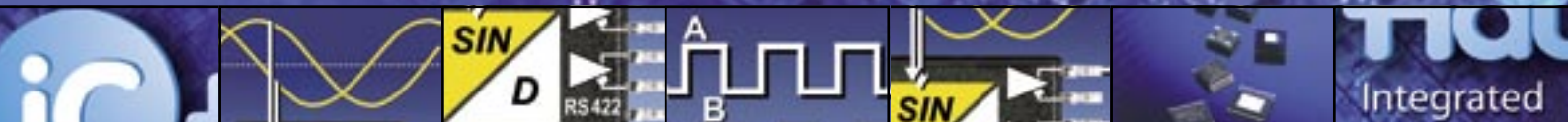
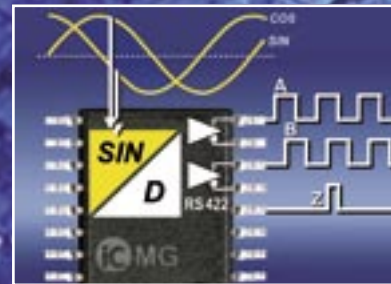


iC-MG

8-BIT SIN/COS INTERPOLATION IC WITH RS422 DRIVER



Interpolator iC-MG is a non-linear A/D converter which, by applying a count-safe vector principle, digitizes sine/cosine sensor signals with selectable resolution and hysteresis. The angle value is output incrementally via differential RS422 drivers as an encoder quadrature signal with an index pulse. The minimum phase distance can be preselected, thus generating fail-safe counter signals and enhancing the noise immunity of the sensor system.

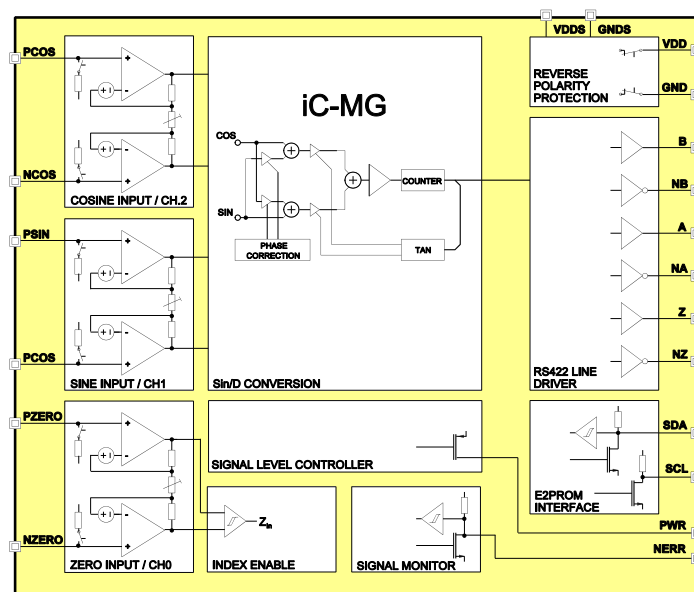
The integrated signal conditioning unit allows signal amplitudes and offset voltages to be calibrated and also a phase error between the sine and cosine signals to be corrected.

Applications

- Optical and magnetic position sensors
- Rotary encoders
- Linear encoders

Features

- Real-time tracking, no-missing-code interpolation to 200 kHz input frequency (with x5, to 20 kHz with x50)
- Interpolation factors: x1, x2, x4, x5, x10, x20, x25, x50
- Differential inputs and programmable instrumentation amps
- Variable input resistance enables current/voltage conversion
- Signal conditioning for offset, amplitude and phase
- Controlled 40 mA current source as LED or MR bridge supply
- Encoder quadrature output via short-circuit-proof 20 mA push-pull line drivers (RS422)
- Fail-safe counting supported by selectable minimum phase distance
- Index signal generation at selectable positions
- Adjustable index length
- Loss-of-signal indicator
- Setup via serial EEPROM interface
- Sub-system power switch offers reverse polarity protection for the overall system



iC-MG 8-BIT SIN / COS INTERPOLATOR IC WITH RS422 DRIVER

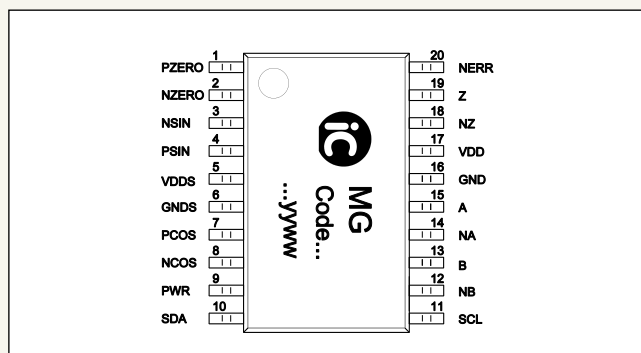
For the purpose of signal stabilization (to minimize the effects of temperature and aging), the conditioned signals are fed into the signal level controller which drives the transmitting LED of optical systems via the integrated 40 mA driver stage (output PWR). If MR sensors are connected this driver stage also powers the measuring bridges. If the control thresholds are reached this is signaled at alarm message output NERR (signal loss due to wire breakage, short circuiting, dirt or aging, for example).

iC-MG is protected against a reversed power supply voltage; the integrated supply switch for loads of up to 20 mA extends this protection to cover the overall system. The device is configured via an external EEPROM.

Pin Functions

No.	Name	Function
1	PZERO	Input Zero Signal +
2	NZERO	Input Zero Signal -
3	NSIN	Input Sine Signal -
4	PSIN	Input Sine Signal +
5	VDDS	Sub-system Positive Supply Output
6	GNDS	Sub-system Ground Output
7	PCOS	Input Cosine Signal +
8	NCOS	Input Cosine Signal -
9	PWR	Signal Level Controller Highside Output
10	SDA	Serial E2PROM Interface, data line
11	SCL	Serial E2PROM Interface, clock line
12	NB	S4 Incremental Output B - / Test Signal Output
13	B	S3 Incremental Output B + / Test Signal Output
14	NA	S2 Incremental Output A - / Test Signal Output
15	A	S1 Incremental Output A + / Test Signal Output
16	GND	Ground
17	VDD	+4.3 ... 5.5 V Supply Voltage
18	NZ	S6 Incremental Index Output Z - / Test Signal Output
19	Z	S5 Incremental Index Output Z + / Test Signal Output
20	NERR	Alarm Message Output, Config. Trigger Input

Pin Configuration TSSOP20 4.4 mm



Compatible Sensors

Photodiode arrays, AMR sensors, GMR sensors

Key Specifications

Inputs and Signal Conditioning	
Differential Input Signal Range	10 to 500 mVpp, 40 mVpp to 2 Vpp
Single-Ended Input Signal Range	20 mVpp to 1 Vpp, 80 mVpp to 4 Vpp
Input Current Range	+/- 10 μ A to +/- 300 μ A
Input Resistance	typ. 1.6 k Ω to 4.6 k Ω (I mode) typ. 20 k Ω or high imped. (V mode)
Permissible Input Frequency	to 200 kHz (20 kHz @ IPF x50)
Input Gain Range	0.5x to 25x and 2x to 100x
Gain Ratio Calibration Range	40 % to 250 % (sine vs. cosine)
Gain Calibration Step	1.5 %
Offset Calibration Range (based on calibration reference)	to +/- 100 %, +/- 200 %, +/- 600 %, +/- 1200 %
Offset Calibration Step	0.8 %, 1.6 %, 4.8 %, 10 % and 3.2 % to 37.4 % for index channel
Phase Calibration Range	+/- 20 ° (sin vs. cos)
Phase Calibration Step	0.65 °

Sine-to-Digital Conversion	
Conversion Rate	typ. 5 MSPS
Interpolation Factors	x1, x2, x4, x5, x10, x20, x25, x50
Angle Resolutions	4, 8, 16, 20, 40, 100, 200 steps/period
Angle Hysteresis	1.8° to 11.7°, ½ and 1 LSB
Absolute Angle Accuracy	2° max.
Relative Angle Accuracy	+/- 10 % edge vs. period
Angle Repeatability	typ. 0.1°

Incremental Outputs	
Drive Modes	push-pull, highside, lowside
Push-pull Drive Mode	RS422 to 100 Ω , +/- 20 mA
A/B Output Frequency	to 1.25 MHz
A/B Output Min. Phase Distance	200 ns to 1.6 μ s
Z Index Position	adjustable to any angle step
Z Index Length	90°, 180°, 270°, 360°

Signal Level Controller	
Control Modes	constant current, sine square, sum
Operating Ranges	to 5, 10, 25, 40 mA (short-circuit-proof)
Source Saturation Volt.	1 V max.
Control Alarm Thresholds	approx. 2 % and 100 % of range limit

Sub-System Power Switch	
Permissible Load Current	to 20 mA
Drop Out Voltage	200 mV per switch (@ 20 mA)

Other Operational Data	
Supply Voltage	single 4.3 to 5.5 V, 30 mA max. (no current draw with reversed polarity)
Operational Temp. Range	-25 °C to +100 °C (ext. -40 °C to +125 °C)
Package	TSSOP20 4.4 mm or bare die
Device Configuration	via I2C interface (EEPROM)
Monitoring and Alarms	lack of input signal (due to wire breakage, short-circuit, loss of magnet, etc.), excessive input signal level, signal level controller out of range, thermal overload, power up configuration error
Other Operational Modes	calibration and test modes

This tentative information shall not be considered as a guarantee of characteristics. Rights to technical changes reserved.