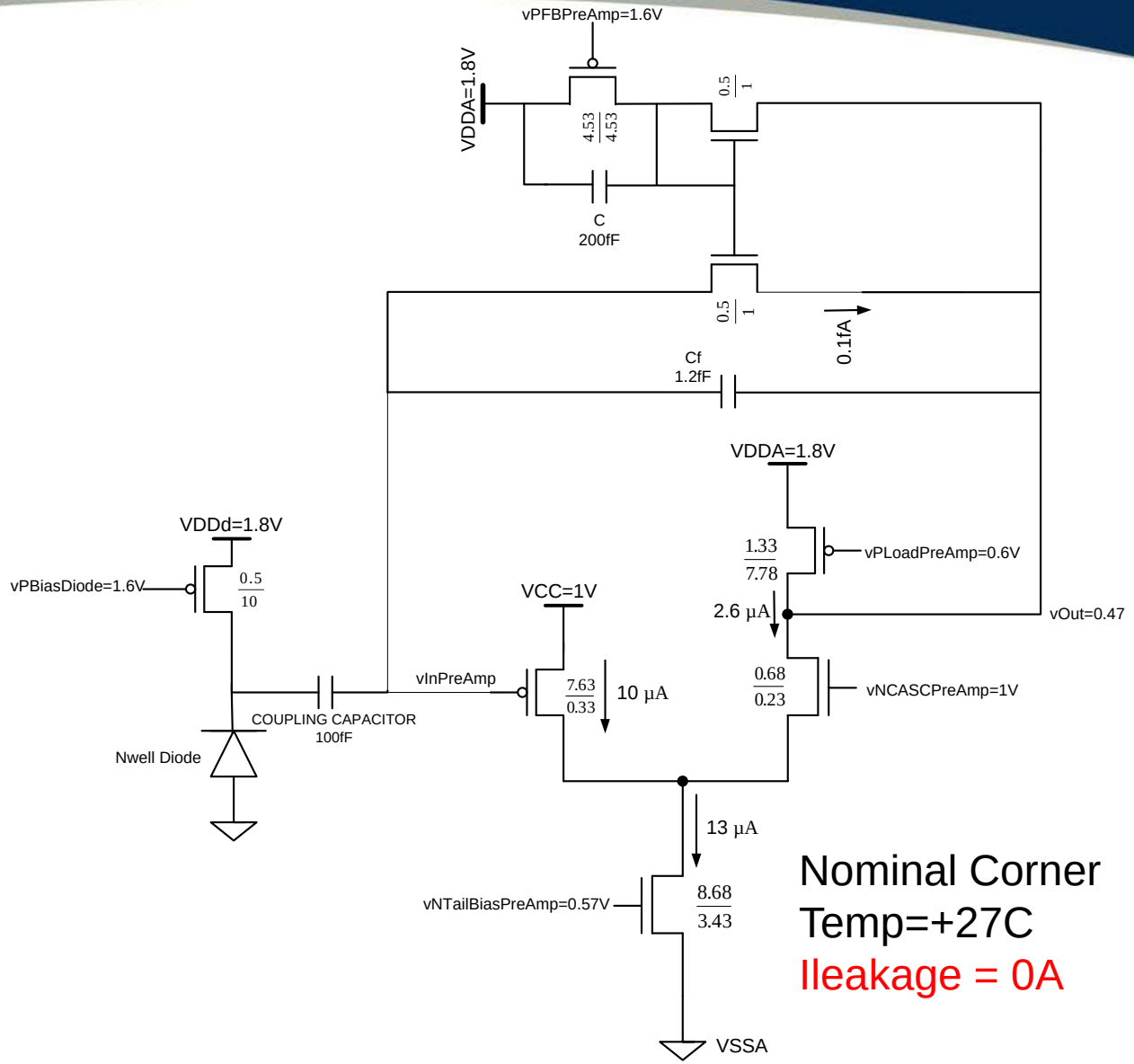
Pre-amplifier schematic

Parameter	Voltage
VDDA	1.8V
VSSA	0V
VCC	1V
VDDd	1.8V
vPBiasDiode	1.6V
vNCASCPreAmp	1V
vPFBPreAmp	1.6V
vPLoadPreAmp	0.6V
vNTailBiasPreAmp	0.57V



Nominal Corner
Temp=+27C
Ileakage = 0A

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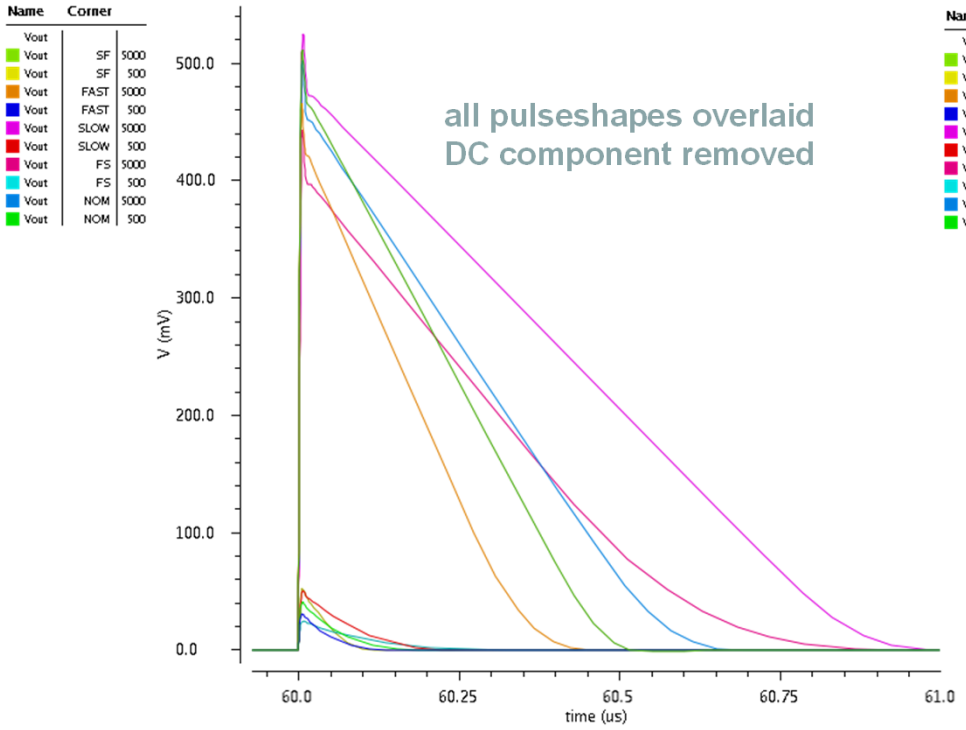
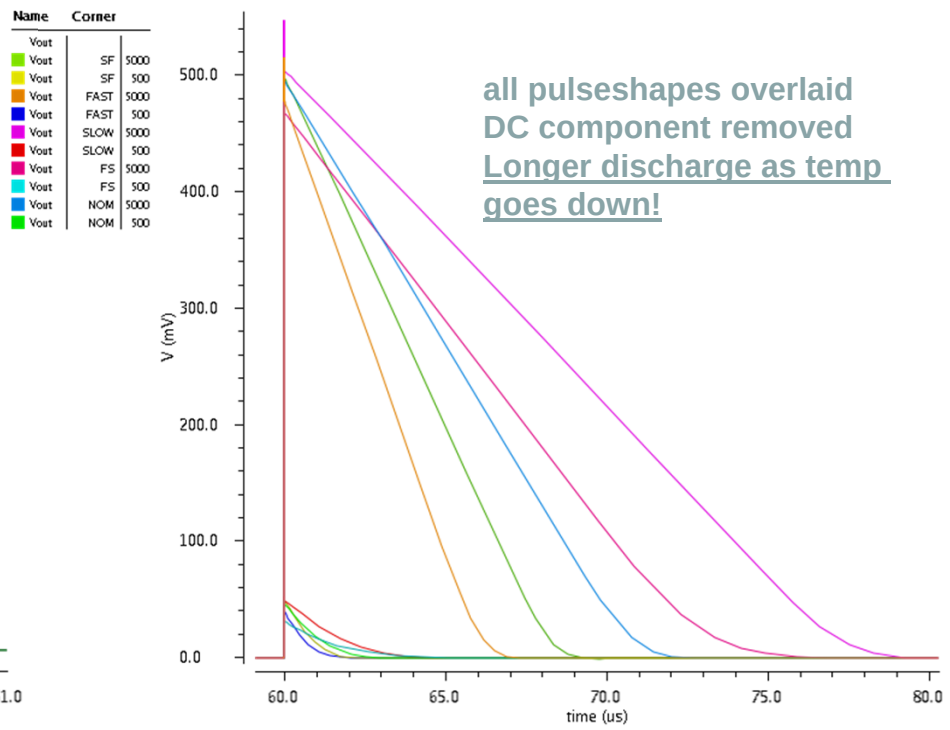
Pre-amplifier performance



T = +40°



T = -40°

- Signal at Pre-Amp output from 500e- to 5Ke- in 2 steps
- All process corners
- Ileakage = 0A

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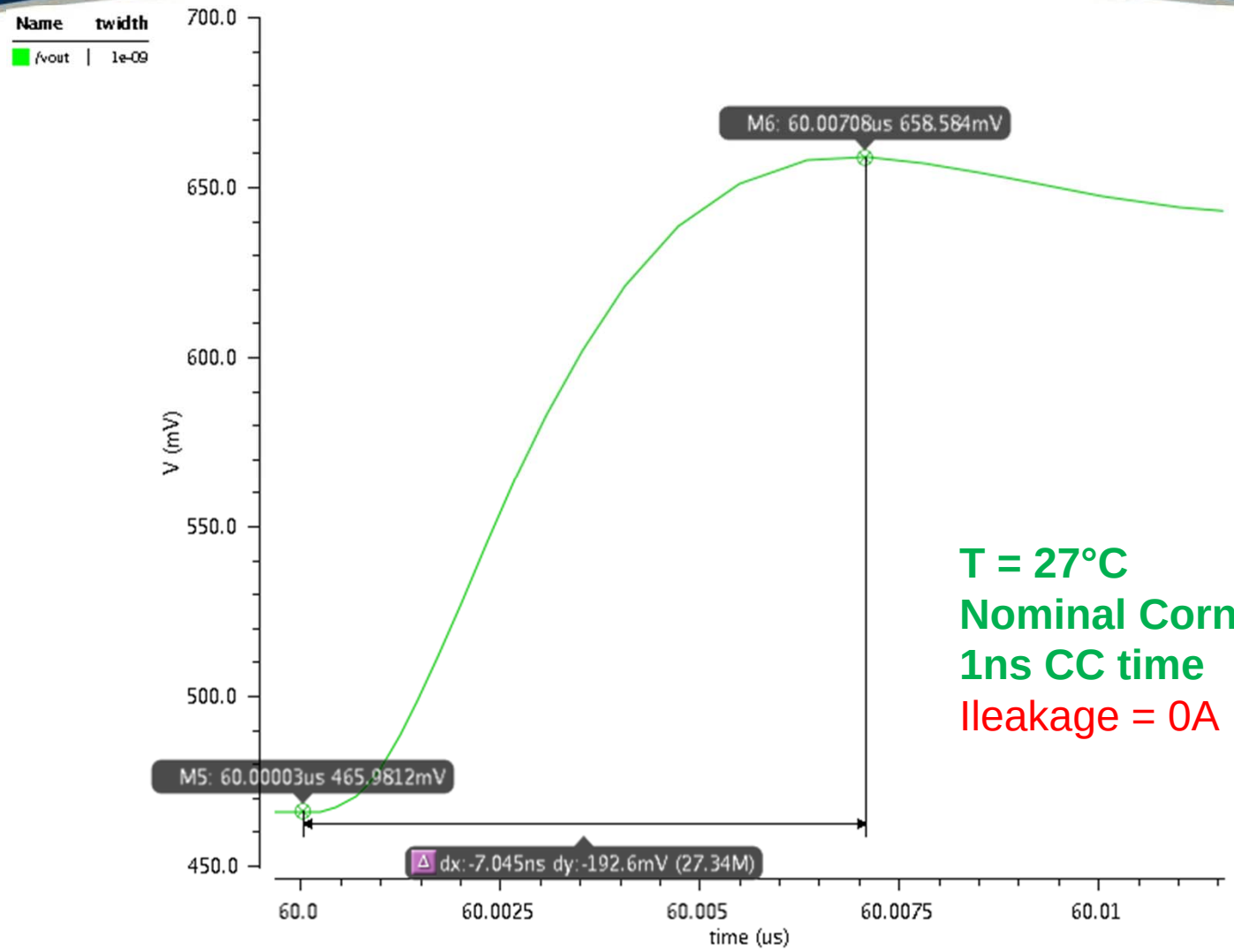
Tpeaking @ 2Ke-
(from baseline up to peak)



T = 27°C
Nominal Corner
1ns CC time
Ileakage = 0A

Tpeaking generally a few ns longer than Trise (10% to 90%)

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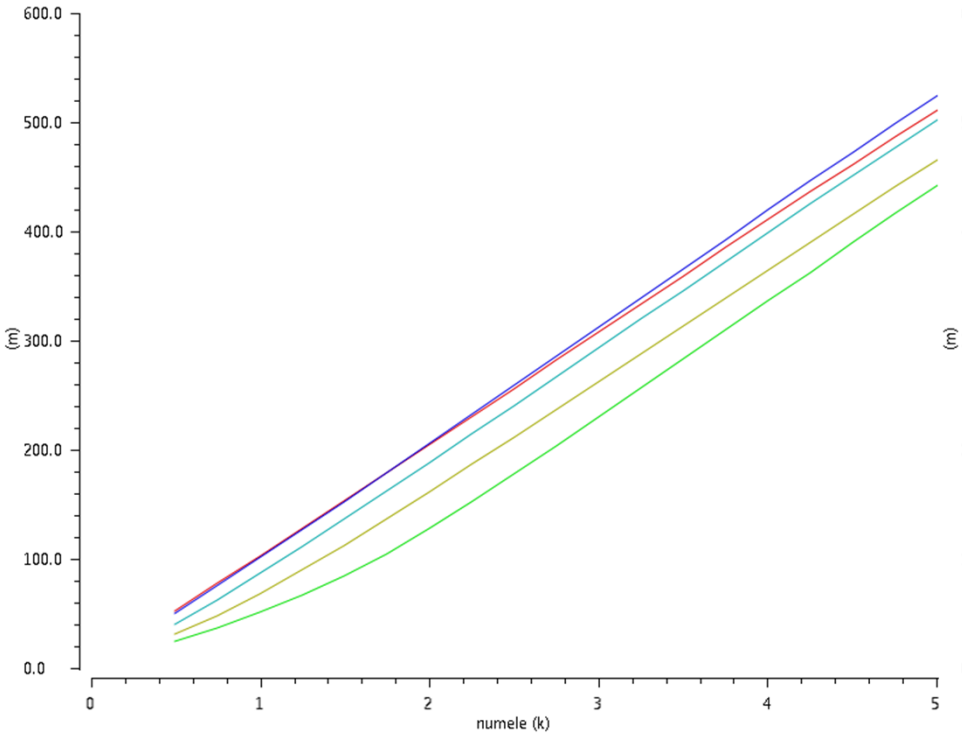
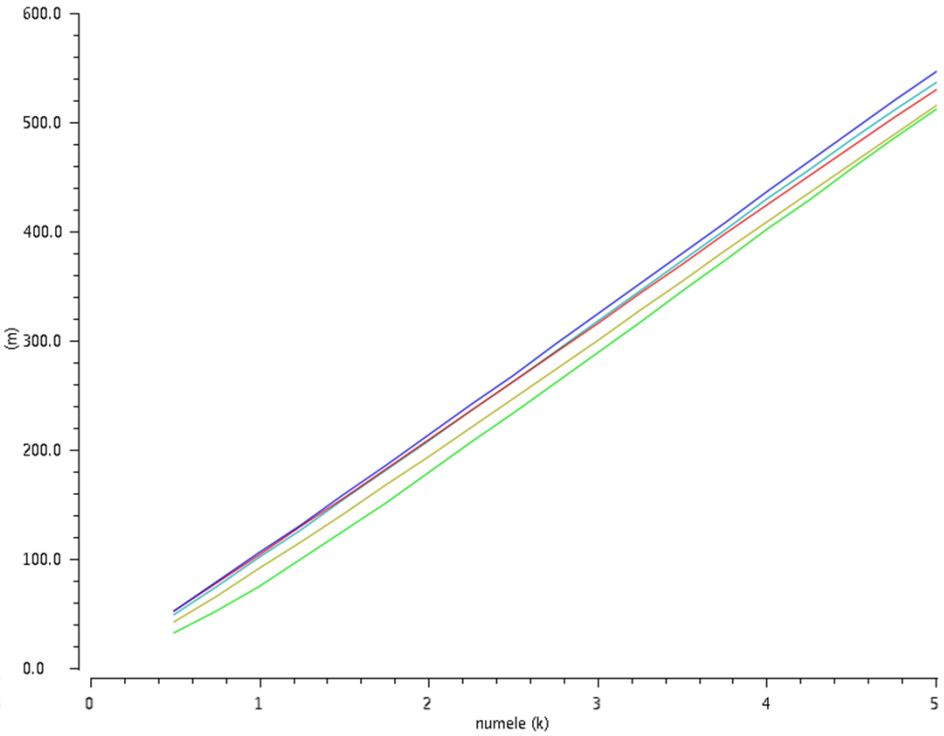
Output pulse amplitude ΔV vs signal



T = +40°



T = -40°

- Difference between peak and baseline voltage from 500e- to 5Ke- in 250e- steps
- All process corners (NOM, FAST, SLOW, SF, FS)
- *No significant change in gain except some non-linearity in FS corner at low e-*

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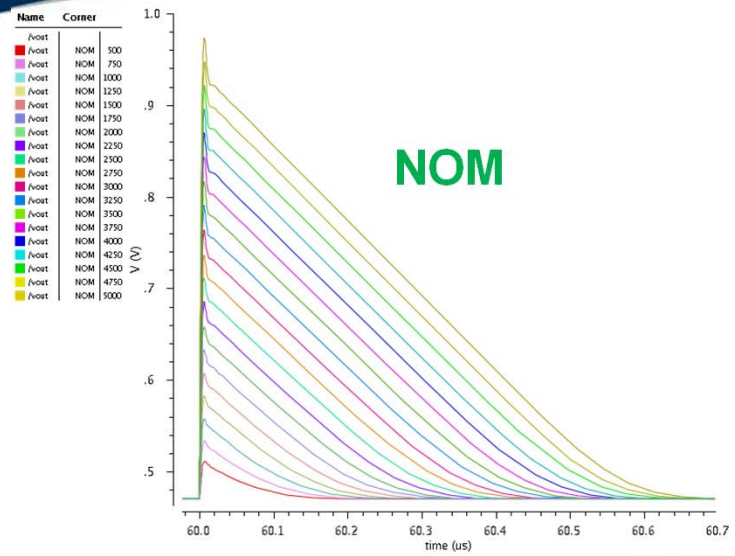
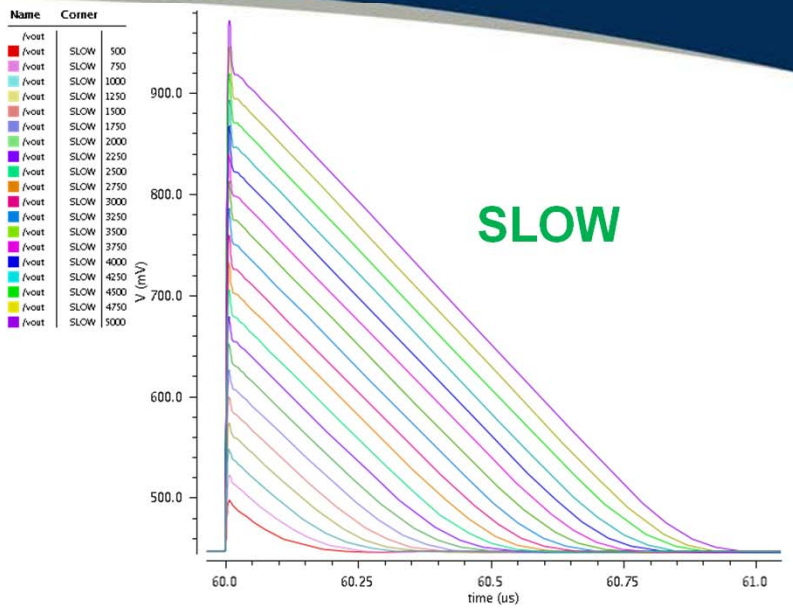
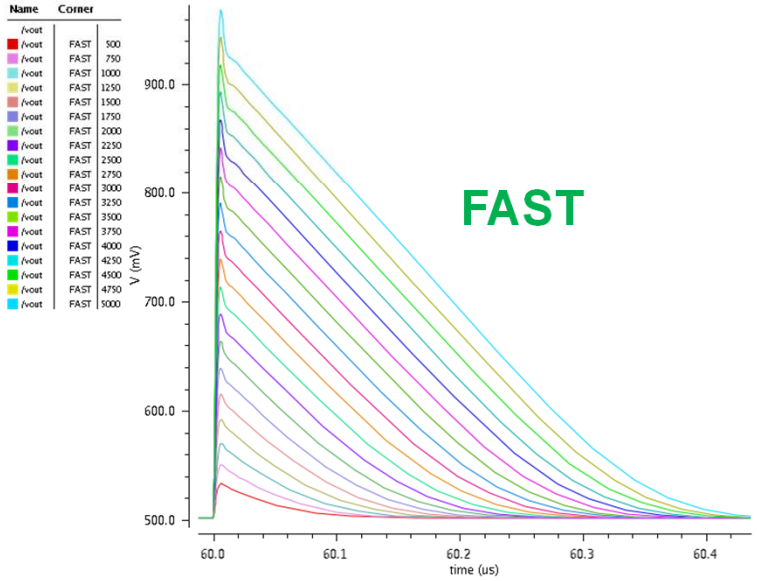
Output pulse shapes vs signal
Temp = +40°



NOM



SLOW



FAST

Signal at Pre-Amp output from
500e- to 5Ke- in 250e- steps
Ileakage = 0A

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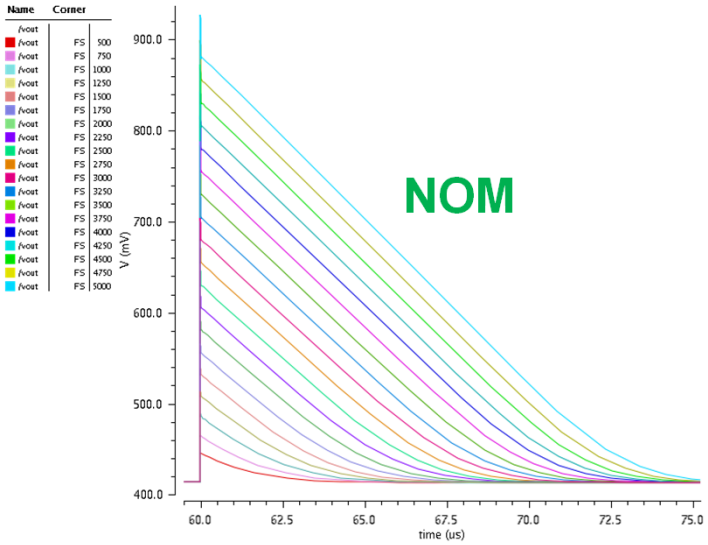
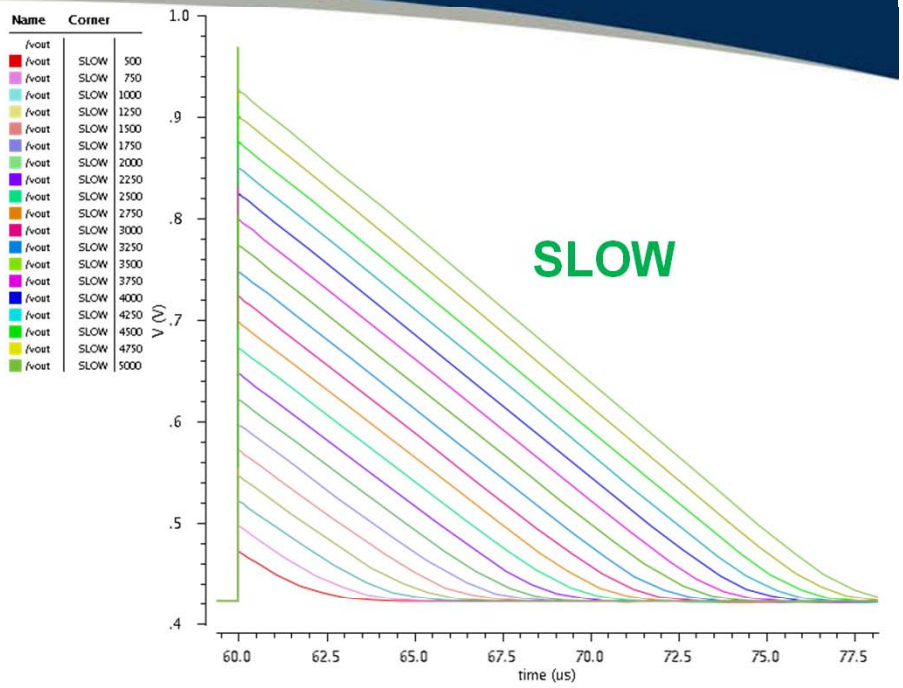
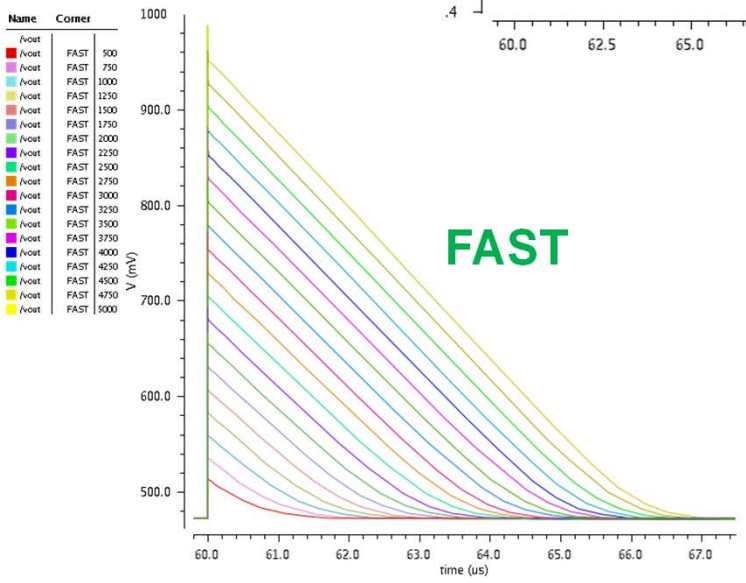
Output pulse shapes vs signal
Temp = -40°



NOM



SLOW



FAST

Signal at Pre-Amp output from
500e- to 5Ke- in 250e- steps
Ileakage = 0A

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Pre-amplifier spec. summary

T = +40°
Ileakage = 0A

	NOM	FAST	SLOW
CG [µV/e]	102	97	105
Tpeaking [ns] (500e-) (input of comp.)	9	7.9	9.6
Noise [e-] (50fF det. cap)	48	41	61
*Phase Margin [º]	115	103	103
Gain Margin [dB]	43	45	41
A_{OL} [dB]	52	49	55
Power [µW]	19.2	22.9	15.9

T = -40°
Ileakage = 0A

	NOM	FAST	SLOW
CG [µV/e]	107	105	110
Tpeaking [ns] (500e-) (input of comp.)	7.6	6.8	8.9
Noise [e-] (50fF det. cap)	50	42	56
*Phase Margin [º]	93	123	81
Gain Margin [dB]	36	38	35
A_{OL} [dB]	61	59	63
Power [µW]	16.2	20	13.1

*Phase margin of >90° is big enough not to find any form of gain peaking or oscillation