Structure	Silicon Monolithic Integrated Circuit
Product Series	4ch PWM Sensorless System Motor Driver for MD
Type	BD6643KN

Features

- Operates at low power supply voltage (2.1V min.)
- Power DMOS output with low ON resistance (0.8Ω typ.)
- Incorporates a charge pump circuit for VG boost
- 3-phase full-wave PWM soft switching sensorless driver for spindle
- 3-value control 3-phase driver for sled (Built-in comparator for BEMF voltage detection)
- 2ch, 3-value control H-bridges for focus/tracking

○Absolute maximum ratings (Ta=25°C)

Parameter	Symbol	Limit	Unit
Power supply voltage for control circuit	VCC	7	V
Power supply voltage for driver block	VM	7	V
Power supply voltage for pre-driver block	VG	14	V
Input voltage	VIN	0～VCC	V
Output current	Iomax	*500	mA
Power dissipation	Pd	**760	mW
Operating temperature range	Topr	-25～+75	℃
Storage temperature range	Tstg	-55～+150	℃
Junction temperature	Tjmax	+150	℃

＊Must not exceed Pd or ASO, Tjmax=150℃.

＊＊Reduced by 6.1mW/°C over Ta=25°C, when mounted on a glass epoxy board (70mm×70mm×1.6mm).

○Operating conditions (Ta=-25～+75℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit
Power supply voltage	VCC	2.1	2.2	6.5	V
	VM	—	—	3.0	V
	VG	3	6.5	13	V

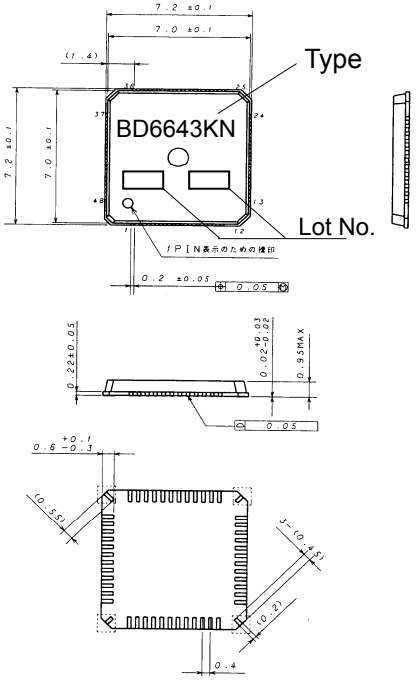
This product described in this specification is not judged whether it applies to COCOM regulations.
Please confirm in case of export.
This product is not designed for protection against radioactive rays.

○ Electrical characteristics (Unless otherwise specified, Ta=25°C, VCC=2.2V, VM=1.0V, fin=176kHz)

Parameter	Symbol	Limit			Unit	Conditions
		Min.	Typ.	Max.		
～Spindle (3-phase full-wave sensorless driver)～						
Position detection comparator offset	VSOFS	-10	-	10	mV	
Position detection comparator input range	VSD	0	-	VCC-1.0	V	
Position detection comparatorinput current H	ISH	-	-	2	μA	input=VCC
Position detection comparatorinput current L	ISL	-2	-	-	μA	input=0V
SLOPE charge current	ISLO	-12.8	-9.8	-6.8	μA	
SLOPE discharge current	ISLI	6.5	9.4	12.5	μA	
SLOPE clamp H level	VSLH	0.5	0.8	1.1	V	
SLOPE clamp L level	VSLL	0.3	0.46	0.6	V	
OSC oscillating frequency	fOSC	70	100	130	kHz	OSC=200pF ISET=50kΩ
OSC charge current	IOSCO	-12.5	-9.65	-6.5	μA	
OSC discharge current	IOSCI	6.5	9.56	12.5	μA	
OSC H level	VOSCH	0.5	0.75	1.0	V	
OSC L level	VOSCL	0.35	0.53	0.70	V	
ISET voltage	VSET	350	505	650	mV	ISET=50kΩ
PWM input frequency	fPWM	60	132	200	kHz	
PWM H level input voltage	VPWH	VCC-0.4	-	VCC	V	
PWM L level input voltage	VPWL	0	-	0.4	V	
PWM H level input current	IPWH	-	-	1	μA	PWM=VCC
PWM L level input current	IPWL	-1	-	-	μA	PWM=0V
BLAKE H level input voltage	VBKH	VCC-0.4	-	VCC	V	Brake ON(BD6641KUT)
						Brake OFF(BD6643KN)
BLAKE L level input voltage	VBKL	0	-	0.4	V	Brake OFF(BD6641KUT)
						Brake ON(BD6643KN)
BLAKE H level input current	IBKH	-	-	1	μA	BRAKE=VCC
BLAKE L level input current	IBKL	-1	-	-	μA	BRAKE=0V
FG H level output voltage	VFGH	VCC-0.4	-	VCC	V	Io=-500μA
FG L level output voltage	VFGL	0	-	0.4	V	Io=500μA
～Sled, focus, tracking (stepping, H-bridge × 2ch)～						
H level input voltage	VINH	VCC-0.4	-	VCC	V	
L level input voltage	VINL	0	-	0.4	V	
H level input current	IINH	-	-	1	μA	VIN=VCC
L level input current	IINL	-1	-	-	μA	VIN=0V
I/O propagation delay time (H-bridge)	TRISE	-	0.2	1	μs	
	TFALL	-	0.1	0.7	μs	
Short pulse input response (H-bridge)	tmin	120	-	-	ns	Input pulse width 200 ns
～Sled, position detection comparator～						
Position detection comparator offset	VAOFS	-10	-	10	mV	
Position detection comparator input range	VAD	0	-	VCC-1.0	V	
Position detection comparator input current H	IAH	-	-	2	μA	
Position detection comparator input current L	IAL	-2	-	-	μA	
Position detection comparator output voltage L	VAOL	-	0.2	0.3	V	Io=300μA
Position detection comparator output pull-up resistance	ROA	10	20	30	kΩ	

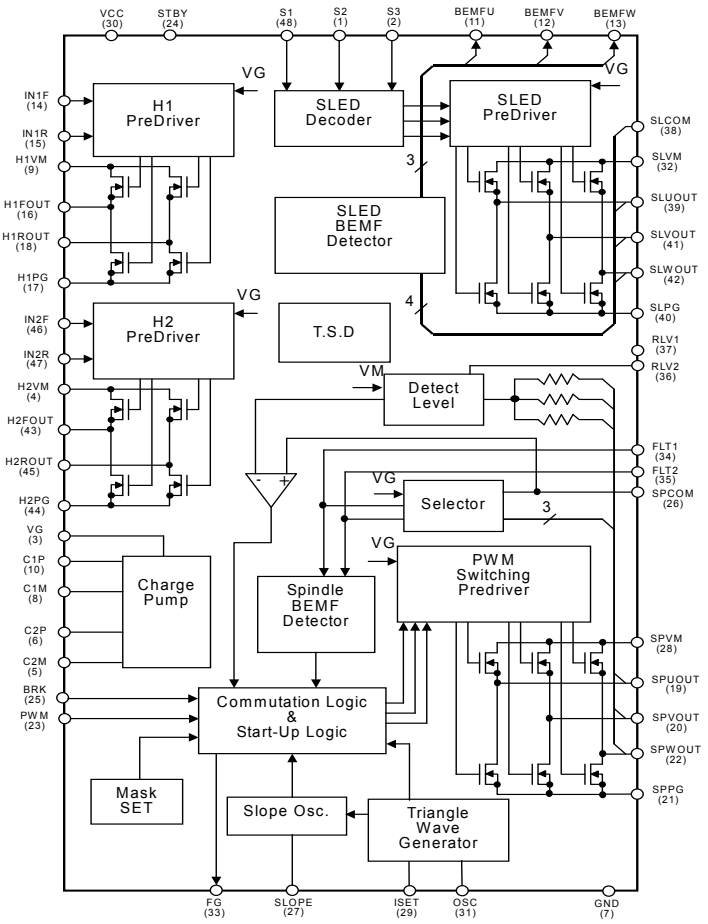
◎This product is not designed for protection against radioactive rays.

○Package outlines



UQFN48 outlines (Unit：mm)

○Block diagram



○Pin No./Pin name

NO.	Pin name	NO.	Pin name
1	S2	33	BRK
2	S3	34	SPCOM
3	VG	35	SLOPE
4	N.C	36	N.C
5	H2VM	37	SPVM
6	N.C	38	MSK
7	C2M	39	ISET
8	C2P	40	VCC
9	GND	41	N.C
10	C1M	42	OSC
11	N.C	43	N.C
12	H1VM	44	SLVM
13	N.C	45	FG
14	C1P	46	FLT1
15	BEMFU	47	FLT2
16	BEMFV	48	RLV2
17	BEMFW	49	SGND
18	IN1F	50	RLV1
19	IN1R	51	SLCOM
20	H1FOUT	52	SLUOUT
21	H1PG	53	SLPG
22	H1ROUT	54	SLVOUT
23	N.C	55	N.C
24	N.C	56	SLWOUT
25	SPUOUT	57	N.C
26	N.C	58	N.C
27	SPVOUT	59	H2FOUT
28	SPPG	60	H2PG
29	SPWOUT	61	H2ROUT
30	N.C	62	IN2F
31	PWM	63	IN2R
32	STBY	64	S1

○Notes on the use

(1) Absolute maximum ratings

If the input voltage or the operating temperature range exceeds absolute maximum ratings, IC may be damaged. No destruction mode (e.g., short-circuiting or open) can be specified in that case. If such special mode as will exceed absolute maximum ratings is assumed, take the physical safety measures, such as a fuse.

(2) Power supply lines

The regenerated current by BEMF of the motor will return. Therefore, take measures, such as the insertion of a capacitor between the power supply and GND as the pass of the 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.

(3) Ground potential

Ensure a minimum GND pin potential in all operating conditions.

(4) Design for heat

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

(5) Operation in strong magnetic field

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

(6) ASO

When using the IC, make settings so that the output transistors for the motor will not be used under conditions in excess of the absolute maximum ratings and ASO.

(7) Thermal shutdown circuit

This IC incorporates thermal shutdown circuit(TSD circuit).

When the chip temperature becomes the one shown in below, TSD circuit operates and makes the coil output to motor open. It is designed to shut the IC off from 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[℃] (typ.)	Hysteresis temperature [℃] (typ.)
175	20

(8) Ground wiring pattern

When having both small signal and large current GND, it is recommended to isolate the two GND 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 voltage variations of the small signal GND. Be careful not to change the GND wiring pattern of any external parts, either.

Notes

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