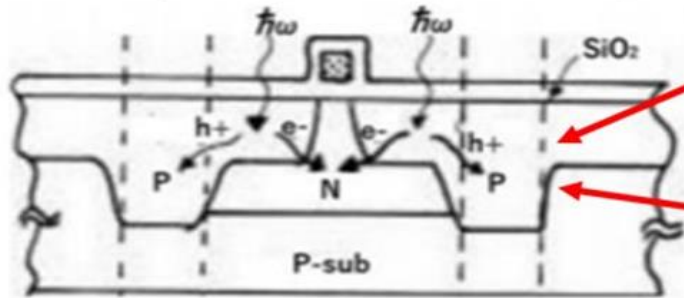


# True History of Photodiode

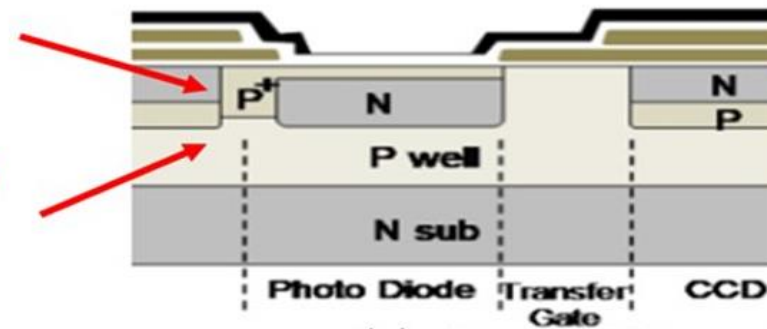
First Pinned Photodiode was invented by Hagiwara in 1975 and reported at SSDM1978 by Sony.

Sony never used LOCOS isolation nor Shallow Trench Isolation. Both suffer the yield problem of Dark Current and White Defects. Instead, Sony used high energy ion implantation to form the adjacent heavily doped P+ channel stops region with the Lamp Anneal Technology invented by Kazuo Nishiyama at Sony.

(1) The first Pinned Photodiode with the adjacent P+ channel stops and no LOCOS isolation invented and reported at SSDM1978 by Hagiwara.

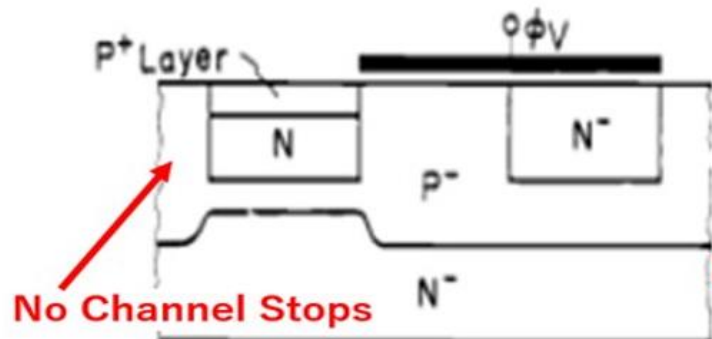


(2) Pinned Photodiode with the adjacent P+ channel stops and no LOCOS isolation as explained by ssis.or.jp in the official Semiconductor History Museum WEB site.



No LOCOS Isolation  
No Shallow Trench Isolation

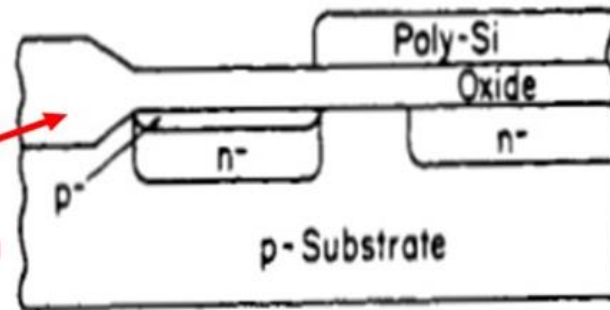
(3) Buried Photodiode reported at IEDM1982 by NEC



LOCOS Isolation

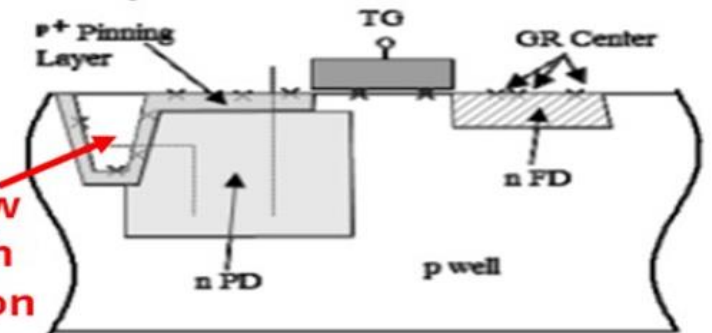
No Channel Stops

(4) Pinned Photodiode reported at IEDM1984 by KODAK



Shallow Trench Isolation

(5) Pinned Photodiode reported by Teranishi in 2014



Sony Pinned Photodiode has the adjacent P+ heavily doped channel stops always directly grounded to the metal wire at the surface since 1978. Sony never used LOCOS isolation nor Shallow Trench Isolation.