

STRUCTURE: Silicon Monolithic integrated circuit

PRODUCT NAME: Servo signal processor for compact disc player

TYPE NAME: **BU9543KV**

FEATURES: The BU9543KV is a servo signal processor complete with built-in pre-servo amplifier and sampling rate converter for application to compact disc player.

○ Absolute maximum ratings (Ta=25°C)

Items	Symbol	Ratings	Unit
Power supply voltage	V <sub>DD</sub>	4.5	V
Internal power supply voltage	V <sub>CORE</sub>	2.5	V
Power dissipation	P <sub>d</sub>	0.85 *1	W
Operating temp. range	T <sub>opr</sub>	-40 ~ +85	°C
Storage temp. range	T <sub>stg</sub>	-55 ~ +125	°C

\*1 Use of this processor at Ta = 25°C and over is subject to reduction of 8.5mW per 1°C.

\* Operation is not guaranteed.

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

Items	Symbol	Ratings	Unit
Power supply voltage	V <sub>DD</sub>	2.7 ~ 3.6	V
Internal power supply voltage	V <sub>CORE</sub>	1.4 ~ 1.65	V

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

○ Electrical characteristics (Digital system)

V<sub>DD</sub>=3.0V, V<sub>CORE</sub>=1.5V (Unless otherwise specified Ta = 25°C)

Items		Symbol	Limit			Unit	Conditions
			MIN	TYP	MAX		
Input voltage	H-level voltage	V <sub>IH</sub>	2.1	-	-	V	
	L-level voltage	V <sub>IL</sub>	-	-	0.9	V	
Hysteresis input voltage	H-level voltage	V <sub>IH</sub>	2.3	-	-	V	
	L-level voltage	V <sub>IL</sub>	-	-	1.1	V	
Input L current to Pull-up resistor		I <sub>IL</sub>	-35	-75	-115	μA	V <sub>IN</sub> =0V
Input H current to Pull-down resistor		I <sub>IH</sub>	20	50	85	μA	V <sub>IN</sub> =3V
Input current		I <sub>I</sub>	-	-	±1	μA	V <sub>IN</sub> =0~3V
Output voltage	H-level voltage	V <sub>OH</sub>	2.5	-	-	V	I <sub>O</sub> =-0.6mA
	L-level voltage	V <sub>OL</sub>	-	-	0.5	V	I <sub>O</sub> =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  $T_a = 25^{\circ}C$ ,  $R_L=10k\Omega$ , standard  $V_C$ )

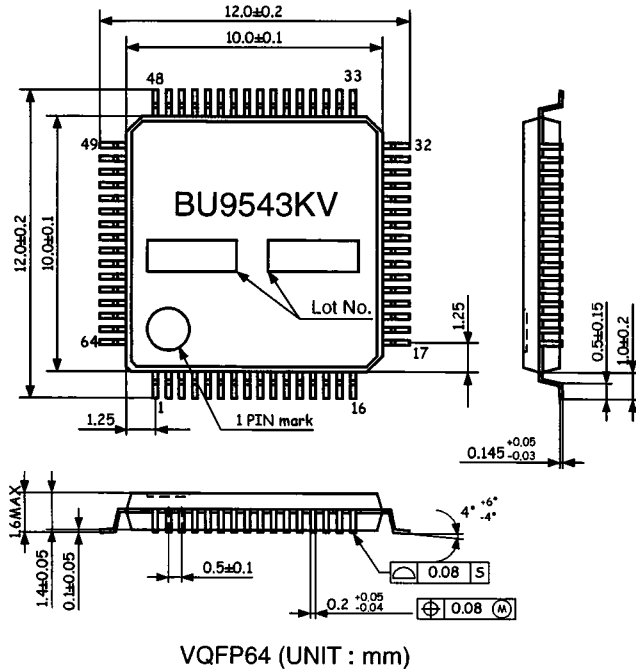
Item	Symbol	Limit			Unit	Applicable pins, conditions
		MIN	TYP	MAX		
<b>Total</b>						
Circuit current 1	$I_{Q1}$	-	10	27	mA	AVDD1,AVDD2,DVDD
Circuit current 2	$I_{Q2}$	-	5	10	mA	VDD_CORE
<b>PLL (VCO)</b>						
Max. oscillation Frequency	$f_{VCOH}$	4.6	6.5	-	MHz	1/4 of FLAG1 and VCO outputs
Min. oscillation Frequency	$f_{VCOL}$	-	1.1	1.7	MHz	1/4 of FLAG1 and VCO outputs
<b>FC DAC</b>						
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
<b>PCO</b>						
L-level output voltage	$V_{PCH}$	-	-1.0	-0.6	V	PCO
H-level output voltage	$V_{PCL}$	0.6	1.0	-	V	PCO
<b>Audio DAC</b>						
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
<b>EFM comparator</b>						
Threshold level	$V_{EFM}$	-200	-	200	mV	RFI,ANA_MONI0,FLAG2
<b>Servo ADC</b>						
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
<b>Servo DAC</b>						
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
<b>Bias amplifier</b>						
Max. output current	$I_{BO}$	-	$\pm 1.5$	-	mA	VBIAS and BIAS fluctuation to be 200mV MAX.

○ Electrical Characteristics (Analog system 2/2)

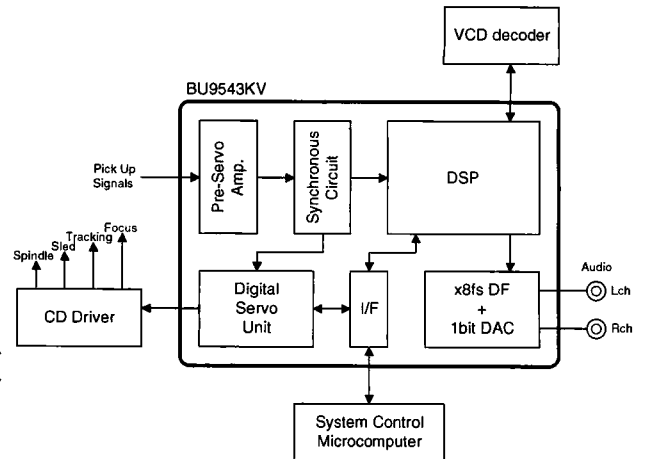
$V_{DD}=3.0V, V_{CORE}=1.5V$  (Unless otherwise specified  $T_a = 25^{\circ}C, R_L=10k\Omega$ , standard  $V_C$ )

Item	Symbol	Limit			Unit	Applicable pins, conditions
		MIN	TYP	MAX		
<b>RF amplifier</b>						
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
<b>FE amplifier</b>						
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
<b>TE amplifier</b>						
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
<b>Asymmetric amplifier</b>						
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)
<b>APC</b>						
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



○ Block diagram



○ Description of Terminal

No.	Name	Description of terminals
1	AVDD1	Analog power terminal
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	For 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	DVDD	Reference clock for SDRAM
18	MCK	Command transfer clock input
19	DIN/DOUT	Command data input/output
20	R/W	Command read/write signal
21	BUSY	Busy signal output
22	SUBSYQ	Sub code synchronous signal
23	SUBDATA	Sub code data signal output
24	SUBCK	Sub code bit clock input
25	WFCK	Disc frame synchronous signal
26	VDD_CORE	Internal digital power supply
27	DGND	Digital GND
28	CLK	Output for various clocks
29	CLK88	Clock output for driver IC
30	RESETB	"L" → reset condition
31	XBUFO	X'tal buffer output
32	DGND	Digital GND

No.	Name	Description of terminals
33	DVDD	I/O Digital power supply
34	DOUTA	Audio serial data output
35	LRCK	Audio LR signal output
36	DCK	Audio serial bit clock output
37	VDD_CORE	Internal digital power supply
38	DFDIN	Audio serial data input
39	DFLRCK	Audio LR signal input
40	DFDCK	Audio serial bit clock input
41	DFSCKI	Audio system clock input
42	DGND	Digital GND
43	FLAG0	Various flag output
44	FLAG1	Various flag output
45	FLAG2	Various flag output
46	FLAG3	Various flag output
47	DVDD	I/O Digital power supply
48	XI	X'tal connecting (input) terminal
49	XO	X'tal connecting terminal
50	DGND	Digital GND
51	TEST_IN	Test signal input
52	TEST_OUT	Test signal output
53	DVDD2	I/O Digital power supply
54	AGND2	Audio system analog GND
55	LDACO	Audio Lch output
56	VCDAC	Audio reference voltage
57	RDACO	Audio Rch output
58	AVDD2	Audio analog power supply
59	AD_MONI0	Monitor signal output
60	AD_MONI1	Monitor signal output
61	ANA_MONI0	Analog monitor signal output
62	ANA_MONI1	Analog monitor signal output
63	RFI	RF data re-input terminal
64	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.

(3) Functionality in the strong electro-magnetic field

Malfunction may occur if in the strong electro-magnetic field.

(4) Input terminals

All LSI contain parasitic components. Some are junctions which normally reverse bias. When these junctions forward bias, currents flows on unwanted path, malfunction or device damage may occur. To prevent this, all input terminal voltage must be between ground and power supply, or in the range of guaranteed value in the Electrical characteristics. And no voltage should be supplied to all input terminal when power is not supplied.

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