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Supplementary Data

High Performance and Gate-controlled GeSe/HfS_2 Negative Differential Resistance Device

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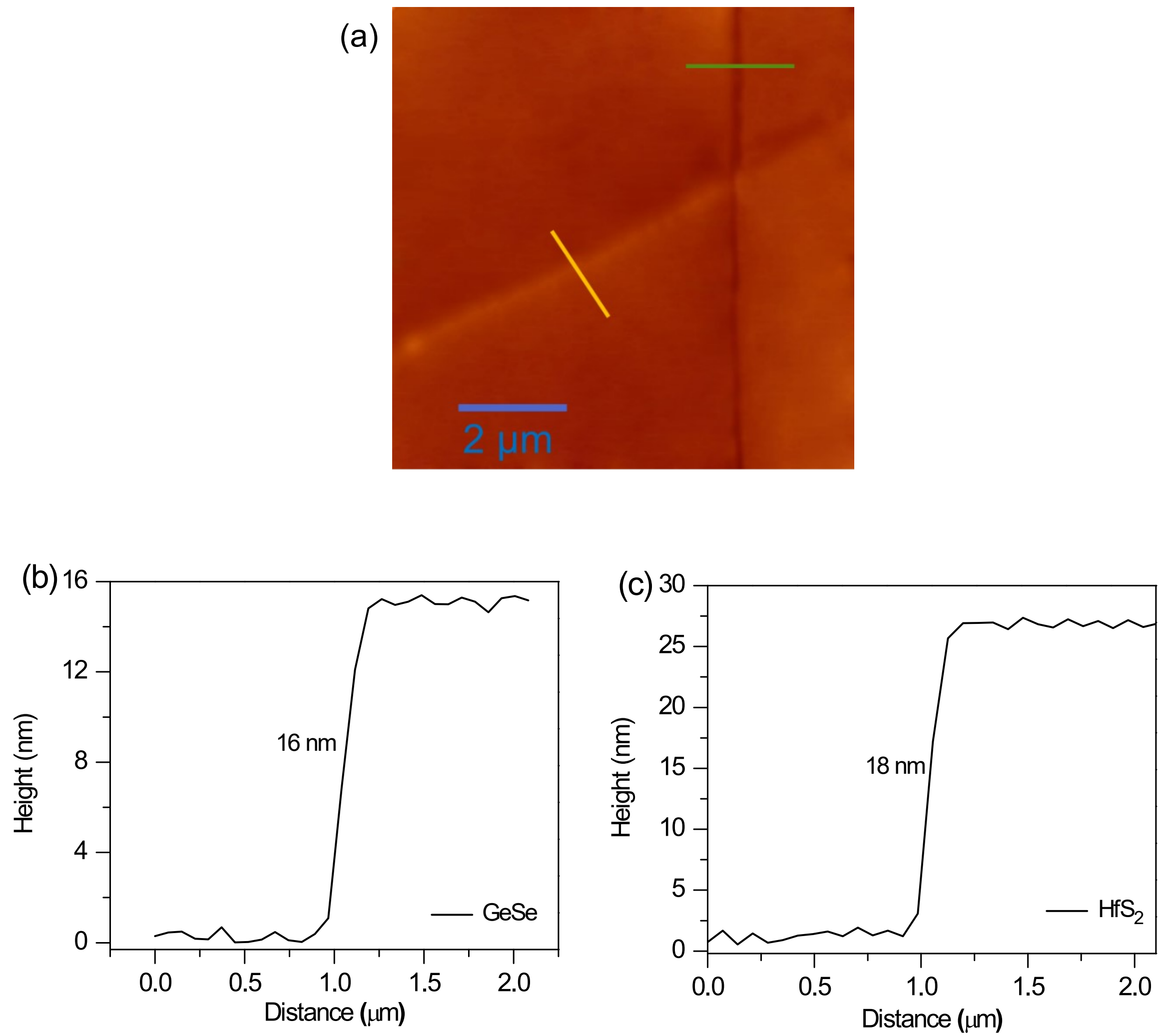

Figure S1. (a) Atomic force microscopy image of GeSe/HfS_2 heterostructure (b) Height profile of GeSe flake. The thickness of GeSe flake is 16 nm (c) Height profile of HfS_2 flake. The thickness of HfS_2 is 18 nm

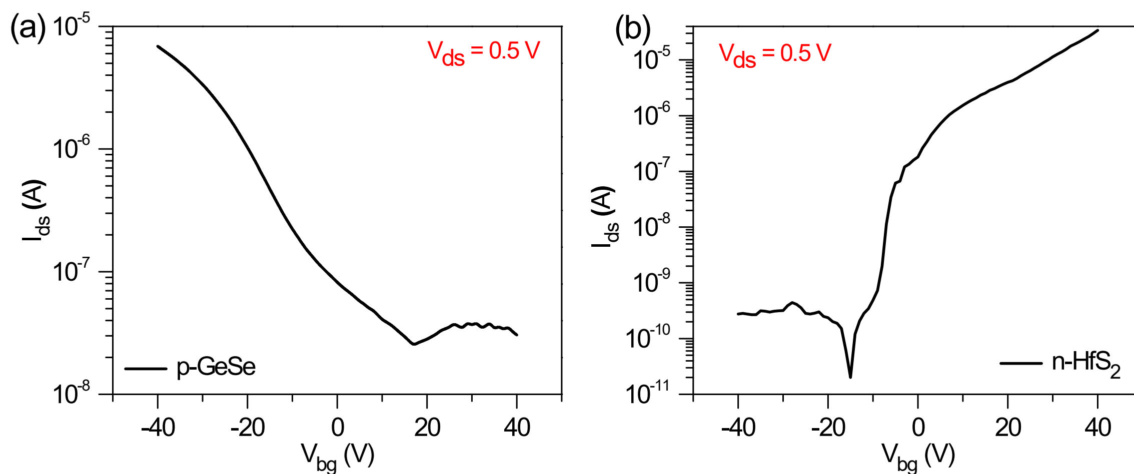

Figure S2. Transfer curves of (a) p-GeSe with Pd/Au (b) n- HfS_2 with Sc/Au

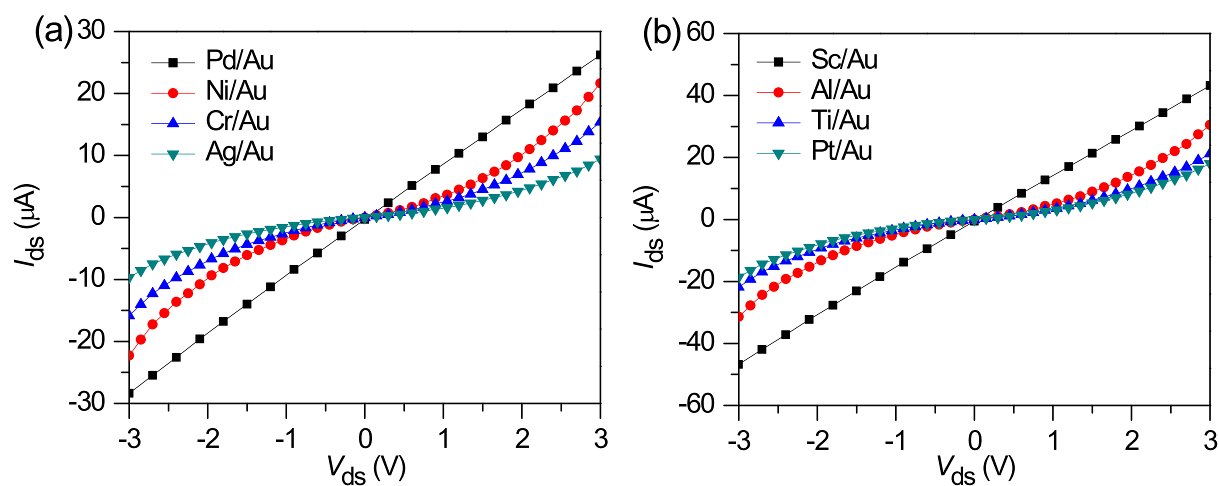

Figure S3. Current-voltage (I_{ds}-V_{ds}) characteristics of (a) p-GeSe with different electrodes (b) n-HfS_2 with different electrodes

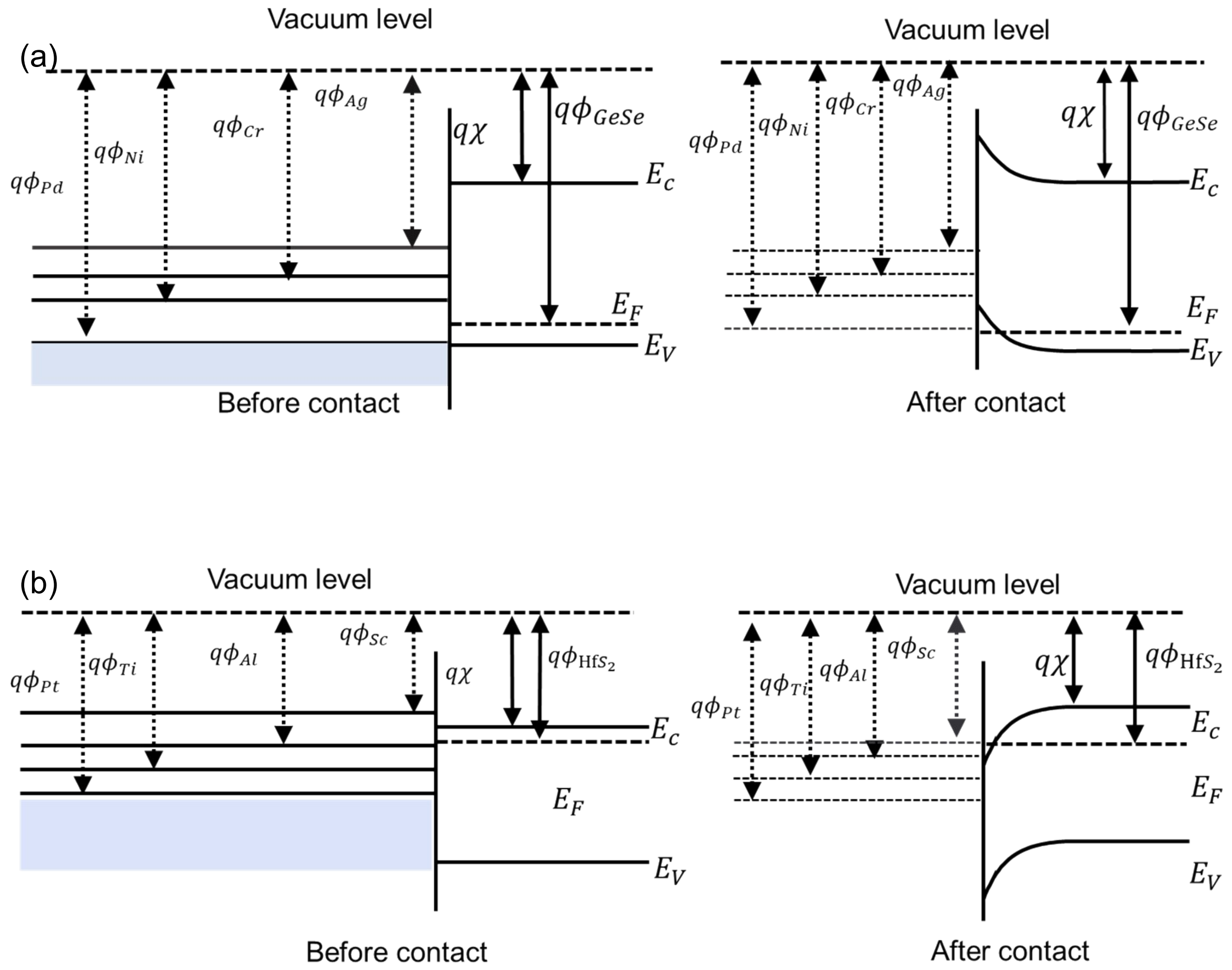

Figure S4. Band energy diagram of metal-TMDs (GeSe and HfS_2) junction before contact and after contact (a) p-GeSe (b) n-HfS_2

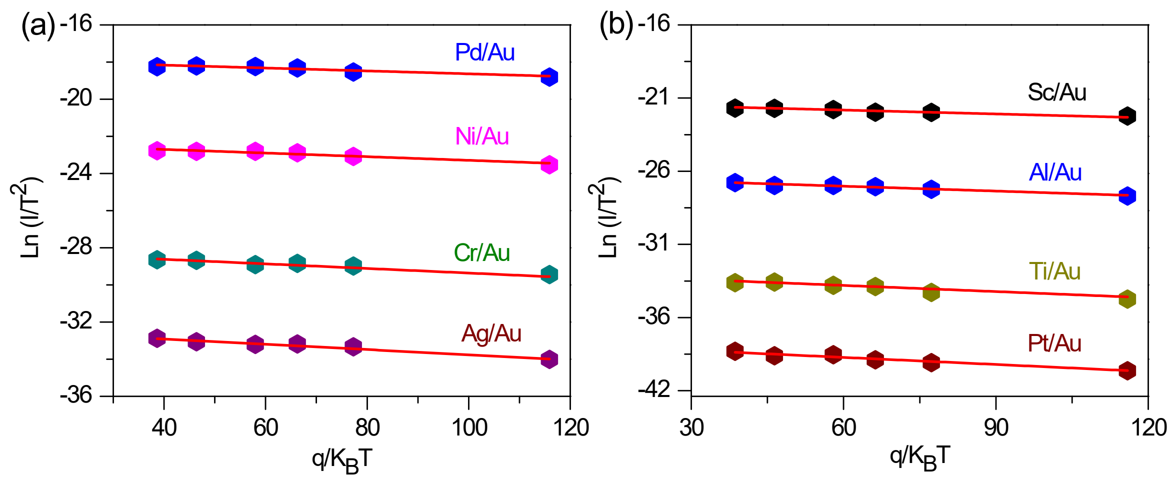

Figure S5. Richardson's plot ($\ln\left(I/T^2\right)$ vs q/K_BT) to calculate the barrier height for (a) GeSe (b) HfS_2

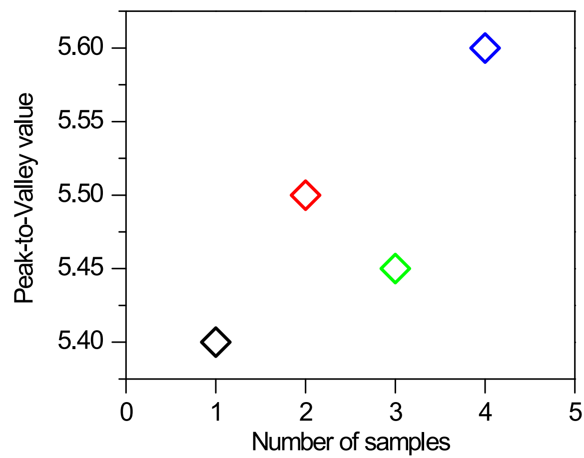

Figure S6. Peak to valley ratio of different samples

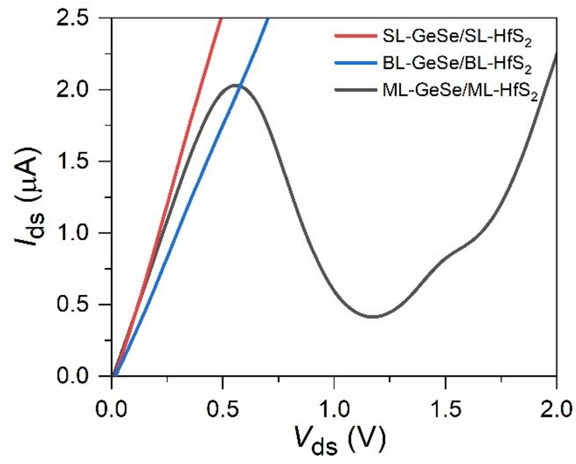

Figure S7. Effect of thickness on the performance of p-GeSe/n-HfS_2 NDR device

Sr. No.	Heterostructure	Peak-to-valley current ratio	Ref.
1	BP/$SnSe_2$	2.8	[1]
2	MoS_2/WSe_2	0.6	[2]
3	MoS_2/WSe_2	1.6	[3]
4	WSe_2/$SnSe_2$	4	[4]
5	BP/$ReSe_2$	3.3	[5]
6	WSe_2	1.5	[6]
7	BP/ReS_2	6.9	[7]
8	GeSe/HfS_2	9.8	This work

Table 1. Comparison of p-GeSe/n-HfS_2 NDR devices with previously reported value.

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