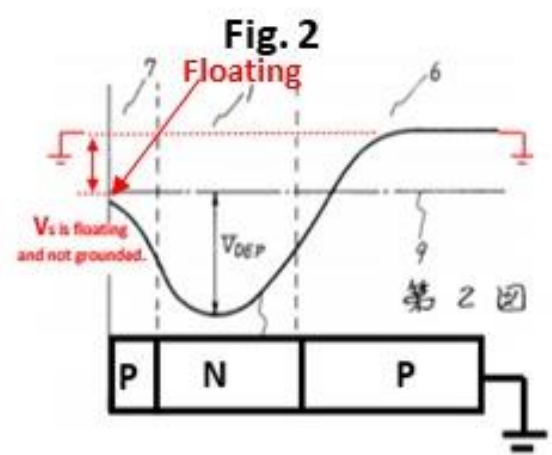


## Difference between Buried Photodiode and Pinned Photodiode

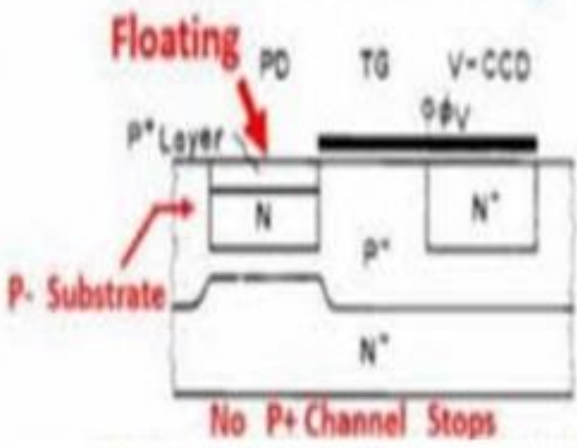
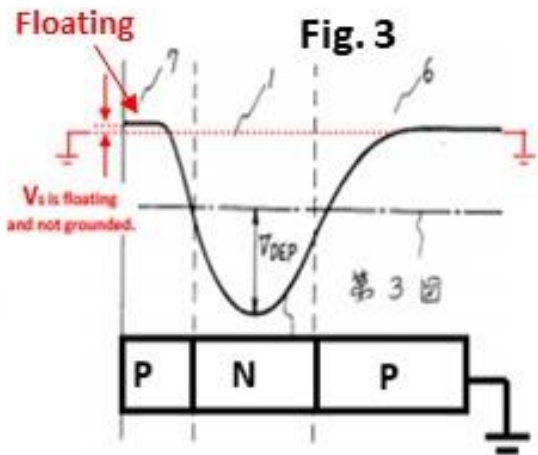
I've edited this Answer to acknowledge Hagiwara-san's contribution. It has long been incorrectly attributed to Teranishi and to Fossum (in CMOS image sensors)

**“The first Pinned Photodiode was invented by Hagiwara at Sony.”**  
**“It has long been incorrectly attributed to Teranish and to Fossum.”**

Teranishi at NEC Patent filed Japanese Patent Application JPA 1980-138026 on Buried Photodiode with Fig. 2 and Fig.3 shown below. Observe that the surface potential in Fig.2 is not pinned. It has an undesired surface electric field which induces the serious surface dark current noise problem. Observe also that the surface potential in Fig.2 is not pinned to the substrate ground potential. This is NOT Pinned Photodiode.



The surface P region is NOT pinned. See Fig.2 of JPA1980-138026



The Buried Photodiode reported in NEC IEDM1982 Paper