C2000™ Solar Inverter Development Kits

TEXAS INSTRUMENTS

Jump start your solar design with development kits for micro, central and string inverters

C2000™ Solar Development Kits provide instructive development platforms for design of highly efficient and reliable solar inverters, including central, string and micro inverter topologies. These kits enable designers to jump-start solar inverter designs using leading technologies found in the solar industry today.

Solar development kits offered today include:

- Solar Micro Inverter Development Kit
- Solar DC/DC MPPT Development Kit
- Solar AC/DC Single Phase Inverter Development Kit
- Solar Explorer Development Kit with F28M35H52C MCU
- Solar Explorer Development Kit with Piccolo TMS320F28035 MCU

The Solar Micro Inverter Development Kit is based on the Piccolo™ TMS320F28035 microcontroller and serves as a complete grid-tied solar micro inverter. The topology of the micro inverter consists of an active clamp fly-back DC/DC converter with secondary voltage multiplier, maximum power point tracking (MPPT), and a grid-tied DC/AC inverter. The single Piccolo MCU functions as the controller for the complete inverter, including control of both power stages, and MPPT execution.

The Solar DC/DC MPPT Development Kit is based on the Piccolo TMS320F28035 MCU and serves as a DC/DC converter with maximum power point tracking (MPPT) for central or string inverters. Its companion kit, the Solar AC/DC Single Phase Inverter Development Kit, is based on the F28M35H52C MCU (alternatively supports the Piccolo TMS320F28035 MCU as well), and serves as a full-bridge, single-phase, grid-tied DC/AC inverter for central or string inverters. Together, the Solar DC/DC MPPT Development Kit and the Solar AC/DC Single Phase Inverter Development Kit operate as a complete central or string solar inverter.

The Solar Explorer Development Kit is designed as a low-voltage learning

Solar DC/DC MPPT Development Kit and Solar AC/DC Single Phase Inverter Development Kit

TMDSHVMPPTKIT, TMDSHV1PHINVKIT

Power stages:

- 2-phase interleaved boost DC/DC converter (for MPPT)
- Resonant LLC DC/DC converter with isolation
- Full-bridge single-phase, grid-tied, DC/AC inverter

Controller(s): Piccolo TMS320F28035 MCU and F28M35H52C MCU
MPPT support: Yes
Grid-tie support: Yes with anti-islanding protection
Input: 200–300 VDC
Output: 120–220 VAC universal, 500W
Other features: Ethernet communication
Test results:

- Greater than 94 percent peak efficiency through DC/DC converters
- Greater than 96 percent peak efficiency through DC/AC inverter

Solar Micro Inverter Development Kit

TMDSSOLARUINVKIT

Power stages:

- Active clamp fly-back DC/DC converter with isolation
- Grid-tied DC/AC inverter

Controller(s): Piccolo TMS320F28035 MCU
MPPT support: Yes
Grid-tie support: Yes
Input: 28–45 VDC
Output: 110–220 VAC universal (280W at 220 VAC, 140W at 110VAC)
Test results: 93 percent peak efficiency, 4 percent total harmonic distortion (THD)

Solar Explorer Development Kit

TMDSSOLARCEXPKIT, TMDSSOLARPEXPKIT

Power stages:

- Boost DC/DC converter (for MPPT)
- SEPIC DC/DC converter (for battery charging)
- Full-bridge, single phase, grid-tie-capable DC/AC inverter

Controller(s): Piccolo TMS320F28035 MCU or F28M35H52C MCU
MPPT support: Yes
Grid-tie support: Capable
Input: 12 VDC
Output: 24 VAC, 50W
Other features: Ethernet communication, built-in PV emulator and ambient light sensor

platform for solar development. The kit features a built-in PV emulator, photo diode for light sensing, DC/DC boost converter for MPPT, DC/DC SEPIC converter for battery charging, and a full-bridge, grid-tie-capable, DC/AC inverter stage. Two versions of the kit are offered, allowing users to experiment with various controllers, a Piccolo TMS320F28035 MCU or an F28M35H52C MCU. Ethernet connectivity for remote control and monitoring is available when using the F28M35H52C MCU version of the kit. Additionally, an online training workshop based around this kit is offered for free. Visit the C2000 Applications tab at www.ti.com/C2000 and see the Solar Power Training and Videos section.

Solar and Digital Power Application Library Contents

Solar and digital power software libraries provide code-optimized building blocks to implement a variety of power topologies and algorithms such as MPPT and Software Phase Locked Loops (PLL), perfect for designing customized solar inverter solutions.

Digital Power Math Algorithms

- Control 2P/2Z
- Control 3P/3Z
- Inverse square
- Exponential moving avg.
- Current command
- Soft /sequential start
- Ramp generators
- And more …

Solar Library Functions

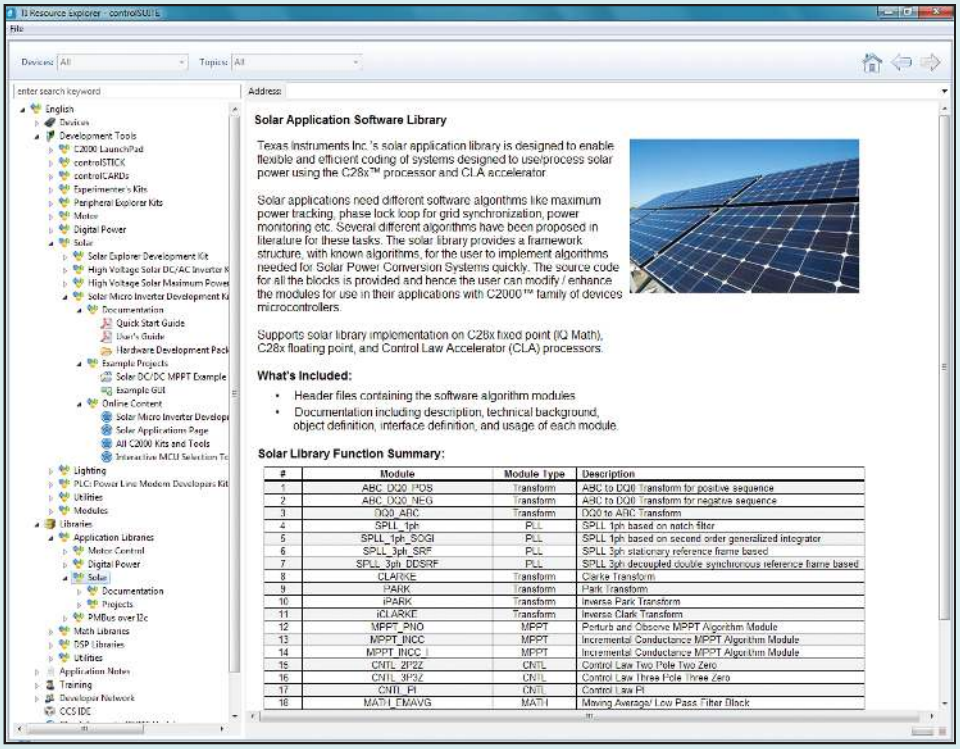
- MPPT (various methods)
- Anti-islanding
- Single-phase inverter
- Sine analyzer for RMS, frequency and ZCD
- ADC driver for sense signals
- PI controller for inverter control
- Software PLL for mains phase lock
- And more …

Digital Power Hardware Drivers

- Single-channel buck
- High-resolution buck
- Multi-phase interleaved
- MP balanced interleaved
- Half-H bridge
- 2-phase interleaved PFC
- ZVS full bridge
- And more …

For more information on solar and digital power libraries for C2000 MCUs and a complete listing of all supported functions, please download controlSUITE for *free* at **www.ti.com/controlsuite**.

To learn more about these kits before purchase, users are encouraged to download and explore controlSUITE™ software. controlSUITE is a completely free, centralized portal of design resources for C2000 Real-Time Control Microcontrollers and development kits. Within controlSUITE, designers can quickly find all of the necessary tools and resources for the C2000 Solar Development Kits, including software source code, quick start GUIs, BOMs, gerber files, schematics, step-by-step documentation, and solar and digital power application libraries.



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