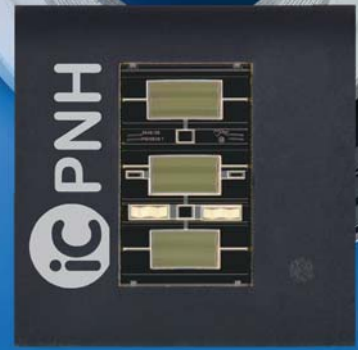


iC-PNH Series

Phased Array Nonius Encoders



Description

This series of optical encoder ICs features monolithically integrated photosensors.

Its precise sine/cosine output signals allow for a high resolution interpolation by subsequent devices, such as iC-MN, resolving a singleturn position with 20 bits and higher.

Output amplitudes of several hundred millivolts are generated at low illumination levels, saving LED current for durability.

As a typical Nonius scale for iC-PNH repeats twice per turn, 2 sector tracks are scanned digitally by additional photosensors. Optionally, this section can be independently operated by a second low voltage supply.

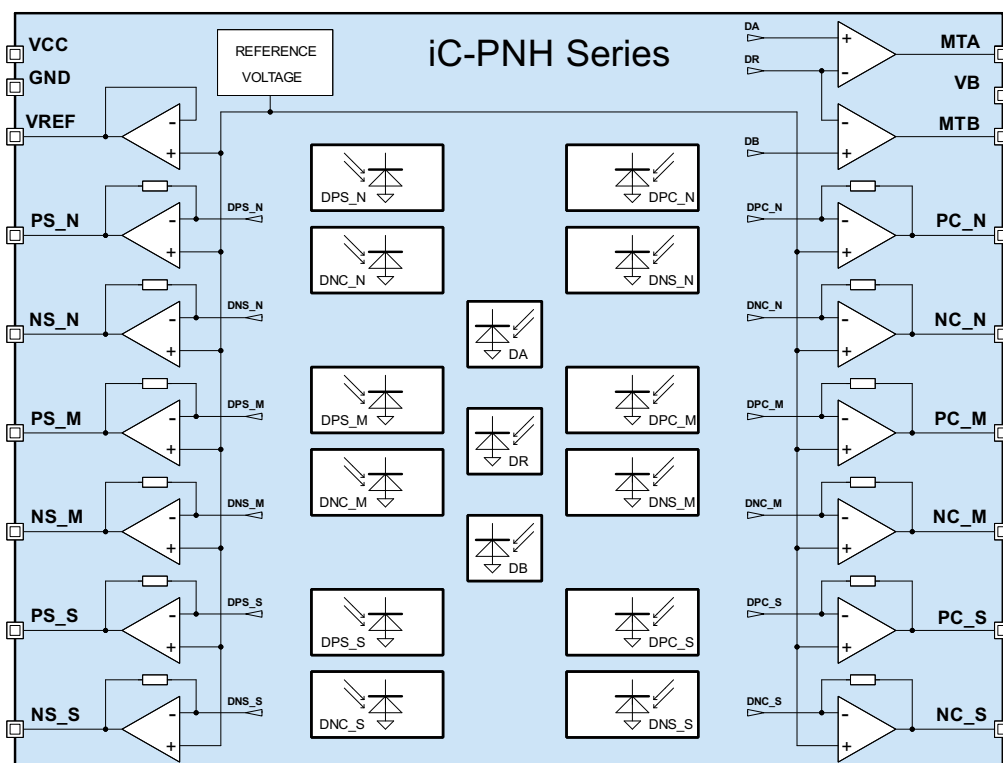
Applications

- Absolute position encoders
- AC servo feedback

Features

- For compact, high resolution absolute position encoders
- Monolithic 3-channel phased array with excellent signal matching
- Embedded sector detection by 2-bit Gray code scanning
- Moderate track pitch for reduced crosstalk
- Ultra-low dark currents for operation at high temperatures
- Low-noise photocurrent amplifiers with 1 M Ω transimpedance gain
- Short-circuit-proof differential voltage outputs
- Enhanced EMI tolerance due to low output impedance
- Operation from 4.1 V up, respectively 1.8 V for digital section
- Operational temperature range of -40°C to +125°C
- Space-saving, RoHS compliant optoQFN package
- Sampling with evaluation kit and code disc

Block Diagram



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Key Specifications

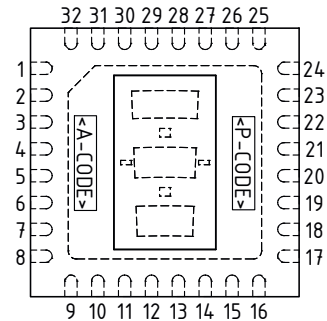
General	
Supply Voltage	+4.1 V ... +5.5 V, VB: +1.8 V ... +5.5 V
Supply Current	typ. 9.5 mA, 15 mA max., VB: 300 μ A max.
ESD Susceptibility	2 kV (HBM 100 pF, 1.5 k Ω)
Operational Temperature	-40 °C to +125 °C
Package (RoHS compliant)	32-pin optoQFN (5.0 mm x 5.0 mm x thickness 0.9 mm)

Photosensors	
Spectral Application Range	400 nm to 950 nm (sensitivity to 25%)
Spectral Sensitivity	typ. 0.3 A/W at $\lambda_{LED} = 460$ nm or 850 nm iC-PNH3348 EncoderBlue®: typ. 0.3 A/W at $\lambda_{LED} = 460$ nm
Effective Area per Photodiode	typ. 0.1 mm ² , typ. 0.03 mm ² for MTA/MTB sensors
Required Irradiance	typ. 3 ... 6 mW/cm ² (at λ_{LED})

Photocurrent Amplifiers	
Operating Range	up to 1120 nA photocurrent
Photo Sensitivity	typ. 0.1 V/ μ W (at λ_{LED})
Transimpedance Gain	typ. 1 M Ω
Gain Matching	+/- 0.2%
Cut-off Frequency (-3 dB)	typ. 400 kHz
Reference Output Voltage	typ. 770 mV

Signal Outputs	
Recommended Signal Level	typ. 250 mVpk
Maximum Signal Level	2.0 V max. above ground
Dark Voltage	typ. 770 mV
Short-Circuit Current	typ. 480 μ A sink, typ. 420 μ A source
Power-On Settling Time	100 μ s max.

Pin Configuration oQFN32-5x5



Pin Functions

No.	Name	Function
1	VCC	+4.1 V ... +5.5 V Supply Voltage
2	VREF	Reference Voltage Output
3, 4	PS_N, NS_N	N-Track Sine +, Sine -
5, 6	PS_M, NS_M	M-Track Sine +, Sine -
7, 8	PS_S, NS_S	S-Track Sine +, Sine -
9 ... 16	n.c.	not connected
17, 18	NC_S, PC_S	S-Track Cosine -, Cosine +
19, 20	NC_M, PC_M	M-Track Cosine -, Cosine +
21, 22	NC_N, PC_N	N-Track Cosine -, Cosine +
23	MTB	Digital Output B
24	GND	Ground
25	MTA	Digital Output A
26 ... 31	n.c.	not connected
32	VB	Supply Voltage Input (optional)

Device Overview

	iC-PNH2628 iC-PNH2612 iC-PNH2624	iC-PNH3312 iC-PNH3348*	iC-PNH3912 iC-PNH3948
Singleturn Resolution with iC-MN	20 bit, 22 bit, 23 bit	22 bit, 24 bit	22 bit, 24 bit
Cycles per Revolution	2x64, 2x256, 2x512	2x256, 2x1024	2x256, 2x1024
Code Discs (glass)	PNH6S 26-128 PNH3S 26-512 PNH5S 26-1024	PNH2S 33-512 PNH1S 33-2048	PNH8S 39-512 PNH4S 39-2048
Diameter	\varnothing 26.0 mm	\varnothing 33.2 mm	\varnothing 39.0 mm
Optical Center Radius (code begin / end)	10.905 mm 9.4/12.4 mm	14.5 mm 13.0/16.0 mm	17.5 mm 16.0/19.0 mm
Bore hole	\varnothing 11.6 mm	\varnothing 18.0 mm	\varnothing 18.0 mm

Recommended collimated LEDs: iC-TL85, iC-SD85, and iC-TL46 (blue).

*) EncoderBlue is a trademark of iC-Haus GmbH (devices require LED iC-TL46).

