High efficiency switching-type motor driver

BP5807

The BP5807 is an output-variable type 3-output DC motor driver module. This module can change the output voltage for driving the DC motor by inputting PWM signal or DC voltage into the control terminal. The power conversion rate is high, and power saving of the application can be realized, since the input voltage can be changed into the specified output voltage by the switching system. Further, this module can be used as the output-variable type DC / DC converter as well.

● Applications

Refeigerator, The rotation-control type DC motor driver and the output-variable type DC / DC converter

● Features

1) Electrical power loss is small even when there is a difference between the input voltage and motor driving voltage, since electrical power conversion efficiency is high (90% Typ.) as the switching system is employed for changing the voltage.
2) Motor driving voltage can be set to any optional value by the output voltage control signal.
3) The control signal corresponds with both PWM signal and DC voltage.
4) The control terminal is easy to be designed, as it is only one-terminal type.
5) The three outputs are independent.
6) This can be used as the output-variable type DC / DC converter as well.
7) Space-saving package of SIP.

● Absolute maximum ratings (Ta=25°C)

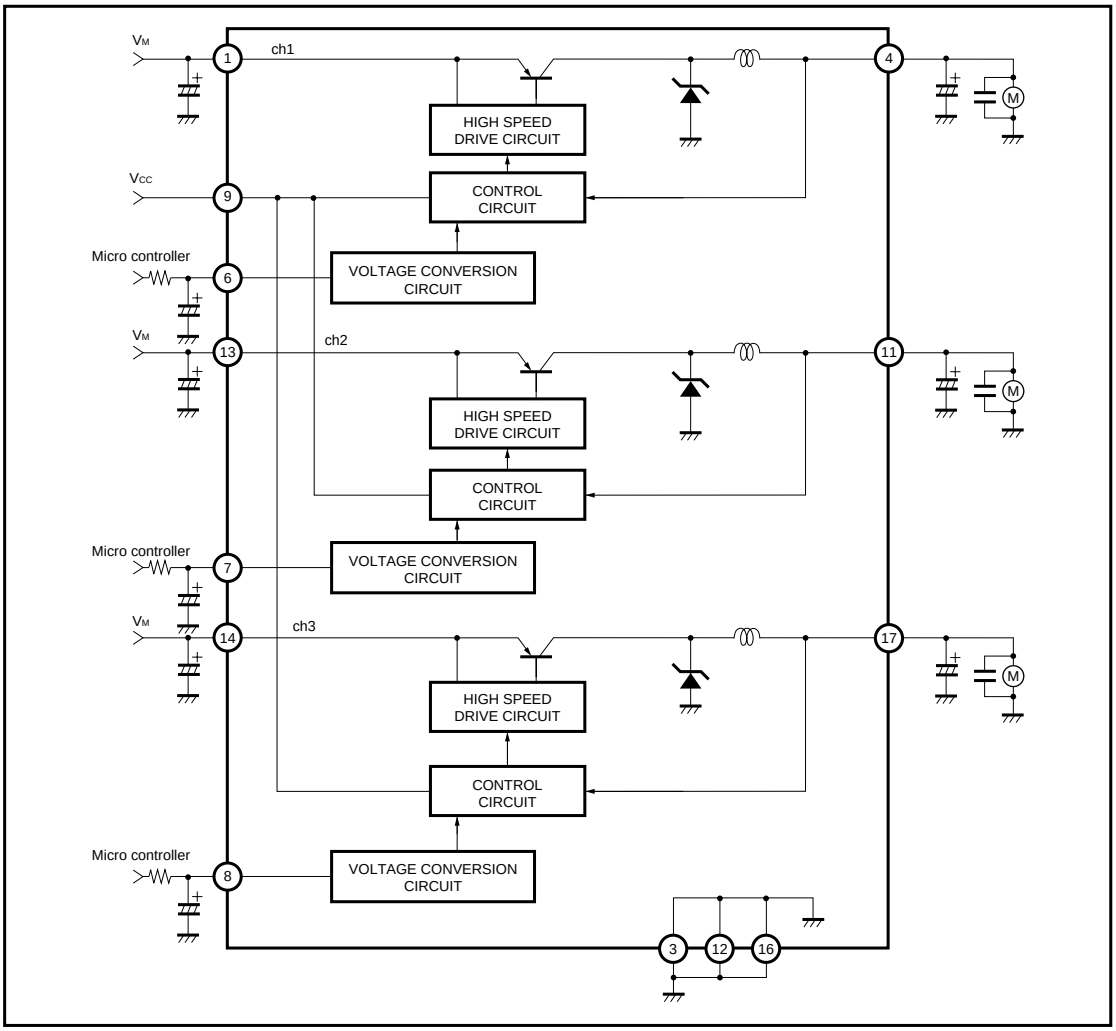
Parameter	Symbol	Limits	Unit
Power supply voltage	V_{CC}	7	V
Motor drive power supply voltage	V_M	16.0	V
Output current	I_O1, 2, 3	0.6(1.3 at peak)*1	A
CTL input voltage	V_{CTL}	7	V
Operating temperature range	Topr	−10 ~ +70	°C
Storage temperature range	Tstg	−25 ~ +80	°C

*1 Derating required according to the output voltage and ambient temperature.

● Recommended operating conditions (Ta=25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit
Power supply voltage	V_{CC}	4.75	5.0	5.25	V
Motor drive power supply voltage	V_M	13	14	15	V

● Block diagram



● Pin descriptions

Pin No.	Pin name	Function
1,13,14	V_M	Input power supply pin for motor drive ; connect a low impedance capacitor with a recommended capacitance of 100μF/35V.
3,12,16	GND	Ground pin
4	Vo1	Output pin for motor drive (ch1) ; connect a low impedance capacitor with a recommended capacitance of 470μF / 35V.
6	CTL1	Output voltage control pin (ch1) ; PWM signal or DC signal is inputted. The output voltage can be changed either by changing the duty of PWM signal or by changing the DC voltage value. ∗1
7	CTL2	Output voltage control pin (ch2) ; PWM signal or DC signal is inputted. The output voltage can be changed either by changing the duty of PWM signal or by changing the DC voltage value. ∗1
8	CTL3	Output voltage control pin (ch3) ; PWM signal or DC signal is inputted. The output voltage can be changed either by changing the duty of PWM signal or by changing the DC voltage value.
9	Vcc	Power supply pin
11	Vo2	Output pin for motor drive (ch2) ; connect a low impedance capacitor with a recommended capacitance of 470μF / 35V.
17	Vo3	Output pin for motor drive (ch3) ; connect a low impedance capacitor with a recommended capacitance of 470μF / 35V.

∗1 Make sure to use the external CR.

● **Electrical characteristics** (Unless otherwise noted, Ta=25°C, V_{CC}=5V, V_M=14V, I_{O1}=I_{O2}=I_{O3}=0.4A, f_{CTL}=50Hz, D_{CTL}=100%)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Output voltage	V_O1, 2, 3	11.82	12.82	13.52	V	
		11.82	12.82	13.0	V	V_M=13V
		5.41	6.41	7.41	V	D_{CTL}1, 2, 3=50%
Ripple noise voltage	ν	–	50	150	mV_{P-P}	*1
Efficiency	η	80	90	–	%	*2
CTL frequency	f_{CTL}	50	–	–	Hz	

*1 Spike noise is not included.

*2 Efficiency= $\frac{V_{O1}\times I_{O1}+V_{O2}\times I_{O2}+V_{O3}\times I_{O3}}{V_M\times I_M}$

● **Measurement circuit**

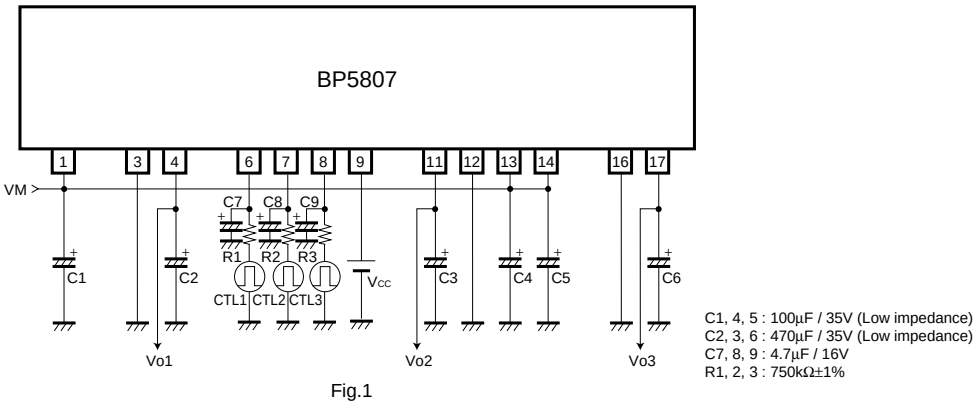


Fig.1

● **Circuit operations**

(1) Description

BP5807 is a DC motor driver that can establish any output voltage by inputting PWM signal and DC voltage into the control pin(6, 7, 8pin).Electrical power loss is small even when there is a difference between the input voltage and output voltage, since changing from the input voltage into the specified output voltage can be made by the switching system. This module is most suitable in case that the number of rotation of the motor is controlled by changing the driving voltage, or in case that the motor of a lower specified voltage than 14V is driven by the electrical power source of 14V.

(2) Control signals

1) PWM signal : the output voltage will be controlled by that duty. The larger the duty is, the higher the output voltage will be. It is necessary to be attentive, because the output voltage value changes depending on the H-level and L-level values of PWM signal as well, at this time.

2) DC voltage : the output voltage will be controlled by that voltage value. The higher the voltage, the higher the output voltage will be.

(3) The two outputs are independent. It is possible to control each output independently with a different kind of the control signal (PWM signal or DC voltage).

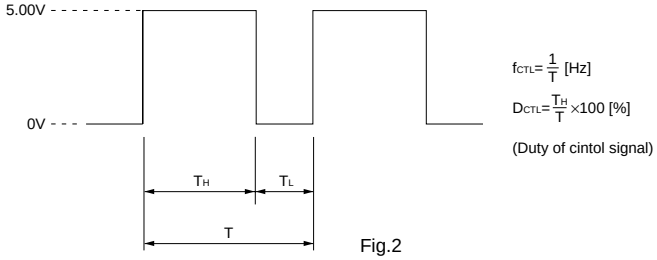


Fig.2

● Application example

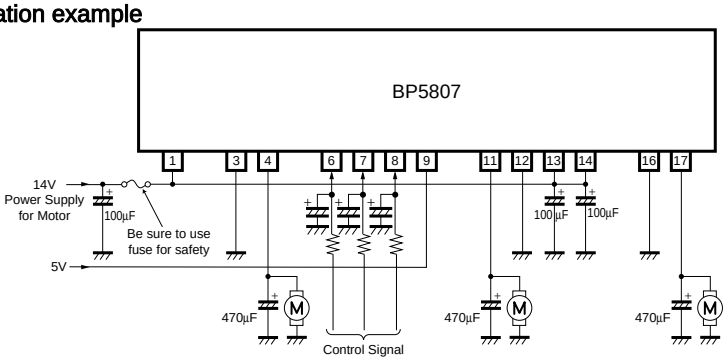


Fig.3

● Operation notes

(1) The output current should be reduced according to an increase in the output voltage or ambient temperature. Use the module within the derating curve range.

(2) The protection circuit for output current is not incorporated. Be sure to take safety measures such as fusing if short-circuit loads or overcurrent is probable.

(3) External capacitor

Since the switching system is employed for the purpose of changing the voltage, ripple current flows to the capacitor to be added to pins 1, 4, 11, 13, 14, 17. Select the product of which allowable ripple current is more than this value.

● Electrical characteristic curves

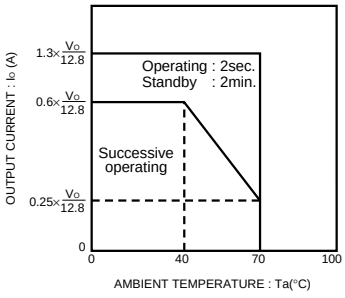


Fig.4 Derating curve

EX. Output voltage : 8V

$0.6 \times \frac{8}{12.8} = 0.375A$

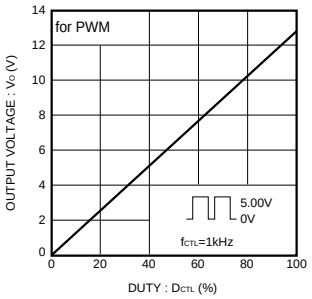


Fig.5 Output voltage vs. Duty

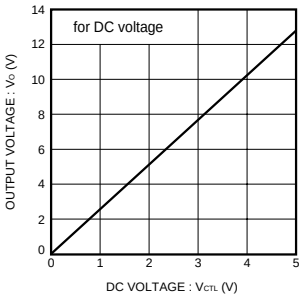
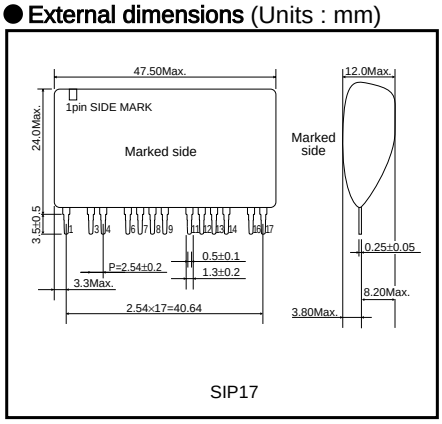


Fig.6 Output voltage vs. DC voltage

● External dimensions (Units : mm)



SIP17

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