Photovoltaic System

Kaneka Silicon PV

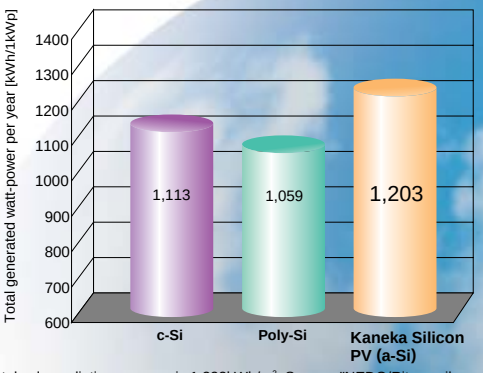
"Gift from the sun"

Thin-film Silicon PV Modules —— Powered by Limitless Solar Energy

Greater actually generated watt-power compared to crystalline silicon PV modules.

Kaneka s amorphous silicon(a-Si) has superior light absorption. Compared to mono-crystalline (c-Si) or poly-crystalline (poly-Si), it generates considerably more power. Another advantage is that the single junction a-Si layer can be made extremely thin, use less material and energy thereby enabling high productivity for mass production.

● **Comparison of generated watt-power (total) per year among various materials**

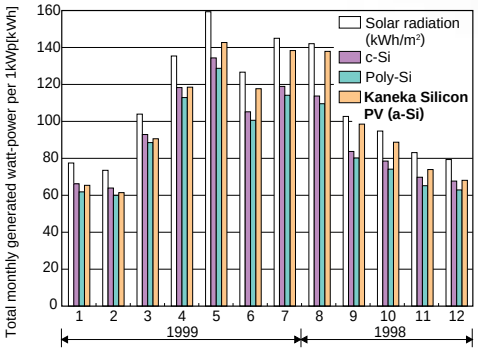


The total solar radiation per year is 1,323kWh/m². Source: "NEDO/Ritsumeikan University Demographic Module Field Test and Operational Analysis" presented at the International PV SEC-11, Sapporo, Hokkaido, Japan, 1999. Installation location: Kusatsu, Shiga Prefecture, Japan Slope angle: 15.3 degree.
∗ NEDO : New Energy and Industrial Technology Development Organization.

Superior performance under high-temperature during summer makes a real difference in actual generated watt-power.

The c-Si PV modules lose some power-generating capability by rises in temperatures. But a-Si PV modules have been higher power generation capability during extreme summer. The a-Si PV modules can deliver maximum performance during summer afternoons, contributing to the peak-cut effect for electricity consumption due to the intensive use of air-conditioners at homes and offices.

● **Comparison of total generated watt-power per month among various materials in relation to total solar radiation**

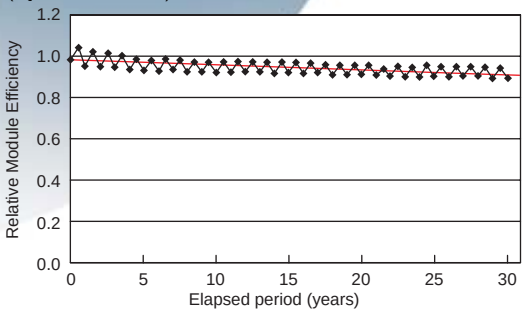


Kaneka Silicon PV's generated watt-power is about the same as that of other crystalline silicon PVs during the winter months, but in summer, the Kaneka Silicon PV generates significantly more power compared to other crystalline silicon PVs.Source: "NEDO/Ritsumeikan University Demographic Module Field Test and Operational Analysis" presented at the International PV SEC-11, Sapporo, Hokkaido, Japan, 1999. Installation location: Kusatsu, Shiga Prefecture, Japan Slope angle: 15.3 degree.

Stable power output over long periods for outstanding reliability.

The a-Si PV module maintains initial energy conversion efficiency(after full stabilization) over long periods, attesting to its outstanding reliability.

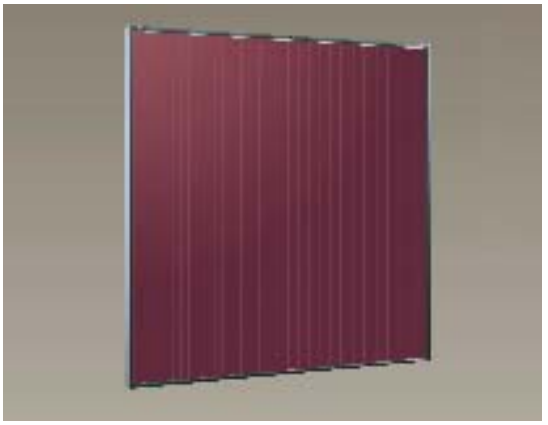
● Long-term reliability data for module efficiency after stabilization (JQA acceleration test)



Long-term reliability data for module efficiency after stabilization
Note 1: Data measured by JQA(Japan Quality Assurance Organization) using Kaneka's a-Si PV module as part of a research project subcontracted by NEDO.
Note 2: The acceleration test was performed to evaluate reliability almost over a 30-year period by considering seasonal variations of solar radiation and temperatures.

Standard PV modules

- For industrial or roof top applications



Long-term (25 years) power output warranty.

Standard PV module will maintain more than 80% of minimum rated power for 25 years (based on data from silicon PV modules installed over a month under conditions of 25°C, A.M. 1.5 and 100m W/cm^2).

Certifications and Qualifications

- IEC61646
- Safety class II equipment
- CE mark

● Specifications

	Standard PV modules		
Model	LSU	CJA	GPA
Nominal power (W)	58	58	64
Open circuit voltage (V)	84	85	92
Short circuit current (A)	1.1	1.12	1.17
Voltage in mpp (V)	65	63	68
Current in mpp (A)	0.89	0.92	0.94
Max. system voltage (V)	500	500	530
Dimensions (mm.)	920 x 920 x 40	920 x 920 x 40	990 x 960 x 40
Weight (kg)	12.5	12.9	13.7
Equipment	MC connectors Bypass diode Double insulated cable	MC connectors Bypass diode Double insulated cable	MC connectors Bypass diode Double insulated cable
Certifications and Qualifications	IEC61646 Safety class II equipment CE mark	IEC61646 Safety class II equipment CE mark	IEC61646 Safety class II equipment CE mark

∗ Data listed above are standard values measured using the JIS testing method but are not guaranteed values.

∗ The PV system's power-generating capacity is represented by the total of individual PV module power outputs calculated based on the JIS Standards. Power output under actual usage conditions can vary depending on the level of solar radiation, installation conditions (directions, angles and ambient conditions), regional climates and temperatures.

∗ Specifications subject to change without notice.

∗ JIS : Japanese Industrial Strandards.

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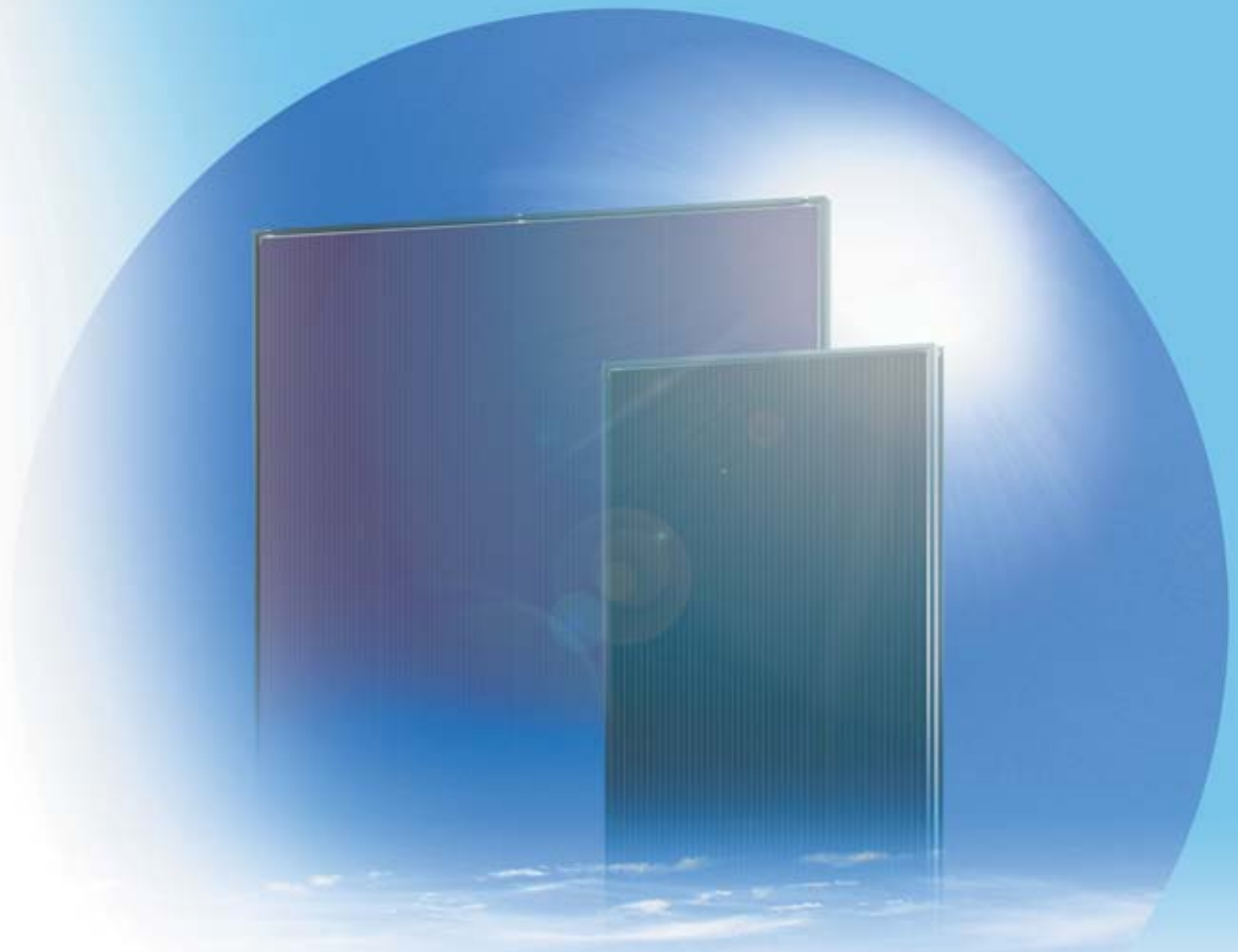
Kaneka's photovoltaic systems installed roofs of houses and buildings can generate clean energy and reduce CO_2 emissions.

To Power the Future

Environmental pollution and energy shortages are now of global concern. More interest is focusing on photovoltaic (PV) power generation, which can use an unlimited source of clean energy - the sun. Kaneka decided to begin research into thin film silicon PV modules at an early stage. This has allowed the company to assume a leading position in the industry over the past 20 years. Kaneka s accumulated expertise now makes it possible to offer next-generation energy all over the world through its advanced PV systems that empower individuals to take a proactive environmental role in their daily lives.



Less material & Shorter EPT

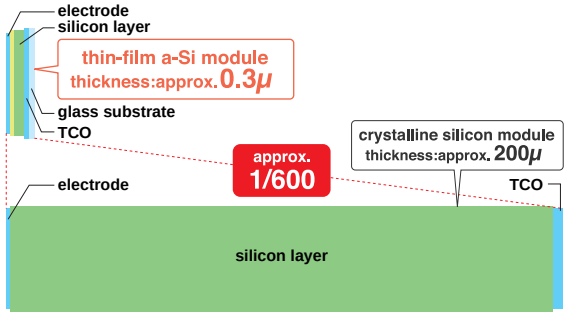
Amorphous silicon module is more environmentally friendly than crystalline silicon module.

Less silicon material

Thin-film silicon PV module req uires less silicon material.

- The thickness of a-Si cell is 0.3 , which is one six hundredth(1/600) of that of crystalline silicon cell(approximately 200).
- The a-Si cell is directly deposited onto the glass substrate and is appropriate for mass-production.

Comparison between thin-film a-Si module and c-Si module

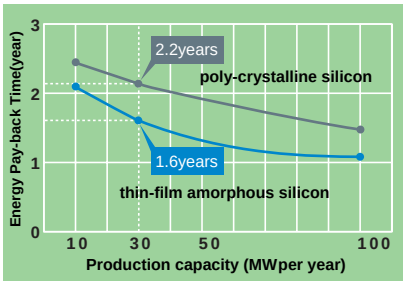


Shorter EPT (Energy Pay-back Time)

EPT is the term in which the PV module can pay-back the energy used in manufacturing by its power generation.
EPT of a-Si PV is 1.6 years, which is about half a year shorter than that of crystalline silicon PV(2.2 years).
EPT is the very important index to evaluate the environmental effect.

Reference : PVTEC(Photovoltaic Power Generation Technology Research Association) 1996 Research for evaluation of photovoltaic power generation.

EPT (Energy Pay-back Time)



EPT = E0 / Eg

E0 : Energy for manufacturing PV
Eg : Generated power by PV for one year