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Nota di contenuto	Optoelectronic Sensors; Table of Contents; Preface; Chapter 1. Introduction to Semiconductor Photodetectors; 1.1. Brief overview of semiconductor materials; 1.2. Photodetection with semiconductors: basic phenomena; 1.3. Semiconductor devices; 1.4. p-n junctions and p-i-n structures; 1.5. Avalanche effect in p-i-n structures; 1.6. Schottky junction; 1.7. Metal-semiconductor-metal (MSM) structures; 1.8. Operational parameters of photodetectors; 1.8.1. Response coefficient, gain and quantum efficiency; 1.8.2. Temporal response and bandwidth; 1.8.3. Noise equivalent power; 1.8.4. Detectivity Chapter 2. PIN Photodiodes for the Visible and Near-Infrared2.1. Introduction; 2.2. Physical processes occurring in photodiodes; 2.2.1. Electrostatics in PIN diodes: depleted region; 2.2.2. Mechanisms of electron-hole pair generation; 2.2.3. Transport mechanisms; 2.3. Static characteristics of PIN photodiodes; 2.3.1. I/V characteristics and definition of static parameters; 2.3.2. External quantum efficiency;

2.3.3. Dark current; 2.3.4. Breakdown voltage; 2.3.5. Saturation current; 2.4. Dynamic characteristics of PIN photodiodes; 2.4.1. Intrinsic limitations to the speed of response; 2.4.2. Limitations due to the circuit; 2.4.3. Power-frequency compromise, Pf^2 "law"; 2.5. Semiconductor materials used in PIN photodiodes for the visible and near-infrared; 2.5.1. Absorption of semiconductors in the range 400-1,800 nm; 2.5.2. From 400 to 900 nm: silicon and the GaAlAs/GaAs family; 2.5.3. From 900 to 1,800 nm: germanium, GaInAsP/InP; 2.6. New photodiode structures; 2.6.1. Beyond the limits of conventional PIN; 2.6.2. Photodiodes with collinear geometry; 2.6.3. Waveguide photodiodes; 2.6.4. Traveling-wave photodiodes; 2.6.5. Beyond PIN structures; 2.7. Bibliography

Chapter 3. Avalanche Photodiodes

3.1. Introduction; 3.2. History; 3.3. The avalanche effect; 3.3.1. Ionization coefficients; 3.3.2. Multiplication factors; 3.3.3. Breakdown voltage; 3.4. Properties of avalanche photodiodes; 3.4.1. Current-voltage characteristics and photomultiplication; 3.4.2. Noise in avalanche photodiodes; 3.4.3. Signal-to-noise ratio in avalanche photodiodes; 3.4.4. Speed, response time and frequency response of avalanche photodiodes; 3.5. Technological considerations; 3.5.1. Guard ring junctions; 3.5.2. "Mesa" structures; 3.5.3. Crystal defects and microplasmas

3.6. Silicon avalanche photodiodes

3.6.1. Si N+P APDs; 3.6.2. Si N+PP+ APDs; 3.6.3. Si N+PP+ APDs; 3.6.4. SiPt-Si N Schottky APDs; 3.7. Avalanche photodiodes based on gallium arsenide; 3.8. Germanium avalanche photodiodes; 3.8.1. Ge APDs with N+P, N+NP and P+N structures for 1.3 μ m communication; 3.8.2. Ge APDs with P+NN- structures for 1.55 μ m communication; 3.9. Avalanche photodiodes based on indium phosphate (InP); 3.9.1. InGaAs/InP APDs for optical communications at 2.5 Gbit/s; 3.9.2. Fast InGaAs/InP APDs; 3.10. III-V low-noise avalanche photodiodes

3.10.1. III-V super-lattice or MQW APDs

Sommario/riassunto

Optoelectronic sensors combine optical and electronic systems for numerous applications including pressure sensors, security systems, atmospheric particle measurement, close tolerance measurement, quality control, and more. This title provides an examination of the latest research in photonics and electronics in the areas of sensors.