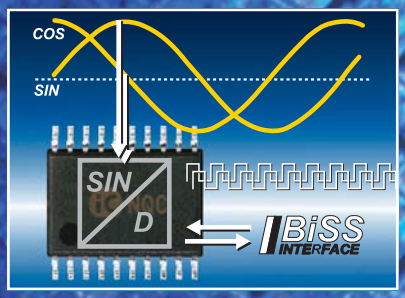
iC-NQC

13-BIT SINE-TO-DIGITAL CONVERTER WITH SIGNAL CONDITIONING



The iC-NQC applies a no-missing-code vector tracking principle for the conversion of sine/cosine sensor signals into absolute angle data. Quadrature encoder signals with an index are generated and output at a pre-selectable minimum phase distance.

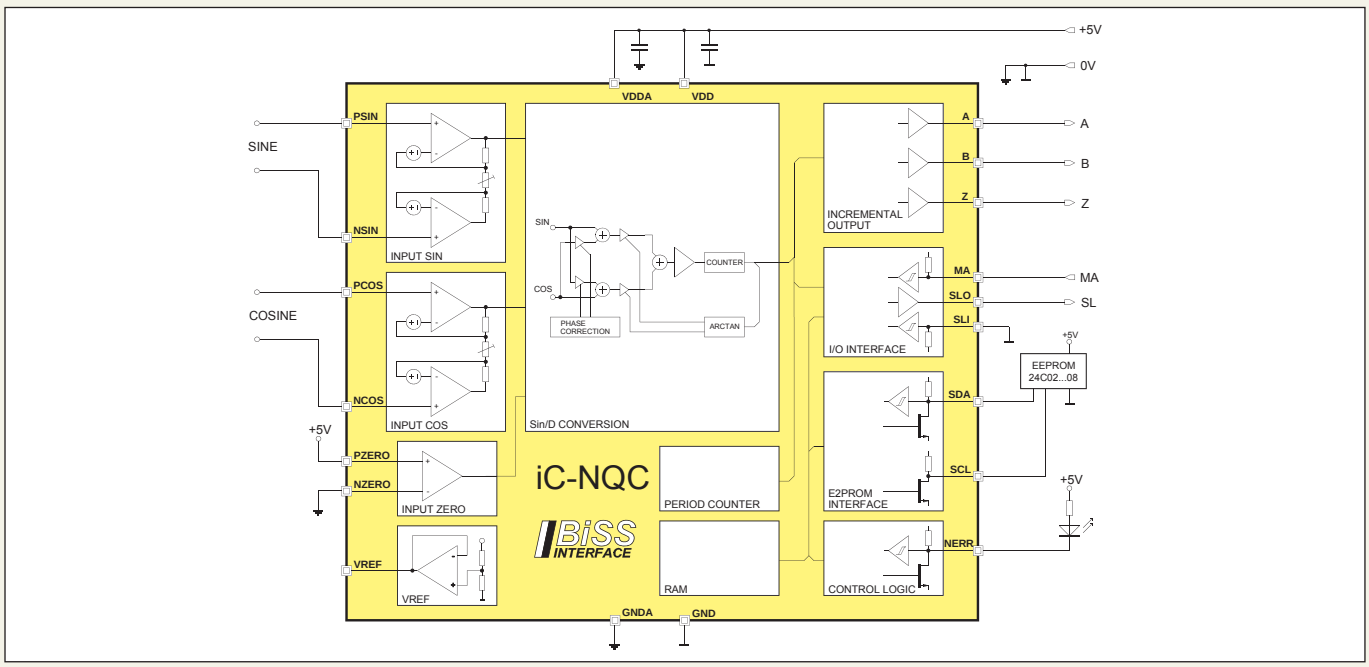
The absolute angle position including a 24-bit period count can be read via a fast synchronous-serial BiSS Interface at clock rates of up to 10 MHz. Selectable output formats allow for compatibility with SSI and BiSS C protocols.

Applications

- Position data acquisition with analog sine/cosine sensors
- Optical linear/rotary encoders
- Magnetic sensor systems

Features

- Resolution of up to 8,192 angle steps per sine/cosine period
- Binary and decimal resolution settings, e.g. 500, 512, 1000, 1024; programmable angle hysteresis
- Count-safe vector tracking principle, real-time system with 70 MHz sampling rate
- Conversion time of just 250 ns including amplifier settling
- Direct sensor connection; selectable input gain
- Input frequency of up to 250 kHz
- Signal conditioning for offset, amplitude, and phase
- A/B quadrature signals of up to 3.75 MHz with adjustable minimum transition distance
- Zero signal processing, adjustable in index position and width
- Period counting with up to 24 bits
- Absolute angle output via fast serial interface (BiSS C, SSI)
- Permanent bidirectional register access
- Error monitoring of frequency, amplitude, configuration
- CRC-protected device setup from serial EEPROM or BiSS C Interface
- ESD protection and TTL-/CMOS-compatible outputs



iC-Haus

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iC-NQC

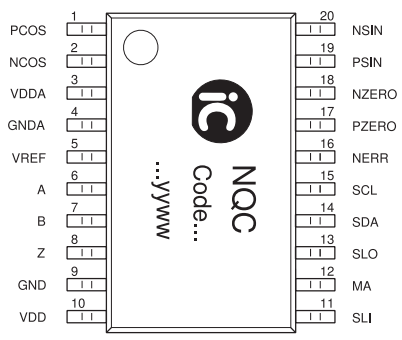
13-BIT SINE-TO-DIGITAL CONVERTER

Adjustable instrumentation amplifiers permit sensors bridges to be directly connected and cope with differential signals of approx. 20 mVpp to 1.5 Vpp and single-ended signals of 40 mVpp to 3 Vpp, respectively. Programmable DACs are available for signal conditioning with regard to offset, amplitude ratio and phase errors.
Conversion and interface settings can be configured by the user and are either stored in an external serial EEPROM (with a CRC) or provided by a microcontroller via the BiSS C interface. iC-NQC acts as a BiSS C Slave and enables bidirectional parameter and OEM data exchange at any time, simultaneously with cyclic readouts of measurement data. Reserved addresses can point to a standard device profile or description file. An optional electronic ID plate can be used to describe the measurement application.

Pin Functions

No.	Name	Function
1	PCOS	Input Cosine +
2	NCOS	Input Cosine –
3	VDDA	+5 V Supply Voltage (analog)
4	GNDA	Ground (analog)
5	VREF	Reference Voltage Output
6	A	Incremental Output A / Analog Cos + / PWM Signal for Offset Sine
7	B	Incremental Output B / Analog Cos – / PWM Signal for Offset Cosine
8	Z	Output Index Z / PWM Signal for Phase or Ratio
9	GND	Ground
10	VDD	+5 V Supply Voltage (digital)
11	SLI	I/O Interface, data input (BiSS)
12	MA	I/O Interface, clock line (BiSS/SSI)
13	SLO	I/O Interface, data line (BiSS/SSI)
14	SDA	EEPROM interface, data line / Analog Sin +
15	SCL	EEPROM interface, clock line / Analog Sin –
16	NERR	Error Input/Output, active low
17	PZERO	Input Zero Signal +
18	NZERO	Input Zero Signal –
19	PSIN	Input Sine +
20	NSIN	Input Sine –

Pin Configuration TSSOP20



Key Specifications

Signal Conditioning Front-End	
Differential Input Signal	20 mVpp to 1.5 Vpp
Single-Ended Input Signal	40 mVpp to 3 Vpp
Differential Input Current	6 µApp to 16 µApp with external resistors
Input Gain	2.6x to 80x
Max. Input Frequency, Example	9 kHz with A/B output and 1024 increments, 250 kHz with serial output
Offset Calibration Range	+/- 50%
Amplitude Calibration Range	+/- 10%
Phase Calibration Range	+/- 12°
Index Signal Enable Input	0 to 5 V

Sine-to-Digital Conversion	
Sampling Rate	typ. 74 MSPS
Conversion Rate	typ. 1.85 MSPS
Binary Angle Resolutions	8, 16, 32, 64, 128, 256, 512, 1024, 2048, 4096, 8192 steps/period
Decade Angle Resolutions	(25, 50), 100, 200, 40, 80, 160, 320, (125, 250), 400, 500, 800, 1000, 1600, 2000 steps/period
Angle Hysteresis	0°, 0.0879° to 5.625°, 45°
Absolute Angle Accuracy	typ. 0.18° (½ LSB at 10 bit, calibrated)
Relative Angle Accuracy	+/- 10 % edge vs. period

Incremental Outputs	
A/B Quadrature Outputs	+/- 6 mA, CMOS, to 460 kHz, to 3.75 MHz at reduced accuracy
A/B Output Min. Transition Distance	adjustable from 65 ns to 22 µs
A/B Output Phase	A leads B or reversed
Z Index Signal Position	adjustable in steps of 11.25°
Z Index Signal Length	90°, 180°

I/O Interface	
Clock Rate	10 MHz (BiSS C bidirectional) 4 MHz (SSI)
Period Counting (Multiturn)	8 to 24 bit, selectable clear-by-zero function

Other Operational Data	
Supply Voltage	single 5 V +/- 10 %, 20 mA
Operational Temperature Range	-20 °C to +85 °C (ext. -40 °C to +125° C)
Package	TSSOP20 (6.5 mm x 6.4 mm)
Device Configuration	BiSS C, from ext. EEPROM (1 to 8 kbit, with OEM memory of ca. 900 bytes)
Monitoring & Alarm	lack of input signals due to wire breakage, short-circuit, loss of magnet, frequency override; power up configuration error, external system error
Calibration	analog sin/cos output, PWM signals for offset, amplitude and phase error

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