ChipEncoder™

SMT Encoder for High Performance, High Volume Designs

Small Size

7.0mm (W) x 11.0mm (L) x 3.1mm (H)

High Resolution

Linear: 10µm or 1µm per quadrature count

Rotary: 3,300 to 327,000 quadrature counts per revolution, dependent on scale diameter

Digital three channel differential output: A, B, and index window

Low Cost

Integration in your PC board design reduces cost through streamlined, automated manufacturing

ChipEncoder Reflective Surface Mount Encoder

The CE300 ChipEncoder is a modular SMT kit encoder system that combines small size with high resolution.

Now high performance digital closed-loop motion control is possible and affordable for your high volume product designs. The optical, non-contact system consists of either a linear or rotary glass scale and a BGA packaged sensor head that you integrate into your own PCB design. Based on a 40µm pitch diffractive scale, the system's integral interpolation electronics can deliver up to 1µm linear resolution at high speed. The total cost of the ChipEncoder is low because it is integrated into your PC board for minimal systems parts count and automated pick and place manufacturing.

Benefits

- ChipEncoder breaks the price performance barrier to open new possibilities for your motion control designs

- Integrates with other components on your PC board for lowest total system cost; designed for low cost automated PC board assembly
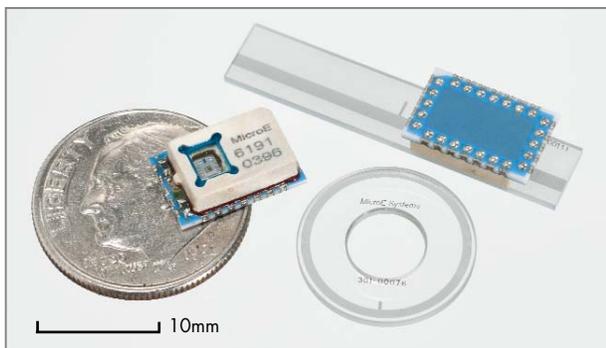
ChipEncoder compared to USA 10 cent coin.

- High resolution with on-board interpolation and digital output improves motion system accuracy and stability

- High speed capability enhances motion system performance

- Non-contact design for high reliability

- Small size enables ultra-miniature, low cost motion control

Features

- Compact total system height

- 24 pin ceramic BGA package

- Side castellated for electrical testing

- Broad alignment tolerances

- Digital quadrature output in differential pairs

- 40µm wide Index Window output in differential pair

- Two interpolation depths, x4 (CE300-4)
                            x40 (CE300-40)

- Linear resolution of 10µm or 1µm

- Rotary resolutions between 3,300 and 327,000 quadrature counts per revolution depending on scale diameter and interpolation depth

- 360kHz analog bandwidth yielding a top linear speed of 14m/s and rotary speed of 26,200 RPM

- RoHS compliant

- Linear and rotary glass scales available in a variety of standard lengths and diameters

- Custom scales available upon request

- Pre-mounted evaluation kits available

ChipEncoder™
Ideal for These Applications:

|		
Replacing Traditional Encoders	ChipEncoder Replaces / Conventional Encoder Sensor	If you need higher resolution than your present encoder can achieve, but you can't meet your performance and cost targets with a traditional encoder, the ChipEncoder is your best solution.
Replacing Packaged Encoders	ChipEncoder Replaces / Conventional Packaged Rotary Encoders	If you need to reduce the size of your system without sacrificing performance, start by replacing your packaged rotary encoder. Packaged encoders are large, bulky, and introduce coupling error. High-performance kit encoders are smaller, but they often cost too much. The Chip Encoder is your best solution.
Improving Stepper Motor Performance	ChipEncoder Improves / Stepper Motor Performance	If you need to improve stepper motor micro-stepping stability and accuracy, or verify position accuracy, you need to add an encoder to get better performance. The problem is cost and size. The ChipEncoder is your best solution.
Closing the Motion Loop in High Volume Designs	ChipEncoder Adds Closed-Loop Performance To High-Volume Open-Loop Designs	If you need accuracy and repeatability in your miniature open loop motion platform, you need an encoder for closed loop control. The ChipEncoder is your best solution. It is low cost, high-performance and tiny.
Adding Low Cost Closed Loop Motion Control to New Designs	ChipEncoder Adds Low-Cost Motion Control to High-Volume Applications	If your new product design requires a tiny encoder for high-resolution position feedback at an affordable cost, you don't have to invent your own encoder to meet your cost and performance objectives. The ChipEncoder is your best solution.

ChipEncoder™
## Linear and Rotary Configurations

Linear Configuration

ChipEncoder

Linear Scale

C/L
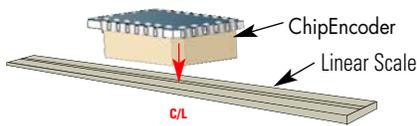
See *www.microesys.com* for interface drawings.

Rotary Configurations

C/L

Low as 5.26mm*

ChipEncoder

1.25mm Air Space

Rotary Scale

C/L
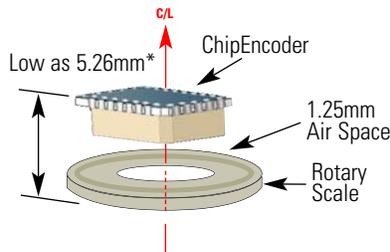
* Depending on scale selected

Profile of the ChipEncoder with a 12mm rotary scale - achieve up to 26,000 RPM and resolutions from 3300 to 33,000 CPR in this tiny package!


14.3mm
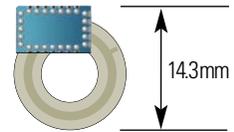
Linear and Rotary Scales

Standard and Custom Designed for Your Application

MicroE Systems offers a wide array of linear and rotary scales, all with built-in index marks. We also offer hubs for use with our rotary scales. If your application requires custom scales or hubs in OEM quantities, contact the factory for pricing and delivery.

CE300-4
CE300-40
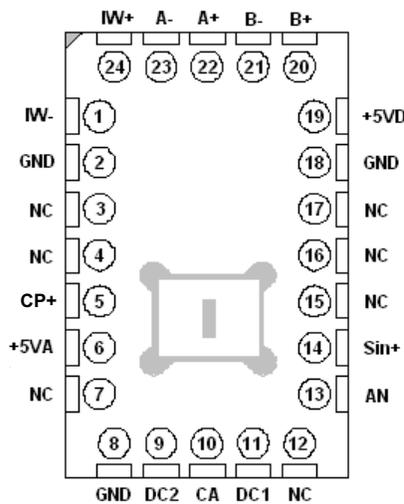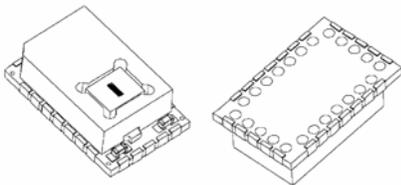
Above: Top view, through package.

Pin Configurations

Pin Name	Function
A+	A Quadrature Channel
A-	
B+	B Quadrature Channel
B-	
IW+	Index Window Channel
IW-	
Sin+	Sinusoidal Alignment Reference
AN	Laser Anode
CA	Laser Cathode
DC1	Reference Threshold 1
DC2	Reference Threshold 2
CP+	Raw Index Signal

ChipEncoder™
Specifications

Parameter	CE300-4	CE300-40
Power Supply	5 ±0.5 Volts DC	5 ±0.5 Volts DC
Current Draw (unterminated outputs)	30mA	30mA
Output Signals	CMOS/TTL	CMOS/TTL
Output Format	Differential Quadrature	Differential Quadrature
Output Impedance (per channel)	60Ω	60Ω
Operating Temp.	0 to +70°C	0 to +70°C
Storage Temp.	-20 to +85°C	-20 to +85°C
Max Lead-free Reflow Temp.†	260°C for < 5 seconds	260°C for < 5 seconds
Humidity (RH non-condensing)	10 to 90%	10 to 90%
Shock	300G (0.40ms half sine)	300G (0.40ms half sine)
Vibration	30G @ 20Hz	30G @ 20Hz
Lifetime (MTTF)	100,000 hours	100,000 hours
Interpolation Depth	x4	x40
Linear Resolution	10µm	1µm
Rotary Resolution (CPR)	See Page 7	See Page 7

† See Installation Manual at www.microesys.com/chipencoder for important handling, solder paste and reflow profile recommendations

CE300-4 (x4)*

CE300-40 (x40)*

φ = quadrature phasing = 90°±30% (both models)
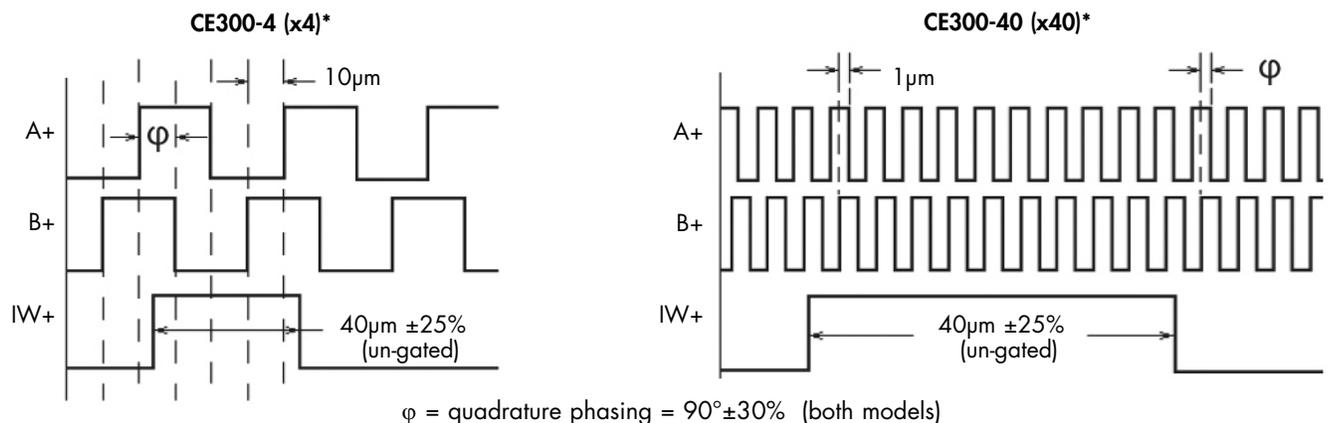
* Negative phases omitted for clarity

ChipEncoder™
Electrical Interface
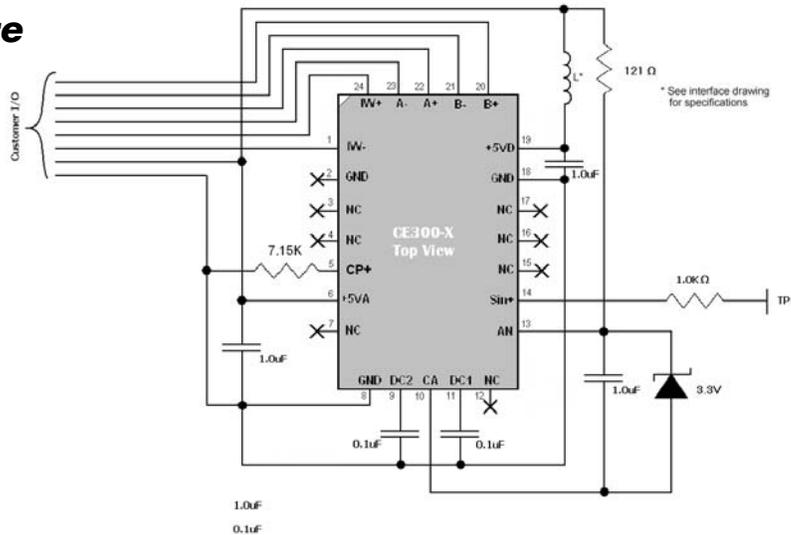
Component Dimensions

inches [mm]

.122[3.10]

Standoff: .049[1.25]

.433[11.00]

.24[6.1]

.275[6.99]

.36[9.1]
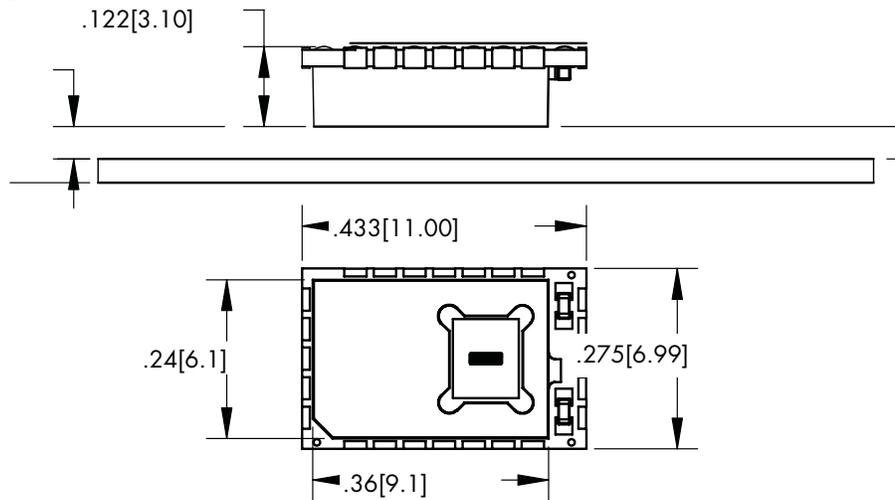
Complete interface drawings available at
www.microesys.com/chipencoder

Evaluation PCB

10 PIN ZIF CONNECTOR	
PINOUTS	
1	+5V
2	GND
3	IW-
4	IW+
5	A-
6	A+
7	B-
8	B+
9	NC
10	SIN+
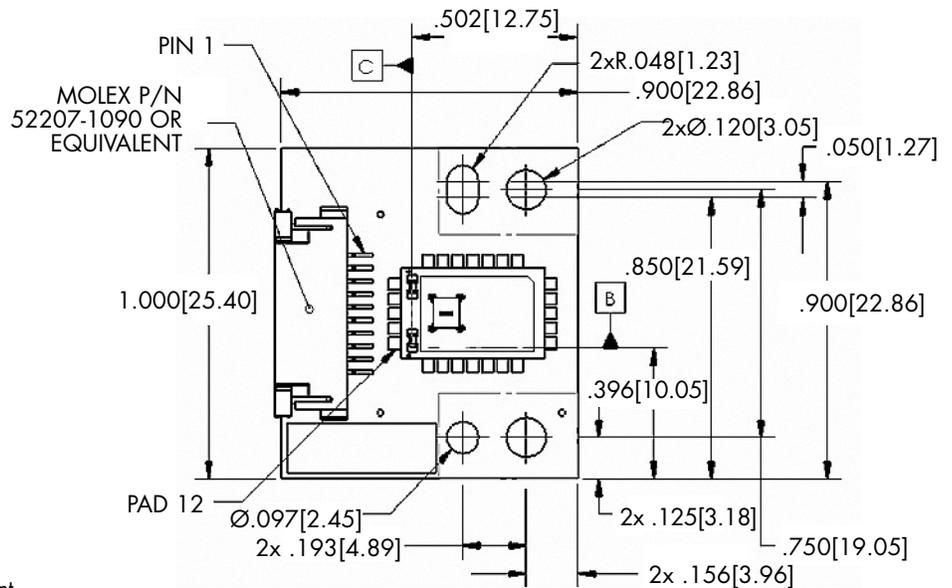
Evaluation PCB is available in limited
quantity to aid in engineering development
and is not intended for use in OEM products.

PIN 1

MOLEX P/N
52207-1090 OR
EQUIVALENT

1.000[25.40]

PAD 12

.502[12.75]

2xR.048[1.23]

.900[22.86]

2xØ.120[3.05]

.050[1.27]

.850[21.59]

.900[22.86]

.396[10.05]

Ø.097[2.45]

2x .193[4.89]

2x .125[3.18]

2x .156[3.96]

.750[19.05]

See *www.microesys.com* for interface drawings with complete mounting dimensions.

ChipEncoder™
Linear Scales
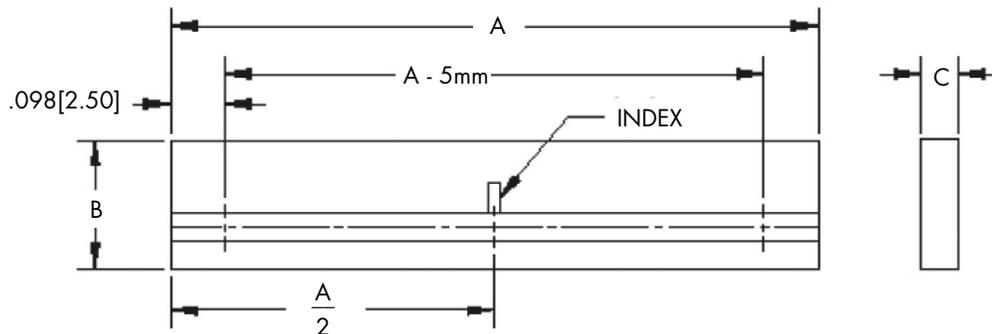
Scale Model	A	B	C
L18CE	0.709[18.00]	0.236[6.00]	0.036[0.91]
L30CE	1.181[30.00]	0.236[6.00]	0.036[0.91]
L55CE	2.165[55.00]	0.236[6.00]	0.036[0.91]
L80CE	3.150[80.00]	0.236[6.00]	0.036[0.91]
L130CE	5.118[130.00]	0.236[6.00]	0.036[0.91]
L155CE	6.102[155.00]	0.236[6.00]	0.098[2.50]
L325CE	12.795[325.00]	0.236[6.00]	0.098[2.50]

(inches [mm])

Features

- 40µm diffraction pattern
  - 10µm resolution with the CE300-4
  - 1µm resolution with the CE300-40
- Maximum speed = 14.4m/s
- Center index mark
- Scales are chrome patterns printed on B240 glass (CTE = 9.4ppm/°C)
- Usable measuring length is 5mm less than total length
- Temporary clamp kits to facilitate epoxy mounting
- Optional pressure sensitive adhesive tape for permanent mounting
- Custom scale lengths, materials and index locations available

ChipEncoder™
Rotary Scales
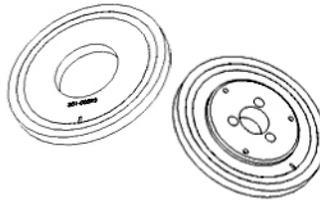
Scale	Fundamental CPR	Max Speed RPM	Resolution, CE300-4			Resolution, CE300-40		
			CPR	μrad	arc-sec	CPR	μrad	arc-sec
R1206CE	825	26,200	3300	1900	393	33,000	190	39.3
R1506CE	1024	21,100	4096	1530	316	40,960	153	31.6
R1910CE	1250	17,280	5000	1260	259	50,000	126	25.9
R3213CE	2048	10,550	8192	767	158	81,920	76.7	15.8
R5725CE	4096	5270	16,384	383	79.1	163,840	38.3	7.9
R10851CE	8192	2640	32,768	192	39.6	327,680	19.2	4.0

A
B
D
MACHINE AXIS
ØE
MOUNTING HOLE AND THREAD F, EO, SPACED ON BOLT CIRCLE ØG
C
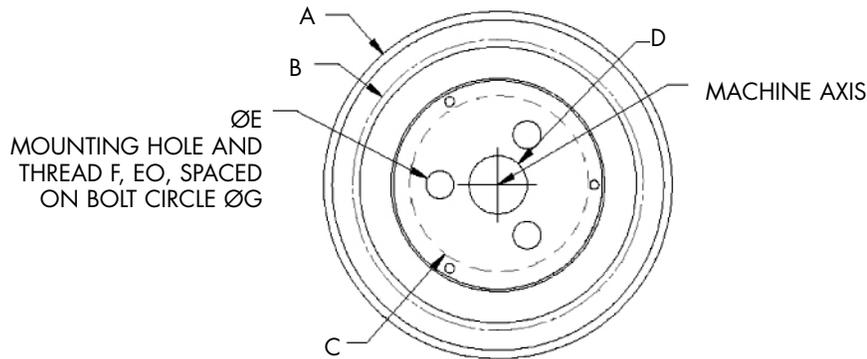
Scale Only	A (OD)	B (CPR)	C (ID)	Glass Thk.	Scale w/ Optional Hub	D (Hub ID)	E (Dia.)	F (Thread)	G (BCD)
R1206CE	0.472[12.00]	825	0.250[6.35]	0.036[0.91]	R1206CE-HF	0.125[3.18]	n/a	n/a	n/a
R1506CE	0.571[14.50]	1024	0.250[6.35]	0.036[0.91]	R1506CE-HF	0.125[3.18]	n/a	n/a	n/a
R1910CE	0.750[19.05]	1250	0.375[9.53]	0.092[2.34]	R1910CE-HG	0.125[3.18]	0.047[1.19]	0-80	0.250[6.35]
R3213CE	1.250[31.75]	2048	0.500[12.70]	0.092[2.34]	R3213CE-HH	0.250[6.35]	0.070[1.78]	2-56	0.370[9.40]
R5725CE	2.250[57.15]	4096	1.000[25.4]	0.092[2.34]	R5725CE-HC	0.500[12.70]	0.136[3.45]	8-32	0.750[19.05]
R10851CE	4.250[107.95]	8192	2.000[50.80]	0.092[2.34]	R10851CE-HD	1.000[25.40]	0.136[3.45]	8-32	1.375[34.80]

(inches[mm])

Features

- Scales are chrome patterns printed on B240 glass (CTE = 9.4ppm/°C)
- Optional hubs are 303/304 stainless steel (CTE = 17ppm/°C)
- For factory mounted scales, optical patterns are centered to within 0.002" of the hub ID
- Custom OD, ID, CPR and materials are available

ChipEncoder™
Ordering Information

To specify your ChipEncoder with the desired scale, consult the chart below to create the correct part number. Call MicroE Systems' Rapid Customer Response team for more information at 781-266-5700.

CE300 - XX - X - XXXX - X

Interpolation
4 = x4
40 = x40

Eval PCB
PCB = mounted to evaluation PCB[1]
(leave blank for unmounted chips)

Scale Model
L18CE = 18mm linear
L30CE = 30mm linear
L55CE = 55mm linear
L80CE = 80mm linear
L130CE = 130mm linear
L155CE = 155mm linear
L325CE = 325mm linear
R1206CE = 12mm OD rotary
R1506CE = 14.5mm OD rotary
R1910CE = 19.05mm OD rotary
R3213CE = 31.75mm OD rotary
R5725CE = 57.15mm OD rotary
R10851CE = 107.95mm OD rotary

Scale Mounting
For linear scales:
T = Tape
C1 = 3 clamps[2]
C2 = 10 clamps[3]

For rotary scales:
NH = No hub
HF = 12mm & 15mm OD
HG = 19.05mm OD
HH = 32.13mm OD
HC = 57.15mm OD
HD = 107.95mm OD

[1] 1-9 quantities only
[2] 3 clamps for scales up to 130mm
[3] 10 clamps for scales 155mm or longer

Examples
Linear encoder evaluation kit: CE300-40-PCB-L30CE-T
Rotary encoder: CE300-4-R5725-HC

Packaging

CE300 Components are provided in SMT tape in all quantities. Orders ≥ 100 pieces are supplied on a reel with a 100mm leader (250 pieces per reel maximum). *See the CE300 Installation Manual for important ESD handling precautions.*

Dimensions in mm

MicroE Systems – World Headquarters: 125 Middlesex Turnpike • Bedford • MA 01730
www.microesys.com • info@microesys.com • T. [781]-266-5700 • F. [781]-266-5112

DS-ChipEncoder-CE300 Rev G © 2011 MicroE Systems

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