We propose a new reconstruction method for the classical case of the Calderón (or conductivity) problem in dimension two. Given a bounded domain Ω with Lipschitz boundary Γ, we aim to recover the location and the shape of a single cavity $\omega \subsetneq \Omega$, with Lipchitz boundary γ, from the knowledge of the Dirichlet-to-Neumann map $\Lambda_\gamma : f \longmapsto \partial_n u^f|_\Gamma$, where u^f is harmonic in $\Omega \setminus \omega$, $u^f|_\Gamma = f$ and $u^f|_\gamma = c$ where $c \in \mathbb{R}$ is such that $\int_\gamma \partial_n u^f \,\mathrm{d}s = 0$. The cavity is supposed to be described via the Riemann map $z \longmapsto a_1 z + a_0 + \sum_{k \leqslant -1} a_k z^k$, ($a_k \in \mathbb{C}$), that conformally maps the exterior of the unit disk onto the exterior of the cavity. Using a boundary integral formulation of the problem, we first prove that the knowledge of this map uniquely determines the so-called generalized Pólia-Szegö tensors (GPST) of the cavity. Next, we prove that recovering the complex coefficients a_k from the generalized polarization tensors is a well-posed problem and we provide a simple one-step numerical scheme allowing one to recover accurately the coefficients a_k from the measurements. Some numerical results will be given to illustrate the efficiency of the reconstruction method.