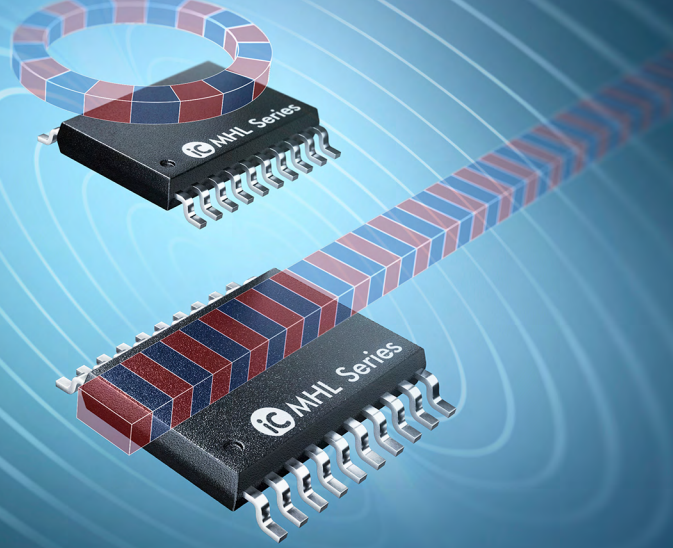


iC-MHL Series

12-Bit Linear/Rotary Position Hall Encoder



Description

The iC-MHL Series, consisting of the 2 mm pole pitch iC-MHL200 and the 1mm pole pitch iC-MHL100, are integrated Hall encoders for sensing linear and off-axis rotary magnetic targets.

The maximum resolution is 12 bits, giving 4096 increments per magnetic period (4 mm for iC-MHL200 and 2 mm for iC-MHL100). Consequently, iC-MHL200 can achieve 1 μm linear resolution, while iC-MHL100 can achieve 0.5 μm linear resolution.

Incremental ABZ quadrature position signals at up to 2 MHz are available as single-ended or differential outputs, allowing a maximum linear speed of 8 m/s for iC-MHL200 and 4 m/s for iC-MHL100 at maximum resolution. Higher velocities are possible at lower resolution. Z output position is adjustable within the magnetic period. For commutation applications, UVW signals of 1 \times and 2 \times per magnetic period are available. The incremental and commutation outputs are RS422 compatible and can be configured for maximum output current and slew rate. Position data is also available over the BiSS/SSI interface; BiSS can also be used for setup. The power-on configuration and internal parameters are stored in a non-volatile on-chip OTP zapping ROM.

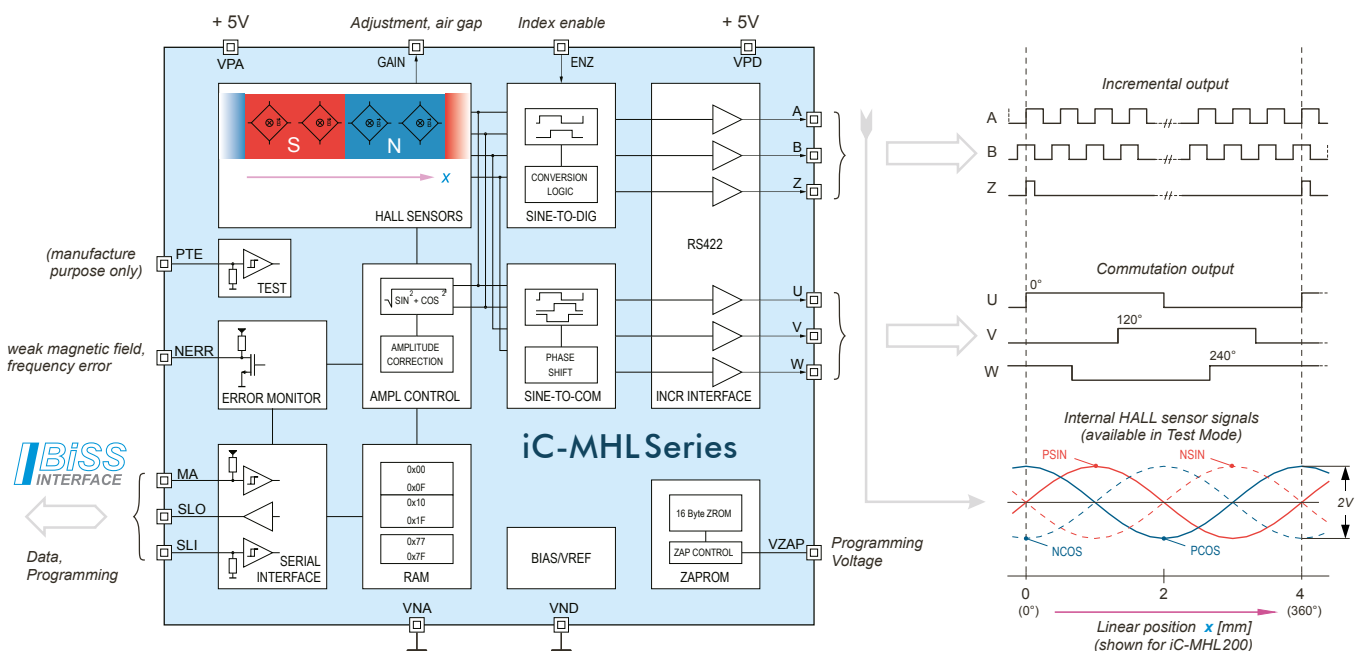
Features

- Automatic signal conditioning with configurable control
- 12-bit real-time interpolation at 8 m/s (4 m/s) velocity
- Interpolation factors $\times 1$ to $\times 128$, $\times 256$, $\times 512$, $\times 1024$
- Quadrature AB and index Z signal outputs
- Z output can be enabled via strobe input ENZ
- One and twofold UVW commutation signals
- Independent zero position for ABZ or UVW
- Incremental AB frequency of up to 2 MHz
- RS422 output driving stages for ABZ and UVW
- BiSS C interface for position readout and programming
- Device setup and OEM data stored into OTP zapping ROM
- Open-drain NERR signal (loss of magnet, frequency error)
- Error codes accessible via BiSS C interface
- Operating temperature range of $-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$

Applications

- Incremental linear and rotary encoders
- Electronic motor commutation

Block Diagram



iC-MHL Series

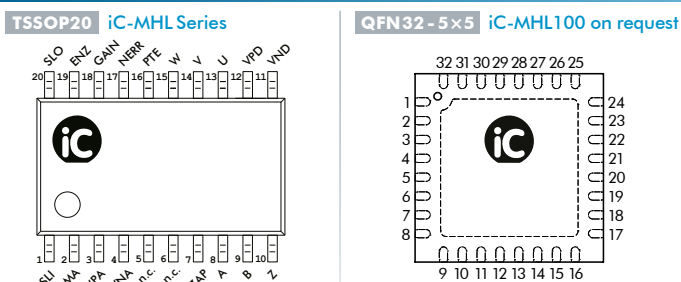
12-Bit Linear/Rotary Position Hall Encoder

Key Specifications

General	
Supply Voltage	5 V +/-10%
Supply Current, normal mode	26 mA max.
Supply Current, power reduction mode	16 mA max.
Magnetic Field Strength	20... 100 kA/m
Operational Temperature Range	-40 to +125 °C
ESD Susceptibility	2 kV (HBM 100 pF, 1.5 kΩ)
Operating Modes	
Output Modes	Single-ended ABZ and UVW Differential ABZ Differential UVW
Interpolation Factors	x1 ... x128, x256, x512, x1024 @ A, B
Commutation Signals UVW	One and two UVW cycles per magnetic input period
Output Driver Settings	
Drive Modes	Push-Pull (RS422), high-side, low-side, tristate
Driving Capability (driving current, rise/fall time, frequency)	+/-4 mA, 12 ns, 10 MHz +/-60 mA, 12 ns, 10 MHz +/-60 mA, 200 ns, 300 kHz +/-20 mA, 20 ns, 3 MHz
Signal Conditioning	
Internal Hall Signal Level	Controlled to 2 Vpp
Coarse Gain Selection	x5, x10, x15, x20
Fine Gain (AGC range)	x1 ... x19 (64 steps)
Sin/Cos Amplitude Ratio	0.91 ... 1.097 (128 steps)
Offset Correction Range	+/- 63 mV in steps of 1 mV
Hysteresis ABZ	0.17°, 0.35°, 0.7° and 1.4°
Zero Position ABZ	Adjustable in increments of 1.4°
Zero Position UVW	Adjustable in increments of 1.875°

Serial Interface Output		
SSI Mode	4 MHz, 13 bit format	
BiSS Mode	10 MHz, register access, CRC	
Device Overview		
	iC-MHL200	iC-MHL100
Pole Pitch	2 mm	1 mm
Linear Speed (@ 12 bit)	8 m/s	4 m/s
Resolution (digital/linear)	12 bit / 1 μm	12 bit / 0.5 μm
Package (RoHS compliant)	TSSOP20	TSSOP20 / QFN32-5x5

Pin Configuration



Pin Functions

TSSOP20 No.	QFN32-5x5 No.	Name	Function
1	6	SLI	Serial Interface, Data Input
2	7	MA	Serial Interface, Clock Input
3	10	VPA	+5V Supply Voltage (analog)
4	11	VNA	Ground (analog)
7	14	VZAP	Zener Zapping Programming Voltage Supply Input
8	15	A	Incremental Output A (NU)
9	18	B	Incremental Output B (NV)
10	19	Z	Index Output Z (NW)
11	20	VND	Ground (digital)
12	21	VPD	+5V Supply Voltage (digital)
13	26	U	Commutation Output U (NA)
14	27	V	Commutation Output V (NB)
15	28	W	Commutation Output W (NZ)
16	29	PTE	Test Enable Input
17	30	NERR	Error output (active low)
18	31	GAIN	Gain Signal
19	4	ENZ	Index Z Enable Input
20	5	SLO	Serial Interface, Data Output
other	other	nc	not connected

Application Example

