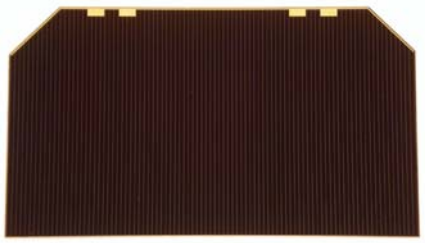
P H O T O V O L T A I C S



Bare Solar Cell Design

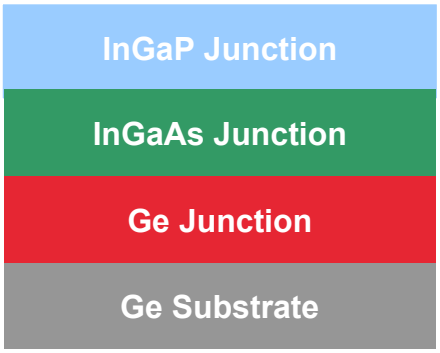
Advanced Triple-Junction (ATJ) High Efficiency Solar Cells for Space Applications

27.5% Minimum Average Efficiency

Typical Performance Data

Electrical Parameters @ AM0 (135.3 mW/cm^2)	28°C
BOL Efficiency at Maximum Power Point	27.5%
Voc:	2.60V
Jsc:	17.1 mA/cm^2
Vmp:	2.30V
Jmp:	16.2 mA/cm^2

Advanced Triple-Junction Structure

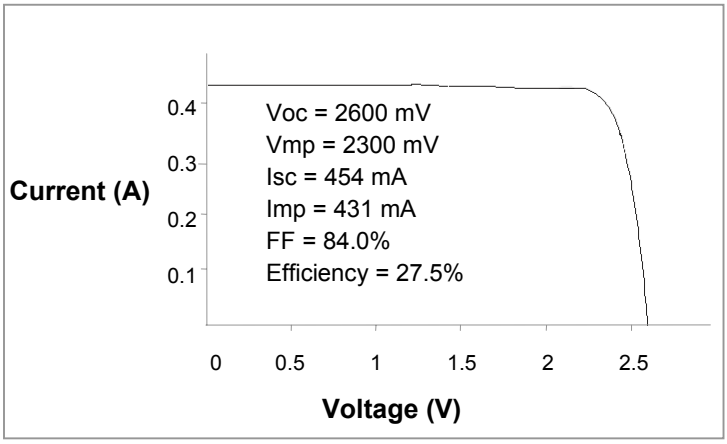


Features and Characteristics

- Advanced Triple-Junction (ATJ) InGaP/InGaAs/Ge Solar Cells with n-on-p polarity on 140-μm Uniform Thickness Ge Substrate
- Lowest solar cell mass of 84 mg/cm^2
- Fully space-qualified with proven flight heritage in LEO and GEO environments
- Excellent radiation resistance with P/Po = 0.89 @ 1-MeV, 5E14 e/cm^2 fluence
- Designed to accept corner mounted silicon bypass diode for individual cell reverse bias protection
- Good mechanical strength for reduced attrition during assembly and laydown
- Weldable or Solderable contacts
- Standard and custom sizes available
- Available at EPI, cell, CIC or panel configuration

Typical ATJ Illuminated I-V Plot

Solar Cell Area = 26.6 cm^2



For more information on this and other products:

Contact Sales at EMCORE 626.934.6541, or e-mail escinfo@emcore.com. Or please visit our website @ www.emcore.com

Advanced Triple-Junction (ATJ)
High Efficiency Solar Cells for Space Applications

PRODUCT BRIEF | MARCH 15, 2004

Temperature Coefficients

Fluence (e/cm^2)	$\Delta Voc/\Delta T$ (mV/°C)	$Jsc/\Delta T^{(1)}$ $\mu A/°C\ cm^2$	$Vm/\Delta T$ mV/°C	$Jmp/\Delta T^{(2)}$ $\mu A/°C\ cm^2$
BOL	-5.48	+12	-5.93	+11
5E13	-5.49	+10	-5.68	+7
1E14	-5.46	+11	-5.66	+7
5E14	-5.61	+12	-5.92	+12
1E15	-5.77	+12	-6.14	+13

(1) Jsc is the symbol for normalized Isc
(2) Jmp is the symbol for normalized Imp

ATJ CIC Configuration

Radiation Performance at 1 MeV Electron Irradiation, EOL/BOL Ratios

Fluence (e/cm^2)	Voc	Isc	Vmp	Imp	Pmp	Efficiency
5E 13	0.97	1.00	0.97	1.00	0.97	0.97
1E 14	0.96	1.00	0.96	1.00	0.96	0.96
5E 14	0.92	0.98	0.92	0.96	0.89	0.89
1E 15	0.90	0.96	0.90	0.94	0.85	0.85
3E 15	0.86	0.90	0.85	0.87	0.74	0.74

Emcore Photovoltaics, Albuquerque, NM

Key Space Qualification Results*

Test	Industry Quality Standard	Typical Test Results
Metal Contact Thickness	4-10 μm	6 μm
Dark Current degradation after reverse bias	Δ Ispec <2%	<0.4%
Electrical performance after 2,000 thermal cycles -180°C to +95°C	<2%	<0.7%
High-Temperature Anneal at 200°C for >5,000 hrs.	<2%	No measurable difference
Contact pull strength	>300 grams	>600 grams
Electrical performance degradation after 40 day humidity exposure at 60°C and 95% RH	<1.5%	No measurable difference

*For complete qualification results, please request EMCORE's ATJ Qual Report EWRP036

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ISO 9001-2000 Registered
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