SUPPORTING INFORMATION:

Detection of Spin Polarized Carrier in Silicon Nanowire with Single Crystal MnSi as Magnetic Contacts

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Figure S1 shows a high-resolution TEM image of MnSi/Si interface. The lattice mismatch between Si$(3\bar{1}\bar{1})$ and MnSi$(1\bar{2}0)$ is about 24.5%. An extra Si semi-plane can be observed every four planes, which is believed to release stress built-up in the crystal, leading to a coherent interface between MnSi and Si.

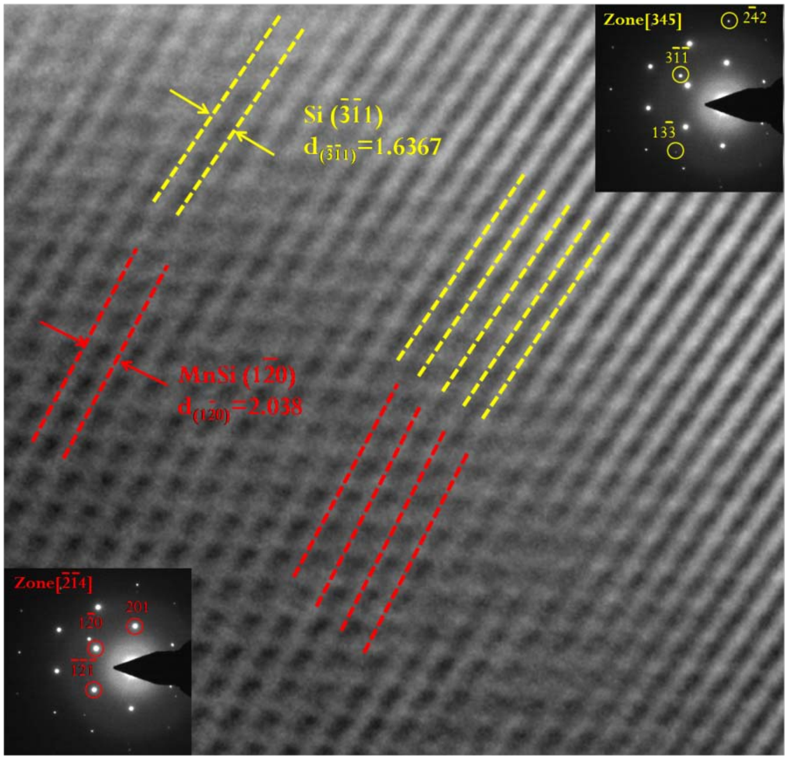

Figure S1. High-resolution TEM image of MnSi/ Si interface. Insets are the diffraction patterns of MnSi$[\bar{2}\bar{1}4]$ and Si[345] zone axis. Measured lattice mismatch at interface is ~24.5 % which is consistent with one-planar spacing between MnSi$(1\bar{2}0)$ and Si$(3\bar{1}\bar{1})$. There is an extra Si semi-plane every four planes.

Figure S2. The equivalent circuit of MnSi/Si/MnSi heterostructure. The heterostructure can be treated as two Schottky diodes (interface) connected back to back and in series with a resistance (silicon region). To determine the Schottky barrier height (SBH) of the MnSi/Si interface, a model of two back-to-back Schottky contacts have been proposed to address the nonlinear *I-V-T* curves of semiconductor nanowire junction. Regarding thermionic emission behavior, the *I-V-T* relation of a reverse-biased Schottky diode can be described by the following equation:

$$I = AA^{**}T^2 \exp\left(-\frac{q\varphi_B}{k_B T}\right)$$

where A is the contact area, A^{**} is the effective Richardson constant, and φ_B the effective Schottky barrier height. φ_B can be obtained from the slope of Figure 4d which is an Arrhenius plot of $\ln(I/T^2)$ versus $1/T$ in the low bias regime. Slope of Arrhenius plot is equal to $-q\varphi_B/k_B$. Therefore, the effective Schottky barrier height φ_B can be extracted. This holds only for high temperatures at which A^{**} and φ_B are temperature independent.[1,2]

Reference:

1. Nam, C. Y.; Tham, D.; Fischer, J. E. *Nano Lett.* **2005,** *5*, 2029-2033.
2. Sze, S. M. *Physics of Semiconductor Devices*; Wiley: New York, 1981.