The preferred equilibrium structure of germanium dicarbide (GeC$_2$) has been an open question for decades: while high-level quantum chemical calculations predict an L-shaped ground state structure, the very flat potential energy surface of the species prevents a T-shaped structure from being entirely ruled out. By recording for the first time the rotational spectrum of GeC$_2$ using sensitive microwave and millimeter techniques, we establish that the molecule adopts a vibrationally-averaged T-shaped structure in the ground state. From isotopic substitution of 14 isotopologues, a precise $r_0$ structure has been derived. This structural work should serve as an important benchmark for future calculations.