Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A.
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Effects of Energy-Level Offset Between a Donor and Acceptor on the Photovoltaic Performance of Non-fullerene Organic Solar Cells

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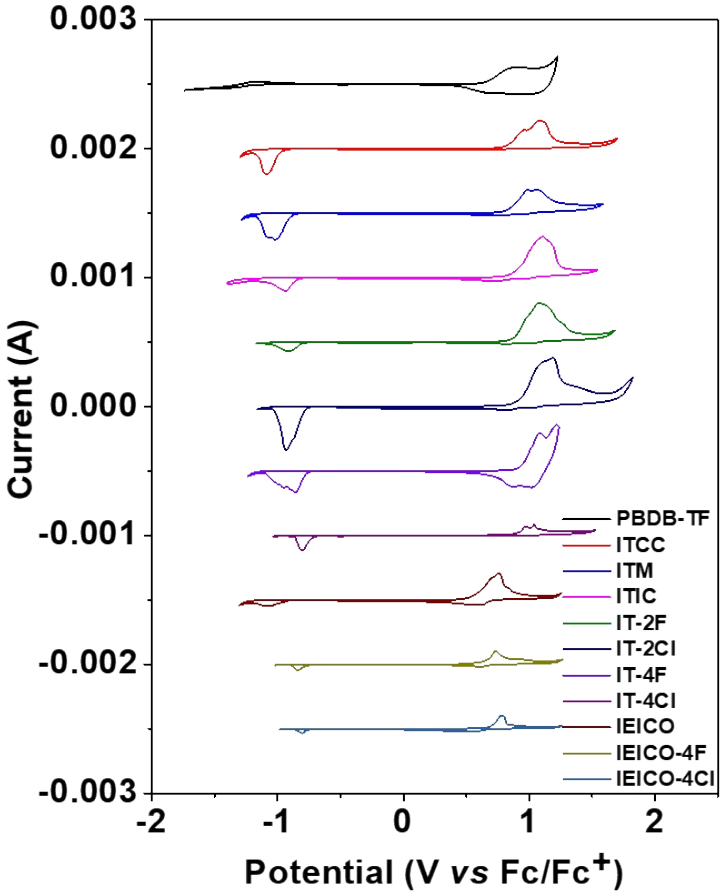

Figure S1. Cyclic voltammograms of donor and acceptors.

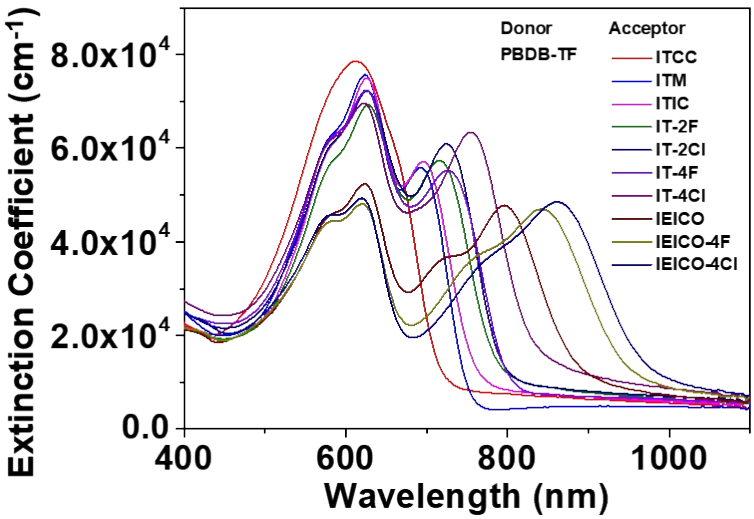

Figure S2. UV–vis absorption spectra of the PBDB-TF-based blend films.

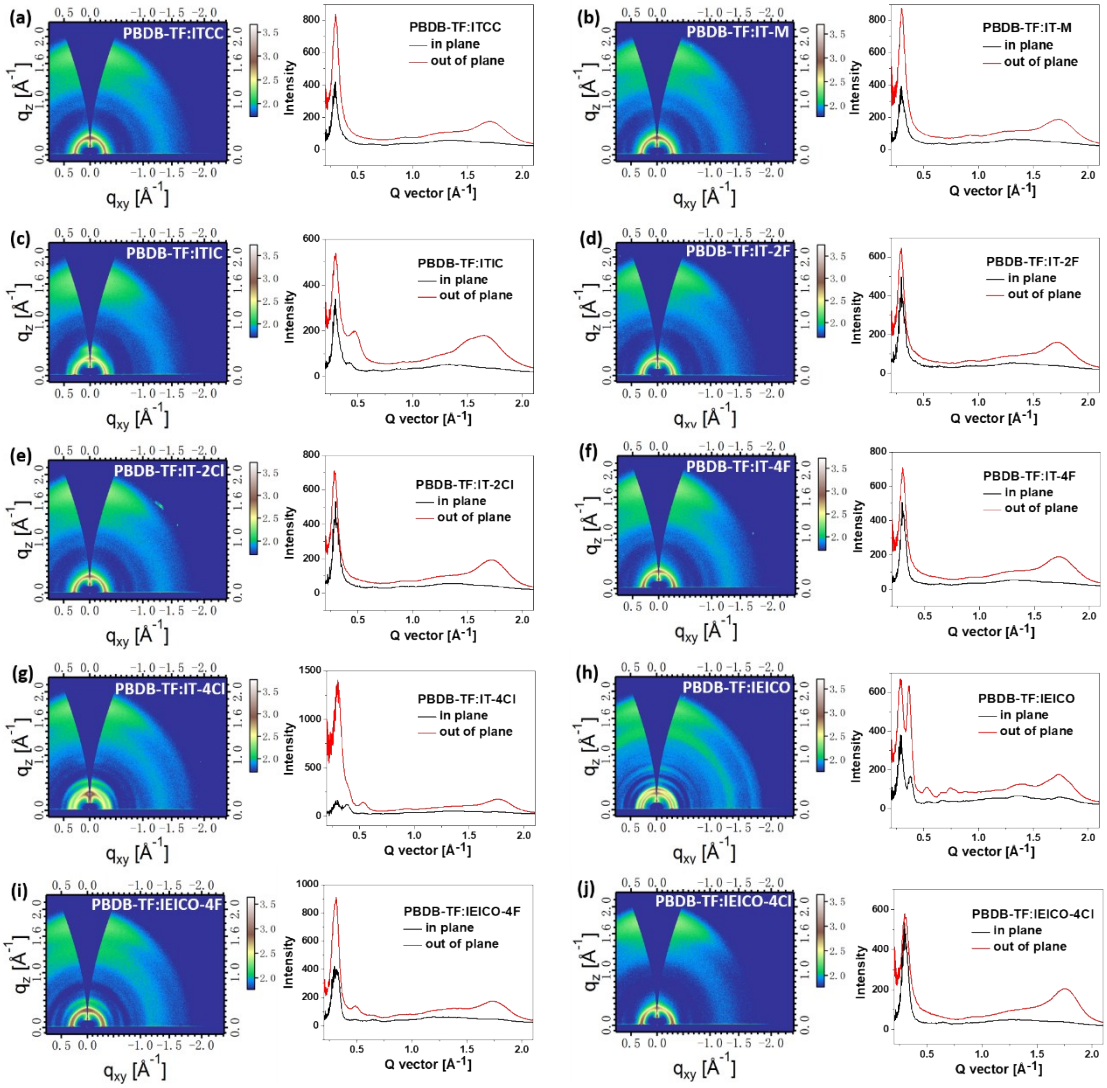

Figure S3. 2D GIWAXS patterns and the corresponding X-ray scattering profiles of (a) PBDB-TF:ITCC, (b) PBDB-TF:IT-M, (c) PBDB-TF:ITIC, (d) PBDB-TF:IT-2F, (e) PBDB-TF:IT-2Cl, (f) PBDB-TF:IT-4F, (g) PBDB-TF:IT-4Cl, (h) PBDB-TF:IEICO, (i) PBDB-TF:IEICO-4F, and (j) PBDB-TF:IEICO-4Cl blend films.

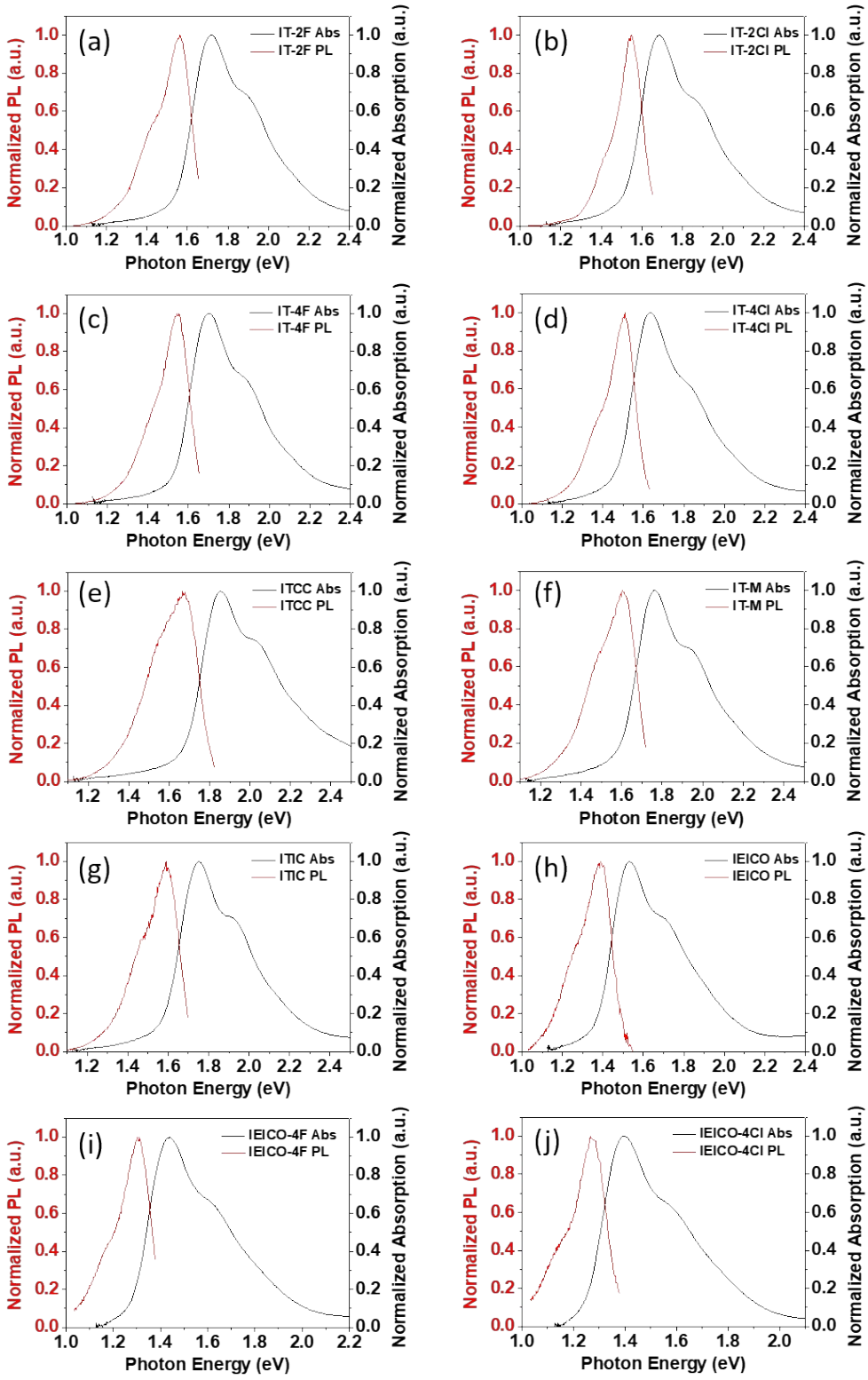

Figure S4. The bandgap of (a) IT-2F, (b) IT-2Cl, (c) IT-4F, (d) IT-4Cl, (e) ITCC, (f) IT-M, (g) ITIC, (h) IEICO, (i) IEICO-4F and (j) IEICO-4Cl were determined from the crossing point between the emission and absorption spectra.

Table S1. The characteristics of PBDB-TF-based OSCs fabricated with different acceptors.

Acceptors	E_{gap} [a] [eV]	ΔE_{DA} [eV]	Mobilities [b] [$cm^2 V^{-1} s^{-1}$]
IT-2F	1.62	1.49	$(3.98\pm0.47)\times10^{-4}$
IT-2Cl	1.60	1.46	$(4.13\pm0.47)\times10^{-4}$
IT-4F	1.61	1.45	$(3.89\pm0.60)\times10^{-4}$
IT-4Cl	1.55	1.40	$(3.83\pm0.30)\times10^{-4}$
ITCC	1.75	1.66	$(3.79\pm0.46)\times10^{-4}$
IT-M	1.67	1.58	$(4.12\pm0.42)\times10^{-4}$
ITIC	1.65	1.55	$(3.16\pm0.42)\times10^{-4}$
IEICO	1.44	1.58	$(4.87\pm0.55)\times10^{-4}$
IEICO-4F	1.35	1.44	$(4.41\pm0.32)\times10^{-4}$
IEICO-4Cl	1.32	1.40	$(4.81\pm0.60)\times10^{-4}$

[a] Extracted from the crossing point between the normalized absorption and emission spectra.
[b] All average values with standard deviations were calculated from 8 devices.

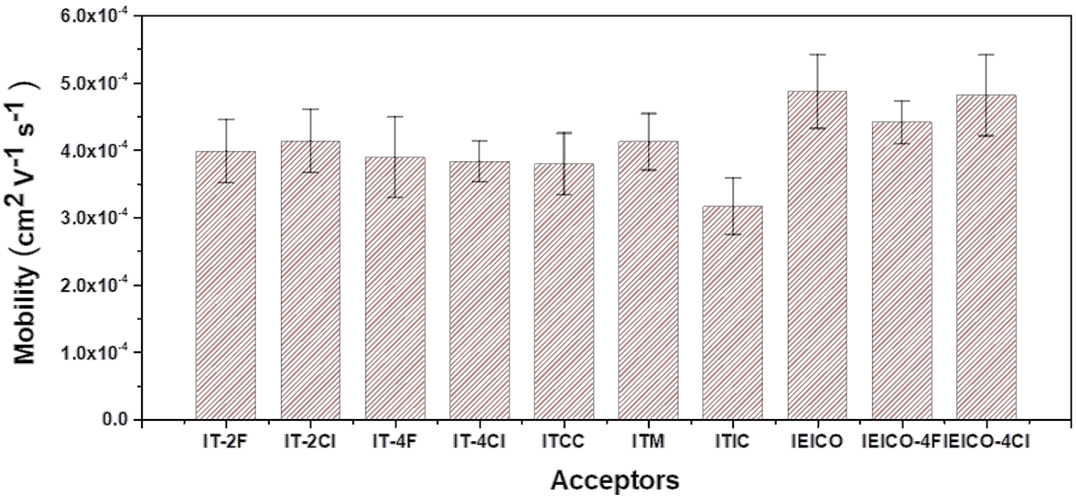

Figure S5. Mobilities of the PBDB-TF-based devices processed with different acceptors (error bars show standard deviation from the mean).

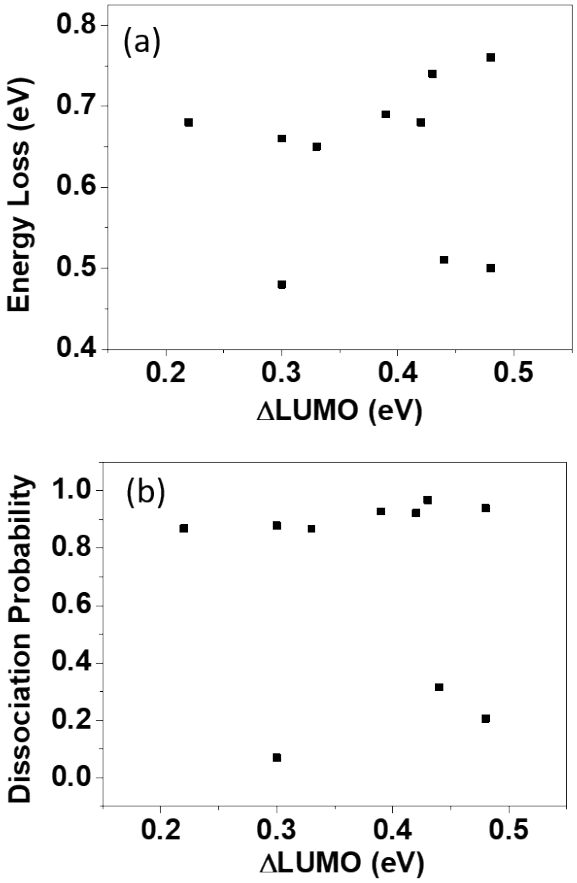

Figure S6. Plot of (a) E_{loss} and (b) P_{diss} versus Δ LUMO in each individual device.