

effective electron mass in pdf

Effective Mass Expression Finally, we obtain the effective mass equation $\frac{d^2v}{dt^2} = -\frac{1}{m^*} \frac{d^2E}{dk^2}$ (8) $F = m^* \frac{dv}{dt}$ (9) $\frac{d^2E}{dk^2} = \frac{1}{m^*}$ The equation (8) is identical to Newton's second law of motion except that the actual particle mass is replaced by an effective mass m^* .

THE EFFECTIVE MASS THEORY - Southern Methodist University

Positive and negative effective mass The sign of the effective mass is determined directly from the sign of the curvature of the E-k curve. Direct-band gap s/c (e.g. GaAs, InP, AlGaAs) e-CB $\frac{d^2E}{dk^2} = \frac{1}{m^*}$ The curvature of a graph at a minimum point is a positive quantity and the curvature of a graph at a maximum point is a negative quantity. Particles (electrons) sitting near the minimum have a positive effective mass.

CHAPTER 2 ENERGY BANDS AND EFFECTIVE MASS

transverse masses in the plane perpendicular to the longitudinal direction. In silicon the longitudinal electron mass is $m_{e,l}^* = 0.98 m_0$ and the transverse electron masses are $m_{e,t}^* = 0.19 m_0$, where $m_0 = 9.11 \times 10^{-31}$ kg is the free electron rest mass. Two of the three band maxima occur at 0 eV.

2.3.7. Detailed description of the effective mass

Effective Mass At $k=0$, the (E,k) relationship near the minimum is usually parabolic: $E = E_0 + \frac{1}{2} \frac{d^2E}{dk^2} k^2$ In a parabolic band, $\frac{d^2E}{dk^2}$ is constant. So, effective mass is constant. In most semiconductors the effective mass is a tensor quantity.

Effective Mass - folk.uio.no

The electron effective mass in the thermal oxide as insulator has been determined earlier to be $0.42m_0$, where m_0 is the free electron mass based on the free Fermi gas model for the carriers at the emitting electrode of a MOS device in accumulation [2, 3].

Determination of electron and hole effective masses in

are parallel. In order to be quantitative, we define effective mass by the relation $\frac{1}{m^*} = \frac{d^2E}{dk^2}$: (1) Using this we can write expressions for the bare momentum $p_b = m_0 v$ of the particle, and the momentum carried by the medium $p_m = p_b - m_0 v$, $p_b = \frac{1}{m_0} \frac{dE}{dk} m_0 \frac{dk}{dt}$; $p_m = \frac{1}{m^*} \frac{dE}{dk} m_0 \frac{dk}{dt}$; (2) where \hat{p} is a unit vector in the direction of p .

Simple understanding of the effective mass - Aalto University

electron with negative effective mass An electron near the top of an energy band will have a negative effective mass. A negatively charged particle with a negative mass will be accelerated like a positive particle with a positive mass (a hole!) $\frac{dE}{dk} = \frac{dE}{dk} \frac{dk}{dt} = m^* a = QE$

The Quasi-Free Electron and Electron Effective Mass, m^*

In the majority of cases, the top of the valence band is clearly "flatter" than the bottom of the conduction band. From this follows that the hole effective mass is often larger than the electron ...

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