

STRUCTURE: Silicon Monolithic integrated circuit
 PRODUCT NAME: Servo signal processor for compact disc player
 TYPE NAME: **BU9541AKV**

FEATURES: The BU9541AKV is a servo signal processor complete with built-in pre-servo amplifier and MP3 decoder and digital HP amplifier and anti-shock memory controller for application to compact disc player.

○ Absolute maximum ratings (Ta=25°C)

Items	Symbol	Ratings	Unit
Power supply voltage	V _{DD}	4.5	V
Internal power supply voltage	V _{CORE}	2.5	V
Power dissipation	P _d	0.9 *1	W
Operating temp. range	T _{opr}	-40 ~ +85	°C
Storage temp. range	T _{stg}	-55 ~ +125	°C

*1 Use of this processor at Ta = 25°C and over is subject to reduction of 9mW per 1°C.

* Operation is not guaranteed.

○ Recommendation Operating range (Ta=-40 ~ +85°C)

Items	Symbol	Ratings	Unit
Power supply voltage	V _{DD}	2.7 ~ 3.6	V
Internal power supply voltage	V _{CORE}	1.4 ~ 1.65	V

* This product is not designed for protection against radioactive rays.

○ Electrical characteristics (Digital system)

V_{DD}=3.0V, V_{CORE}=1.5V (Unless otherwise specified Ta = 25°C)

Items	Symbol	Limit			Unit	Conditions	
		MIN	TYP	MAX			
Input voltage	H-level voltage	V _{IH}	2.1	-	-	V	
	L-level voltage	V _{IL}	-	-	0.9	V	
Hysteresis input voltage	H-level voltage	V _{IH}	2.3	-	-	V	
	L-level voltage	V _{IL}	-	-	1.1	V	
Input L current to Pull-up resistor	I _{IL}	-35	-75	-115	μA	V _{IN} =0V	
Input H current to Pull-down resistor	I _{IH}	20	50	85	μA	V _{IN} =3V	
Input current	I _I	-	-	±1	μA	V _{IN} =0~3V	
Output voltage	H-level voltage	V _{OH}	2.5	-	-	V	I _O =-0.6mA
	L-level voltage	V _{OL}	-	-	0.5	V	I _O =0.6mA

Status of this document

The Japanese version of this document is the formal specification.

A customer may use this translation version only for a reference to help reading the formal version.

If there are any differences in translation version of this document, formal version takes priority.

The product described in this specification is designed to be used with ordinary electronic equipment or devices (such as audio-visual equipment, office-automation equipment, communications devices, electrical appliances, and electronic toys).

Should you intend to use this product with equipment or devices which require an extremely high level of reliability and the malfunction of which would directly endanger human life (such as medical instruments, transportation equipment, aerospace machinery, nuclear-reactor controllers, fuel controllers and other safety devices), please be sure to consult with our sales representative in advance.

○ Electrical Characteristics (Analog system 1/2)

V_{DD}=3.0V, V_{CORE}=1.5V (Unless otherwise specified Ta = 25°C, R_L=10kΩ, standard V_C)

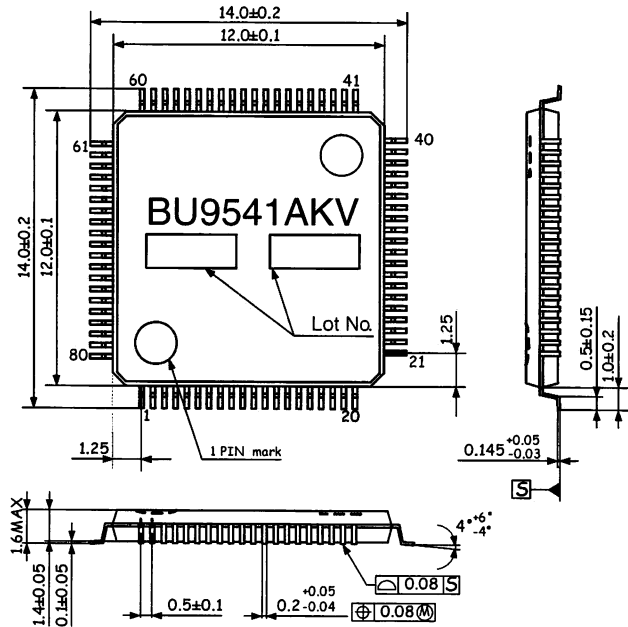
Item	Symbol	Limit			Unit	Applicable pins, conditions
		MIN	TYP	MAX		
Total						
Circuit current 1	I _{Q1}	-	10	27	mA	AVDD1,AVDD2,DVDD1,DVDD2, VDD_LD,VDD_RD
Circuit current 2	I _{Q2}	-	15	30	mA	VDD_CORE1,VDD_CORE2
PLL (VCO)						
Max. oscillation Frequency	f _{VCOH}	4.6	6.5	-	MHz	1/4 of A13 and VCO outputs
Min. oscillation Frequency	f _{VCOL}	-	1.1	1.7	MHz	1/4 of A13 and VCO outputs
FC DAC						
Offset voltage	V _{FCOF}	-50	-	50	mV	FCO
Max. output voltage	V _{FCH}	0.2	0.5	-	V	FCO
Min. output voltage	V _{FCL}	-	-0.5	-0.2	V	FCO
PCO						
L-level output voltage	V _{PCH}	-	-1.0	-0.6	V	PCO
H-level output voltage	V _{PCL}	0.6	1.0	-	V	PCO
Audio DAC						
Distortion rate	THD	-	0.01	-	%	LDACO,RDACO,0dB 1kHz sine
Dynamic range	DR	-	90	-	dB	LDACO,RDACO,-60dB 1kHz sine
S/N ratio	S/N	-	96	-	dB	LDACO,RDACO
Max. output level	V _{SMAX}	0.75	0.85	0.95	V _{rms}	LDACO,RDACO,0dB 1kHz sine
Class D HP amp.						
Distortion rate	THD	-	0.52	-	%	HPLDACO,HPRDACO,0dB 1kHz sine
Dynamic range	DR	-	82	-	dB	HPLDACO,HPRDACO,-60dB 1kHz sine
S/N ratio	S/N	-	85	-	dB	HPLDACO,HPRDACO
Max. output level	V _{SMAX}	-	0.4	-	V _{rms}	HPLDACO,HPRDACO,0dB 1kHz sine,R _L =16Ω
EFM comparator						
Threshold level	V _{EFM}	-200	-	200	mV	RFI,ANA_MONI0,A12
Servo ADC						
Offset voltage	V _{ADOF}	-140	-	140	mV	ANA_MONI0,ANA_MONI1
Max. conversion level	V _{ADH}	1.0	1.2	1.4	V	ANA_MONI0,ANA_MONI1
Min. conversion level	V _{ADL}	-1.4	-1.2	-1.0	V	ANA_MONI0,ANA_MONI1
Servo DAC						
Offset voltage	V _{DAOF}	-80	-	80	mV	FDOUT,TDOUT,SDOUT,CLVOUT
Max. output voltage	V _{DAH}	0.8	1.2	-	V	FDOUT,TDOUT,SDOUT,CLVOUT
Min. output voltage	V _{DAL}	-	-1.2	-0.8	V	FDOUT,TDOUT,SDOUT,CLVOUT
Bias amplifier						
Max. output current	I _{BO}	-	±1.5	-	mA	VBIAS and BIAS fluctuation to be 200mV MAX.

○ Electrical Characteristics (Analog system 2/2)

$V_{DD}=3.0V$, $V_{CORE}=1.5V$ (Unless otherwise specified $T_a = 25^\circ C$, $R_L=10k\Omega$, standard V_C)

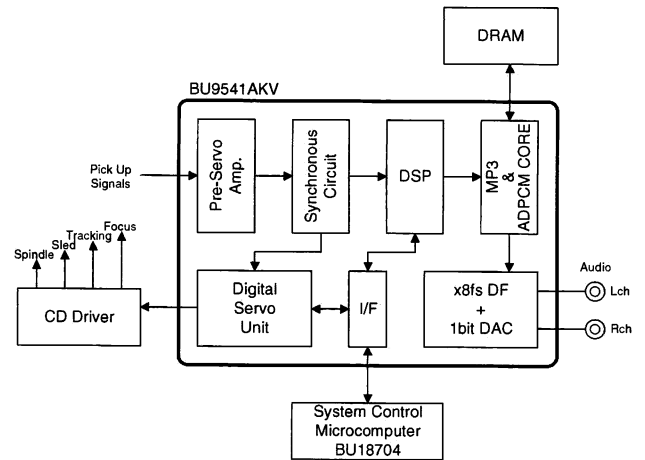
Item	Symbol	Limit			Unit	Applicable pins, conditions
		MIN	TYP	MAX		
RF amplifier						
Offset voltage	V_{RFOF}	-	0	-	mV	AC,BD,EQO
Max. output voltage	V_{RFH}	1.0	1.2	-	V	AC,BD,EQO
Min. output voltage	V_{RFL}	-	-1.3	-1.1	V	AC,BD,EQO
FE amplifier						
Offset voltage	V_{FEOF}	-	0	-	mV	AC,BD,ANA_MONI0,ANA_MONI1
Max. output voltage	V_{FEH}	1.0	1.4	-	V	AC,BD,ANA_MONI0,ANA_MONI1
Min. output voltage	V_{FEL}	-	-1.4	-1.0	V	AC,BD,ANA_MONI0,ANA_MONI1
TE amplifier						
Offset voltage	V_{TEOF}	-	70	-	mV	E,F,ANA_MONI0,ANA_MONI1
Max. output voltage	V_{TEH}	1.0	1.4	-	V	E,F,ANA_MONI0,ANA_MONI1
Min. output voltage	V_{TEL}	-	-1.4	-1.0	V	E,F,ANA_MONI0,ANA_MONI1
Asymmetric amplifier						
Offset voltage	V_{ASYOF}	-	0	-	mV	ASY= V_C ,RFI,ANA_MONI0(ASY_TEST)
Max. output voltage	V_{ASYH}	1.1	1.4	-	V	ASY,RFI,ANA_MONI0(ASY_TEST)
Min. output voltage	V_{ASYL}	-	-1.4	-1.1	V	ASY,RFI,ANA_MONI0(ASY_TEST)
APC						
Output voltage1	V_{APC1}	2.4	2.8	-	V	PD="H",LD,ANA_MONI0(APCREF)
Output voltage2	V_{APC2}	-	0.1	0.5	V	PD="L",LD,ANA_MONI0(APCREF)
Max. reference voltage	V_{APCH}	-	220	-	mV	PD,LD,ANA_MONI0(APCREF)
Min. reference voltage	V_{APCL}	-	145	-	mV	PD,LD,ANA_MONI0(APCREF)

○ Package Outline, Appearance marking diagram



VQFP80 (UNIT : mm)

○ Block diagram



○ Description of Terminal

No.	Name	Description of terminals
1	AVDD1	Analog power supply
2	AC	A + C voltage input
3	BD	B + D voltage input
4	VBIAS	Bias level (VDD/2)
5	AGND1	Analog GND
6	E	E voltage input
7	F	F voltage input
8	PD	Photo detector input
9	LD	Laser drive output
10	ASY	Asymmetric correction
11	PCO	PCO output
12	FCO	FCO-DAC output
13	FDOUT	Focus drive output
14	TDOUT	Tracking drive output
15	SDOUT	Sled drive output
16	CLVOUT	CLV drive output
17	RCLK	Reference clock output
18	RCKE	Clock enable output
19	A13	Address output
20	A12	Address output
21	A11	Address output
22	A10	Address output
23	A09	Address output
24	A08	Address output
25	A07	Address output
26	A06	Address output
27	A05	Address output
28	A04	Address output
29	A03	Address output
30	A02	Address output
31	A01	Address output
32	A00	Address output
33	VDD_CORE1	Internal digital power supply
34	RASX	Row address strobe signal
35	CASX	Column address strobe signal
36	WEX	Write enable output
37	LDQM	Lower data mask enable signal
38	UDQM	Upper data mask enable signal
39	DQ07	Data input
40	DGND1	Digital GND

No.	Name	Description of terminals
41	DVDD1	I/O digital power supply
42	DQ06	Data input/output
43	DQ05	Data input/output
44	DQ04	Data input/output
45	DQ03	Data input/output
46	DQ02	Data input/output
47	DQ01	Data input/output
48	DQ00	Data input/output
49	VDD_CORE2	Internal digital power supply
50	R/W	Command read/write signal
51	DIN/DOUT	Command data input/output
52	MCK	Command transfer clock input
53	BUSY	Busy signal output
54	SUBSYQ	Sub code synchronous signal
55	CLK	Output for various clocks
56	CLK88	Clock output for driver IC
57	RESETB	"L" → reset condition
58	TEST	Test signal input
59	DGND2	Digital GND
60	XI	X'tal connecting (input) terminal
61	XO	X'tal connecting terminal
62	DVDD2	I/O Digital power supply
63	FLAG0	Various flag output
64	AGND2	Audio system analog GND
65	LDACO	Audio Lch output
66	VCDAC	Audio reference voltage
67	RDACO	Audio Rch output
68	AVDD2	Audio analog power supply
69	VDD_LD	Lch HP amp. power supply
70	HPLDACO	Lch HP amp. output
71	VSS_LD	Lch HP amp. GND
72	VSS_RD	Rch HP amp. GND
73	HPRDACO	Rch HP amp. output
74	VDD_RD	Rch HP amp. power supply
75	AD_MONI0	Monitor signal output
76	AD_MONI1	Monitor signal output
77	ANA_MONI0	Analog monitor signal output
78	ANA_MONI1	Analog monitor signal output
79	RFI	RF data re-input terminal
80	EQO	After-RF-equalizer output

○ Cautions

(1) ABSOLUTE MAXIMUM RATINGS

Permanent device damage may occur and break mode (open or short) can not be specified if power supply, operating temperature, and those of ABSOLUTE MAXIMUM RATINGS are exceeded. If such a special condition is expected, components for safety such as fuse must be used.

(2) Power Supply

Power and Ground line must be designed as low impedance in the PCB. Print patterns if digital power supply and analog power supply must be separated even if these have same voltage level. Print patterns for ground must be designed as same as power supply. These considerations avoid analog circuits from the digital circuit noise. All pair of power supply and ground must have their own de-coupling capacitor. Those capacitor should be checked about their specification, etc. (nominal electrolytic capacitor degrades its capacity at low temperature) and choose the constant of an electrolytic capacitor.

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