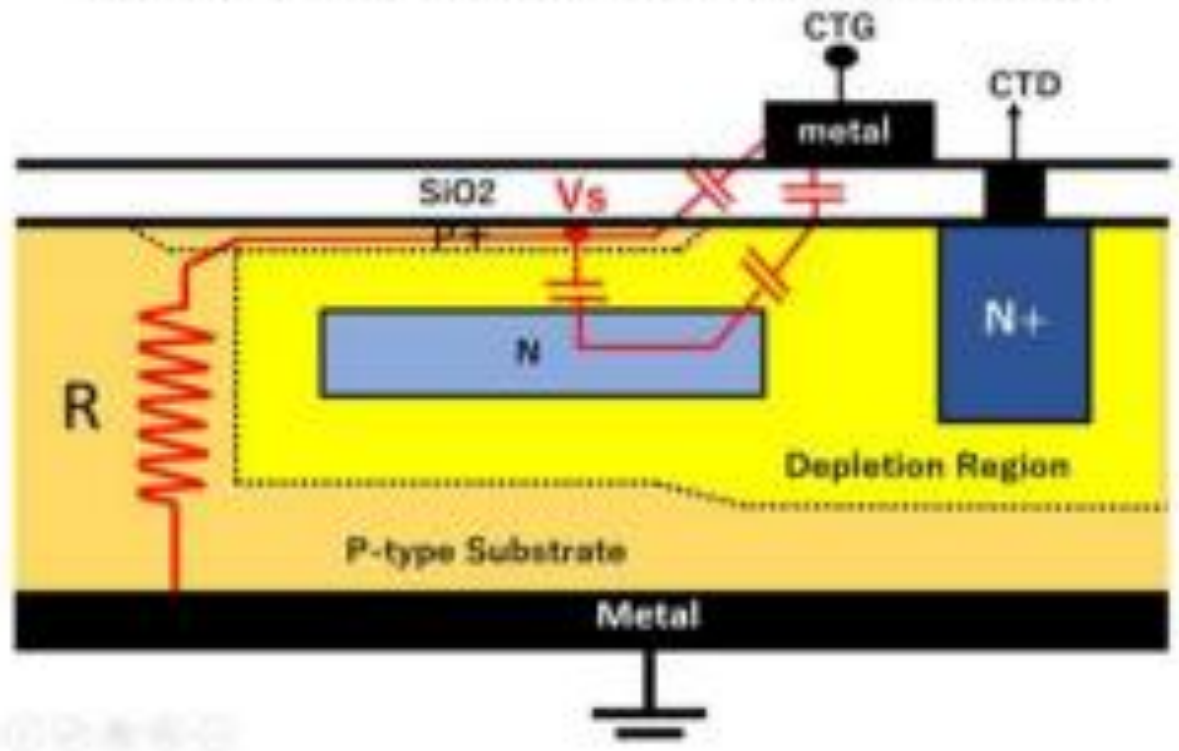


II. DIFFERENCE BETWEEN FLOATING SURFACE AND PINNED SURFACE BURIED PHOTODIODES

(b) Floating P+ Surface with RC Delay Time of the finite ohmic substrate resistance (R).



The non-zero RC time delay was always a serious problem in 1950s for high frequency device operations, especially for the collector and the emitter non-zero on-resistance problems for high performance power bipolar transistors. The collector and the emitter terminal of a PNP power bipolar transistor had to be pinned to the external voltage with the zero on-resistance to achieve the zero RC time delay for high frequency operations. The concept of Pinned Surface Device was already well understood in early 1950s. When Hagiwara at Sony invented Pinned Buried Photodiode in 1975, the concept of the buried base storage region was also well understood. See Fig.4. There are two types of Buried Photodiode. NEC type [2] is shown in Fig. 4a while Philips type [3] is shown in Fig. 4b. They are Buried Photodiodes with a floating surface and a floating empty potential well with the serious image lag

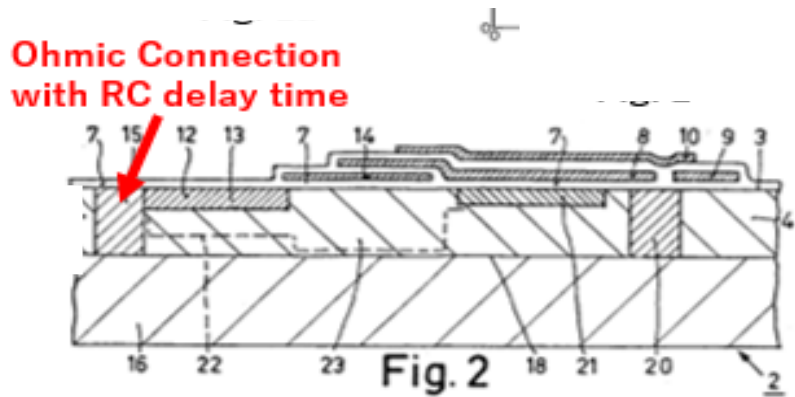


Fig.4 Difference of Buried Photodiode and Pinned Photodiode

[3] JPA1976-65707 (Patent No. 7596795, filed on June 9, 1975, Netherland) on Buried Photodiode with Floating Empty Potential Well.