Electronic Supplementary Material (ESI) for Journal of Materials Chemistry C.

Supporting Information

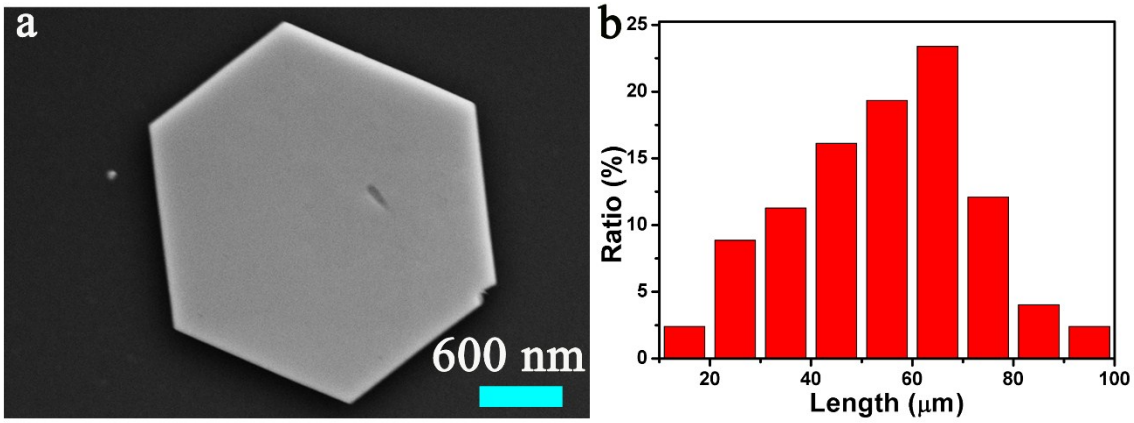

Figure S1 a) High-magnification SEM image of the ZnSb nanoplate. b) Length distribution of the ZnSb nanoplates.

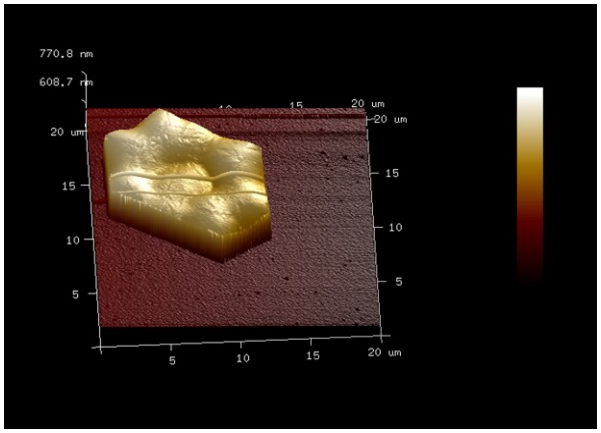

Figure S2 Three-dimensional diagram of the ZnSb nanoplate.

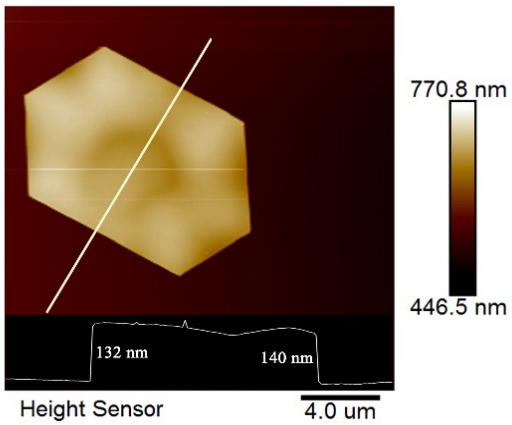

Figure S3 AFM image of the corresponding ZnSb nanoplate.

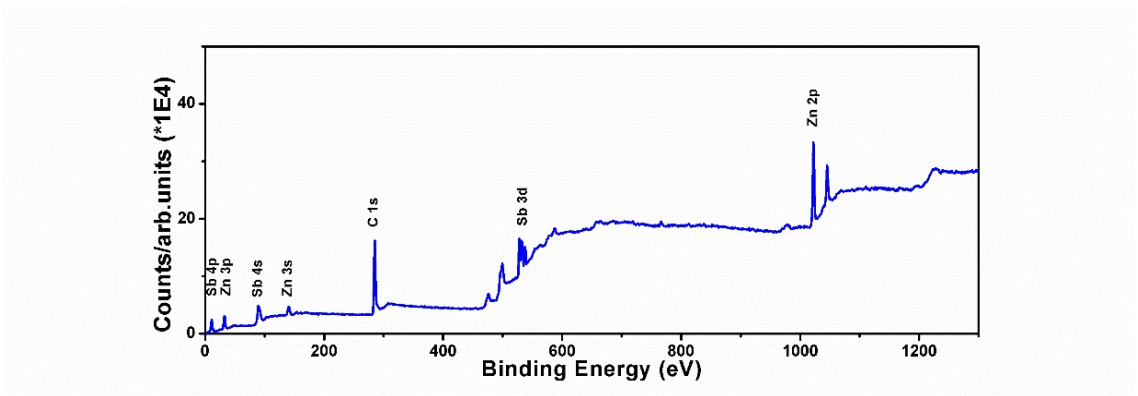

Figure S4 XPS survey scan of the ZnSb nanoplates.

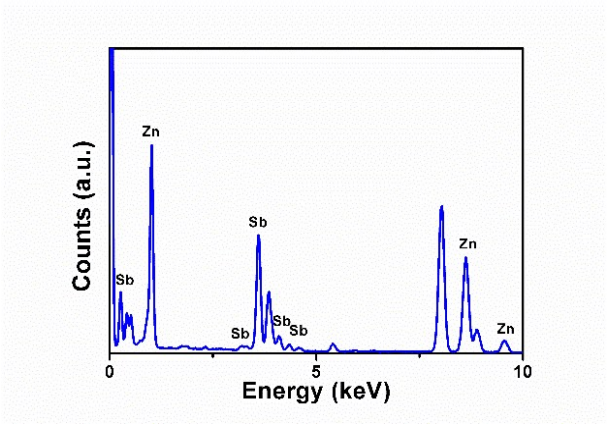

Figure S5 EDX spectrum of the ZnSb nanoplates.

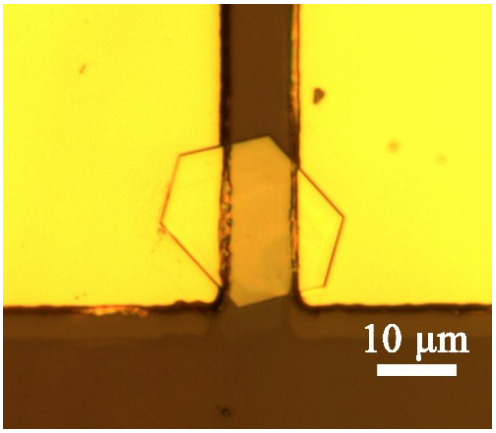

Figure S6 Optical image of single micrometer-sized nanoplate-based device.

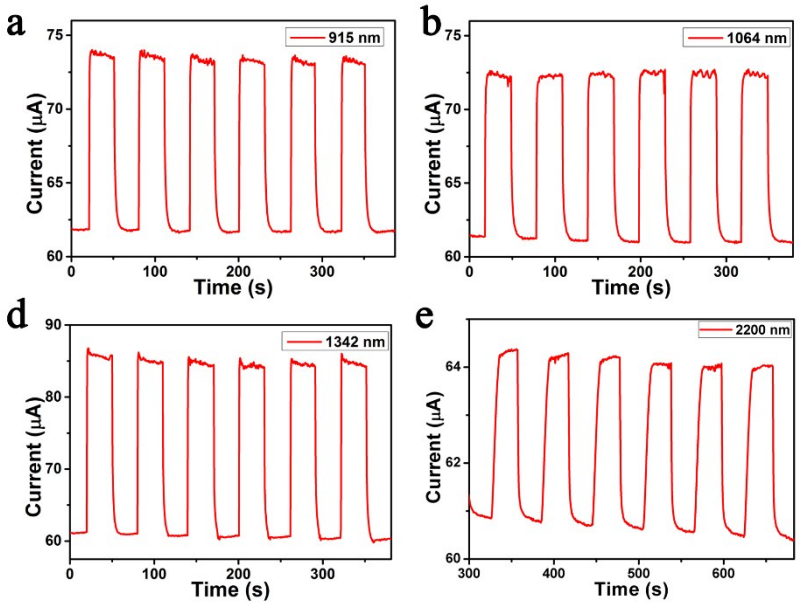

Figure S7 a-e) *I-T* curves of the device with a bias of 0.5 V under the 915 nm, 102 mW/cm^2; 1064 nm, 92 mW/cm^2; 1342 nm, 200 mW/cm^2; 2200 nm, 54 mW/cm^2 illumination at room temperature.

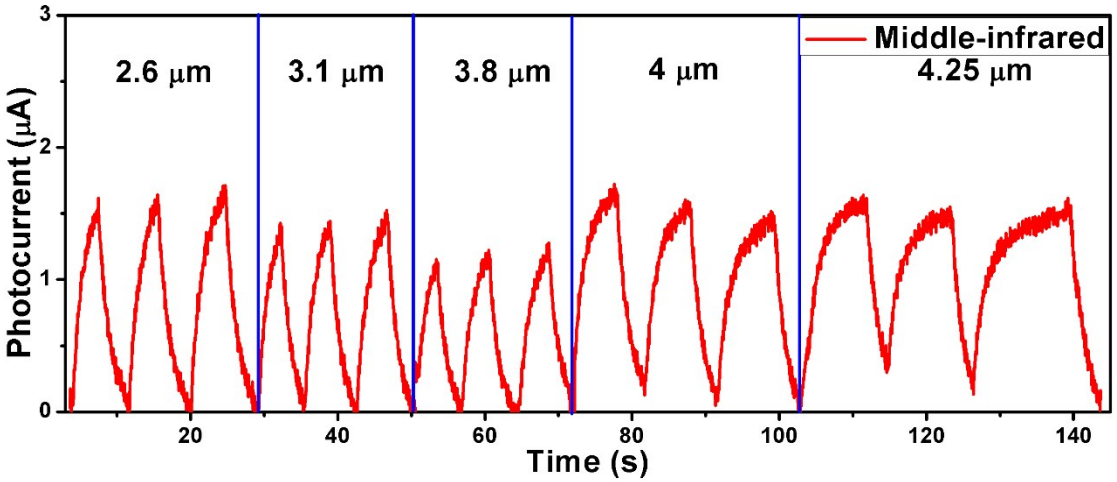

Figure S8 The photocurrent of the device measured in the MIR at room temperature.

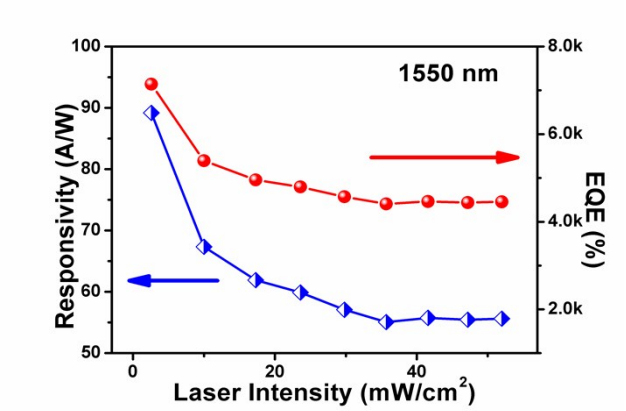

Figure S9 Photoresponsivity and *EQE* of the device versus laser intensity measured at V_{ds} = 0.5 V.

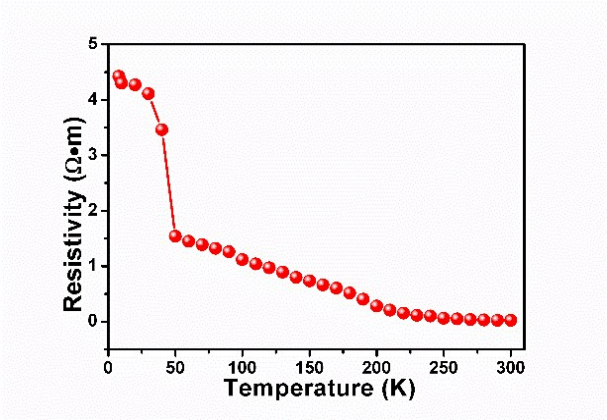

Figure S10 The resistivity versus temperature ranging from 8 to 300 K.

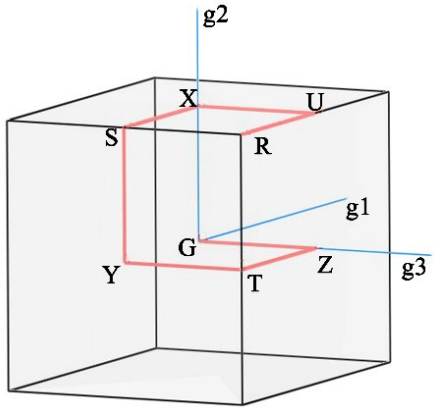

Figure S11 The Brillouin zone of calculated ZnSb unit cell.

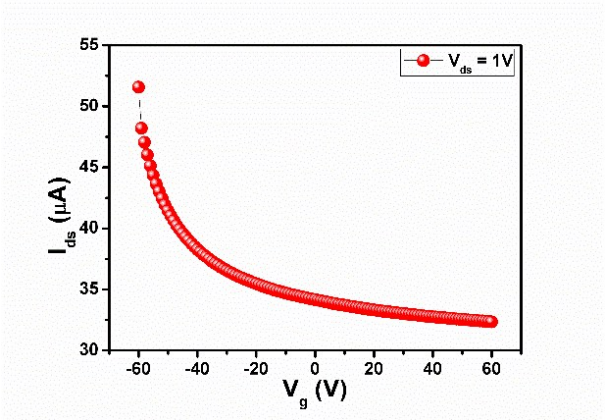

Figure S12 Transfer characteristic curve of ZnSb nanoplate.

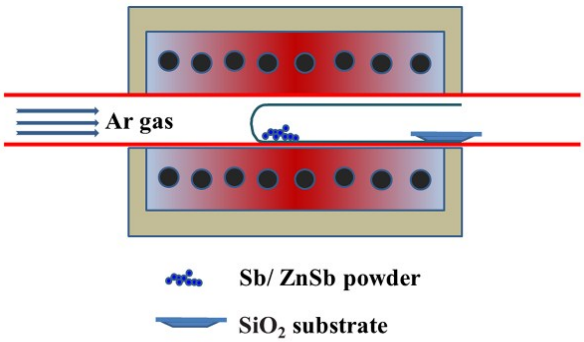

Figure S13 Schematic diagram of chemical vapor deposition system for synthesizing ZnSb plates.

Table S1. Electronic energies (in eV) of ZnSb at some high symmetry points in the Brillouin zone, as calculated from the HSE06-Non-optimization (1.004 eV).

G-point	Z-point	T-point	Y-point	S-point	X-point	U-point	R-point
3.852	4.671	4.163	3.850	3.152	3.871	3.656	3.867
3.764	3.988	4.158	3.843	3.146	3.858	3.648	3.853
3.623	3.903	3.274	3.476	3.141	3.782	3.640	3.829
3.529	3.707	3.268	3.446	3.138	3.732	3.629	3.817
3.434	3.130	3.209	3.042	2.636	3.634	2.314	3.263
3.403	2.912	3.208	3.034	2.625	3.633	2.299	3.256
3.079	2.404	2.323	2.506	2.620	2.593	2.293	3.246
2.689	2.217	2.307	2.506	2.618	2.577	2.284	3.237
2.567	1.874	2.004	2.176	1.686	2.475	1.459	1.400
2.084	1.420	2.003	2.172	1.669	2.438	1.455	1.397
1.898	1.111	1.940	1.556	1.666	1.140	1.414	1.363
1.130	1.004	1.932	1.548	1.653	1.136	1.412	1.357
-0.879	-0.677	-0.873	0.000	-0.734	-1.128	-1.252	-1.089
-0.904	-0.815	-0.885	-0.001	-0.758	-1.181	-1.259	-1.101
-1.220	-1.357	-1.034	-0.669	-0.779	-1.581	-1.271	-1.137
-1.665	-1.495	-1.047	-0.692	-0.790	-1.585	-1.281	-1.143
-1.741	-2.067	-1.796	-1.155	-1.537	-2.243	-1.545	-2.480
-2.068	-2.155	-1.799	-1.188	-1.564	-2.255	-1.552	-2.495
-2.102	-2.336	-1.958	-1.265	-1.579	-2.373	-1.584	-2.517
-2.279	-2.383	-1.964	-1.276	-1.597	-2.384	-1.594	-2.531
-2.557	-2.524	-2.815	-2.032	-2.629	-2.843	-3.574	-2.667
-3.431	-2.680	-2.827	-2.066	-2.664	-2.873	-3.589	-2.685
-3.449	-2.915	-3.183	-2.761	-2.675	-2.882	-3.599	-2.691
-3.631	-3.110	-3.213	-2.762	-2.683	-2.887	-3.611	-2.703

Table S2. Electronic energies (in eV) of ZnSb at some high symmetry points in the Brillouin zone, as calculated from the HSE06-optimization (0.460 eV).

G-point	Z-point	T-point	Y-point	S-point	X-point	U-point	R-point
4.328	4.574	3.909	3.879	3.324	3.978	3.635	4.150
3.979	4.562	3.895	3.871	3.320	3.977	3.633	4.136
3.783	4.451	3.880	3.813	3.307	3.948	3.621	4.110
3.671	4.449	3.866	3.799	3.295	3.933	3.615	4.101
3.635	3.021	3.195	3.433	2.784	3.750	2.236	3.458
3.592	3.012	3.183	3.428	2.777	3.727	2.215	3.453
3.585	2.207	3.170	2.608	2.775	2.743	2.210	3.444
2.932	2.205	3.165	2.601	2.762	2.730	2.201	3.436
2.614	1.576	2.151	2.207	1.705	2.474	1.445	1.463
1.913	1.576	2.147	2.205	1.690	2.424	1.443	1.458
1.635	0.552	2.113	2.149	1.686	1.104	1.390	1.422
1.030	0.551	2.106	2.144	1.676	1.093	1.386	1.413
-1.235	-0.994	-1.201	0.000	-0.992	-1.677	-1.549	-1.390
-1.278	-1.003	-1.211	-0.007	-1.003	-1.728	-1.559	-1.399
-1.537	-2.001	-1.231	-0.803	-1.042	-1.818	-1.572	-1.442
-2.118	-2.003	-1.255	-0.823	-1.044	-1.825	-1.579	-1.453
-2.402	-2.163	-1.883	-1.464	-1.909	-2.881	-1.994	-3.251
-2.419	-2.170	-1.909	-1.490	-1.935	-2.886	-1.999	-3.260
-2.501	-3.159	-1.935	-1.688	-1.970	-2.903	-2.046	-3.267
-2.840	-3.171	-1.939	-1.688	-1.980	-2.919	-2.056	-3.277
-3.065	-3.211	-3.248	-2.397	-3.183	-3.423	-4.459	-3.287
-4.150	-3.233	-3.258	-2.424	-3.209	-3.464	-4.469	-3.288
-4.276	-3.623	-3.265	-3.528	-3.219	-3.678	-4.493	-3.294
-4.456	-3.625	-3.273	-3.528	-3.221	-3.706	-4.500	-3.301

Table S3. Electronic energies (in eV) of ZnSb at some high symmetry points in the Brillouin zone, as calculated from the GGA-optimization (0.714 eV).

G-point	Z-point	T-point	Y-point	S-point	X-point	U-point	R-point
-3.371	-3.487	-3.591	-3.823	-3.256	-3.255	-3.616	-3.542
-3.237	-2.740	-2.664	-2.310	-2.456	-2.591	-3.127	-2.377
-2.970	-2.740	-2.664	-2.310	-2.456	-2.591	-3.127	-2.377
-2.964	-2.220	-2.664	-1.882	-2.456	-2.492	-3.127	-2.377
-2.311	-2.220	-2.664	-1.882	-2.456	-2.492	-3.127	-2.377
-2.203	-2.207	-1.245	-1.206	-1.336	-2.178	-1.552	-2.347
-1.886	-2.207	-1.245	-1.206	-1.336	-2.178	-1.552	-2.347
-1.701	-1.563	-1.245	-1.162	-1.336	-2.034	-1.552	-2.347
-1.540	-1.563	-1.245	-1.162	-1.336	-2.034	-1.552	-2.347
-1.452	-1.515	-0.847	-0.460	-0.702	-1.441	-1.069	-0.856
-0.920	-1.515	-0.847	-0.460	-0.702	-1.441	-1.069	-0.856
-0.742	-0.536	-0.847	0.000	-0.702	-0.964	-1.069	-0.856
-0.655	-0.536	-0.847	0.000	-0.702	-0.964	-1.069	-0.856
1.014	0.872	1.597	0.968	1.234	0.780	1.219	1.230
1.141	0.872	1.597	0.968	1.234	0.780	1.219	1.230
1.664	1.075	1.597	1.781	1.234	2.108	1.219	1.230
1.906	1.075	1.597	1.781	1.234	2.108	1.219	1.230
2.030	1.793	2.700	2.303	2.352	2.261	1.895	2.640
2.806	1.793	2.700	2.303	2.352	2.261	1.895	2.640
2.822	2.358	2.700	2.505	2.352	3.156	1.895	2.640
2.978	2.358	2.700	2.505	2.352	3.156	1.895	2.640
3.130	3.419	3.048	2.969	2.641	3.234	3.121	3.331
3.293	3.419	3.048	2.969	2.641	3.234	3.121	3.331
3.376	3.575	3.048	3.275	2.641	3.357	3.121	3.331
3.377	3.575	3.048	3.275	2.641	3.357	3.121	3.331

Table S4. The calculated effective mass of the free carries in ZnSb, $m_{\perp}/m_0$ and $m_{//}/m_0$, the symbols $\perp$ and // mean transverse and longitudinal directions, m_0 is the mass of the electron.

Methods	m_h // /m_0	$m_h \perp /m_0$	m_e // /m_0
HSE06-Non-optimization	0.504	0.218	0.260
HSE06-Optimization	0.424	0.334	0.392
GGA-Optimization	0.497	0.472	0.225

Table S5. The calculated effective mass of the free carries in ZnSb along different directions, m_h/m_0 and m_e/m_0, m_0 is the mass of the electron.

	G→Z	Z→T	T→Y	Y→S	S→X	X→U	U→R
HSE06- Non-optimization							
mh/m0	/	0.291	0.111	0.826	0.448	0.326	0.453
me/m0	0.489	0.272	0.557	0.288	0.110	0.647	0.369
HSE06-Optimization							
mh/m0	0.578	/	0.091	0.799	0.214	/	0.330
me/m0	0.328	/	0.853	0.331	0.528	0.710	0.317
GGA-Optimization							
mh/m0	0.820	0.069	0.111	0.826	0.448	0.326	0.453
me/m0	0.489	0.272	0.557	0.288	0.110	0.647	0.369