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

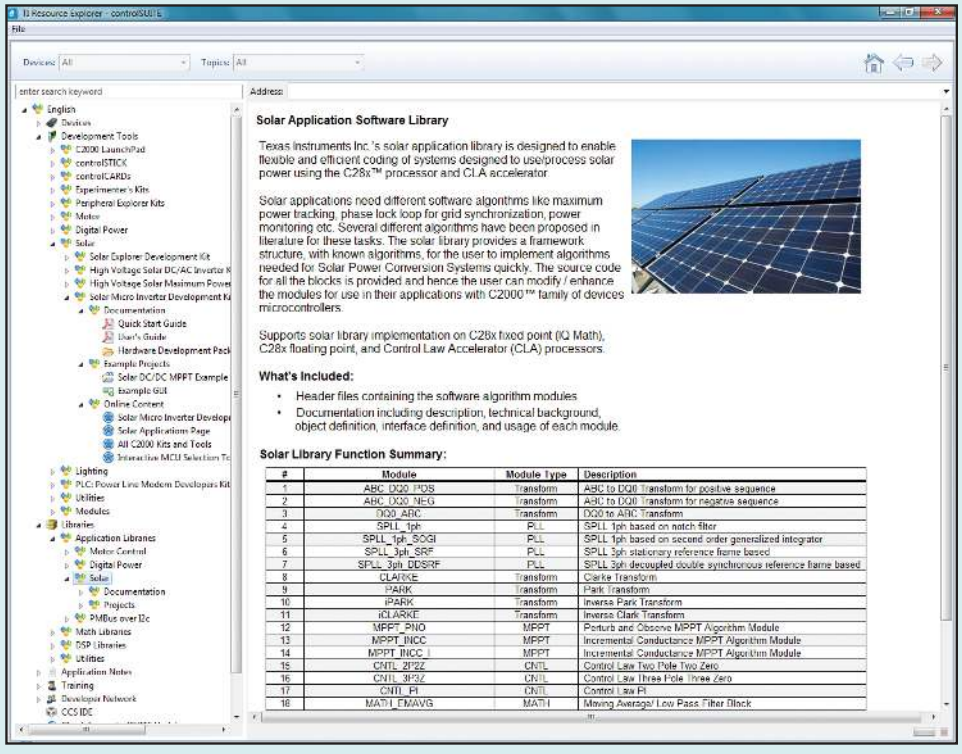
- MPPT (various methods)
- Anti-islanding
- Single-phase inverter
- Sine analyzer for RMS, frequency and ZCD
- ADC driver for sense signals
- PI controller for inverter control
- Software PLL for mains phase lock
- And more …

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.



IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, enhancements, improvements and other changes to its semiconductor products and services per JESD46, latest issue, and to discontinue any product or service per JESD48, latest issue. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All semiconductor products (also referred to herein as “components”) are sold subject to TI’s terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its components to the specifications applicable at the time of sale, in accordance with the warranty in TI’s terms and conditions of sale of semiconductor products. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by applicable law, testing of all parameters of each component is not necessarily performed.

TI assumes no liability for applications assistance or the design of Buyers’ products. Buyers are responsible for their products and applications using TI components. To minimize the risks associated with Buyers’ products and applications, Buyers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which TI components or services are used. Information published by TI regarding third-party products or services does not constitute a license to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of significant portions of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI components or services with statements different from or beyond the parameters stated by TI for that component or service voids all express and any implied warranties for the associated TI component or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Buyer acknowledges and agrees that it is solely responsible for compliance with all legal, regulatory and safety-related requirements concerning its products, and any use of TI components in its applications, notwithstanding any applications-related information or support that may be provided by TI. Buyer represents and agrees that it has all the necessary expertise to create and implement safeguards which anticipate dangerous consequences of failures, monitor failures and their consequences, lessen the likelihood of failures that might cause harm and take appropriate remedial actions. Buyer will fully indemnify TI and its representatives against any damages arising out of the use of any TI components in safety-critical applications.

In some cases, TI components may be promoted specifically to facilitate safety-related applications. With such components, TI’s goal is to help enable customers to design and create their own end-product solutions that meet applicable functional safety standards and requirements. Nonetheless, such components are subject to these terms.

No TI components are authorized for use in FDA Class III (or similar life-critical medical equipment) unless authorized officers of the parties have executed a special agreement specifically governing such use.

Only those TI components which TI has specifically designated as military grade or “enhanced plastic” are designed and intended for use in military/aerospace applications or environments. Buyer acknowledges and agrees that any military or aerospace use of TI components which have ***not*** been so designated is solely at the Buyer's risk, and that Buyer is solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI has specifically designated certain components as meeting ISO/TS16949 requirements, mainly for automotive use. In any case of use of non-designated products, TI will not be responsible for any failure to meet ISO/TS16949.

Products		**Applications**	
Audio	www.ti.com/audio	Automotive and Transportation	www.ti.com/automotive
Amplifiers	amplifier.ti.com	Communications and Telecom	www.ti.com/communications
Data Converters	dataconverter.ti.com	Computers and Peripherals	www.ti.com/computers
DLP® Products	www.dlp.com	Consumer Electronics	www.ti.com/consumer-apps
DSP	dsp.ti.com	Energy and Lighting	www.ti.com/energy
Clocks and Timers	www.ti.com/clocks	Industrial	www.ti.com/industrial
Interface	interface.ti.com	Medical	www.ti.com/medical
Logic	logic.ti.com	Security	www.ti.com/security
Power Mgmt	power.ti.com	Space, Avionics and Defense	www.ti.com/space-avionics-defense
Microcontrollers	microcontroller.ti.com	Video and Imaging	www.ti.com/video
RFID	www.ti-rfid.com		
OMAP Applications Processors	www.ti.com/omap	**TI E2E Community**	e2e.ti.com
Wireless Connectivity	www.ti.com/wirelessconnectivity		

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265