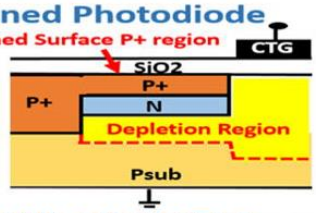
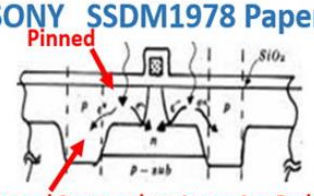
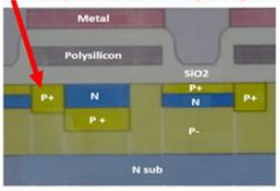
Difference of Buried Photodiode and Pinned Photodiode

Pinned Photodiode



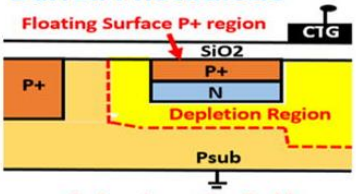
SONY SSDM1978 Paper





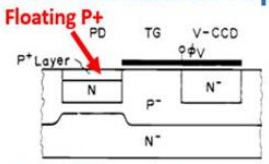
SONY 1987 HAD Sensor

Buried Photodiode

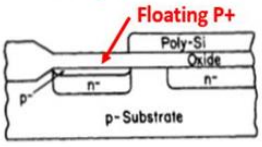


Serious Image Lag Problem

NEC IEDM1982 Paper



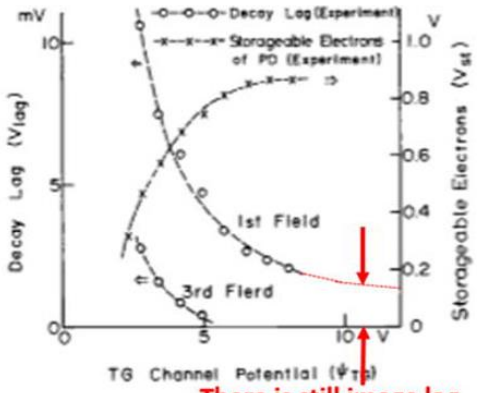
No P+ Channel Stops and Serious Image Lag



KODAK IEDM1984 Paper

NEC IEDM1982 Paper reported Image Lag

Figure 6 shows that there is still image lag at the CTG gate voltage of > 10 volt.



There is still image lag at the CTD gate voltage more than 10 volt.

Fig.6. Storageable electrons vs. transfer gate channel potential, and decay lag vs. transfer gate channel potential in the P+NP- structure photodiode

KODAK had LOCOS Channel Stops but NEC did not have any P+ Channel Stops. NEC buried N region may be floating ?

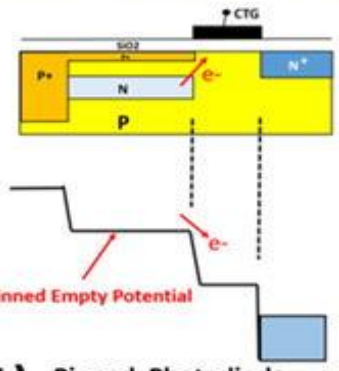
Difference of Pinned Photodiode and Buried Photodiode

Pinned Photodiode must have the P+ heavy doped channel stops nearby.

Pinned Photodiode must be a buried photodiode.

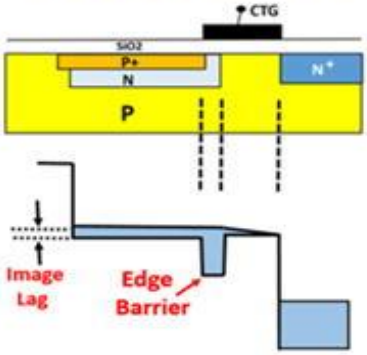
Pinned Photodiode must not have the edge barrier to the Charge Transfer Gate

Pinned Buried Photodiode does not have the edge barrier



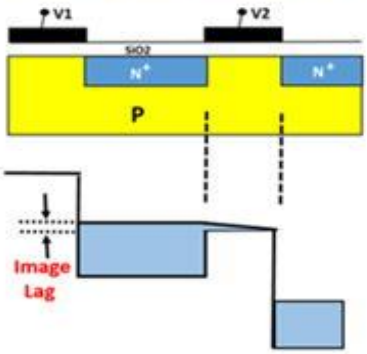
(1) Pinned Photodiode with No Image Lag

Buried Photodiode with the edge barrier

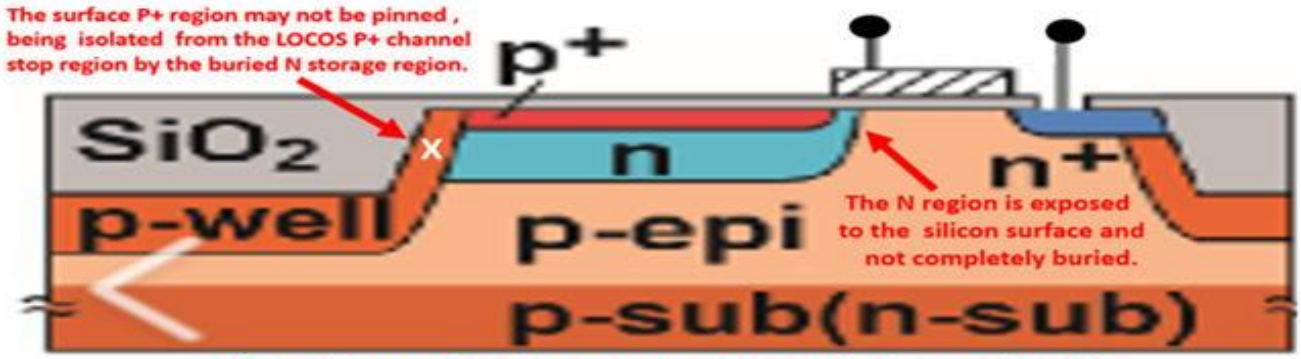


(2) Buried Photodiode with BBD Barrier

Bucket Bridgade Device (BBD) with Serious Image Lag



(3) Bucket Brigade Device (BBD)



This photodiode is not Pinned Photodiode since the N storage region is not completely buried.