

HOT ELECTRON InSb DETECTOR

When cooled to liquid helium temperatures, absorption of radiation by free carrier electrons causes their mean temperature (T) to rise above that of the host lattice. Electron mobility is proportional to $T^{3/2}$, hence this temperature rise can be sensed as a change in conductivity. The very low thermal mass of the free electrons with short energy relaxation times of about 10^{-7} seconds leads to very fast and sensitive millimeter and submillimeter wave detection.

This detector uses a specially shaped high purity N-type InSb crystal which may be coupled directly to a very low noise preamplifier. Typical performance figures are given below:

Detector Area	5mm x 5mm
Detector Mounting	Sapphire substrate in integrating cavity
Operating Temperature	4.2 Kelvin
Spectral Response	0.3mm – 5.0mm
Frequency Response (3db)	0 - 600 kHz
Detector Electrical Responsivity	>5000 V/Watt
Detector Optical Responsivity	>3500 V/Watt
System Optical Responsivity	>2000 V/Watt
NEP (Electrical)	7.5×10^{-13} W/Hz ^{1/2}