NCP1010, NCP1011, NCP1012, NCP1013, NCP1014

Self-Supplied Monolithic Switcher for Low Standby-Power Offline SMPS

The NCP101X series integrates a fixed−frequency current−mode controller and a 700 V MOSFET. Housed in a PDIP−7 or SOT−223 package, the NCP101X offers everything needed to build a rugged and low−cost power supply, including soft−start, frequency jittering, short−circuit protection, skip−cycle, a maximum peak current setpoint and a Dynamic Self−Supply (no need for an auxiliary winding).

Unlike other monolithic solutions, the NCP101X is quiet by nature: during nominal load operation, the part switches at one of the available frequencies (65 − 100 − 130 kHz). When the current setpoint falls below a given value, e.g. the output power demand diminishes, the IC automatically enters the so−called skip−cycle mode and provides excellent efficiency at light loads. Because this occurs at typically 1/4 of the maximum peak value, no acoustic noise takes place. As a result, standby power is reduced to the minimum without acoustic noise generation.

Short−circuit detection takes place when the feedback signal fades away, e.g. in true short−circuit conditions or in broken Optocoupler cases. External disabling is easily done either simply by pulling the feedback pin down or latching it to ground through an inexpensive SCR for complete latched−off. Finally soft−start and frequency jittering further ease the designer task to quickly develop low−cost and robust offline power supplies.

For improved standby performance, the connection of an auxiliary winding stops the DSS operation and helps to consume less than 100 mW at high line. In this mode, a built−in latched overvoltage protection prevents from lethal voltage runaways in case the Optocoupler would brake. These devices are available in economical 8−pin dual−in−line and 4−pin SOT−223 packages.

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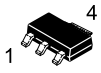
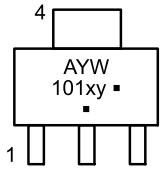
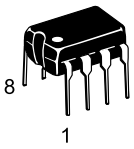
MARKING DIAGRAMS

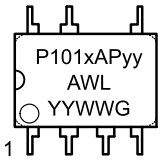


SOT−223
CASE 318E
ST SUFFIX





PDIP−7
CASE 626A
AP SUFFIX



x = Current Limit (0, 1, 2, 3, 4)
y = Oscillator Frequency
A (65 kHz), B (100 kHz), C (130 kHz)
yy = 06 (65 kHz), 10 (100 kHz), 13 (130 kHz)
A = Assembly Location
WL = Wafer Lot
YY, Y = Year
WW, W = Work Week
▪ or G = Pb−Free Package
(Note: Microdot may be in either location)

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 21 of this data sheet.

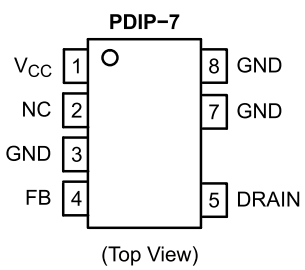
Features

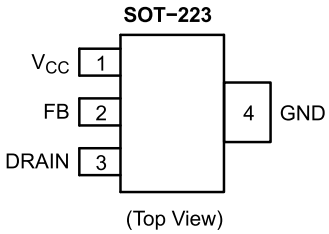
- Built−in 700 V MOSFET with Typical R_{DSon} of 11 Ω and 22 Ω
- Large Creepage Distance Between High−Voltage Pins
- Current−Mode Fixed Frequency Operation: 65 kHz – 100 kHz − 130 kHz
- Skip−Cycle Operation at Low Peak Currents Only: No Acoustic Noise!
- Dynamic Self−Supply, No Need for an Auxiliary Winding
- Internal 1.0 ms Soft−Start
- Latched Overvoltage Protection with Auxiliary Winding Operation
- Frequency Jittering for Better EMI Signature
- Auto−Recovery Internal Output Short−Circuit Protection
- Below 100 mW Standby Power if Auxiliary Winding is Used
- Internal Temperature Shutdown
- Direct Optocoupler Connection
- SPICE Models Available for TRANsient Analysis
- These are Pb−Free and Halide−Free Devices

Typical Applications

- Low Power AC/DC Adapters for Chargers
- Auxiliary Power Supplies (USB, Appliances,TVs, etc.)

PIN CONNECTIONS





Indicative Maximum Output Power from NCP1014

R_{DSon} − Ip	230 Vac	100 − 250 Vac
11 Ω − 450 mA DSS	14 W	6.0 W
11 Ω − 450 mA Auxiliary Winding	19 W	8.0 W

1. Informative values only, with: Tamb = 50°C, Fswitching = 65 kHz, circuit mounted on minimum copper area as recommended.

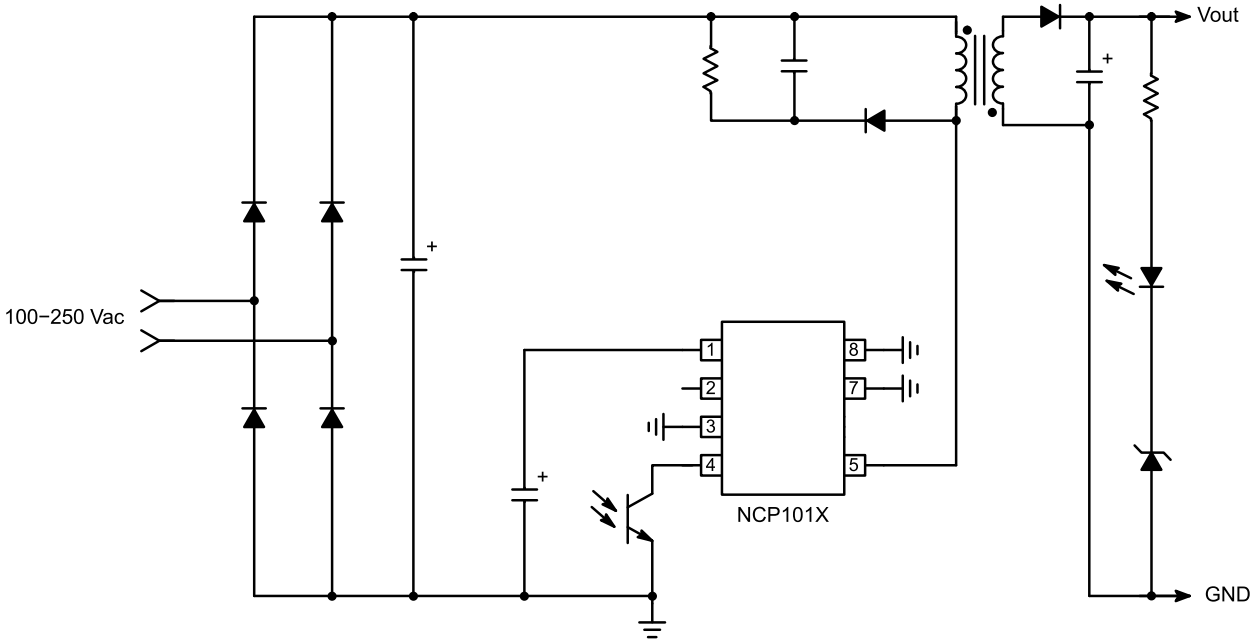


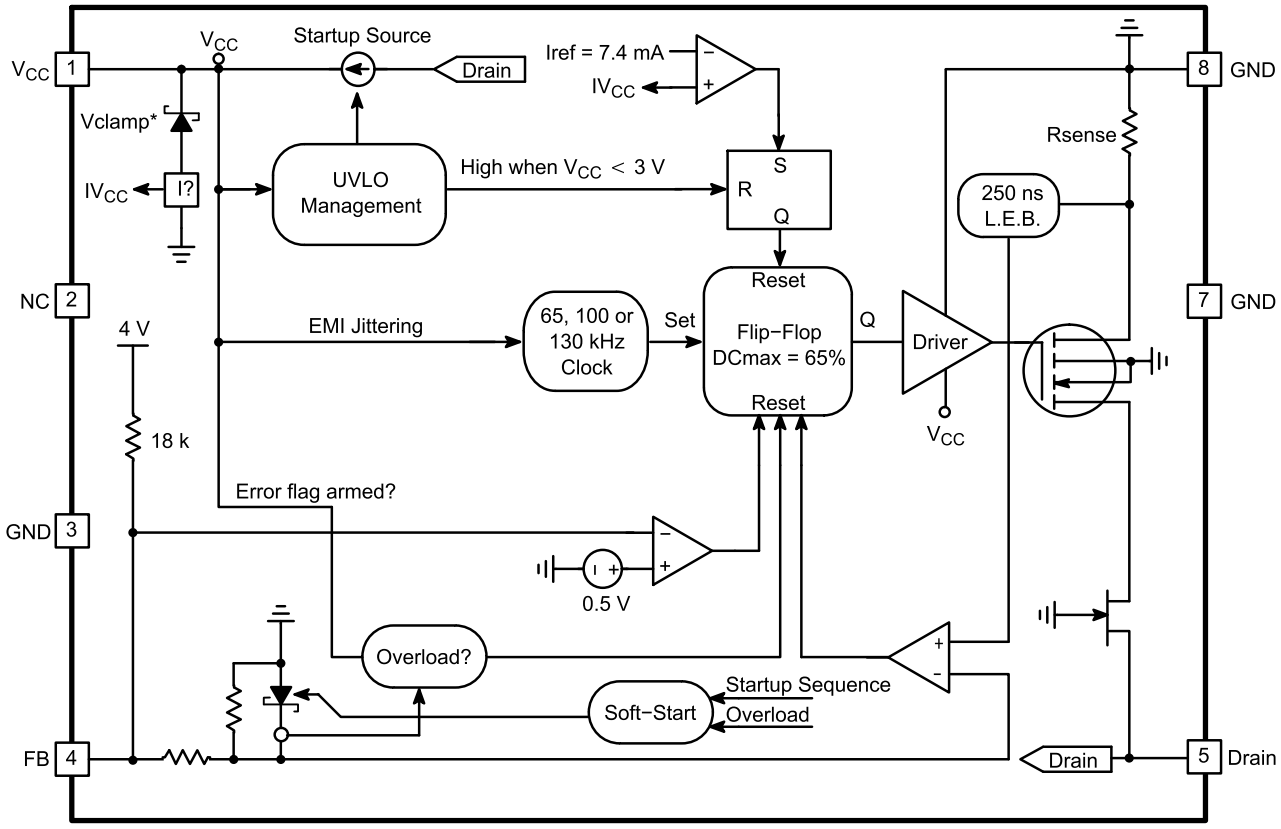
Figure 1. Typical Application Example

Quick Selection Table

	NCP1010			NCP1011			NCP1012			NCP1013			NCP1014	
R_{DSon} [Ω]	22						11							
Ipeak [mA]	100			250			250			350			450	
Freq [kHz]	65	100	130	65	100	130	65	100	130	65	100	130	65	100

PIN FUNCTION DESCRIPTION

Pin No. (SOT−223)	Pin No. (PDIP−7)	Pin Name	Function	Description
1	1	V_{CC}	Powers the Internal Circuitry	This pin is connected to an external capacitor of typically 10 μF. The natural ripple superimposed on the V_{CC} participates to the frequency jittering. For improved standby performance, an auxiliary V_{CC} can be connected to Pin 1. The V_{CC} also includes an active shunt which serves as an opto fail−safe protection.
−	2	NC	−	−
−	3	GND	The IC Ground	−
2	4	FB	Feedback Signal Input	By connecting an optocoupler to this pin, the peak current setpoint is adjusted accordingly to the output power demand.
3	5	Drain	Drain Connection	The internal drain MOSFET connection.
−	−	−	−	−
−	7	GND	The IC Ground	−
4	8	GND	The IC Ground	−



*Vclamp = VCC_{OFF} + 200 mV (8.7 V Typical)

Figure 2. Simplified Internal Circuit Architecture