

Product Bulletin

Digital Power Supply Developer's Kit

Key Features

- Offers a complete hardware and software solution
- Enables designers to implement true digital control, supervisory and monitoring
- Provides designers with a new level of performance and flexibility for designing power supplies
- Leverage a single control architecture across multiple products with full software programmability
- Get started quickly with TI's software library for controlling a power supply
- Reduces parts count, board space and time-to-market
- Makes code security difficult to copy or reverse engineer

With new levels of performance and flexibility, the TMDSP701235 Digital Power Supply Developer's Kit is the industry's first digital solution that allows power supply designers to reduce their parts count and cut development time in an easy-to-use software and hardware environment.

Power supply designers are constantly challenged to enhance performance while reducing cost to meet customer demands. Power systems also have become more complex, and the need for more features and functions in smaller, more efficient form factors under shrinking time frames is increasing.

The Digital Advantage

Digital signal processors' (DSPs) flexibility and integration for control means that today the vast majority of control applications use DSPs. Similar to the industrial control industry, power supplies require extremely tight and

optimized control of the switching loops to ensure a robust, safe and efficient design. Controlling the power supply digitally results in several notable advantages.

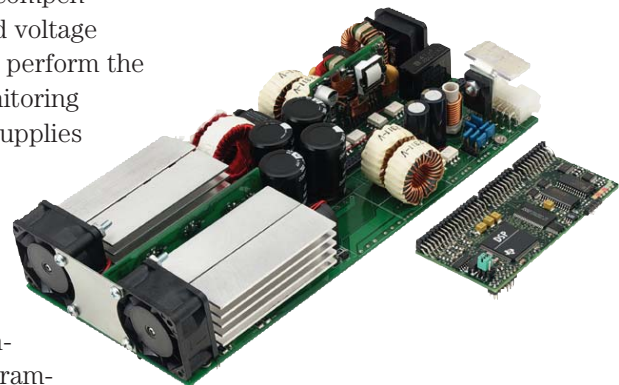
The high level of integration from TI's control-optimized DSPs provides a significant component and parts count reduction. Fewer components require less board space and reduce the risk of failure, thus increasing yields in manufacturing and the field.

By implementing a DSP-based control design in their power supplies, designers can perform the closed-loop control compensation of current and voltage loops. They also can perform the supervising and monitoring functions in power supplies such as soft start profiles, inrush control, fault protection, sequencing and monitoring.

In addition, designers have a fully program-

mable controller that can be used with multiple power trains and magnetic designs. Therefore, designers are able to take advantage of changing design and control parameters in software, reducing time-to-market and manufacturing lines.

DSPs also offer feature enhancements. TI currently uses DSPs for inrush control, soft start, power factor correction (PFC), DC/DC conversion, digital current sharing and all supervising and monitoring functions. With adding new



features to power supply designs as simple as writing a few lines of code, more powerful and intelligent digital control algorithms will emerge and enhance power supplies' performance, features and lifetime. As designers implement more technology in software, they are taking advantage of TI's code security and creating designs difficult to copy or reverse engineer.

System Simplification and Faster Time-to-Market

System simplification is the core of digital power supply. Analog-

only designs typically consist of multiple chips for control with a microcontroller for supervisory functions and require dedicated designs for each product. By moving to digital, designers can simplify designs and reduce parts count up to 40 percent. TI's leading integrated DSPs control the primary and secondary sides of the power supply and handle supervisory and monitoring functions. This simplified design allows multiple products to use one core architecture with customization

for each product achieved through software. TI provides customers with the baseline software needed to control the power supply, further accelerating the designers prototyping and design efforts.

The kit includes Code Composer Studio™ (CCStudio), a fully integrated software development environment (IDE) that slashes development and integration time. CCStudio integrates all host and target tools, including TI's DSP/BIOS™ kernel, code-generation tools and debugger, in

Electrical Specifications

Input

Input voltage	90 – 260 VAC
Frequency	47 – 65 Hz
Inrush current	≤ 30 A
Efficiency	80%
PFC	0.99 typical designed to meet EN61000-3-2
EMI filter standard	Designed for CISPR22
Leakage current	< 3.5 mA
Radiated EMI	Designed to meet CISPR22
Holdup time	20 mS
AC ok	To be added by software
Harmonic distortion	Designed for EN61000-3-2
Isolation	Designed to meet EN60950

Output

Output power	Designed for 750 W, characterized at 500 W
Margining	– 50% to +20% (fully software programmable via comms link)
PFC boost voltage	Software programmable, range adjustment subject to input voltage and DC/DC loading
Overall reg	0.1% over full load
Ripple	0.4% of V_{out} Pk–Pk
Dynamic response	< 1% with 25% load step < 2% with 50% load step
Recovery time	Does not deviate outside 1% for 25% load step Settles to within 1% in < 500 μ S for a 50% load step
Overcurrent protection	Pulse-by-pulse (software programmable threshold)
Short circuit protection	To be added by software
Overvoltage protection	To be added by software
Reverse voltage protection	100% of rated output current
Thermal protection	No (can be added to spare ADC input)
Remote sense	Yes – but not characterized beyond 0.5 V
Current Share	Digital share loop via CAN bus
DC ok	Programmable tolerance limits (tightest limits = $\pm 0.5\%$)
Minimum load	Zero
Global inhibit / Enable	Yes, via serial communications (CAN bus)

a unified environment to simplify DSP system configuration and application design. CCStudio's open architecture allows TI and third parties to extend the IDE's functionality by seamlessly plugging in additional specialized tools.

Complete Hardware and Software Development Suite

The kit is a complete hardware and software development environment and includes:

- 750-W rectifier with 48-V output (configurable to many topologies, comes in half bridge)
- TI's CCStudio version 2.12 for the TMS320C2000™ DSP platform
- Two DSP plug-in controller cards
- User's Guide
- EZ Start-Up Guide

The kit is available for purchase at www.ti.com/dp

Features

- Full digital control on all current and voltage compensation loops
- Guaranteed loop stability over temperature range and module age

- Average current mode control
- Pulse-by-pulse current overload protection
- Remote sensing and diagnostics of all key variables
 - Rectified AC input voltage
 - Input frequency*
 - DC boost voltage (also programmable)
 - Bulk cap midpoint voltage*
 - Output voltage (also programmable)
- Primary side current (limit programmable)
- Output current (limit programmable)
- Voltage (margining) and current limit programming over wide range (20–100 percent) via CAN bus link
- Multiple operating mode capability
- Constant voltage
- Constant current*
- Constant power (at programmable limits)*
- Intelligent power sequencing
- Intelligent fault recovery
- Integrated OR-ing MOSFET
- Active inrush control (relay sequence is software programmable)
- Designed to EN61000 immunity standards
- PFC to 0.99
- No minimum load
- Overvoltage protection (via software fault manager)*
- Intelligent communications link with host via isolated CAN bus allows the following functions:
 - Input OK signal*
 - Inhibit / Enable
 - Output good signal*
 - Current monitor (remote sense)
 - Fan fail signal*
 - Module present signal*
 - Module individually addressable via CAN node ID
- AC line discriminator*
- AC undervoltage / overvoltage lockout*
- Hot plug
- N+1 redundancy using digital current share method via CAN bus comms*
- Short circuit latch via software fault manager*

**Note – to be added by software, no extra hardware required.*

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