

SPV1020

Solar boost converter



STMicroelectronics

Interleaved DC-DC boost converter (4 phases) with built-in MPPT algorithm

The SPV1020 is a monolithic DC-DC boost converter designed to maximize the power generated by photovoltaic panels.

The power conversion is optimized with an embedded logic which performs the MPPT algorithm. Since the maximum power point is locally computed, the efficiency at system level is higher than for conventional topologies.

The SPV1020 embeds the power MOSFETs for active switches and synchronous rectification, minimizing the number of external components. Furthermore, the 4-phase interleaved topology of the DC-DC converter avoids the use of electrolytic capacitors.

Key features

- PWM mode DC-DC boost converter
- Operating voltage range: 6.5 to 45 V
- Maximum input current: 9 A
- Overvoltage, overcurrent and over-temperature protection
- Built in soft-start
- Up to 98% efficiency
- Automatic transition to burst mode for improved efficiency at low solar radiation
- SPI interface

Targeted applications

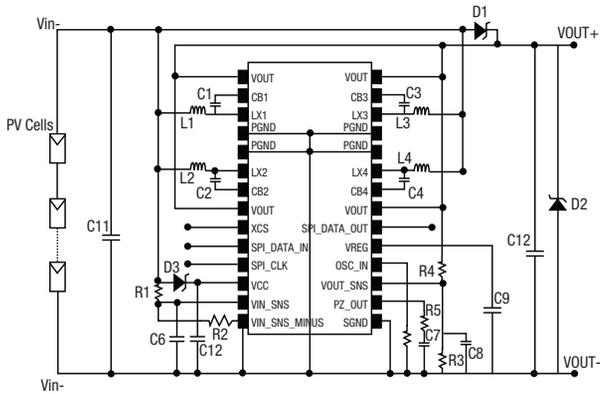
- Photovoltaic panels
- Street lights, solar battery chargers

Key benefits

- Panel level MPPT, optimizes each panel separately, minimizing impact of temperature variation and cell mismatch due to manufacturing spread
- Remote control and monitoring for easy module and string-level fault detection with power line or wireless technology
- Bypass and cutoff diodes can be removed; the main inverter can be simplified
- Cost: by using very fine lithography, power switches, analog and logic are integrated on one chip giving a very cost-effective solution
- Reliability: fewer devices on the board means lower failure rate over time



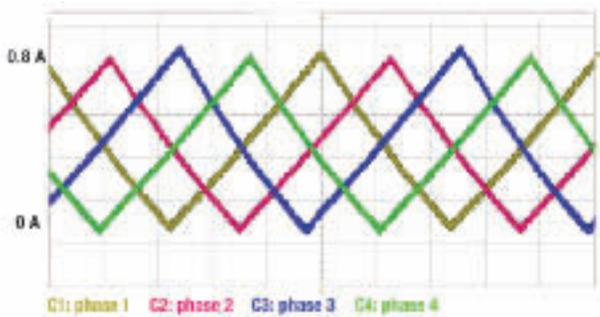
Application block diagram



Demo board



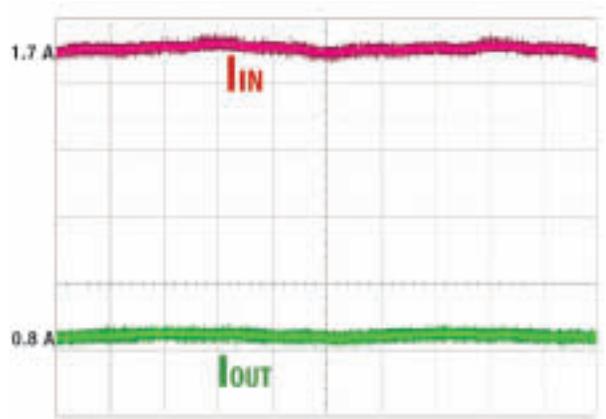
Current monitoring in the four phases



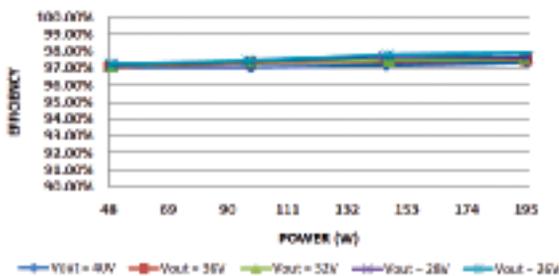
The 4-phase interleaved topology of the SPV1020 allows the use of ceramic capacitors, that offer better performances and longer lifetime than electrolytic capacitors.

The two diagrams show that the value of the input and output currents are constant, with benefits in terms of low ripple and long lifetime

Input and output current



SPV1020 efficiency versus V_{OUT}



SPV1020 MPPT accuracy versus V_{OUT}

