Supplementary information

Strain-induced phase transitions and high carrier mobility in two-dimensional Janus $M\text{GeS}_2$ ($M = \text{Ti, Zr, and Hf}$) structures:

First-principles calculations

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Fig. S1. AIMD simulations for temperature fluctuations to simulation time at 300 K of strained $M\text{GeS}_2$ monolayers at $\epsilon_b = +9\%$ (a) and $\epsilon_b = -9\%$ (b).
Fig. S2. Band structures of (a) TiGeSN₂, (b) ZrGeSN₂, and (c) HfGeSN₂ under a uniaxial strain along the x-axis $\varepsilon_x$. 
Fig. S3. Band structures of (a) TiGeSN$_2$, (b) ZrGeSN$_2$, and (c) HfGeSN$_2$ under a uniaxial strain along the y-axis $\varepsilon_y$. 