Supplementary Information

Layer dependent magnetoresistance of vertical MoS$_2$ magnetic tunnel junctions

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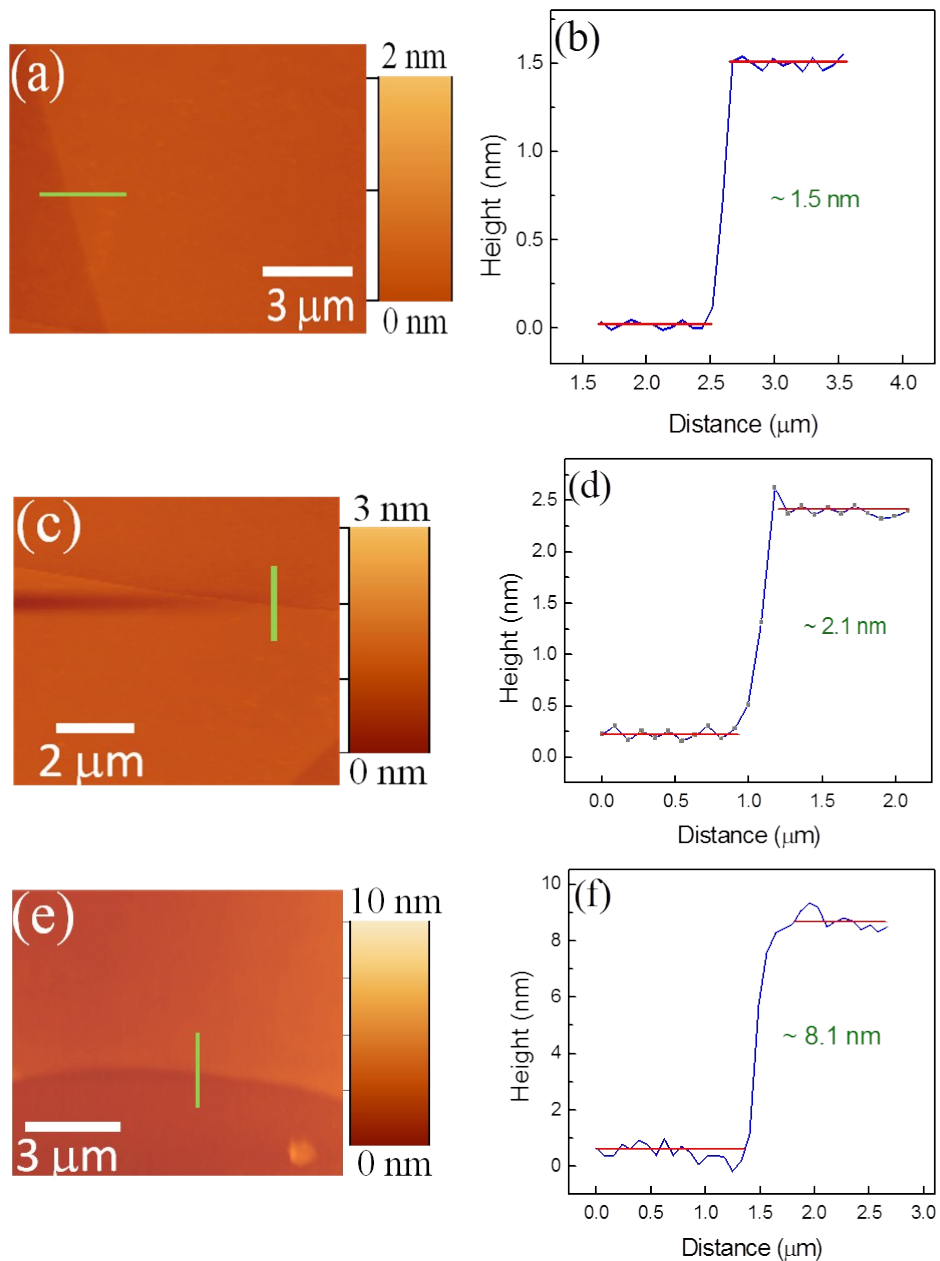Daejeon 34113, Korea

Atomic force microscopy (AFM)

Figure S1   Images by AFM of **(a)** bi-, **(c)** tri-, and **(e)** multilayer MoS$_2$ flakes with their corresponding height profiles in **(b)**, **(d)** and **(f)** respectively.

The measurements of junction resistance as a function of temperature

The product of junction resistance (R) and junction area (A) is defined as (R x A = RA). The *RA-T* of mono-, bi-, tri-, and multilayer MoS_2 flakes were investigated at different temperatures.
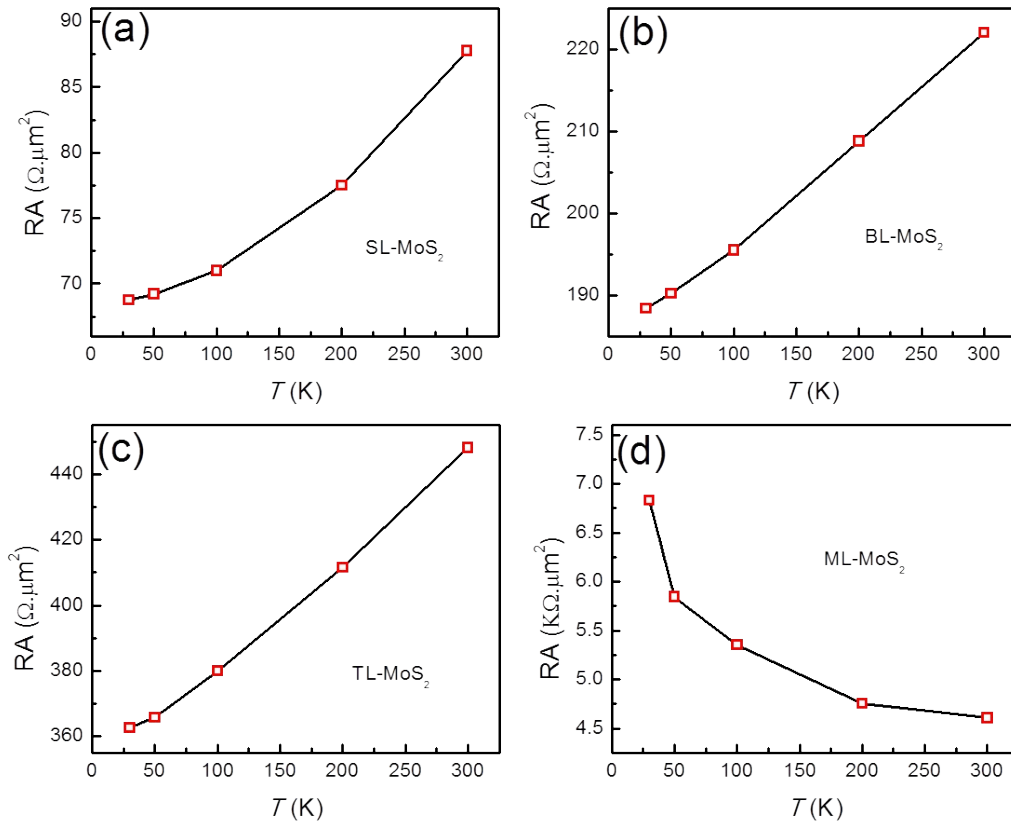

Figure S2   Product of resistance (*R*) and junction area (*A*) measured as a function of temperature for **(a)** mono-, **(b)** bi-, **(c)** tri-, and **(d)** multilayer MoS_2 vertical magnetic tunnel junctions. All these measurements were accomplished at I = 10 μA.

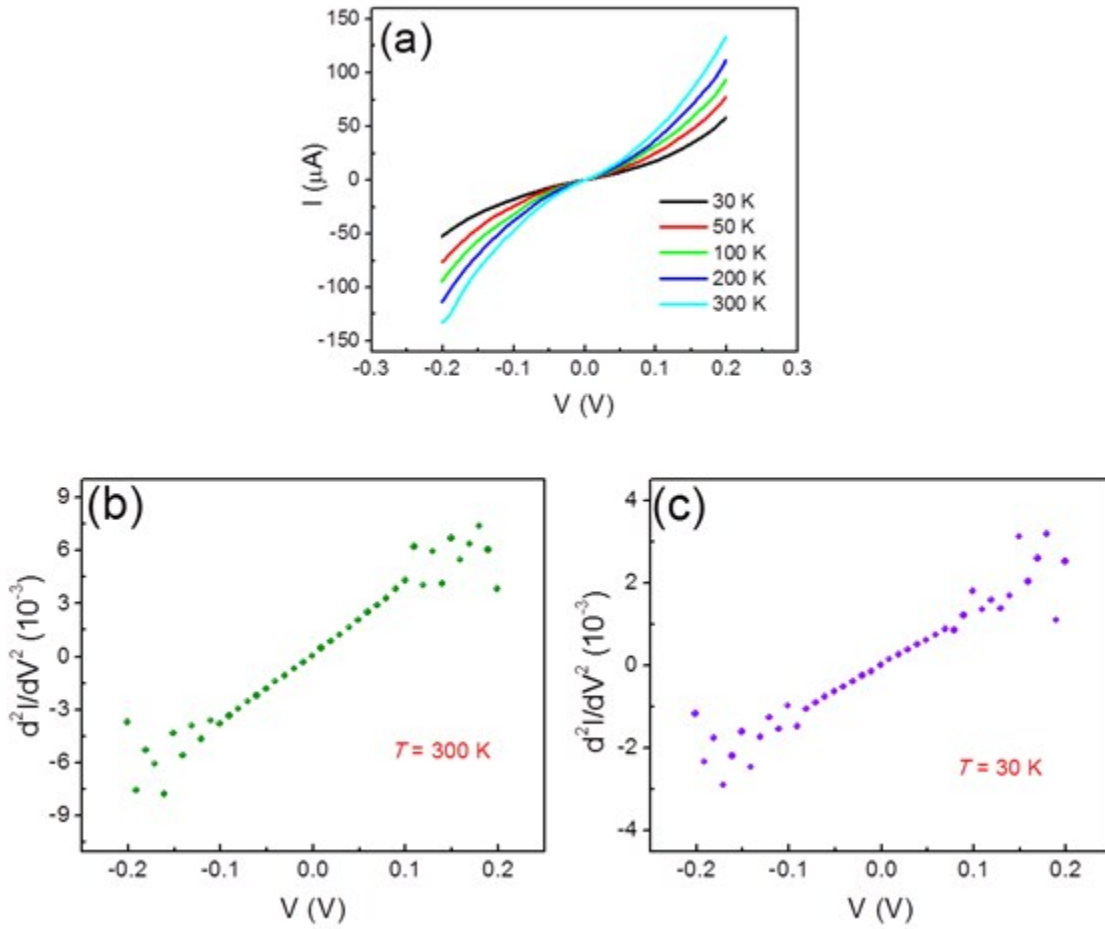**The current-voltage measurement of multilayer MoS$_2$ at different temperature**

Figure S3 **(a)** Temperature dependent current-voltage characteristics of multilayer MoS$_2$ spin valve junction. The second derivative of *I-V* curves of multilayer MoS$_2$ device at **(b)** 300 K and **(c)** 30 K.

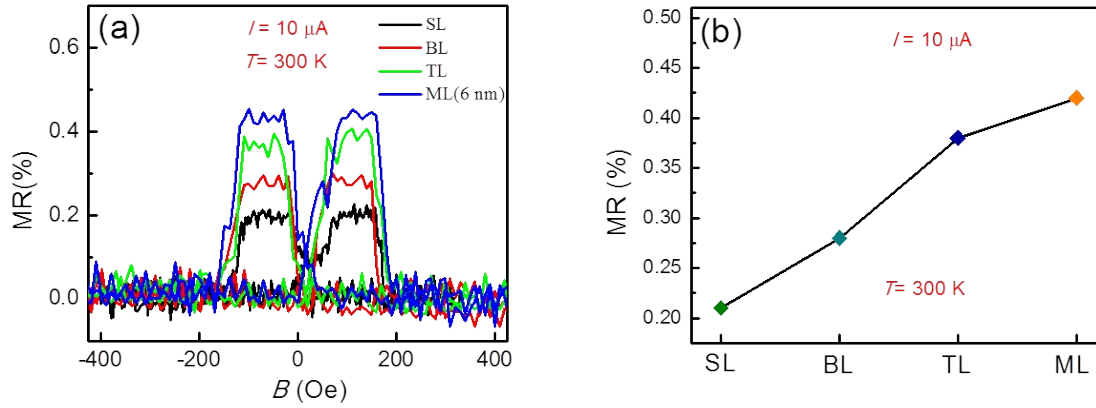**Layer dependent magnetoresistance loops of MoS$_2$**

Figure S4   Set-2 of devices. **(a)** Magnetoresistance measurements traces of mono- to multilayer MoS$_2$ spin valve junctions as a function of external magnetic field at room temperature. **(b)** The values of MR ratios of mono-, bi-, tri-, and multilayer MoS$_2$ vertical magnetic tunnel junctions. The current is fixed at I = 10 µA.