



Description

The synchronous rectification can effectively reduce the secondary side rectifier power dissipation and provide high performance solution. By sensing MOSFET SW-to-source voltage, NDP7935KC can output ideal drive signal with less external components. It can provide high performance solution for 3V to 30V output voltage application.

- Supports CCM, DCM and Quasi-Resonant Topologies
- Wide VIN pin operating voltage up to 30V
- Optimized for output voltages from 3V to 30V in multi-level output voltage and current applications
- Supports Low-side/High-side Rectification
- Max 150kHz Switching Frequency
- Fast Turn-off Total Delay of 12ns
- Compatible with Energy Star
- ~320uA Low Quiescent Current
- Available in SOP8 Package

- Chargers for Cell Phones
- AC/DC adapter
- Industrial Power Systems
- Flyback Converters

The diagram illustrates a full-bridge inverter circuit. On the left, a transformer is shown with its primary winding connected to a high-voltage (HV) source and a pulse-width modulation (PWM) signal source. The secondary winding is connected to a full-bridge inverter. The inverter consists of four switching devices (SW) labeled 5, 6, 7, and 8. The input (VIN) of the inverter is connected to the secondary winding of the transformer. The output (VOUT) of the inverter is connected to the primary winding of a second transformer, which is then connected to a load. The inverter's output is also connected to a filter capacitor and a load inductor. The output voltage is labeled VO+ and VO-.

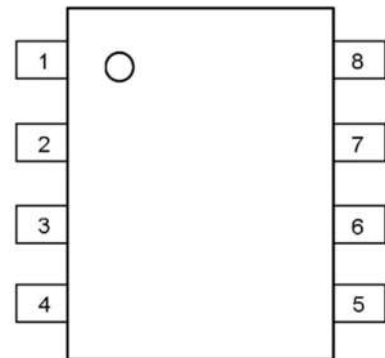


Absolute Maximum Ratings (at TA = 25°C)

| Characteristics | Symbol | Rating | Unit |
|---|---------------|------------|------|
| VCC to GND | | -0.3 to 8 | V |
| SW to GND | | -0.7 to 65 | V |
| VIN to GND | | -0.3 to 32 | V |
| Operating Junction Temperature | | -40 to 150 | °C |
| Storage Junction Temperature | | -55 to 150 | °C |
| Thermal Resistance from Junction to case | θ_{JC} | 80 | °C/W |
| Thermal Resistance from Junction to ambient | θ_{JA} | 160 | °C/W |

Pin Function And Descriptions

| PIN | NAME | Description |
|---------|------|--|
| 1,2 | GND | Ground |
| 3 | VCC | Output of internal LDO, it provides bias voltage for the internal circuit and MOSFET driver. Connect this pin to a capacitor |
| 4 | VIN | Input of internal LDO |
| 5.6.7.8 | SW | Drain of internal N-MOS |



Order information

| Order Information | Top Marking |
|---|---|
| <p>NDP7935 K C</p> <p>Pin NO. C:8 Package K: SOP Product Number</p> | <p>Y: Year (9=2019, 0=2020...A=2029...) WW: Weekly (01-53) D/X : Internal ID Code</p> |



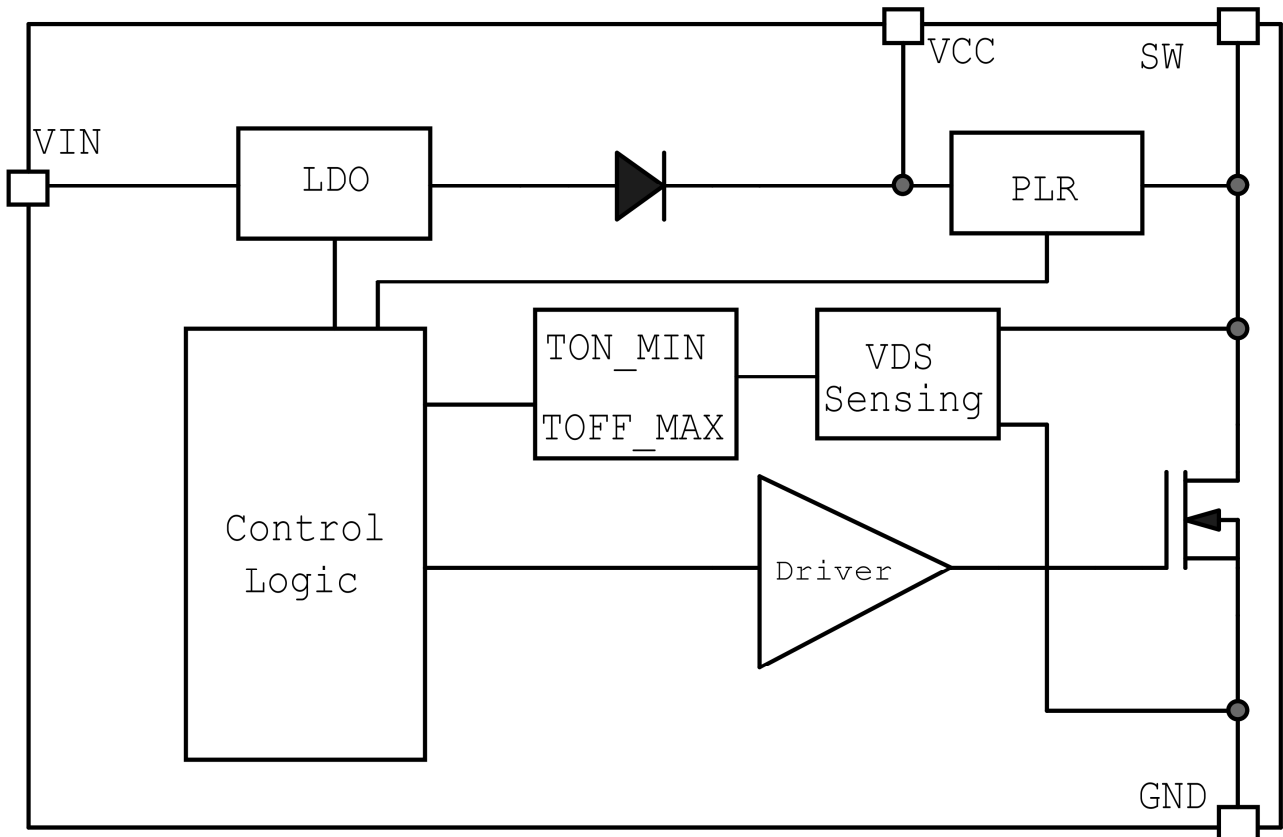
Electrical Characteristics

T_J = 25°C. VCC = 6.2V, unless otherwise noted

| Characteristics | Symbol | Conditions | Min | Typ | Max | Units |
|-----------------------------|--------------------------------|-----------------------|-----|------|-----|-------|
| Input Voltage | V _{IN} | | 5.0 | - | 30 | V |
| VCC UVLO OFF | VCC _{UVLO_OFF} | | | 3 | | V |
| VCC UVLO Voltage ON | VCC _{UVLO_ON} | | | 2.6 | | V |
| VCC UVLO Hysteresis | | | | 0.2 | | V |
| VCC output voltage | V _{PLR} | SW >10V | | 6.2 | | V |
| VCC output voltage | V _{LDO} | V _{IN} > 10V | | 7 | | V |
| Quiescent Current | V _{IN} _{ICQ} | no switch | - | 320 | - | uA |
| Turn on Threshold | V _{TH_ON} | | | -170 | | mV |
| Driver Voltage Regulator | V _{reg} | | | -70 | | mV |
| Turn OFF Threshold | V _{TH_OFF} | | | -40 | | mV |
| Turn-off Total Delay | T _{off_delay} | | | 12 | | nS |
| Minimum on time | T _{min} | | | 700 | | nS |
| NMOS R _{DS(ON)} | R _{DS} | | | 8 | | mΩ |
| Breakdown Voltage | BV _{DSS} | | 60 | | | V |
| Thermal shutdown Temp | T _{SD} | | - | 150 | - | °C |
| Thermal Shutdown Hysteresis | T _{SH} | | - | 30 | - | °C |



Block Diagram



Operation

The NDP7935KC supports operation in CCM, DCM and Quasi-Resonant topologies. Operating in either a DCM or Quasi-Resonant topology, the control circuitry controls the gate in forward mode and will turn the gate off when the MOSFET current is fairly low. In CCM operation, the control circuitry turns off the gate when very fast transients occur.

VCC Under voltage lockout(UVLO)

When the Vcc is below UVLO threshold, the part is in sleep mode and the internal N-MOS will be turn off.

Turn ON phase

When the synchronous MOSFET is conducting, current will flow through its body diode which generates a negative Vds across it. Because this body diode voltage drop is much

smaller than the turn on threshold of the control circuitry (-170mV), which will then turn on the N-MOS.

Conducting Phase

When the synchronous N-MOS is turned on, Vds becomes to rise according to its on resistance, as the current become smaller Vds rises above the Driver Voltage Regulator (-70mV), the circuitry starts pulling down the gate driver which leads to the VDS be regulated to a fixed voltage (the internal reference).

Turn OFF phase

When the Vds rises to trigger the turn off threshold(-40mV), the N-MOS gate voltage is pulled to low after about 12nS delay by the control circuitry, a 1.7uS blanking time is added after the synchronous N-MOS is turn off to avoid error trigger because of the ringing.



Blanking

The NDP7935KC control circuitry contains a blanking function. When it pulls the MOSFET OFF, it makes sure that the OFF state at least lasts for about $\sim 1.7\mu\text{s}$, so it is not recommended to set the synchronous period less than $1.6\mu\text{s}$ at CCM condition in flyback converter, otherwise shoot through may occur During normal operation.

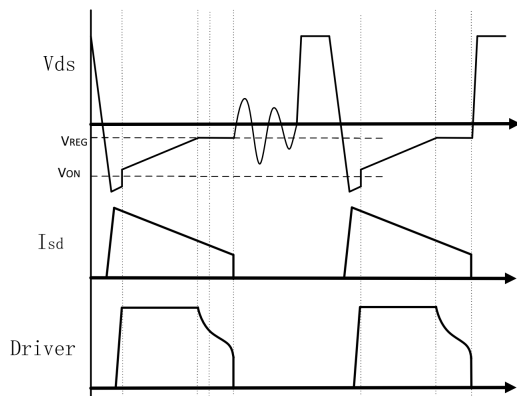


Figure 1 Operation in DCM mode

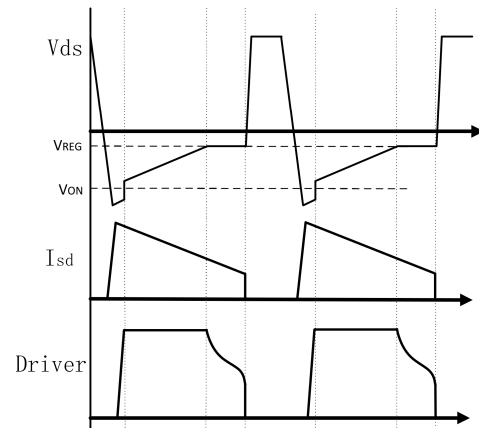
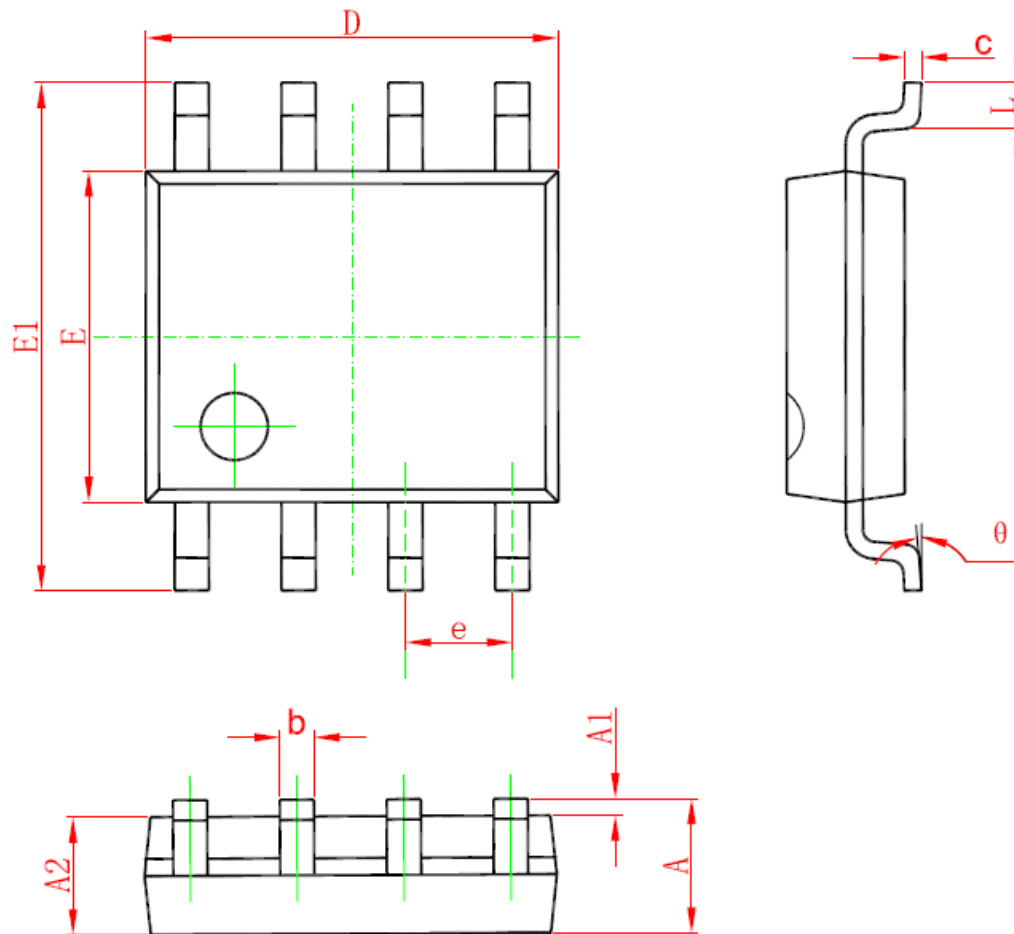


Figure 2 Operation in CCM mode



Package Description

8-Lead Standard Small Outline Package [SOP-8]



| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|-------|----------------------|-------|
| | Min | Max | Min | Max |
| A | 1.350 | 1.750 | 0.053 | 0.069 |
| A1 | 0.050 | 0.250 | 0.002 | 0.010 |
| A2 | 1.250 | 1.650 | 0.049 | 0.065 |
| b | 0.310 | 0.510 | 0.012 | 0.020 |
| c | 0.170 | 0.250 | 0.006 | 0.010 |
| D | 4.700 | 5.150 | 0.185 | 0.203 |
| E | 3.800 | 4.000 | 0.15 | 0.157 |
| E1 | 5.800 | 6.200 | 0.228 | 0.244 |
| e | 1.270 (BSC) | | 0.05 (BSC) | |
| L | 0.400 | 1.270 | 0.016 | 0.050 |
| θ | 0° | 8° | 0° | 8° |