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Let  $K$  be a noetherian ring and  $S$  a commutative algebra, which is essentially of finite type over  $K$  and is projective as a  $K$ -module. The  $K$ -algebra  $S$  is said to be Gorenstein if the non-trivial fibers of the structure homomorphism  $K \rightarrow S$  are Gorenstein rings. This property will be characterized in terms of the vanishing of appropriate Hochschild cohomology groups  $\mathrm{HH}^n(S|K; S \otimes_K S)$ . (Received February 09, 2006)