

ST Microelectronics Solar Diodes Solar MPPT Booster

Available from Avnet

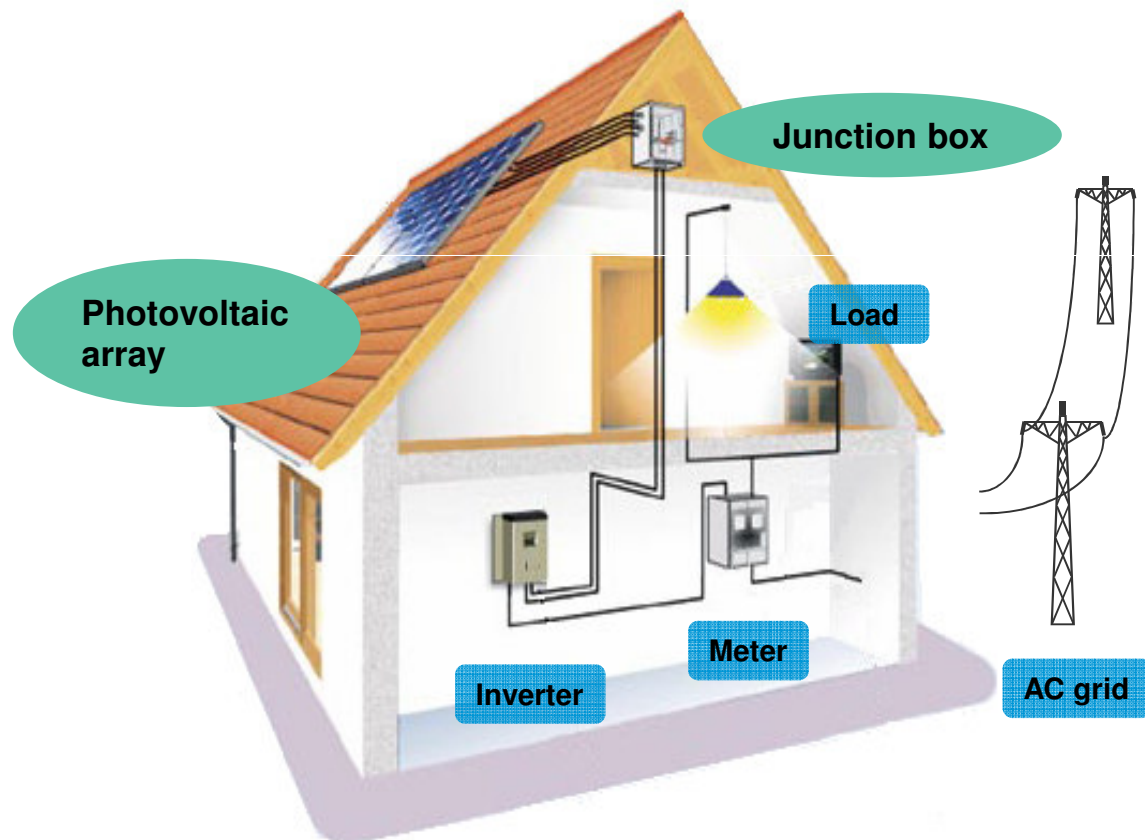


Boosting solar energy conversion



Improving solar energy conversion

- At junction box or panel level – **cool bypass switch**
- At photovoltaic array level – **solar energy booster**



More efficient solar energy conversion

New approach to renewable energy based 100% on ST's proprietary IPs and technologies for:

At junction-box level

- Minimized power dissipation and leakage currents
- Improved reliability and maximized lifetime

At photovoltaic-panel array level

- Minimized shadowing impact on power generation
- Minimized panel mismatch
- Improved inverter efficiency
- Panel diagnosis using remote monitoring and control functions

Cool bypass switch (CBS)

Key features

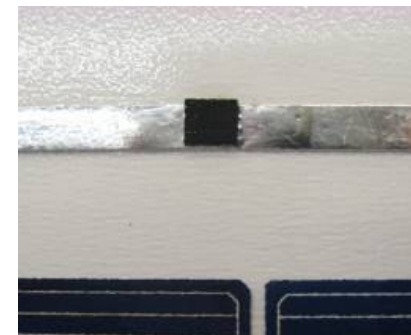
- System in package
- Embedded power MOSFET
- Very low forward-voltage drop
- Very low reverse leakage current

Main benefits

- Cooler than Schottky diodes
- Low power dissipation
- Longer lifetime
- Higher reliability



(1)



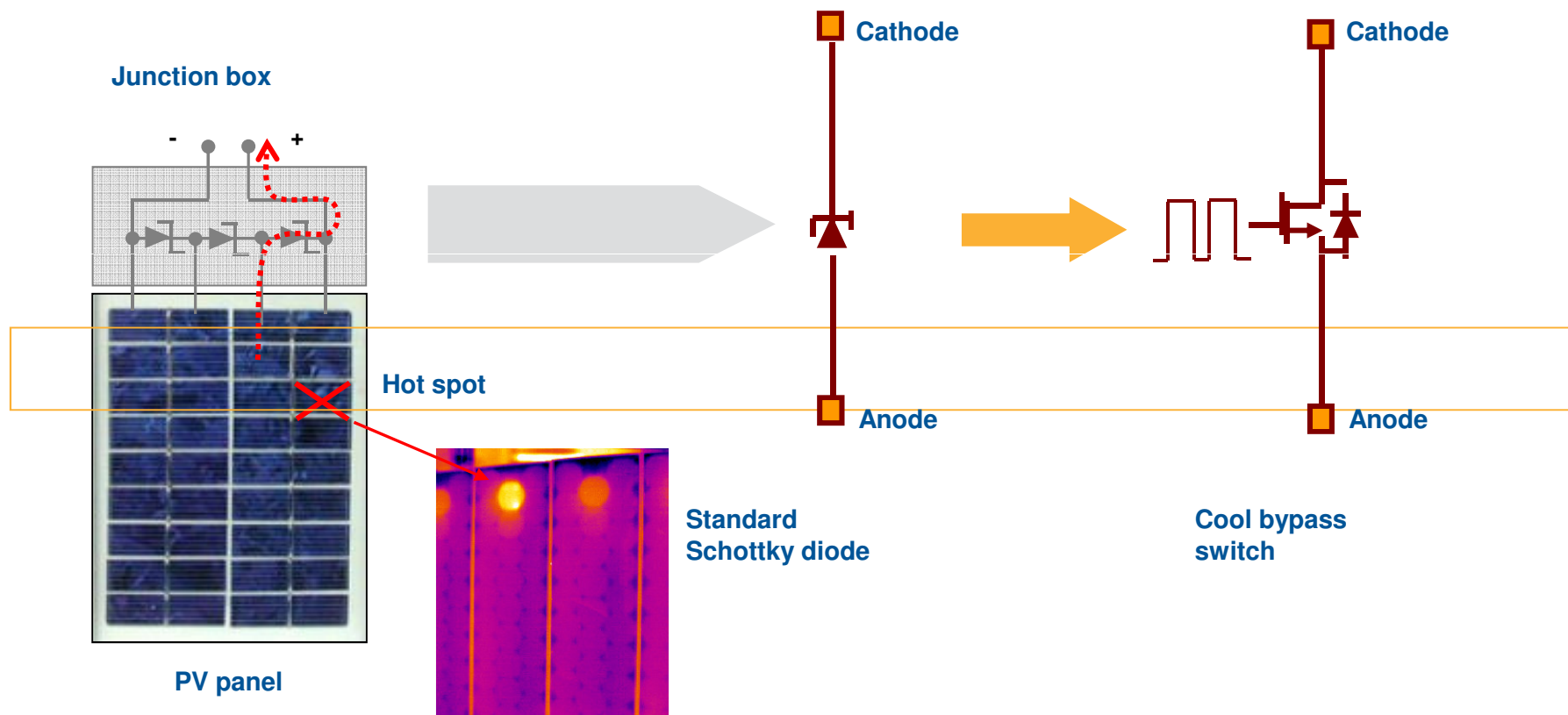
(2)

(1) CBS available in different packages

(2) CBS in MLPD package: very low profile (less than 1mm) to laminate device directly on the panel

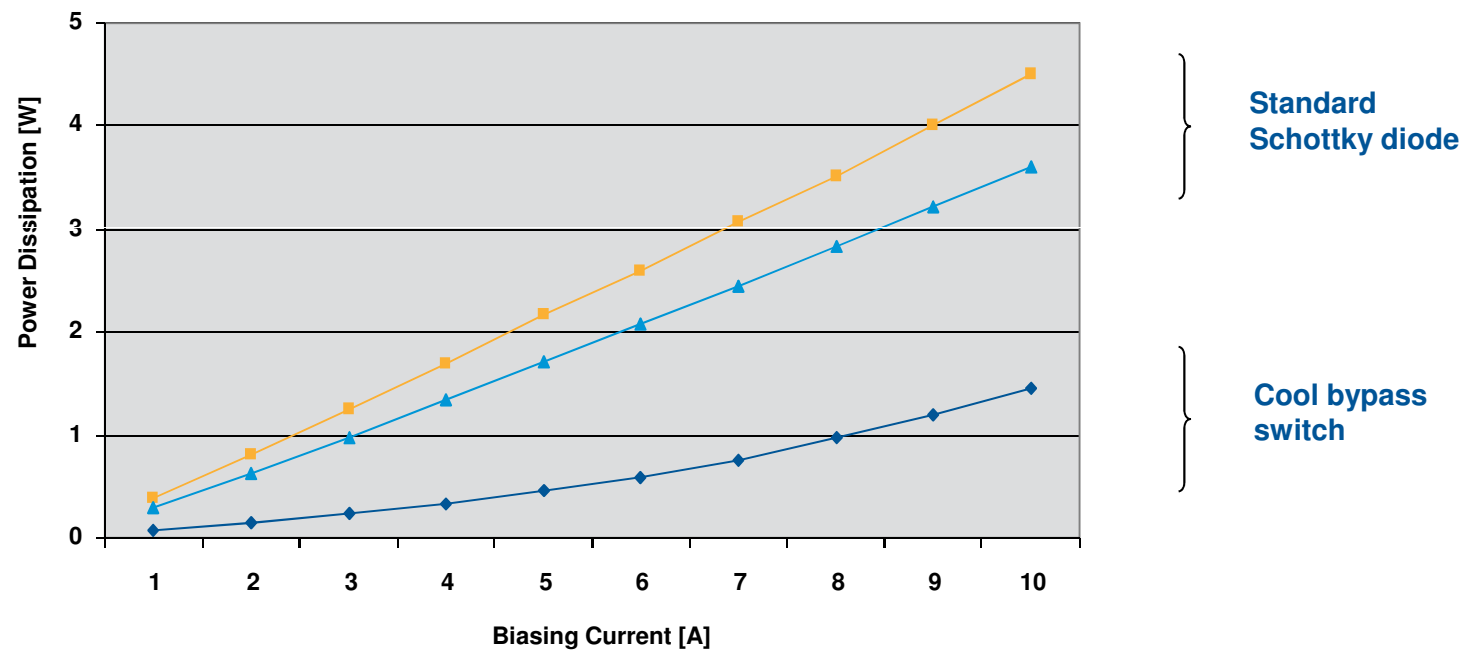
Cool bypass switch (CBS)

- CBS versus standard Schottky diodes



Cool bypass switch (CBS)

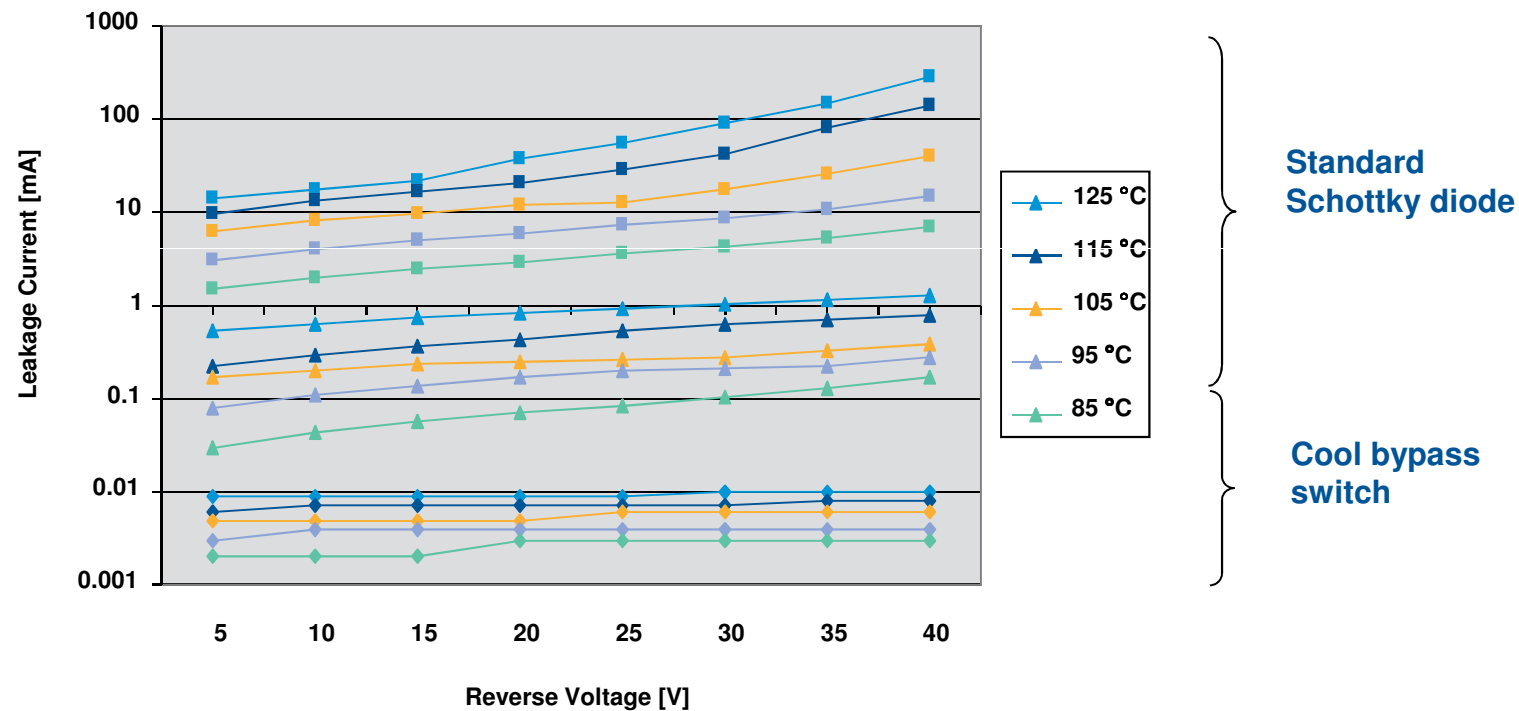
- CBS vs standard Schottky diodes: power dissipation in forward biasing



Note: acquisitions made at steady state

Cool bypass switch (CBS)

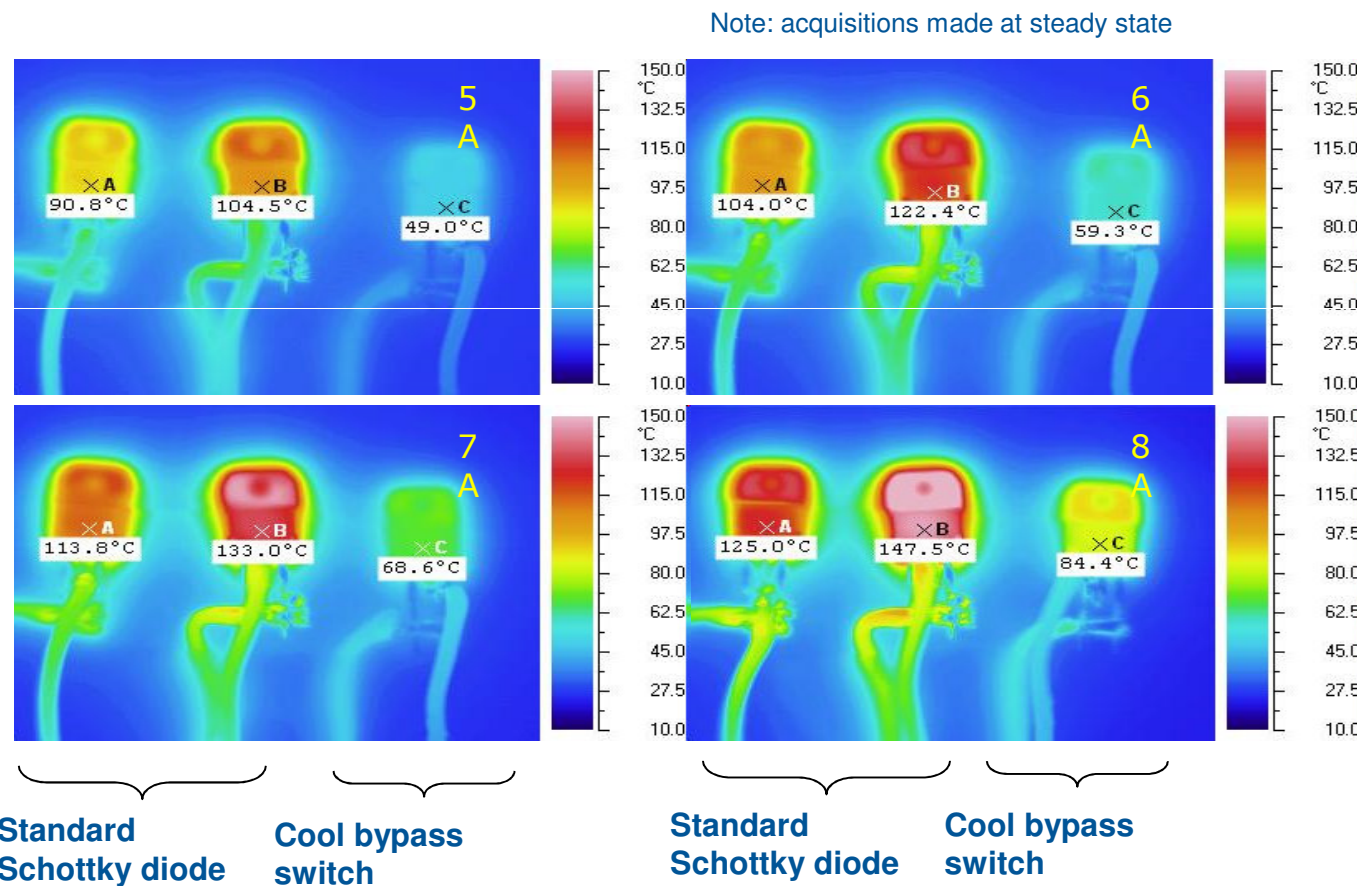
- CBS vs standard Schottky diodes: leakage current in reverse polarity



Note: acquisitions made at steady state

Cool bypass switch (CBS)

- CBS versus standard Schottky diodes: heat dissipation compared at ambient temperature, without dissipation tools



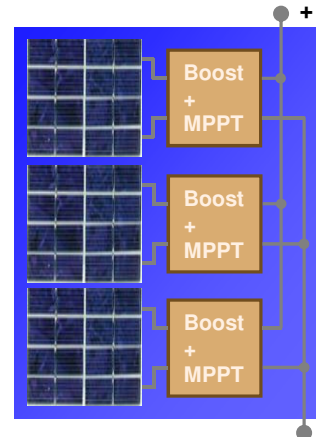
Solar energy booster

- Removes need for centralized power conversion, moving part of the electronics from the inverter to the panel

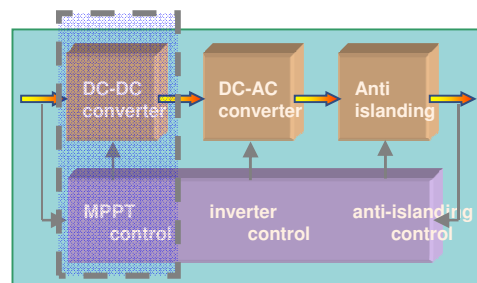
Standard PV panel

Solar energy booster

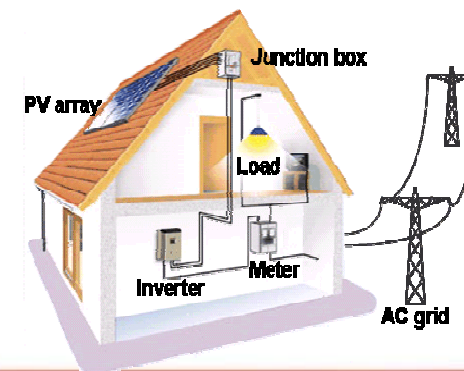
electronic parts centralized at inverter level



distributed architecture
DC-DC and MPPT at single cell-string level



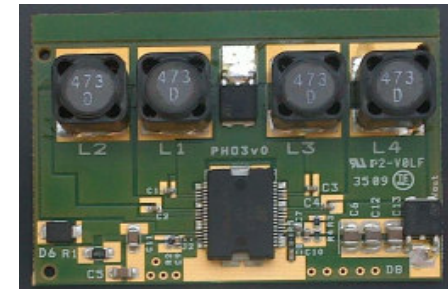
Inverter basic architecture



Solar energy booster

Key features

- Monolithic power converter embedded in the panel
 - Breakthrough device allows distributed architecture: one or more power converters integrated on the panel
 - MPPT implemented at single cell-string level
- Maximum power point tracker (MPPT) algorithm
 - Maximizes solar DC power from the PV panels under any temperature and radiation conditions (shadowing, panel performance mismatch, thermal gradient, etc.)
 - Tracks power-output changes from the PV modules and maintains continuous grid connectivity



Solar energy booster demonstration board

Main benefits

- MPPT computed for each cell string
 - Maximized power extracted from a single cell string
 - Boosted overall efficiency of the photovoltaic system
- Panel diagnostics using remote monitoring and control function

Improving photovoltaic technology

Main benefits

Cool bypass switch

- Reduced power dissipation
- Cooler device
- Longer lifetime
- Higher reliability
- Smaller and lighter junction box

Solar energy booster

- Maximized efficiency of the photovoltaic system
- Extra energy production
- Panel diagnostics: remote monitoring and control
- Higher reliability: fewer devices, lower failure rate