

Yoshiaki Hagiwara as a presenter at the ISSCC2013 Plenary Panel.

Yoshiaki Hagiwara: The p-n-p-n Diode in Future Linear Motor Cars and in Modern Imagers

John Louis Moll (1921–2011) was studying a p-n-p-n diode switch in his Ph.D. dissertation work when the first ISSCC was held in 1954. In a normal operation mode, this device works as a thyristor, which can drive a large current and is the key device structure of an IGBT applied for a linear motor car of the future (see Figure 9). In a dynamic operation mode, this device may work as a simple p-n-p-n dynamic capacitance that can detect and store one single electron, which is a key device structure of the modern image sensor (see Figure 10).

I recall, when I was taking his physics course at Caltech, that Feynman once said that an electron is always free, moving around rapidly in free space, even in solid, and it

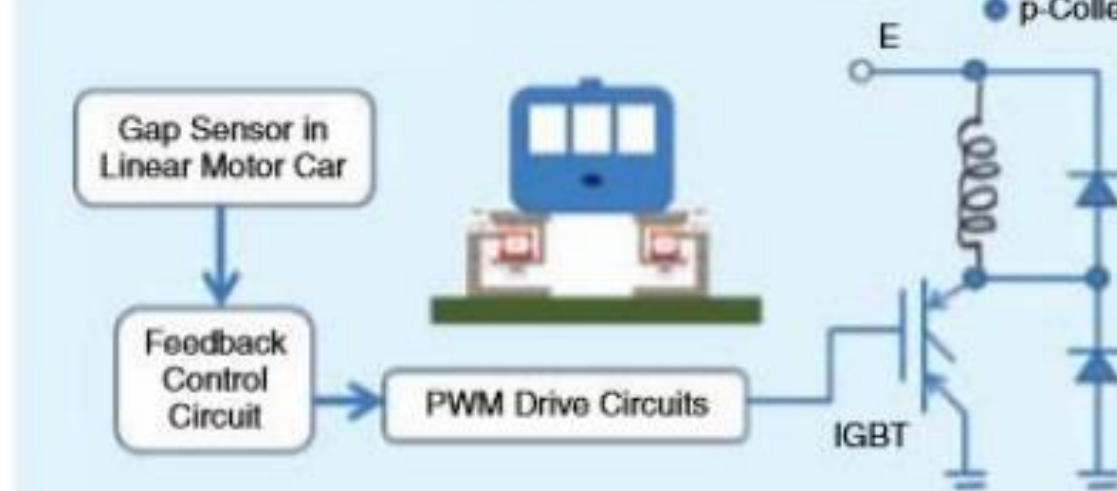
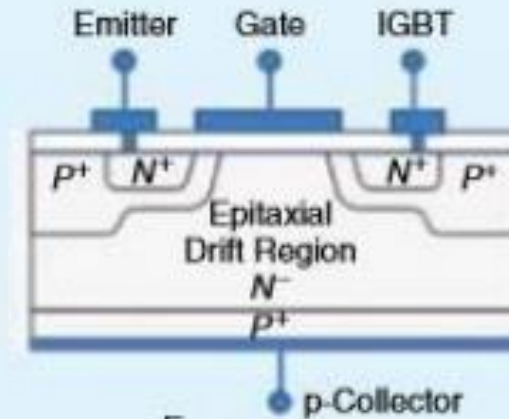


FIGURE 9: The p-n-p-n switch diode for a modern linear motor car.