

Transportation Solutions 2020

WHY CANADUS

- Flexible, Rugged, Lightweight, mono cSi PV modules.
- Peel & Stick Modules easy to install
- Delivers 20% More Energy in real world conditions
- 80% Lighter than Glass
- 50x More durable than BusBar
- 2.5x Power Density vs. Thin-Film
- Zero Maintenance
- Impressive ROI numbers, Customer Validated, with Thousands of Deployments in North America and Asia.



CANADUS SOLUTIONS ARE FLEXIBLE & VERSATILE





- ✓ 24, 48, 60 & 72 cell panel configurations
- Versatile shapes to suit any surface
- ✓ Simple "Plug & Play" system, easy install.
- ✓ Thin, lightweight and flexible panels are 1/8" thick

CANADUS: HIGHER Efficiency of cSi cells with Flexibility of Thin-Film Solar



BUS & COACH TOP SELLERS

1 - Battery Retainer & Aux Support



Jump Start Avoidance

2 – Solar Power Electric HVAC



Idle Reduction

3 – Aux Power Support & Range Extension



EV Bus

Over 100 buses in operation, multiple OEM pilot testing with great satisfaction



SUV, VAN & PASSENGER VEHICLES CANADUS SOLAR SOLUTIONS



- Security Vehicles
- Taxi
- Mobile Office
- EV
- No-Idle SUV

- Enables ~8hrs of HVAC runtime with engine completely turned OFF.
- Saves 5 gallons a day $\square \sim $3000/year$ savings on fuel alone.
- Great comfort for the troops
- Great help for environment with no pollution during idling.
- No jump start needed, a key concern for INL due to cold weather. •



Form, Fit, Function Optimized for Fairing Designs with Full OEM Coverage



Kits Available for OEM & Aftermarket for: Freightliner – Kenworth – PB – Volvo- Mack– International

33% Higher watt @ STC vs Competitor



Home away from home – Loads increase



Canadus Solar vs Competitor Side by Side Performance Test Data Results



Canadus VS COMPETITOR

Key Feature/Attributes	Canadus Grid Technology	Bussbar and/or Ribbon	Flexible Thinfilm
	(cSi with Canadus Grid)	cSi Technology	Cells w/ Bussbar
Cell Efficiency \rightarrow Power Density for the system	20% Mono Crystalline Cells	16 – 20% Most Competition uses 16% Multi Crystalline Si Cells	5 – 12% Very Low Due to Technology Limitation
Sensitivity to moisture	Low Concerns	Low Concerns	Very Sensitive Even a pin-hole can start degrading the panel
Thermal Cycling (-45C to 85C)	Very Robust	Prone to Damage	Prone to Damage
	Technology Used for	The cell & busbar breakage possible hence	The busbar breakage possible hence
	-140C to +140C Space Application	degrading the power output to 30-50%	degrading the power output to 30-50%
Mechanical Vibrations	Very Robust	Prone to Damage	Prone to Damage
	Canadus grid enables to generate power	The cell & busbar breakage possible hence	The busbar breakage possible hence
	even when Si cell cracks	degrading the power output to 30-50%	degrading the power output to 30-50%
Damp Heat (Reliability @ 85C & 85%RH)	Very Robust Survived 2500 Hr in Damp heat, IEC certified technology for rooftop solar systems	Prone to Damage Some commercial panels damaged in <100hrs; most panels not certified for IEC standards	Very Sensitive Even a pin-hole can start degrading the panel





Canadus POWER DENSITY vs Thin-Film Technology



10

Canadus is RUGGED

Thermal Cycles Test. -70°C to 85°C

Strong & Durable

- Continually subjected to rigorous environmental & accelerated lifecycle testing
- ✓ Adhesive rated to withstand a minimum of 150 mph wind.
- Designed to withstand harsh environments, truck washes etc.
- ✓ Out ETFE layer is resistant to soiling requiring less cleaning.



Canadus panel still going strong at >900 cycles



Canadus Module >50X Durable Canadus going strong at >900 cycles only <5% power drop

3BB dropped >5% in ~100 cycles



EXTREME VIBRATION FIELD TEST <0.5% DEGRADATION

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Standard Bus Bar





Canadus virtually eliminates the impact of cell cracks & ribbon fatigue. Canadus <0.5% degradation 3BB >30% degradation





STANDARTD DAMP HEAT TEST 85°C @ 85% RH. - EL IMAGES





Canadus panel after 500 Hours of DH Test



Competitor panel after 100 Hours of DH Test



CANADUS PANEL SURVIVED 2,500 HOURS





Canadus Solar Panel EL Image After few weeks on the Road Few cracked cells but all cells Module is active & working



Competitor (thinfilm) Solar EL After few weeks on the Road Few Cell completely disconnected Several cells with partial dead area



CANADUS IS RUGGED: EXTREME DAMAGE TESTING



CANADUS

CANADUS IS RUGGED: EXTREME DAMAGE MILITARY TEST





	lsc	Voc	FF	Power (max)
PRE	9.098	3.809	0.775	26.852
POST	8.746	4.662	0.640	20.508
% DROP	3.87%	3.87%	17.36%	23.63%

TEST Included:

- •Multiple throwing to ground
- •Hitting the wall with the solar panel
- •Severe bending the panel
- •Walking/Stomping on it

•Etc.

Even after the severe treatment the Canadus Panel WORK! Dropped in power only by 23% with extreme cell cracks.



CANDUS PANEL – BETTER PERFORMANCE IN REAL WORLD CONDITIONS

Powerful & Efficient

CANADUS

- ✓ Substantial increases in output over competitive solar systems in real world conditions
- ✓ Superior performance under all light conditions including **low sun angle and shade**
- Delivers maximum possible power throughout the day, all year long



20% More energy delivered in real world conditions

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ENERGY YIELD: CANADUS BETTER PERFORMANCE IN REAL WORLD



Intermittently Cloudy, 37 Day Cumulative Data, Roof Mount, California. Certification Lab Data



CANADUS vs COMPETITOR – AMP HOURS DELIVERED TO BATTERY





- Side-Side Field Test Canadus
 400 series vs Competitor
 300 Series
- •53% more Ah than the competitor
 - 33% higher watt @STC

•Canadus System delivered 178Ah Or 2.6kWh to battery pack in a day



CANADUS SOLAR: SUNNY DAY VS CLOUDY DAY – 440W Canadus System



• Sunny day total output 2.2kWh w/ being in building shadow until 10am. Projected output would be \sim 2.5kWh

• Cloudy day total output 2.0kWh \sim 80% of the sunny day



CANADUS IS RUGGED: Interconnect strain fatigue test

- Simulates $\Delta T \sim 116$ °C with reduced test time, 2 cell coupon.
- Canadus achieved 1M+ cycles without any issue
- Bus Bar 0.2mm ribbon breaks in 15-20K cycles





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TRANSPORTATION KIT OPTIONS – TRACTOR

- TRICKLE CHARGE 50W, 80W
 - Canadus PV Module, Charge Controller, Hardware Kit
- BATTERY MAINTENANCE 165W
 - Canadus PV Module, Charge Controller, Hardware Kit
- HVAC 330W, 440W, 660W
 - Canadus Single PV Module 330W e/a, Charge Controller, Hardware Kit
 - Canadus Dual PV Modules 220W e/a, Charge Controller, Hardware Kit
 - Canadus Quad PV Modules 110W, e/a Charge Controller, Hardware Kit
 - Canadus Triple PV Modules 220W e/a, Charge Controller, Hardware Kit



TRANSPORTATION KIT OPTIONS – TRAILER & BOX TRUCK

- TRICKLE CHARGE 80W
 - Canadus PV Module, Charge Controller, Hardware Kit
- BATTERY MAINTENANCE 165W
 - Canadus PV Module, Charge Controller, Hardware Kit
- LIFTGATE 110W, 220W , 330W
 - Canadus PV Module, Charge Controller, Hardware Kit
- REFRIGERATION 1kw to 6kW
 - Canadus Custom Design based on vehicle system specs.



TRANSPORTATION KIT OPTIONS – BUSES

- BATTERY RETAINER AND AUX SUPPORT 1kW
 - Canadus Config PV Modules, Charge Controller, Hardware Kit
- SOLAR POWER ELECTRIC HVAC 1kW up to 3kW
 Canadus Config PV Modules, Charge Controller, Hardware Kit
- AUXILIARY POWER SUPPORT AND RANGE EXTENSION 3kW
 Canadus Config PV Module, Charge Controller, Hardware Kit



TRANSPORTATION KIT OPTIONS – RV, Marine and SUV

- Multiple Cell Configurations and sizes to maximize output
- Versatile shapes to suit any surface and RV Roof Contour
- Turn-key Solar Power No-Idle HVAC
- Keep battery failsafe devices running
- Saltwater, Fog & Moisture resistance
- Power appliances and maintain battery



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