Front-End Electronics: Target Specifications and Parameters

Haspide WP2

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System Specificaitons

parameter	value	assumed/reached
I_{min}		$10\,\mathrm{pA}$
I_{Max}		$100\,\mathrm{nA}$
$T_{mes}(I_{min})$		$400\,\mu\mathrm{s}$
$T_{mes}(I_{Max})$		$60\,\mathrm{ns}$
$SNR(I_{min})$		100
$SNR(I_{Max})$		100

- Measurement time: $T_{mes} \propto \frac{1}{I_s}$

Sensor Model

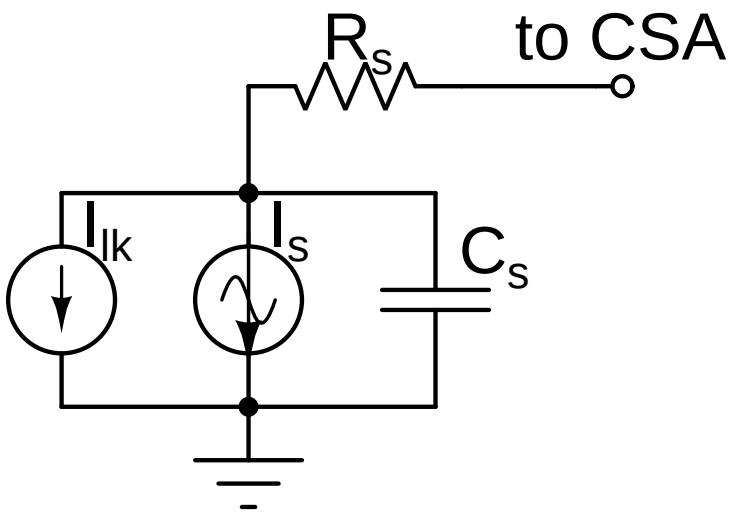


Figure: (example)

- Essential for the Front-End design.
- C_s: sensor capacitance connected to DC nodes.
- R_s: series resistance (significant values $> 1\,\mathrm{k}\Omega$).
- I_{min}, I_{Max}: current range (double polarity).
- I_{lk}: leakage current.

Sensor parameters

parameter	value	assumed/reached
C_s		$10\,\mathrm{pF}$
R_s		$<1\,\mathrm{k\Omega}$
I_{lk}		$10\,\mathrm{pA}$

Interconnection Model

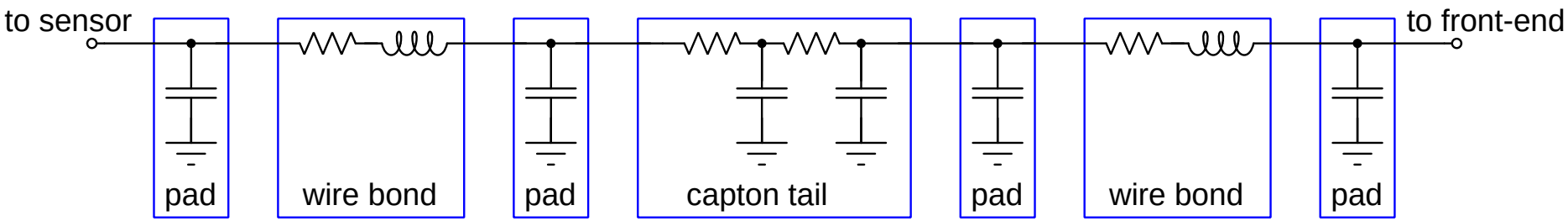
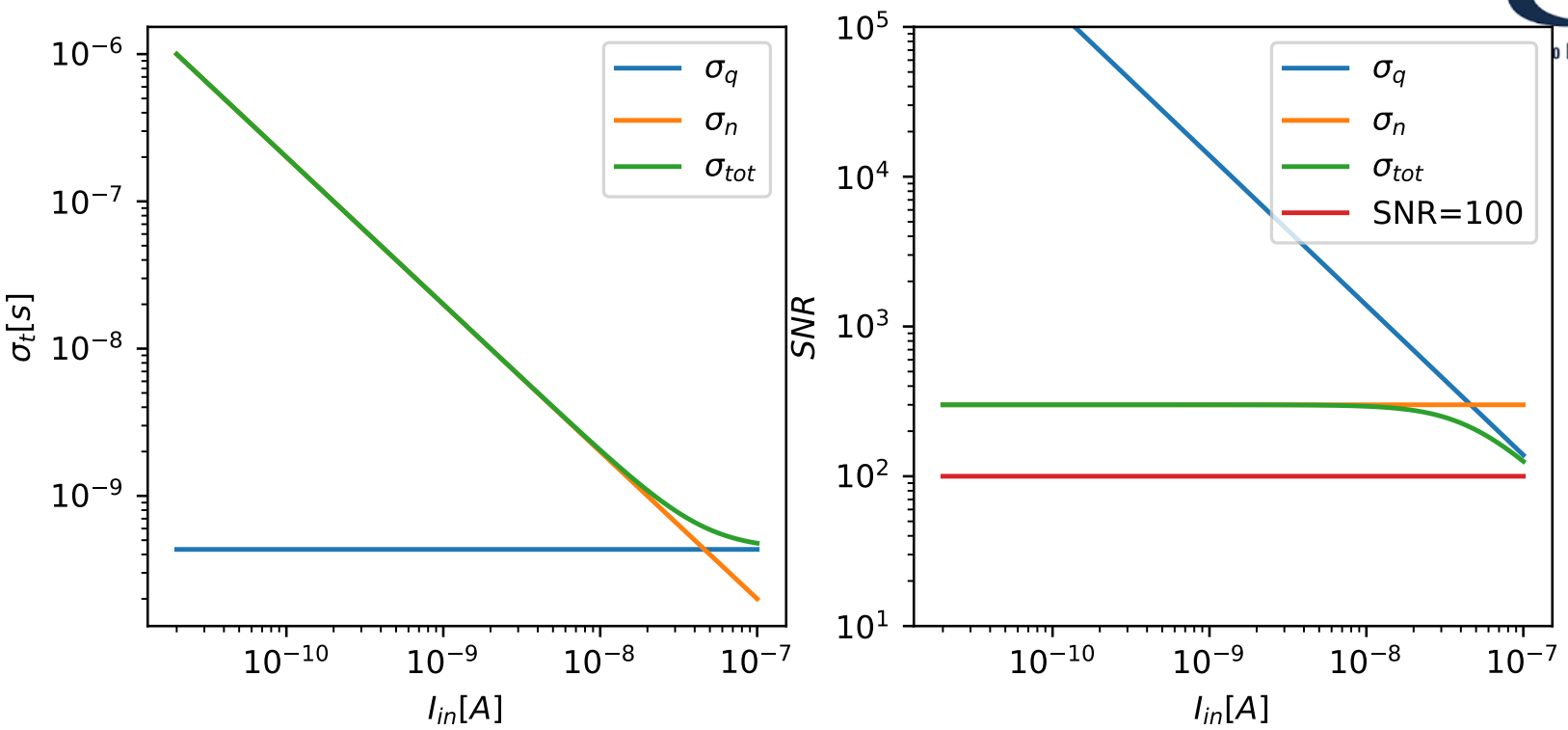


Figure: (example)

SNR evaluation



- $C_{int} = 20\,\mathrm{fF}$.
- $V_{th} = 300\,\mathrm{mV}$.
- $\sigma_n = 1\,\mathrm{mV}$.
- $T_{ck} = 1.5\,\mathrm{ns}$ (σ_q: quantzation error).