

STRUCTURE Silicon Monolithic Integrated Circuit

PRODUCT SERIES 7ch Stepping Motor Driver

TYPE **BD6757KN**

FEATURES

- Built in 6 Full-ON Drivers
- Built in 1 Linear Constant-Current Driver

●Absolute maximum ratings (Ta=25°C)

| Parameter | Symbol | Limit | Unit |
|-----------------------------|--------|----------------------------|-------|
| Power supply voltage | VCC | -0.5 to +7.0 | V |
| Motor power supply voltage | VM | -0.5 to +10.0 | V |
| Charge pump voltage | VG | 15.0 | V |
| Control input voltage | VIN | -0.5 to VCC+0.5 | V |
| Power dissipation | Pd | 950 ^{*1} | mW |
| Operating temperature range | Topr | -25 to +75 | °C |
| Junction temperature | Tjmax | 150 | °C |
| Storage temperature range | Tstg | -55 to +150 | °C |
| H-bridge output current | Iout | -800 to +800 ^{*2} | mA/ch |

*1 Reduced by 7.6mW/°C over 25°C, when mounted on a glass epoxy board (70mm × 70mm × 1.6mm).

*2 Must not exceed Pd, ASO, or Tjmax of 150°C.

●Operating Conditions (Ta=-25°C to +75°C)

| Parameter | Symbol | Min. | Typ. | Max. | Unit |
|----------------------------|--------|------|------|--------------------|-------|
| Power supply voltage | VCC | 2.5 | 3.0 | 5.5 | V |
| Motor power supply voltage | VM | 2.5 | 5.0 | 8.0 | V |
| Control input voltage | VIN | 0 | - | VCC | V |
| H-bridge output current | Iout | - | - | ±500 ^{*3} | mA/ch |

*3 Must not exceed Pd or ASO.

The product described in this specification is a strategic product (and/or service) subject to COCOM regulations. It should not be exported without authorization from the appropriate government authorities. This product isn't designed for protection against radioactive rays.

●Package Outline

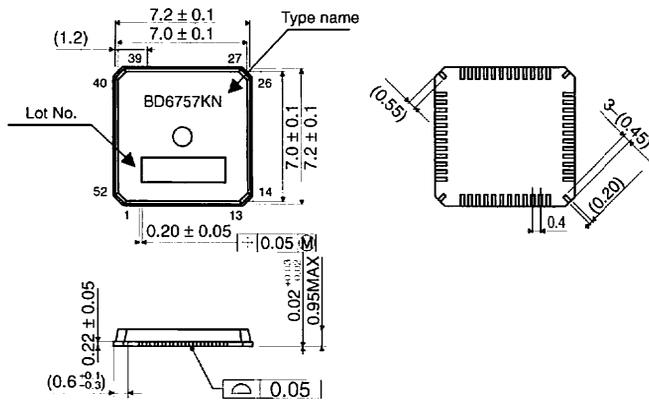


Fig.1 UQFN52 Package (Unit: mm)

●Pin Arrangement (Top View)

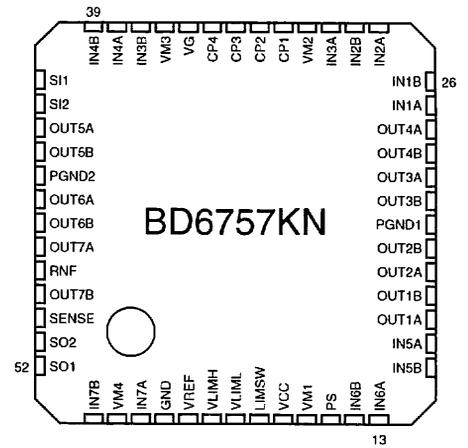


Fig.2 BD6757KN Pin Arrangement (Top View)

●Block Diagram

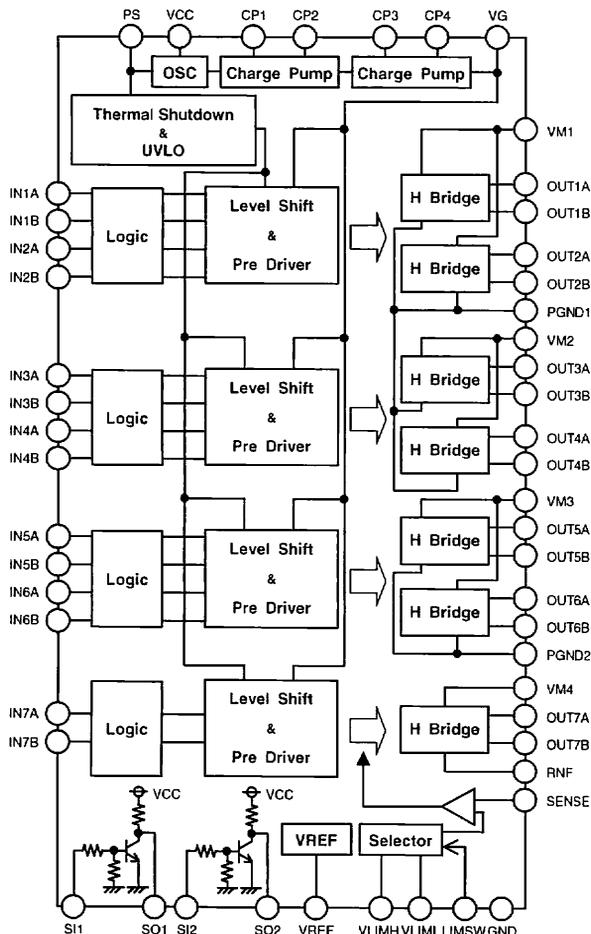


Fig.3 BD6757KN Block Diagram

●Pin No. and Pin Name

| No. | Pin name | No. | Pin name |
|-----|----------|-----|----------|
| 1 | IN7B | 27 | IN2A |
| 2 | VM4 | 28 | IN2B |
| 3 | IN7A | 29 | IN3A |
| 4 | GND | 30 | VM2 |
| 5 | VREF | 31 | CP1 |
| 6 | VLIMH | 32 | CP2 |
| 7 | VLIML | 33 | CP3 |
| 8 | LIMSW | 34 | CP4 |
| 9 | VCC | 35 | VG |
| 10 | VM1 | 36 | VM3 |
| 11 | PS | 37 | IN3B |
| 12 | IN6B | 38 | IN4A |
| 13 | IN6A | 39 | IN4B |
| 14 | IN5B | 40 | SI1 |
| 15 | IN5A | 41 | SI2 |
| 16 | OUT1A | 42 | OUT5A |
| 17 | OUT1B | 43 | OUT5B |
| 18 | OUT2A | 44 | PGND2 |
| 19 | OUT2B | 45 | OUT6A |
| 20 | PGND1 | 46 | OUT6B |
| 21 | OUT3B | 47 | OUT7A |
| 22 | OUT3A | 48 | RNF |
| 23 | OUT4B | 49 | OUT7B |
| 24 | OUT4A | 50 | SENSE |
| 25 | IN1A | 51 | SO2 |
| 26 | IN1B | 52 | SO1 |

● BD6757KN Electrical Characteristics (Unless otherwise specified, Ta=25°C, VCC=3.0V, VM=5.0V)

| Parameter | Symbol | Limit | | | Unit | Conditions |
|---|--------|-------|------|------|------|--|
| | | Min. | Typ. | Max. | | |
| Overall | | | | | | |
| Circuit current during standby operation | ICCST | - | 0 | 10 | μA | PS=L |
| Circuit current | ICC | - | 1.0 | 3.0 | mA | PS=H with no signal |
| Control input | | | | | | |
| High level input voltage | VINH | 2.0 | - | - | V | IN1A~IN7B, LIMSW, PS |
| Low level input voltage | VINL | - | - | 0.7 | V | IN1A~IN7B, LIMSW, PS |
| High level input current | IINH | 15 | 30 | 60 | μA | IN1A~IN7B, LIMSW, PS; VIN=3V |
| Low level input current | IINL | -1 | 0 | - | μA | IN1A~IN7B, LIMSW, PS; VIN=0V |
| Pull-down resistor | RIN | 50 | 100 | 200 | kΩ | |
| Charge pump | | | | | | |
| Charge pump voltage | VCP | 10 | 11 | - | V | |
| UVLO | | | | | | |
| UVLO voltage | VUVLO | 1.6 | - | 2.4 | V | |
| Full-ON Drive block (ch1 to ch6) | | | | | | |
| Output ON-Resistance | RON | - | 1.3 | 1.6 | Ω | Io=±400mA on high and low sides in total |
| Pulse input response | tp | 100 | - | - | ns | With an input pulse with of 200ns |
| Linear Constant-Current Drive block (ch7) | | | | | | |
| Output ON-Resistance | RON | - | 0.9 | 1.1 | Ω | Io=±400mA on high and low sides in total |
| VREF output voltage | VREF | 0.88 | 0.90 | 0.92 | V | Iout=0~1mA |
| Output limit current 1 | VOL1 | 388 | 400 | 412 | mA | RNF=0.5Ω with a load of 10Ω VLIMH(or L)=0.2V, LIMSW=0V(or 3V) ^{*4} |
| Output limit current 2 | VOL2 | 285 | 300 | 315 | mA | RNF=0.5Ω with a load of 10Ω VLIMH(or L)=0.15V, LIMSW=0V(or 3V) ^{*4} |
| Output limit current 3 | VOL3 | 190 | 200 | 210 | mA | RNF=0.5Ω with a load of 10Ω VLIMH(or L)=0.1V, LIMSW=0V(or 3V) ^{*4} |
| Digital transistor block for waveform shaping | | | | | | |
| Input current | ISIH | - | - | 0.1 | mA | SIx=3V |
| Low level output voltage | VSOL | - | 0.1 | 0.25 | V | SIx=3V, ISO=0.5mA |
| Input dividing resistance | RSIL | 70 | 100 | 130 | kΩ | |
| Output pull-up resistance | RSOH | 5 | 10 | 20 | kΩ | |
| Input dividing resistance comparison | - | 0.8 | 1.0 | 1.2 | - | Division resistance comparison between SIx and GND ^{*4} |

^{*4} Design target value (No total shipment inspection is made.)

●Operation Notes

(1) Absolute maximum ratings

Use of the IC in excess of absolute maximum ratings such as the applied voltage or operating temperature range (Topr) may result in IC damage. Assumptions should not be made regarding the state of the IC (short mode or open mode) when such damage is suffered. The implementation of a physical safety measure such as a fuse should be considered when use of the IC in a special mode where the absolute maximum ratings may be exceeded is anticipated.

(2) Power supply lines

Regenerated current may flow as a result of the motor's back electromotive force. Insert capacitors between the power supply and ground pins to serve as a route for regenerated current. Determine the capacitance in full consideration of all the characteristics of the electrolytic capacitor, because the electrolytic capacitor may lose some capacitance at low temperatures. If the connected power supply does not have sufficient current absorption capacity, regenerative current will cause the voltage on the power supply line to rise, which combined with the product and its peripheral circuitry may exceed the absolute maximum ratings. It is recommended to implement a physical safety measure such as the insertion of a voltage clamp diode between the power supply and GND pins.

(3) Ground potential

Ensure a minimum GND pin potential in all operating conditions.

(4) Setting of heat

Use a thermal design that allows for a sufficient margin in light of the power dissipation (Pd) in actual operating conditions.

(5) Actions in strong magnetic field

Use caution when using the IC in the presence of a strong magnetic field as doing so may cause the IC to malfunction.

(6) ASO

When using the IC, set the output transistor for the motor so that it does not exceed absolute maximum ratings or ASO.

(7) Thermal shutdown circuit

This IC incorporates a TSD (thermal shutdown) circuit (TSD circuit). If the temperature of the chip reaches the following temperature, the motor coil output will be opened. The thermal shutdown circuit (TSD circuit) is designed only to shut the IC off to prevent runaway thermal operation. It is not designed to protect the IC or guarantee its operation. Do not continue to use the IC after operating this circuit or use the IC in an environment where the operation of this circuit is assumed.

| | |
|-----------------------------------|---------------------------------------|
| TSD ON temperature [°C] (Typ.) | Hysteresis temperature [°C] (Typ.) |
| 175 | 20 |

(8) Ground Wiring Pattern

When using both small signal and large current GND patterns, it is recommended to isolate the two ground patterns, placing a single ground point at the application's reference point so that the pattern wiring resistance and voltage variations caused by large currents do not cause variations in the small signal ground voltage. Be careful not to change the GND wiring pattern of any external components, either.

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