

iC-LV

5-BIT OPTICAL POSITION ENCODER WITH SERIAL/PARALLEL OUTPUT



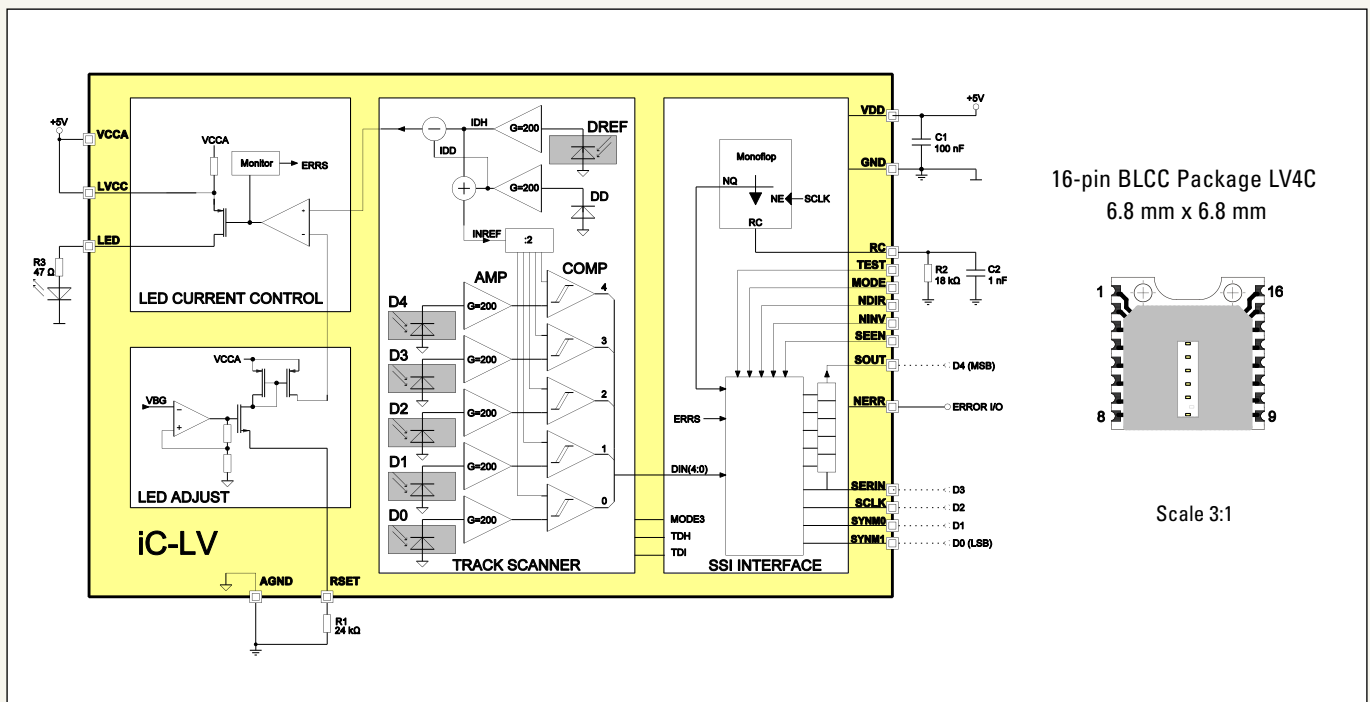
iC-LV is an optoelectronic encoder IC for absolute position sensing systems such as glass scales and rotary encoders, for example. Photosensors, amplifiers and comparators for 5 tracks at a pitch of 600 μm and a reference photosensor operating the LED power control are monolithically integrated on the chip.

Applications

- Scanning with constant light evaluation for optical encoders
- Low-resolution singleturn encoders
- Multiturn encoders

Features

- High synchronism and technical reliability due to monolithic construction featuring on-chip photosensors
- Scanning with constant light evaluation at a pitch of 600 μm
- Photocurrent amplifiers with a high cut-off frequency
- Adjustable illumination control with a 40 mA LED driver ensures constant receiver power
- Monitoring of safe operating range with alarm message (e.g. EOL message on LED control error)
- Serial data output via extended SSI interface
- Parallel 5-bit data output in Gray or binary code
- Adjustable MSB track phase selects Gray code direction
- Selectable all-track bit inversion
- Supports chain circuits of multiple devices including synchronization options
- Integrated test aids
- Single 4 to 5.5 V supply, low power consumption
- Extended operating temperature range of -40 to 125 $^{\circ}\text{C}$



iC-LV 5-BIT OPTICAL POSITION ENCODER

The internal comparator outputs switch to high when the amplified photocurrents exceed a given threshold. This threshold can be adjusted using an external resistor at RSET.

The resistor also establishes a setpoint for the LED current control which irrespective of temperature or the effects of aging keeps the optical receiver power constant. A watchdog generates an alarm message via the error output if the control range is exceeded.

Track information can be read out in parallel (either in Gray or binary code) or serially via an SSI protocol. Here, any number of iC-LVs can be cascaded and synchronized with one another; data is then output as a binary word (requiring Gray code discs). The serial data output can be complemented by an error bit. Electronic test modes can be selected by pin and permit a complete test of functions with the exception of the sensors.

Pin Functions

PAR No.	SER Name	Interface Mode Pin Function
1	RC	RC Network for SSI Monoflop (wiring is optional)
2	VCCA VDD LVCC	+4...+5.5 V Analog Supply Voltage +4...+5.5 V Digital Supply Voltage +4...+5.5 V LED Driver Supply Voltage
3	NINV	+4...+5.5 V LED Driver Supply Voltage
4	MODE	Operating Mode Selection Input
5	TEST	Test Mode Enable Input (high active)
6	RSET	LED Power Control Adjustment (wiring is optional)
7	NERR	Error Output (low active)
8	NDIR	Reversal of Rotation Dir. Input (low active) (Test Mode: Enable)
9	LED	LED Power Control Output (high-side current source)
10	GND AGND	Digital Ground Analog Ground
11	D4 SOUT	Data Output / Serial Data Output (SSI)
12	D3 SERIN	Data Output / Serial Data Input (SSI)
13	D2 SCLK	Data Output / Clock Input (SSI)
14	D1 SYNMO	Data Output / Synchronisation Mode Input (Test Mode: Current Input)
15	D0 SYNMI	Data Output / Synchronisation Mode Input (Test Mode: Current Input)
16	SEEN	Gray-to-binary Conversion / Serial Error Bit Enable (No Sync Mode), Configuration of Phase Shift (Sync Out Mode, SSI Out Mode)

Key Specifications

General	
Supply Voltage	single 4 V to 5.5 V
Supply Current	typ. 2 mA
ESD Susceptibility	2 kV (HBM 100 pF, 1.5 kΩ)
Operational Temperature Range	-20 °C to +90 °C (-40 °C to +125 °C optional)
LED Power Control	40 mA max. (highside current source output)
Chip size	1.68 mm x 3.5 mm
Package	16-pin BLCC LV4C (6.8 mm x 6.8 mm x 1.7 mm)
Package Options	BMST, customized COB systems

Position Acquisition	
Max. Singleturn Resolution	5 bits / 360° (32 CPT) or 4+1 bits / 360° (synchronization modes)
Max. Multiturn Resolution	12 bits (3x iC-LV), 24 bits (6x iC-LV)
Max. Operating Speed	12,000 RPM (mode SSI Out, 200 kHz clock rate, 3x iC-LV)

Data I/O	
Serial Two-Wire Interface	up to 2 MHz, SSI compatible
Parallel Data Output	5 bits, to 100 kHz, +/- 4 mA, CMOS levels

Operational Functions	
Device Configuration	by pin
Parameterization	output data formats (parallel, serial, error bit), encoding, MSB bit inversion, code inversion
Monitoring & Alarm	illumination error (end of life)
Test Modes	analog sensor stimulation

Serial Operational Modes	
Name	Shift Data Format
No Sync	5(+1)-bit Gray coded (option: error bit)
No Sync Binary	5-bit binary coded
Sync Out	4-bit binary coded, corrected by +/- 1
SSI Out	4-bit binary coded, corrected by +/- 1

Application Examples

