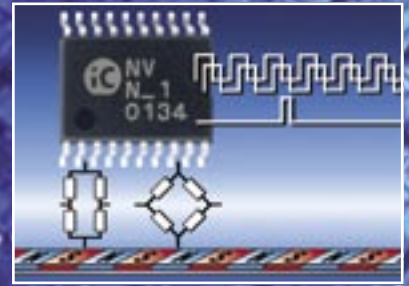# iC-NV
6-BIT SIN/D FLASH CONVERTER

iC-NV is a monolithic A/D converter which generates incremental encoder quadrature signals (A, B, Z) from sine/cosine input signals. The converter operates on the flash principle with fast single comparators. The back-end signal processing circuit includes a no-delay glitch filter which can be adjusted by an external resistor (optional), so that only clearly countable incremental signals are output.

Nine different interpolation factors between 1 and 16 are selectable by pin, giving a maximum resolution of 64 angle steps per input period. The phase relation between the input signals and the A/B outputs is reversible.
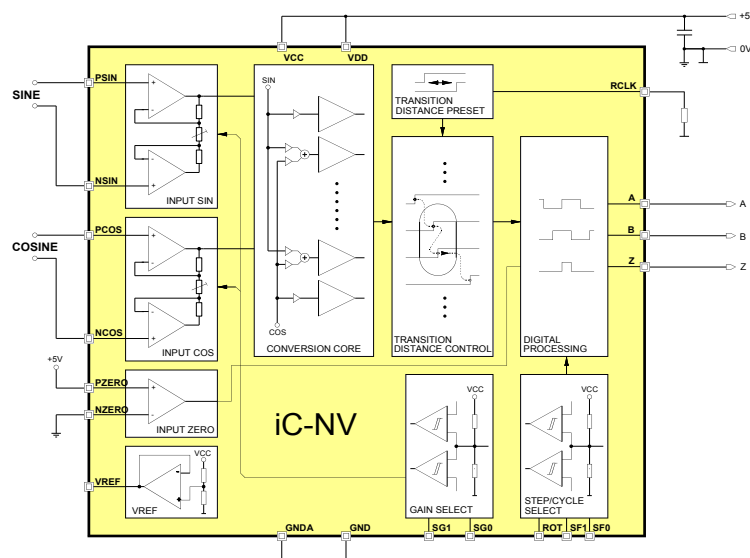
Applications

– Interpolator IC for position data acquisition from analog sine/cosine sensors
– Optical and MR linear/rotary encoder
– Motion control, robotics, brushless DC motor commutation, power tools

Features

– Resolution of up to 64 angle steps per sine/cosine period (binary and decimal interpolation factors from 1 to 16)
– Fast flash conversion permits 200 kHz input frequency
– Input instrumentation amplifiers with pin-selectable gain
– Direct connection of sensor bridges without external components
– Operates from 20 mVpp to 1.3 Vpp sensor signals
– Output of encoder quadrature signals of up to 3.2 MHz

– Fail-safe counting by adjustable no-delay glitch filter (controlled minimum transition distance)
– Selectable A/B output phase
– Index signal processing
– Sensor calibration supportable by analog/digital test signals
– Low power consumption from a single 5 V supply
– ESD protection and TTL-/CMOS-compatible outputs
– All settings are pin selectable

The device generates an index/zero pulse dependent on the sine/cosine input signals and the set resolution; the release inputs PZERO/NZERO choose the signal period for which the index is output to pin Z. Alternatively, the converter MSB can also be output here for synchronization purposes in an absolute measuring system.

The input amplifiers are configured as instrumentation amplifiers and permit sensor bridges to be directly connected without the need for external resistors. The input gain is pin-selectable to suit standard sensor signals of between ca. 20 mVpp and 1.3 Vpp (single-ended to 2.6 Vpp). If a sensor requires calibration, with regard to offset for example, various test functions can be activated. This makes the amplified sensor signals available at the outputs, for instance.

Pin Functions

No.	Name		Function
1	PCOS		Input Cosine +
2	NCOS		Input Cosine −
3	SG1		Gain Selection Input
4	SG0		Gain Selection Input
5	VREF		Reference Voltage Output
6	ROT	S6	A/B Phase Selection Input / Test Signal Output
7	SF1	S5	Resolution Selection Input / Test Signal Output
8	SF0	S4	Resolution Selection Input / Test Signal Output
9	GND		Ground (digital)
10	Z (MSB)	S3	Index Signal Output Z (MSB Output when ROT= open) / Test Signal Output
11	B	S2	Incremental Output B / Test Signal Output
12	A	S1	Incremental Output A / Test Signal Output
13	VDD		+5 V Supply Voltage (digital)
14	RCLK		Min. Transition Distance Preset Input (use is optional; alternatively can be wired to VCC)
15	VCC		+5 V Supply Voltage (analog)
16	GNDA		Ground (analog)
17	PZERO		Index Signal Enable Input +
18	NZERO		Index Signal Enable Input −
19	PSIN		Input Sine +
20	NSIN		Input Sine −

Pin Configuration TSSOP20
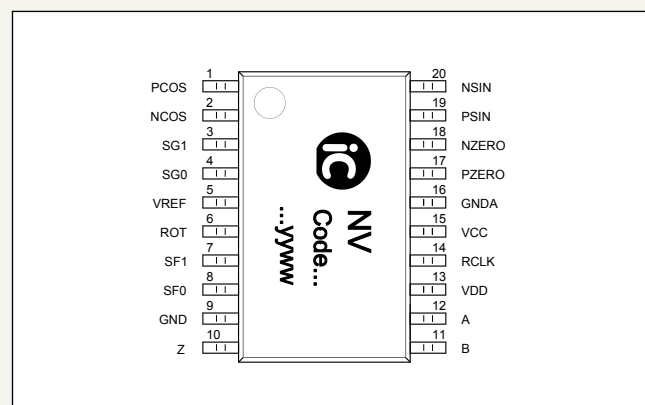
Key Specifications

General Operational Data

Supply Voltage	single 5 V +/- 10 %, 20 mA max.
Operational Temperature Range	-25 °C to +85 °C (ext. -40 °C to +125 °C)
Device Configuration	by pins
Test Modes	digital and analog calibration modes, up/down counter signals
Package	TSSOP20 4.4 mm (6.5 mm x 6.4 mm) or bare die

Signal Amplifier

Input Signal Range	20 mVpp to 1.3 Vpp, differential 30 mVpp to 2.6 Vpp, single-ended
Input Gain	3x to 66x
Max. Input Frequency, Example	200 kHz (at 16-fold interpolation)
Index Signal Enable Input	0 to 5 V

Sine-to-Digital Conversion

Conversion Rate	typ. 30 ns flash conversion
Interpolation Factor	1, 2, 3, 4, 5, 8, 10, 12, 16
Angle Resolution	4, 8, 12, 16, 20, 32, 40, 48, 64 angle steps/period
Angle Hysteresis	5.625° to 9° (depending on interpolation factor selected)
Absolute Angle Accuracy	1°
Relative Angle Accuracy	+/- 10 % edge vs. period

Incremental Signal Outputs

A/B Quadrature Outputs	to 6 MHz, +/- 6 mA, CMOS levels
A/B Output Min. Transition Distance	35 ns to 7 µs (adjustment range depending on interpolation factor selected)
A/B Output Phase	A leads B or vice versa
Index Signal Position	typ. 45°
Index Signal Length	90° of A/B period

Application Examples

Magnetic encoder

Optical encoder