

Solar Module Comparison Table

Parameter	Mono PERC (Monofacial)	Mono-PERC Bifacial	N-type TOPCon Bifacial
Typical module efficiency (2024–25 products)	18–22%	18–22% (front)	23–25% (module); High-power 540–670 W
Temperature coefficient (Pmax)	−0.35 to −0.40 %/°C	Similar to monofacial PERC	−0.29 to −0.32 %/°C (better high-temp yield)
Initial + annual degradation	~1% first year, 0.5–0.7%/yr	Similar	~1% first year, 0.3–0.5%/yr (lower long-term degradation)
LID / PID susceptibility	Higher LID/PID risk (p-type)	Still p-type issues	Much lower LID/PID (N-type)
Bifaciality factor (rear/front)	Not applicable	~70–85%	~80–90%
Expected bifacial energy gain (albedo 0.2–0.35)	N/A	5–12% site dependent	7–15% potential
Soiling sensitivity	Less rear soiling concern	Rear gets soiled → reduced gain	Rear gets soiled; long life offsets loss
Cost (CAPEX/W)	Lowest	Moderate premium	Highest (but lower LCOE possible)
Indian availability / supply chain	Widely available	Widely available	Available & ramping (Jinko, Vikram, Waaree, Avaada)
Typical warranty	10–12 yr product, 25–30 yr performance	Same	15 yr product, 30 yr performance (many vendors)