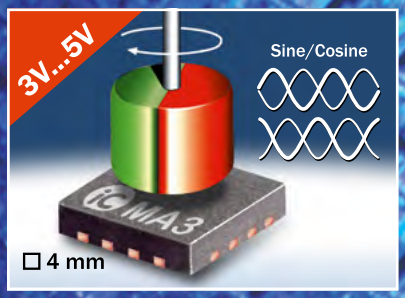
iC-MA3

ANGULAR HALL SENSOR WITH SIN/COS OUTPUT, CASCADABLE



The magnetic angle sensor iC-MA3 is easily configured by pins and runs off a single 3 V to 5.5 V supply. The device outputs conditioned sine/cosine signals representing the axis angle, introduced by a diametric permanent magnet facing the package.

An array of four Hall sensors is used for the differential scanning of the magnetic field, whereas unwanted external stray fields are nearly compensated, and thus not detected. Besides, a high lateral mechanical placement tolerance is obtained easing device installation.

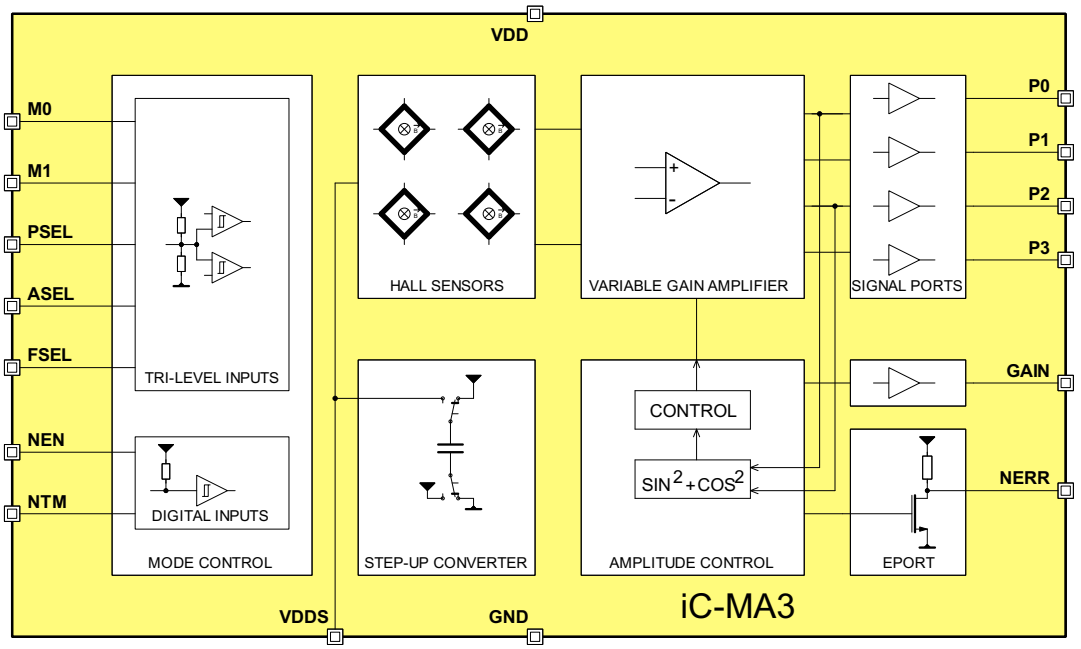
The sine/cosine signals can be output either single-ended or differential, with a pin-configured amplitude controlled to 0.25 V, 0.5 V or 1 V. At full signal bandwidth of 10 kHz, iC-MA3 can track the magnet rotation at up to 60,000 rpm.

Applications

- Precision magnetic angle sensing
- Absolute rotary position sensors
- Magnetic multiturn encoders

Features

- Single supply operation from 3.0 V to 5.5 V
- For rotational speeds of up to 60,000 rpm
- Quad Hall array for high assembly tolerances
- High immunity to external stray fields
- Automatic gain control
- Digital control error output (loss-of-magnet indicator)
- Analog gain signal for magnetic field strength monitoring
- Two output modes: differential, or single-ended with reference and gain signal
- Pin-selectable output amplitude: 250 mV, 500 mV, 1 V
- Pin-selectable power modes: full, reduced, eco
- Pin-selectable bandwidth of 500 Hz, 5 kHz, 10 kHz
- Bus-capable outputs for chain operation of multiple devices
- Quick start from power saving standby
- Operating temperature range of -40 °C to 125 °C



iC Haus

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The signal bandwidth can be lowered to 5 kHz or 500 Hz by pin configuration, to cut noise and improve the measurement precision. Furthermore, the Hall sensors' sampling rate can be reduced to lower the power consumption of the device.

The analog gain signal is output to pin GAIN and indicates the magnet-to-sensor operating distance. At an excessive distance, the GAIN signal saturates and open-drain output NERR indicates the loss-of-magnet failure by a low signal.

Multiple iC-MA3 devices can be cascaded to sense several rotary axes, one at a time, but sharing a common analog signal bus to report the angle positions.

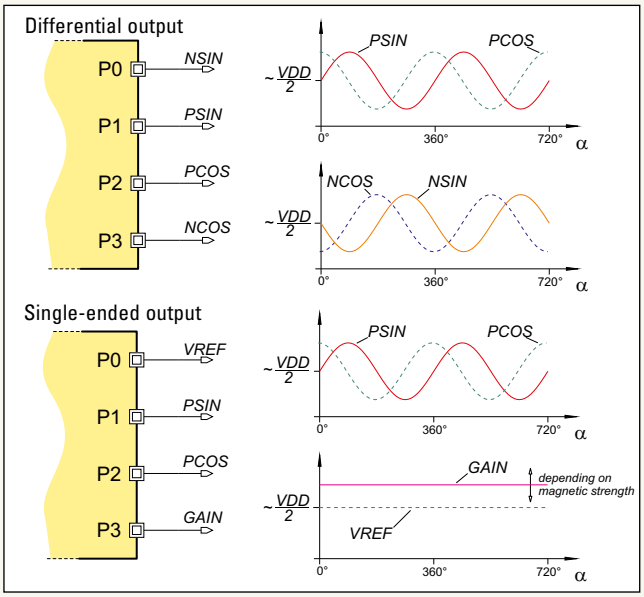
Key Specifications

General	
Supply Voltage	3 V to 5.5 V
Supply Current Full power Reduced power Eco power Standby	 20 mA max. (15 mA @ 3.3 V) 9 mA max. 8 mA max. 200 µA
Signal Amplitude	1 V, 0.5 V and 250 mV
Max. Rotation Speed	60,000 rpm
Magnetic Field Strength	20...110 kA/m @ 3 V 15...65 kA/m @ 5 V

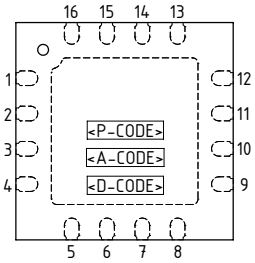
Single-Chip Operation	
Single-ended Output	sine and cosine, reference, gain signal
Differential Output	differential sine and cosine

Multi-Chip Chain Operation	
Single-ended Output	clock and enable control signals, sine and cosine, reference and gain signals
Differential Output	clock and enable control signals, differential sine and cosine signals

Output Signals



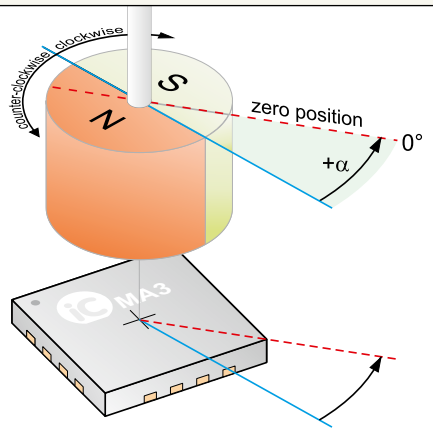
Pin Configuration QFN16 4 mm x 4 mm



Pin Functions

No.	Name	Function
1	VDDS	Internal Supply Voltage (Step-Up Converter Output)
2	M0	Operating Mode Input 0: hi = differential output lo = single-ended output
3	M1	Operating Mode Input 1: hi = chain operation lo = single-chip operation
4	NTM	Test Mode Input, low active
5	P0	Signal Port 0 / Input CLK
6	P1	Signal Port 1
7	P2	Signal Port 2
8	P3	Signal Port 3 / Output NENO
9	NEN	Enable Input, low active
10	PSEL	Power Setting Input: hi = full, mid (open) = eco, lo = low power
11	ASEL	Amplitude Setting Input: hi = 1 V, mid (open) = 250 mV, lo = 500 mV
12	FSEL	Speed Setting Input: hi = max, mid (open) = 1/20, lo = half
13	GAIN	Amplitude Control Gain Output
14	VDD	+3.0...+5.5 V Supply Voltage Input
15	GND	Ground
16	NERR	Error Output, low active

Definition of Angular Position



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