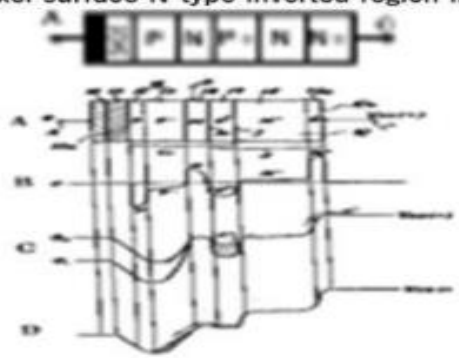
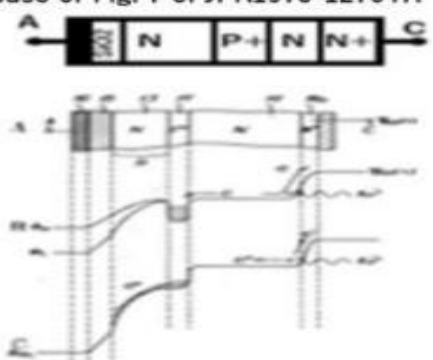
Who_invented_Pinned_Photodiode_with_No_Image_Lag_and_Electric_Shutter_function.html

Who invented Electric Shutter ?

Hagiwara at Sony invented Electric Shutter in October 23, 1975. The evidence is give and explained in Fig. 7 of the Japanese patent application, JPA1975-127646, in which the first Electric Shutter function was defined. The photo charge is transferred and drained to the in-pixel buried channel type vertical overflow drain (VOD) region, which is defined as the buried channel region of the buried channel type CCD/MOS buffer memory capacitor. The three-voltage-level clocking scheme (Clock C and D) of the first Electric Shutter Function mode was defined in Fig. 7 of JPA1975-127646, using the strong punch-thru action mode between the buried P type photo charge storage region and the P-type in-pixel vertical overflow drain (VOD) region. The strong draining gate clock D voltage as shown by creates the very deep potential well in the in-pixel P-type buried vertical overflow drain (VOD) region in case of Fig. 7 of JPA1975-127646 while the strong draining gate clock C voltage creates the very deep potential well in the in-pixel surface N-type inverted region in case of Fig. 7 of JPA1975-127647.



JPA1975-127646 Fig. 7



JPA1975-127647 Fig. 7

Hagiwara at Sony invented in 1975 the first Electric Shutter Function.

To achieve the complete Electric Shutter function, the surface of the photodiode must be pinned and fixed by the external constant voltage with the zero resistance.

The first Pinned Photodiode was invented by Hagiwara in 1975 to achieve the electric shutter function.

Hagiwara invented in 1975 the triple junction dynamic thyristor type Pinned Photodiode with the in-pixel CCD/MOS Capacitor Global Shutter Buffer Memory, with the top metal contact of zero RC time constant and the no image lag feature which realized the ideal high-frequency Electric Shutter function for the modern back-light CMOS image sensors. The first Pinned Photodiode was invented in 1975 in order to realize the completely mechanical-parts free electric shutter function by Hagiwara at Sony.

We need to pin and fix one end of a flexible rubber band in order to expand it by stretching the other end.