CD-ROM spindle motor driver BA6855AFM

The BA6855AFM is a CD-ROM motor driver with a built-in motor power supply switching regulator.

The switching regulator allows low-power designs, and reduced thermal dissipation from the IC. It is possible to select reverse brake and short brake modes.

Applications

CD-ROM, CD-R, CD-RW, DVD-ROM, and DVD-RAM

Features

- 1) Motor switching regulator on chip.
- 2) Selectable brake mode via BR pin.
- FG signal output also possible at power save via FGS.

● Absolute maximum ratings (Ta = 25°C)

Parameter	Symbol	Limits	Unit
Applied voltage (power supply)	Vcc	7	V
Applied voltage (switching power supply)	VR	15	٧
Power dissipation	Pd	2200*1	mW
Operating temperature	Topr	−20 ~+75	င
Storage temperature	Tstg	-55~+150* ²	°
Junction temperature	Tjmax	150	ဗ
Output current	Іомах	1300*3	mA

^{*1} Reduced by 17.6mW for each increase in Ta of 1°C over 25°C (when mounted on a 70mm×70mm×1.6mm glass epoxy PCB).

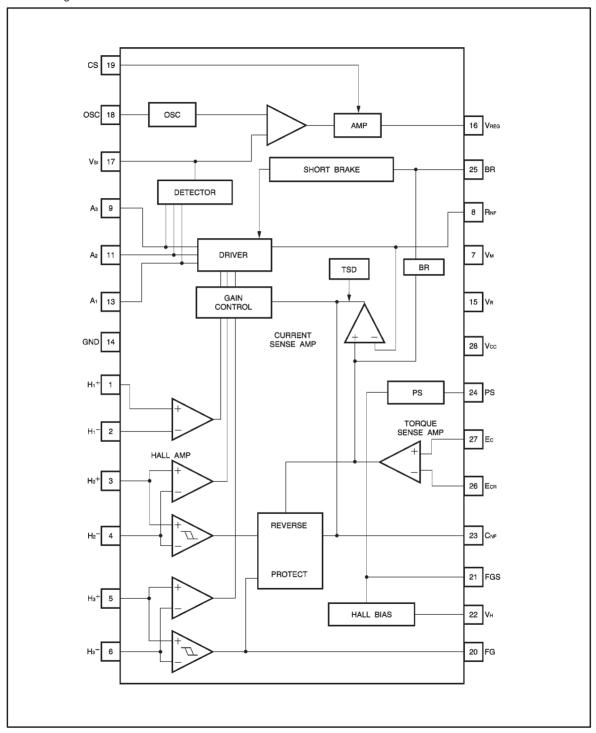
● Recommended operating conditions (Ta = 25°C)

Parameter	Symbol	Limits	Unit
Power supply voltage	Vcc	4.5~5.5	V
Power supply voltage	Vм	3~14	V

^{*2} Do not exceed Tj=150°C.

^{*3} Should not exceed Pd or ASO values.

Block diagram



Pin descriptions

Pin No.	Pin name	Function		
1	H ₁ +	Hall signal input		
2	H ₁ -	Hall signal input		
3	H ₂ +	Hall signal input		
4	H2 ⁻	Hall signal input		
5	H ₃ +	Hall signal input		
6	H₃ ⁻	Hall signal input		
7	V _M	Motor power supply		
8	RNF	For connection of resistor for output current detection		
9	Аз	Output		
10	N.C.	_		
11	A2	Output		
12	N.C.	_		
13	A 1	Output		
14	GND	GND		
15	VR	Switching power supply		
16	VREG	Switching regulator output (SINK output)		
17	Vsı	Lower-side saturation detector output		
18	osc	Oscillator capacitor output		
19	CS	Lower-side saturation voltage setting		
20	FG	FG signal output		
21	FGS	FG switch for PS		
22	Vн	Hall bias		
23	CNF	For connection of phase compensation capacitor		
24	PS	Power save		
25	BR	Brake mode switch		
26	Ecr	Torque control reference		
27	Ec	Torque control		
28	Vcc	Power supply		
FIN	FIN	GND		

^{*} FIN must be connected to GND.

●Electrical characteristics (unless otherwise noted, Ta = 25°C, Vcc = 5V, VR = 12V, and VM = 12V)

Parameter	Symbol	Min.	Тур.	Max.	Unit	Conditions
〈Total〉						
Circuit current 1	lcc1	_	9	14	mA	Power save off
Circuit current 2	lcc2	_	2.5	5	mA	Only FG and V _H operating
Circuit current 3	lcc3	_	0	0.2	mA	Power save on (FGS=L)
⟨Power save⟩						
ON voltage range	VPSON	_	_	1.0	V	_
OFF voltage range	VPSOFF	2.5	_	_	V	_
〈Hall bias〉						
Hall bias voltage	Vнв	0.5	0.9	1.5	V	I _{HB} =10mA
〈Hall amplifier〉						
Input bias current	Іна	_	0.7	3.0	μΑ	_
Same phase input voltage range	VHAR	1.5	_	4.0	٧	_
Minimum input level	VINH	50	_	_	mV _{P-P}	_
Hysteresis	VHYS	5	20	40	mV	_
〈Torque command〉			1	1		
Ec input voltage range	Ec	1.0	_	4.0	V	_
Eca input voltage range	Ecr	1.6	_	3.4	V	_
Offset voltage ""	Ecoff-	-80	-50	-20	mV	Ecr=2.5V
Offset voltage "+"	Ecoff+	20	50	80	mV	Ecr=2.5V
Input bias current	Ecin	-3	_	3	μΑ	Ec=Ecr
Input / output gain	GEC	0.8	1.0	1.2	A/V	_
⟨FG⟩			•	•		
FG output low level voltage	VFGL	_	0.25	0.4	V	I _{FG} =3mA
Duty (reference value)	D υ	_	50	_	%	_
⟨FGS⟩			•	•		
FGS ON voltage range	VFGSON	2.5	_	_	V	FG / V _H ON when PS ON
FGS OFF voltage range	VFGSOFF	_	_	1.0	٧	FG / V _H OFF when PS ON
OSC oscillator frequency 1	OSC1	80	125	180	kHz	Ec=Ecr OSC=470pF
OSC oscillator frequency 2	OSC2	400	_	_	kHz	Ec=Ecr OSC=5pF
(Output)						
Output saturation high level voltage	Vон	_	1.0	1.4	V	_
Output saturation low level voltage	Vol	_	0.4	0.7	V	_
Vм pre-drive current	IVMP	_	35	70	mA	_
Output limit current	lτι	560	700	840	mA	Ecr=1.65V, Ec=0.5V
⟨BR⟩		•	•	•		
Short brake range	VBRS	2.5	_	_	٧	Ec>EcR
Reverse brake range	VBRR	_	_	1.0	V	Ec>EcR

Parameter	Symbol	Min.	Тур.	Max.	Unit	Conditions
⟨Regulator⟩						
Saturation detect output gain	Gvsı	5	10	15	V/V	_
Regulator current capacity	IREGO	30	_	_	mA	_

ONot designed for radiation resistance.

Operation notes

(1) FGS

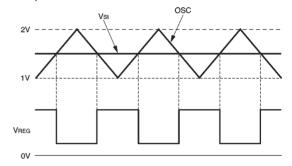
When a high-level voltage is input to FGS, the FG output is output even when power save is on (PS = low level). Also, the Hall bias terminal stays in the operating state.

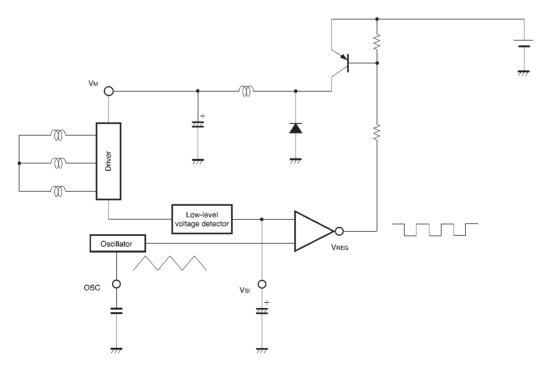
		FGS			
		H L			
	н	V _H =ON	V _H =ON		
PS		FG=ON	FG=ON		
	V _H =ON	V _H =OFF			
		FG=ON	FG=OFF		

(2) Switching regulator

The BA6855AFM has a switching regulator pin.

The IC has an oscillator circuit, and the output is compared to the low-level voltage detector output and output on V_{REG} .





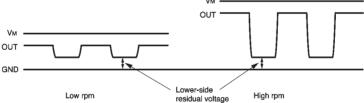
Motor driver ICs

Operating in this way reduces the Collector to Emitter voltage applied on the drive stage transistor, and serves to reduce the power consumption.

Of the power consumed by the IC itself, most is consumed at the collector and emitter of the output stage transistor. This power consumption (Pc) increases as the collector to emitter voltage, and output current increases. This collector to emitter voltage is the power supply voltage less the voltage applied to the motor, and as the voltage applied to the motor decreases with the current, this amount is unnecessarily applied to the between the collector and emitter. Therefore, to effectively use power, (and to prevent power dissipation from exceeding the IC's limits) it is necessary to vary the power supply voltage in accordance with the output current. In other words, when the output current is low, the power supply voltage should be lowered, and when it is high, the power supply voltage should be increased to prevent more voltage than necessary from being applied between the collector and emitter of the output transistor.

(3) V_M variation

The result of the comparison of the output lower-side residual voltage and the triangular wave is output, and V_M is controlled by controlling an externally-connected PNP transistor to maintain the lower-side residual voltage at a roughly fixed level.



(4) The CS pin

The CS pin (pin 19) controls the lower-side residual voltage (above) in the increasing direction.

Pull it down with a resistor when the IC heat generation is low, and the external transistor heat generation is high. Normally this is open.

(5) The relationship between BR and Ec / Ecr When a high level is applied to the BR pin, the normal Ec > Ecr relationship reverses (Ec > Ecr) and the IC enters short brake mode.

	Ec <ecr< th=""><th>Ec>Ecr</th></ecr<>	Ec>Ecr
BR=L	Normal rotation	Reverse brake
BR=H	Normal rotation	Short brake

Application example

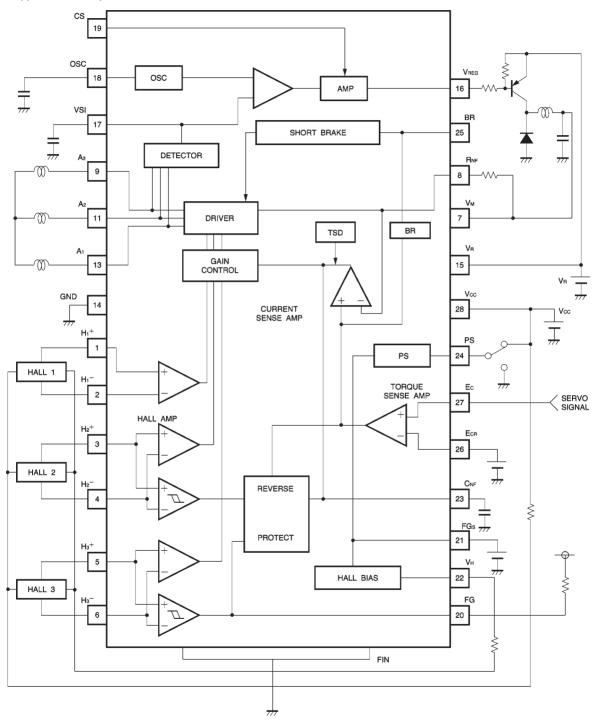
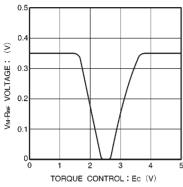


Fig.1

Electrical characteristic curves



00.100 NOLTAGE HIGH : VOH (V)

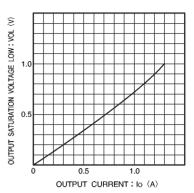
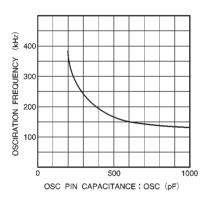


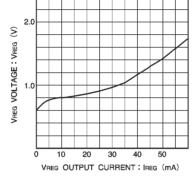
Fig.2 Torque command characteristics

OUTPUT CURRENT: Io (A)

Fig.3 Upper-side output saturation voltage

Fig.4 Lower-side output saturation voltage





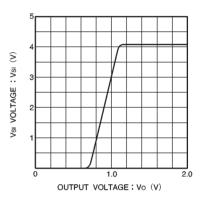


Fig.5 OSC pin frequency vs. external capacitance

Fig.6 VREG current capacity

Fig.7 Output vs. Vsi voltage

External dimensions (Units: mm)

