

STRUCTURE Silicon Monolithic Integrated Circuit

PRODUCT SERIES 3ch Stepping Motor Driver

Under Developing

TYPE **BD6878GUW**

- FEATURES
- Built in 2 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 +7.0	V
Control input voltage	VIN	-0.5 to VCC+0.5	V
Power dissipation	Pd	619 <sup>*1</sup>	mW
Operating temperature range	Topr	-25 to +85	°C
Junction temperature	Tjmax	125	°C
Storage temperature range	Tstg	-55 to +125	°C
H-bridge output current	Iout	-800 to +800 <sup>*2</sup>	mA/ch

<sup>\*1</sup> Reduced by 6.19mW/°C over 25°C, when mounted on a glass epoxy board (114.3mm x 76.2mm x 1.6mm).

<sup>\*2</sup> Must not exceed Pd, ASO, or Tjmax of 125°C.

●Operating Conditions (Ta=-25°C to +85°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	5.5	V
Control input voltage	VIN	0	-	VCC	V
H-bridge output current	Iout	-	-	±500 <sup>*3</sup>	mA/ch

<sup>\*3</sup> 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

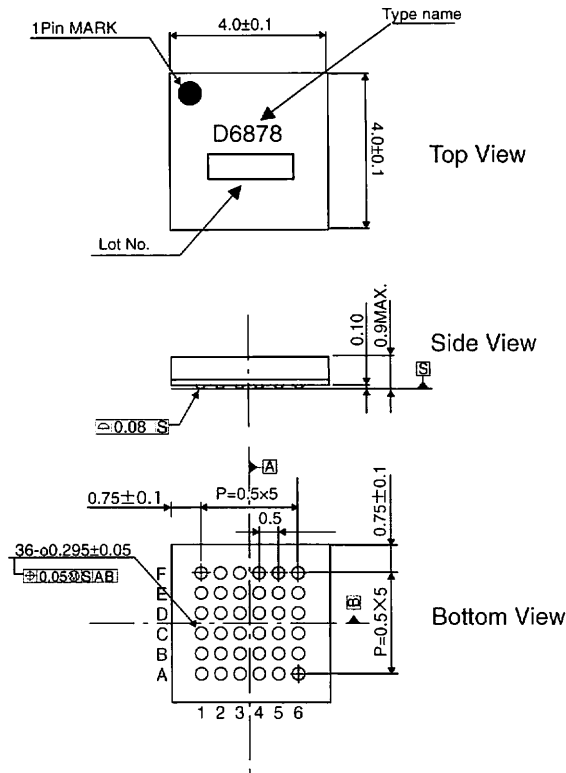


Fig.1 VBGA036W040 Package (Unit: mm)

●Pin Arrangement (Top View)

	1	2	3	4	5	6
A	N.C.	VREF	VLIMH	VLIML	VLIMS	N.C.
B	OUT3A	BRAKE1	IN3A	IN3B	IN2A	IN1A
C	RNF	SENSE	VM3	VCC	IN2B	IN1B
D	OUT3B	BRAKE2	VM1	VM2	PGND2	OUT2B
E	N.C.	PGND1	PGND1	GND	PGND2	OUT2A
F	N.C.	OUT1A	OUT1B	SEL	PS	N.C.

Fig.2 BD6878GUW Pin Arrangement (Top View)

●Block Diagram

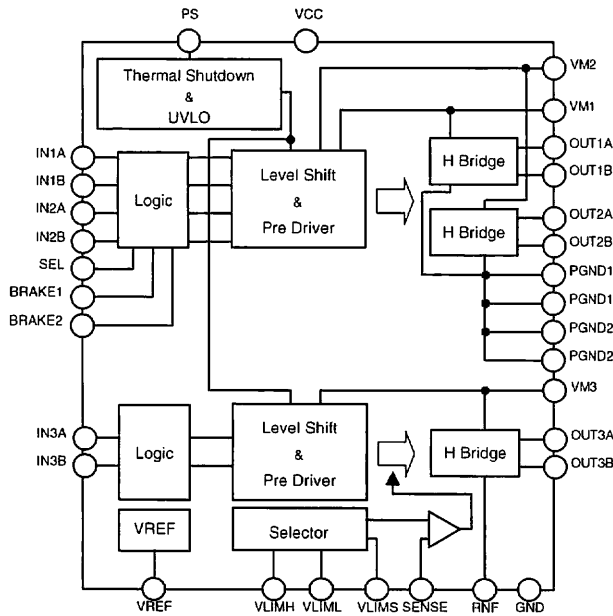


Fig.3 BD6878GUW Block Diagram

●Pin No. and Pin Name

No.	Pin name	No.	Pin name
1A	N.C.	1D	OUT3B
2A	VREF	2D	BRAKE2
3A	VLIMH	3D	VM1
4A	VLIML	4D	VM2
5A	VLIMS	5D	PGND2
6A	N.C.	6D	OUT2B
1B	OUT3A	1E	N.C.
2B	BRAKE1	2E	PGND1
3B	IN3A	3E	PGND1
4B	IN3B	4E	GND
5B	IN2A	5E	PGND2
6B	IN1A	6E	OUT2A
1C	RNF	1F	N.C.
2C	SENSE	2F	OUT1A
3C	VM3	3F	OUT1B
4C	VCC	4F	SEL
5C	IN2B	5F	PS
6C	IN1B	6F	N.C.

●BD6878GUW Electrical Characteristics (Unless otherwise specified, Ta=25°C, VCC=3.0V, VM=5.0V)

Parameter	Symbol	Target Limit			Unit	Conditions
		Min.	Typ.	Max.		
<b>Overall</b>						
Circuit current during standby operation	ICCST		0		μA	PS=L
Circuit current	ICC		1.2		mA	PS=H with no signal
<b>Power-saving</b>						
High level input voltage	VPSH		-		V	
Low level input voltage	VPSL		-		V	
High level input current	IPSH		30		μA	PS=3V
Low level input current	IPSL		0		μA	PS=0V
<b>Control input</b>						
High level input voltage	VINH		-		V	IN1A~IN3B, SEL, BRAKE1~2, VLIMS
Low level input voltage	VINL		-		V	IN1A~IN3B, SEL, BRAKE1~2, VLIMS
High level input current	IINH		30		μA	IN1A~IN3B, SEL, BRAKE1~2, VLIMS; VIN=3V
Low level input current	IINL		0		μA	IN1A~IN3B, SEL, BRAKE1~2, VLIMS; VIN=0V
Pull-down resistor	RIN		100		kΩ	IN1A~IN3B, SEL, BRAKE1~2, VLIMS
<b>UVLO</b>						
UVLO voltage	VUVLO		-		V	
<b>Full-ON Drive block (ch1 and ch2)</b>						
Output ON-Resistance	RON		1.2		Ω	Io=±400mA on high and low sides in total
Turn-on time	ton		0.6		μs	With 20Ω load
Turn-off time	toff		0.08		μs	With 20Ω load
Rise time	tr		0.15		μs	With 20Ω load
Fall time	tf		0.03		μs	With 20Ω load
<b>Linear Constant-Current Drive block (ch3)</b>						
Output ON-Resistance	RON		1.0		Ω	Io=±400mA on high and low sides in total
VREF output voltage	VREF		0.90		V	Iout=0~1mA
Output limit voltage 1	VOL1		300		mV	RNF=1.5Ω, VLIM=0.3V
Output limit voltage 2	VOL2		450		mV	RNF=1.5Ω, VLIM=0.45V
Output limit voltage 3	VOL3		200		mV	RNF=0.5Ω, VLIM=0.2V
Turn-on time	ton		1.0		μs	With 10Ω load
Turn-off time	toff		0.1		μs	With 10Ω load
Rise time	tr		0.5		μs	With 10Ω load
Fall time	tf		0.07		μs	With 10Ω load

●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.)
150	25

(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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