Structure Silicon Monolithic Integrated Circuit

Product Series 5ch Sensorless System Motor Driver for MD

Type BD6603KVT

Features
- Operates at low power supply voltage (2.3V min.)
- Power DMOS output with low ON resistance (0.8Ω typ.)
- Incorporates a charge pump circuit for VG boost
- 3-phase full-wave sensorless driving system for spindle
- 4ch, 2-value control H-bridges for sled/focus/tracking/head up/down
- 2ch half-bridges for spindle/sled VM power supply

○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	15	V
Input voltage	VIN	0～VCC	V
Output current	Iomax	*500	mA
Power dissipation	Pd	**1250	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 10.0mW/°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	2.3	3.0	6.5	V
	VM	—	—	6.5	V
	VG	VM+3	9	14	V
Pulse input frequency	fin	—	—	200	kHz

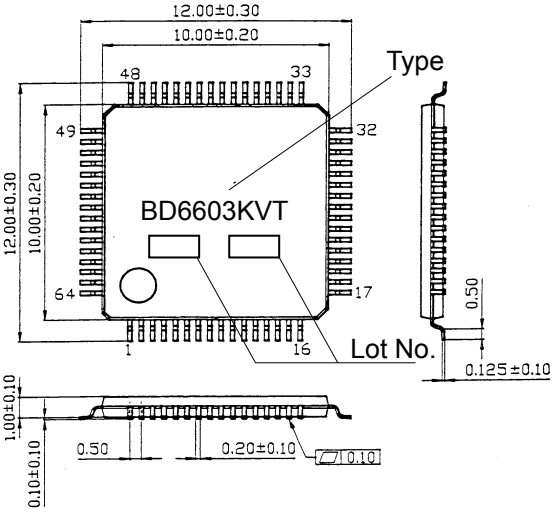
○Electrical characteristics

(Unless otherwise specified, Ta=25°C, VCC=3V, VM=2.5V, fin=176kHz)

Parameter	Symbol	Limit			Unit	Conditions
		Min.	Typ.	Max.		
Circuit current	ICC	—	5.6	8.0	mA	at operation in all blocks
	IST	—	16	50	μA	at standby in all blocks
Output ON resistance	RON	—	0.8	1.2	Ω	upper and lower ON resistance in total VG=10V
～Boost circuit～						
Output voltage	VG1	7.5	8.9	10.0	V	each input L
	VG2	6.0	7.3	9.5	V	at operation in all blocks
～Oscillation circuit～						
Self propelled oscillating frequency	fOSC	125	250	400	kHz	
External clock synchronous range	fSYNC	—	—	500	kHz	input from EXTCLK pin
～Spindle (3-phase full-wave sensorless driver) block～						
Position detection comparator offset	VCO	-10	—	+10	mV	
Detection comparator input range	VCD	0	—	VCC-1.0	V	
CST charge current	ICTO	-0.9	-2.1	-3.3	μA	CST=1V
CST discharge current	ICTI	2.0	3.6	5.3	mA	CST=1V
CSL charge current	ICLO	-4.0	-8.0	-12	μA	CSL=VCC-0.4V
CSL discharge current	ICLI	2.0	5.5	5.3	μA	CSL=VCC-0.4V
Brake comparator input current	IBR	—	—	2.0	μA	BRK=VCC
Brake comparator input offset	VBO	-15	—	+15	mV	
Brake comparator input range	VBD	0	—	VCC-1.5	V	
FG output L voltage	VOLF	—	0.2	0.3	V	Io=500μA
～Sled, focus, tracking, head up/down, PWM power supply (H-bridge, half-bridge driver) block～						
Logic H level input voltage	VINH	VCC-0.4	—	—	V	
Logic L level input voltage	VINL	—	—	0.4	V	
Logic H level input current	IINH1	—	—	1	μA	VIN=3V
	IINH2	—	350	600	μA	VIN=3V EXTCLK pin
Logic L level input current	IINL	-1	—	—	μA	VIN=0V
Output propagation delay time	TRISE	—	0.2	1	μsec	
	TFALL	—	0.1	0.7	μsec	
Minimum input pulse width	tmin	200	—	—	nsec	output pulse width 2/3tmin or more

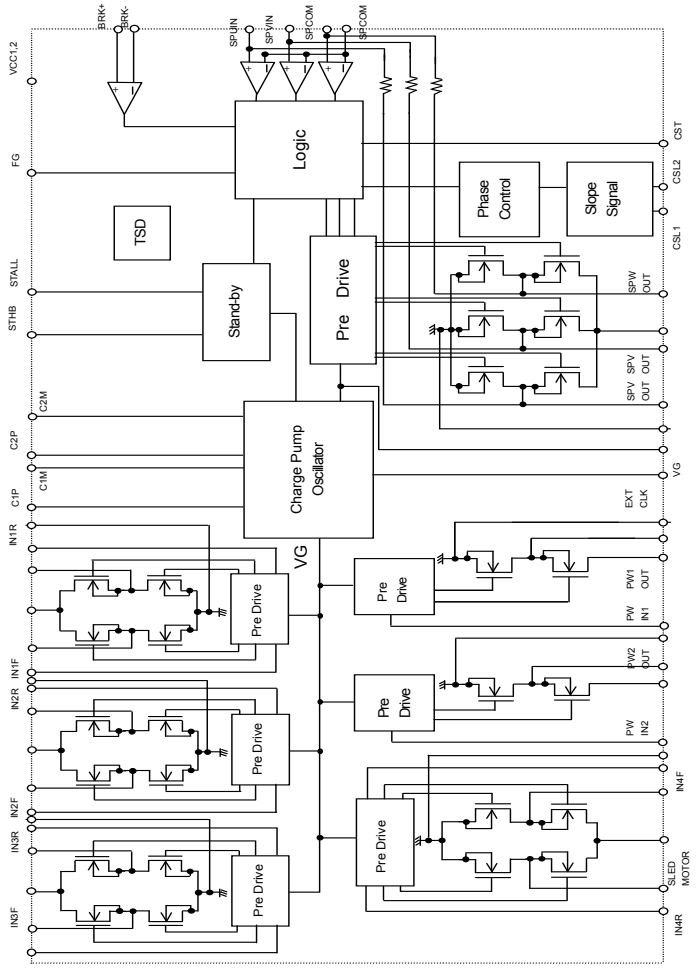
◎This product is not designed for protection against radioactive rays.

○Package outlines



TQFP64V outlines (Unit : mm)

○Block diagram



○Pin No./Pin name

NO.	Pin name	NO.	Pin name
1	PWIN2	33	CSL1
2	IN1F	34	FG
3	IN1R	35	IN4R
4	IN2F	36	IN4F
5	IN2R	37	IN3R
6	H1PG2	38	IN3F
7	H1ROUT	39	H4PG1
8	H1VM	40	H4FOUT
9	H1FOUT	41	H4VM
10	H1PG1	42	H4ROUT
11	H2PG2	43	H4PG2
12	H2ROUT	44	H3PG1
13	H2VM	45	H3FOUT
14	H2FOUT	46	H3VM
15	H2PG1	47	H3ROUT
16	BRK-	48	H3PG2
17	BRK+	49	VG
18	SPUIN	50	C2M
19	SPVIN	51	C2P
20	SPWIN	52	C1M
21	SPCOM	53	C1P
22	SGND	54	EXTCLK
23	ASGND	55	STHB
24	SPPG2	56	STALL
25	SPUOUT	57	VCC1
26	SPVM2	58	VCC2
27	SPVOUT	59	PW2VM
28	SPPG1	60	PW2OUT
29	SPWOUT	61	PWPG
30	SPVM1	62	PW1OUT
31	CST	63	PW1VM
32	CSL2	64	PWIN1

○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 emperature [℃] (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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