



Cat[®] Thin Film Photovoltaic Module

———— Record Setting Performance

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Caterpillar

Caterpillar is the world's leading manufacturer of construction and mining equipment, diesel and natural gas engines, industrial gas turbines and diesel-electric locomotives, having the largest global presence in the industries served.

With headquarters located in America, it's now ranking among Fortune 500 list, Interbrand's Top 100 global brands and the 100 Most Valuable Brands. Caterpillar is also the largest construction equipment manufacturer in the world. It has almost 100 thousand full time employees and 171 dealers serving 192 countries around the world.

First Solar

First Solar is a leading global provider of comprehensive PV solar energy solutions with over 17GW installed in more than 35 countries. First Solar designs, manufactures and sells PV solar modules with an advanced thin film semiconductor technology. First Solar has ranked on the Fortune's "Change the World" list - Ranked #10 of 50 global Companies that are taking on society's biggest problems and doing well by doing good. First Solar also ranked #1 among Top 500 Solar Contractors/Top Developer. There are 6 solar plants of the largest solar plants in the world using First Solar thin film modules.

Caterpillar made strategic alliance with First Solar in 2015 to drive Caterpillar's solar business. Under the cooperation strategy, Cat® brand thin film solar panels were introduced to the market and the product could be assured with both First Solar's excellent built-in quality and Caterpillar's global network service.

The Thin Film Advantage

Get superior efficiency, higher energy yield, and long-term reliability from an affordable, field proven module. Thin Film Cadmium Telluride (CdTe) photovoltaic (PV) technology continues to set performance records in both research and real world environments.

Land Use Advantage

As a result of higher efficiency, Cat modules offer higher power density with comparable land use when compared to typical c-Si modules, resulting in more installed capacity per square meter (m²). Given the same land area, Cat modules have up to 12.2% energy density advantage.

Specific Energy Yield Advantage

Thin film high efficiency modules have a proven specific energy yield advantage to deliver more usable energy per nameplate watt than conventional c-Si modules. Specific annual energy yield captures operating data over a year of module performance during varying real-world conditions where temperature, sunlight intensity, and solar spectrum all change throughout the days and seasons.

Higher Energy Yield in Hot Conditions

All PV modules produce less power than their nameplate as temperatures rise above their labeled 25°C standard test condition. In hot climates, module operating temperatures will exceed 25°C for as much as 90% of generating hours. With a lower temperature co-efficient of power, Cat modules produce more energy than c-Si modules.



Spectral Response Advantage in Humid Conditions

On humid days, water in the atmosphere reduces specific wavelengths of available light. Because Cat CdTe modules are less sensitive to reductions in wavelengths most affected by this type of high atmospheric water content, the thin film modules produce up to 6% more annual energy in humid conditions.

Minimal Power Loss with Better Shading Response

When shading occurs, thin film's unique cell design ensures only the shaded portion is impacted, while the rest of the module continues to produce power. Typical c-Si modules turn off disproportionately large portions of module to protect them from damage. In an environment with 10% shading, a thin film module will still produce 90% power, compared to a 30% loss of power with a standard c-Si module.

Lower Degredation Rate

Cat modules decline by 0.5% per year, ending at 86% power after 25 years, which is much lower than other brand modules.



Manufacturing Process

Glass to panel in 2.5 hours.

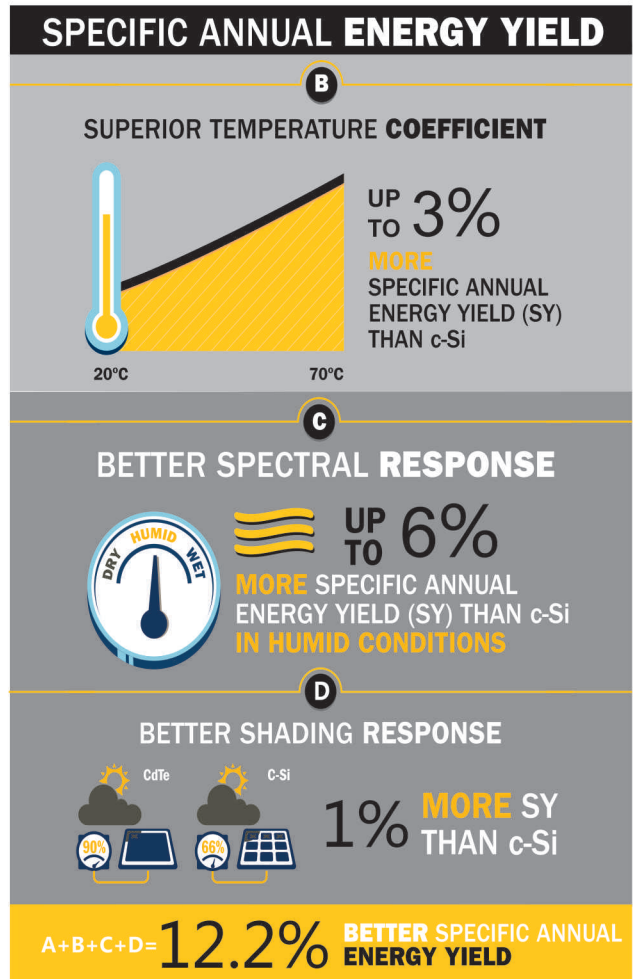
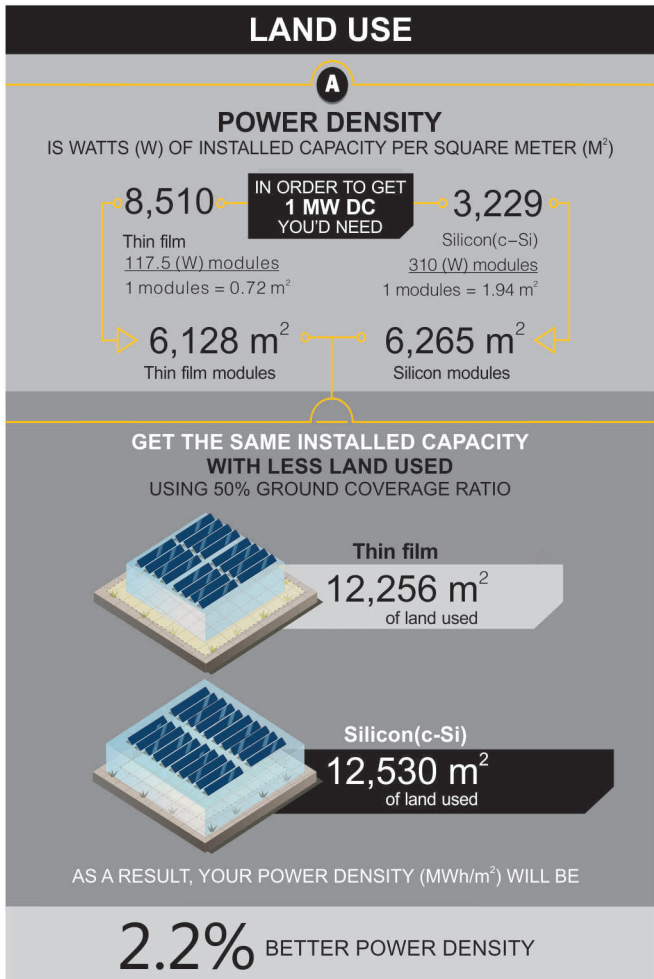
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No Manual Intervention

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High Quality Production Process



Technical Data

Caterpillar offers three different types of PV modules for customers' choice from : PVT110, PVT115 and PVT117.

Technical Data		Module Rating at Standard Test Conditions (STC) (1000 W/m ² AM 1.5 , 25°C)			Rating at Nominal Operating Cell Temperature of 45°C 800 W/m ² , 20°C Air Temperature, AM 1.5, 1 m/w Wind Speed
		PVT110	PVT115	PVT117	PVT117
Nominal Power (-0/+5 W)	P _{MPP} (W)	110.0	115.0	117.5	89.0
Voltage at P _{MAX}	V _{MPP} (V)	69.4	69.3	70.1	65.9
Current at P _{MAX}	I _{MPP} (A)	1.60	1.66	1.68	1.35
Open Circuit Voltage	V _{OC} (V)	87.2	87.6	88.1	83.2
Maximum System Voltage	V _{SYS} (V)	1500	1500	1500	1500
Temperature Characteristics					
Module Operating Range	(°C)	-40 to +85	-40 to +85	-40 to +85	-40 to +85
Coefficient of P _{MPP}	T _K (P _{MPP})	-0.34%/°C	-0.28%/°C	-0.28%/°C	-0.28%/°C
Coefficient of V _{OC}	T _K (V _{OC})	-0.29%/°C	-0.28%/°C	-0.28%/°C	-0.28%/°C
Mechanical Description					
Length,Width,Thickness	mm (in)	1200(47.2 in)/600(23.6 in)/6.8(0.27 in)			
Weight	kg (lbs)	12(26.5 in)			
Front Glass		3.2 mm heat strengthened			
Back Glass		3.2 mm tempered			
Encapsulation		Laminate material with edge seal			

Projects



Cosmetics Factory~100.05KW



Hand Craft Factory~87.4KW



CEL Office~86.17KW



7 Days Hotel~38.18KW



School~68.31KW



Government~48.175KW



Residential~20KW



Residential~16.5KW



Residential~4.4KW

The above projects are only some of CEL's projects for reference.



Brand Support

Caterpillar was found in 1863 and has enjoyed more than 150 years' history. Caterpillar's dealer –The China Engineers, Ltd. (CEL) was established in 1928 and has enjoyed 90 years' history, now have around 70 branches across Southern China, Hong Kong and Macao. Both companies can assure customers with long term peace of mind and good service.

Product Warranty

Caterpillar provides 10 years product warranty and 25 years power warranty which warranted the product will decline by 0.5% per year, ending at 86% power after 25 years. Other brands can only assure 80% power after 25 years.

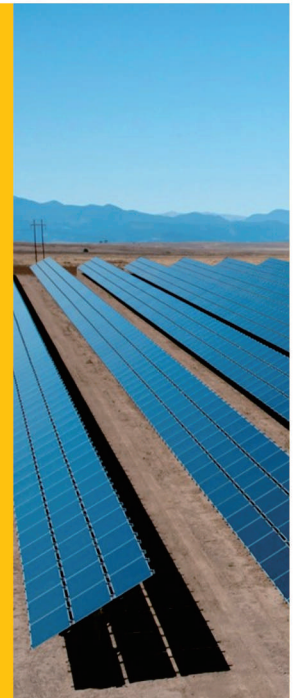
Business Cooperation

You can join us for Cat solar business cooperation and development only if you meet the following requirements:

- A** Your company has good reputation or credit in the local places.
- B** Your company has solar business experience and have a good understanding of your market.
- C** Your company will obey the installation standards and rules, and aftersales service standards set by Cat solar.

Support from us

- A Aftersales Support:** Professional service team from Caterpillar and CEL.
- B Brand Support:** Backed up by Caterpillar's Fortune 500 brand value and reputation, CEL's online and offline promotion support and sales materials support.



Authorized Dealer for Caterpillar Products

The China Engineers, Limited
020-3819 9605 / 189 0222 3500
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