

HIT Technology



SANYO Component Europe
Solar Division

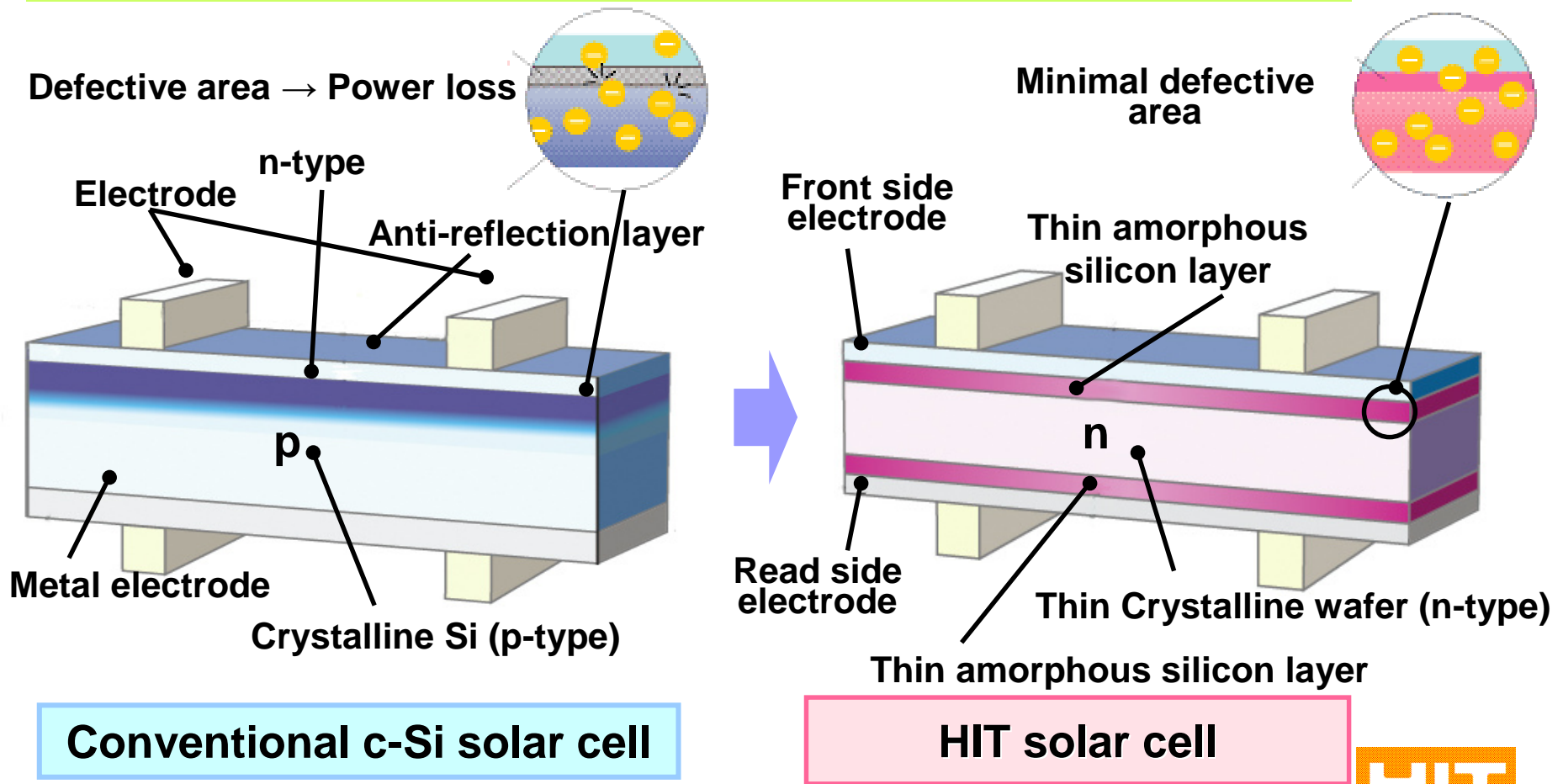
April, 2009

- **Basic structure of HIT solar cell**
- **Clean surface characteristics of HIT solar cell**
- **HIT features**
- **Towards Higher Conversion Efficiency**
- **Surface Passivation Effect of HIT Solar Cell**
- **World's highest efficiency for a practical-size cell**
- **High efficiency at high temperatures**
- **Advantages of HIT modules**
- **HIT – where to use?**

Basic Structure of HIT Solar Cell



Impurity-free i-type Amorphous silicon layers between the crystalline base and p- and n-type amorphous silicon layers leads to reduction of power generation losses.

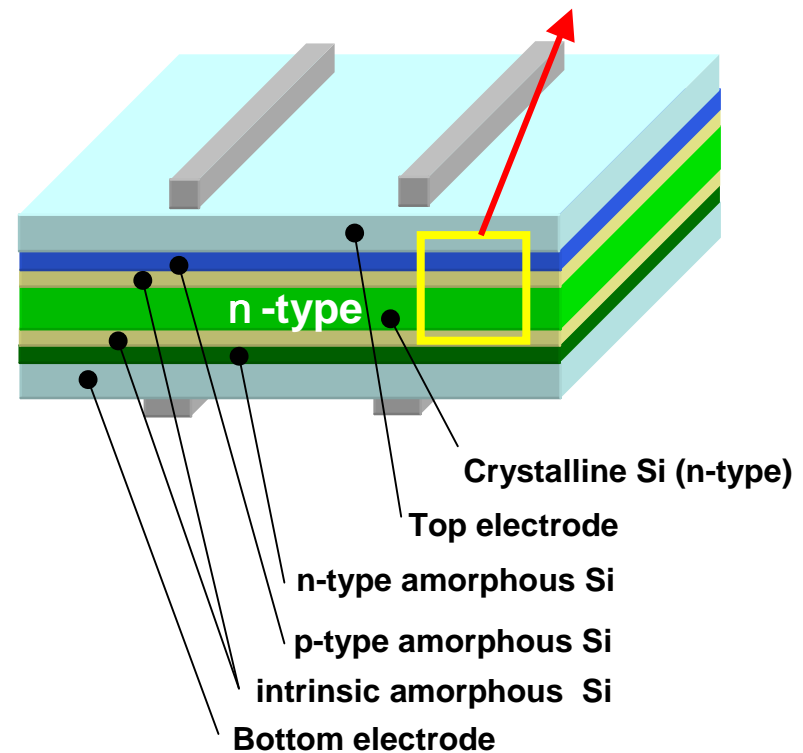
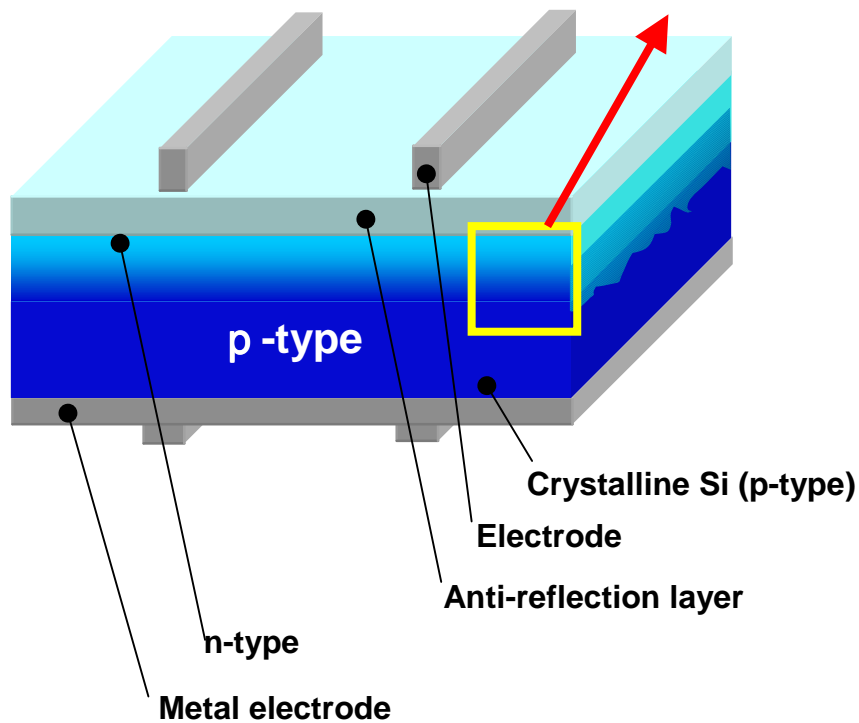
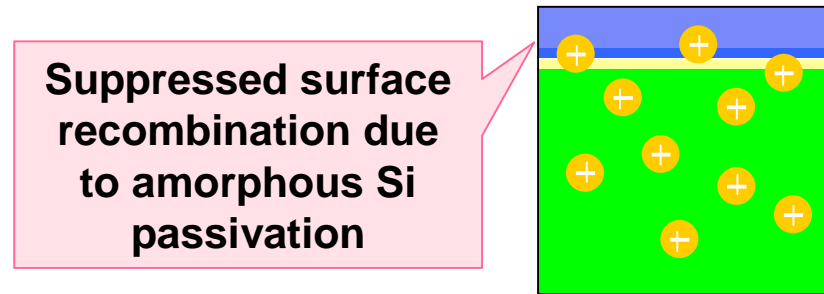
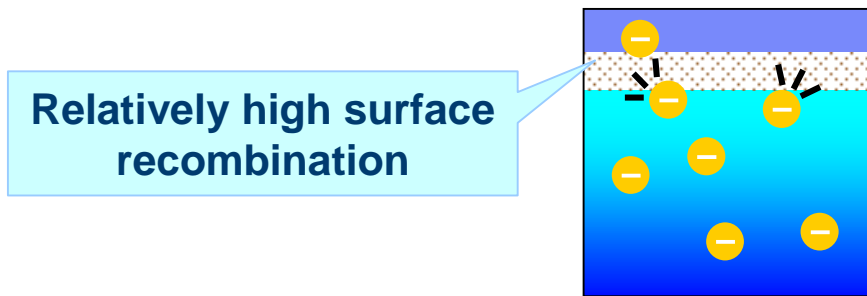


Conventional c-Si solar cell

HIT solar cell



Clean Surface Characteristics of HIT Solar Cell



Conventional c-Si solar cell

HIT solar cell



- 1. High conversion efficiency**
- 2. Excellent temperature characteristics**
- 3. Considerable output also under diffuse light conditions**

Towards Higher Conversion Efficiency

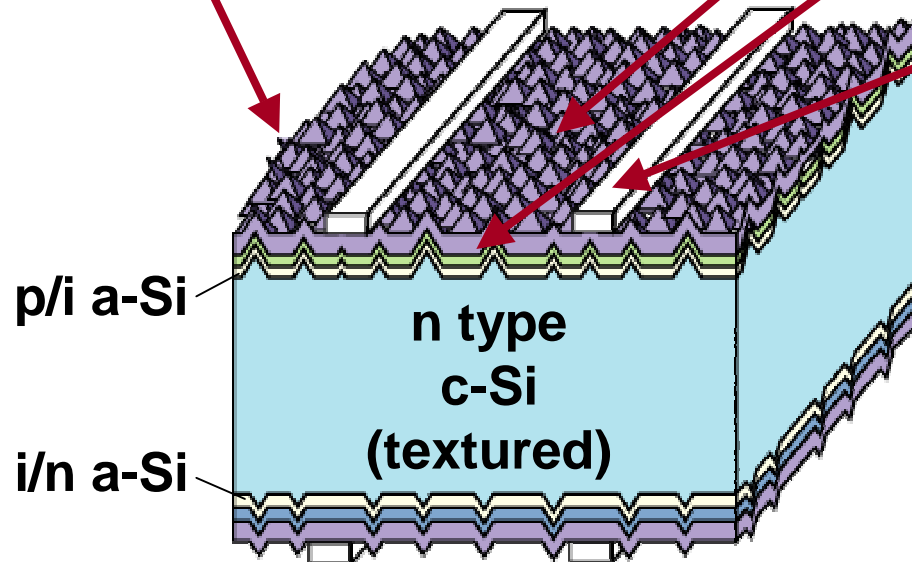


1. Higher junction quality

- ① Passivation by low-damage deposition of a-Si → Voc

2. High utilization efficiency of incident light

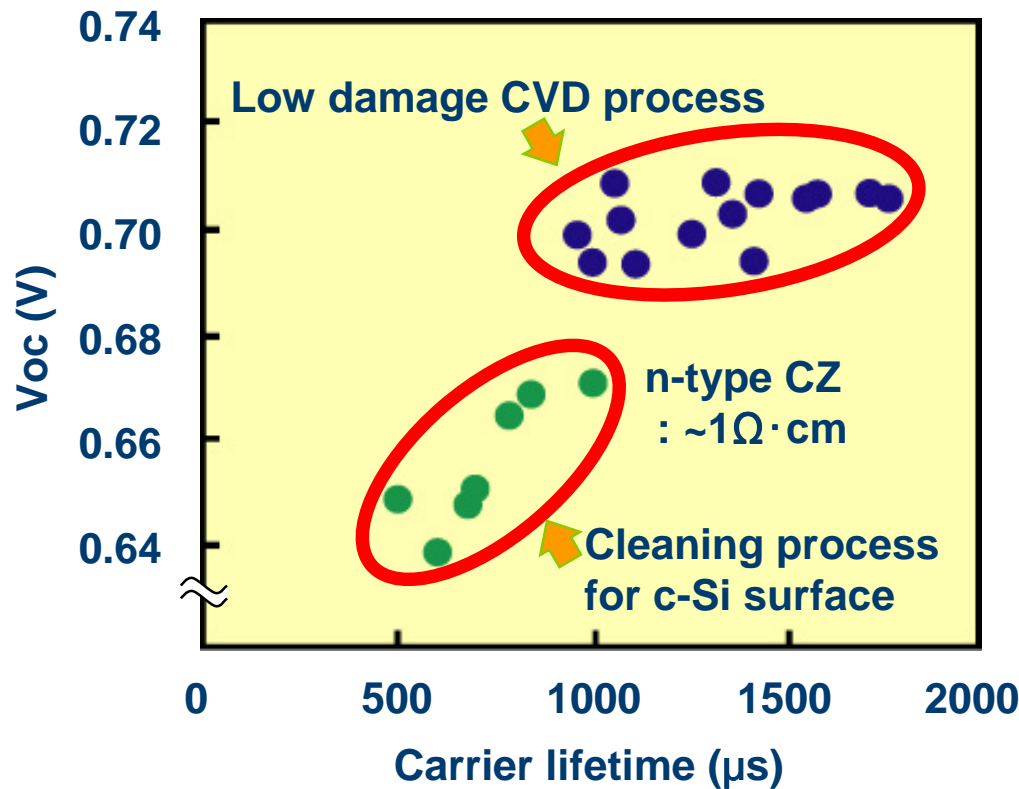
- ① High optical confinement → Isc
- ② Low absorption loss in the a-Si and TCO → Isc
- ③ Fine pattern electrode → Isc



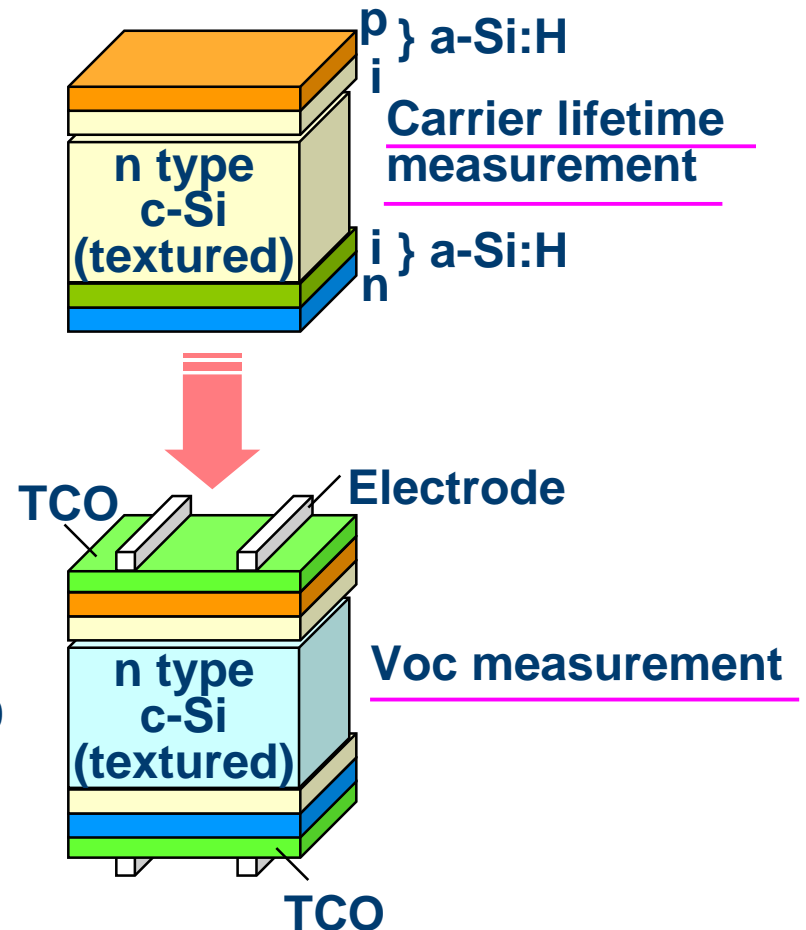
Surface Passivation Effect of HIT Solar Cell



Realization of a high Voc of over 0.7V by low-damage deposition of a-Si



Relationship between carrier lifetime (μ -PCD) and Voc



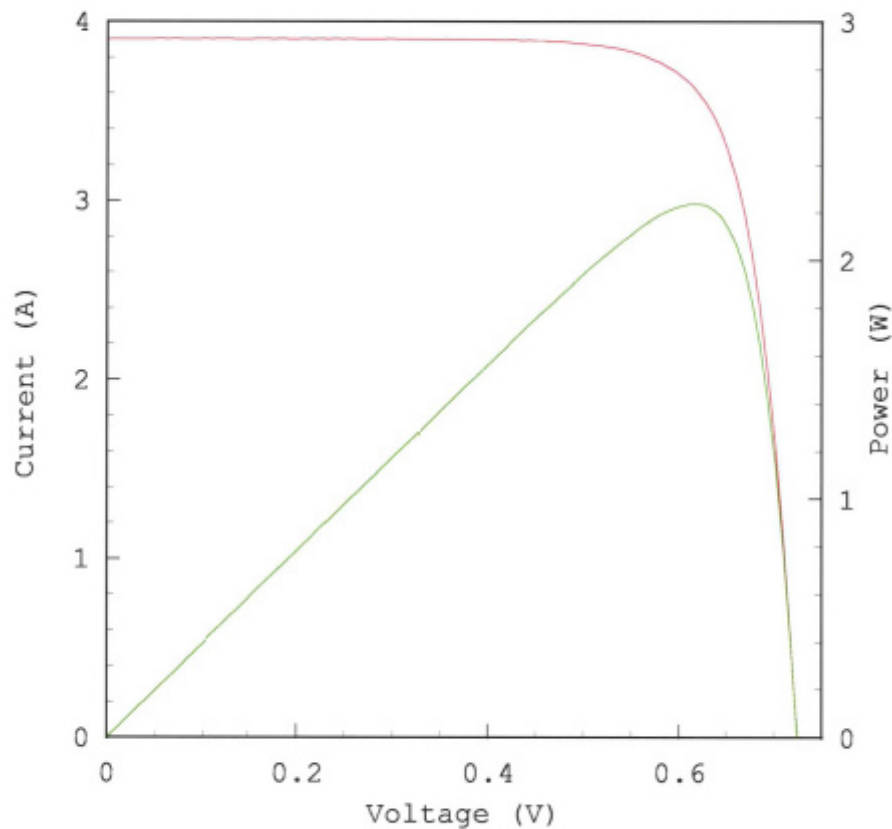
World's highest efficiency for a practical-size cell



Laboratory level

I-V CURVE

IEC60904-3 100.5 cm² (total area) WXS-220S-20



Date : 24 Jul 2007

Data No :

i625-1-4-01

Sample No :

i625-1-4

Repeat Times : 9

Isc 3.909 A

Voc 0.725 V

Pmax 2.242 W

I_{pmax} 3.641 A

V_{pmax} 0.616 V

F.F. 79.1 %

Eff (T) 22.3 %

DTemp. 25.0 °C

MTemp. 25.0 °C

DIrr. 100.0 mW/cm²

MIrr. 100.4 mW/cm²

Ref. Device No

J-SY28

Cal. Val. of Ref.

122.9 [mA at 100mW/cm²]

Scan Mode

Isc to Voc



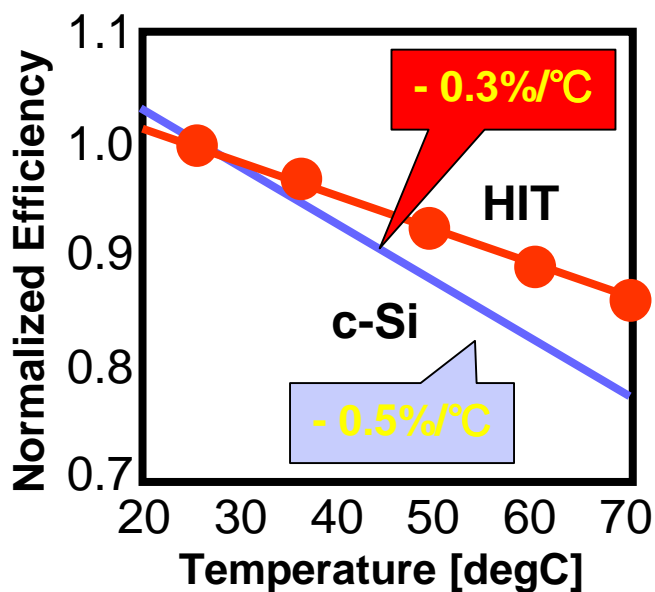
High Efficiency at High Temperatures



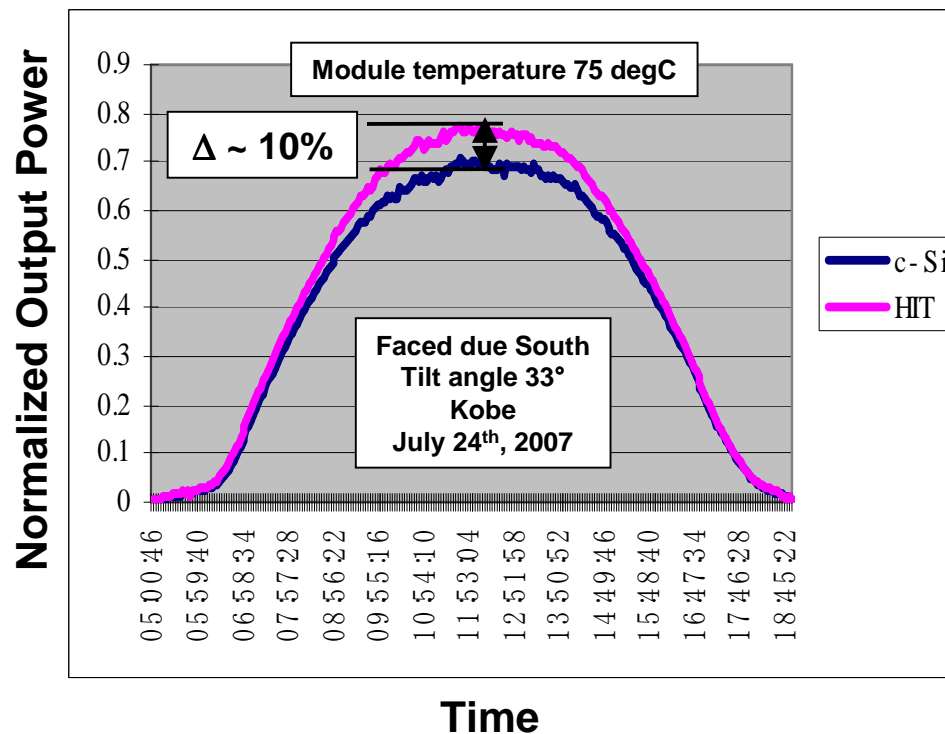
Excellent feature of temperature dependence:

- High efficiency at high temperatures
- More output power even at high temperatures in summertime

Temperature vs. Conversion Efficiency



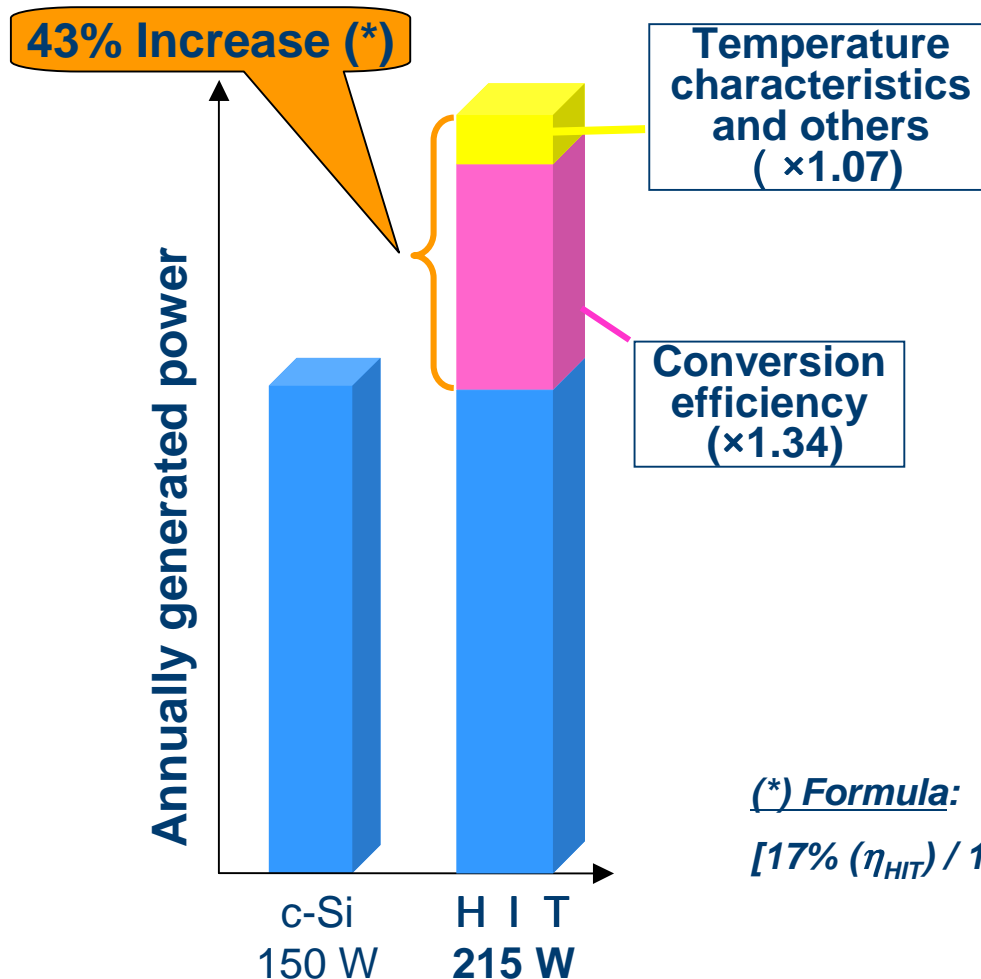
Changes in Generated Power Daytime



Advantages of HIT Modules



HIT 215 W Module ($\eta \sim 17\%$) vs. c-Si 150 W Module (with $\eta \sim 12.7\%$):
output 43% (*) higher on the same installation area



(*) Formula:

$$[17\% (\eta_{\text{HIT}}) / 12.7\% (\eta_{\text{c-Si}})] * 1.07 (T_{\text{Coeff}}) = 1.432$$

