

NANO



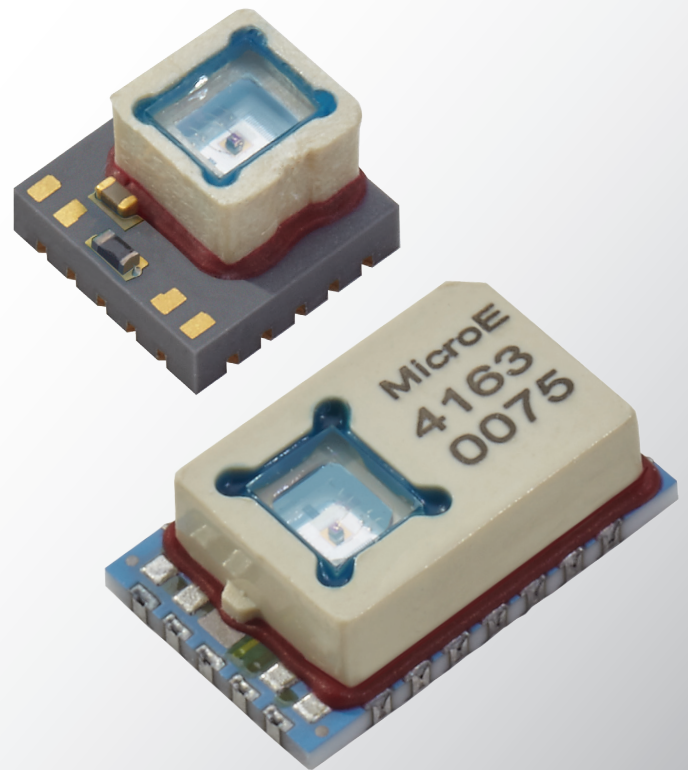
MicroE
Encoders

PRODUCT DATA SHEET

ChipEncoder™ Series

SMT Encoders for
High Performance,
High Volume Designs

ChipEncoder models feature built-in interpolation and mount directly on your printed circuit board, providing significant space and cost savings through design integration.



CE Actual Size



6 x 6 mm

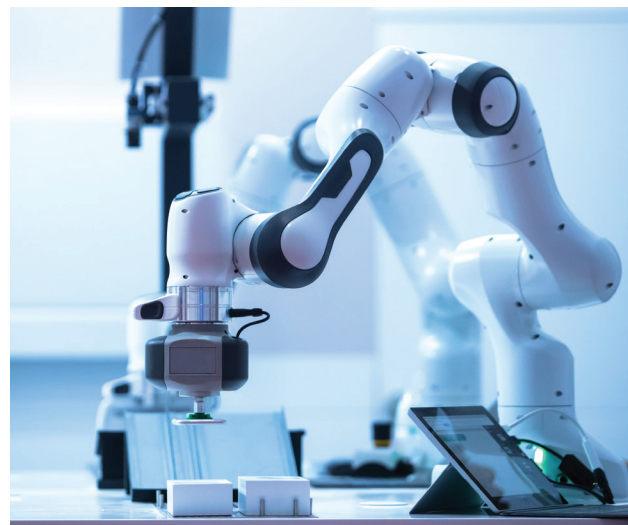
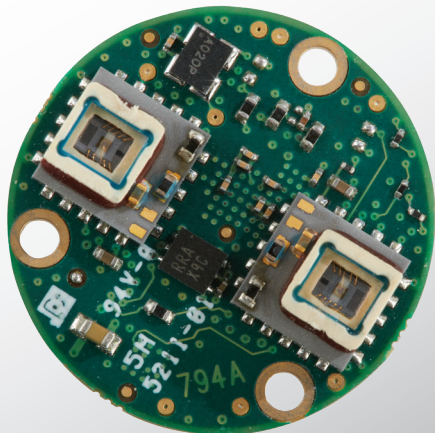
CE300 Actual Size



7 x 11 mm

ChipEncoder™ Series Encoders

SMT Encoders for High Performance, High Volume Designs



Small, Low Cost, High Resolution.

The CE300 and CE ChipEncoders are modular SMT kit encoder systems that combine small size with high resolution making high performance digital closed-loop motion control 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 40 µm pitch diffractive scale, the system's integral interpolation electronics can deliver up to 1 µm linear resolution at high speed. The total cost of the ChipEncoder is low because it is integrated into your PCB board for minimal systems parts count and automated pick and place manufacturing.

Benefits

- Integrates with other components on your PCB board for lowest total system cost; designed for low cost automated PCB board assembly
- 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

Specifications

Dimensions:	6.1 x 6.1 x 3.9 mm (CE) 11.0 x 7.0 x 3.1 mm (CE300)
Interfaces:	A-quadr-B digital
Resolution:	10 µm or 1 µm (linear) 3,300 CPR – 327,680 CPR (rotary)
Accuracy Class:	± 1 µm (linear glass) ± 2 arc-seconds (rotary)
Input Voltage:	5 VDC ± 0.5
Supply Current:	30 mA, unterminated outputs
Max Speed:	14 m/s
Index:	40 µm Window
Outputs:	A-quadr-B, Index
Operating Environment:	Atmospheric
Scale Pitch:	40 µm
Repeatability: (Hysteresis)	1 ± 1 LSB
Weight:	0.37 g (CE300), 0.25 g (CE)
Grating Compatibility:	Linear and Rotary (glass only)

Specifications subject to change.

RoHS
CE

ChipEncoder™ Series

SMT Encoders for High Performance, High Volume Designs

Specifications

System

Scales

ChipEncoders are compatible with ChipEncoder Linear and Rotary Glass Scales

Scale Pitch 40 μm

System Resolution	CE300-4	CE300-40	CE-40GC
Linear Resolution:	10 μm	1 μm	1 μm
Rotary Resolution:		See Page 12	
Interpolation Depth:	x4	x40	x40

Accuracy

Linear Glass $\pm 5 \mu\text{m}/\text{m}$
Rotary Glass $\pm 2 \text{ arc-seconds}^1$

Size and Weight

Dimensions (mm):	Width	Length	Height
CE300:	7.0	11.0	3.1
CE:	6.1	6.1	3.9
Weight:			
CE300:	0.37 g		
CE:	0.25 g		

Note

1. Excludes eccentricity

Operating and Electrical Specifications

Power Supply 5 V_{DC} $\pm 0.5 \text{ V}_{\text{DC}}$
Current Draw: 30 mA, unterminated outputs

Temperature
Operating: 0°C to 70°C
Storage: -20°C to 85°C (CE300)
-20°C to 100°C (CE)

Max Lead-Free Reflow Temperature 260°C for <5 seconds

Humidity
Operating: 10% to 90% RH, non-condensing

Vibration 30 G @ 20 Hz; EN60068-2-6

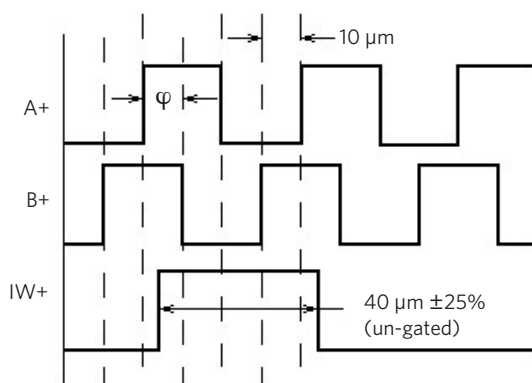
Shock 300 G (0.40, half sine) CE300
100 G (11 ms, half sine) CE

Reliability (MTTF) 100,000 Hours

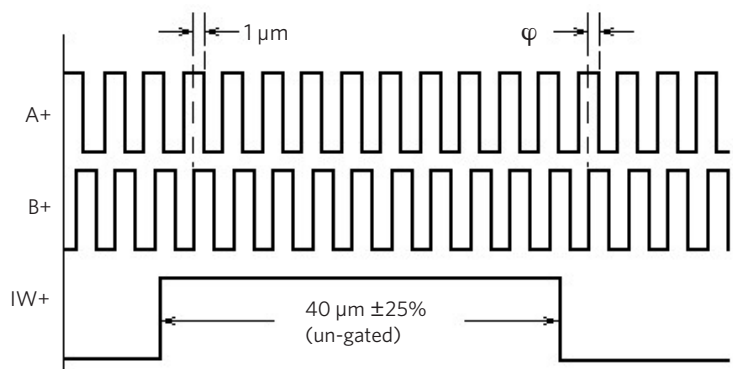
Outputs Signals: CMOS/TTL
Format: Digital - differential quadrature
Output impedance per channel = 60 Ω

Output Signals

**CE300-4
(x4 interpolation)***



**CE300-40, CE-40GC
(x40 interpolation)***



*Negative phases omitted for clarity

ϕ = quadrature phasing = $90^\circ \pm 30\%$

ChipEncoder™ Series

SMT Encoders for High Performance, High Volume Designs

Alignment Tolerances

Broad Alignment Tolerances

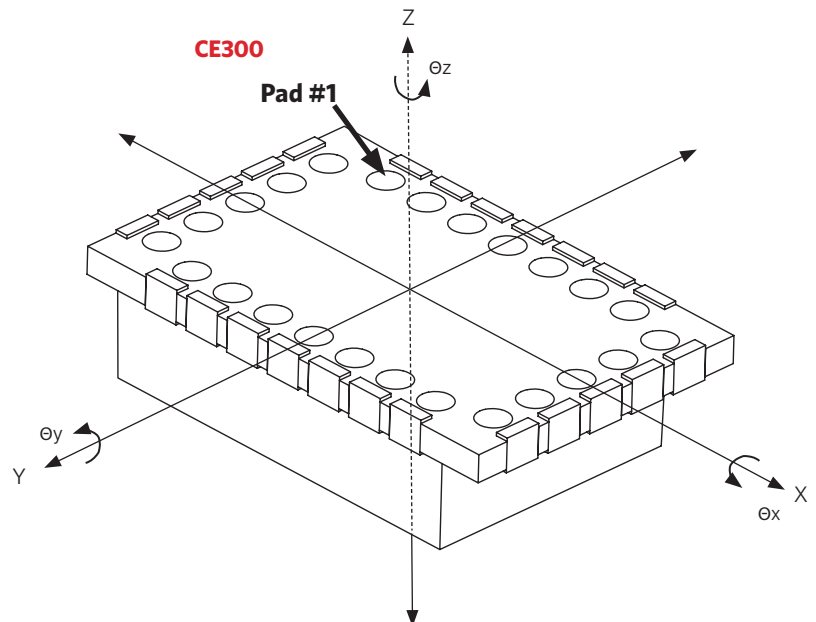
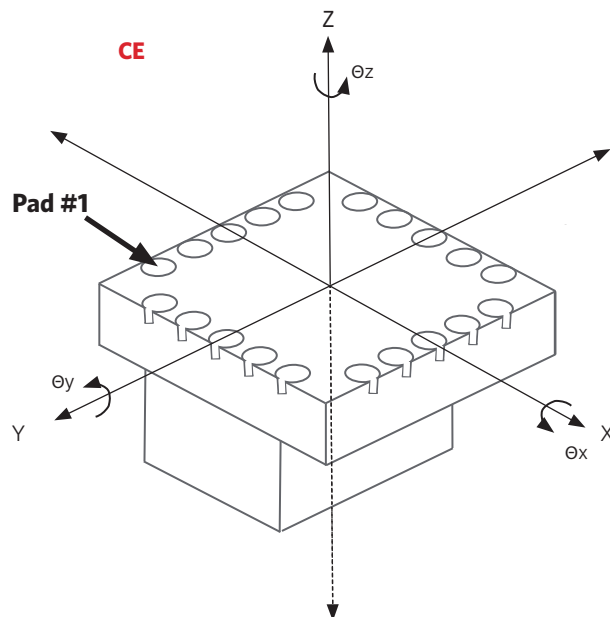
Encoder Mounting with Linear Scales

AXIS	ALIGNMENT TOLERANCE
X	Direction of motion
Y	$\pm 0.008"$ (0.20 mm)
Z	$\pm 0.010"$ (0.25 mm)
θ_x	$\pm 1.5^\circ$
θ_y	$\pm 1.5^\circ$
θ_z	$\pm 2.0^\circ$

Encoder Mounting with Rotary Scales

AXIS	ALIGNMENT TOLERANCE
X	$\pm 0.004"$ (0.10 mm)
Y	$\pm 0.004"$ (0.10 mm)
Z	$\pm 0.010"$ (0.25 mm)
θ_x	$\pm 1.5^\circ$
θ_y	$\pm 1.5^\circ$
θ_z	$\pm 2.0^\circ$

Alignment Axes



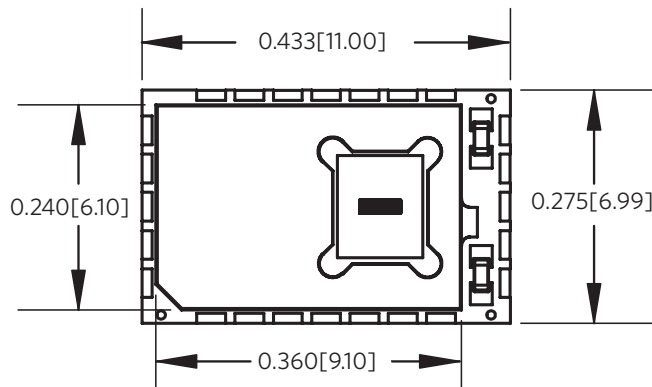
ChipEncoder™ Series

SMT Encoders for High Performance, High Volume Designs

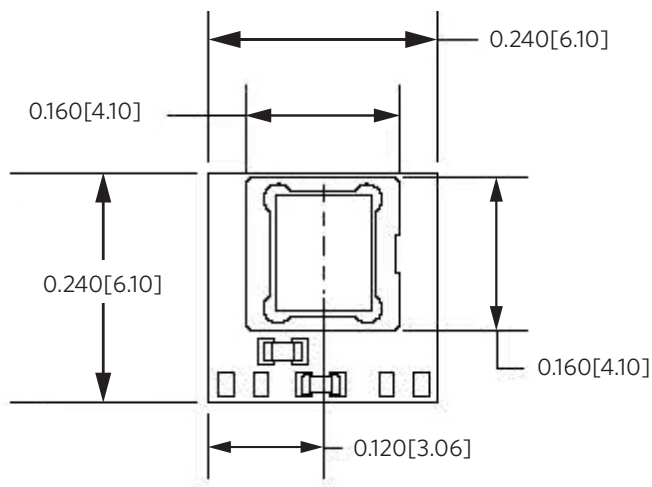
Component Dimensions

Units: inches [mm]

CE300



CE



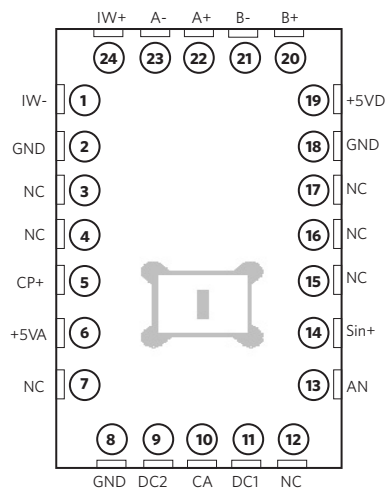
ChipEncoder™ Series

SMT Encoders for High Performance, High Volume Designs

Pad Configurations

(Top view, through package)

CE300

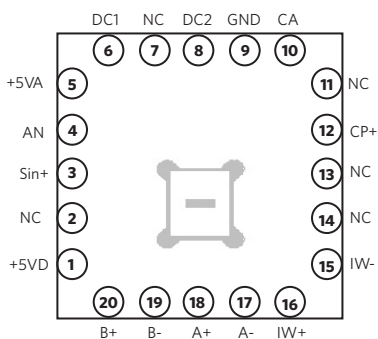


CE300 Pad Configuration

PAD NUMBER	SIGNAL	FUNCTION
1	IW-	Index Window Channel
2	GND	Ground
3	NC	No Connect
4	NC	No Connect
5	CP+	Raw Index Signal
6	+5VA	Supply Voltage
7	NC	No Connect
8	GND	Ground
9	DC2	Reference Threshold 2
10	CA	Laser Cathode
11	DC1	Reference Threshold 1
12	NC	No Connect

PAD NUMBER	SIGNAL	FUNCTION
13	AN	Laser Anode
14	Sin+*	Sinusoidal Alignment Reference
15	NC	No Connect
16	NC	No Connect
17	NC	No Connect
18	GND	Ground
19	+5VD	Supply Voltage
20	B+	B Quadrature Channel
21	B-	B Quadrature Channel
22	A+	A Quadrature Channel
23	A-	A Quadrature Channel
24	IW+	Index Window Channel

CE



CE Pad Configuration

PAD NUMBER	SIGNAL	FUNCTION
1	+5VD	Supply Voltage
2	NC	No Connect
3	Sin+*	Sinusoidal Alignment Reference
4	AN	Laser Anode
5	+5VA	Supply Voltage
6	DC1	Reference Threshold 1
7	NC	No Connect
8	DC2	Reference Threshold 2
9	GND	Ground
10	CA	Laser Cathode

PAD NUMBER	SIGNAL	FUNCTION
11	NC	No Connect
12	CP+	Raw Index Signal
13	NC	No Connect
14	NC	No Connect
15	IW-	Index Window Channel
16	IW+	Index Window Channel
17	A-	A Quadrature Channel
18	A+	A Quadrature Channel
19	B-	B Quadrature Channel
20	B+	B Quadrature Channel

Note

*See **Technical Note 1104: Alignment of the ChipEncoder Series Product** for using Sin+ for optimal alignment.

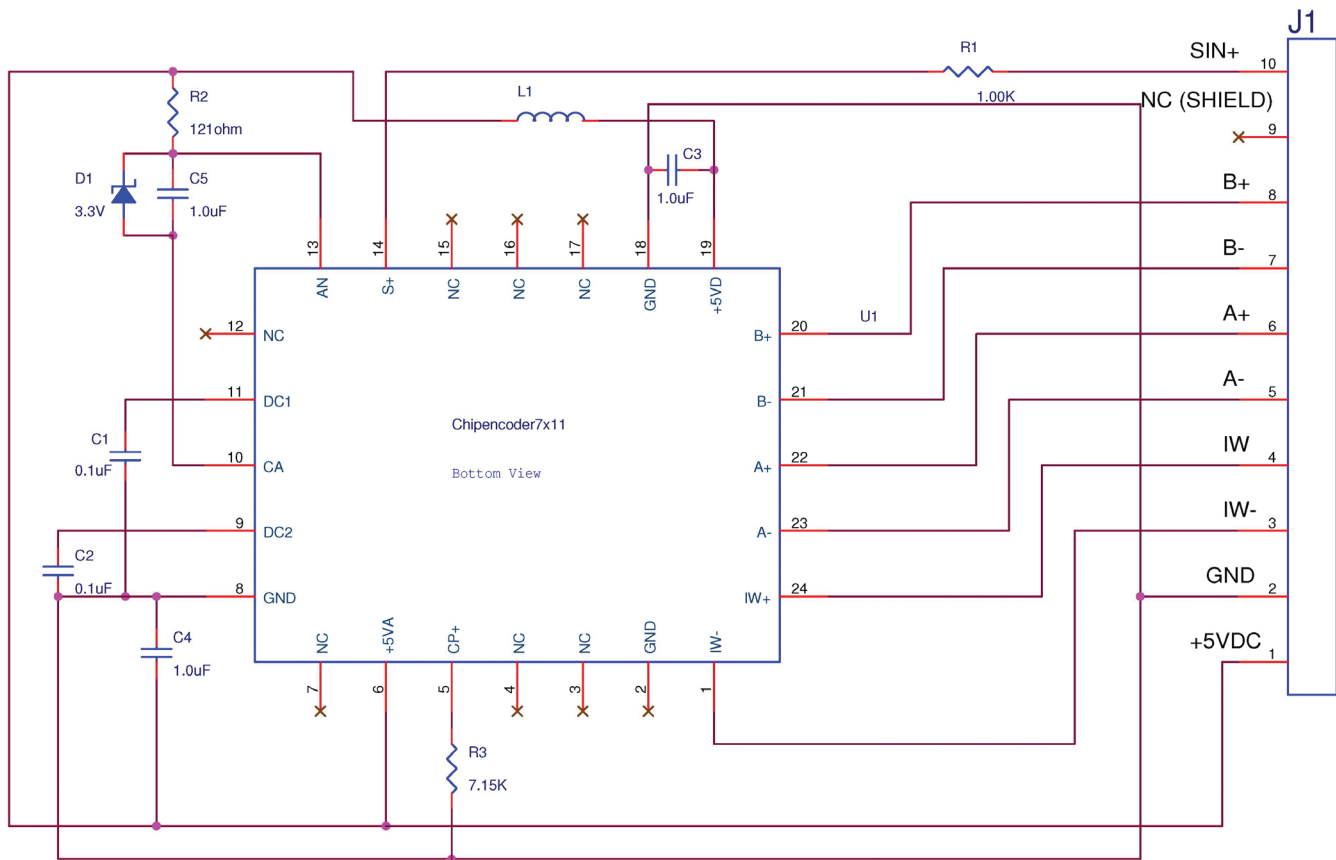
ChipEncoder™ Series

SMT Encoders for High Performance, High Volume Designs

Electrical Interface

CE300

Recommended customer circuit with the CE300 ChipEncoder:

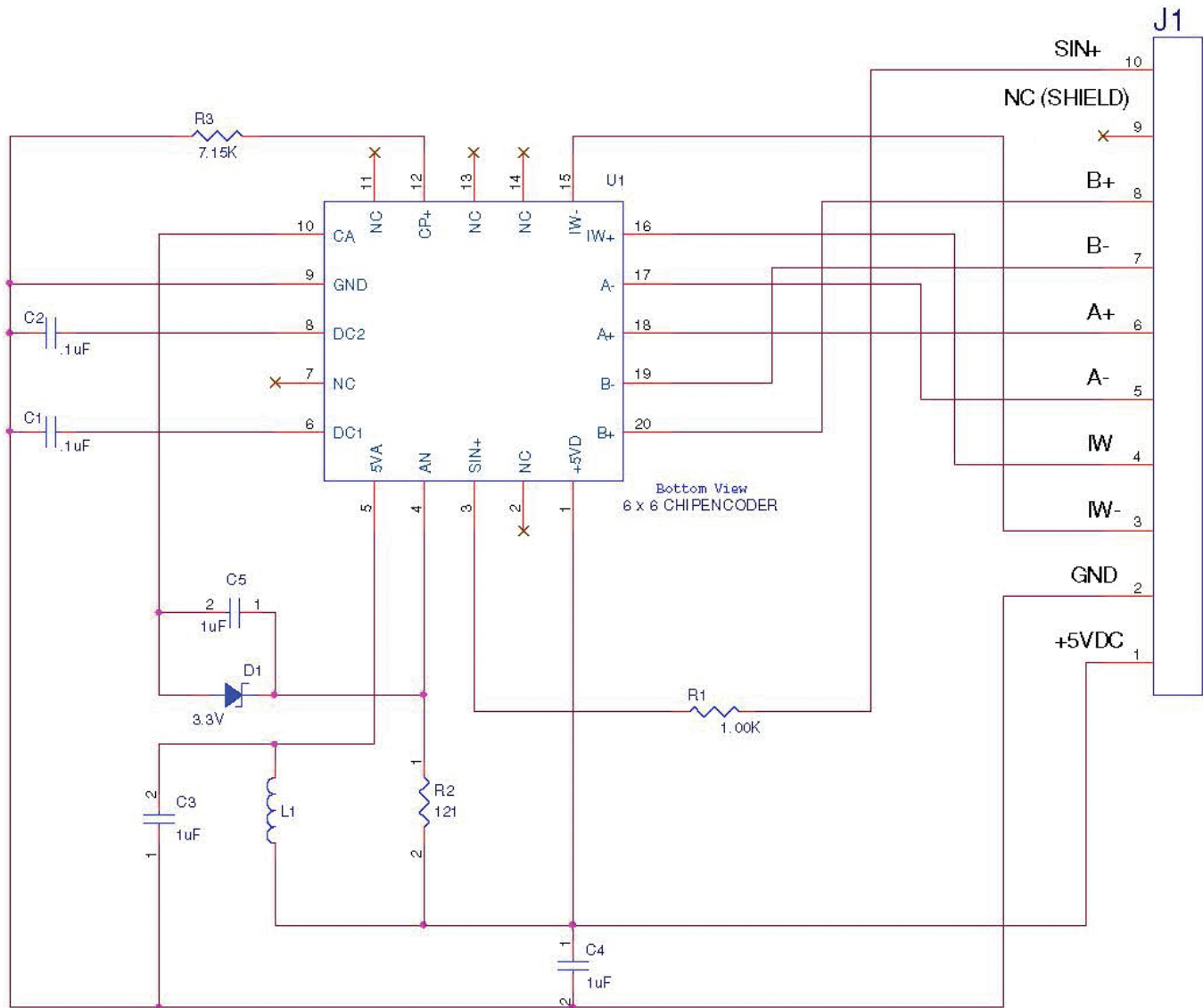


ChipEncoder™ Series

SMT Encoders for High Performance, High Volume Designs

CE

Recommended customer circuit with the CE ChipEncoder:



ChipEncoder™ Series

SMT Encoders for High Performance, High Volume Designs

Linear and Rotary Scales

Standard and Custom Designed for Your Application

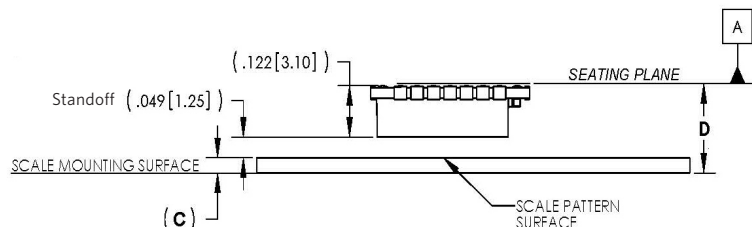
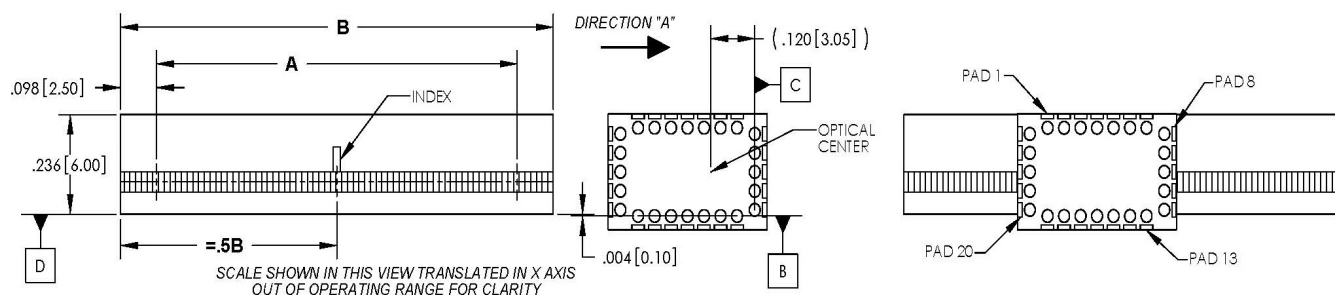
MicroE Systems offers a wide array of linear and rotary scales, all with built-in index marks. We also offer hubs for use with our rotary scales. If your application requires custom scales or hubs in OEM quantities, contact the factory for pricing and delivery.

Note
See interface drawings for more details.

CE300

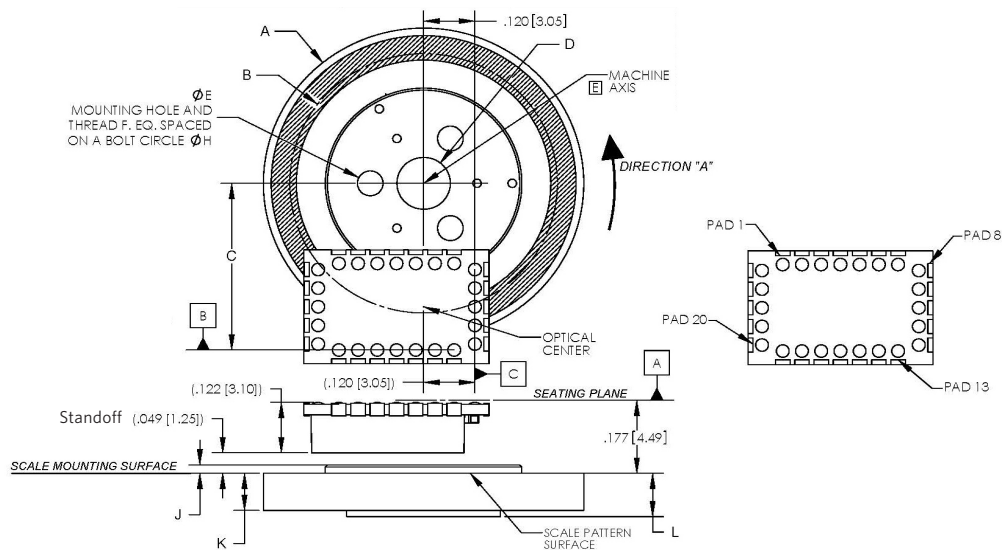
Linear Scale

(See table on page 11 for details needed to select linear scales.)



Rotary Scale

(See tables on page 12 for details needed to select rotary scales.)



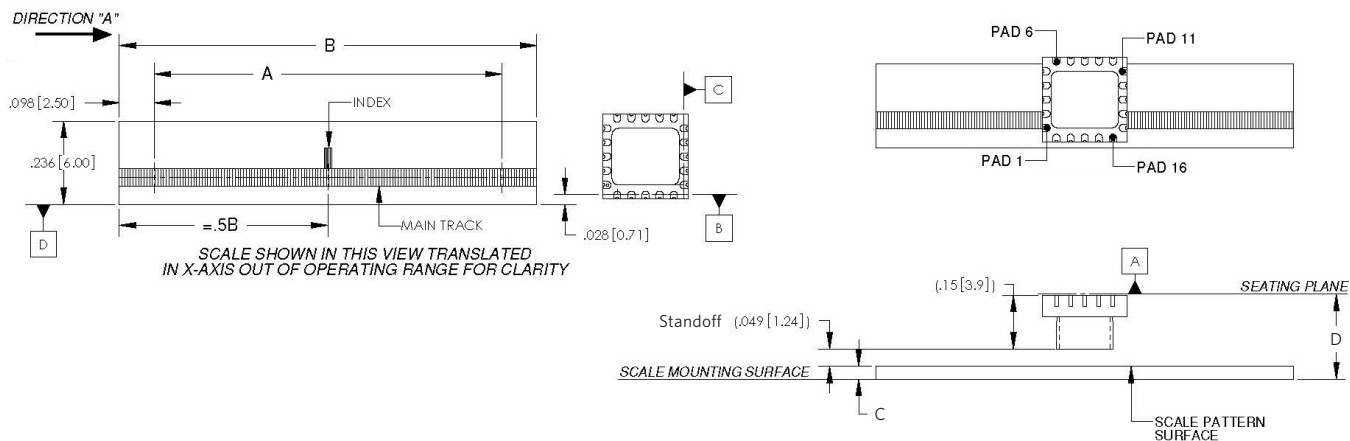
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CE

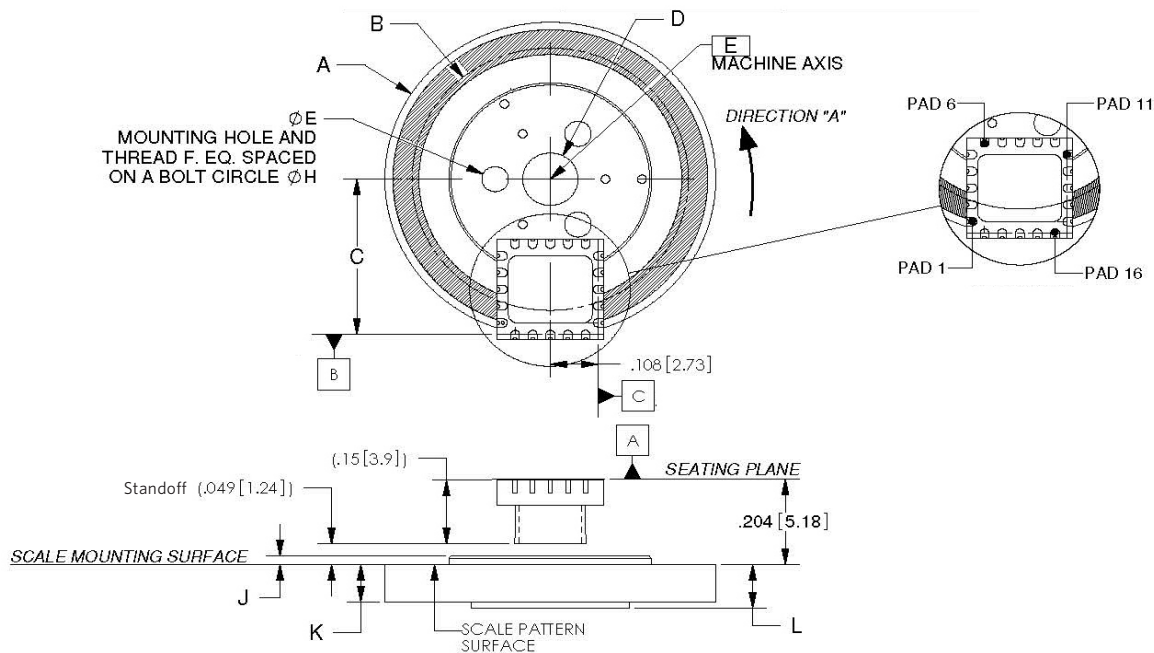
Linear Scale

(See table on page 11 for details needed to select linear scales.)



Rotary Scale

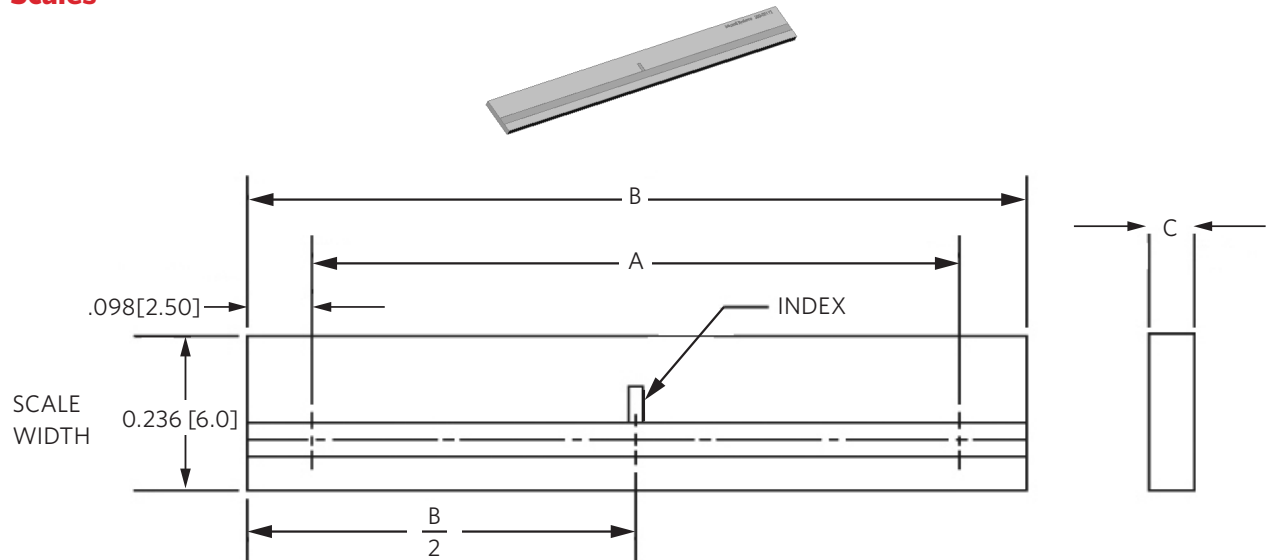
(See tables on page 12 for details needed to select rotary scales.)



ChipEncoder™ Series

SMT Encoders for High Performance, High Volume Designs

Linear Scales



LINEAR SCALE IDENTIFICATION AND SIZE

SCALE MODEL	A USABLE MEASURED LENGTH*	B SCALE LENGTH	C SCALE THICKNESS
L18CE	Scale Length (mm) - 5mm = 13mm	0.709 (18.0)	0.036 (0.91)
L30CE	Scale Length (mm) - 5mm = 25mm	1.181 (30.0)	0.036 (0.91)
L55CE	Scale Length (mm) - 5mm = 50mm	2.165 (55.0)	0.036 (0.91)
L80CE	Scale Length (mm) - 5mm = 75mm	3.150 (80.0)	0.036 (0.91)
L130CE	Scale Length (mm) - 5mm = 125mm	5.118 (130.0)	0.036 (0.91)
L155CE	Scale Length (mm) - 5mm = 150mm	6.102 (155.0)	0.098 (2.50)
L325CE	Scale Length (mm) - 5mm = 320mm	12.795 (325.0)	0.098 (2.50)

*inches (mm)

Features

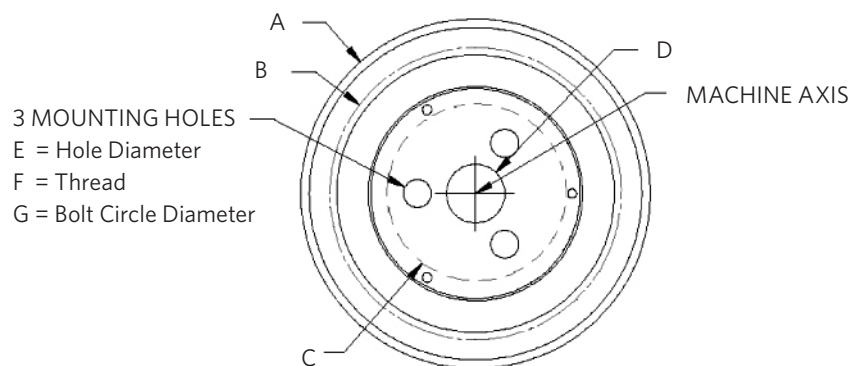
- 40 μm diffraction pattern
 - 10 μm resolution with CE300-4
 - 1 μm resolution with CE300-40 and CE-40GC
- Maximum speed = 14.4 m/s
- Center index mark
- Scales are chrome patterns printed on soda lime glass (CTE = 9.4 ppm/°C)
- Usable measuring length is 5 mm less than total length
- Temporary clamp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

ChipEncoder™ Series

SMT Encoders for High Performance, High Volume Designs

Rotary Scales

SCALE	FUNDAMENTAL CPR	MAX SPEED RPM	RESOLUTION CE300-40, CE-40GC			RESOLUTION CE300-4		
			CPR	μRAD	ARC-SEC	CPR	μRAD	ARC-SEC
R1206CE	825	26,200	33,000	190.0	39.3	3,300	1,900	393.0
R1506CE	1,024	21,100	40,960	153.0	31.6	4,096	1,530	316.0
R1910CE	1,250	17,280	50,000	126.0	25.9	5,000	1,260	259.0
R3213CE	2,048	10,550	81,920	76.7	15.8	8,192	767	158.0
R5725CE	4,096	5,270	163,840	38.3	7.9	16,384	383	79.1
R10851CE	8,192	2,640	327,680	19.2	4.0	32,768	192	39.6



ROTARY SCALE IDENTIFICATION AND SIZE									
SCALE ONLY	A (GLASS OD)*	B (OPTICAL DIAMETER)*	C (GLASS ID)*	GLASS THICKNESS*	SCALE WITH OPTIONAL HUB	D (HUB ID)*	E (DIAMETER)*	F (THREAD)	G (BCD)*
R1206CE	0.472 (12.00)	0.414 (10.50)	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)	0.513 (13.04)	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)	0.627 (15.92)	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)	1.027 (26.08)	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)	2.053 (52.15)	1.000 (25.40)	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)	4.106 (104.30)	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 soda lime glass (CTE = 9.4 ppm/°C)
- Optional hubs are 303/304 stainless steel (CTE = 17 ppm/°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™ Series

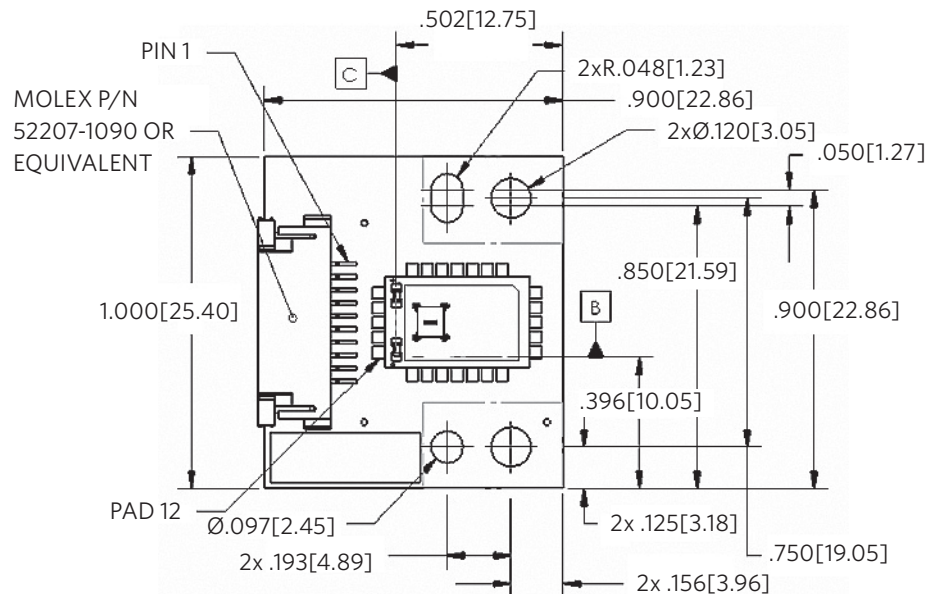
SMT Encoders for High Performance, High Volume Designs

Evaluation PCB

The Evaluation PCB is available in limited quantity to aid in engineering development and is not intended for use in OEM products.

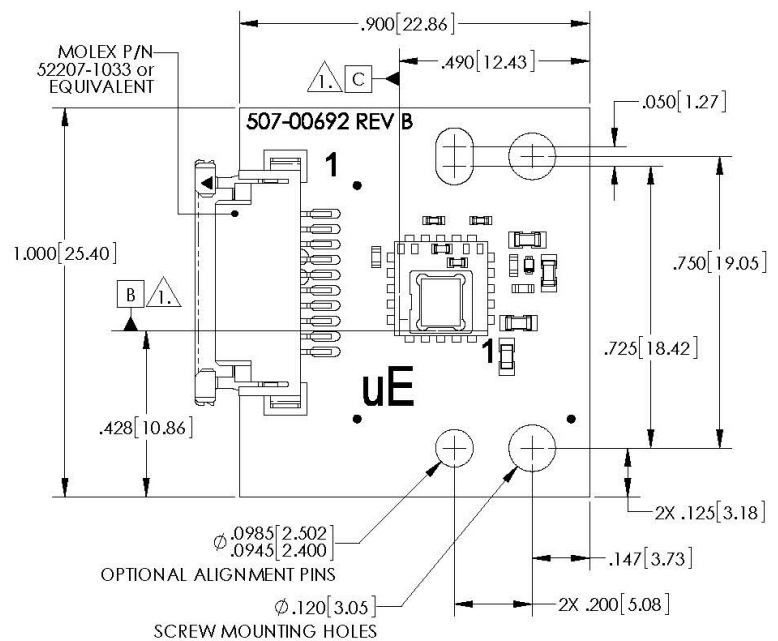
CE300

10 PIN ZIF CONNECTOR	
PINOUTS	
1	+5VDC
2	Gnd
3	IW-
4	IW+
5	A-
6	A+
7	B-
8	B+
9	NC
10	Sin+



CE

10 PIN ZIF CONNECTOR	
PINOUTS	
1	+5VDC
2	Gnd
3	IW-
4	IW+
5	A-
6	A+
7	B-
8	B+
9	NC
10	Sin+



ChipEncoder™ Series

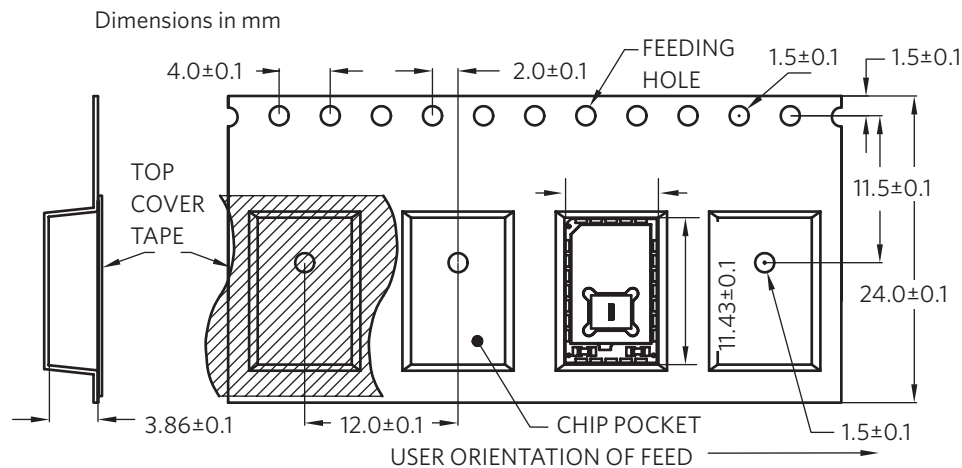
SMT Encoders for High Performance, High Volume Designs

Packaging

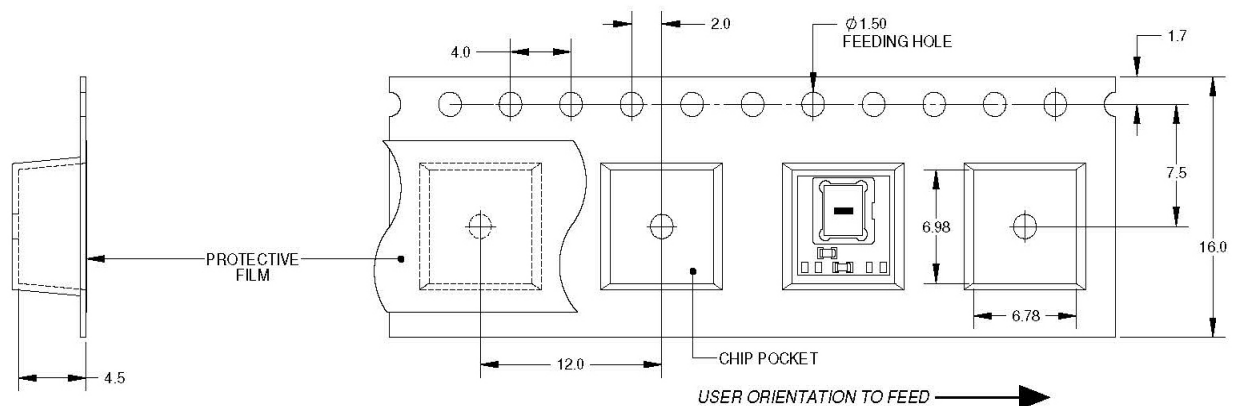
ChipEncoder Components are provided in SMT tape in all quantities.

- For orders, 100 pieces are supplied on a reel with a 100mm leader (250 pieces per reel maximum).
- See the Installation Manual for important ESD handling precautions.

CE300



CE



ChipEncoder™ Series

SMT Encoders for High Performance, High Volume Designs

How to Order

Sensor

CE300-40-PCB (example)

Eval PCB
PCB=mounted to evaluation PCB¹
Blank=unmounted chips

Interpolation
4=x4 (Model CE300 only)
40=x40 (Model CE300 only)
40GC= x40 (Model CE only)

Model
CE300
CE

Scales

R5725-HC (example)

Scale Mounting

For Linear Scales:

T=Tape

C1=3 clamps²

C2=10 clamps³

For Rotary Scales:

NH=No hub

HF=Standard hub

(only valid for R1206CE and R1506CE)

HG=Standard hub

(only valid for R1910CE)

HH=Standard hub

(only valid for R3213CE)

HC=Standard hub

(only valid for R5725CE)

HD=Standard hub

(only valid for R10851CE)

Scale Model

Linear:

L18CE=18 mm linear

L30CE=30 mm linear

L55CE=55 mm linear

L80CE=80 mm linear

L130CE=130 mm linear

L155E=155 mm linear

L325CE=325 mm linear

Rotary:

R1206CE=12 mm OD rotary

R1506CE=14.5 mm OD rotary

R1910CE=19.05 mm OD rotary

R3213CE=31.75 mm OD rotary

R5725CE=57.15 mm OD rotary

R10851CE=107.95 mm OD rotary

Notes

1. Quantities of 1 - 9 only

2. 3 clamps for scales up to 130 mm

3. 10 clamps for scales 155 mm or longer