

AN3860SA

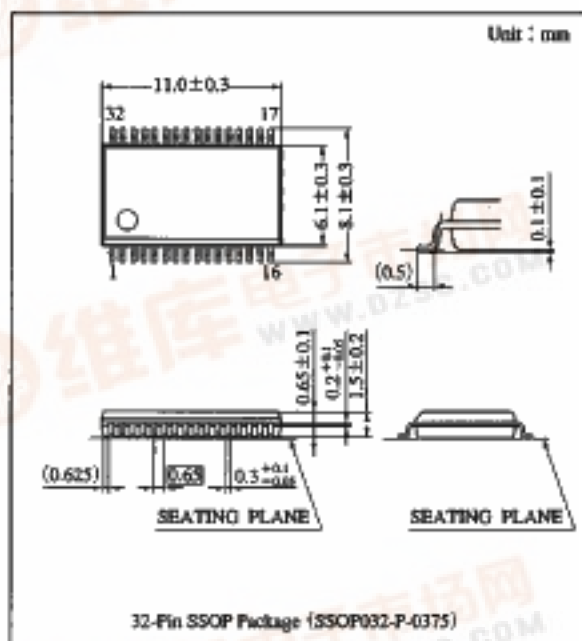
Cylinder Motor Driver IC for Video Camera

Overview

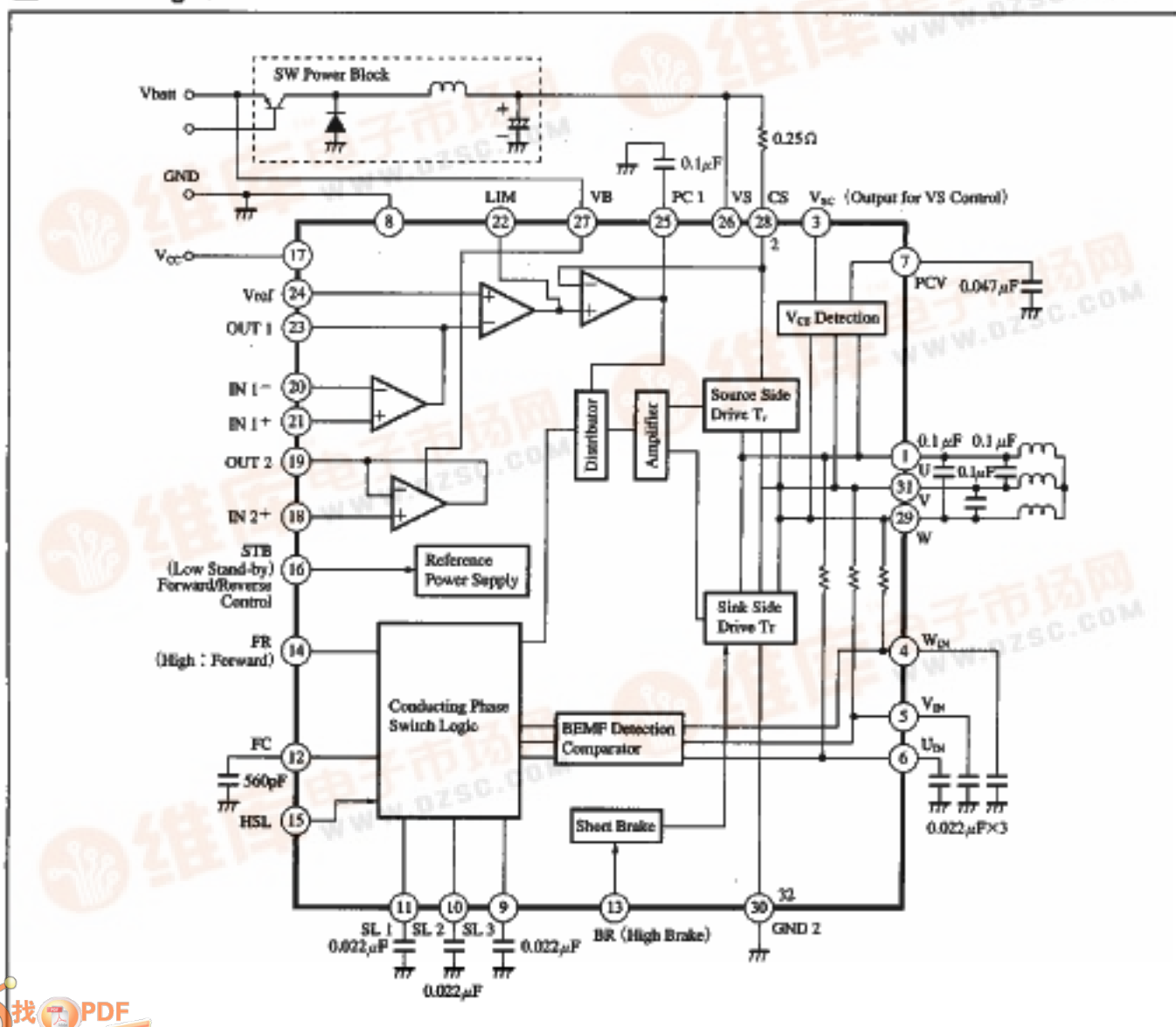
The AN3860SA is a cylinder sensorless-motor driver IC for Video Camera.

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 V _S
11	Slope generation (1) SL1	27	Unregulated power supply V _B
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 _s	11	V
Output current n = 1, 29, 31	I _{Os}	1000	mA
Power dissipation	P _D	668	mW
Operating ambient temperature ^(max.)	T _{opr}	-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

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

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_{OAI}		-50	5	50	nA
Voltage gain	G_{AI}		60	67	—	dB
Output sink current (1)	$I_{OSI(1)}$	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)	$I_{OSI(2)}$		1.8	4	—	mA
Output sink current 2 - (2)	$I_{OSI(2)}$		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_{ASW}	$V_{SW}=2V$	—	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

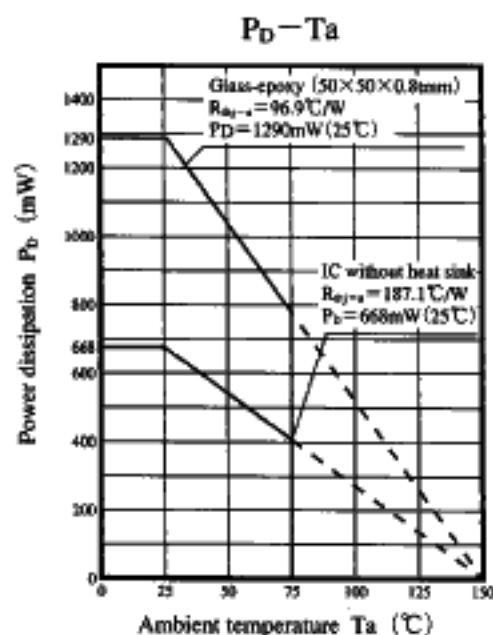
Supply Current

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	