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PWM Controllers

Public Information

NCP1344: QR Flyback PWM Controller for USB PD Adapters

Product Teaser

NCP1344: 250 mA, Ultra-Low Noise and High PSRR LDO

What?	The NCP1344 is a highly integrated quasi−resonant mode flyback controller for adapter applications. This controller implements valley switching mode with low loss VCC bias and auto−tune OCP for wide−range Vout applications, such as USB−PD.
Where?	The market trend is pushing for improved efficiency and towards the adoption of USB-C with Power Delivery for laptops, tablets, and smart phones. These requirements would be a challenge to meet with traditional fixed-frequency PWM controller designs.
Why?	Charging adapters are adopting USB-C and will be utizilized in the majority of new portable electronics

NCP1344 One Pager

Value Proposition

The NCP1344 is a highly integrated quasi−resonant mode flyback controller, which implements valley switching mode with low loss VCC bias and auto−tune OCP for wide−range Vout applications, such as USB−PD adapters. Addition of High−Voltage startup and Brownout detection greatly simplifies the design of the auxiliary power supply.

Unique Features

- Valley switching to 32th valley
- Valley lockout
- Low loss DSS
- Auto-tuning OCP
- Quiet Skip

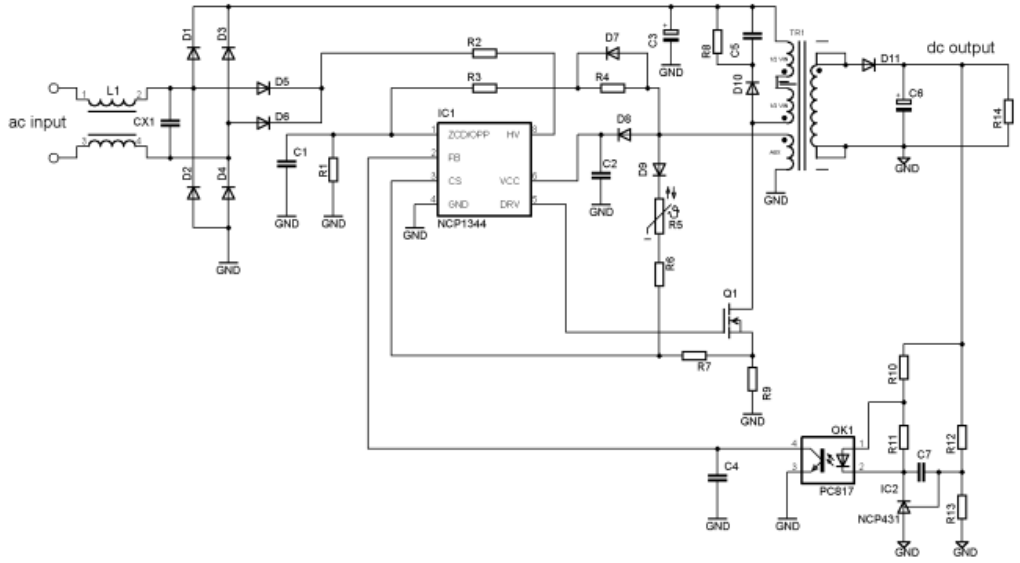
Benefits

- Improved efficiency
- Eliminates valley jumping
- Enables wide variable Vout
- OCP adjusts with variable Vout
- Reduces audible noise

Other Features

- 750 V High−Voltage Startup Circuit with Brownout Detection
- 65, 100, 130, and 200 kHz frequency clamp options
- Frequency foldback down to 25 kHz
- Adjustable over power protection
- Frequency jitter for improved EMI signature
- OTP on dedicated pin or combined on CS pin

Typical Application Circuit

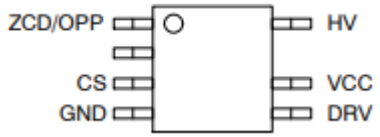


Market & Applications

- USB PD Adapters
- Notebook Computer Adapters
- Battery Chargers

Ordering & Package information

- See datasheet for up to date options
- SOIC-7



NCP12601: Multi-Mode Flyback Controller for USB PD

Product Teaser

NCP12601: Multi-Mode Flyback Controller for USB PD

What?	A multi-mode controller that can operate in CCM, DCM with valley switching, and skip mode for improved efficiency. USB Power Delivery optimizations, such as low loss self-bias, auto-tune OCP, enables wide Vout range with minimal external BOM cost.
Where?	The market trend is pushing for improved efficiency and towards the adoption of USB-C with Power Delivery for laptops, tablets, and smart phones. These requirements would be a challenge to meet with traditional fixed-frequeny PWM controller designs.
Why?	Anywhere requiring improved performance over fixed-frequency flyback controllers, and in USB Power Delivery applications, such as mobile and notebook adapters, tablets, printers, and battery charging.

NCP12601 One Pager

Value Proposition

The NCP12601 is a multi-mode controller which implements valley switching mode with a proprietary lockout scheme for noise-free operations. In high power conditions, the part operates in continuous conduction mode (CCM). As the load decreases, the converter enters discontinuous conduction mode (DCM). The NCP12601 controller is optimized for USB PD applications with the integration of high-voltage start-up, X2 discharge, auto-tuning OCP, and low loss dynamic self-supply.

Unique Features

- Multi-mode Operation
- Valley lockout
- Low loss DSS
- Auto-tuning OCP
- Quiet Skip

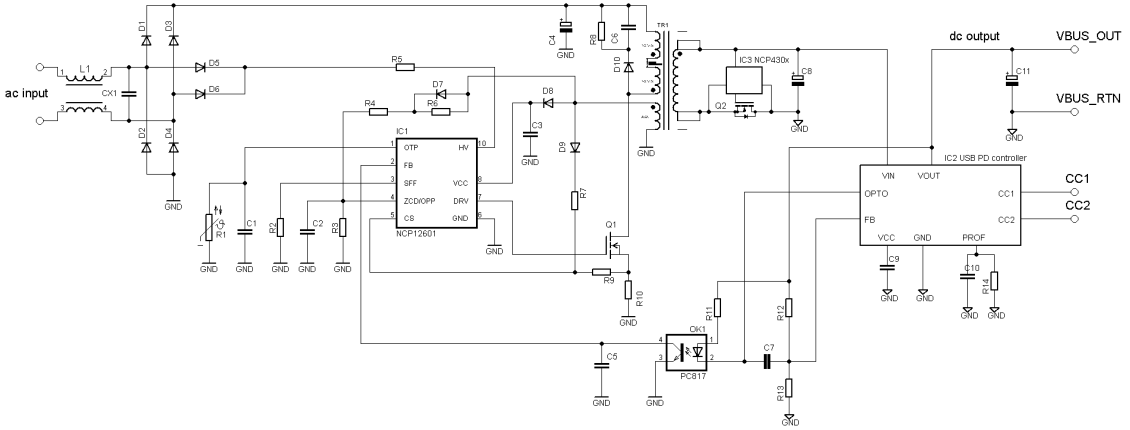
Benefits

- Improved efficiency
- Eliminates valley jumping
- Enables wide variable Vout
- OCP adjusts with variable Vout
- Reduces audible noise

Other Features

- High−Voltage Startup Circuit with Brownout Detection
- X2 Capacitor Discharge
- Valley switching in DCM for improved efficiency
- 65, 100 or 130 kHz fixed-frequency operation
- Frequency foldback down to 25 kHz
- Frequency jitter for improved EMI signature
- OTP on dedicated pin or combined on CS pin

Typical Application Circuit



Market & Applications

- USB PD Adapters
- Notebook Computer Adapters
- Printer Adapters

Ordering & Package information

- SOIC-9 with dedicated OTP pin
- SOIC-7

NCP13992 Current Mode LLC Controller

Product Teaser

NCP13992 – Current Mode LLC Controller

Value Proposition

The NCP13992 is a high performance controller for half bridge LLC resonant converters supporting operation over a wide range of bulk or line voltages. Current mode controller and enhanced light load efficiency makes it ideal for high power designs. The controller also implements proprietary light load and quiet skip mode operation that improve light load efficiency, reduce no load power consumption as well as significantly reduce audible noise.

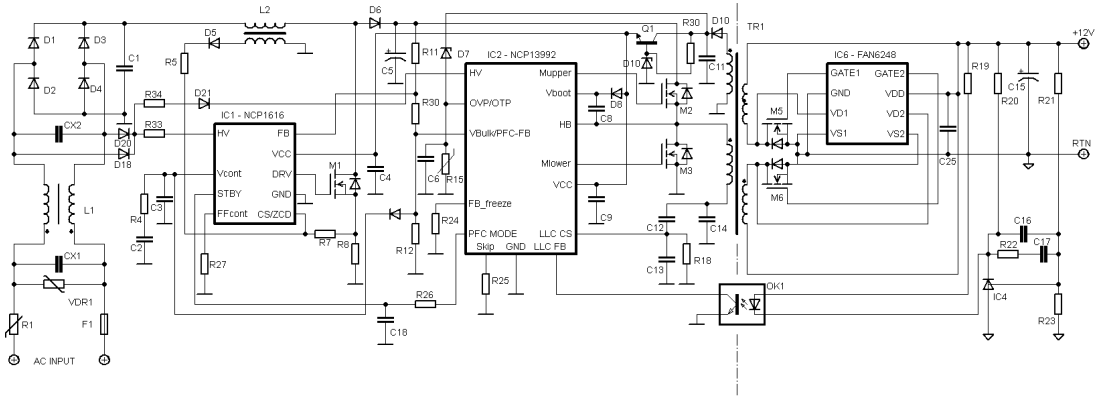
Unique Features

- Built-in 600 V/1 A Driver
- Current Mode Control
- High Frequency 20 kHz to 750 kHz
- Light Load Mode for Improved Efficiency
- Quiet Skip Mode for Reduced Audible Noise

Benefits

- Compact Design
- Inherent Anti-Capacitive Switching Protection
- <30 mW Off-mode
- <100 mW No Load

Application Data

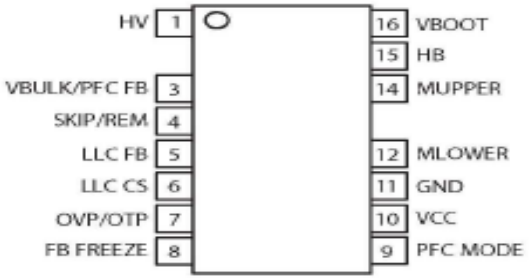


Others Features

- BO Protection
- PFC Stage Operation Control According to Load Conditions
- Automatic or Fixed Dead-Time Adjust Options
- Safety Design for Pin-Pin Short and Open/Short
- High Flexibility Via Custom Options

Ordering & Package Information

- NCP13992xy (IPT options)



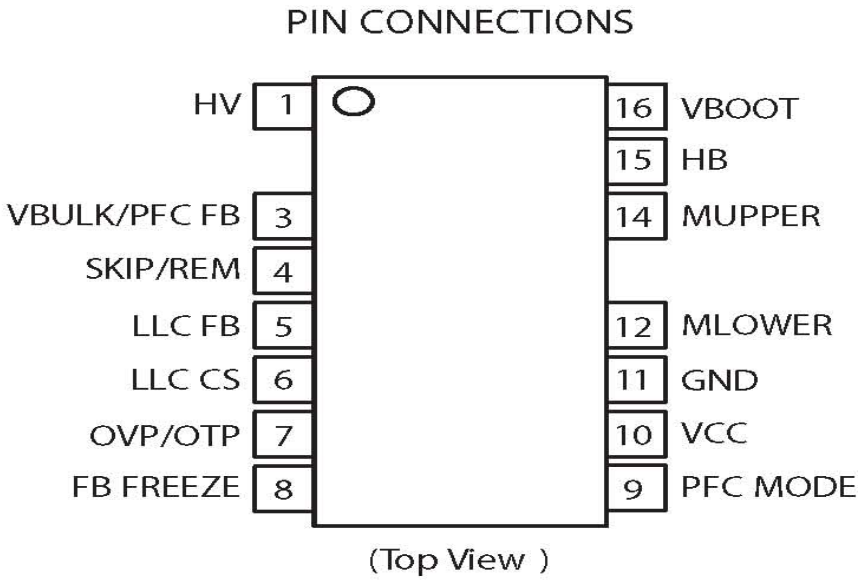
Market & Applications

- Desktop PCs and All-In-One PCs
- Gaming Console Power Supplies
- Flat TVs
- High Power Notebook PC Adapters

NCP13992 LLC controller overview

Features:

- High-Frequency Operation from 20 kHz up to 750 kHz
- Current Mode Control Scheme
- Automatic Dead-time
- Dedicated Startup Sequence
- **Light Load Operation Mode for Improved Efficiency**
- **Quiet Skip Operation Mode**
- Off-mode Operation
- Latched or Auto-recovery Overload Protection
- Latched or Auto-recovery Output Short Circuit Protection
- Latched Input for Severe Fault Conditions, e.g. OVP or OTP
- Out of Resonance Switching Protection
- Open Feedback Loop Protection
- Precise Brown-out Protection
- **PFC Stage Operation Control According to Load Conditions**
- Startup Current Source with Extremely Low Leakage Current
- Dynamic Self-Supply (DSS) Operation in Off-mode or Fault Modes
- Pin to Adjacent Pin / Open Pin Fail Safe



NCP1342 High-Frequency QR Controller

With Enhanced Light Load Efficiency

Product Teaser

NCP1342 High Frequency QR Controller

Value Proposition

The NCP1342 is a highly integrated quasi-resonant flyback controller capable of controlling rugged and high-performance off-line power supplies as required by adapter applications. With an integrated active X2 capacitor discharge feature, the NCP1342 can enable no-load power consumption below 30 mW for USB PD Notebook Adapters from 45W to 100W.

Unique Features

- QR Frequency Jittering
- New Quiet-Skip Technology
- Maximum Peak Current Modulation

Benefits

- Reduces EMI Signature
- Ensures Operation Outside Audible Range
- Enhanced Light Load Efficiency

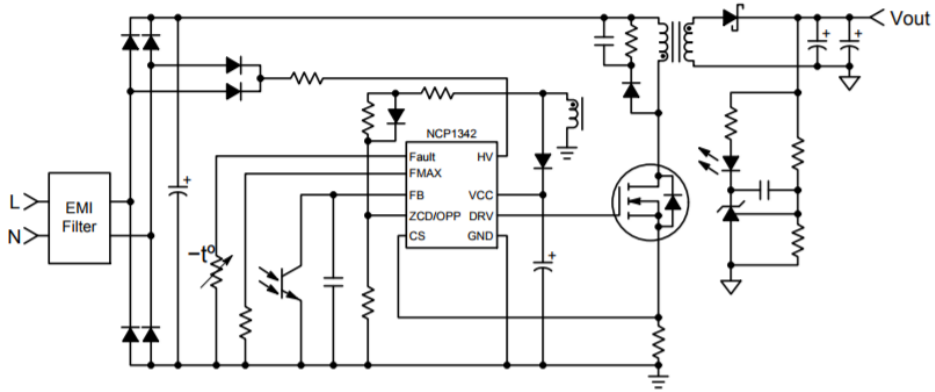
Other Features

- High voltage startup circuit with Integrated Brownout
- Valley Switching Operation with Valley Lockout
- Frequency Foldback with 25 kHz Minimum Frequency
- V_{CC} Overvoltage Detection
- NTC Compatible Fault Pin
- Soft-Start for Smooth Start-up Operation
- High Drive Capability: -500 mA / +800 mA

Market & Applications

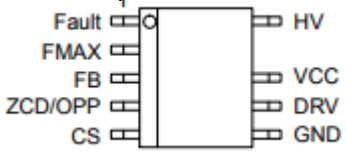
- Low/Medium USB PD Adapters
- Notebook Computer Adapters

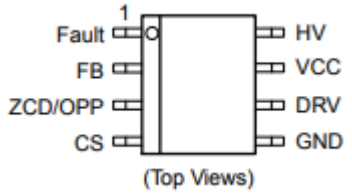
Typical Application Schematic



Package information

- SOIC-8 and SOIC-9
- Pin compatible with NCP1340





(Top Views)

Overview

- High Frequency Quasi-Resonant flyback controller
- High Voltage startup with integrated X2 discharge and Brown-out detection
- Valley lockout switching with operation up to 6 valleys
- Minimum Frequency clamp and Quiet-Skip operation to eliminate audible noise
- Low current consumption in skip mode allowing for low standby power < 30 mW at 265 Vac
- Frequency Jitter for improved EMI performance

NCP1340/1 Quasi-Resonant Controller

Featuring Valley Lock-Out Switching and Power Excursion Mode

Product Teaser

NCP1340/1 QR Controller with Power Excursion Mode

Value Proposition

The NCP1340/1 is a highly integrated quasi-resonant flyback controller capable of controlling rugged and high-performance off-line power supplies as required by adapter applications. With an integrated active X2 capacitor discharge feature, the NCP1340/1 can enable no-load power consumption below 30 mW for 65 W notebook adapters.

Unique Features

- QR Frequency Jittering
- New Quiet-Skip Technology
- Power Excursion Mode

Benefits

- Reduces EMI Signature
- Ensures Operation Outside Audible Range
- Allows CCM Operation for up to 2x Peak Power (NCP1341)

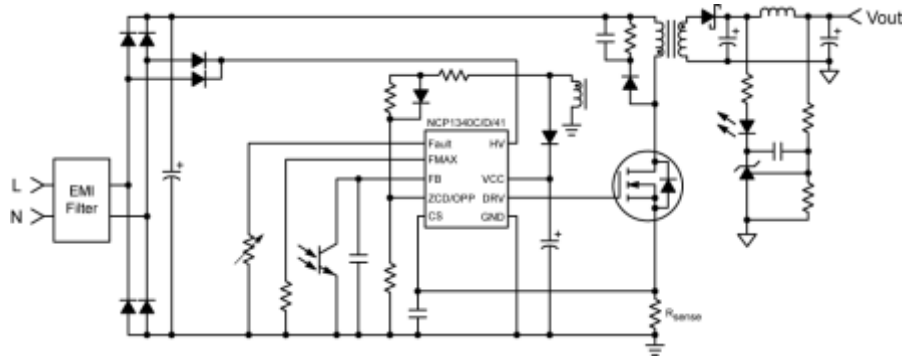
Other Features

- High voltage startup circuit with Integrated Brownout
- Valley Switching Operation with Valley Lockout
- Frequency Foldback with 25 kHz Minimum Frequency
- V_{CC} Overvoltage Detection
- NTC Compatible Fault Pin
- Soft-Start for Smooth Start-up Operation
- High Drive Capability: -500 mA / +800 mA

Market & Applications

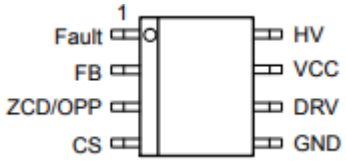
- Medium/High Power Adapters
- Flat TVs
- Computer Power Supplies
- Cell Phone/Tablet Chargers

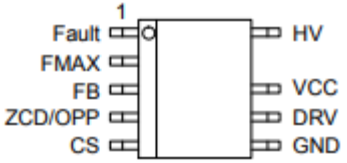
Typical Application Schematic



Package information

- SOIC-8 and SOIC-9





Device Overview and Features

- High Frequency Quasi-Resonant flyback controller
- High Voltage startup with integrated X2 discharge and Brown-out detection
- Valley lockout switching with operation up to 6 valleys
- Power Excursion Mode (PEM) for high transient load capability while maintaining minimally sized inductor
- Minimum Frequency clamp and Quiet-Skip™ operation to eliminate audible noise
- Low current consumption in skip mode allowing for low standby power consumption → < 30 mW at 265 Vac
- Frequency Jitter for improved EMI performance

NCP1937 CrM PFC & QR Combo

<10 mW Standby Solution for 90-W~120-W Applications

Product Teaser

NCP1937 – Combination PFC + Quasi-Resonant Flyback

Value Proposition

The NCP1937 combines a Power Factor Correction (PFC) Controller and a Quasi-Resonant (QR) controller enabling compact power supplies for adapters with minimal power consumption at standby and light loads.

Unique Features

- Power Savings Mode
- Active X-Cap Discharge
- QR Controller with valley-lockout

Benefits

- Minimizing power consumption during standby to < 10 mW
- Reduces external comp.
- Noise Free Operation

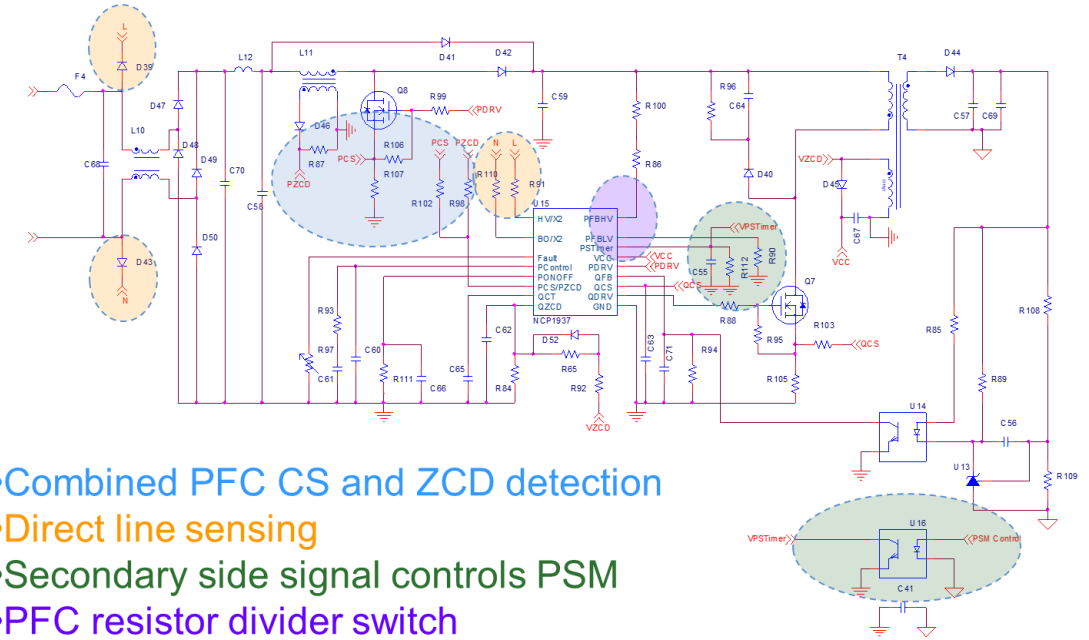
Other Features

- High Voltage Pin for Reduced Standby Power
- Startup Time with Built-in Output Voltage Sensing
- 4 ms Soft-Start Timer
- Feed-Forward for Improved Operation across line and load

Market & Applications

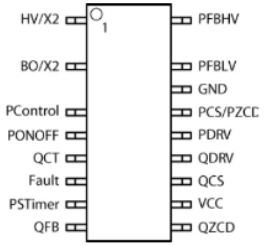
- Highly efficient NB Adapters
- LED-TV power supply

Typical Application Schematic



- Combined PFC CS and ZCD detection
- Direct line sensing
- Secondary side signal controls PSM
- PFC resistor divider switch

Package information



PFC Features

- Critical conduction mode (CrM) with valley switching.
- Novel architecture determines output power to enable/disable PFC stage based on output power.
  - User adjustable level
  - Different levels for US and Europe mains allows reduction of bulk capacitor
  - Can be disabled
- Follower boost architecture discretely adjust PFC output voltage based on line voltage and reduce power dissipation
  - US Mains: 250 V
  - Europe/Asia Mains: 400 V
- Line voltage feedforward increases dynamic range and improves noise immunity
- Excellent transient load response due to dynamic response enhancer (DRE)
- Soft-overvoltage reduces possibility of audible noise during load transients
- Safety protections:
  - Fast OVP
  - Open PFB pin
  - Boost and bypass diodes short circuit detection
- Positive current sensing combined with PFC ZCD detection
- 250-kHz frequency clamp and skip for light load operation

QR Flyback Features

- Quasi-resonant peak current mode control operation with valley lockout
- 3-µs delay blanks leakage ringing during QDRV turn off
- Internal 4-ms soft start
- 128-ms timer for short circuit detection (auto-recovery or latched options)
  - Light Load operation modes:
  - VCO beyond 4th valley. Minimum frequency is limited at 23.5 kHz
- Skip mode forced at lighter load
- Overpower compensation combined on the ZCD pin
- Direct optocoupler connection

NCP12510 Fixed-Frequency PWM Controller

Flyback Controller in TSOP-6

NCP12510 6-Pin PWM Flyback Controller

Value Proposition

NCP12510 flyback controller is an improved and pin compatible controller based on the very popular NCP1250. It enables Highly Efficient Off-line Power Supplies meets EU CoC Tier-2 v.5 Standard. The NCP12510 is a highly integrated PWM controller capable of delivering a rugged and high performance offline power supply in a tiny TSOP−6 package. With a voltage supply range up to 35 V, the controller hosts a jittered 65-kHz or 100-kHz switching circuitry operated in peak current mode control.

Unique Features

- Improved 4 kV ESD robustness
- Increased Vcc max level to 35 V
- Reduces no-load power consumption to < 35mW
- Achieves >89% average efficiency
- Pin to Pin Compatible with Legacy NCP1250 series

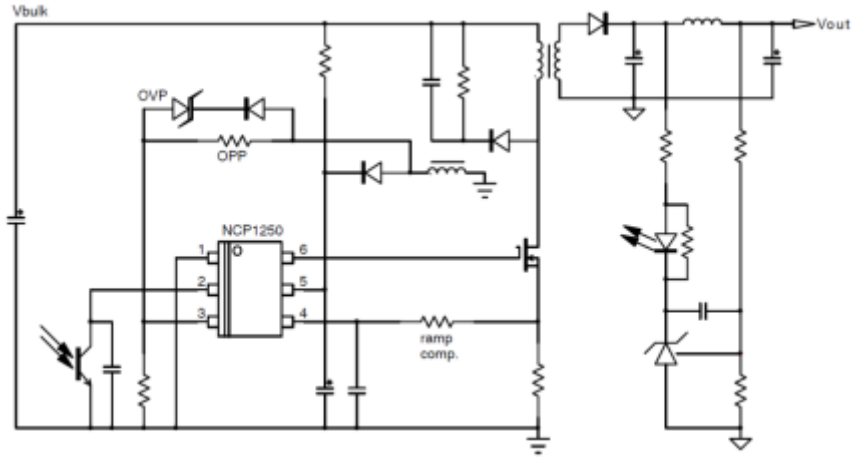
Other Features

- 65 kHz or 100kHz fixed frequency with dither
- Frequency Foldback with Skip Mode, Frequency Jitter. Protections, OPP, OVP, SCP

Market & Applications

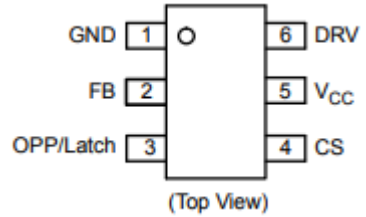
- Netbook & Notebook Adapters
- Low Power Open frame (DVD, STB)

Typical Application Schematic



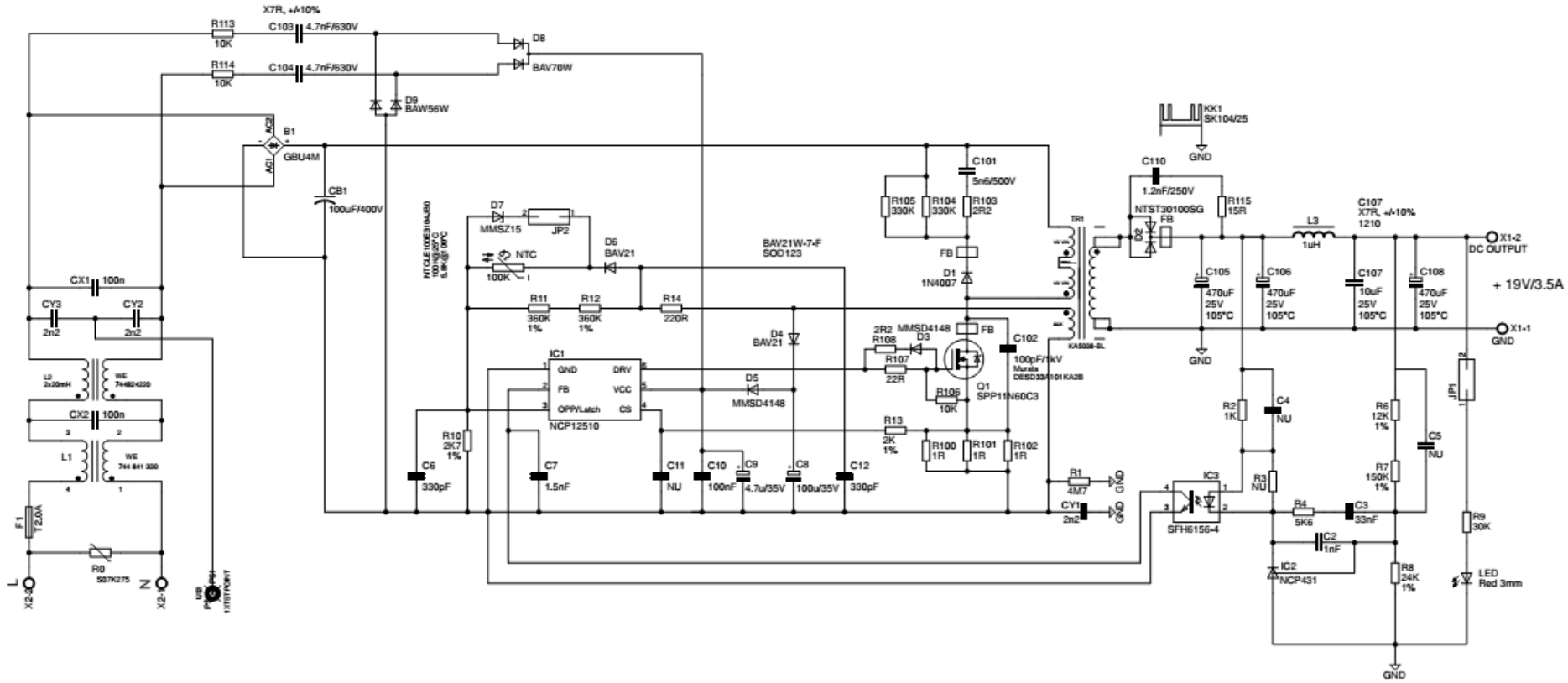
Package information

- TSOP-6



NCP12510 in a 65-W Ac-Dc Adapter

Electrical schematic diagram – ac-dc adapter, 19 V/3.5 A



NCP12400

Enhanced Fixed Frequency PWM Controller

NCP12400 High Performance FF Controller

Value Proposition

The NCP12400 is a low cost flyback controller with integrated HV startup and X2 discharge capabilities. It offers excellent light load efficiency and no-load power consumptions, enable customers to meet the latest CoC tier 2 standards.

Unique Features

- No-load standby power < 30 mW
- Integrated HV Startup
- Integrated X2 discharge
- Integrated BO protection

Benefits

- Low cost integrated flyback solution to customers
- With low standby power loss
- And low acoustic noise

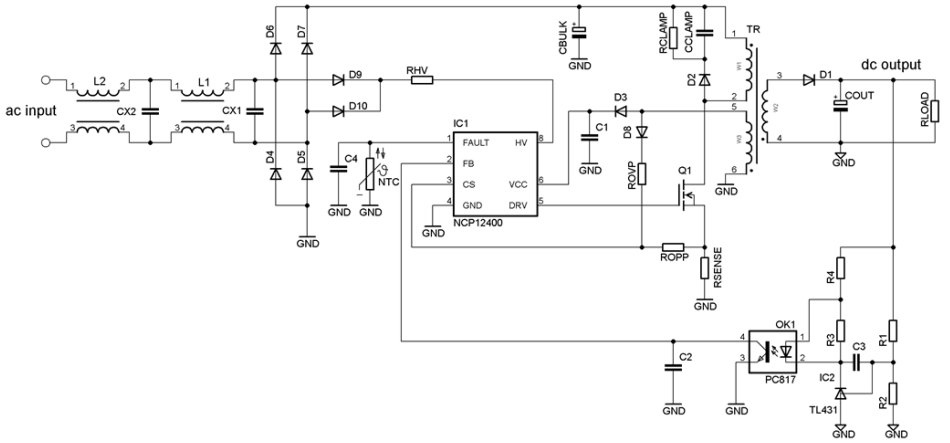
Other Features

- Frequency Foldback then Skip Mode for Maximized Performance in Light Load and Standby Conditions with no acoustic noise. (Quiet skip)
- Frequency Modulation for Softened EMI Signature
- 10 ms Soft-Start
- Internal Thermal Shutdown

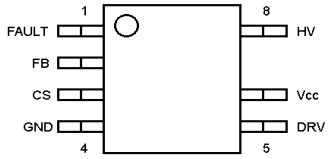
Market & Applications

- Adapter
- Gaming, AIO, (Aux PSU)
- Printer

Typical Application Schematic

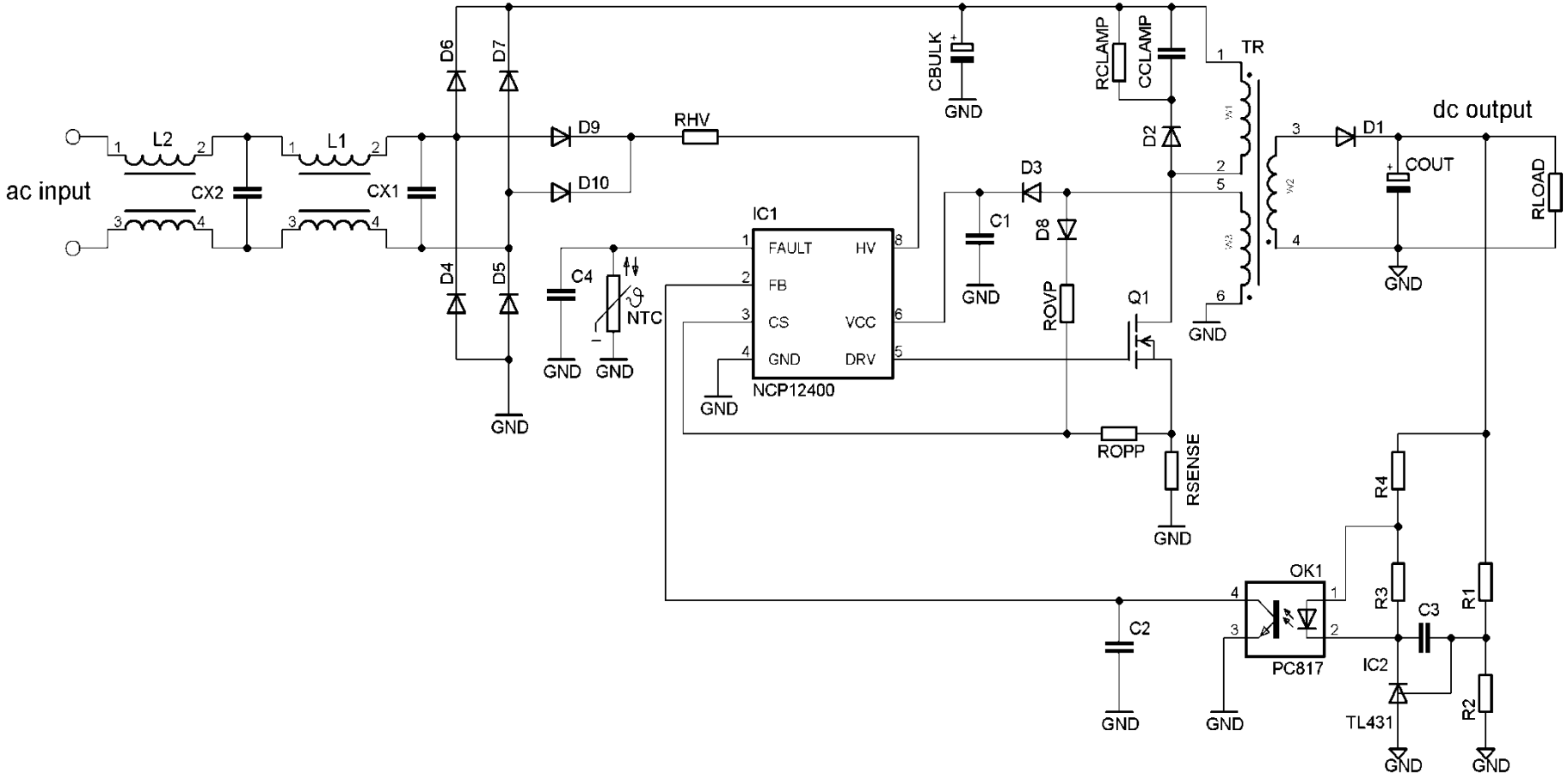


Package information



SOIC7

Application schematic



Same as NCP1246 family