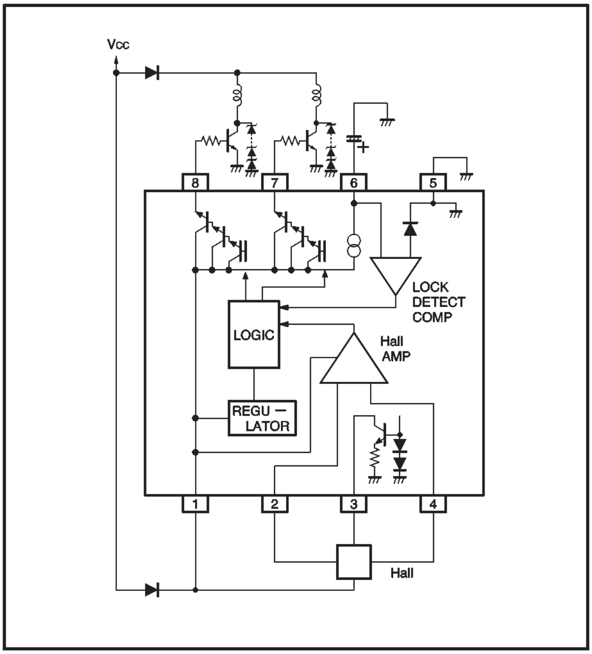
2-phase half-wave motor predriver
BA6402F

The BA6402F is a 2-phase, half-wave motor predriver suitable for fan motors.

●Features
1) Lock detection and rotational speed sensing mechanisms are built in.
2) Hall constant current source is built in.
3) Compact 8-pin SOP package reduces the number of external components required.

●Block diagram and application example



●Absolute maximum ratings (Ta = 25°C)

Parameter	Symbol	Limits	Unit
Applied voltage	V_{CC}	30	V
Power dissipation	Pd	450*	mW
Operating temperature	Topr	−20～+80	℃
Storage temperature	Tstg	−55～+125	℃
Output current	$I_{OMax.}$	70	mA

*Reduced by 4.5 mW for each increase in Ta of 1℃ over 25 ℃.

●Recommended operating conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Applied voltage	V_{CC}	4	—	28	V	Operate within the allowable power dissipation for -20℃ < Ta < 80℃
Input voltage	V_{BH}	0.8	—	V_{CC}−0.2	V	

●Electrical characteristics (unless otherwise noted, Ta = 25°C and V_{CC} = 12V)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Supply current	I_{CC}	—	1.9	4.0	mA	
Hall amplifier input hysteresis (+)	V_{hys}^{+}	3	—	15	mV	
Hall amplifier input hysteresis (−)	V_{hys}^{-}	−3	—	−15	mV	
Pin 3 constant current	I_3	5	6.8	10	mA	
Pin 6 constant current	I_6	5	6.8	10	μA	
Pin 6 clamp voltage	V_6	3.1	—	3.7	V	
Pin 7 Output high level voltage	V_{7H}	10	10.5	—	V	I_O=10mA
Pin 8 Output high level voltage	V_{8H}	10	10.5	—	V	I_O=10mA

●Rotational speed sensing and lock detection (6 pin)

The circuit around pin 6 is described in Fig. 1. Normally, the C_6 external capacitor is charging or discharging around the Hall signal when the motor is running. When the motor is locked, discharging does not occur at C_6 because the Hall signal stops switching. Charging continues at C_6 until the voltage increases to the pin-6 clamp voltage, and then Q_1 turns ON to turn OFF the output. With the pin-6 current being constant (I_6=6.8μA, typical), the time required after the motor is locked until the output current is turned OFF (duration between B and C in Fig. 2) is determined by the C_6 capacitance.

$$T_{off}=T_{B\sim C}=\frac{(V_{6CL}-V_{BEQ3})\,C_6}{I_6}$$

$$\fallingdotseq \frac{4V_{BE}\bullet C_6}{6.8\mu A\ (Typ.)}$$

$$\fallingdotseq 4.12\times10^{5}\times C_6\ (sec)\ (Typ.)$$

where V_{6CL} is pin-6 clamp voltage (nearly equal to $5V_{BE}$)

For C_6=2.2μF, for example, T_{off} is about 0.91s (typical).

●Operation notes

(1) Hall constant current source (3 pin, 6.8mA typically), which is directly connected with the IC bias circuit, is not available when pin 3 is OPEN (saturated).

(2) Power dissipation

The allowable power dissipation is plotted against ambient temperature in Fig. 3.

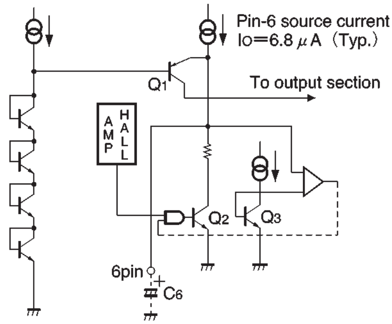


Fig.1

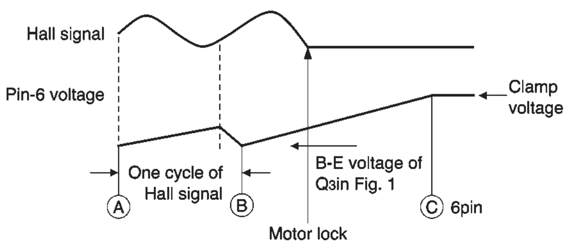


Fig.2

●Thermal derating curve

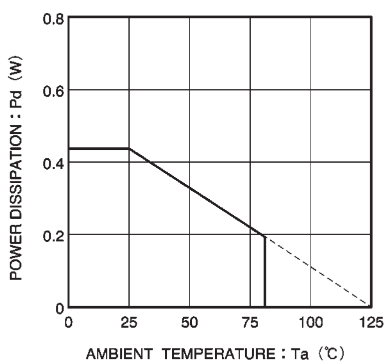


Fig.3

(3) Power dissipation

The power consumed in the IC can be calculated from the following equation :

$$P_C = \sum_{n=1}^{3} P_{Cn}$$

1) P_{C1} is power consumed by the circuit current.

$$P_{C1} = V_{CC} \times I_{CC}$$

2) P_{C2} is power consumed by the Hall current (pin 3).

$$P_{C2} = I_3 \times V_3$$

where V_3=pin 3 voltage. Connecting a resistor between the V_{CC} pin and pin 3 effectively reduces the IC current consumption.

3) P_{C3} is power consumed by the output current.

$$P_{C3} = (V_{CC} - V_{OH}) \times I_O$$

V_{OH} is the HIGH level voltage of pins 7 and 8. Power consumption can be reduced by raising the h_{FE}-rank of the external output transistor and thereby reducing the I_O value. Make sure that your application does not exceed the allowable power dissipation of the IC.

(4) Restarting when motor is locked

The outputs are turned OFF if the motor is stopped for some reason. To restart the motor from this situation, turn off the power first, fully discharge the pin 6 capacitor next, and then turn on the power again.

●Electrical characteristic curve

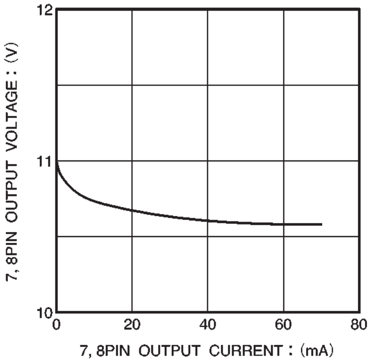
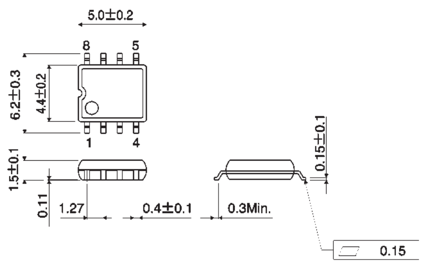


Fig.4 Output voltage vs. output current for pins 7 and 8

●External dimensions (Units: mm)



SOP8