

Single-chip 4-bit Microcontroller for CD-DA

BU34440

The BU34440 is a single-chip 4-bit microcontroller designed for CD-DA and contains parallel I/O, serial I/O, timer/counter and all other functions required for CD control in a single compact package.

●Applications

Portable CD-DA devices, portable CD stereos

●Features

- 1) Low-voltage, high-speed operation ($V_{DD}=2.3\sim 5.5V$ at 4.4MHz).
- 2) 4kByte ROM, 256 nibble RAM.
- 3) Internal 8-bit SIO (LSB first).
- 4) 14 programmable pull-up input/outputs.
- 5) 5 programmable pull-up inputs.

●Pin arrangement

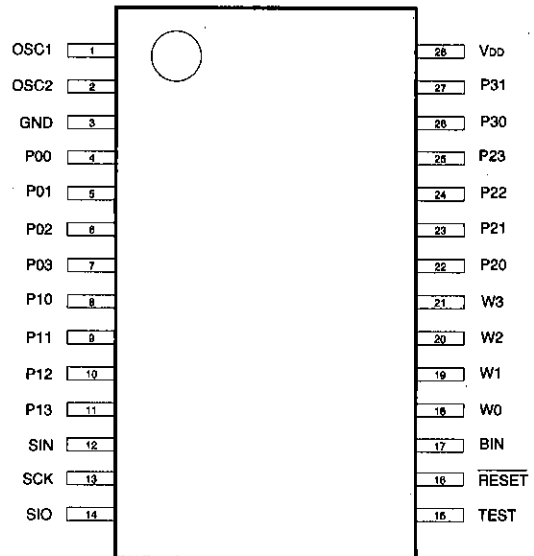


Fig. 1

●Absolute maximum ratings ($T_a=25^\circ C$)

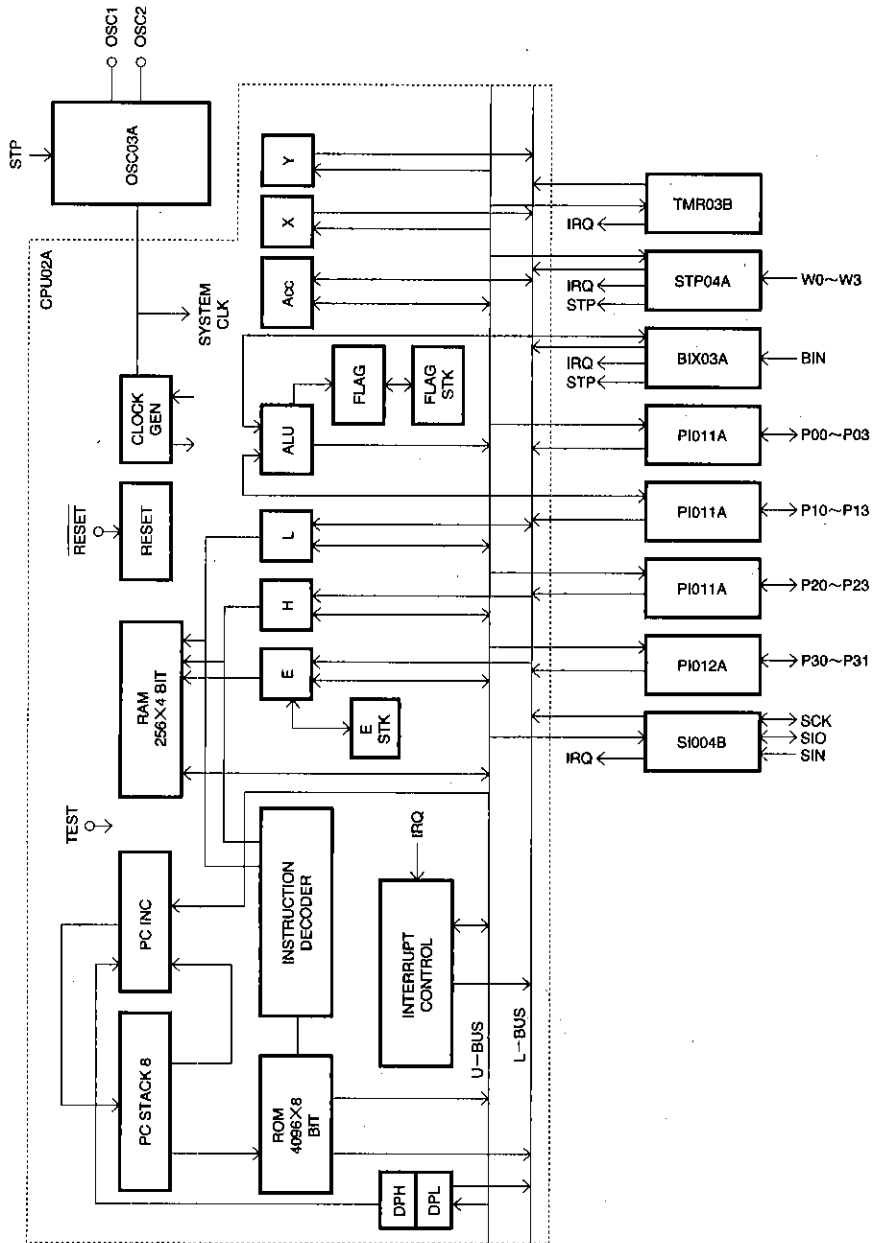
Parameter	Symbol	Limits	Unit
Power supply voltage	V_{DD}	$-0.3\sim 7.0$	V
Power dissipation	P_d	500*	mW
Operating temperature	T_{opr}	$-25\sim 75$	$^\circ C$
Storage temperature	T_{stg}	$-55\sim 125$	$^\circ C$

* Reduced by 5.0 mW for each increase in T_a of $1^\circ C$ over $25^\circ C$.

●Recommended operating conditions ($T_a=25^\circ C$)

Parameter	Symbol	Min.	Typ.	Max.	Unit
Power supply voltage	V_{DD}	2.3	—	5.5	V
Input voltage, HIGH (without hysteresis)	V_{IH}	$0.7V_{DD}$	—	V_{DD}	V
Input voltage, LOW (without hysteresis)	V_{IL}	0	—	$0.3V_{DD}$	V
Input voltage, HIGH (with hysteresis)	V_{IHS}	$0.75V_{DD}$	—	V_{DD}	V
Input voltage, LOW (with hysteresis)	V_{ILS}	0	—	$0.25V_{DD}$	V

● Block diagram



- * No internal PROM
- * The address bus and data bus do not output externally (addressing to external memory is not possible).
- * 4-bit ALU

System Control Microcontrollers for CD

For CDs/CD-ROMs

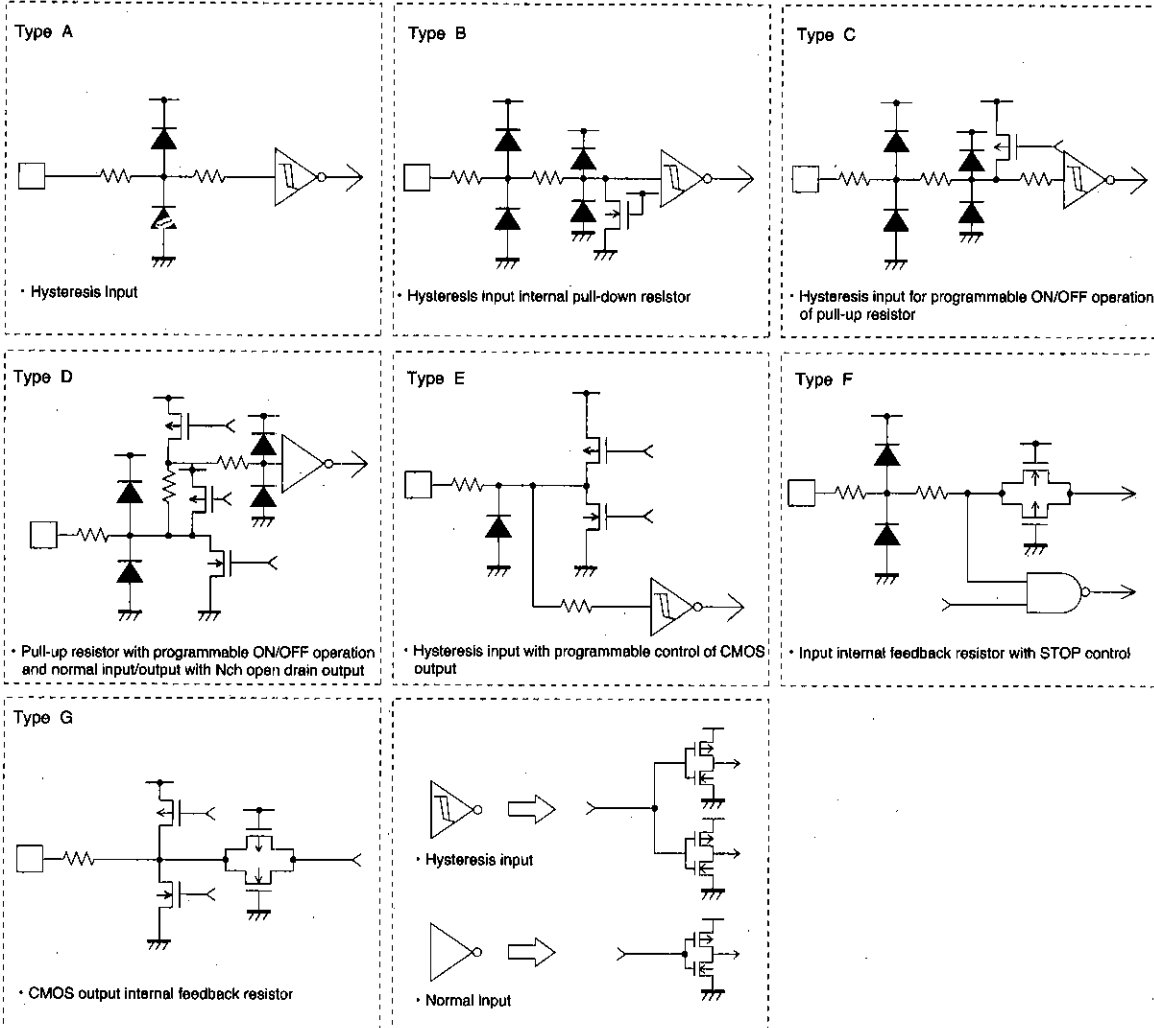
● Pin description

Pin No.	Pin name	I/O	Function	Type
4~7 8~11 22~25	P00~P03 P10~P13 P20~P23 (block PI011A)	I/O	<ul style="list-style-type: none"> • 4-bit input and output. • Each bit is programmable for input or output (open drain output N-channel). • Pull-up resistor ON/OFF operation is programmable (each bit can be set separately). • Resetting turns the pull-up resistors off via input. 	D
26~27	P30~P31 (block PI012)	I/O	<ul style="list-style-type: none"> • 2-bit input and output. • Each bit is programmable for input or output (open drain output N-channel). • Pull-up resistor ON/OFF operation is programmable (each bit can be set separately). • Resetting turns the pull-up resistors off via input. * 1 	D
18~21	W0~W3 (block STP04A)	I	<ul style="list-style-type: none"> • Standard 4-bit input. • Programmable for stop cancel input or interrupt request signal output (each bit can be set separately). • Pull-up resistor ON/OFF operation is programmable (each bit can be set separately). • Resetting turns the pull-up resistors off. 	C
17	BIN (block BIX03A)	I	<ul style="list-style-type: none"> • Standard 1-bit input. • Programmable for stop cancel input or interrupt request signal output. • Pull-up resistor ON/OFF operation is programmable. • Resetting turns the pull-up resistors off. 	C
12	SIN	I	<ul style="list-style-type: none"> • 8-bit serial data input. 	A
14	SIO	I/O	<ul style="list-style-type: none"> • 8-bit serial data input/output. • Programmable selection of input/output. 	E
13	SCK (block SI004B)	I/O	<ul style="list-style-type: none"> • Clock input/output for sending and receiving serial data. • Programmable selection from among 3 int. clocks and 1 ext. clock. 	E
1	OSC1	I	<ul style="list-style-type: none"> • Oscillator input. • External clock input. 	F
2	OSC2 (block OSC03A)	O	<ul style="list-style-type: none"> • Oscillator output. 	G
15	TEST	I	<ul style="list-style-type: none"> • Test input (This is a chip test pin that contains an internal pull-down resistor and so should normally remain open.) 	B
16	RESET	I	<ul style="list-style-type: none"> • Reset input (Setting this pin to LOW resets the CPU.) 	A
28	V _{DD}	—	<ul style="list-style-type: none"> • Power supply pin. 	—
3	GND	—	<ul style="list-style-type: none"> • Ground pin. 	—

Type: Refer to "Input and output equivalent circuits."

* 1 Because these pins reach high impedance immediately after resetting, some applications may require pin processing.

● Input/output circuit



System Control Microcontrollers for CD

For CDs/CD-ROMs

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

Parameter	Symbol	Pin	Min.	Typ.	Max.	Unit	Conditions
STOP circuit current	I _{DDST}		—	—	1	μA	• STOP mode
HALT circuit current	I _{DDHT}		—	1	—	mA	• HALT mode • f _{osc} =4.4MHz
Operational circuit current	I _{DDOP}		—	4	—	mA	• f _{osc} =4.4MHz
Clock frequency	f _{osc}	OSC1, OSC2	2	—	4.4	MHz	
Input voltage 1, HIGH	V _{IH1}	P00~P03, P10~P13, P20~P23, P30~P31	3.5	—	—	V	• Pxx = input
Input voltage 2, HIGH	V _{IH2}	W0~W3, BIN, SIN, SIO, SCK, TEST, RESET	3.75	—	—	V	• Hysteresis input • SIO, SCK = input
Input voltage 3, HIGH	V _{IH3}	OSC1	3.9	—	—	V	• External clock input
Input voltage 1, LOW	V _{IL1}	P00~P03, P10~P13, P20~P23, P30~P31	—	—	1.5	V	• Pxx = input
Input voltage 2, LOW	V _{IL2}	W0~W3, BIN, SIN, SIO, SCK, TEST, RESET	—	—	1.25	V	• Hysteresis input • SIO, SCK = input
Input voltage 3, LOW	V _{IL3}	OSC1	—	—	1.1	V	• External clock input
Input current 1, HIGH	I _{IH1}	P00~P03, P10~P13, P20~P23, P30~P31, W0~W3, BIN, SIN, SIO, SCK, RESET	—	—	1	μA	• No pull-down resistor • Pxx, SIO, SCK=input • V _{IN} = V _{DD}
Input current 2, HIGH	I _{IH2}	TEST	35	70	140	μA	• Internal pull-down resistor • V _{IN} =V _{DD}
Input current 1, LOW	I _{IL1}	P00~P03, P10~P13, P20~P23, P30~P31, W0~W3, BIN, SIN, SIO, SCK, RESET, TEST	—	—	-1	μA	• No pull-up resistor • Pxx, SIO, SCK=input • V _{IN} =GND
Input current 2, LOW	I _{IL2}	P00~P03, P10~P13, P20~P23, P30~P31, W0~W3, BIN	-90	-125	-160	μA	• Internal pull-up resistor • V _{IN} =GND
Output voltage 1, HIGH	V _{OH1}	SIO, SCK	4.5	—	—	V	• SIO, SCK = output • I _{OH} =-500 μA
Output voltage 1, LOW	V _{OL1}	P00~P03, P10~P13, P20~P23, P30~P31, SIO, SCK	—	—	0.4	V	• Pxx, SIO, SCK = output • I _{OL} =1.6mA
Output leak current	I _L	P00~P03, P10~P13, P20~P23, P30~P31	—	—	1	μA	• Pxx = high-impedance output
OSC feedback current	I _{FO}	OSC1, OSC2	-4.0	-10	-14	μA	• Approx. 500 kΩ

*1 machine cycle = 1/6 oscillation frequency

●Electrical characteristics (unless otherwise noted, Ta=25°C, V_{DD}=3V)

Parameter	Symbol	Pin	Min.	Typ.	Max.	Unit	Conditions
STOP circuit current	I _{DDST}		—	—	1	μA	• STOP mode
HALT circuit current	I _{DDHT}		—	0.4	—	mA	• HALT mode • f _{osc} =4.4MHz
Operational circuit current	I _{DDOP}		—	1.5	—	mA	• f _{osc} =4.4MHz
Clock frequency	f _{osc}	OSC1, OSC2	2	—	4.4	MHz	
Input voltage 1, HIGH	V _{IH1}	P00~P03, P10~P13, P20~P23, P30~P31	2.1	—	—	V	• Pxx = input • ADC = digital input
Input voltage 2, HIGH	V _{IH2}	W0~W3, BIN, SIN, SIO, SCK, TEST, RESET	2.25	—	—	V	• Hysteresis input • SIO, SCK = input
Input voltage 3, HIGH	V _{IH3}	OSC1	2.4	—	—	V	• External clock input
Input voltage 1, LOW	V _{IL1}	P00~P03, P10~P13, P20~P23, P30~P31	—	—	0.9	V	• Pxx = input • ADC = digital input
Input voltage 2, LOW	V _{IL2}	W0~W3, BIN, SIN, SIO, SCK, TEST, RESET	—	—	0.75	V	• Hysteresis input • SIO, SCK = input
Input voltage 3, LOW	V _{IL3}	OSC1	—	—	0.65	V	• External clock input
Input current 1, HIGH	I _{IH1}	P00~P03, P10~P13, P20~P23, P30~P31, W0~W3, BIN, SIN, SIO, SCK, RESET	—	—	1	μA	• No pull-down resistor • Pxx, SIO, SCK=input • V _{IN} =V _{DD}
Input current 2, HIGH	I _{IH2}	TEST	10	20	35	μA	• Internal pull-down resistor • V _{IN} =V _{DD}
Input current 1, LOW	I _{IL1}	P00~P03, P10~P13, P20~P23, P30~P31, W0~W3, BIN, SIN, SIO, SCK, RESET, TEST	—	—	-1	μA	• No pull-up resistor • Pxx, SIO, SCK=input • V _{IN} =GND
Input current 2, LOW	I _{IL2}	P00~P03, P10~P13, P20~P23, P30~P31, W0~W3, BIN	-20	-40	-60	μA	• Internal pull-up resistor • V _{IN} =GND
Output voltage 1, HIGH	V _{OH1}	SIO, SCK	2.5	—	—	V	• SIO, SCK = output • I _{OH} =-500 μA
Output voltage 1, LOW	V _{OL1}	P00~P03, P10~P13, P20~P23, P30~P31, SIO, SCK	—	—	0.6	V	• Pxx, SIO, SCK = output • I _{OL} =1.6mA
Output leak current	I _L	P00~P03, P10~P13, P20~P23, P30~P31	—	—	1	μA	• Pxx = high-impedance output
OSC feedback current	I _{FO}	OSC1, OSC2	-1.5	-3	-5	μA	• Approx. 1 MΩ

* 1 machine cycle = 1/6 oscillation frequency

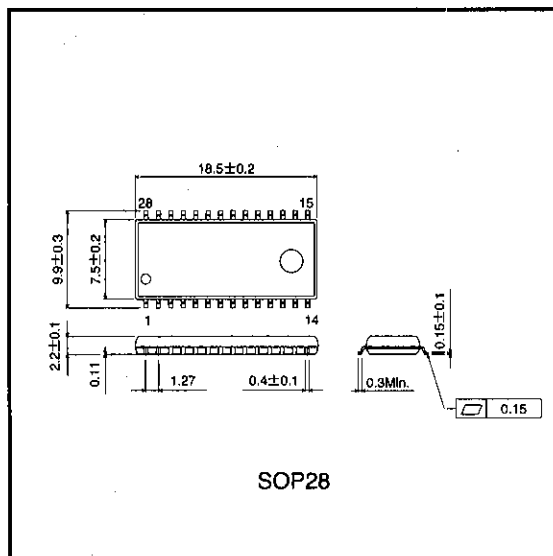
System Control Microcontrollers for CD

For CDs/CD-ROMs

● Hardware description

- (1) Operates on a single power supply ($V_{DD}=2.3\sim 5.5V$)
- (2) Memory size
 - ROM : 4096×8 bits
 - RAM : 256×4 bits
- (3) Instruction execution time (1 cycle instruction)
 - 1.5 μ sec : (at 4MHz)
- (4) Subroutine nesting : 8 levels
- (5) Interrupts : 4 factors
 - External : 2 factors
 - Internal (timer/counter, serial I/O) : 2 factors
- (6) ROM data table function (data table area : 4KB)
- (7) Two energy-saving modes (STOP/HALT)
- (8) Internal 8-bit timer counter
- (9) Internal serial I/O, simplifying interface with attached LSI ICs (LSB first)
- (10) 14 programmable pull-up input/outputs
- (11) 5 programmable pull-up inputs

● External dimensions (Units: mm)



Notes

- The contents described in this catalogue are correct as of March 1997.
- No unauthorized transmission or reproduction of this book, either in whole or in part, is permitted.
- The contents of this book are subject to change without notice. Always verify before use that the contents are the latest specifications. If, by any chance, a defect should arise in the equipment as a result of use without verification of the specifications, ROHM CO., LTD., can bear no responsibility whatsoever.
- Application circuit diagrams and circuit constants contained in this data book are shown as examples of standard use and operation. When designing for mass production, please pay careful attention to peripheral conditions.
- Any and all data, including, but not limited to application circuit diagrams, information, and various data, described in this catalogue are intended only as illustrations of such devices and not as the specifications for such devices. ROHM CO., LTD., disclaims any warranty that any use of such device shall be free from infringement of any third party's intellectual property rights or other proprietary rights, and further, assumes absolutely no liability in the event of any such infringement, or arising from or connected with or related to the use of such devices.
- Upon the sale of any such devices; other than for the buyer's right to use such devices itself, resell or otherwise dispose of the same; no express or implied right or license to practice or commercially exploit any intellectual property rights or other proprietary rights owned or controlled by ROHM CO., LTD., is granted to any such buyer.
- The products in this manual are manufactured with silicon as the main material.
- The products in this manual are not of radiation resistant design.

The products listed in this catalogue are 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 these products 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, or other safety devices) please be sure to consult with our sales representatives in advance.

- Notes when exporting
 - It is essential to obtain export permission when exporting any of the above products when it falls under the category of strategic material (or labor) as determined by foreign exchange or foreign trade control laws.
 - Please be sure to consult with our sales representatives to ascertain whether any product is classified as a strategic material.