

# Integrated Power Supply Primary Circuit Diagram

## Article Overview

An integrated power supply primary circuit typically features a switching IC, a primary-side MOSFET, a transformer, and feedback/control circuitry to regulate output without secondary-side optocouplers.

## Primary Circuit Overview

The primary side of an integrated power supply is responsible for converting the input voltage (AC or DC) into a controlled high-frequency signal that drives the transformer. Key components include:

- o Switching Device: Usually a MOSFET integrated into the IC (e.g., LM5180) that switches the input voltage at high frequency .
- o Controller IC: Provides primary-side regulation (PSR), monitoring the voltage across the primary winding to maintain output voltage without secondary feedback .
- o Transformer: Steps down or isolates the voltage. In PSR designs, the secondary voltage is inferred from primary-side sensing.
- o Snubber/Clamp Circuit: Protects the MOSFET from voltage spikes caused by transformer leakage inductance.
- o Input Filter: Capacitors and inductors smooth the input voltage and reduce EMI.

## Typical Operation

- o Input Voltage Application: The AC or DC input is filtered and applied to the primary winding.
- o Switching Control: The IC turns the MOSFET on and off in boundary conduction mode (BCM) or continuous mode, controlling energy transfer to the transformer .
- o Primary-Side Feedback: The IC senses the reflected voltage from the secondary through the transformer and adjusts the duty cycle to regulate output voltage, eliminating the need for optocouplers .
- o Output Rectification: On the secondary side, diodes or synchronous rectifiers convert the high-frequency AC to DC, which is then filtered by capacitors.

## Example Block Diagram

A simplified primary-side regulated flyback circuit includes:

- o AC Input -> EMI Filter -> Bridge Rectifier -> Bulk Capacitor -> Primary MOSFET (controlled by IC) -> Transformer -> Secondary Rectifier -> Output Capacitor
- o Primary Feedback Loop: Voltage sense resistor or auxiliary winding feeds back to the IC to regulate switching duty cycle .

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## Design Considerations

- o Load Regulation: PSR designs can achieve  $\pm 1\%$  regulation without secondary feedback components .
- o Isolation: Transformer provides galvanic isolation between input and output.
- o Protection: Overvoltage, overcurrent, and thermal shutdown are integrated in modern ICs.
- o Efficiency: Boundary conduction mode and integrated MOSFETs reduce switching losses and component count .

## References for Practical Circuits

- o LM5180 Flyback PSR Design: Provides a compact primary-side regulated solution with integrated MOSFET and high-density transformer design .
- o SMPS Power Supply Circuits: Various AC-DC and DC-DC topologies with primary-side regulation and integrated ICs for hobbyist and industrial applications .
- o Linear Power Supply Examples: For simpler low-power applications, series voltage regulators with primary-side control can be used . This structure allows designers to implement compact, efficient, and isolated power supplies without requiring secondary-side optocouplers, making it ideal for modern integrated power supply designs.

Find out how to design and build an electronic power supply circuit with a detailed diagram and step-by-step instructions.

**Power Supply Circuits** There are three major kinds of power supplies: unregulated (also called brute force), linear regulated, and

This application note proposes a circuit that accomplishes the power supply sequence without using any dedicated power supply

This power supply circuit explained guide delves into power supply circuit blocks -- transformation, rectification,

Figures 3 and 4 show two classic circuits commonly used to obtain continuous voltages starting from an alternating voltage. The Fgi

Learn how a power supply works with a detailed schematic diagram. Understand the components and circuitry to design and

Learn how a power supply works with a detailed schematic diagram and explanation. Understand the

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components and circuitry

**Power Supply block Diagram** Many electronic circuits need a direct current (DC) voltage source, but what we commonly find are

Learn how a power supply works and see a schematic diagram to understand the circuitry and components involved.

In this section we will design and test various types of power supply circuits that can fit into a wide variety of

Find out everything you need to know about power supply circuits and schematics. From understanding the basics to designing and

Find a detailed power supply board circuit diagram and learn how it functions to provide electrical power to various electronic

A power supply circuit diagram is a simple drawing that shows the individual components and their connections in a

Circuits to regulate the output voltage, output current and power supply maximum temperature are also included in

Here I will explain you how we can design and build a super simple power supply circuit. We'll start from the very

This chapter provides a fresh start regarding another section of diode circuits. This gives an introduction to the Power supply circuits

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