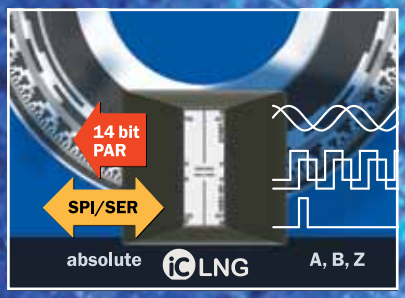
iC-LNG

16-BIT OPTICAL ENCODER WITH SPI AND SERIAL/PARALLEL OUTPUTS



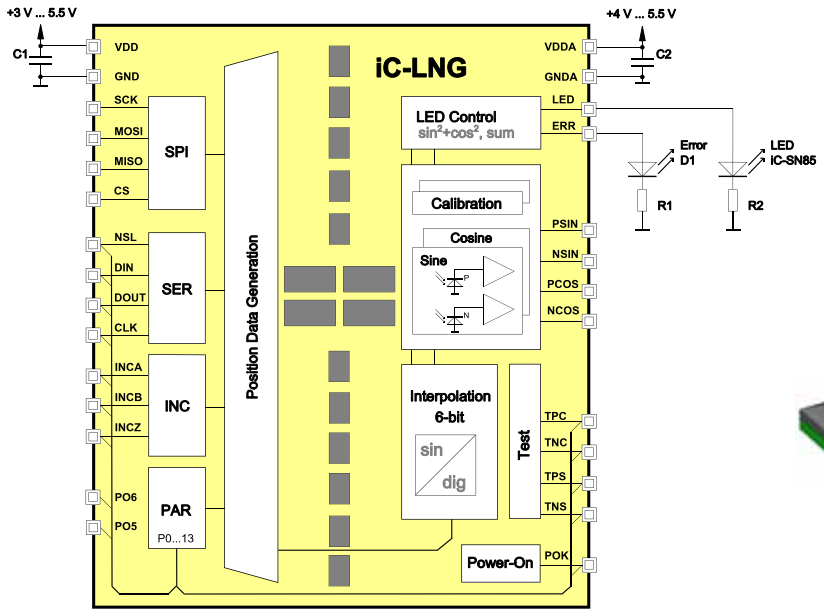
iC-LNG is an optoelectronic encoder IC for absolute linear and angle measuring systems. Photosensors, amplifiers, and comparators, an LED power control and an adjustable signal conditioning unit have been monolithically integrated into the device, as have the necessary interfaces for configuration and data output.

Applications

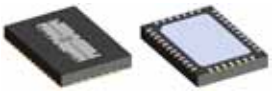
- Absolute position sensors
- Linear and rotary encoders
- Motion control

Features

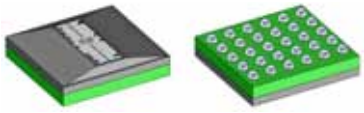
- Excellent matching and reliability thanks to integrated photosensors
- Very compact array size
- Gray code scanning by 11 digital tracks pitched at 400 µm
- Sin/cos track with adjustable signal conditioning
- Differential sin/cos outputs with 1024 CPR and 500 mVpk
- 6-bit flash interpolation for 16-bit singleturn resolution in real time
- Encoder quadrature signals with 1024, 2048, 4096, 8192, 16384 CPR
- Gated index signal, in phase with B low
- Parallel data output of 14 bits
- Serial data readout in 1 µs cycles at 16 MHz via a 14/16-bit shift register
- 3.3 V SPI interface for configuration and data output
- LED power control (mean or sin/cos square) with a 50 mA highside driver
- Permanent monitoring of RAM parity bits
- Alarm indication for configuration and illumination errors (end of life)
- Undervoltage detection
- 4 V to 5.5 V single supply operation, low power consumption
- Operating temperature range of -40 °C to 110 °C
- Available accessories:
  LED lamp and code discs (512 CPR, 1024 CPR)
- 30-pin optoBGA or 38-pin optoQFN package for SMT



38-pin optoQFN
5.0 mm x 7.0 mm



30-pin optoBGA LNB2C
7.6 mm x 7.1 mm



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SPI/SER

absolute

iC-LNG

16-BIT OPTICAL ENCODER WITH SPI AND SER/PAR OUTPUTS

iC-LNG derives the position data from an analog sine/cosine track and 10 or 11 Gray-coded digital tracks. Using the integrated 6-bit flash interpolator absolute position data of up to 16 bits can be generated in real time. Output is through an SPI interface, a fast shift register, or a 14-bit parallel interface.

iC-LNG also has incremental encoder quadrature signals with an index and conditioned sine/cosine signals from the analog track at its disposal. The number of pulses for the quadrature signals can be varied.

The integrated LED power control with a driver stage allows the transmitting LED to be directly connected and keeps the optical receive power constant with changes in temperature and throughout the device lifetime.

The chip is configured through the 3.3 V and 5 V-compatible SPI interface by an external microcontroller. Various error messages are provided for the monitoring of functions (illumination error, undervoltage error, and configuration error).

Pin Functions

Name	Function
VDD	+3 V to +5.5 V I/O Port Supply Voltage
GND	I/O Port Ground
VDDA	+4 V to +5.5 V Supply Voltage
GNDA	Ground
SCK	SPI Clock Input
MOSI	SPI Data Input
MISO	SPI Data Output
CS	SPI Chip Select
NSL	Shift Register Load / Parallel Output Bit 10
DIN	Shift Register Data Input / Parallel Output Bit 9
DOUT	Shift Register Data Output / Parallel Output Bit 8
CLK	Shift Register Clock Input / Parallel Output Bit 7
PO6	Parallel Output Bit 6
PO5	Parallel Output Bit 5
POK	Power OK Message / Parallel Output Bit 4
INCA	Incremental Output A / Parallel Output Bit 2
INCB	Incremental Output B / Parallel Output Bit 3
INCZ	Incremental Output Z / Parallel Output Bit 11
PSIN	Analog Voltage Output PSIN
NSIN	Analog Voltage Output NSIN
PCOS	Analog Voltage Output PCOS
NCOS	Analog Voltage Output NCOS
LED	LED Current Control (Highside Output)
ERR	Error Message Output
TPS	Test Input PSIN / Parallel Output Bit 1
TPC	Test Input PCOS / Parallel Output Bit 0
TNC	Test Input NCOS / Parallel Output Bit 13
TNS	Test Input NSIN / Parallel Output Bit 12

Key Specifications

General	
Supply Voltage	+4 V to +5.5 V, typ. 15 mA
I/O Port Supply Voltage	+3 V to +5.5 V
I/O Port Characteristics	CMOS/TTL compatible, ±2 mA @ 3.3 V, ±3.5 mA @ 5 V
LED Current Control	up to 50 mA
ESD Susceptibility	2 kV (HBM 100 pF, 1.5 kΩ)
Operational Temperature	-40°C to +110°C
Package (RoHS compliant)	30-pin optoBGA LNB2C (7.6 x 7.1 x 1.6 mm) 38-pin optoQFN (5.0 x 7.0 x 0.9)

Position Acquisition	
Singleturn Resolution	up to 16 bits / 360° @ sin/cos 1024 CPR up to 15 bits / 360° @ sin/cos 512 CPR
Absolute Angle Accuracy	±1 LSB @ 16 bits
Operating Speed	12,000 RPM @ full resolution

Interpolation	
Sin/Cos Input Frequency	up to 200 kHz
Resolution	6 bits (absolute outputs)
Interpolation Factors	x1, x2, x4, x8, x16 (incremental outputs)

Data Interfaces	
SPI	10 MHz, 3.3 V and 5 V, for configuration and position data
Serial Shift Register	up to 16 MHz, 14 bits or 16 bits
Parallel Outputs	up to 3.2 MHz, 14 bits
Incremental Outputs	A/B to 3.2 MHz, Z index in phase with B low
Sin/Cos Outputs	500 mVpk (calibrated), up to 200 kHz, load 1 mA max.

Available Accessories	
LED	iC-SN85 BLCC SN1C
Code Disc	LNG1S 42-1024 (glass 1mm, OD Ø 42.0 mm, ID Ø 18.0 mm, optical radius 17.6 mm, 1024 ppr) LNG2S 25-512 (glass 1mm, OD Ø 24.8 mm, ID Ø 2.0 mm, optical radius 8.8 mm, 512 ppr)