

STRUCTURE: Silicon Monolithic integrated circuit

PRODUCT NAME: Servo signal processor for compact disc player

TYPE NAME: **BU24530**

FEATURES: The BU24530 is a servo signal processor complete with built-in pre-servo amplifier and 4-bit microcomputer for application to compact disc player

○ Absolute maximum ratings (Ta=25°C)

Items	Symbol	Ratings	Unit
Power supply voltage	V _{DD}	4.5	V
Power dissipation	P _d	0.9 *1	W
Operating temp. range	T _{opr}	-25 ~ +75	°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=-25 ~ +75°C)

Items	Symbol	Ratings	Unit
Power supply voltage	V _{DD}	2.5 ~ 3.3	V

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

○ Electrical characteristics (Digital system)

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

Items		Symbol	Limit			Unit	Conditions
			MIN	TYP	MAX		
Input voltage	H-level voltage	V _{IH}	2.4	-	-	V	
	L-level voltage	V _{IL}	-	-	0.6	V	
Hysteresis input voltage	H-level voltage	V _{IH}	2.1	-	-	V	
	L-level voltage	V _{IL}	-	-	0.9	V	
Input L current to Pull-up resistor		I _{IL}	-35	-80	-150	μA	V _{IN} =0V
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}	-	-	0.4	V	I _O =0.6mA
Open-drain Output	Output leak current	I _{ODH}	-	-	1	μA	Hi-z output
	L-level voltage	V _{ODL}	-	-	0.4	V	I _O =1.6mA

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.

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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)

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

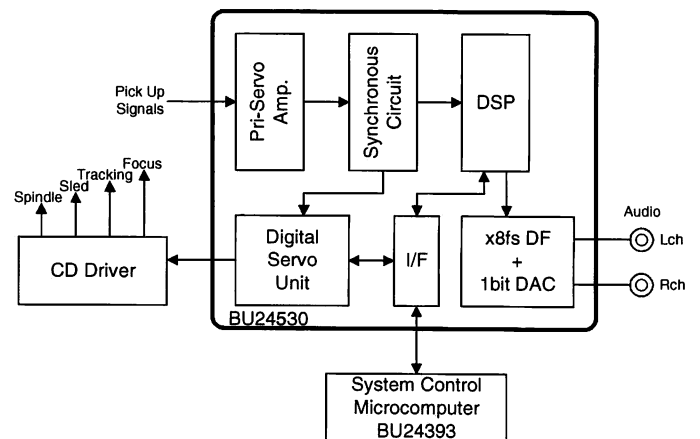
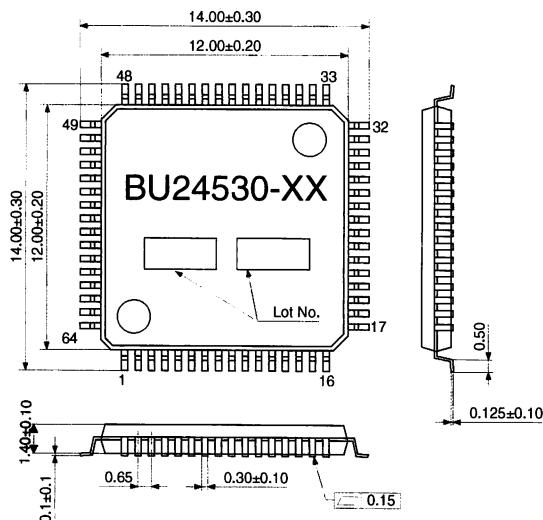
Item	Symbol	Limit			Unit	Applicable pins, conditions
		MIN	TYP	MAX		
Total						
Circuit current	I _Q	-	24	32	mA	AVDD1,AVDD2,AVDD3,DVDD
PLL (VCO)						
Max. oscillation Frequency	f _{VCOH}	12.5	18	-	MHz	1/2 of PWC/W and VCO outputs
Min. oscillation Frequency	f _{VCOL}	-	0.4	0.8	MHz	1/2 of PWC/W and VCO outputs
FC DAC						
Offset voltage	V _{FCOF}	-50	-	50	mV	FCO
Max. output voltage	V _{FCH}	0.8	1.2	-	V	FCO
Min. output voltage	V _{FCL}	-	-1.2	-0.8	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
CLV DAC						
Offset voltage	V _{CLVOF}	-50	-	50	mV	CLVOUT
Max. output voltage	V _{CLVH}	0.8	1.2	-	V	CLVOUT
Min. output voltage	V _{CLVL}	-	-1.2	-0.8	V	CLVOUT
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
EFM comparator						
Threshold level	V _{EFM}	-200	-	200	mV	RFI,TZCRFM,WFCR
TZC comparator						
Threshold level	V _{TZC}	-50	-	50	mV	TZCRFN,WFCR
Servo ADC						
Offset voltage	V _{ADOF}	-140	-	140	mV	SDIN,RFRPRFM,TZCRFM
Max. conversion level	V _{ADH}	1.0	1.2	1.4	V	SDIN,RFRPRFM,TZCRFM
Min. conversion level	V _{ADL}	-1.4	-1.2	-1.0	V	SDIN,RFRPRFM,TZCRFM
Servo DAC						
Offset voltage	V _{DAOF}	-80	-	80	mV	FDOUT,JUMPO,TDOUT,SDOUT
Max. output voltage	V _{DAH}	0.8	1.2	-	V	FDOUT,JUMPO,TDOUT,SDOUT
Min. output voltage	V _{DAL}	-	-1.2	-0.8	V	FDOUT,JUMPO,TDOUT,SDOUT
Bias amplifier						
Max. output current	I _{BO}	-	±1.5	-	mA	VBIAS and BIAS fluctuation to be 200mV MAX.
RF amplifier						
Offset voltage	V _{RFOF}	-	-0.7	-	V	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,FEN,FEO
Max. output voltage	V _{FEH}	1.0	1.4	-	V	AC,BD,FEN,FEO
Min. output voltage	V _{FEL}	-	-1.4	-1.0	V	AC,BD,FEN,FEO
TE amplifier						
Offset voltage	V _{TEOF}	-	0	-	mV	E,F,TEN,TEO
Max. output voltage	V _{TEH}	1.0	1.4	-	V	E,F,TEN,TEO
Min. output voltage	V _{TEL}	-	-1.4	-1.0	V	E,F,TEN,TEO
FOK comparator						
Threshold level	V _{FOK}	-0.5	-0.3	-0.1	V	RFI,TZCRFM(FOK)
Asymmetric amplifier						
Offset voltage	V _{ASYOF}	-	0	-	mV	ASY=V _C ,RFI,TZCRFM(EFM)
Max. output voltage	V _{ASYH}	1.0	1.4	-	V	ASY,RFI,TZCRFM(EFM)
Min. output voltage	V _{ASYL}	-	-1.4	-1.1	V	ASY,RFI,TZCRFM(EFM)

○ Electrical Characteristics (Analog system 2/2)

$V_{DD}=3.0V$ (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		
APC						
Output voltage1	V _{APC1}	2.4	2.8	-	V	PD="H",LD,TZCRFM(APCREF)
Output voltage2	V _{APC2}	-	0.1	0.5	V	PD="L",LD,TZCRFM(APCREF)
Max. reference voltage	V _{APCH}	-	185	-	mV	PD,LD,TZCRFM(APCREF)
Min. reference voltage	V _{APCL}	-	110	-	mV	PD,LD,TZCRFM(APCREF)
AGC						
Reference voltage	V _{AGC}	0.1	0.3	0.5	V	ASY,RFI,CAGC(EFM),(RFDET)
Max. gain	G _{AGC}	7.5	11.5	15.5	dB	ASY,RFI,CAGC(EFM),(RFDET)
Operating gain	G _{AGCOP}	1	6	10	dB	ASY,RFI,CAGC(EFM),(RFDET)
Compression gain	G _{AGCCM}	-6	0	4	dB	ASY,RFI,CAGC(EFM),(RFDET)
Mirror detector						
Max. output voltage	V _{MRH}	2.5	-	-	V	AC,BD,RFRPRFM(MIRR)
Min. output voltage	V _{MRL}	-	-	0.5	V	AC,BD,RFRPRFM(MIRR)
Defect detector						
Max. output voltage	V _{DFH}	2.5	-	-	V	AC,BD,RFRPRFM(DEFECT)
Min. output voltage	V _{DFL}	-	-	0.5	V	AC,BD,RFRPRFM(DEFECT)
RF ripple detector						
Output voltage	V _{RFRP}	0.55	0.75	0.95	V	AC,BD,RFRPRFM(RFRP)
Operating amplitude	V _{RPOP}	90	140	240	mV _{P-P}	AC,BD,RFRPRFM(RFRP)
A/D conversion						
Resolution	RES	-	8	-	bits	ADC0,ADC1
Settling time	ts	-	35.4	-	μsec	ADC0,ADC1
Linearity	E _L	-	-	±3	LSB	ADC0,ADC1
LCD driver						
2/3 level voltage	V ₁	-	2	-	V	COM0~3,SEG0~6, Based on GND
1/3 level voltage	V ₂	-	1	-	V	COM0~3,SEG0~6, Based on GND

○ Package Outline, Appearance marking diagram ○ Block diagram



The address bus and the data bus of CPU are not opened outside.

(Can't access the external memory as a CPU)

The bit width of ALU is 4 bits.

SQFP-T64 (UNIT : mm)

○ 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	E	E voltage input
6	F	F voltage input
7	AGND1	Analog GND
8	FEN	Focus error feedback input
9	FEO	Focus error output
10	PKC	RF signal peak detector C
11	BTC	RF signal bottom detector C
12	PD	Photo detector input
13	LD	Laser drive output
14	ASY	Asymmetric correction
15	AVDD2	Analog power supply
16	PCO	PCO output
17	FCO	FCO-DAC output
18	AGND2	Analog GND
19	FDOUT	Focus drive output
20	JUMPO	Jump pulse output
21	TDOUT	Tracking drive output
22	SDIN	Sled drive input
23	SDOUT	Sled drive output
24	CLVOUT	CLV drive output
25	ADC0	Analog data input
26	ADC1	Analog data input
27	CLK88	Clock output for driver IC
28	LON	Laser ON control output
29	P20/COM0	LCD common output
30	P21/COM1	LCD common output
31	P22/COM2	LCD common output
32	P23/COM3	LCD common output

No.	Name	Description of terminals
33	SEG0	LCD common output
34	SEG1	LCD common output
35	SEG2	LCD common output
36	SEG3	LCD common output
37	SEG4	LCD common output
38	SEG5	LCD common output
39	SEG6	LCD common output
40	P00	4-bit parallel output
41	P01	4-bit parallel output
42	P02	4-bit parallel output
43	P03	4-bit parallel output
44	P10	2-bit parallel output
45	P11	2-bit parallel output
46	PWC/W	Pulse input / General 1-bit input
47	RESETB	"L" → reset condition
48	DVDD	Digital power supply
49	XI	X'tal connecting (input) terminal
50	XO	X'tal connecting terminal
51	DGND	Digital GND
52	AVDD3	Audio analog power supply
53	LDACO	Audio Lch output
54	VCDAC	Audio reference voltage
55	RDACO	Audio Rch output
56	AGND3	Audio analog GND
57	RFRPRFM	C-fitted terminal for RFRP
58	TZCRFM	C-fitted terminal for TZC
59	SC	Scratch depth adjust
60	TEO	Tracking error output
61	TEN	Tracking error feedback input
62	CAGC	C-fitted for constant at RFAGC
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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