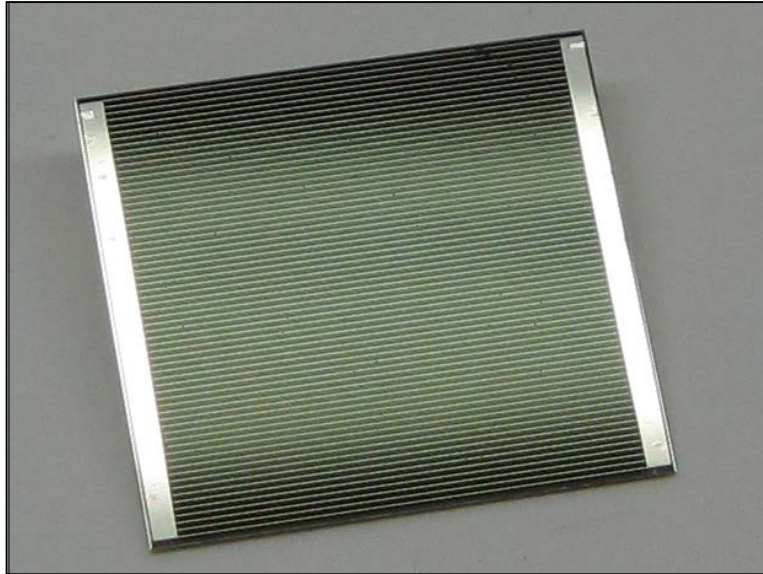


## CPV Point Focus Solar Cells

### C4MJ Metamorphic Fourth Generation CPV Technology

- ✓ *First 40% production cell*
- ✓ *First fully qualified metamorphic cell*



#### Product Description

Typical Efficiency 40%  
 Recommended operating temperature <110°C

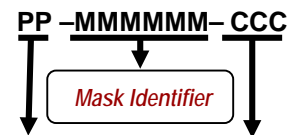
#### Epitaxial Structure

Triple junction solar cell on Germanium substrate  
 GaInP (1.82 eV) / GaInAs (1.33 eV) / Ge (0.66 eV)

#### Metallization

- Silver metallization on front busbar and grid fingers (optional gold flash finish)
- Silver metallization with 500Å gold on back surface

#### CPV Cell Ordering Guide



#### Packaging Format

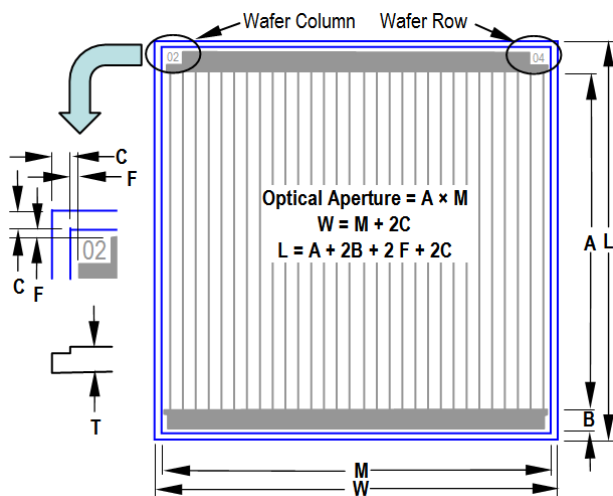
- 11 - Processed Wafer
- 21 - Bare Cell in Waffle Tray

#### Configuration Options

- 401 - C4MJ, Silver front contact finish, 100% Tested
- 411 - C4MJ, Gold front contact finish, 100% Tested

Example: **21 - 046191 - 411** Bare Cell in Waffle Tray -- 9.99x9.95mm Aperture -- C4MJ Gold Front Contact, 100% Tested

#### Mechanical Dimensions



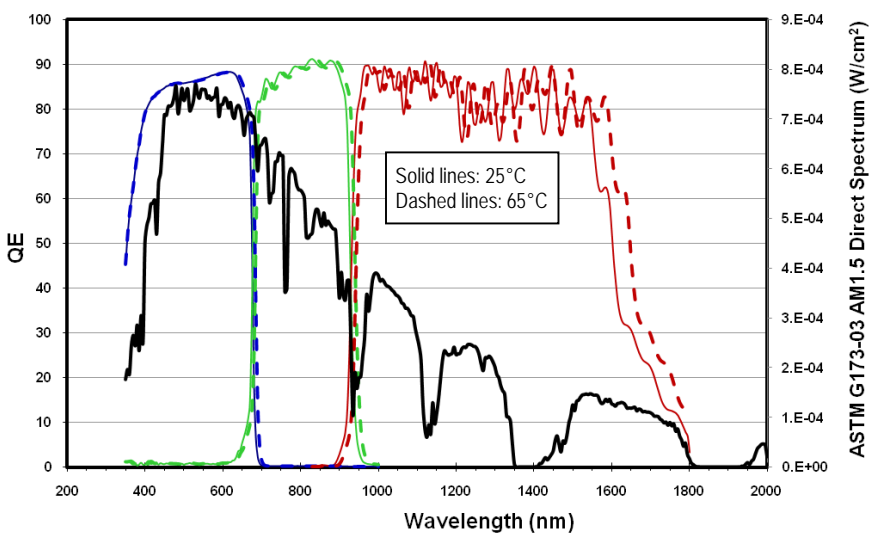
T = 190 μm in all cases  
 F = 25 μm in all cases  
 C = 38.2 μm in all cases



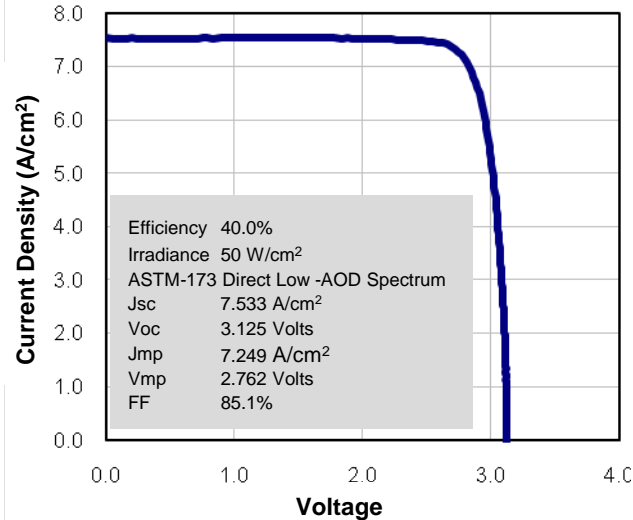
Product	Aperture Area	Aperture Dimensions (mm)		Busbar (μm)
		M	A	
CPV Cell #	(mm <sup>2</sup> )			
PP- 046191 - CCC "CDO-100"	99.00	10.000	9.900	400 μm
PP- 046167 - CCC "CDO-086"	86.47	9.299	9.299	252 μm
PP- 046192 - CCC "CDO-076"	76.50	8.854	8.640	300 μm
PP- 046193 - CCC "CDO-030"	30.74	5.547	5.542	300 μm

ENVIRONMENTAL MANAGEMENT SYSTEM  
 CERTIFIED BY DNV  
**ISO 14001**

## Spectral Response



## Typical Current-Voltage Characteristics



## Typical Performance Over Temperature

Temperature coefficient of efficiency:  $< -0.06\%/^{\circ}\text{C}$

## Qualification Tests Completed

Full Qualification Report is available on request (May 2011)

Test	Conditions	Requirement	Results
Performance	50 W/cm <sup>2</sup>	Effmp > 37.6% target avg = 40.0%	Avg = 39.8%
Thermal Cycle	1500 cycles, -40°C to +110°C with 10 m dwell	unprotected cell < 2% degradation	NEff = 1.0
Unprotected Cell Damp Heat	1000 hrs, 85°C/85% RH	characterization	NEff > 0.98
High Temperature Soak	Unbiased soak at 180°C, 200°C, 225°C and 250°C	< 0.5% degradation after 25 year lifetime	NEff = 1.0
Outdoor Field Trial	> 10 kW on sun for 6 months	characterization	> 10 kW total
High Temperature Reverse Bias	-0.8V and -1.6V @ 140°C until failure	characterization	Complete
HTOL	1 A & 4 A dark forward bias at 160°C	characterization	NEff > 0.99
ESD	HBM 4000 V, CDM 2000 V	characterization	NEff = 1.0