

3.1A,60V Synchronous Rectifier

Description

NDP7932KC is a synchronous rectifier for switch mode power supplies, which combines an N-Channel MOSFET and a driver circuit designed for synchronous rectification in DCM, QR and CCM operation.

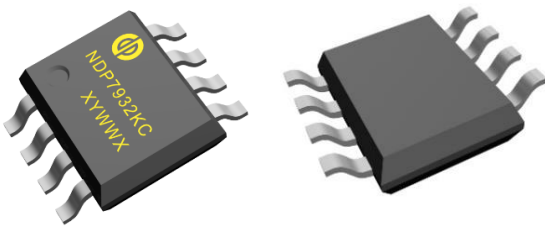
The synchronous rectification can effectively reduce the secondary side rectifier power dissipation and provide high performance solution. By sensing MOSFET SW-to-Source voltage, NDP7932KC can output ideal drive signal with less external components. It can provide high performance solution for 3V to 30V output voltage application.

Features

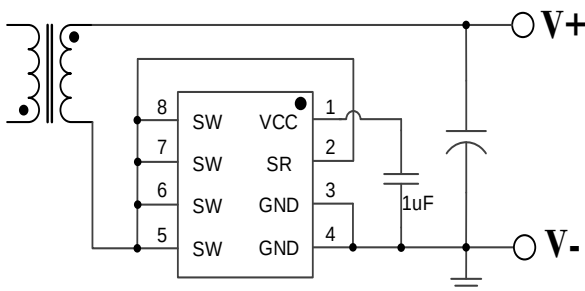
- Supports CCM, DCM and Quasi-Resonant Topologies
- Supports Low-side/High-side Rectification
- Max 200kHz Switching Frequency
- Fast Turn-off Total Delay of 12ns
- Compatible with Energy Star
- ~320uA Low Quiescent Current
- Available in SOP8 Package

Applications

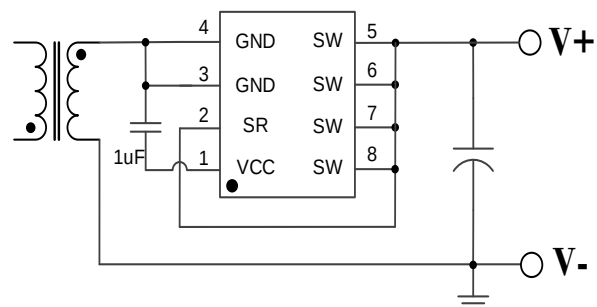
- Chargers for Cell Phones
- AC/DC adapter
- Industrial Power Systems
- Flyback Converters



Typical Application

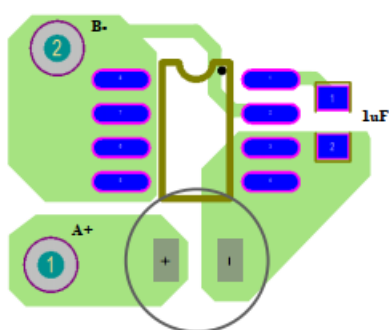


Low-side Rectification

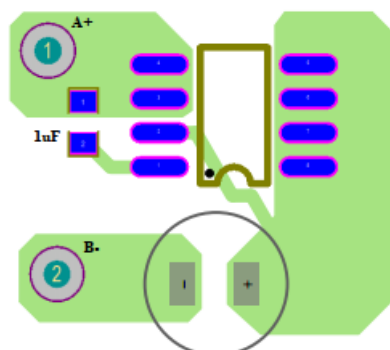


High-side Rectification

Layout Consideration



Low-side Rectification

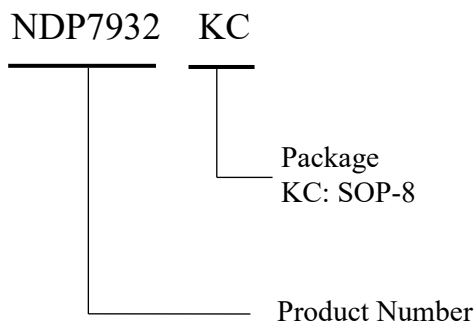


High-side Rectification

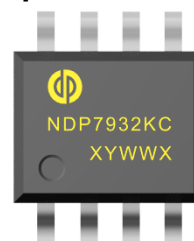
Order Information

Orderable Device	Package Type	Packing Qty/reel	MSL- Peak Temp -Floor Life	Eco Std	Marking Information
NDP7932KC	SOP-8	4000	MSL3-260°C-168hrs	RoHS & Green	Refer to below

Product Naming



Top Side Marking



X/X: Internal ID Code
Y: Year (3=2023,4=2024.....)
WW: Weekly (01-53)

Notes:

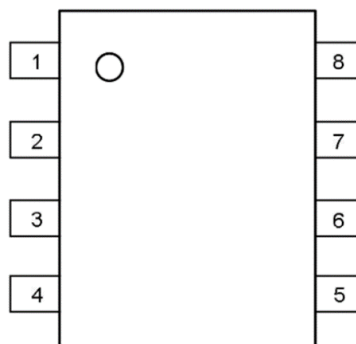
- (1) **RoHS:** Quoted from **RoHS Directive (EU) 2015/863**, Deep-Pool defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. Deep-Pool may reference these types of products as "**Pb-Free**".
- (2) **RoHS Exempt:** Deep-Pool defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.
- (3) **Green:** Deep-Pool defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JEDEC (**JS709C**) low halogen requirements of $\leq 1000\text{ppm}$ threshold.
- (4) **MSL, Peak Temp.** - The Moisture Sensitivity Level rating according to the JEDEC (**J-STD-020F**) industry standard classifications, as well as the peak solder temperature of SMT and the floor life after unpacking, which customers should pay attention and strictly comply with the standard to use.

- (5) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

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Pin Function and Definition

PIN	NAME	Description
1	VCC	Output of Internal LDO, It Provides Bias Voltage for the Internal Circuit and MOSFET Driver. Connect this Pin to a Capacitor
2	SR	N-MOS Drain Voltage Sense Input
3,4	GND	Ground
5,6,7,8	SW	Drain of Internal N-MOS



Absolute Maximum Ratings (at TA = 25°C)

Characteristics	Symbol	Rating	Unit
VCC to GND		-0.3 to 8	V
SW, SR to GND		-0.3 to 65	V
Operating Junction Temperature	T _A	-40 to 150	°C
Storage Junction Temperature	T _{stg}	-65 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

Notes:

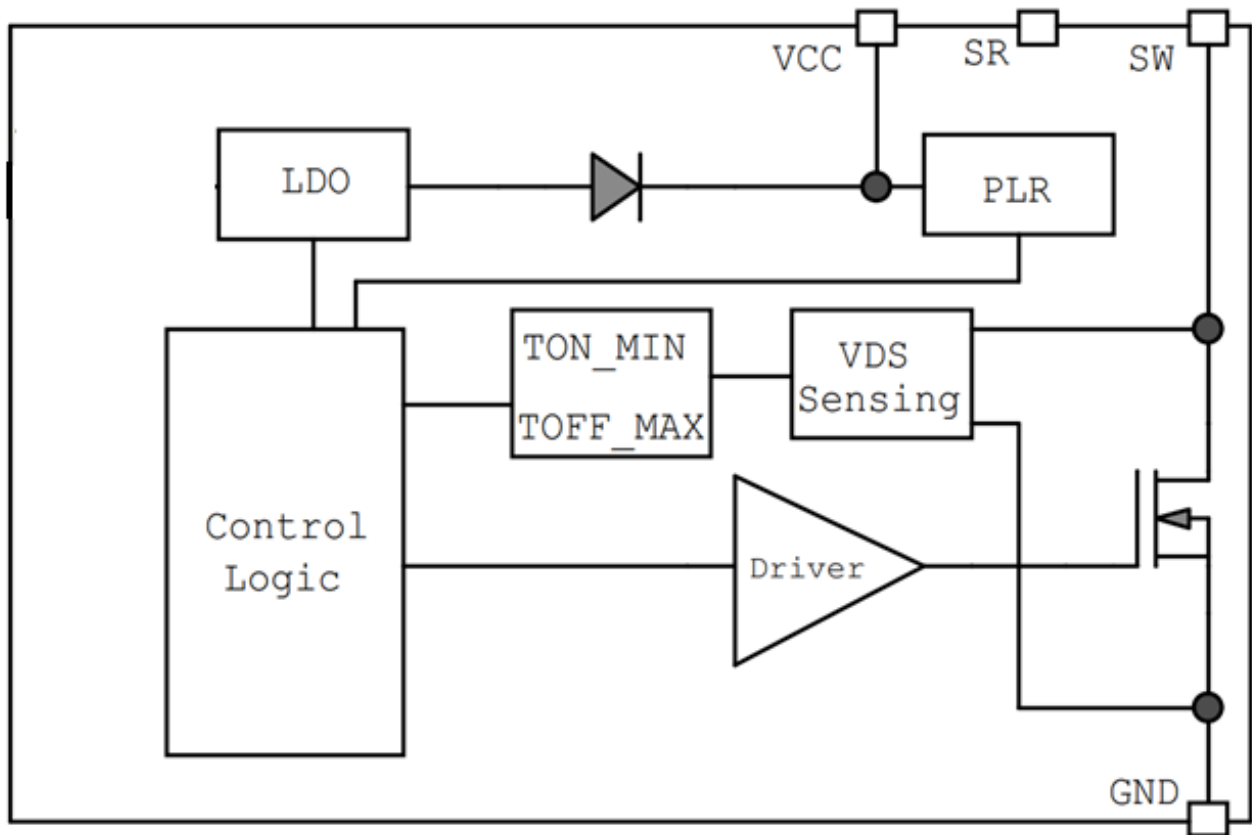
Stresses at or above those listed under Absolute Maximum Ratings may cause permanent damage to the product. This is a stress rating only; functional operation of the product at these or any other conditions above those indicated in the operational section of this specification is not implied. Operation beyond the maximum operating conditions for extended periods may affect product reliability.

Electrical Characteristics

T_J = 25°C, unless otherwise noted.

Characteristics	Symbol	Conditions	Min	Typ	Max	Units
VCC UVLO OFF Voltage	VCC _{UVLO_OFF}				4	V
VCC UVLO ON Voltage	VCC _{UVLO_ON}		2.7			V
VCC UVLO Hysteresis				0.2		V
VCC Output Voltage	V _{PLR}	SW >10V		6.2		V
VCC Output Voltage	V _{LDO}			7		V
Quiescent Current	I _{CCQ}	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 RDSON	R _{DS_ON}			15		mΩ
Breakdown Voltage	BV _{DSS}		60			V
Thermal Shutdown Temperature	T _{SD}		-	150	-	°C
Thermal Shutdown Hysteresis Temperature	T _{SH}		-	30	-	°C

Block Diagram



Operational Description

The NDP7932KC supports operation in CCM, DCM and Quasi-Resonant topologies. Operating in either a DCM or Quasi-Resonant topology, the control circuitry controls the gate .it 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 V_{CC} 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 V_{ds} 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, V_{DS} becomes to rise according to its on resistance, as the current become smaller V_{DS} rises above the Driver Voltage Regulator ($-70mV$), the circuitry starts pulling down the gate driver which leads to the V_{DS} be regulated to a fixed voltage (the internal reference).

Turn OFF Phase

When the V_{ds} 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 $1.7\mu S$ blanking time is added after the synchronous N-MOS is turn off to avoid error trigger because of the ringing.

Blanking

The NDP7932KC control circuitry contains a blanking function. When it pulls the MOSFET OFF, it makes sure that the OFF state at least lasts for about $\sim 1.7\mu s$, so it is not recommended to set the synchronous period less than $1.6\mu s$ at CCM condition in flyback converter, otherwise shoot through may occur During normal operation.

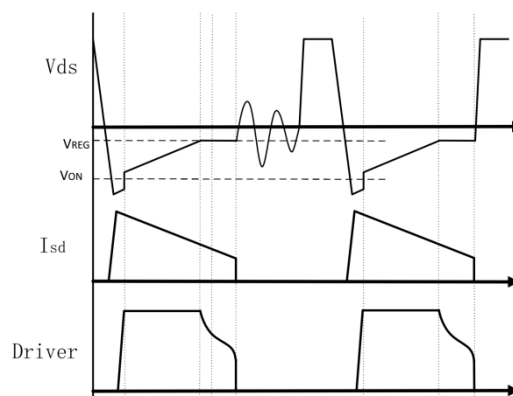


Figure 1 Operation in DCM mode

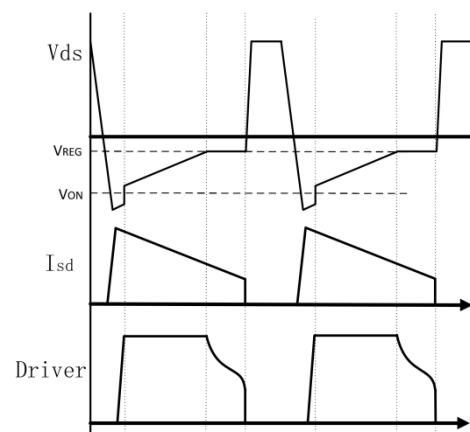
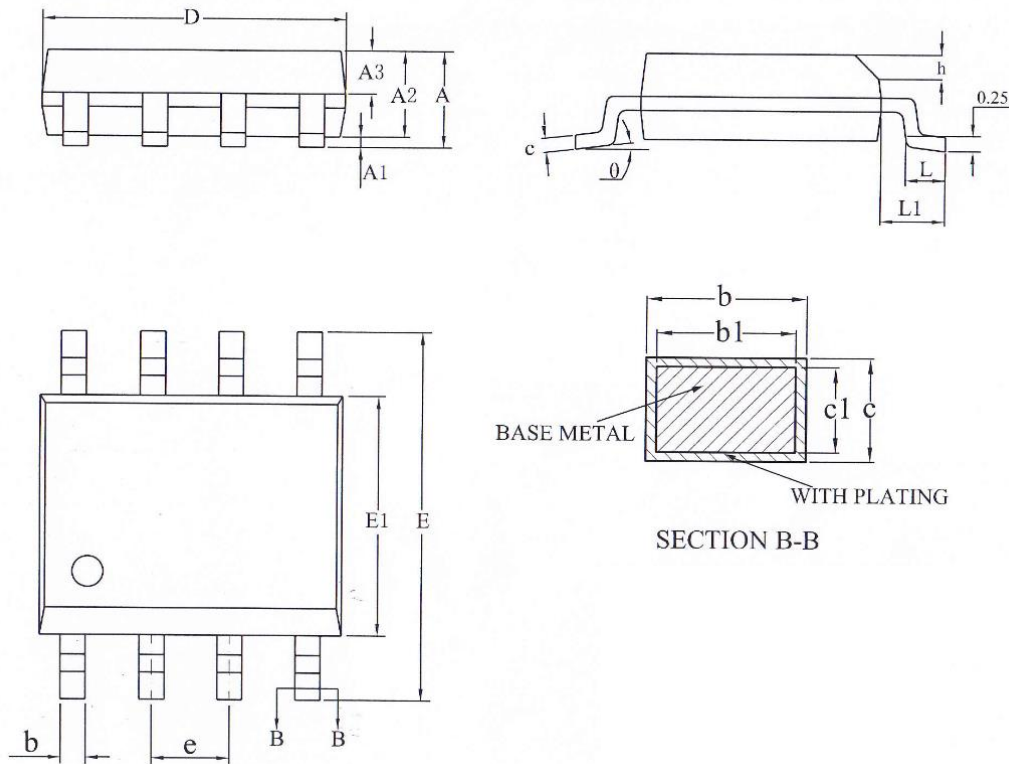


Figure 2 Operation in CCM mode

Package Outline Drawing

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



Dimensional In Millimeters			
SYMBOL	MIN	NOM	MAX
A	/	/	1.75
A1	0.10	/	0.225
A2	1.30	1.40	1.50
A3	0.60	0.65	0.70
b	0.39	/	0.47
b1	0.38	0.41	0.44
c	0.20	/	0.24
c1	0.19	0.20	0.21
D	4.80	4.90	5.00
E	5.80	6.00	6.20
E1	3.80	3.90	4.00
e	1.27 BSC		
h	0.25	/	0.50
L	0.50	/	0.80
L1	1.05 REF		
θ	0	/	8°

Notes

1. Use millimeters as the primary measurement
2. Dimensioning and tolerances conform to ASME Y14.5M. – 1994
3. These dimensions do not include mold flash or protrusions.
4. Mold flash or protrusions shall not exceed 0.15mm

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