STRUCTURE Silicon Monolithic Integrated Circuit

PRODUCT SERIES Single-Phase Full-Wave Motor Driver for Fan Motor

TYPE ＢＤ６９６１Ｆ

FEATURES PWM speed control
Soft switching function

○ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Limit	Unit
Supply voltage	Vcc	15	V
Power dissipation	Pd	780＊	mW
Operating temperature	Topr	-40～+105	℃
Storage temperature	Tstg	-55～+150	℃
Output voltage	Vomax	15	V
Output current	Iomax	1000＊＊	mA
FG signal output voltage	VFG	15	V
FG signal output current	IFG	10	mA
Junction temperature	Tjmax	150	℃

＊ Reduce by 6.24mW/℃ over Ta=25℃.
(On 70.0mm×70.0mm×1.6mm glass epoxy board)
＊＊ This value is not to exceed Pd.

○OPERATING CONDITIONS

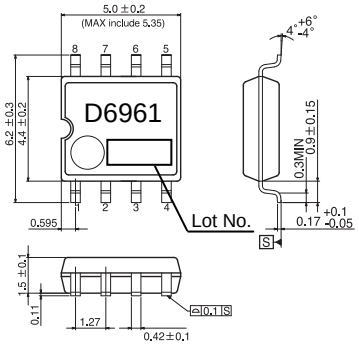
Parameter	Symbol	Limit	Unit
Operating supply voltage range	Vcc	3.5～14	V
Hall input voltage range	VH	0～Vcc/3	V

＊This product is not designed for production against radioactive rays.

○ELECTRICAL CHARACTERISTICS (Unless otherwise specified Ta=25℃,Vcc=12V)

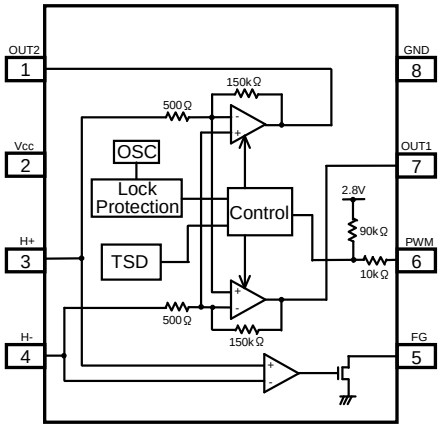
Parameter	Symbol	Limit			Unit	Conditions
		Min.	Typ.	Max.		
Circuit current 1	Icc1	1	3	5	mA	PWM=GND
Circuit current 2	Icc2	2	5	8	mA	PWM=OPEN
Input offset voltage	VHOFS	-	-	±6	mV	
FG hysteresis voltage	VHYS	±5	±10	±15	mV	
PWM input H level	VPWMH	2.5	-	Vcc+0.3V	V	
PWM input L level	VPWML	-0.3	-	0.8	V	
PWM input current	IPWMH	11	22	33	μA	PWM=5.0V
	IPWML	-42	-28	-14	μA	PWM=GND
Input frequency	FPWM	0.02	-	50	kHz	
Output voltage	VO	-	0.4	0.6	V	Io＝300mA Upper and Lower total
Input-output Gain	GIO	45	48	51	dB	
FG low voltage	VFGL	-	-	0.4	V	IFG＝5mA
FG leak current	IFGL	-	-	20	μA	VFG=15V
Lock detection ON time	TON	0.35	0.50	0.65	s	
Lock detection OFF time	TOFF	3.5	5.0	6.5	s	

○PACKAGE OUTLINES



SOP8 (Unit:mm)

○BLOCK DIAGRAM



○TERMINAL NAME

PIN No.	Terminal name
1	OUT2
2	Vcc
3	H+
4	H-
5	FG
6	PWM
7	OUT1
8	GND

○CAUTIONS ON USE

1) Absolute maximum ratings
An excess in the absolute maximum rations, such as supply voltage, temperature range of operating conditions, etc., can break down the devices, thus making impossible to identify breaking mode, such as a short circuit or an open circuit. If any over rated values will expect to exceed the absolute maximum ratings, consider adding circuit protection devices, such as fuses.

2) Connecting the power supply connector backward
Connecting of the power supply in reverse polarity can damage IC. Take precautions when connecting the power supply lines. An external direction diode can be added.

3) Power supply line
Back electromotive force causes regenerated current to power supply line, therefore take a measure such as placing a capacitor between power supply and GND for routing regenerated current. And fully ensure that the capacitor characteristics have no problem before determine a capacitor value. (when applying electrolytic capacitors, capacitance characteristic values are reduced at low temperatures)

4) GND potential
It is possible that the motor output terminal may deflect below GND terminal because of influence by back electromotive force of motor. The potential of GND terminal must be minimum potential in all operating conditions, except that the levels of the motor outputs terminals are under GND level by the back electromotive force of the motor coil. Also ensure that all terminals except GND and motor output terminals do not fall below GND voltage including transient characteristics. Malfunction may possibly occur depending on use condition, environment, and property of individual motor. Please make fully confirmation that no problem is found on operation of IC.

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

6) Inter-pin shorts and mounting errors
Use caution when positioning the IC for mounting on printed circuit boards. The IC may be damaged if there is any connection error or if pins are shorted together.

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

8) ASO
When using the IC, set the output transistor so that it does not exceed absolute maximum rations or ASO.

9) Thermal shut down circuit
The IC incorporates a built-in thermal shutdown circuit (TSD circuit). Operation temperature is 175℃(typ.) and has a hysteresis width of 25℃(typ.). When IC chip temperature rises and TSD circuit works, the output terminal becomes an open state. TSD circuit is designed only to shut the IC off to prevent thermal runaway. It is not designed to protect the IC or guarantee its operation. Do not continue to use the IC after operation this circuit or use the IC in an environment where the operation of this circuit is assumed.

10) Testing on application boards
When testing the IC on an application board, connecting a capacitor to a pin with low impedance subjects the IC to stress. Always discharge capacitors after each process or step. Always turn the IC's power supply off before connecting it to or removing it from a jig or fixture during the inspection process. Ground the IC during assembly steps as an antistatic measure. Use similar precaution when transporting or storing the IC.

11) GND 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 ground potential of application 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.

12) Capacitor between output and GND
When a large capacitor is connected between output and GND, if Vcc is shorted with 0V or GND for some cause, it is possible that the current charged in the capacitor may flow into the output resulting in destruction. Keep the capacitor between output and GND below 100uF.

13) IC terminal input
When Vcc voltage is not applied to IC, do not apply voltage to each input terminal. When voltage above Vcc or below GND is applied to the input terminal, parasitic element is actuated due to the structure of IC. Operation of parasitic element causes mutual interference between circuits, resulting in malfunction as well as destruction in the last. Do not use in a manner where parasitic element is actuated.

Notes

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