Servo signal processor for CD
BU9312AKS

The BU9312AKS is a CD servo signal processing IC that contains a speed doubling unadjusted PLL, program servo, and signal processor, and that delivers low voltage operation and low power consumption. This IC is ideal for miniaturized, low-power-consumption applications.

●Applications

Portable CD players, portable stereos and mini component stereo systems

●Features

1) Internal PLL circuit, allowing EFM data demodulation and bit clock sampling with minimum attached components.
2) Frame synch signal detection and protection.
3) Internal focus, tracking and thread servo filters. Characteristics can be controlled with commands from the controller.
4) Subcode serial output pin.
5) Output pins for P code and Q code.
6) Internal CLV sequencer that automatically sets the CLV mode.
7) Internal track jump sequencer that jumps the desired number of tracks.
8) Single-chip IC with deinterleaving function and internal C1 / C2 double error detection, correction and flag processor.
9) Signals to DAC are output via MSB fast 2'SCOMP serial outputs, enabling control of ON / OFF operation of CD-ROM interpolators.
10) 16k bits of internal SRAM, for the storage of up to ± 4 frames of jitters.
11) Doubled-speed playback.

●Absolute maximum ratings (Ta = 25°C)

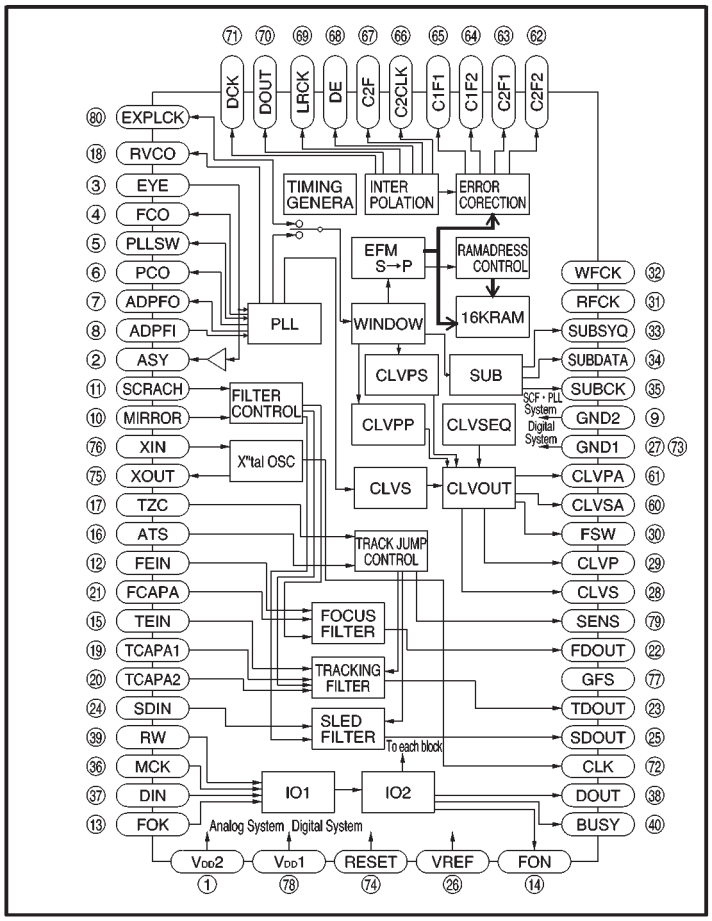
Parameter	Symbol	Limits	Unit
Power supply voltage	V_{CC}	7	V
Power dissipation	Pd	400*	mW
Operating temperature	Topr	−25～+75	℃
Storage temperature	Tstg	−55～+125	℃

* Reduced by 4.0 mW for each increase in Ta of 1℃ over 25℃.

●Recommended operating conditions (Ta = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit
Power supply voltage	V_{CC}	3.0	—	5.5	V

●Block diagram



●Pin description

Pin No.	Pin name	Analog / digital	I / O	Function	I / O circuit
1	$V_{DD}2$	—	—	PLL and servo filter block power supply	—
2	ASY	Digital	O	EFM signal slicing level control output	Fig.5
3	EYE	Digital	I	Input of EFM signals from the RF amplifier	Fig.4
4	FCO	Analog	O	PLL frequency comparison error voltage output	Fig.7
5	PLLSW	Digital	O	PLL time constant switching	Fig.3
6	PCO	Analog	O	PLL phase comparison error voltage output	Fig.7
7	ADPFO	Analog	O	PLL adding amplifier output	Fig.2
8	ADPFI	Analog	I	PLL adding amplifier inverted input	Fig.1
9	GND2	—	—	PLL servo filter block ground	—
10	MIRROR	Digital	I	Mirror signal input	Fig.4
11	SCRACH	Digital	I	Scratch signal input	Fig.4
12	FEIN	Analog	I	Focus error signal input	Fig.1
13	FOK	Digital	I	Focus OK signal input	Fig.4
14	FON	Digital	O	Focus ON signal output	Fig.5
15	TEIN	Analog	I	Tracking error signal input	Fig.1
16	ATS	Analog	I	Anti-shock detection window comparator input	Fig.1
17	TZC	Analog	I	Tracking zero-cross comparator input	Fig.1
18	RVCO	Analog	O	PLL VCO free running resistor	Fig.2
19	TCAPA1	Analog	I / O	Tracking servo filter capacitor connection	Fig.6
20	TCAPA2	Analog	I / O	Tracking servo filter capacitor connection	Fig.6
21	FCAPA	Analog	I / O	Focus servo filter capacitor connection	Fig.6
22	FDOUT	Analog	O	Focus driver output	Fig.2
23	TDOUT	Analog	O	Tracking drive output	Fig.2
24	SDIN	Analog	I	Thread amplifier input	Fig.1
25	SDOUT	Analog	O	Thread driver output	Fig.2
26	VREF	Analog	I	Bias voltage input	Fig.6
27	GND1	—	—	Digital ground	—
28	CLVS	Digital	O	Spindle motor drive output (speed control output)	Fig.7
29	CLVP	Digital	O	Spindle motor drive output (rough or phase control output)	Fig.7
30	FSW	Digital	O	Spindle motor output (filter time constant switching output)	Fig.3
31	RFCK	Digital	O	Read frame clock output (X'tal 7.35 kHz)	Fig.5
32	WFCK	Digital	O	Write frame clock output (7.35 kHz when locked on X'tal)	Fig.5
33	SUBSYQ	Digital	O	Subcode sink S0 + S1 output	Fig.5
34	SUBDATA	Digital	O	Subcode serial output	Fig.5

Pin No.	Pin name	Analog / digital	I / O	Function	I / O circuit
35	SUBCK	Digital	I	Subcode read clock	Fig.4
36	MCK	Digital	I	Clock for CPU serial data reading or sub Q code reading	Fig.4
37	DIN	Digital	I	CPU serial data input	Fig.4
38	DOUT	Digital	O	Sub Q code or internal status serial output	Fig.7
39	RW	Digital	I	Read / write switching or track jump command input (H = data output from DOUT, L = data input from DIN)	Fig.4
40	BUSY	Digital	O	Busy output (L during track jumping)	Fig.5
41～59	N.C.	—	—	—	—
60	CLVPA	Analog	O	CLV phase linear output	Fig.1
61	CLVSA	Analog	O	CLV speed linear output	Fig.1
62	C2F2	Digital	O	C2 double correction flag	Fig.5
63	C2F1	Digital	O	C2 single correction flag	Fig.5
64	C1F2	Digital	O	C1 double correction flag	Fig.5
65	C1F1	Digital	O	C1 single correction flag	Fig.5
66	C2CLK	Digital	O	Strobe signal (f = 176.4 kHz)	Fig.5
67	C2F	Digital	O	Correction status output	Fig.5
68	DE	Digital	O	Strobe signal (f = 88.2 kHz)	Fig.5
69	LRCK	Digital	O	Strobe signal (f = 44.1 kHz)	Fig.5
70	DOUTA	Digital	O	Audio data output (2'SCOMP)	Fig.5
71	DOCK	Digital	O	DOUTA bit clock (f = 2.1168 MHz)	Fig.5
72	CLK	Digital	O	Clock output (4 settings selected with &hE4 command)	Fig.5
73	GND1	—	—	Digital ground	—
74	RESET	Digital	I	Internal circuit reset (pulled up with 100 kΩ internal resistor)	Fig.8
75	XOUT	Digital	O	X'tal oscillator output (f = 16.9 MHz)	Fig.9
76	XIN	Digital	I	X'tal oscillator input (f = 16.9 MHz)	Fig.9
77	GFS	Digital	O	GFS monitor output (4 settings selected with &hE4 command)	Fig.5
78	$V_{DD}1$	—	—	Digital power supply	—
79	SENS	Digital	O	Status output for signal selected with the &hE4 command	Fig.5
80	EXPLCK	Digital	I / O	PLL output and playback clock input for attached PLL	Fig.10

●Input / output circuits

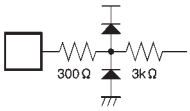


Fig. 1

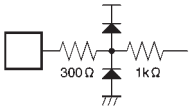


Fig. 2

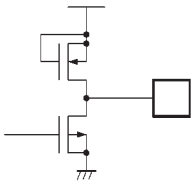


Fig. 3

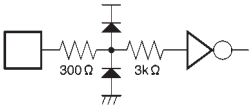


Fig. 4

Fig. 5

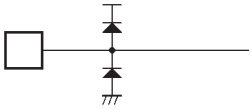


Fig. 6

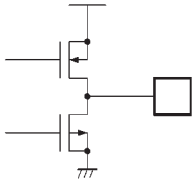


Fig. 7

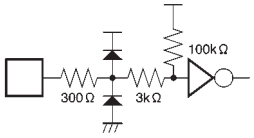


Fig. 8

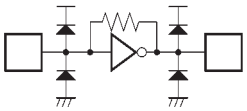


Fig. 9

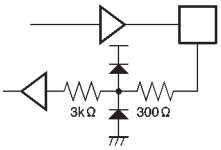


Fig. 10

●Electrical characteristics (unless otherwise noted, Ta = 25°C, V_{DD} = 5V)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	Suitable pins
Input voltage, high level	V_{IH}	3.5	—	—	V		∗1
Input voltage, low level	V_{IL}	—	—	0.3	V		∗1
Output voltage, high level	V_{OH}	4.0	—	V_{DD}	V	I_{OH}=−1mA	∗2
Output voltage, low level	V_{OL}	0	—	0.4	V	I_{OL}=1mA	∗2, 5
Input resistance 1	V_{O1}	80	100	120	kΩ	Between V_{DD1} pins	∗3
Input resistance 2	V_{O2}	60	75	90	kΩ	Between BIAS pins	TZC
Input resistance 3	V_{O3}	180	230	280	kΩ	Between BIAS pins	ATS
Input resistance 4	V_{O4}	20	25	30	kΩ	Between BIAS pins	∗6
Input leakage current	I_{LI}	—	—	±5	μA	V_I=0～5.25V	∗1, 2
Output leakage current	I_{LO}	—	—	±5	μA	V_O=0～5.25V	∗4, 5

Suitable pins

∗1 MIRROR, SCRACH, FOK, SUBCK, MCK, DIN, RW, RESET, EXPLCK, EYE

∗2 FON, CLVS, CLVP, RFCK, WFCK, SUBSYQ, SUBDATA, DOUT, BUSY, XOUT, SENS, GFS, ASY, C1F1, C1F2, C2F1, C2F2, C2CLK, C2F, DE, LRCK, DOCK, CLK

∗3 RESET

∗4 CLVS, CLVP

∗5 PLLSW, TCAPA2, FSW

∗6 FEIN, TEIN

●External dimensions (Units: mm)