STRUCTURE Silicon Monolithic Integrated Circuit

PRODUCT SERIES 6ch Stepping Motor Driver

TYPE **BD6753KV**

FEATURES
- Built in 4 PWM Constant-Current Drivers
- Built in 2 Linear Constant-Current Drivers

●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 +12.5	V
Charge pump voltage	VG	18.0	V
Control input voltage	VIN	-0.5 to VCC+0.5	V
Power dissipation	Pd	1125※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 9.0mW/°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	2.7	3.3	5.5	V
Motor power supply voltage	VM1	4.5	10.5	10.5	V
	VM2~VM4	2.0	10.5	10.5	V
Control input voltage	VIN	0	-	VCC	V
Output current control input voltage range	VLIM	0	-	VCC	V
PWM signal input frequency	FPWM	0	-	0.1	MHz
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

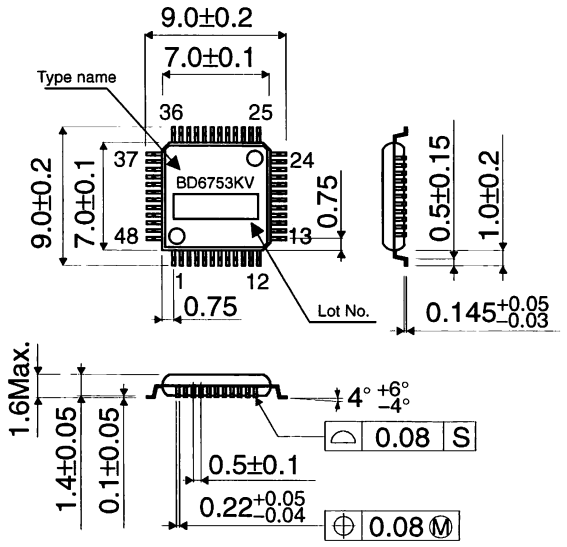

Fig.1 VQFP48C Package (Unit: mm)

●Pin Arrangement (Top View)

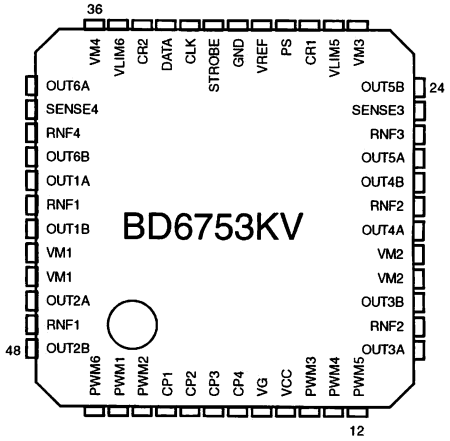

Fig.2 BD6753KV Pin Arrangement (Top View)

●Block Diagram

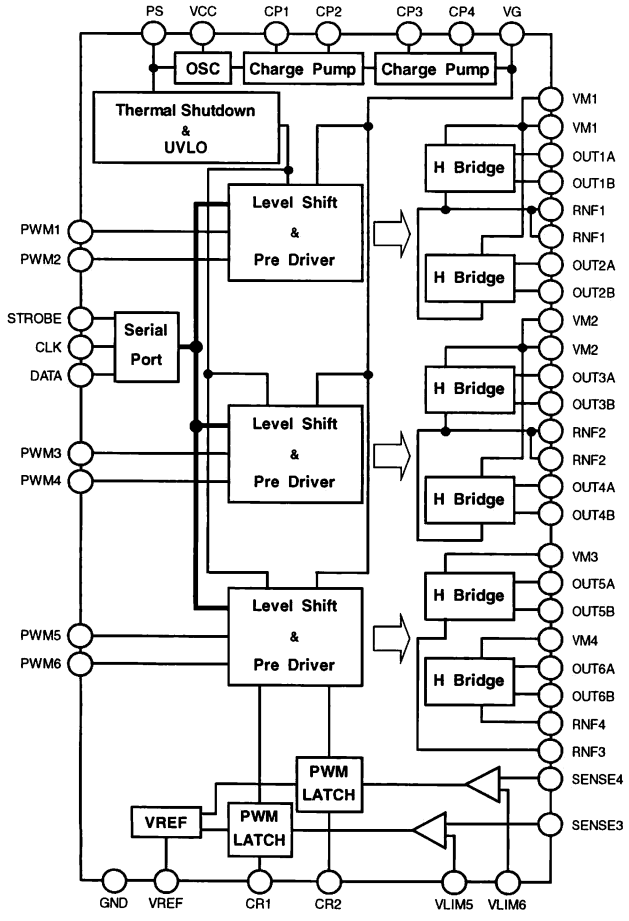

Fig.3 BD6753KV Block Diagram

●Pin No. and Pin Name

No.	Pin name	No.	Pin name
1	PWM6	25	VM3
2	PWM1	26	VLIM5
3	PWM2	27	CR1
4	CP1	28	PS
5	CP2	29	VREF
6	CP3	30	GND
7	CP4	31	STROBE
8	VG	32	CLK
9	VCC	33	DATA
10	PWM3	34	CR2
11	PWM4	35	VLIM6
12	PWM5	36	VM4
13	OUT3A	37	OUT6A
14	RNF2	38	SENSE4
15	OUT3B	39	RNF4
16	VM2	40	OUT6B
17	VM2	41	OUT1A
18	OUT4A	42	RNF1
19	RNF2	43	OUT1B
20	OUT4B	44	VM1
21	OUT5A	45	VM1
22	RNF3	46	OUT2A
23	SENSE3	47	RNF1
24	OUT5B	48	OUT2B

● BD6753KV Electrical Characteristics (Unless otherwise specified, Ta=25°C, VCC=3.3V, VM=10.5V)

Parameter	Symbol	Limit			Unit	Conditions
		Min.	Typ.	Max.		
Overall						
Circuit current during standby operation	ICCST	-	0	10	μA	PS=L
Circuit current	ICC	-	2.2	3.0	mA	PS=H with no signal; CRx open
Power-saving						
High level input voltage	VPSH	2.0	-	-	V	
Low level input voltage	VPSL	-	-	0.7	V	
High level input current	IPSH	25	50	100	μA	VPS=3.3V
Low level input current	IPSL	-1	0	-	μA	VPS=0V
Control input						
High level input voltage	VINH	2.0	-	-	V	STROBE, CLK, DATA, PWMx
Low level input voltage	VINL	-	-	0.7	V	STROBE, CLK, DATA, PWMx
High level input current	IINH	16.5	33	66	μA	STROBE, CLK, DATA, PWMx, VIN=3.3V
Low level input current	IINL	-1	0	-	μA	STROBE, CLK, DATA, PWMx, VIN=0V
Pull-down resistance	RIN	50	100	200	kΩ	
Charge pump						
Charge pump voltage	VCP	16	16.5	-	V	
UVLO						
UVLO voltage	VUVLO	1.6	-	2.5	V	
Full-ON Drive block (ch1 to ch4)						
Output ON-Resistance	RON	-	1.2	1.5	Ω	Io=±400mA, VG=16.5V on high and low sides in total
PWM Linear Constant-Current Drive block (ch5 and ch6)						
Output ON-Resistance	RON	-	1.2	1.5	Ω	Io=±400mA, VG=16.5V on high and low sides in total
VLIM pin input current	IVLIM	-1	-0.2	-	μA	VLIMx=0V, SENSEx=0.5V
SENSE pin input current	ISENSE	-1	-0.2	-	μA	VLIMx=0.5V, SENSEx=0V
Output limit voltage	VOL	485	500	515	mV	VLIMx=500mV
CR clamp voltage	VCR	0.8	0.9	1.0	V	R=10kΩ
CR switching high voltage	VCRH	0.72	0.8	0.88	V	
CR switching low voltage	VCRL	0.36	0.4	0.44	V	
Minimum ON time	TMINON	0.1	0.5	1.0	μs	C=470pF, R=10kΩ
Constant voltage power supply						
VREF output voltage	VREF	0.81	0.9	0.99	V	Iout=0~1mA

●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 loose 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	40

(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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