

AN3860SA

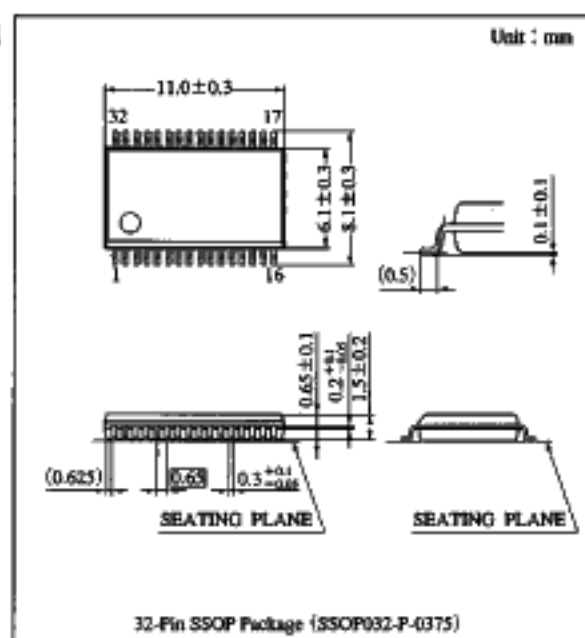
Cylinder Motor Driver IC for Video Camera

Overview

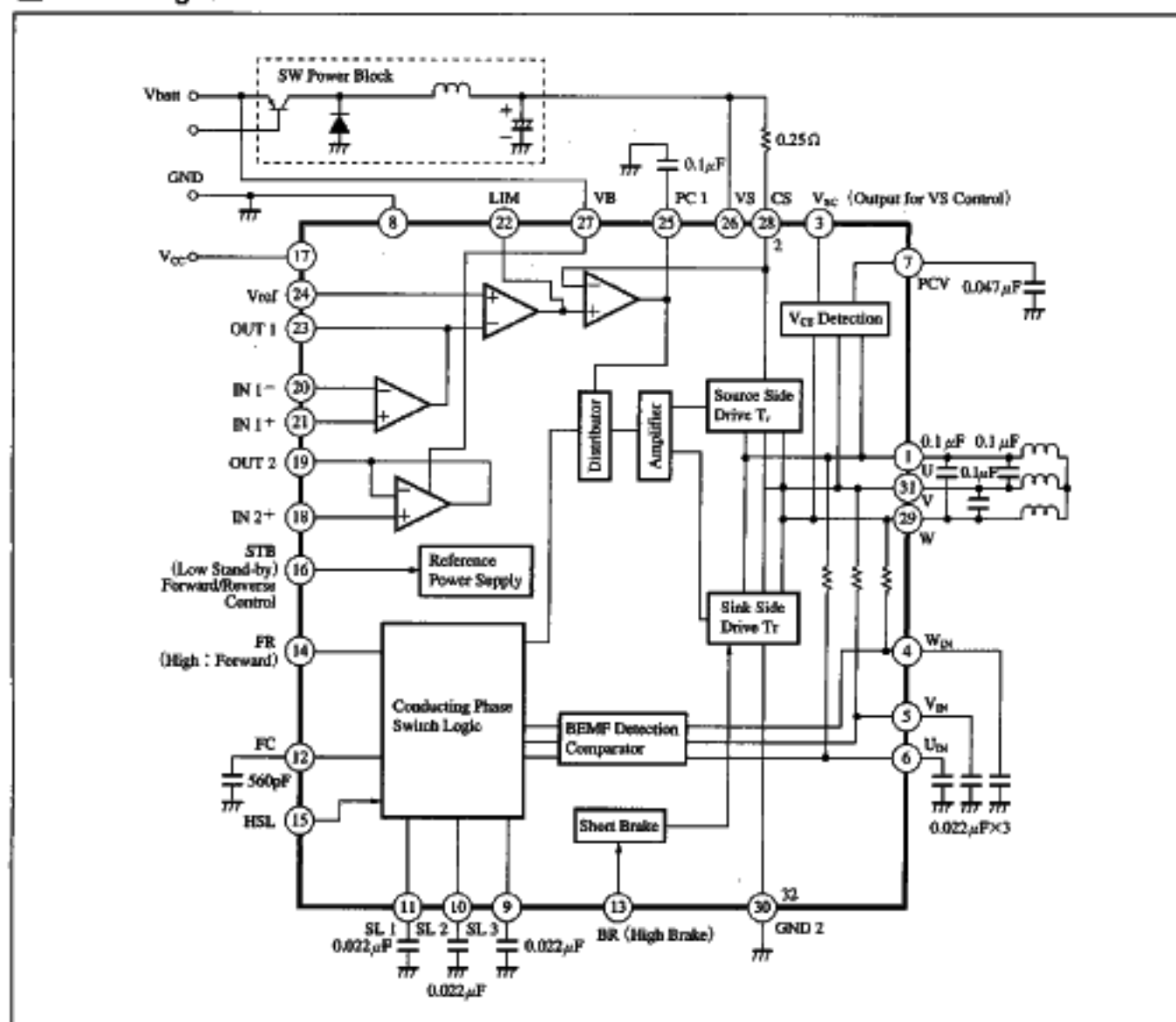
The AN3860SA is a cylinder sensorless-motor driver IC for Video Camera.

Features

- Operating voltage range : $V_{CC}=3.0$ to $5.5V$
- Reduction of noise generated at current switching by 3-phase full-wave overlapping drive and built-in power transistors
- Standby mode for reducing power consumption
- Switching regulator control output



Block Diagram



Pin Descriptions

Pin No.	Pin name and Symbol	Pin No.	Pin name and Symbol
1	U-phase drive output U	17	Power supply V _{CC}
2	Drive current output CS	18	Operational amplifier (2) input IN2H
3	Switching regulator control output VSC	19	Operational amplifier (2) output OUT2
4	W-phase detection WIN	20	Operational amplifier (1) reverse input IN1 ⁻
5	V-phase detection VIN	21	Operational amplifier (1) normal input IN1 ⁺
6	U-phase detection UIN	22	Output maximum current switching LIM
7	Voltage feedback phase correction PCV	23	Operational amplifier (1) output OUT1
8	Ground GND1	24	Servo reference voltage input V _{ref}
9	Slope generation (3) SL3	25	Current feedback phase correction PCI
10	Slope generation (2) SL2	26	Motor drive power supply VS
11	Slope generation (1) SL1	27	Unregulated power supply VB
12	Oscillation FC	28	Drive current output CS
13	Dynamic brake control BR	29	W-phase drive output W
14	Forward/reverse switching FR	30	Ground for driver circuits GND2
15	Slope current switching HSL	31	V-phase drive output V
16	Standby input STB	32	Ground for driver circuits GND2

Absolute Maximum Ratings (T_a = 25°C)

Parameter	Symbol	Rating	Unit
Supply voltage	V _{CC}	6.0	V
Unregulated voltage supply	V _B	11	V
Motor supply voltage (within V _B)	V _S	11	V
Output terminal voltage n = 1, 29, 31	V _a	11	V
Output current n = 1, 29, 31	I _o	1000	mA
Power dissipation	P _O	668	mW
Operating ambient temperature ^(*)	T _{op}	-25 to +70	°C
Storage temperature	T _{stg}	-55 to +150	°C

Note) T_a = 25°C except operating ambient temperature and storage temperature.

Recommended Operating Range (T_a = 25°C)

Parameter	Symbol	Range
Operating supply voltage range	V _{CC}	3.0V to 5.5V
	V _B	4.0V to 10.5V
	V _S	1.5V to V _B

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Electrical Characteristics ($V_{CC}=3.3V$, $V_B=6V$, $V_S=6V$, $T_a=25\pm2^\circ C$)

Parameter	Symbol	Condition	min	typ	max	Unit
Drive Section						
Drive gain	G_{IO}	$\frac{\Delta V_{CS}}{\Delta OUT1}$	0.11	0.14	0.17	times
Drive amp. offset	V_{IOCS}	Input offset voltage OUT1 and V_{ref}	-100	6	100	mV
Max. output current (1)	$I_{Omax}(1)$	LIM : H $R_{CS}=0.25\Omega$	480	560	640	mA
Max. output current (2)	$I_{Omax}(2)$	LIM : L $R_{CS}=0.25\Omega$	625	750	875	mA
Brake current	IBR		200	500	—	mA
Sink side output voltage	V_{CE}	$I_O=100mA$	0.15	0.25	0.35	V
Sink side saturation voltage	$V_{SAT(1)}$	$I_O=500mA$	—	0.25	0.35	V
Source side saturation voltage	$V_{SAT(2)}$	$I_O=500mA$	—	0.90	1.3	V
Bemf Detection Section						
Comparator hysteresis width	V_{HCOM}		9	14	21	mV
Oscillator						
Triangular wave oscillation frequency	f_{FC}	$C_{FC}=560pF$	11.0	16.3	22.8	kHz
Slope Section						
Slope terminal charging current (1)	$I_{SLC(1)}$	HSL : L $C_{FC}=560pF$ $f_{emf}<160Hz$	-26	-20	-14	μA
Slope terminal discharging current (1)	$I_{SLD(1)}$		14	20	26	μA
Slope terminal charging current (2)	$I_{SLC(2)}$	HSL : L $C_{FC}=560pF$ $f_{emf}>181Hz$	-52	-40	-28	μA
Slope terminal discharging current (2)	$I_{SLD(2)}$		28	40	52	μA
Slope terminal charging current (3)	$I_{SLC(3)}$	HSL : H $C_{FC}=560pF$ $f_{emf}<160Hz$	-52	-40	-28	μA
Slope terminal discharging current (3)	$I_{SLD(3)}$		28	40	52	μA
Slope terminal charging current (4)	$I_{SLC(4)}$	HSL : H $C_{FC}=560pF$ $f_{emf}>181Hz$	-78	-60	-42	μA
Slope terminal discharging current (4)	$I_{SLD(4)}$		42	60	78	μA
Operation Amplifier 1 Only						
Common mode input voltage range	$V_{ICR(1)}$		0.2	—	V_B to 1.4 or V_{CC}	V
Input offset voltage	I_{IOAI}		-50	5	50	nA
Voltage gain	G_{AI}		60	67	—	dB
Output sink current (1)	$I_{OSH(1)}$	OUT1=0.2V	20	140	—	μA
Operation Amplifier 2 Only						
Common mode input voltage range	$V_{ICR(2)}$		0	—	$V_B-1.4$	V
Operation Amplifier 1, 2 Common						
Input offset voltage	$V_{IOAI,2}$		-20	-3	20	mV
Output sink current 1 - (2)	$I_{OSH(2)}$		1.8	4	—	mA
Output sink current 2 - (2)	$I_{OSH(2)}$		2	4	—	mA
Output source current (2)	$I_{OSAI,2}$		—	-15	-2	mA
Mode Switch=HSL, STB, FR, BR, LIM						
Input high level	V_{SWH}		2.0	—	—	V
Input low level	V_{SWL}		—	—	0.6	V
Input bias current	I_{BSW}	$V_{SW}=2V$	—	25	100	μA
Motor Supply Control						
Input output gain	G_{IOS}	$\frac{\Delta V_{SC}}{\Delta U}$	1.4	2.0	2.6	times
Output impedance	Z_{OS}		12	18	24	k Ω
Operation point (1)	$V_{S-U(1)}$	V_S-V_U at $V_{SC}=1.6V$ in case of OUT1= V_{ref}	0.1	0.35	0.6	V

■ Electrical Characteristics (cont.) ($V_{CC}=3.3V$, $V_B=6V$, $V_S=6V$, $T_a=25\pm 2^\circ C$)

Parameter	Symbol	Condition	min	typ	max	Unit
Operation point (2)	$V_{S-U(2)}$	$V_S - V_U$ at $V_{SC}=1.6V$ in case of $OUT1 = V_{ref} + 1$	0.35	0.63	0.9	V

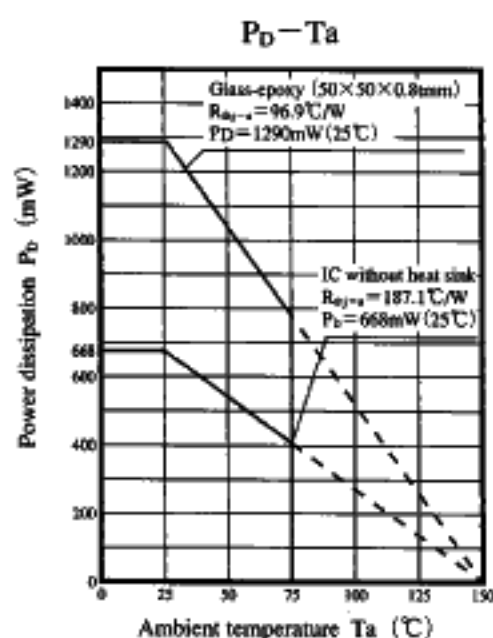
Supply Current

Supply current at operation	$I_{CC(1)}$	STB : H	—	10	15	mA
Supply current in STB	$I_{CC(2)}$	STB : L	—	6	10	mA
Unregulated supply current (1)	$I_{BB(1)}$	$V_{CC}=0V$	—	0.1	10	μA
Unregulated supply current (2)	$I_{BB(2)}$	$V_{CC}=3.3V$, $I_{n2+}=0V$	—	0.3	1.5	mA

■ Electrical Characteristics ($T_a=25\pm 2^\circ C$) [for reference only]

Parameter	Symbol	Condition	for reference only	Unit
Over heat-protection-circuit operation-temperature	T_{SD}	$V_{CC}=3.3V$	175	$^\circ C$

Note) The value in the above characteristics is not a guaranteed value, but reference one on design.

■ Reference


Pin Descriptions

Pin No.	Symbol	Equivalent circuit	Pin No.	Symbol	Equivalent circuit
1 31 29 2 30 32	U V W CS GND2 GND2		3	VSC	
4 5 6	Uin Vin Win		7	PCV	
9 10 11	SL1 SL2 SL3		12	FC	
13	BR		14	FR	
15	SHL		16	STB	

■ Pin Descriptions (cont.)

Pin No.	Symbol	Equivalent circuit	Pin No.	Symbol	Equivalent circuit
18	lin2+		19	OUT2	
21 20	lin1+ lin1-		23	OUT1	
24	Vref		25	PCI	
28	CS		22	LIM	

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