

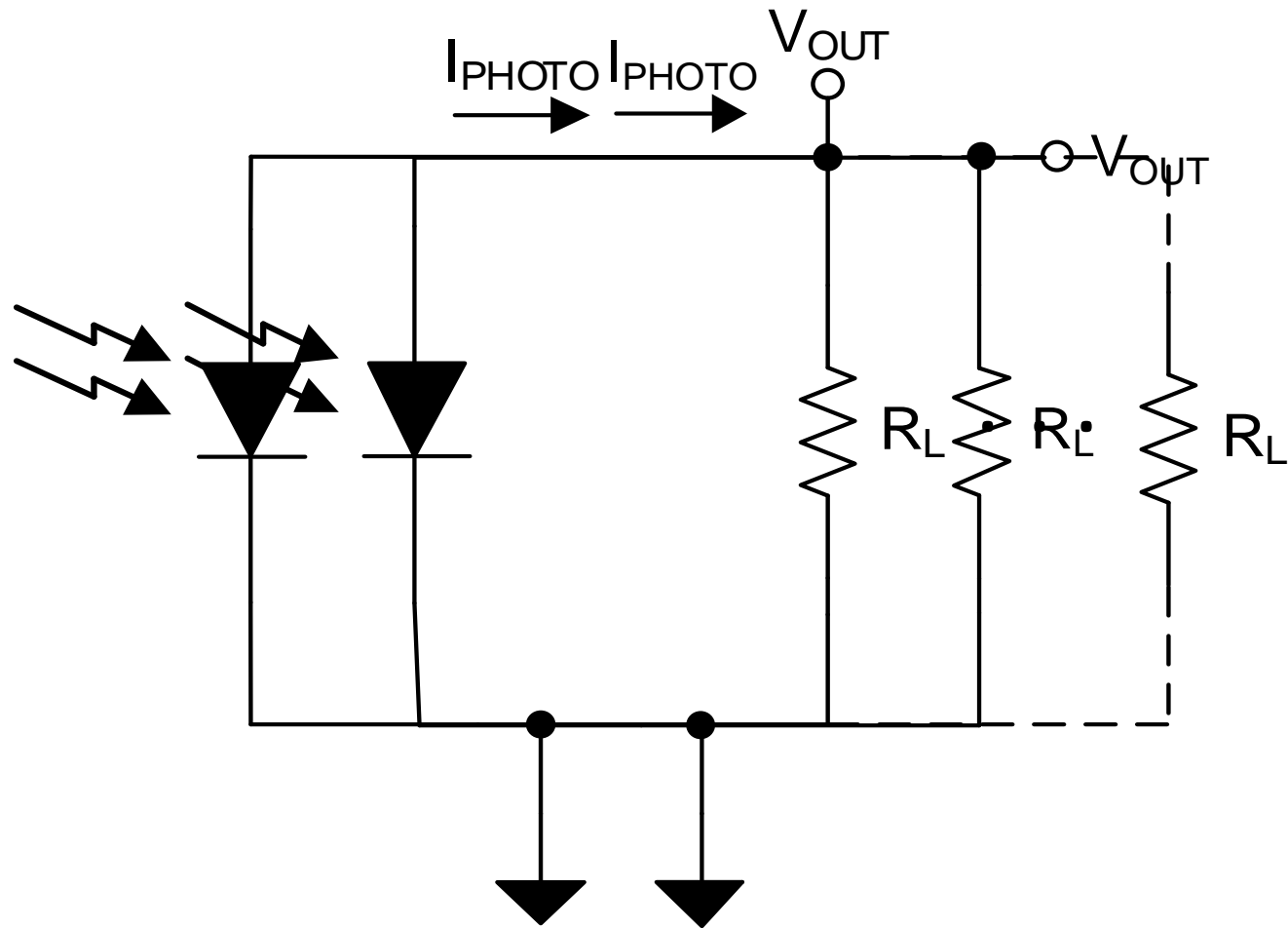
# Transimpedance Amplifier-1

TI Precision Labs: High-Speed Operational Amplifiers

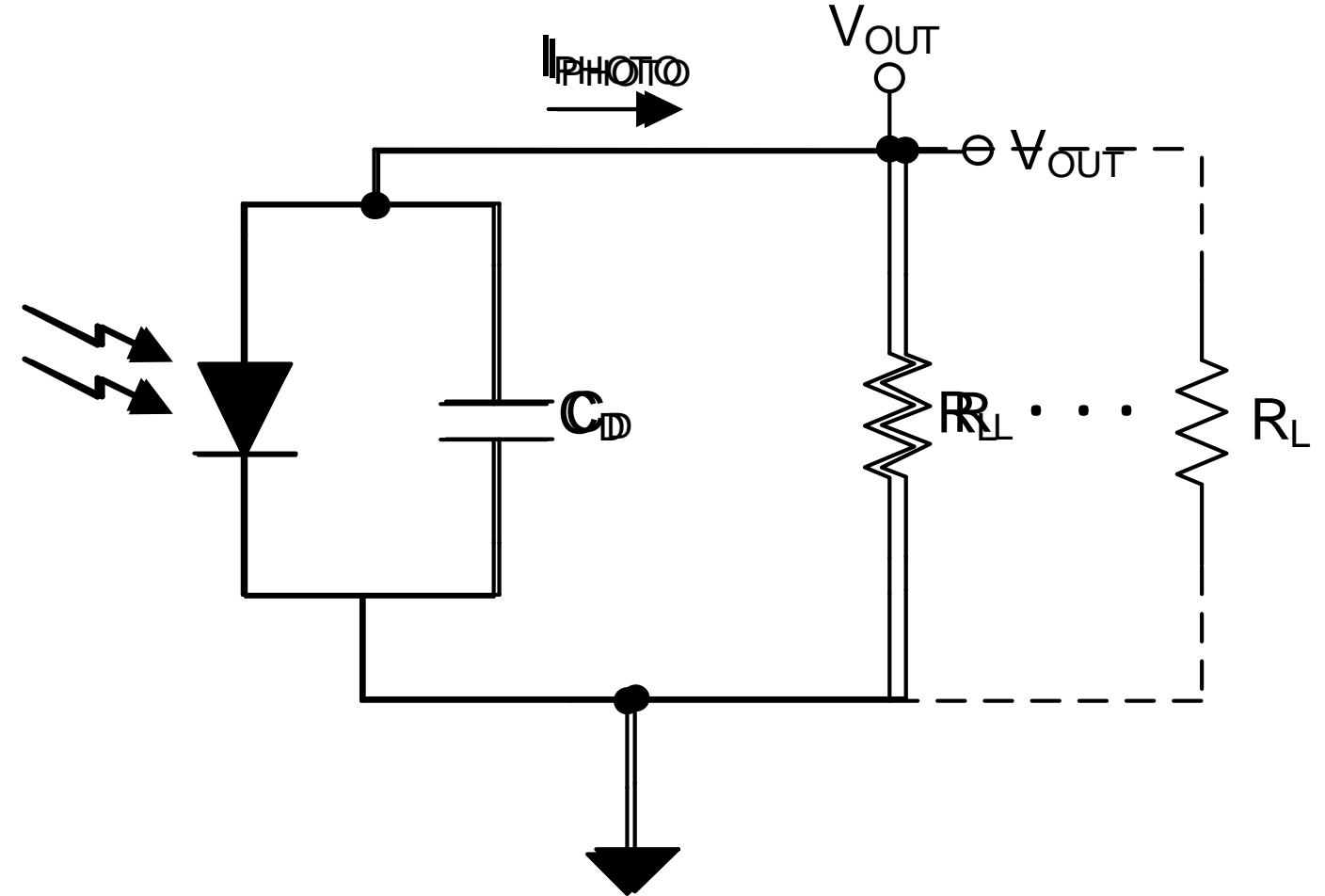
Presented by Sima Jalaliddine

Prepared by Sima Jalaliddine

# Transimpedance Amplifier (TIA): Introduction

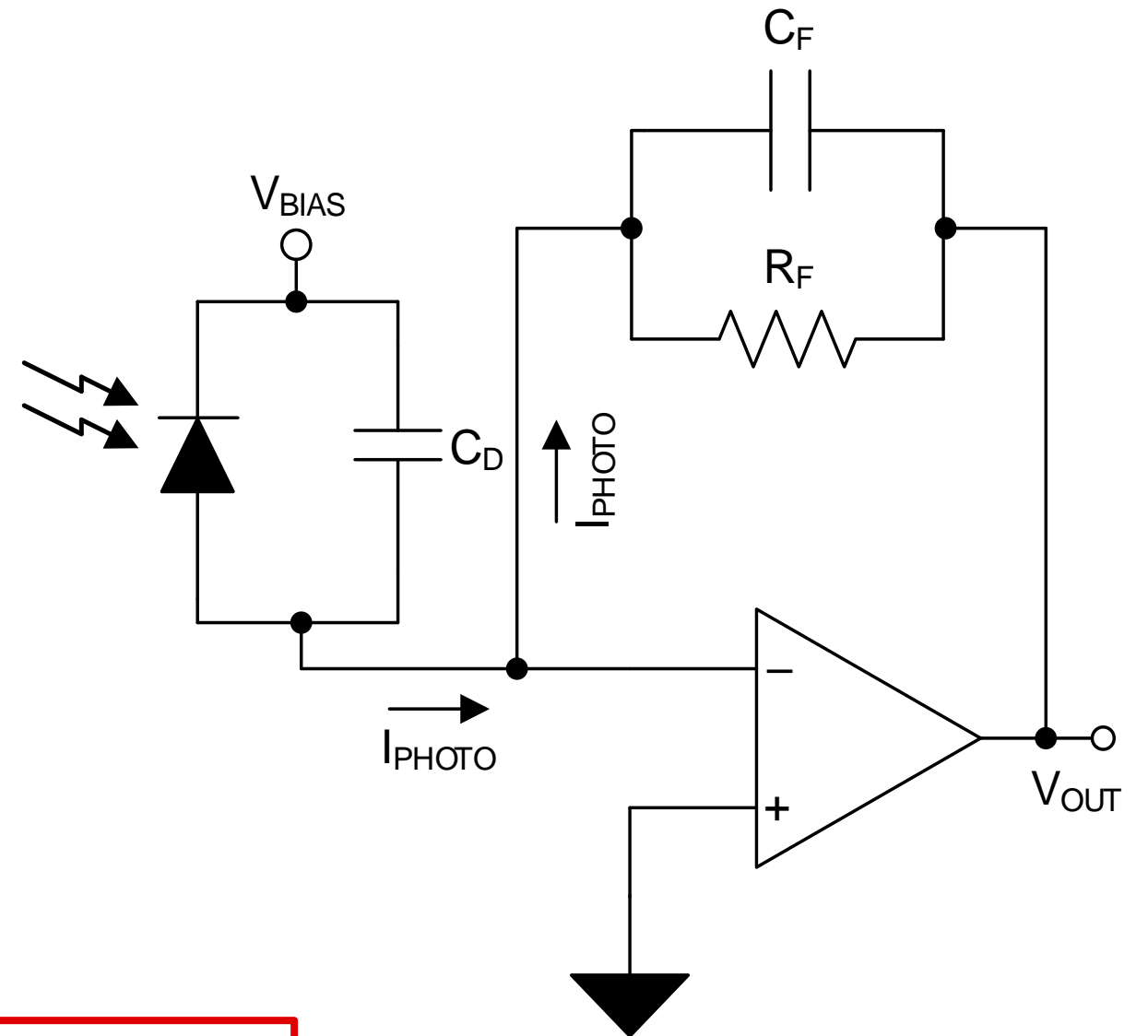
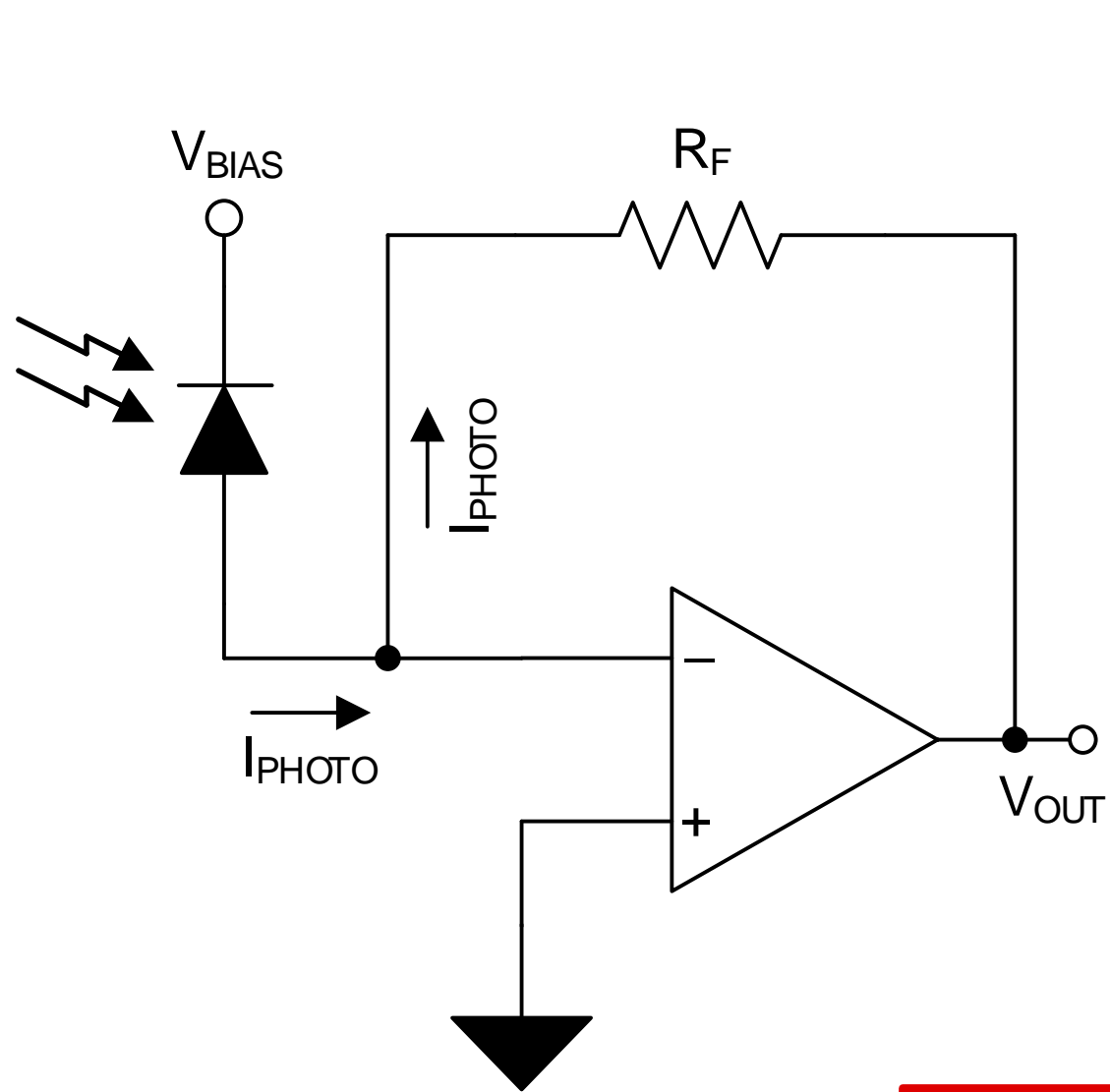


$$V_{out} = I_{photo} * R_L$$



$$\tau = R_L * C_D$$

# TIA Applications



$$V_{out} = -I_{photo} * R_f$$



# Optical front-end Applications



Range Finders



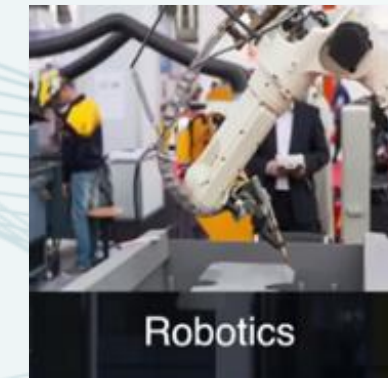
Retinal Imagers



Speed Measurement Devices



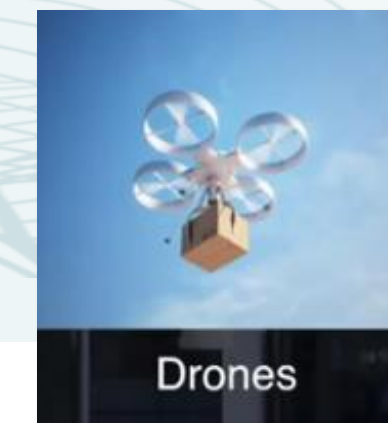
Automotive Advanced Driver Assistance Systems



Robotics

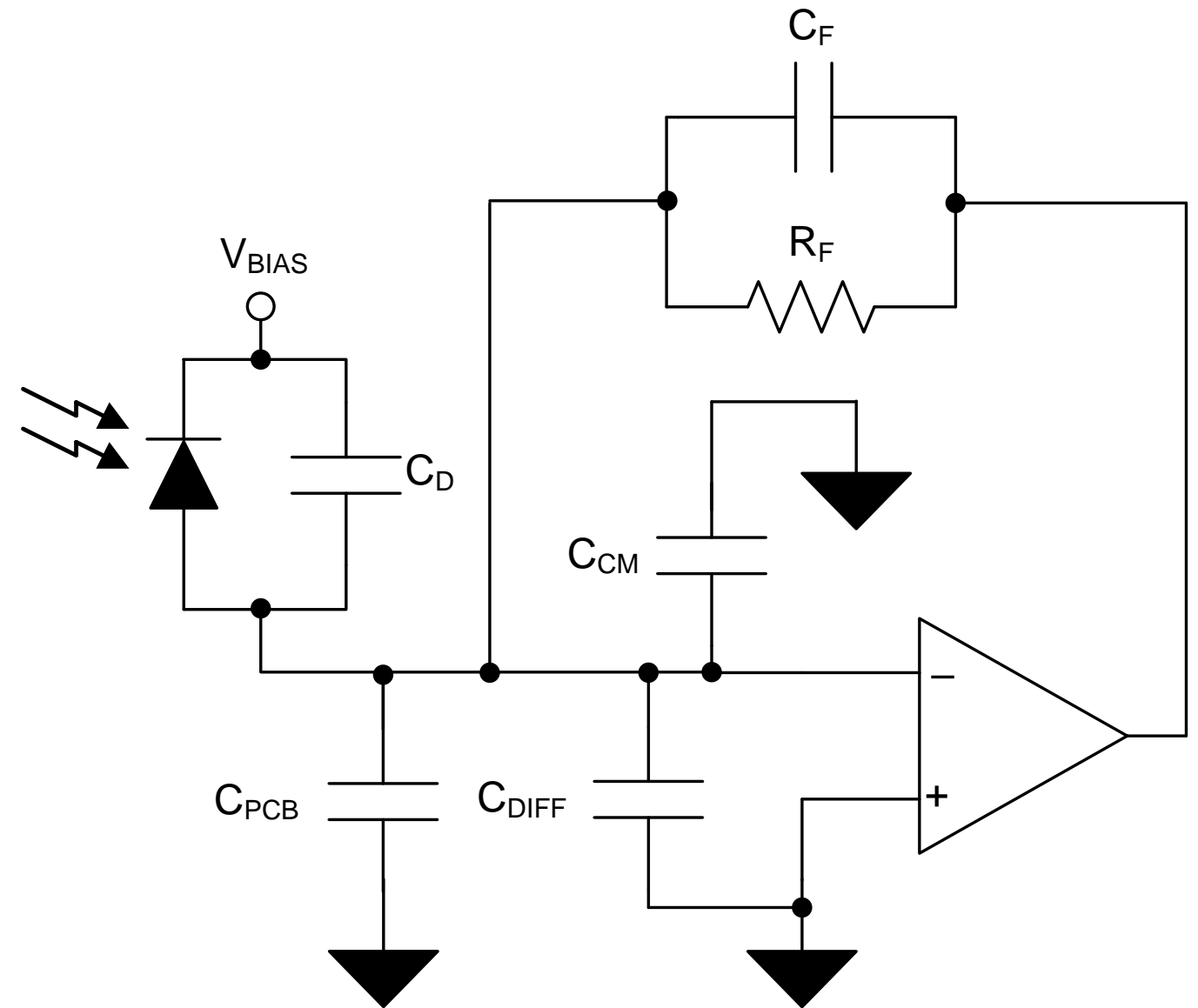
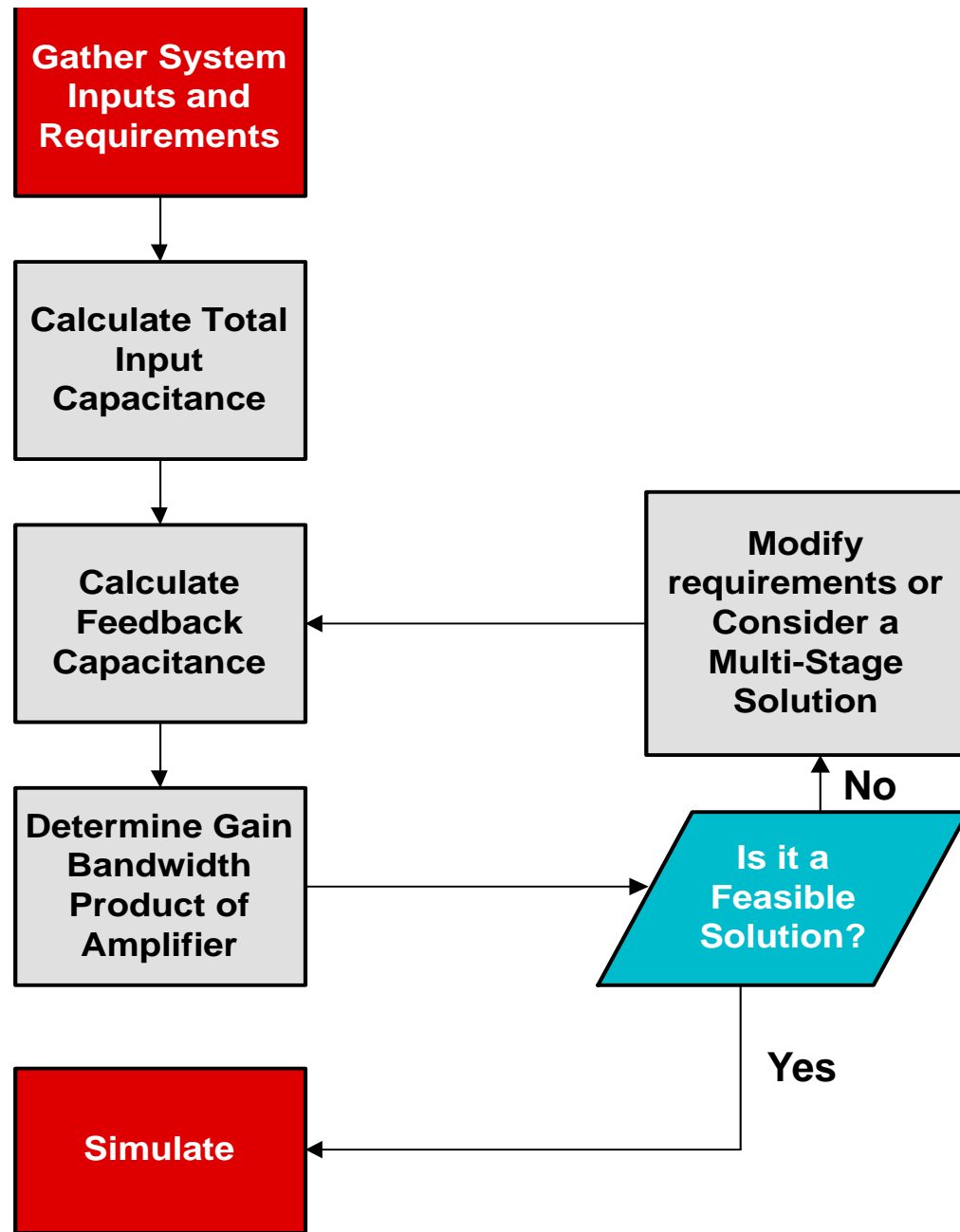


Surveying Equipment



Drones

# TIA Design Overview

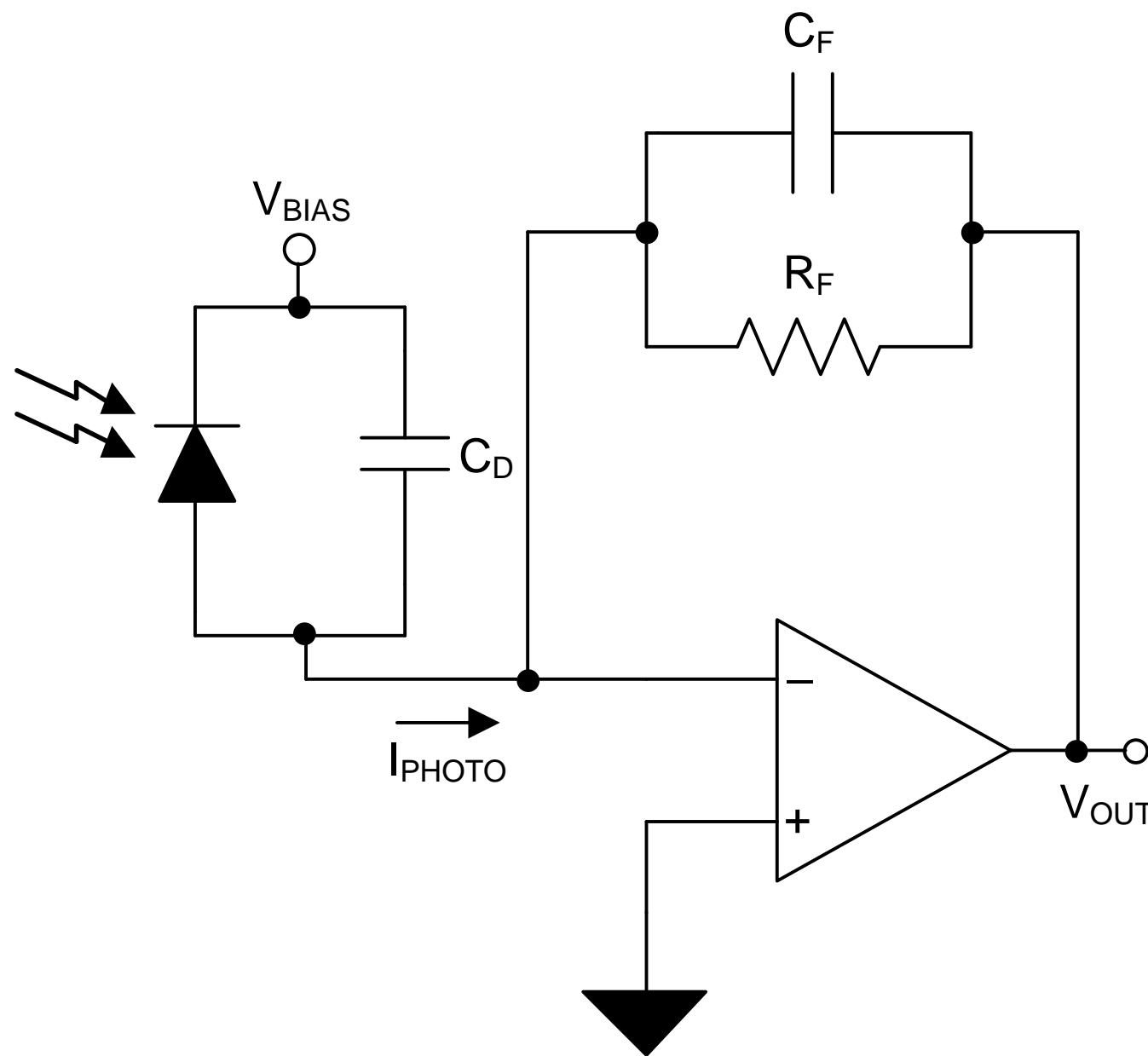


# System Inputs: Transimpedance Gain

$$V_{\text{out}} = -I_{\text{photo}} * R_f$$

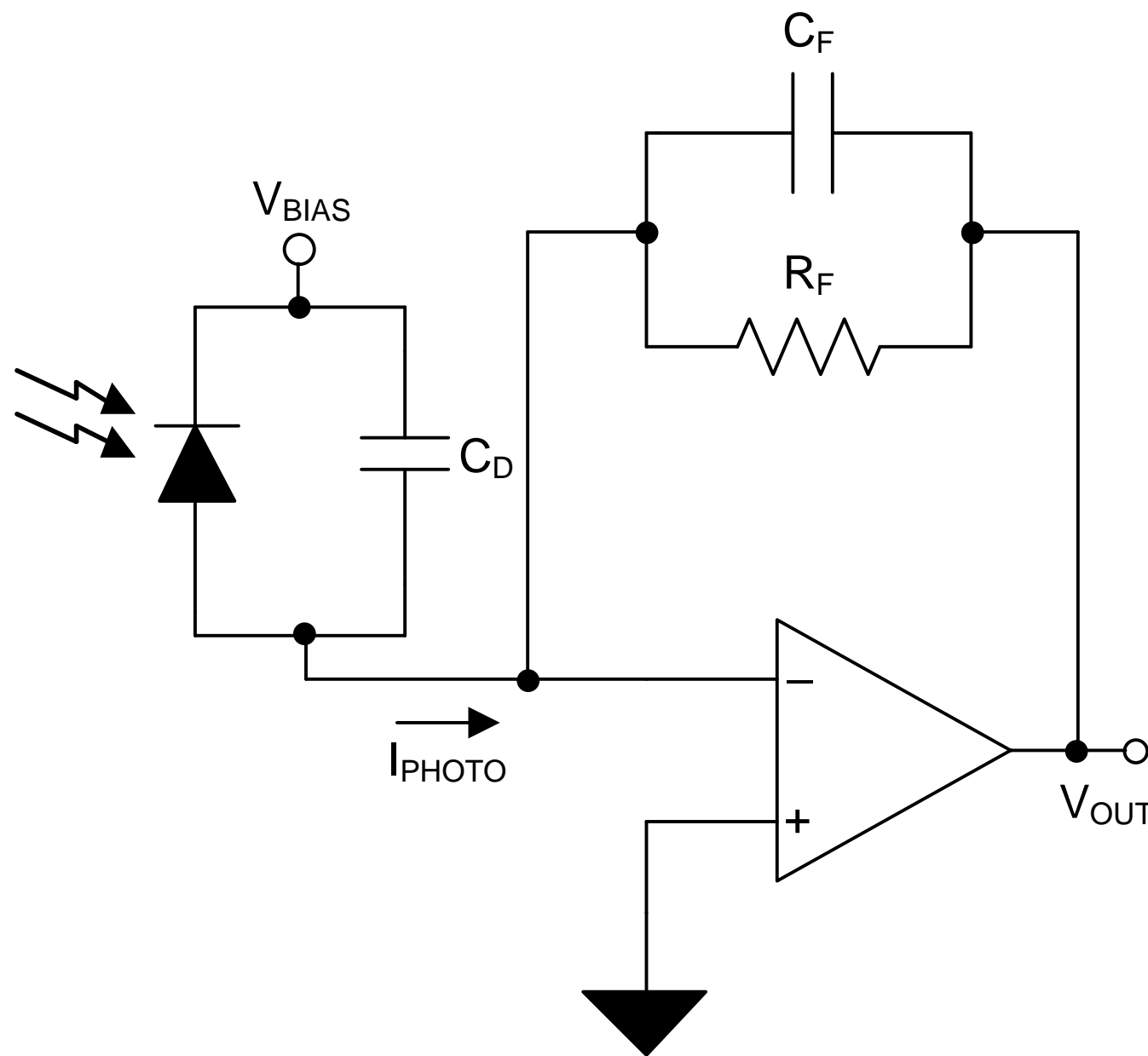
$$R_{F \text{ max}} = \frac{V_{\text{max\_swing}}}{I_{\text{max}}}$$

$$R_{F \text{ min}} = \frac{V_{\text{Noise RMS}}}{I_{\text{min}}}$$



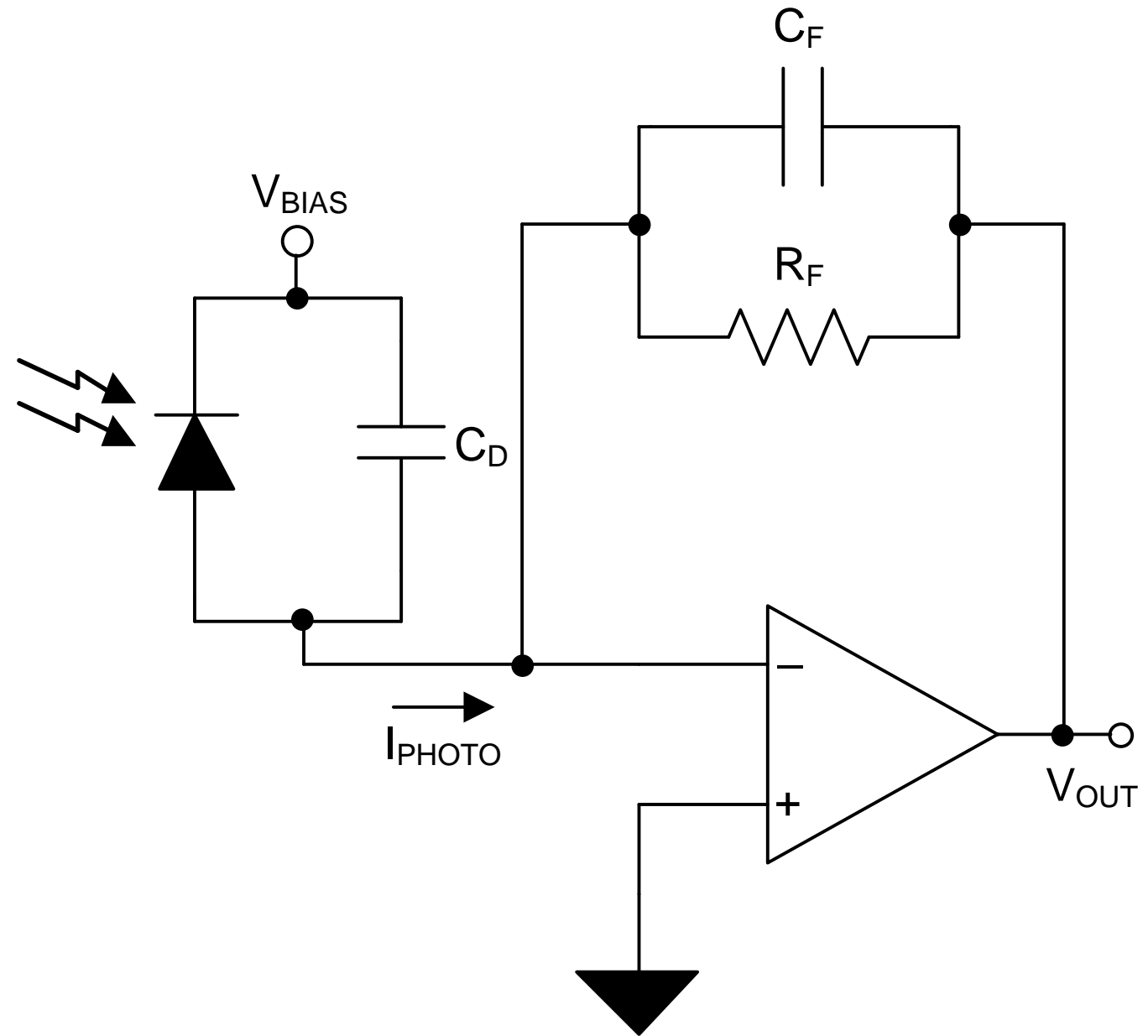
# System Inputs: Photodiode Capacitance

$$C_D \approx 1\text{pF}-1\text{nF}$$



# System Inputs: Bandwidth

$$F_{-3\text{dB}} = \frac{0.35}{t_R}$$
$$SR = \frac{V_{\text{max\_swing}}}{t_R}$$





**Thanks for your time!**