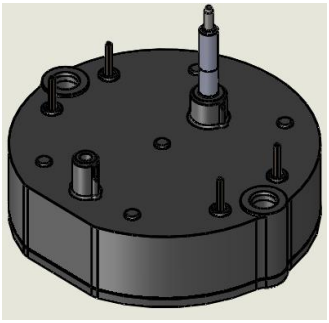
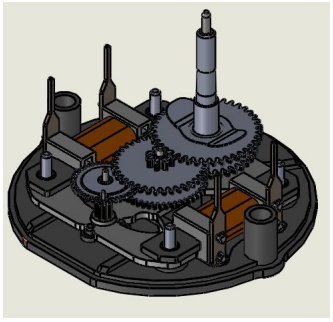
## DESCRIPTION

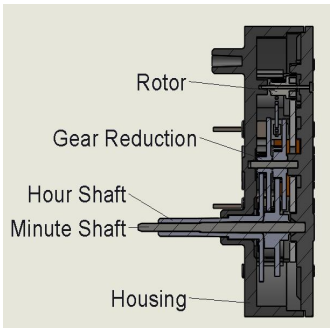
**BKA30C series Car Clock**
is a precise stepping motor design, which consists of a motor and gear train with a reduction ratio of 1/60 for the minute shaft and a 1/12 reduction for the hour shaft. It's mainly used in dashboard instrumentation or other digital indicator equipments, to display time.

**BKA30C series Car Clock**
is driven by 2 sequent logic pulse signals.it can be driven by partial step mode in 5V ~ 10V power.

**BKA30C series Car Clock**
has 6 step gears design to construct high efficiency, high position accuracy and extremely robust gear system. The special gear shape is helpful to decrease friction and noise. It chooses appropriate material for each component to increase durability and safety of the motor. All these features enhance the motor's stability and long life time.



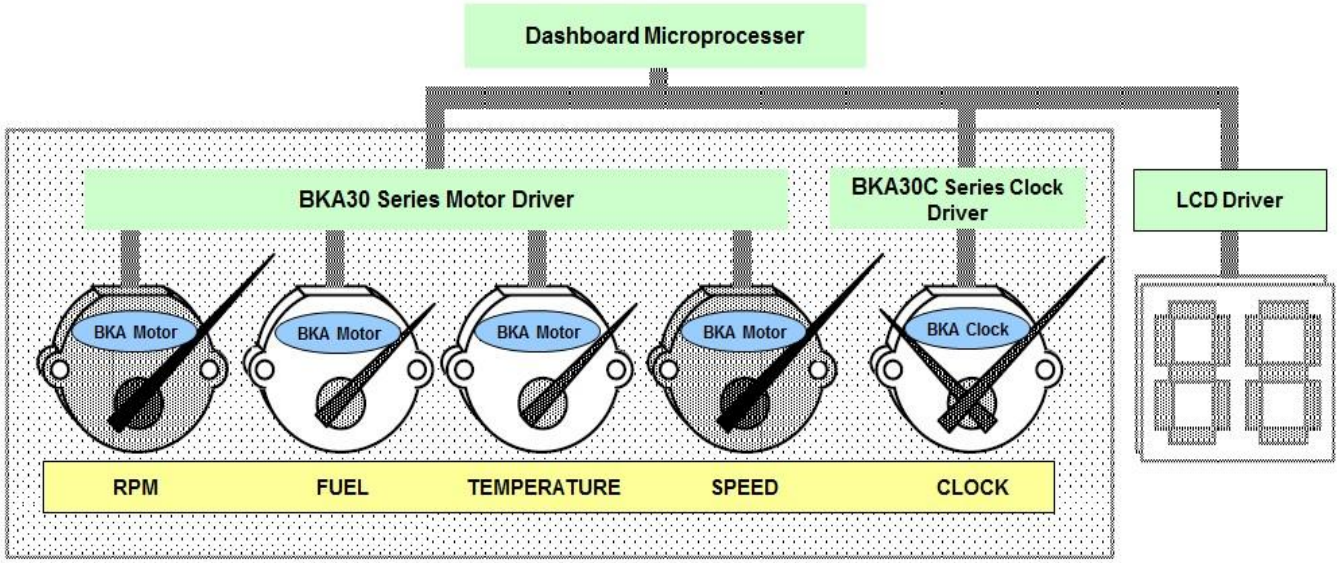




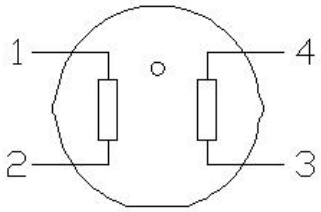
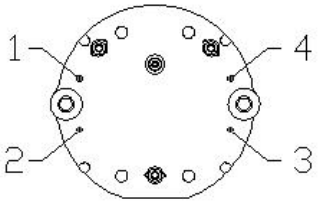
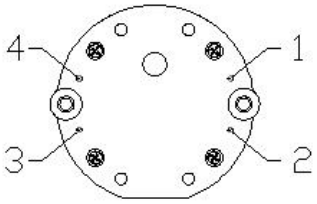

## FEATURE

- Wide working voltage: 5~10V.
- Wide working temperature: -40~105℃.
- Low current consumption: 18mA, 5V, 2X90mW.
- Small dimension: Φ30mm X 8.4mm.
- Directly driven by a μ-controller.
- Large static torque.
- Currentless static torque.
- Qualified for automotive applications.

## TYPICAL APPLICATION



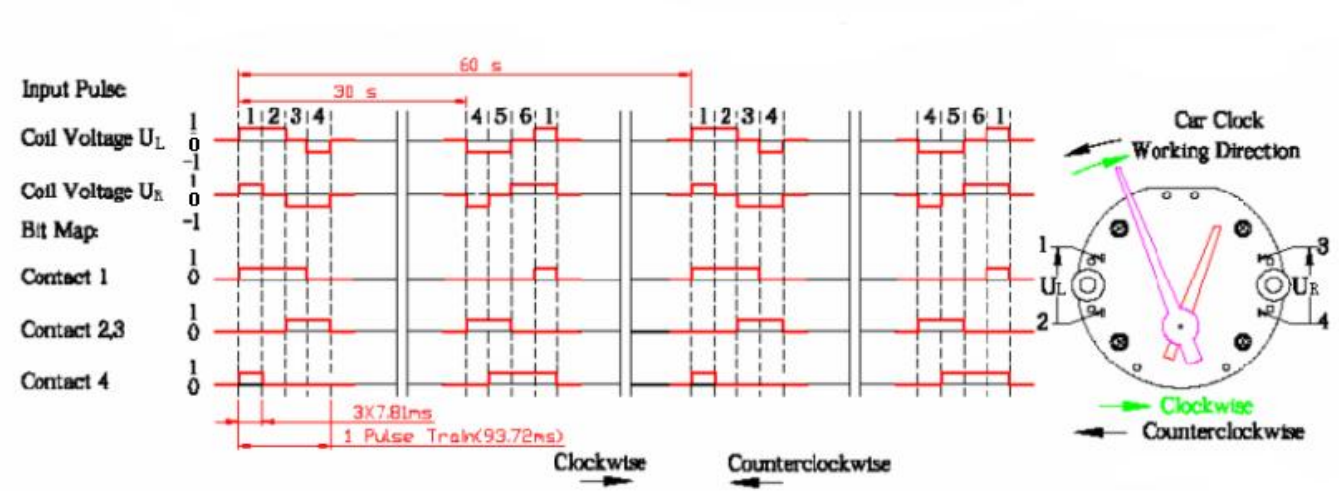
## PIN CONNECTION

| Schematic | BKA30C-R5(Real Mounting) | BKA30C-F2(Front Mounting) |
|---|---|---|
|  |  |  |

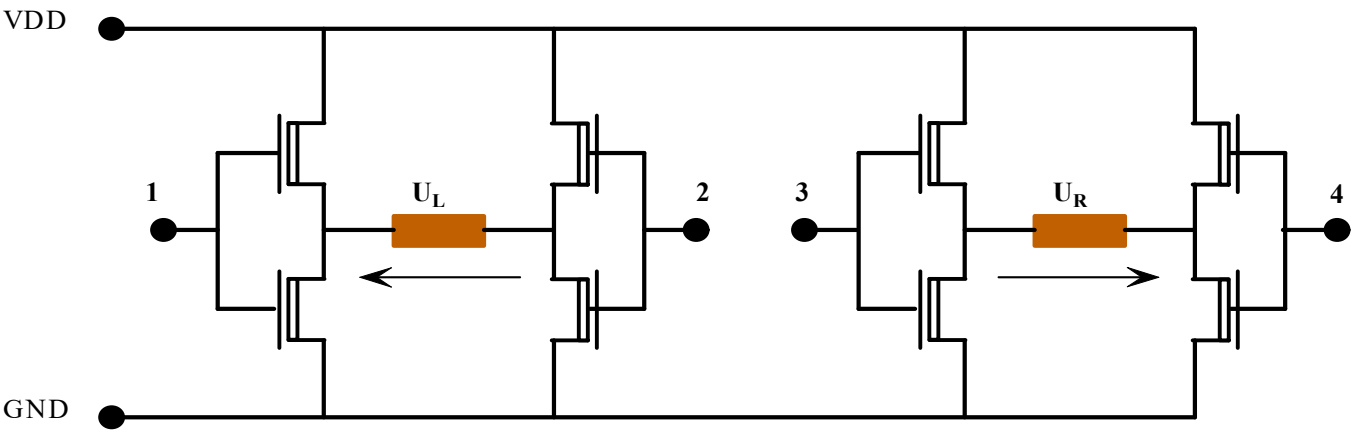


## DRIVE PULSE AND CONTROL CIRCUIT

the car clock can be directly driven by a standard logic voltage level with 18mA current output capacity In partial-step driving mode. Each pulse can make 60° revolution of rotor(minute shaft rotate 1°).The bit-time sequence determines the turning direction of the motor.




## DRIVING CONTROL CIRCUIT OF PARTIAL STEP MODE



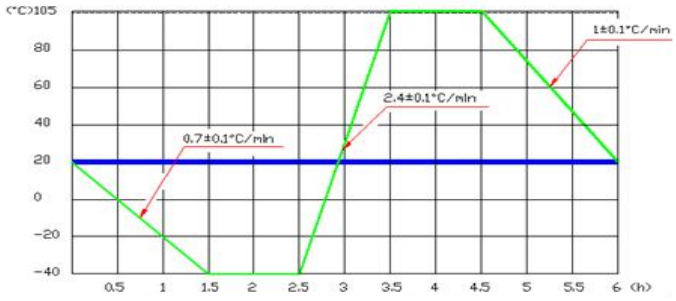
## ELECTRICAL AND MECHANICAL CHARACTERISTICS

$T_{amb}$=25ºC and $U_b$=5V, unless other specified.

| Parameter | Symbol | Test Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| Operating Temperature | $T_a$ | | -40 | | 105 | ºC |
| Coil Resistance | $R_b$ | | 260 | 280 | 300 | Ω |
| Operating Current | $I_m$ | $f_a$=16Hz(50º/s) | | 18 | 19 | mA |
| Start-Stop Frequency | $f_{ss}$ | $J_L$=0.2x10$^{-6}$kgm$^2$ | 70(210) | | | Hz(º/s) |
| Dynamic Torque | M50<br>M200 | $f_a$=16Hz(50º/s)<br>$f_a$=66Hz(200º/s) | 0.4 | <br>0.4 | | mNm |
| Static Torque | $M_s$<br>$M_0$ | $U_b$=5V<br>$U_b$=0V | 1.0<br>0.25 | 1.2<br>0.35 | | mNm |
| Gear Play | | | | ±0.3 | 1 | Degree |
| Force allowed on the minute shaft:<br>Axial force (push)<br>Axial force (pull)<br>Perpendicular force<br>Imposed acceleration | <br>Fa<br>Fa<br>Fq<br>$\alpha_p$ | | <br>100<br>80<br>12 | <br>120<br>100<br>15 | <br><br><br><br>1000 | <br>N<br>N<br>N<br>Rad/s2 |
| Noise Level | SPL | Background noise:30 | | 35 | 42 | dB(A) |

**Note:** $f_a$ – full-step frequency $J_L$ -- Load inertia

## RELIABILITY TEST




**Temperature Cycle Test**

- Low Temperature:-40°C±2°C
- High Temperature:+105°C±2°C
- Dwell time:1 Hrs/each
- Transfer Time:1.5 hrs
- Cycle:50 Cycles
- Car clock Status : running
- The test was carried out according to IEC68-2-14 and PF-9688(DaimlerChrysler)

Temperature change like the above curve

**Humidity Test**

- Temperature:+50°C
- Humidity:94±2％RH
- Duration:144 Hrs
- Car clock Status: non-running
- The test was carried out according to IEC68-2-3 and PF-9688(DaimlerChrysler)

**High Temperature Test**

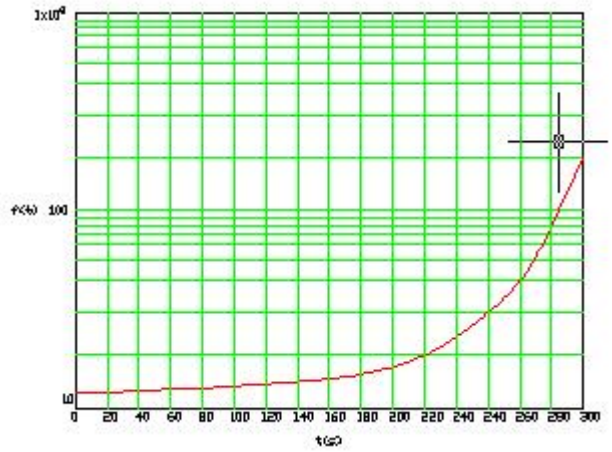
- Temperature:+105°C±2°C
- Duration:168 Hrs
- Car clock Status : running
- The test was carried out according to IEC68-2-2 and PF-9688(DaimlerChrysler)

**Low Temperature Test**

- Temperature:-40°C±2°C
- Duration:48 Hrs
- Car clock Status : running
- The test was carried out according to IEC68-2-1 and PF-9688(DaimlerChrysler)

**Mechanical Vibration Test**

- Pulse shape: sine pulse form
- Range of frequency:10Hz～200Hz(logarithm sweep)
- Sweep cycle: 300 sec.
- Direction: axial / radial
- Duration:8 hrs /each Direction
- Acceleration : 6 g
- Car clock Status : running
- The test was carried out according to IEC68-2-6
- Frequency change with time (The following picture)




**Mechanical Shock Test**

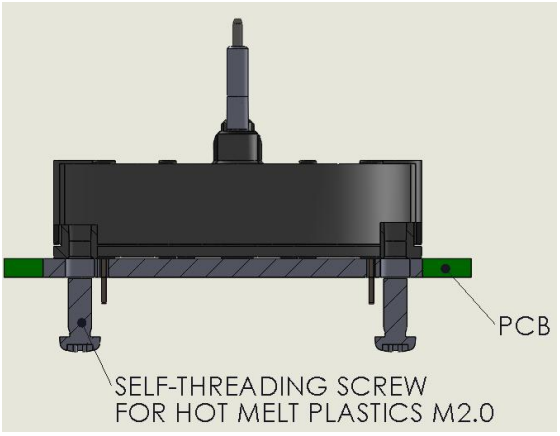
- Height: 1.2 m
- Direction:X/Y/Z
- Motor Status : non-running
- The test was carried out according to IEC68-2-62 and ISO 1413

**Life Test**

- Operating time: 176 hours
- Environment temperature: 20~25℃
- Car clock status : fa=16HZ; non-load

## INSTALLATION ADVICE

The BKA30C series motor can be easily installed. The four contact pins can be soldered on PCB circuits. If the application is subject to very strong vibrations, screws might be necessary.




## POINTER ASSEMBLY

The assembly of the pointers on the minute shaft and protrusion of the hour wheel is usually done in the pressing status. All operations should be done carefully within the values of forces(***Fa*** and ***Fq***) as shown in the table .During the assembly of pointers the rotor have to be in a static.

**Caution**

The axial force including pull force and push force can not exceed the value as shown in next figure. The perpendicular force is also. Excessive acceleration should not be imposed onto the pointer shaft (minute shaft and hour shaft). a resistless concussion on the mounting pointer might damage the gear or gear assembly, even can cause the permanent damage to the car clock.