Overview
The main purpose of a power supply is to provide clean and stable power to a load, regardless of power grid conditions. The SMPS has been widely used in office equipment, computers, communication systems and other applications because of its high efficiency and high energy density.

Key Benefits
> Power applications become more flexible and universal
> High input power factor lowers power pollution to the power grid
> Intelligent mode management and fault supervision
> Operating status can be monitored and controlled in real time
> Lower system and maintenance cost
Presently, the vast majority of SMPS are implemented in an analog fashion. But analog implementations have significant disadvantages that can be rectified by implementing the SMPS using modern digital mechanisms. Until recently, this has not been cost effective, due to performance and cost of the processors required to do the job. The 56F801 and 56F8300 hybrid controllers specified here have the required performance, peripherals, and price targets to enable SMPS to make the conversion from analog to digital implementations.

### Freescale Semiconductor Solution

The digital 56800/E Switched-Mode Power Supply minimizes the number of system components, maximizes the system reliability, and makes it possible to easily add advanced functions without increasing cost.

The performance, integrated peripherals, and low cost of the 56F800, 56F8000, 56F8100 and 56F8300 controllers make the digital SMPS possible and practical.

### Design Challenges

The system in this example is a 100-Watt SMPS controlled by a 56F801 device on the primary side and a 56F8323 on the secondary side. Optional components could include user interfaces, such as an LCD or LED display.

During normal operation, an AC/DC rectifier controlled by a 56F801 will correct the input power factor while simultaneously rectifying the AC input voltage. The output of the AC/DC rectifier is a DC voltage that will feed the DC/DC converter, which is controlled by a 56F8323 device. The DC/DC converter has a full bridge topology, used to convert the DC Bus voltage to a precise and constant DC output voltage. For the Power Factor Correction (PFC) converter, the 56F801 samples the input AC voltage, input AC current, and DC output voltage. The output DC voltage is regulated by the 56F801, while maintaining the same phase for both the AC input current and voltage. The PWM module on the 56F801 produces the PWM pulse for the PFC main power component. The DC/DC converter controlled by the 56F8323 is operating on a phase-shifted soft-switching mode, so that switching losses and noise can be kept to a minimum.

Control functions implemented within the primary hybrid controller are:

- Input power factor correction
- Automatic detection of input voltage frequency

Control functions implemented within the secondary hybrid controller are:

- Power on/off control
- DC Bus voltage regulation
- Output DC voltage regulation
- DC/DC full-bridge phase-shifted control strategy
- Power system monitoring and communication protocols (optional)
- Fault and mode management
# Development Tools

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## Disclaimer

This document may not include all the details necessary to completely develop this design. It is provided as a reference only and is intended to demonstrate the variety of applications for the device.