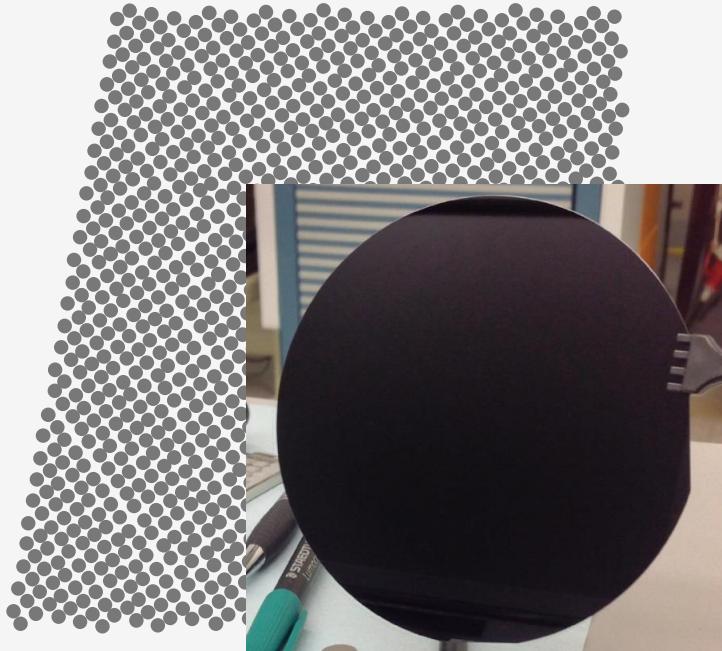


PV Technology Based on Crystalline Silicon Wafers

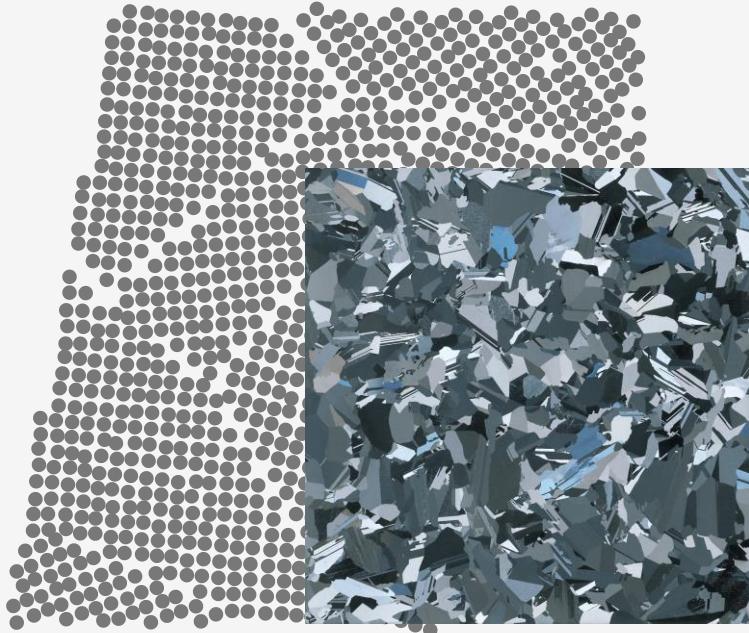
High-Efficiency Concepts of c-Si Wafer Based Solar Cells

Week 4.4

Arno Smets

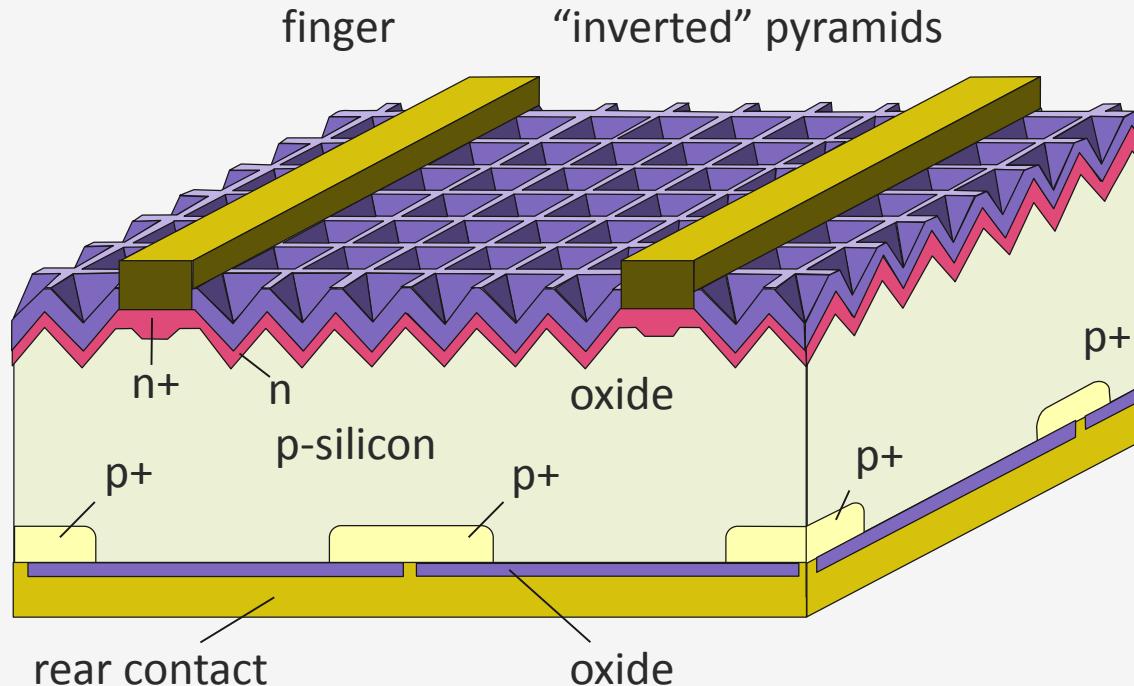


Monocrystalline



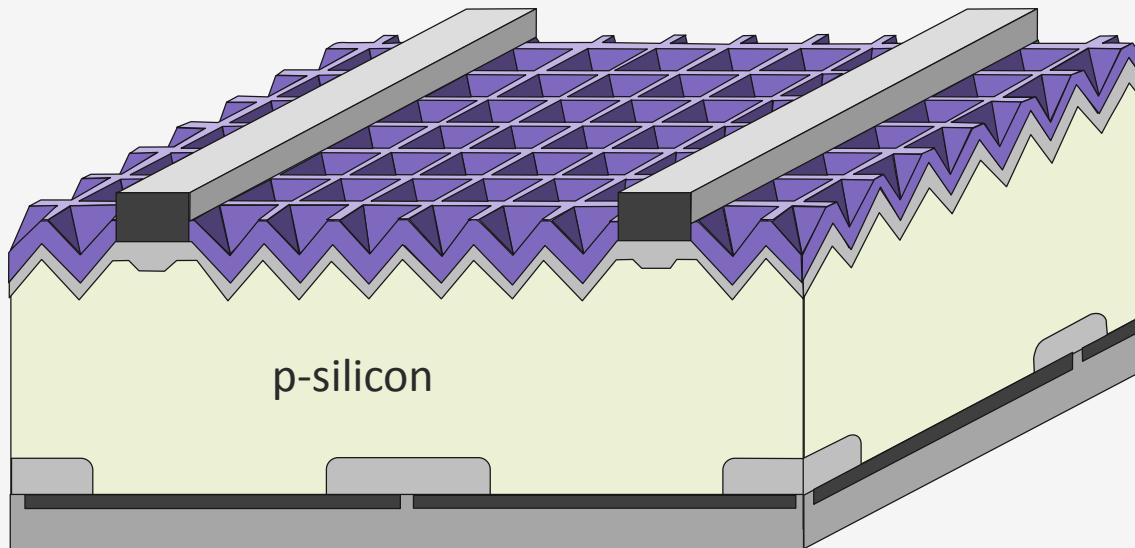
Multicrystalline

Losses in charge collection and separation



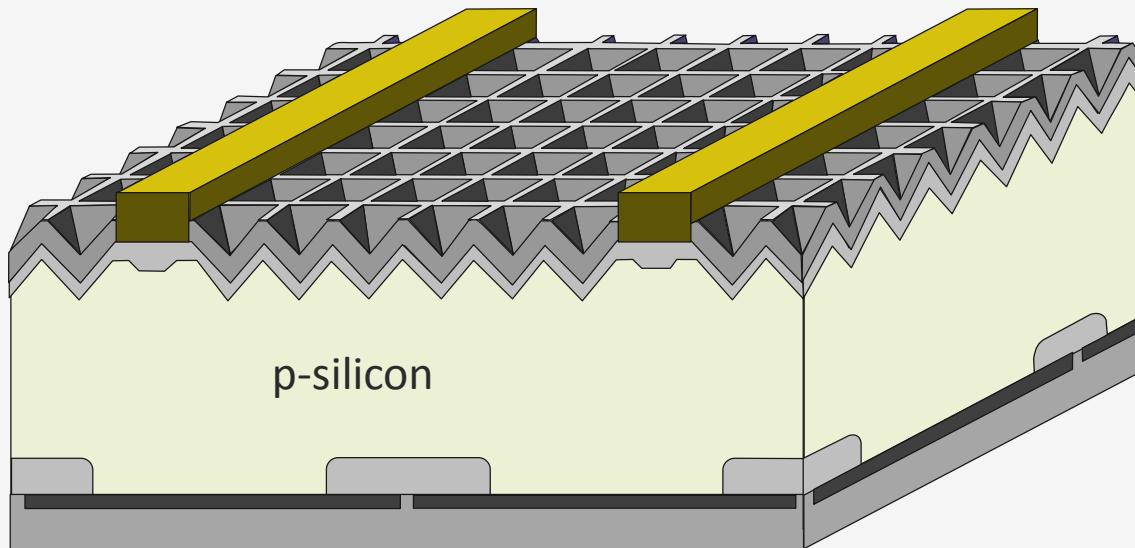
PERL solar cell

“inverted” pyramids

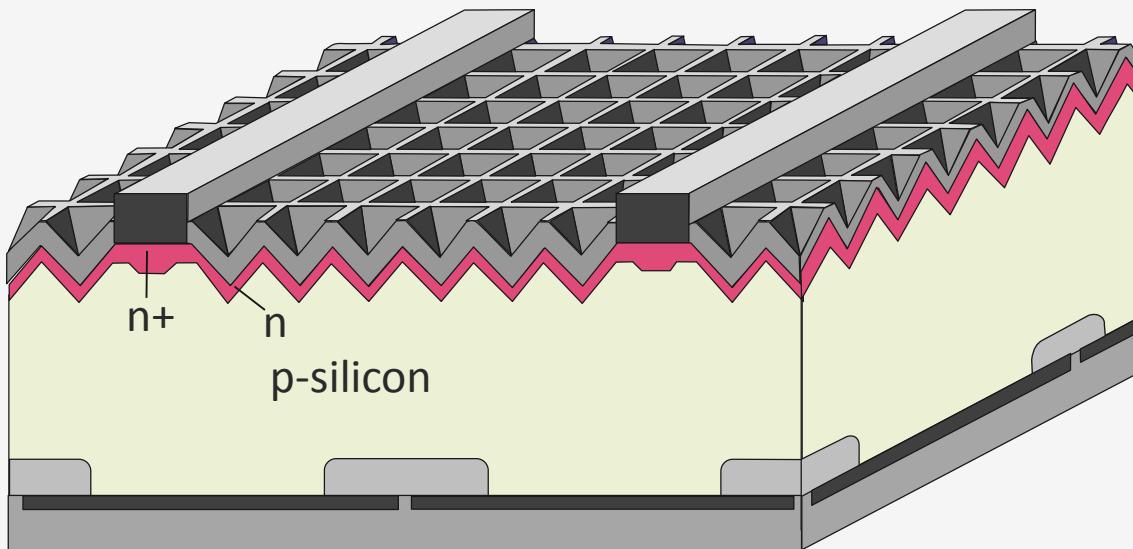


PERL solar cell

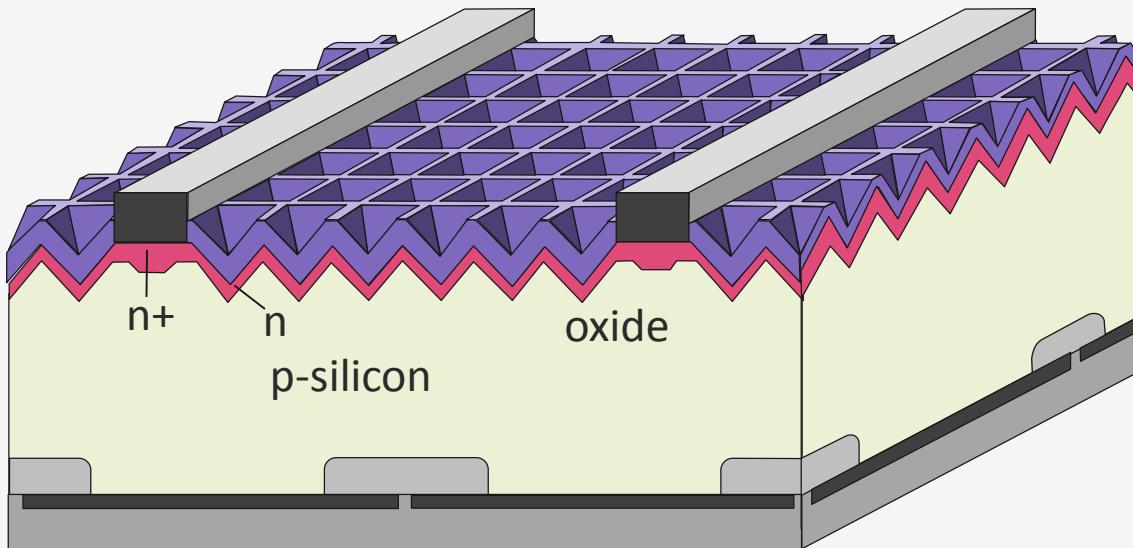
“inverted” pyramids



PERL solar cell

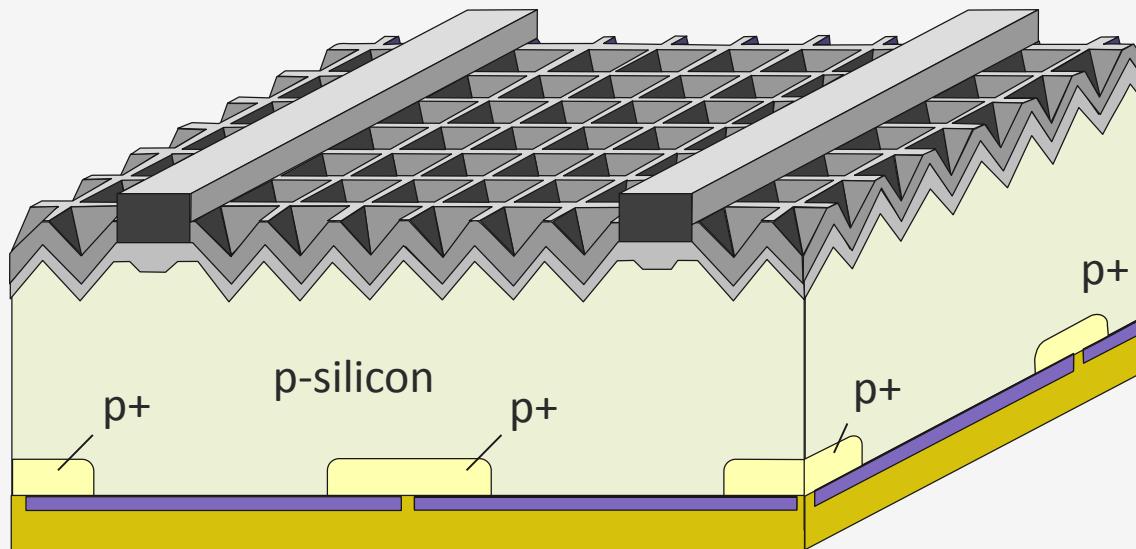


PERL solar cell

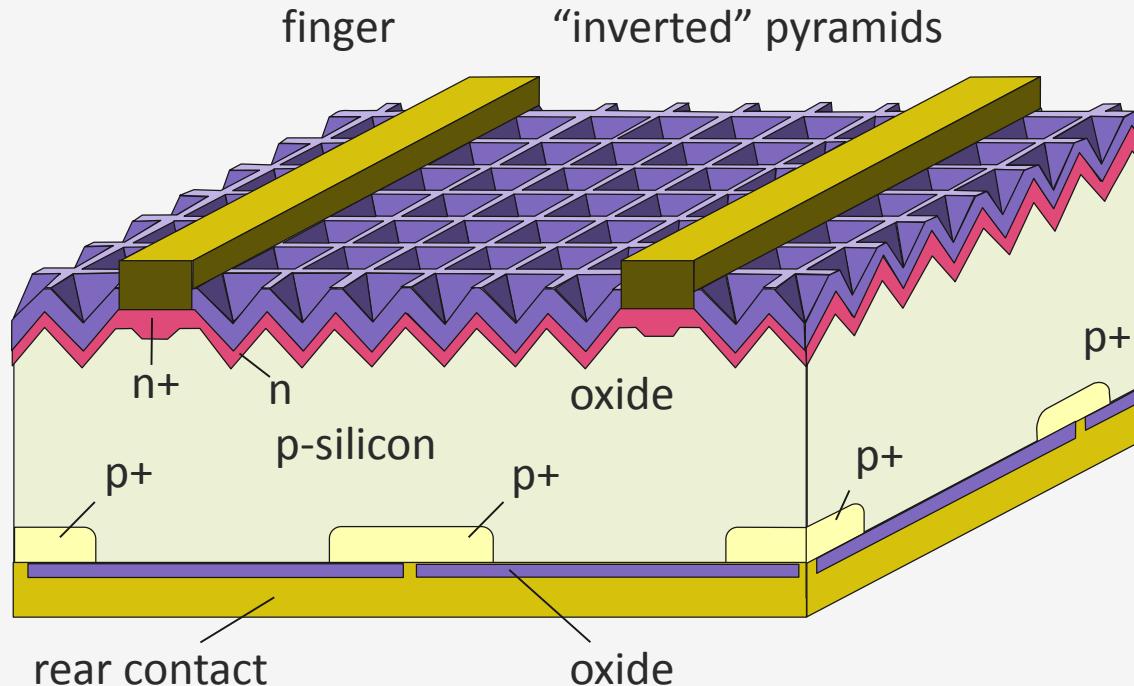


PERL solar cell

“inverted” pyramids



Losses in charge collection and separation



Losses in charge collection and separation

Lightly doped front diffusion

Texture + SiO₂ + ARC

n-type silicon – 240 µm tick

p+

n+

p+

n+

p+

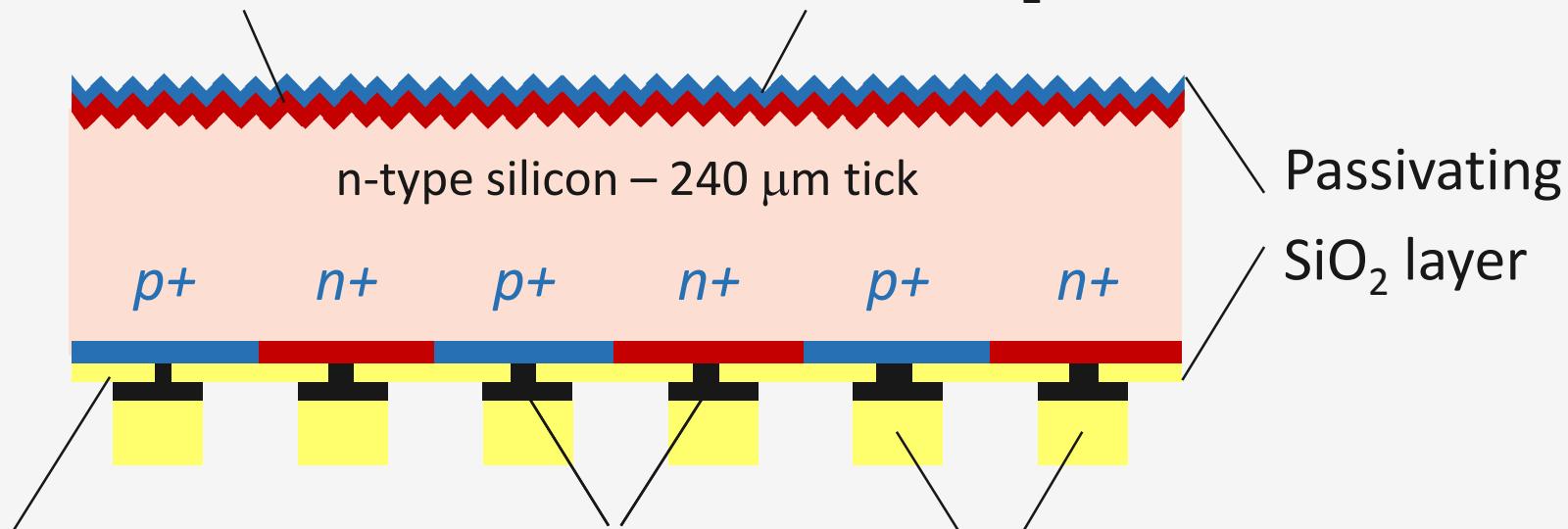
n+

Passivating
SiO₂ layer

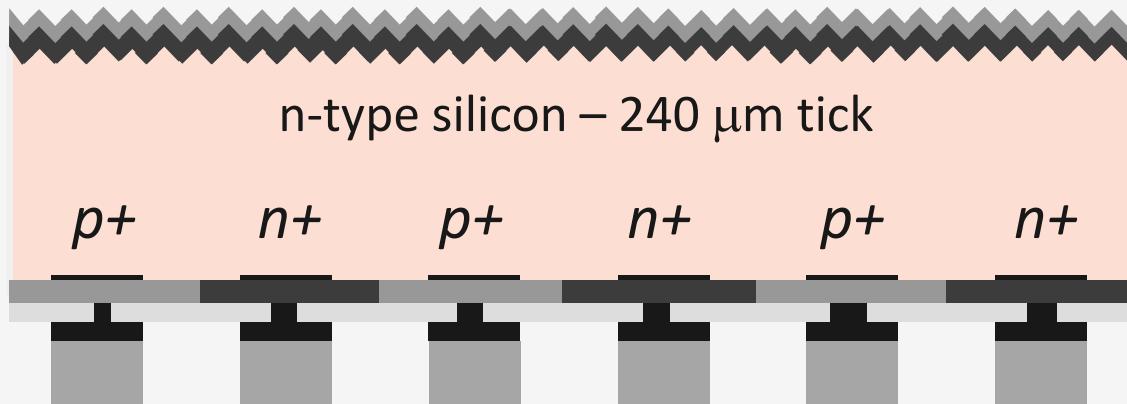
Backside mirror

Localized contacts

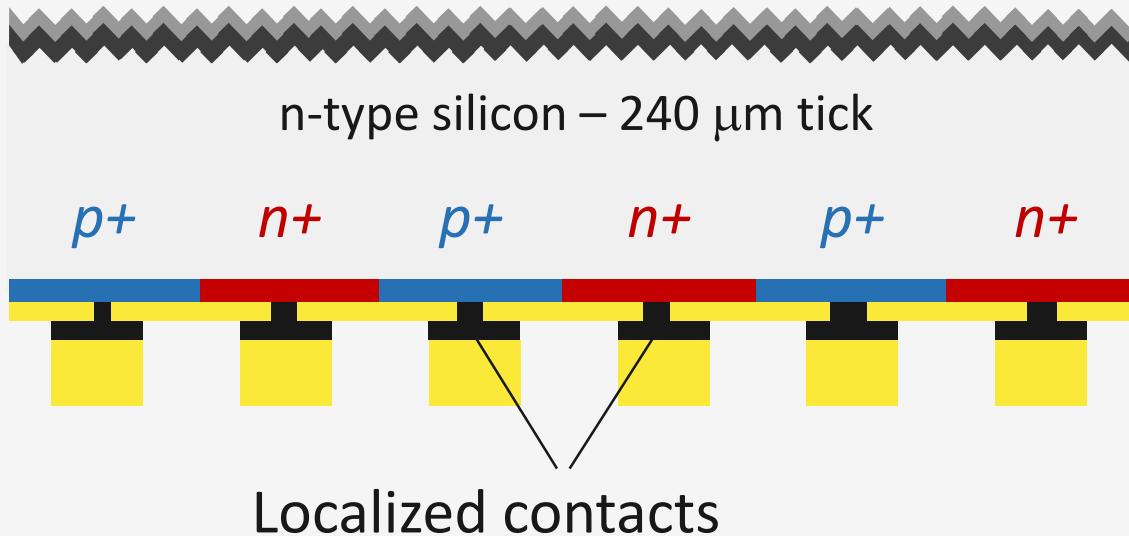
Backside gridlines



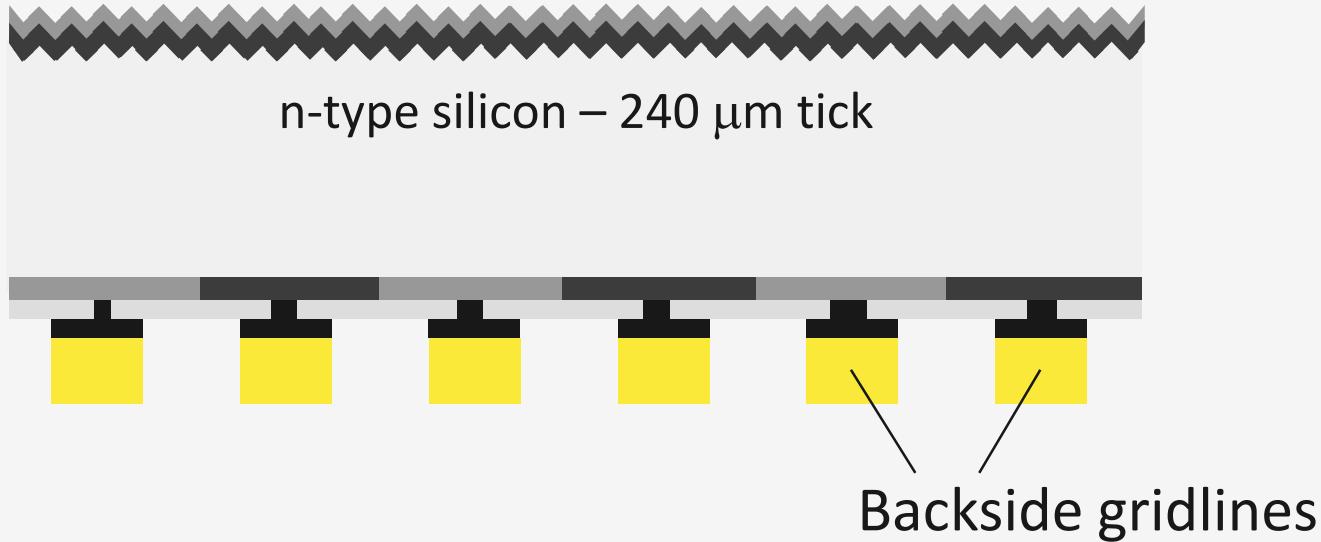
Losses in charge collection and separation



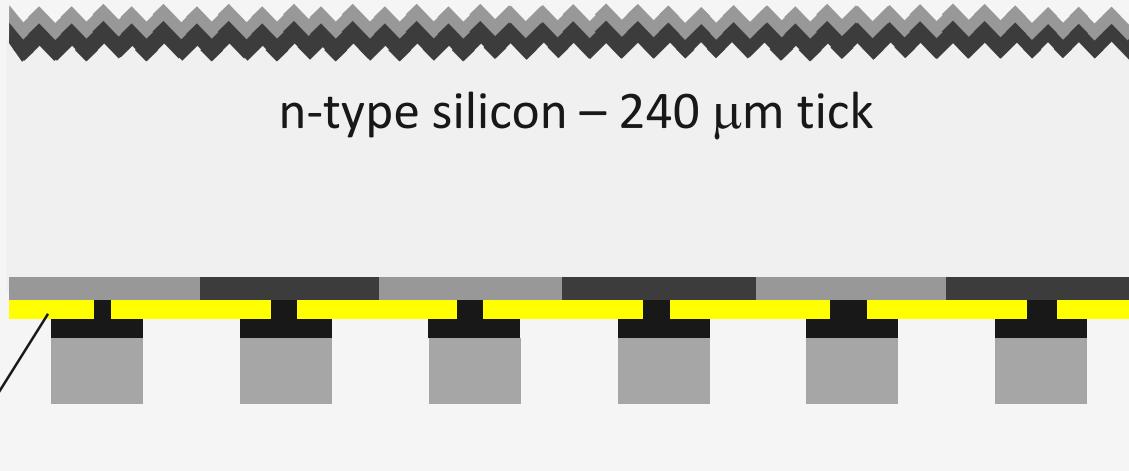
Losses in charge collection and separation



Losses in charge collection and separation

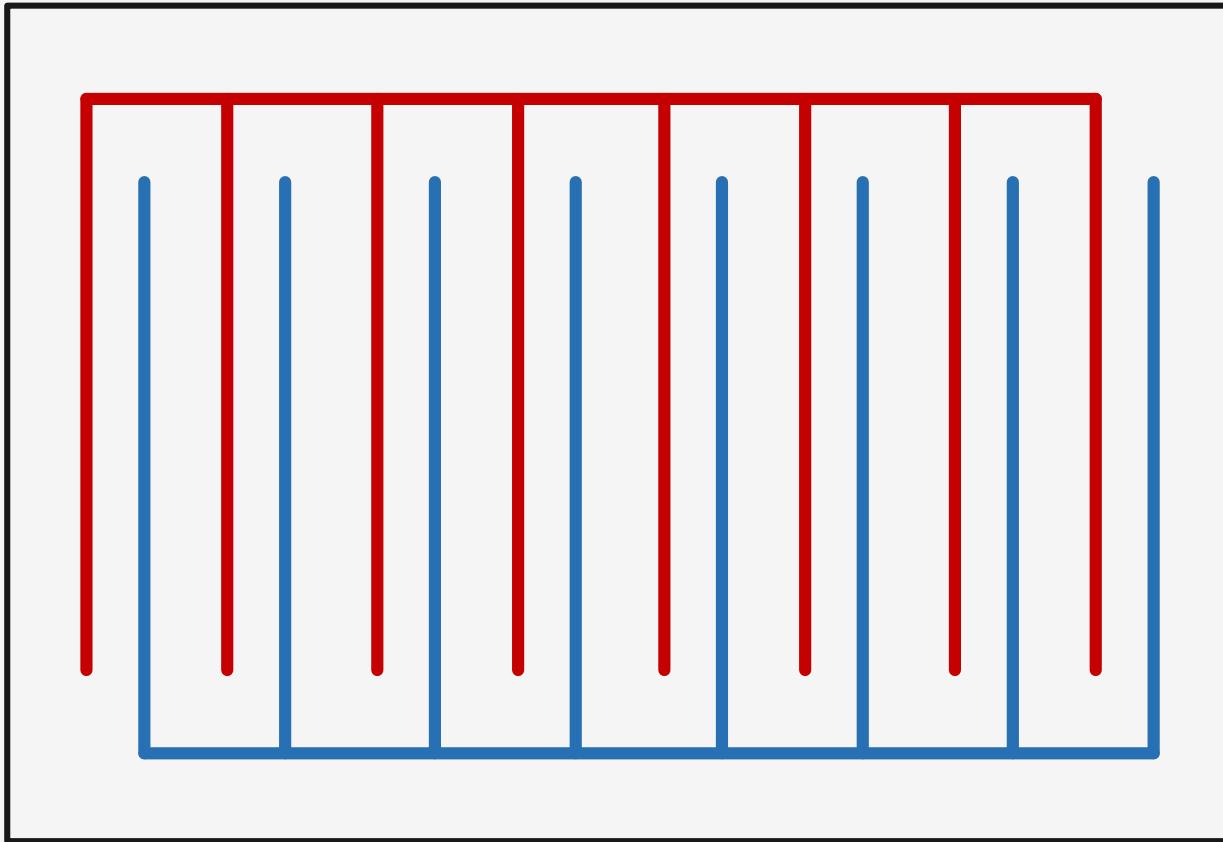


Losses in charge collection and separation

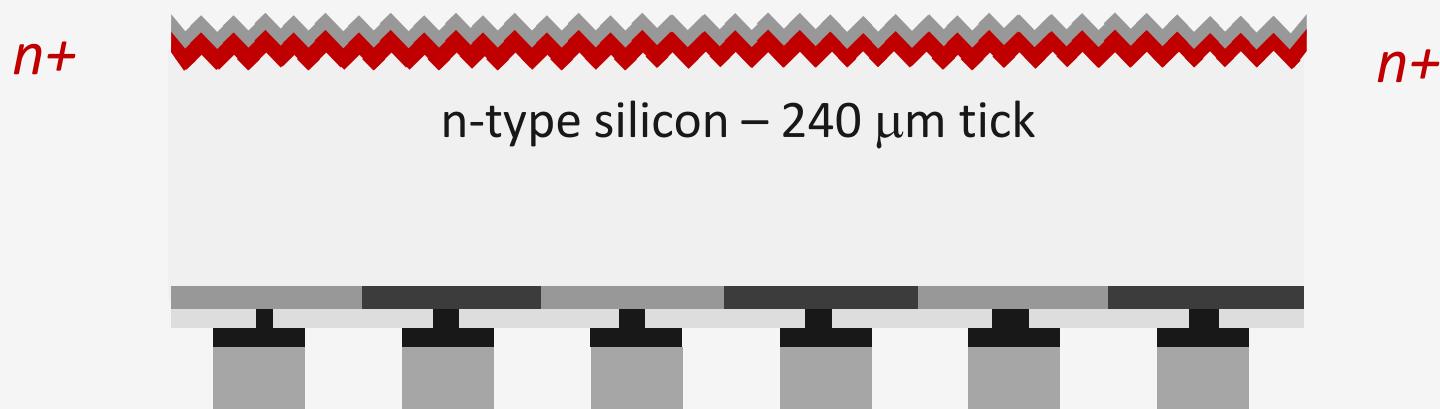


Backside mirror

Interdigitated back contact grid

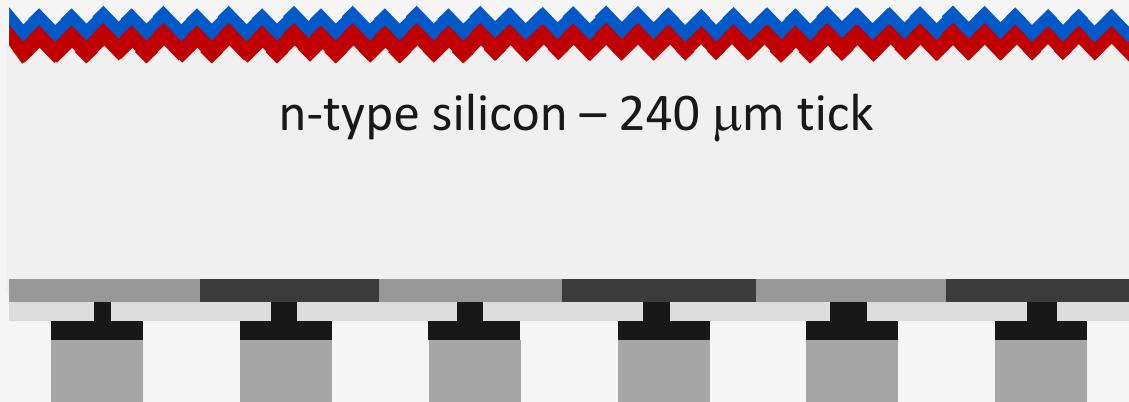


Losses in charge collection and separation



Losses in charge collection and separation

Passivation + antireflection coating



Losses in charge collection and separation

Lightly doped front diffusion

Texture + SiO₂ + ARC

n-type silicon – 240 µm tick

p+

n+

p+

n+

p+

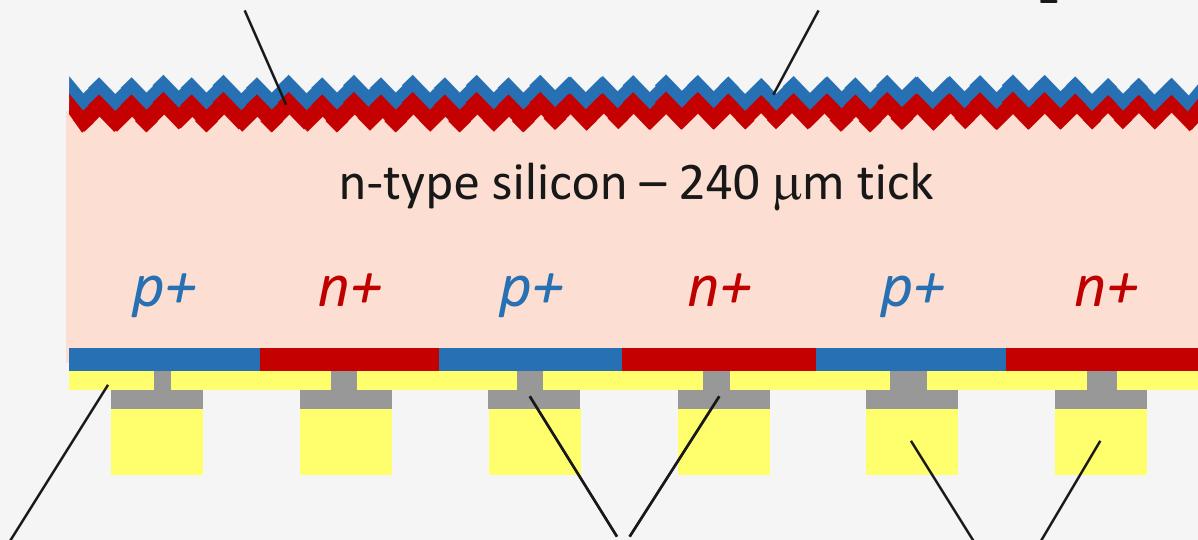
n+

Passivating
SiO₂ layer

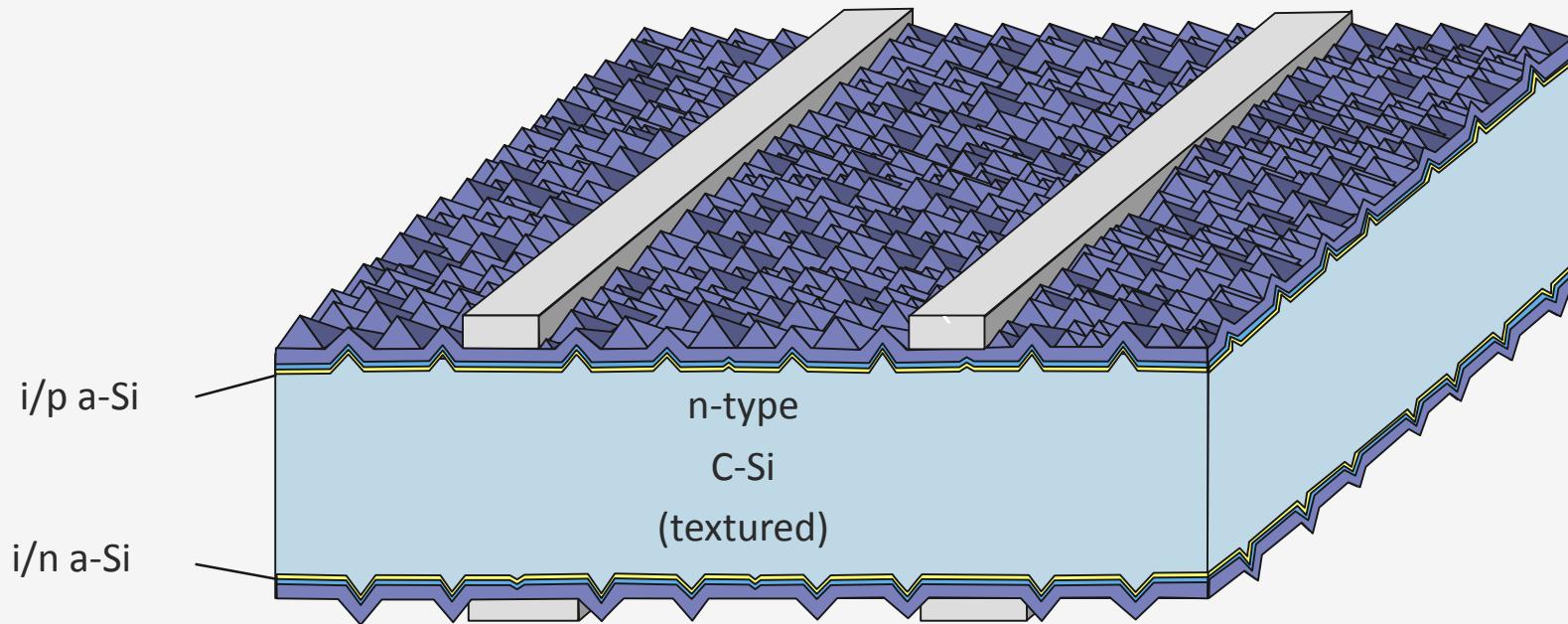
Backside mirror

Localized contacts

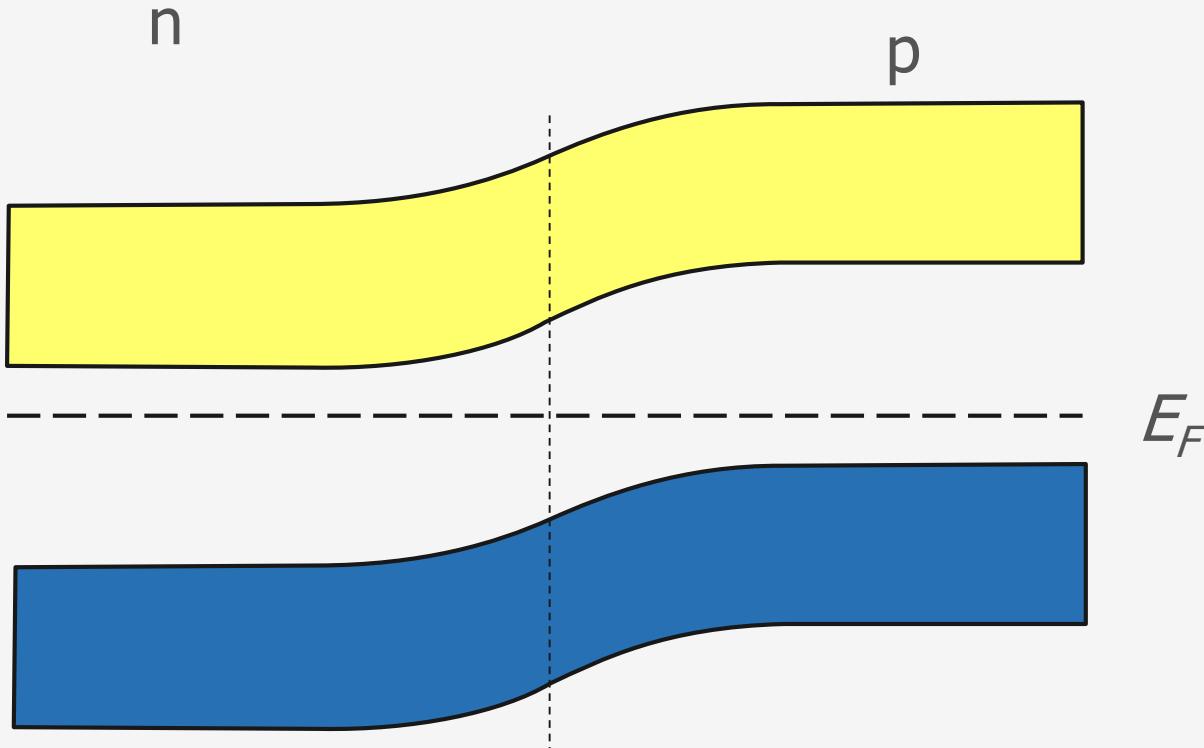
Backside gridlines



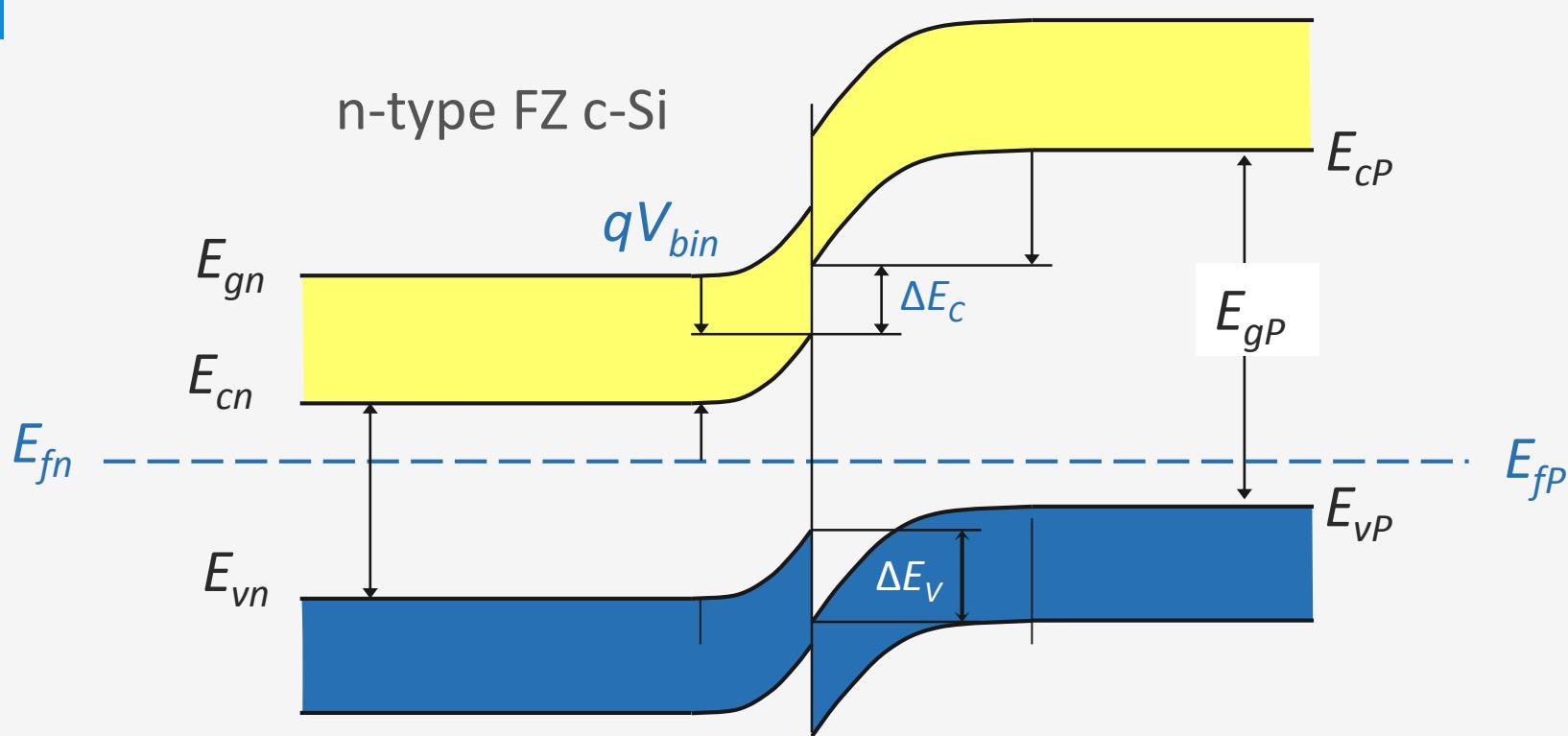
C-Si wafer based hetero-junction solar cell



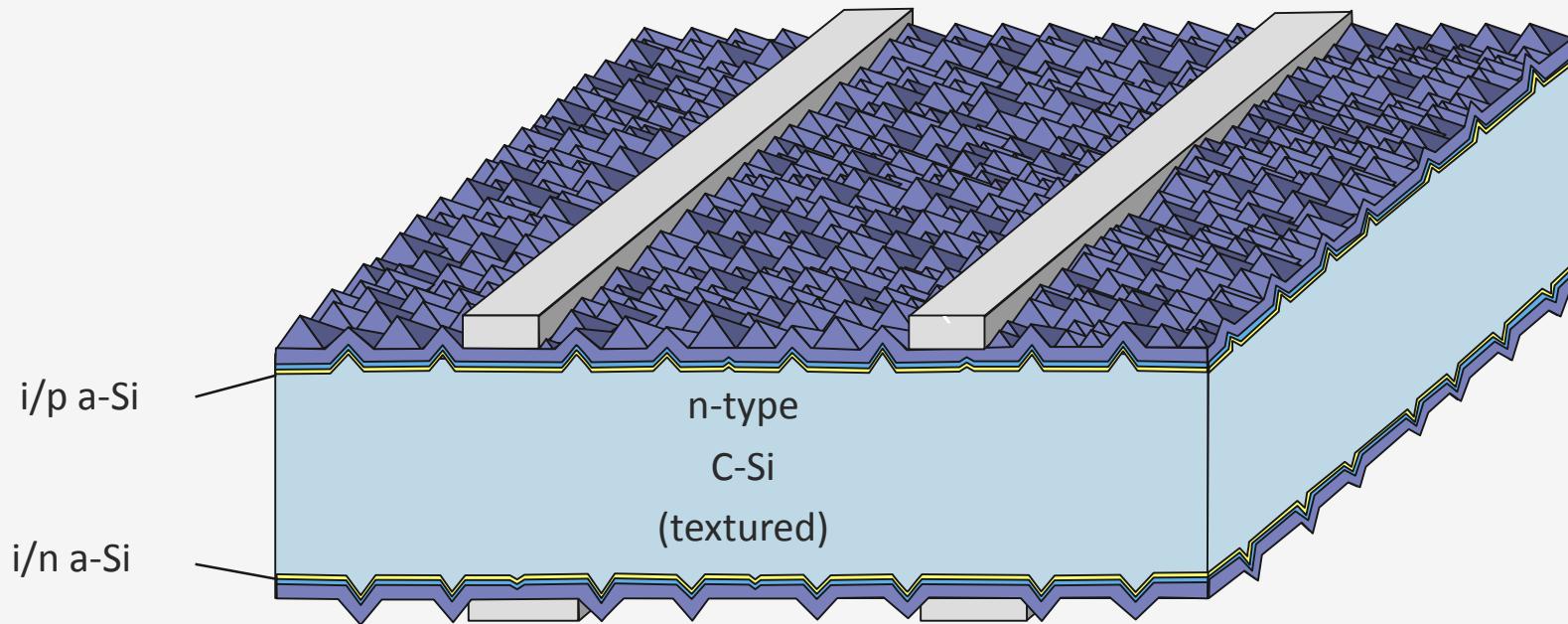
Homojunction



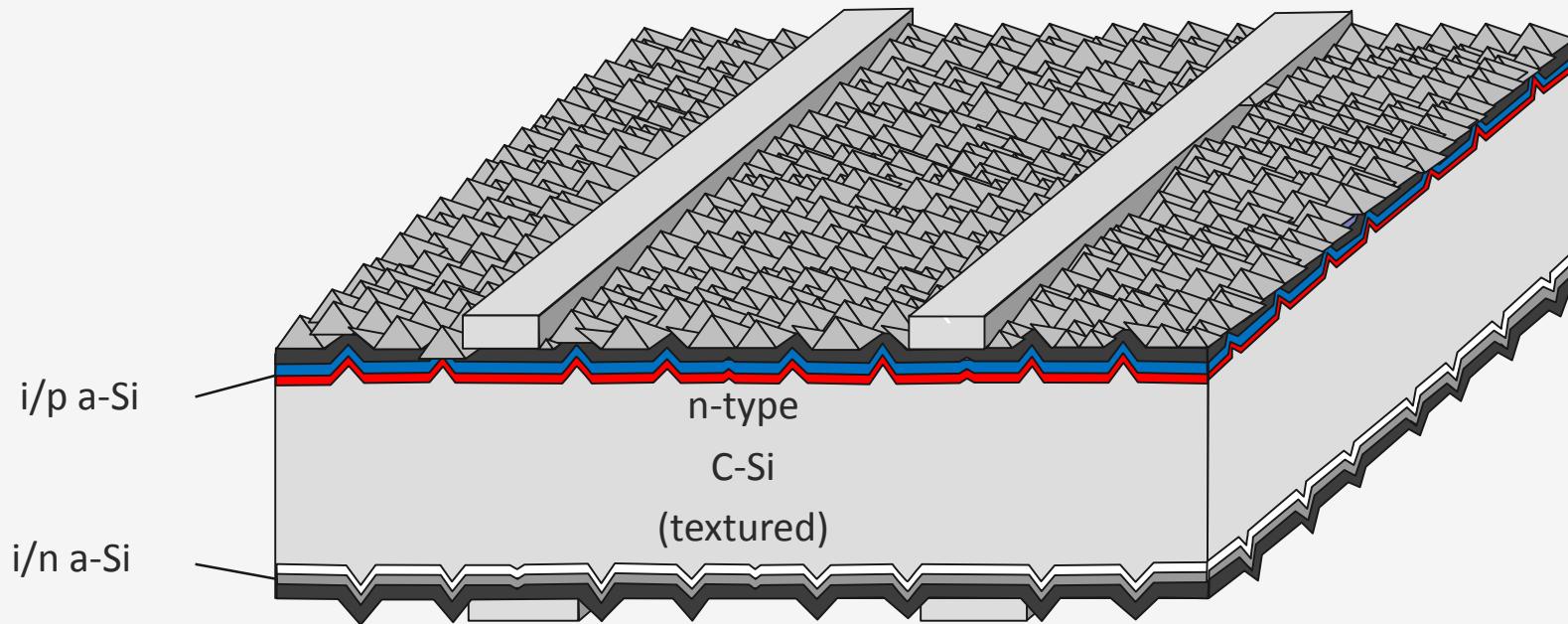
Heterojunction



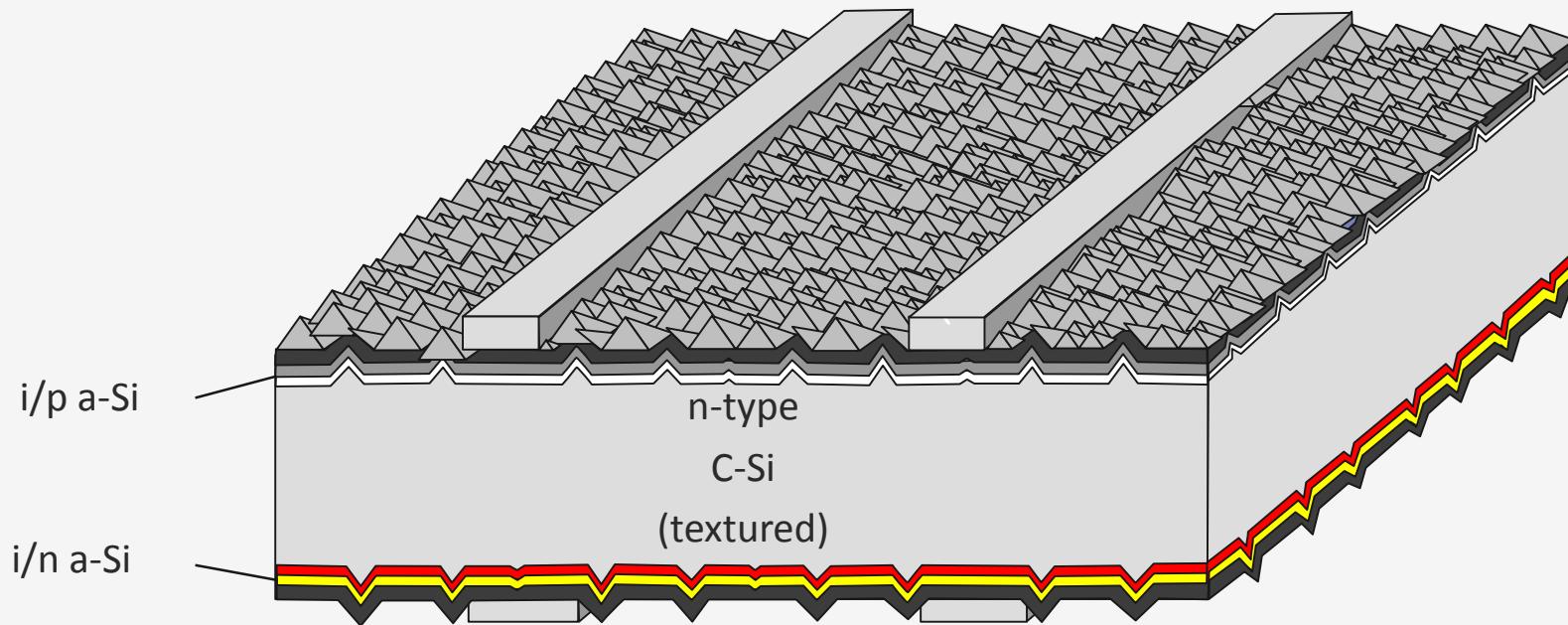
C-Si wafer based hetero-junction solar cell



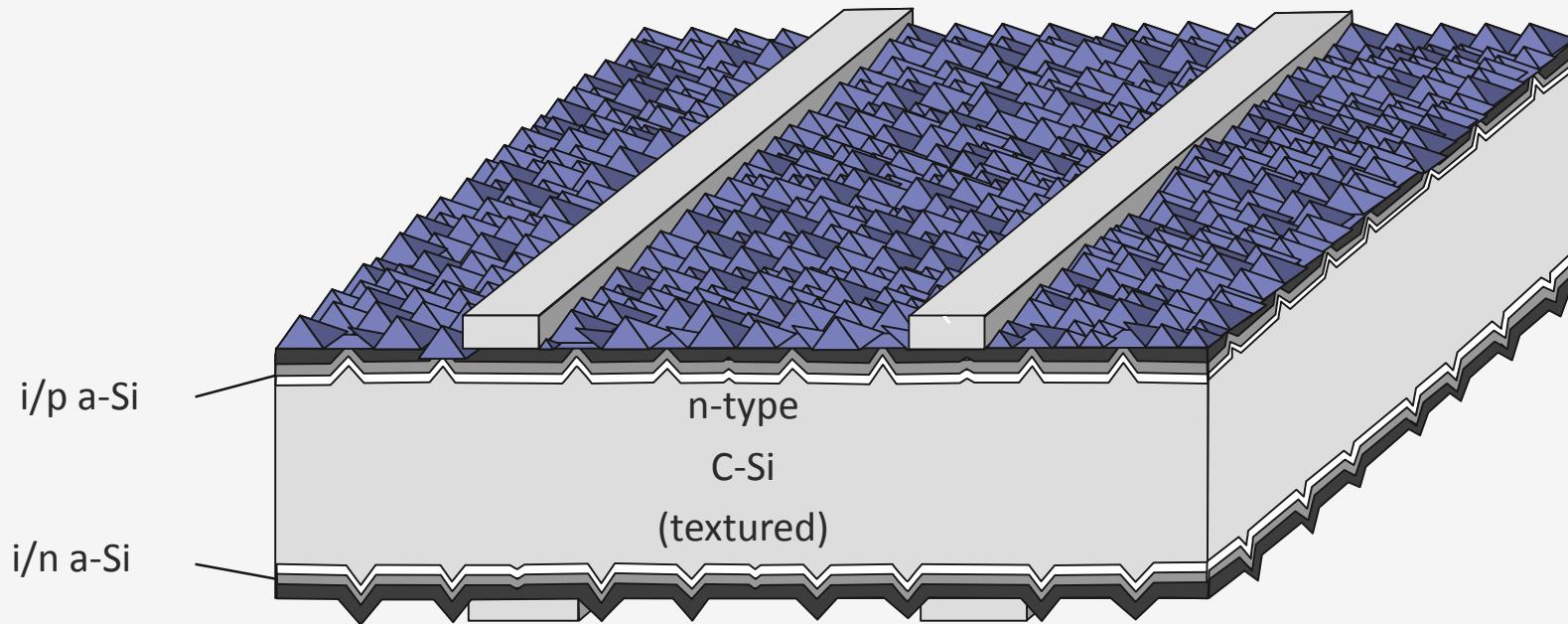
C-Si wafer based hetero-junction solar cell



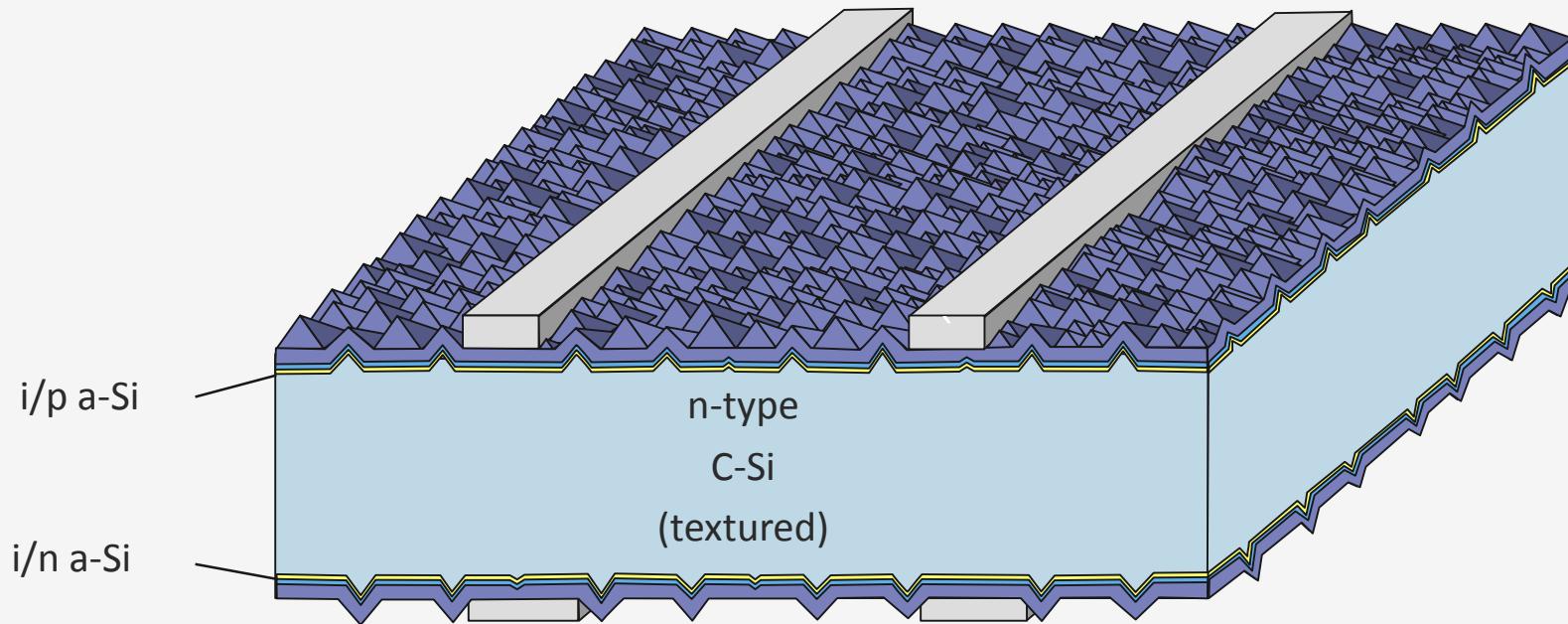
C-Si wafer based hetero-junction solar cell



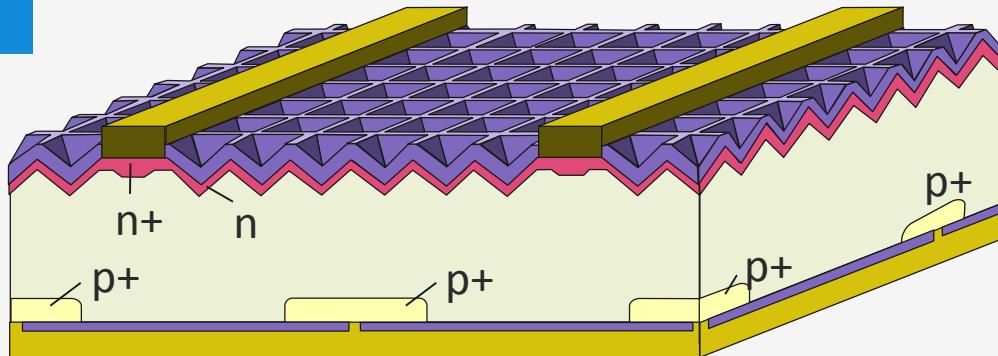
C-Si wafer based hetero-junction solar cell



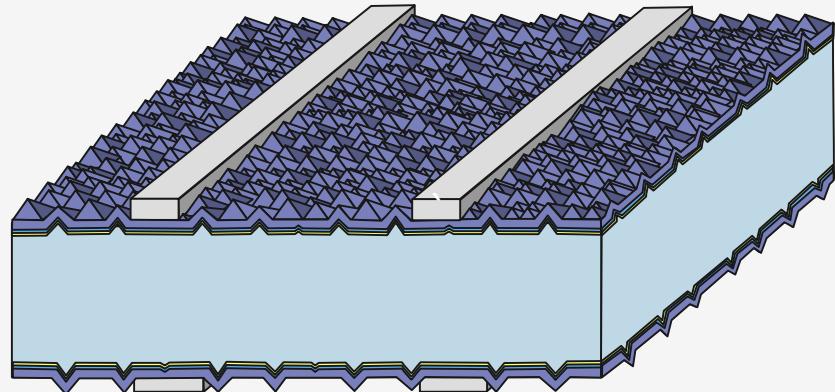
C-Si wafer based hetero-junction solar cell



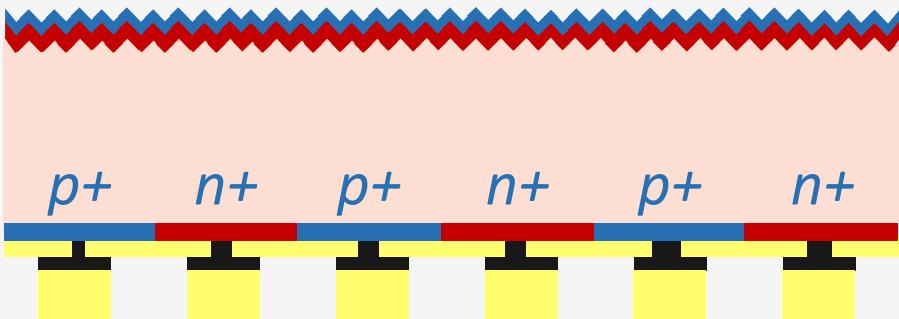
Novel concepts



$\eta = 25\%$; Area = 4 cm²



$\eta = 24.7\%$; Area = 102 cm²



$\eta = 24.2\%$; Area = 155 cm²

Thank you for your attention!



Challenge the future