Position-sensitive device

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1 Introduction

2 Position-sensitive detector

[1]

Parameter	Symbol	Values		Unit
		Typical	Maximum	
Dark current	I_d	0.5	10	nA
Interelectrode resistance	R_e	7	15	kΩ
Terminal capacitance	C_t	150	300	pF

Table 1: Important parameters of the S5990 extracted from the datasheet [2].

3 Preamplifier

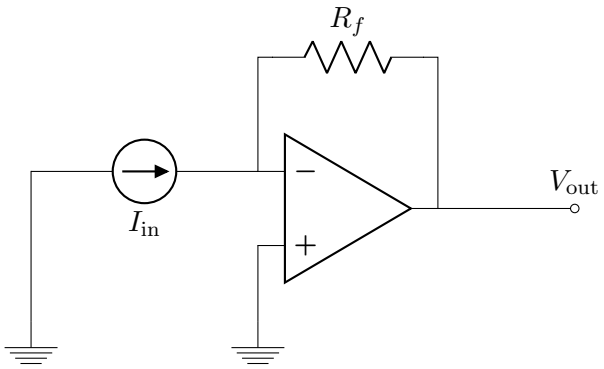
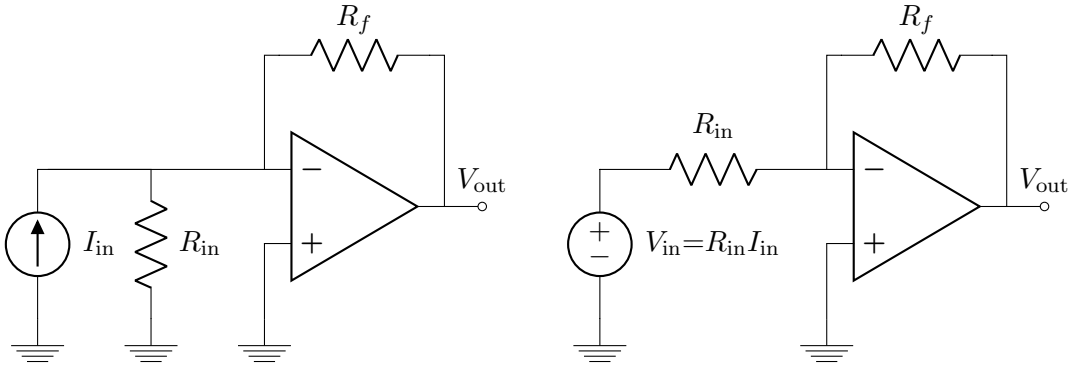


Figure 1: Simple transimpedance amplifier circuit.

$$V_{\text{out}} = R_f I_{\text{in}} \tag{1}$$



(a) Transimpedance amplifier.

(b) Inverting amplifier.

Figure 2: Equivalence between transimpedance and inverting amplifier using source transformation.

3.1 Offset

3.1.1 Input offset voltage

[3, p. 54]

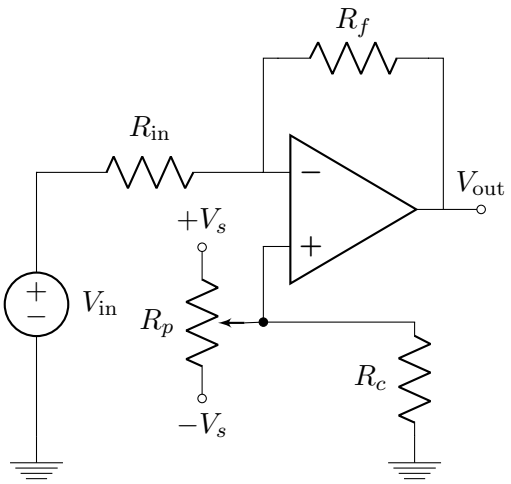
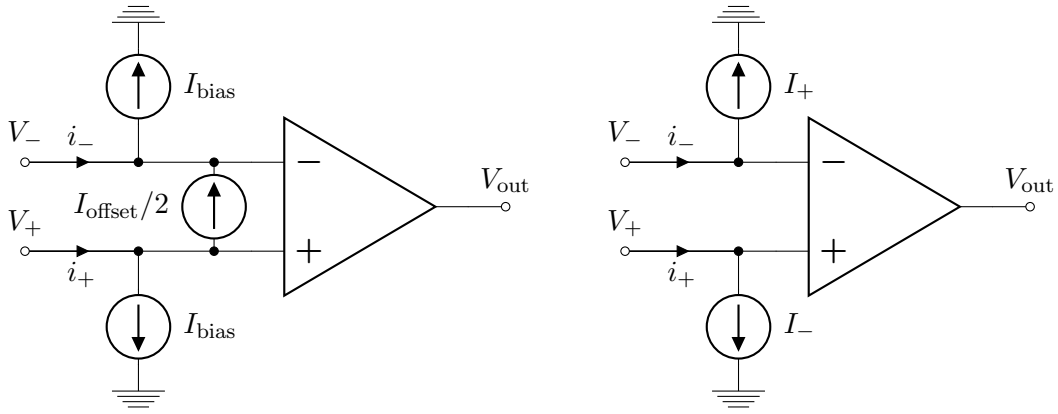


Figure 3: Input current offset compensation.

3.1.2 Input current



(a) Equivalent current sources as reported in the datasheet.

(b) Alternative equivalent current sources.

Figure 4: Non-zero input current from the operational amplifier.

$$I_+ = I_{\text{bias}} + \frac{1}{2} I_{\text{offset}} \qquad I_{\text{offset}} = I_+ - I_- \tag{2}$$

$$I_- = I_{\text{bias}} - \frac{1}{2} I_{\text{offset}} \qquad I_{\text{bias}} = \frac{I_+ + I_-}{2} \tag{3}$$

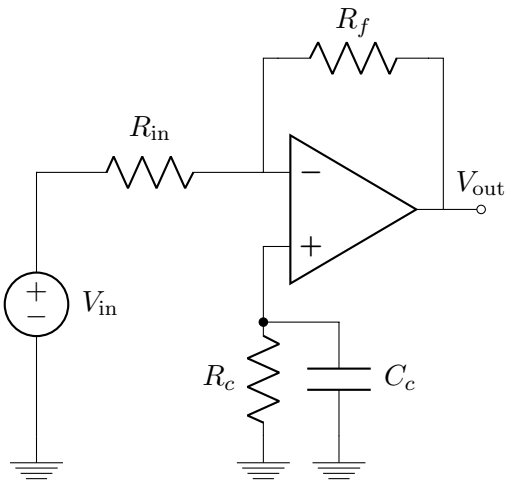


Figure 5: Input current offset compensation.

[3, p. 57] [4, p. 25]

$$R_c = \frac{R_{\text{in}} R_f}{R_{\text{in}} + R_f} \tag{4}$$

3.2 Bandwidth and stability

[5, p. 693] [6, p. 183] [7, Ch. 5] [4, Ch. 3]

Glossary

S5990 Hamamatsu two-dimensional PSD. 3

References

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[2] *S5990 2D PSD*. Hamamatsu. URL: `https://www.hamamatsu.com/resources/pdf/ssd/s5990-01_etc_kpsd1010e.pdf` (visited on 03/03/2019).

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