PCBMotor

Piezo motor's integrated on a Printed Circuit Board !

Welcome to PCBMotor Optical World

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Are you working in these industries?

- Vision control
- Robotics
- Optical
- Lasers
- Health care
- Lab equipment
- CCTV
- Or

Struggling to get high resolution motion control to the right price?

Then let us introduce you to PCBMotor Optical World Enabling high resolution low cost motion control devices
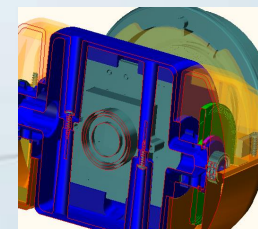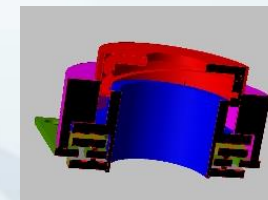
Applications

- Focus units
- Vision control & Quality
- Vision guided robotics
- Lenses, prisms, wedges, filters, Polarizers
- Lasers
- Analyzes
- Pan & Tilt
- And much more

Henrik Staehr-Olsen, CEO
PCBMotor

Features

- Hollow center
- High resolution
- Slim line
- Direct drive with no slack
- Low speed
- Holding torque when power is off
- Multiple motor on same PCB Board

The value proposition

The challenge many equipment manufactures are facing is how to built motion control devices with a free aperture, small form factor and still with high precision, at a competitive market price.

Our customers increases sales of their products by implementing a PCBMotor, a small, high resolution, hollow-center motor, which improve design and performance. Our customers are selling products such as:

- Camera's with Focus control

- Vision control & Quality

- Vision guided robotics

- Lenses, prisms, wedges, filters, Polarizers

- Lasers

- Analyzes

- Pan & Tilt

Which gives ***accurate*** and ***slimline motors*** at a ***low cost*** in volume not seen before

How is that possible?

5 facts about PCBMotor core technology

- ✓ PCBMotor is a combination of piezo components & PCB technologies are an evolution not a revolution

- ✓ PCBMotor piezo components are made as standard SMD components – tailored for mainstream volume production

- ✓ 1 driver can control multiple PCBMotors

- ✓ Enable economies of scale – standardized in-line processes

- ✓ Piezo ceramic material have been used since WWII
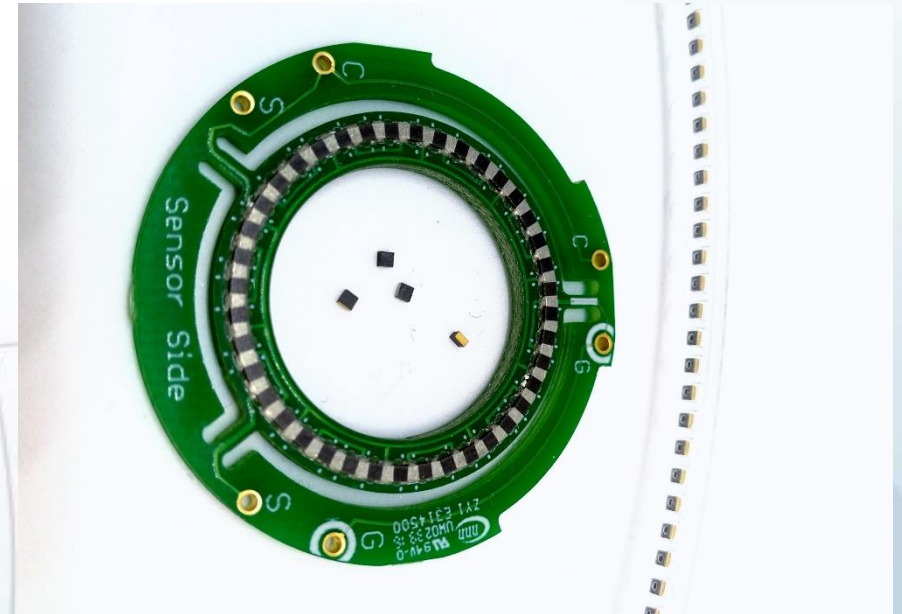
Hollow Center motors

- Hollow center motor(s) with large ratio of free aperture for the outer diameter, for example

- Digital encoder with 300 LPI (Lines per Inch) precision, ie. Optical diameter of 40mm ~0.0625° , with index mark for home position

- Motors can be mounted:
  - Back to back with minimum clearance down to ~0.5mm between objects, still with an overall low total building height
  - Inside each other allowing optics on same side

- Motors keeps their position when power is off

- High Resolution controller can with multiplexing drive any number of motors
  - RX/TX & TTL
  - 0 & 5V DC and 500mA (Max)

- Speed for an Ø30mm motor up to ~300° sec,

- Torque up to ~ 10Nmm
  - @3.5V DC and 450mA
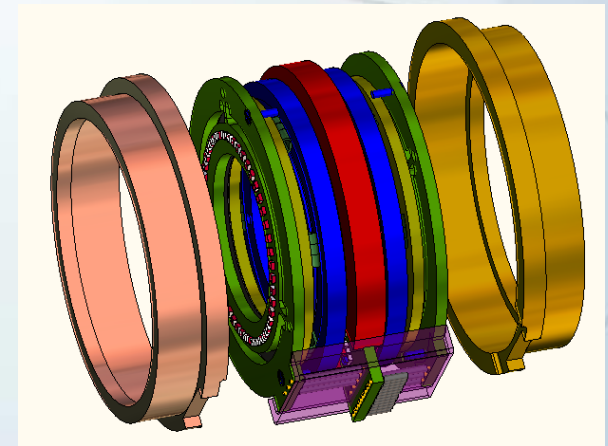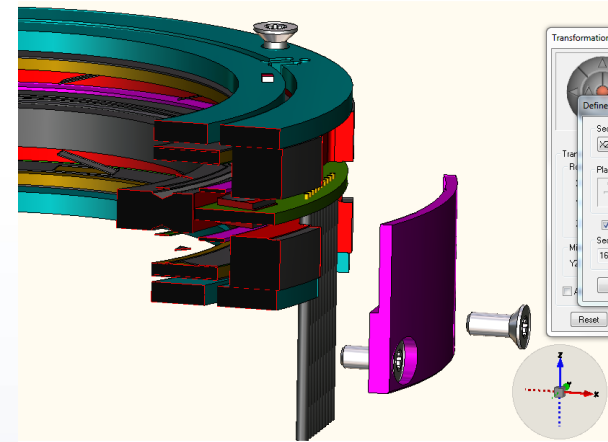
PCBMotor for Focus Unit

PCBMotor focus units made for M12 lenses for Vision systems, Quality control, Robot guided vision system and similar applications with typical specifications:

(Can be customized to fit specific applications)

- Stroke length of ~4mm, and can be customized to any length

- Max speed ~4mm/s

- Focus resolution down to ~2um

- The bore in the motor is made for an M12 lens can go through the motor and in principle down to the image plane and fit practical all M12 lenses on the market

- Standard driver for the motor is 42*27*10mm (LxWxH)
  - TTL connection for start/stop, direction and speed.
  - RX/TX connections
 - 0 & 5V DC and 500mA (Max)
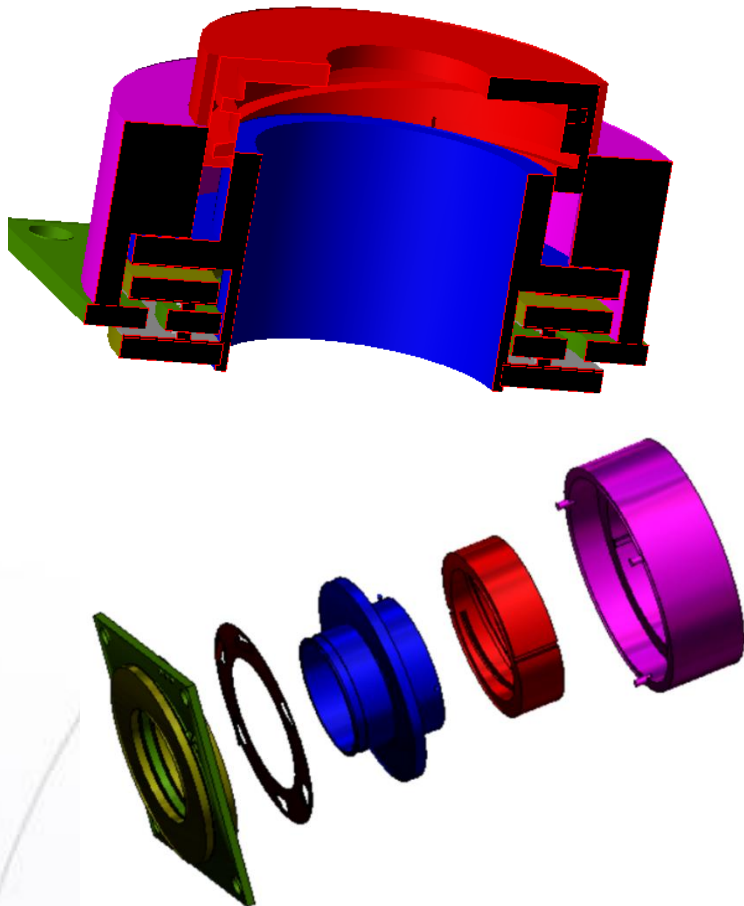
PCBMotor for Pan & Tilt – Camera

Suited for fast, low weight, low profile, yet high resolution Pan & Tilt applications, UAV, CCTV, and similar.

Example specifications: (Based up 30mm stator)

- Weight for stator ~4gram each and without mechanics

- Speed up to 300 degree per second

- Toque up to 10Nmm

- Digital encoder with 300 LPI (Lines per Inch) precision, ie. Optical diameter of 40mm ~0.0625° , with index mark for home position
    - @3.5V DC and 450mA

- High Resolution controller can by multiplexing driver 2 motors
    - RX/TX & TTL
    - 0 & 5V DC and 500mA (Max)
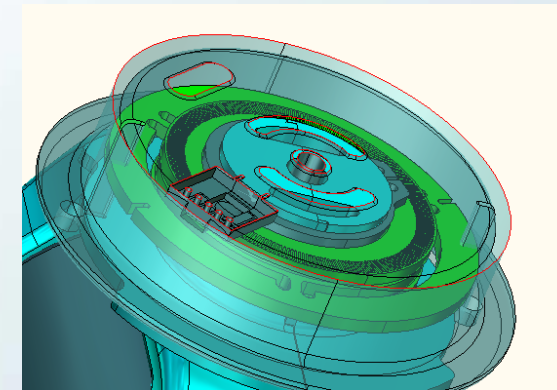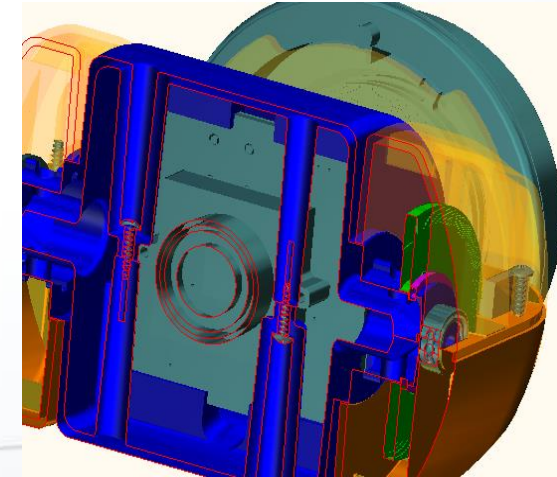
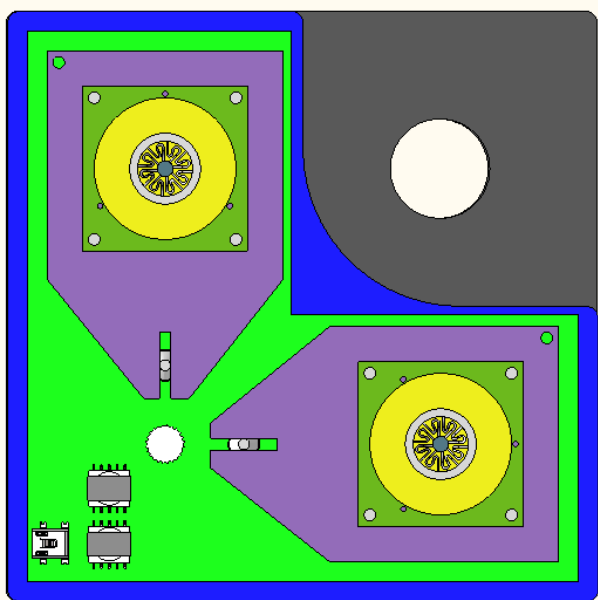# Pan & tilt Optical Mount
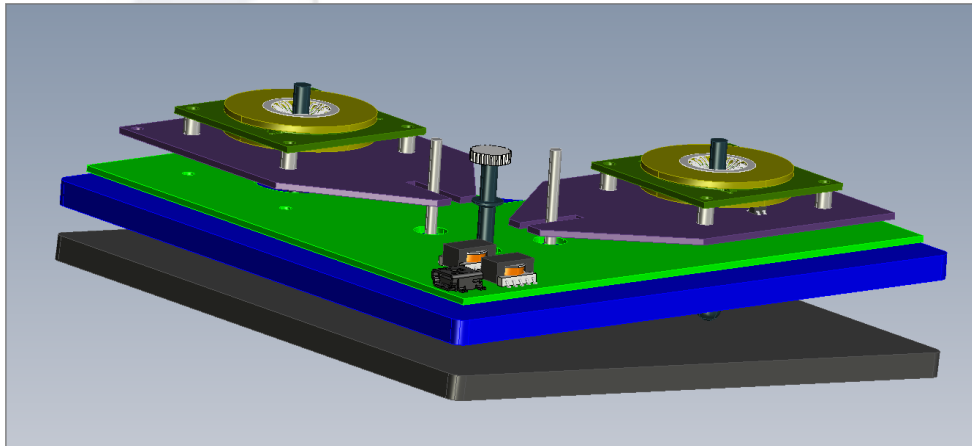
Motorized 1" Optical Mount 9809

Pan & Tilt Two PCBMotors

Sensor with 800 steps

Screw pitch 250um per revolution

Precision on screw depth ~0.3um in closed loop

Stroke length ~4mm

Motors for Optical Objects

Low profiles motors with central fix point for low weight objects, suited for applications which requires simplified mechanical construction, but with high resolution, at low cost in volume

Speed up to 720° per second @ ~2Nmm for Ø13mm stators

High resolution and wide selection of sensors and encoders for precision

Easy integration of multi motors on same PCB for advanced optical applications.
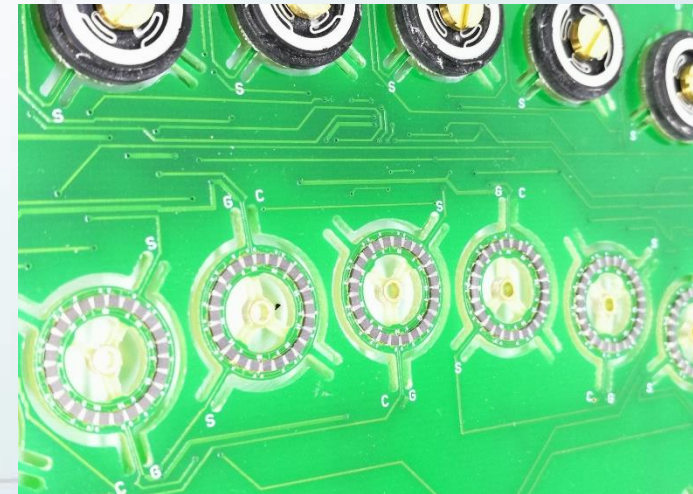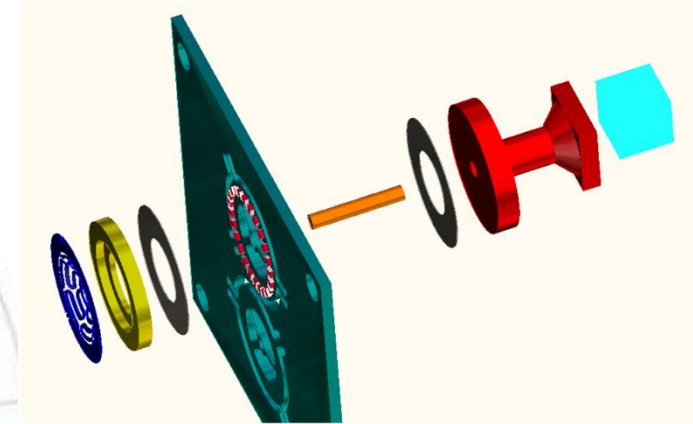
High-resolution applications

- **Superior resolution with up to 2,6M µpulses/revolution**

- Utilizing open-loop and micro-pulsing the controller, system engineers can now achieve superior micro-positioning in applications with resolutions over 2.6 million µpulses per revolution.

- **Technology experiment record**
  The controller is open-loop, i.e. the µpulses are entirely "free-running".

- In a practical application, external feedback is needed to determine the position. The digital codewheel can be used for calibrating µpulses/step for each digital step.

Example of PCBmotor resolution
Note: Actual resolution depends on application
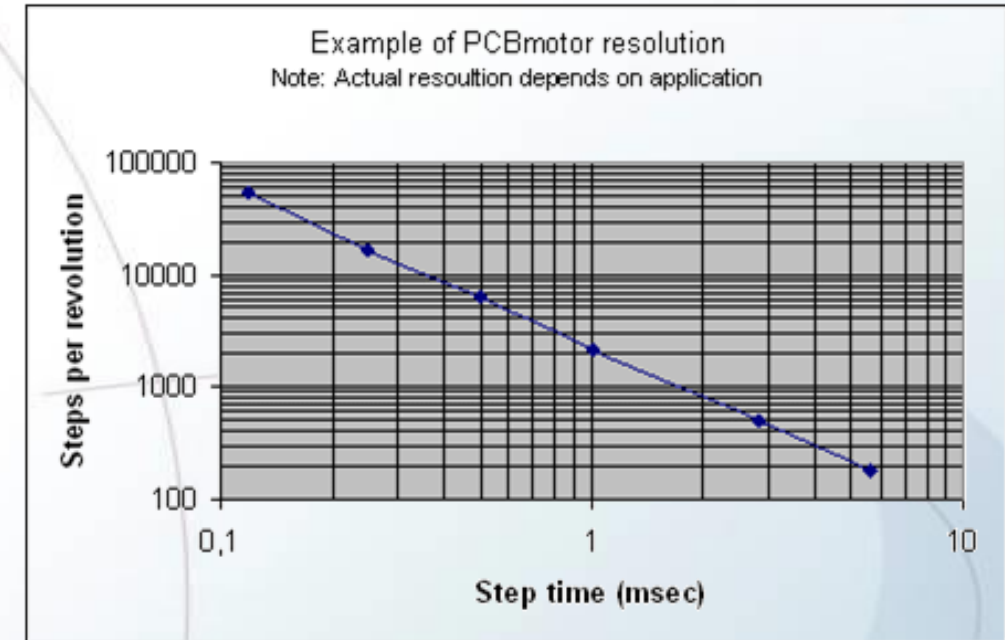
Watch the high resolution technology record on our Youtube channel:
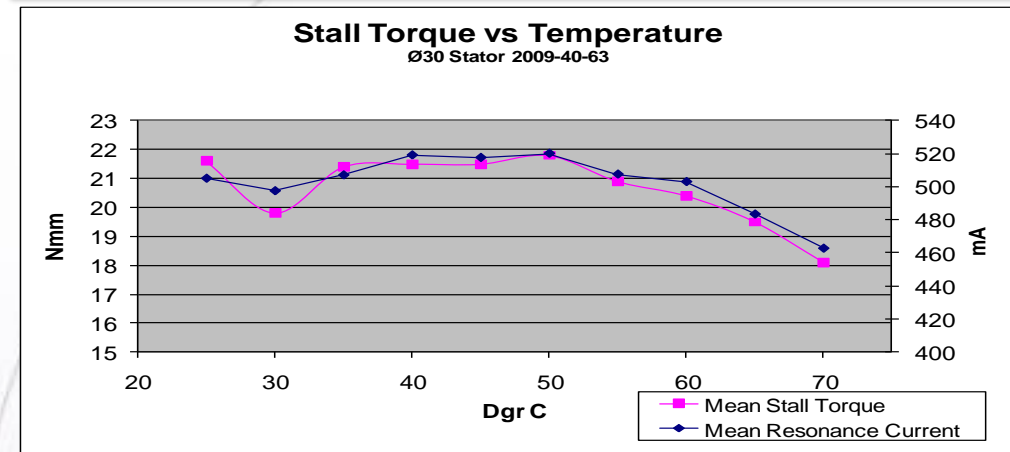http://www.youtube.com/user/pcbmotor

Increased resolution gives greater accuracy
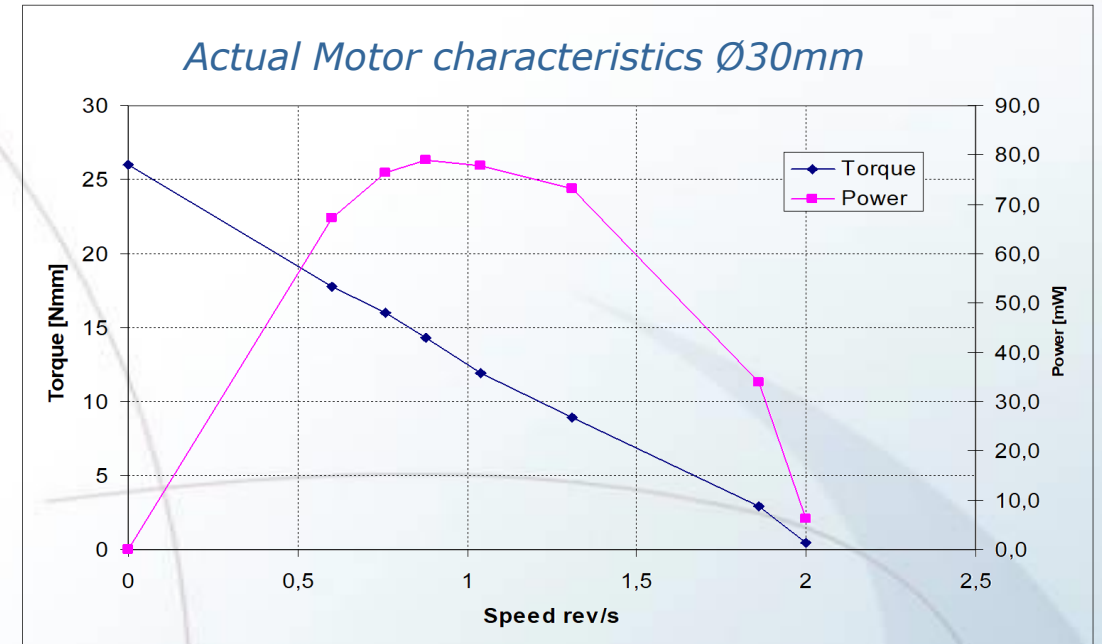
Performance & Motor characteristics

Outer Diameter mm	Inner Diameter mm	#Pz/Stator	Free Speed rev/sec (Stall torque = 0)	Stall torque Nmm (Speed = 0)	Max Output Power mW On a shaft
20	14	64	1.6	8	40
25	18	80	1.3	13	50
30	22	96	1.0	18	59
40	32	128	0.8	32	79
50	42	160	0.6	50	99
60	52	192	0.5	72	118
70	62	224	0.4	98	138
90	82	288	0.3	162	177

Typical free speed and stall torque
Double side-mounted – Voltage stepped up to 200 V in driver electronics.

Actual Motor characteristics Ø30mm


Stall Torque vs Temperature
Ø30 Stator 2009-40-63

> Motor characteristics for a Ø30 mm stator measured at 200 Vrms.
> Maximum available power at the shaft is 80 mW at a speed of 1 rev/s.
> Notice the linear Torque/Speed curve.

An operating temperature range of **-40 to 85 °C** has been tested and confirmed in some applications.

Basic control driver (without position sensor)

The driver generates a two-phase sinusoidal that is stepped up through two transformers to a drive voltage of 50- 200 Vrms.

❑ 0.2-1.5 W power for Ø30mm motor

❑ Motor resonance: 40-45 kHz

❑ Frequency Tracking needed for max performance at different temperatures


Current vs Frequency (3V supply voltage)
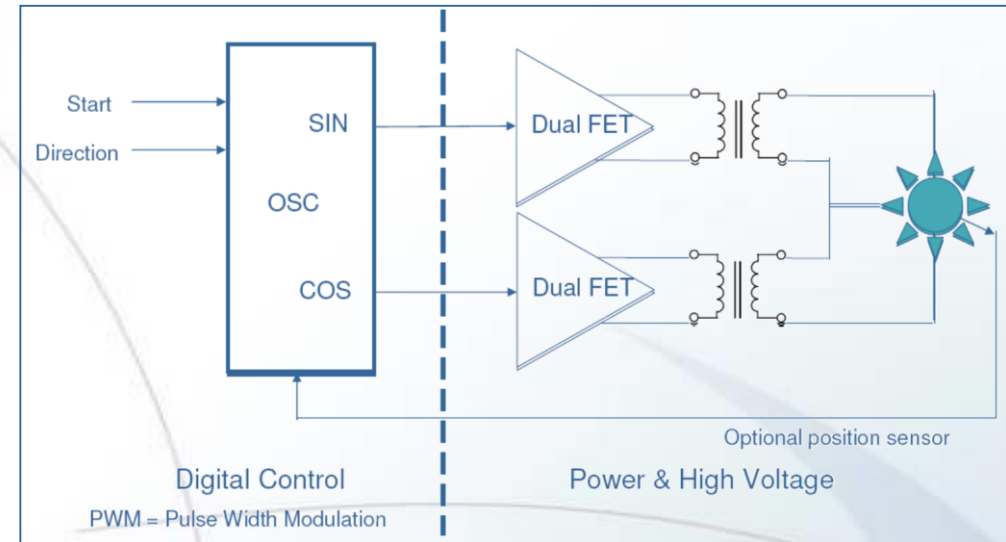
❑ 1 Central control driver can drive several motor positions, by multiplexing,

❑Driver can be with application electronics on the same PCB

❑ The basic components in the driver are the transformers, and IC for frequency control

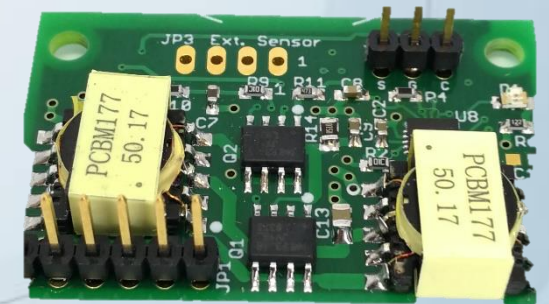❑The transformers are need induction for tuning of the output stage
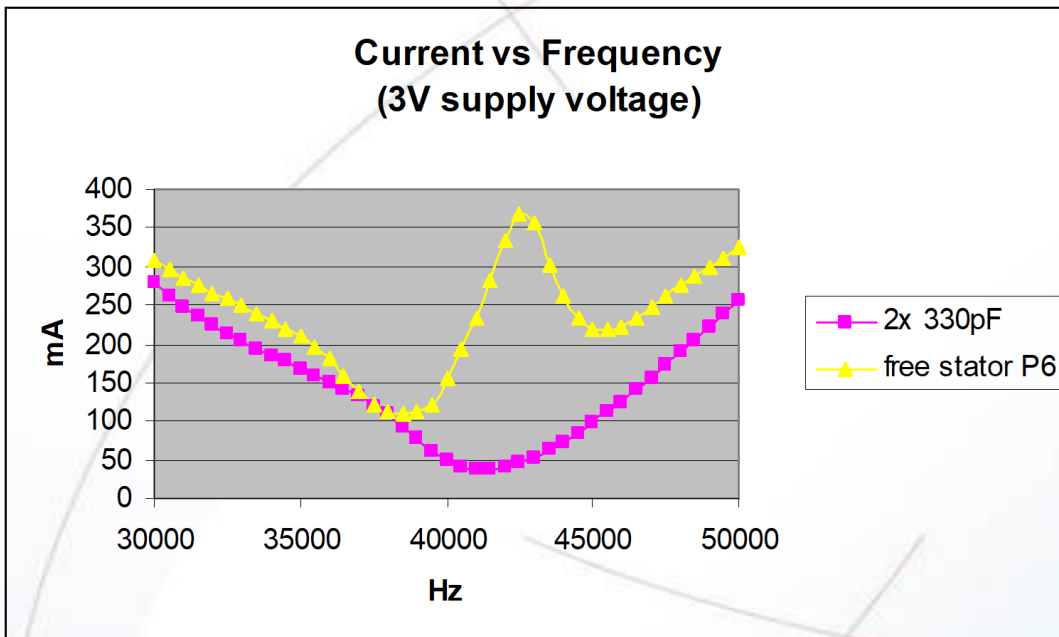
Low cost flexible driver

Driver schematic
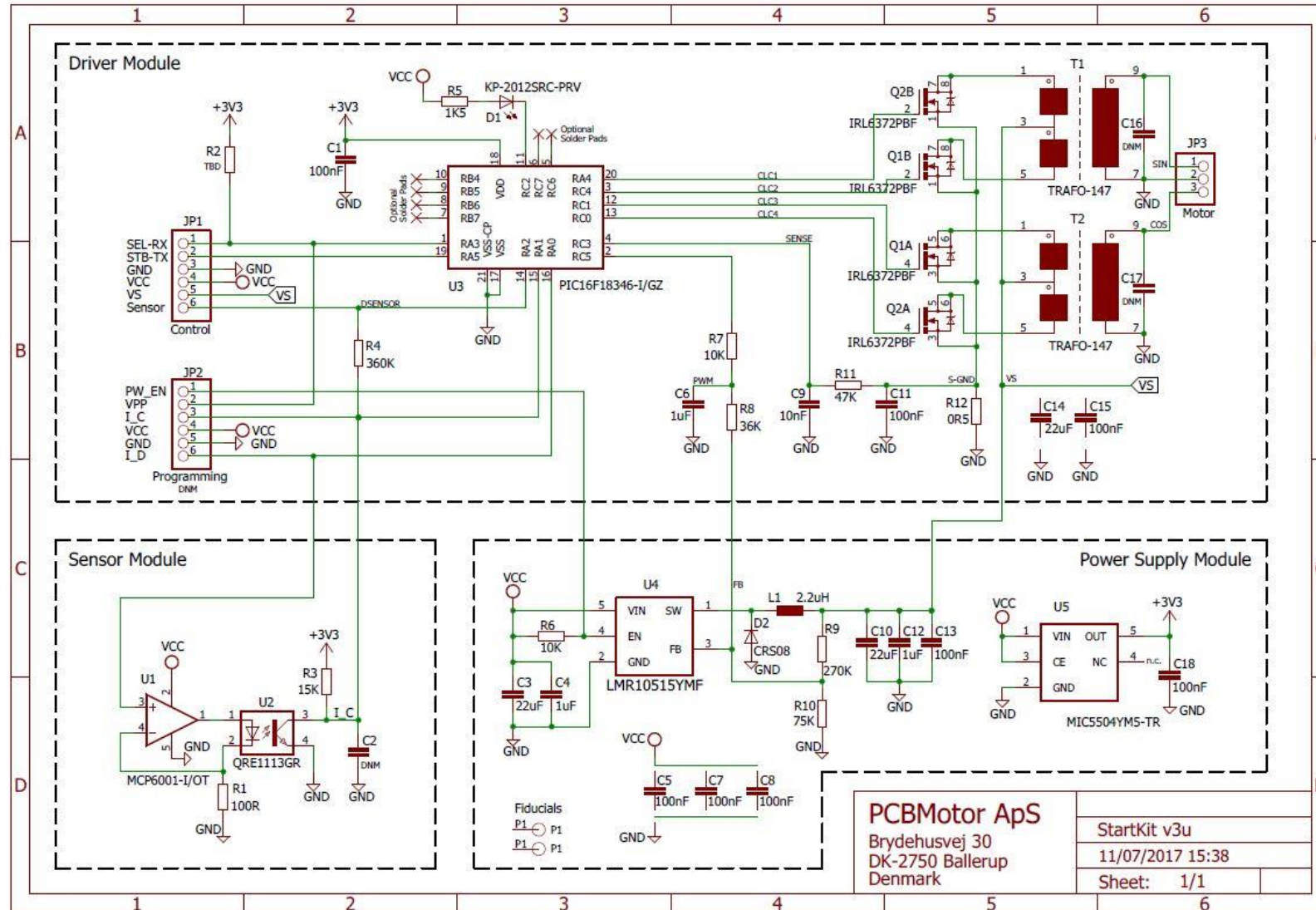
- Driver module can also serve as controller for positing commands when sensor module is implemented in application
- RX/TX and TTL
- 0V and 5V DC
- 42 x 27 x 8mm (LxBxH)
- Implementation in other from factor possible as part of project
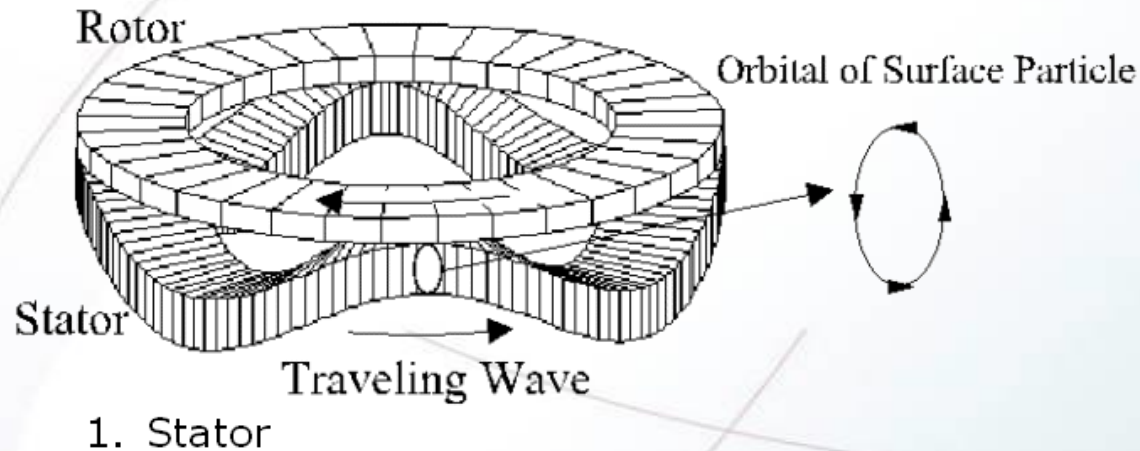
Creating movement right on the PCB

A PCBMotor consists of

1. The Stator

  The PCB with piezos mounted, to which a voltage is applied, thus causing the traveling wave

2. The Rotor

  Pressed onto the stator, delivers the mechanical output

See the traveling wave on our Youtube channel:
http://www.pcbmotor.com/pcbmotor

Turn your PCB into a motor

Next Step

- Need more in depth technical information?
  - Then sign up for free White paper – at PCBMotor.com

- What to discuss a specific project?
  - Then Contact Henrik at:
  - +45 7028 3210
  - hso@pcbmotor.com

Sign-Up for

White Paper, Schematics and Performance Overview

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Get Started

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