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The S-1463AF/14L63AF is a CMOS 4-bit microcomputer, which integrates ROM, RAM, a timer and I/O ports on a single chip. Since the S-1463AF/14L63AF has a 2K×16-bit ROM, a special terminal for remote control signal output and key-on wake-up functions, it is ideal for infrared remote controller.

The S-14L63AF with a low operating voltage range (1.2 V to 3.6 V) is suitable for single-battery powered devices.

## ■ Features

### *Characteristics*

- Power supply voltage : 2.2 to 6.0 V (S-1463AF)  
1.2 to 3.6 V (S-14L63AF)
- Current consumption
  - S-1463AF : Running : 0.7 mA max. at 1 MHz, 3V operation  
Standby : 0.1  $\mu$ A typ., 2.0  $\mu$ A max.
  - S-14L63AF : Running : 0.3 mA max. at 1 MHz, 1.5 V operation  
Standby : 10  $\mu$ A max
- Operating frequency : 1 MHz
- Instruction execution time : 4.0  $\mu$ s at 1 MHz oscillation

### *Hardware functions*

- ROM : 2K×16 bits
- RAM : 128×4 bits
- Port : 6-bit input, 7-bit output, 3-bit I/O
- Remote control signal output
- Standby counter
- Timer / Counter : 10-bit counter , 8-bit timer
- Watchdog timer
- Key-on wake-up
- Interrupt function: Internal (two)
- Oscillation circuit : Ceramic oscillator is built in
- Standby status : Stops oscillation, holds internal status

### *Software*

- Instruction: 35 basic instruction sets (166 if addressing modes are included)
- 16-level subroutine nesting

### *Package*

- 24-pin SOP

### *OTP version*

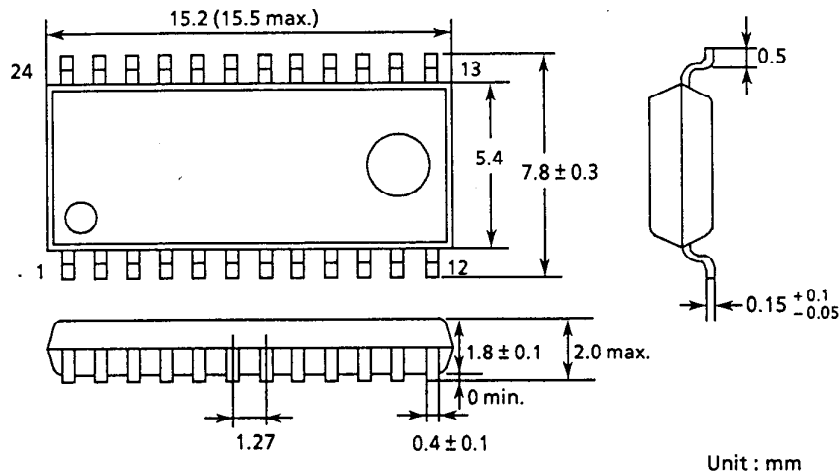
- S-1463AF : For software evaluation, use the S-14P63AF
- S-14L63AF : For software evaluation, use the S-14P63AF

## ■ Applications

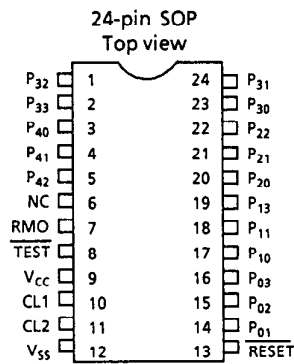
- Remote controller
- Other small-sized control equipment

**CMOS 4-bit 1-chip MICROCOMPUTER**  
**S-1463AF/14L63AF**

■ **Dimensions (24-pin SOP)**



■ **Pin Assignment**

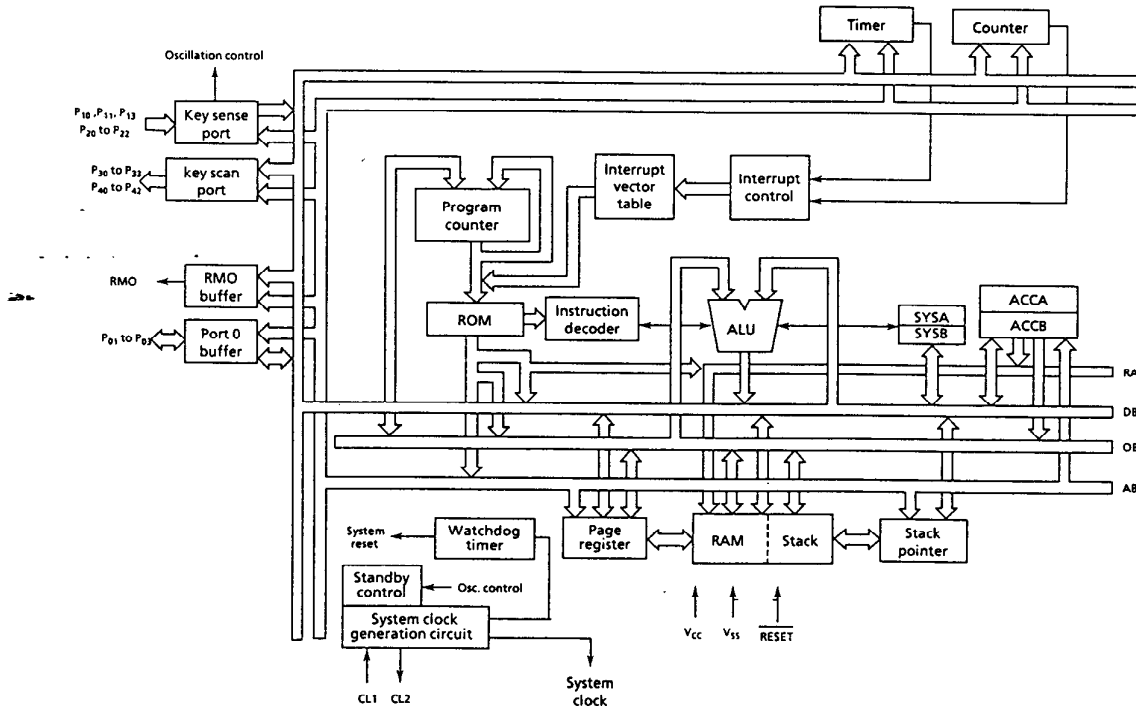


■ **Terminal Functions**

Name	I/O	Functions
V <sub>CC</sub>	—	Positive power supply
V <sub>SS</sub>	—	GND potential terminal
CL1	Input	Oscillation circuit input terminal
CL2	Output	Oscillation circuit output terminal
RESET	Input	Reset input terminal (pull-up resistor is built in)
TEST	Input	Test input terminal (pull-up resistor is built in)
RMO	Output	Remote control signal output terminal
P <sub>01</sub> to P <sub>03</sub>	I/O	I/O ports, selectable in bit unit. Built-in pull-up resistor and Nch opendrain output are available in mask option.
P <sub>10</sub> , P <sub>11</sub> , P <sub>13</sub> P <sub>20</sub> to P <sub>22</sub>	Input	Input ports, also used as sense input of key matrix. Standby status is released by inputting low level in standby status. Pull-up resistor is built in.
P <sub>30</sub> to P <sub>33</sub> P <sub>40</sub> to P <sub>42</sub>	Output	Output ports, also used as scan output of key matrix. Nch opendrain output is also available in mask option.

■ Block Diagram

The S-1463AF/14L63AF blocks connect with a 4-bit data bus (DB), 4-bit address bus (AB), 4-bit RAM address bus (RA) and 12-bit operation bus (OB).



■ Absolute Maximum Ratings

Parameter	Symbol	Conditions	Ratings	Unit
Storage temperature	T <sub>stg</sub>		-40 to +125	°C
Operating temperature	T <sub>opr</sub>		-10 to +70	°C
Power supply voltage	V <sub>CC</sub>	T <sub>a</sub> = 25°C S-1463AF	-0.3 to +7.0	V
Power supply voltage	V <sub>CC</sub>	T <sub>a</sub> = 25°C S-14L63AF	-0.3 to +4.0	V
Input voltage	V <sub>IN</sub>	T <sub>a</sub> = 25°C	V <sub>SS</sub> -0.3 to V <sub>CC</sub> +0.3	V
Output voltage	V <sub>OUT</sub>	T <sub>a</sub> = 25°C	V <sub>SS</sub> to V <sub>CC</sub>	V
Power dissipation	P <sub>D</sub>	T <sub>a</sub> = 25°C	300	mW

■ Recommended Operating Conditions

(T<sub>a</sub> = -10°C to +70°C)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Power supply voltage	V <sub>CC</sub>	f <sub>OSC</sub> = 1 MHz S-1463AF	2.2	—	6.0	V
Power supply voltage	V <sub>CC</sub>	f <sub>OSC</sub> = 1 MHz S-14L63AF	1.2	—	3.6	V
Input voltage	V <sub>IN</sub>		0	—	V <sub>CC</sub>	V
System clock frequency	f <sub>OSC</sub>	V <sub>CC</sub> = 2.2 to 6.0 V (S-1463AF) V <sub>CC</sub> = 1.2 to 3.6 V (S-14L63AF)	0.2	—	1.0	MHz

# CMOS 4-bit 1-chip MICROCOMPUTER

## S-1463AF/14L63AF

### DC Electrical Characteristics

#### 1. S-1463AF

•  $V_{CC} = 3\text{ V}$

( $T_a = -10^\circ\text{C}$  to  $+70^\circ\text{C}$ )

Parameter	Symbol	Conditions(applicable terminals)	Min.	Typ.	Max.	Unit
Operating current consumption	$I_{CCO}$	$f_{OSC} = 1\text{ MHz}$ , no load	—	0.25	0.7	mA
Standby current consumption	$I_{CCS}$	OFF mode	—	0.1	2.0	$\mu\text{A}$
High level input voltage	$V_{IH}$		$0.8 \times V_{CC}$	—	—	V
Low level input voltage	$V_{IL}$		—	—	$0.2 \times V_{CC}$	V
High level input leakage current	$I_{LH}$	All input pins* $V_{IN} = V_{CC}$	—	—	1	$\mu\text{A}$
Low level input leakage current	$I_{LL}$	Without pull-up resistor $P_{01}$ to $P_{03}$ , $V_{IN} = V_{SS}$	-1	—	—	$\mu\text{A}$
High level input current	$I_{IH}$	$\overline{\text{RESET}}$ , $V_{IN} = V_{CC} - 0.3\text{V}$	-9	—	-0.9	$\mu\text{A}$
Low level input current 1	$I_{IL1}$	With pull-up resistor, $P_{01}$ to $P_{03}$ , $P_{10}, P_{11}, P_{13}, P_{20}$ to $P_{22}$ , $V_{IN} = V_{SS}$	-90	-30	-10	$\mu\text{A}$
Low level input current 2	$I_{IL2}$	$\overline{\text{RESET}}$ , $V_{IN} = V_{SS}$	-6	-2	-0.6	$\mu\text{A}$
Low level input current 3	$I_{IL3}$	$\overline{\text{TEST}}$ , $V_{IN} = V_{SS}$	-30	-10	-3	$\mu\text{A}$
High level output current 1	$I_{OH1}$	RMO, $V_{OUT} = 2.1\text{ V}$	—	—	-5.0	mA
High level output current 2	$I_{OH2}$	$P_{01}$ to $P_{03}$ , $P_{30}$ to $P_{33}$ , $P_{40}$ to $P_{42}$ , $V_{OUT} = 2.6\text{ V}$	—	—	-100	$\mu\text{A}$
Low level output current 1	$I_{OL1}$	RMO, $V_{OUT} = 0.4\text{ V}$	250	—	—	$\mu\text{A}$
Low level output current 2	$I_{OL2}$	$P_{01}$ to $P_{03}$ , $P_{30}$ to $P_{33}$ , $P_{40}$ to $P_{42}$ , $V_{OUT} = 0.4\text{ V}$	1.0	—	—	mA
Schmitt hysteresis width	$V_{WD}$		—	1.0	—	V

\*  $\overline{\text{TEST}}$ ,  $\overline{\text{RESET}}$ ,  $P_{01}$  to  $P_{03}$ ,  $P_{10}, P_{11}, P_{13}$ ,  $P_{20}$  to  $P_{22}$

#### 2. S-1463AF

•  $V_{CC} = 5\text{ V}$

( $T_a = -10^\circ\text{C}$  to  $+70^\circ\text{C}$ )

Parameter	Symbol	Conditions(applicable terminals)	Min.	Typ.	Max.	Unit
Operating current consumption	$I_{CCO}$	$f_{OSC} = 1\text{ MHz}$ , no load	—	0.6	1.2	mA
Standby current consumption	$I_{CCS}$	OFF mode	—	0.1	5.0	$\mu\text{A}$
High level input voltage	$V_{IH}$		$0.8 \times V_{CC}$	—	—	V
Low level input voltage	$V_{IL}$		—	—	$0.2 \times V_{CC}$	V
High level input leakage current	$I_{LH}$	All input pins* $V_{IN} = V_{CC}$	—	—	1	$\mu\text{A}$
Low level input leakage current	$I_{LL}$	Without pull-up resistor $P_{01}$ to $P_{03}$ , $V_{IN} = V_{SS}$	-1	—	—	$\mu\text{A}$
High level input current	$I_{IH}$	$\overline{\text{RESET}}$ , $V_{IN} = V_{CC} - 0.3\text{V}$	-15	—	-1.5	$\mu\text{A}$
Low level input current 1	$I_{IL1}$	With pull-up resistor, $P_{01}$ to $P_{03}$ , $P_{10}, P_{11}, P_{13}, P_{20}$ to $P_{22}$ , $V_{IN} = V_{SS}$	-230	-90	-30	$\mu\text{A}$
Low level input current 2	$I_{IL2}$	$\overline{\text{RESET}}$ , $V_{IN} = V_{SS}$	-15	-6	-2.4	$\mu\text{A}$
Low level input current 3	$I_{IL3}$	$\overline{\text{TEST}}$ , $V_{IN} = V_{SS}$	-75	-30	-12	$\mu\text{A}$
High level output current 1	$I_{OH1}$	RMO, $V_{OUT} = 4.1\text{ V}$	—	—	-7	mA
High level output current 2	$I_{OH2}$	$P_{01}$ to $P_{03}$ , $P_{30}$ to $P_{33}$ , $P_{40}$ to $P_{42}$ , $V_{OUT} = 4.6\text{ V}$	—	—	-250	$\mu\text{A}$
Low level output current 1	$I_{OL1}$	RMO, $V_{OUT} = 0.4\text{ V}$	450	—	—	$\mu\text{A}$
Low level output current 2	$I_{OL2}$	$P_{01}$ to $P_{03}$ , $P_{30}$ to $P_{33}$ , $P_{40}$ to $P_{42}$ , $V_{OUT} = 0.4\text{ V}$	1.5	—	—	mA
Schmitt hysteresis width	$V_{WD}$		—	2.2	—	V

\*  $\overline{\text{TEST}}$ ,  $\overline{\text{RESET}}$ ,  $P_{01}$  to  $P_{03}$ ,  $P_{10}, P_{11}, P_{13}$ ,  $P_{20}$  to  $P_{22}$

**CMOS 4-bit 1-chip MICROCOMPUTER  
S-1463AF/14L63AF**

3. S-14L63AF

•  $V_{CC} = 1.5\text{ V}$

( $T_a = -10^\circ\text{C}$  to  $+70^\circ\text{C}$ )

Parameter	Symbol	Conditions(applicable terminals)	Min.	Typ.	Max.	Unit
Operating current consumption	$I_{CCO}$	$f_{osc} = 1\text{ MHz}$ , no load	—	0.1	0.3	mA
Standby current consumption	$I_{CCS}$	OFF mode	—	1	10	$\mu\text{A}$
High level input voltage	$V_{IH}$		$0.8 \times V_{CC}$	—	—	V
Low level input voltage	$V_{IL}$		—	—	$0.2 \times V_{CC}$	V
High level input leakage current	$I_{LH}$	All input pins* $V_{IN} = V_{CC}$	—	—	1	$\mu\text{A}$
Low level input leakage current	$I_{LL}$	Without pull-up resistor $P_{01}$ to $P_{03}$ $V_{IN} = V_{SS}$	-1	—	—	$\mu\text{A}$
High level input current	$I_{IH}$	$\overline{\text{RESET}}$ , $V_{IN} = V_{CC} - 0.3\text{ V}$	-4	—	-1	$\mu\text{A}$
Low level input current 1	$I_{IL1}$	With pull-up resistor, $P_{01}$ to $P_{03}$ , $P_{10}$ , $P_{11}$ , $P_{13}$ , $P_{20}$ to $P_{22}$ , $V_{IN} = V_{SS}$	-30	-10	-3	$\mu\text{A}$
Low level input current 2	$I_{IL2}$	$\overline{\text{RESET}}$ , $V_{IN} = V_{SS}$	-2	-0.6	-0.2	$\mu\text{A}$
Low level input current 3	$I_{IL3}$	$\overline{\text{TEST}}$ , $V_{IN} = V_{SS}$	-8	-2	-0.5	$\mu\text{A}$
High level output current 1	$I_{OH1}$	RMO, $V_{OUT} = 1.1\text{ V}$	—	—	-2	mA
High level output current 2	$I_{OH2}$	$P_{01}$ to $P_{03}$ , $P_{30}$ to $P_{33}$ , $P_{40}$ to $P_{42}$ , $V_{OUT} = 1.1\text{ V}$	—	—	-100	$\mu\text{A}$
Low level output current 1	$I_{OL1}$	RMO, $V_{OUT} = 0.4\text{ V}$	200	—	—	$\mu\text{A}$
Low level output current 2	$I_{OL2}$	$P_{01}$ to $P_{03}$ , $P_{30}$ to $P_{33}$ , $P_{40}$ to $P_{42}$ , $V_{OUT} = 0.4\text{ V}$	0.5	—	—	mA
Schmitt hyseresis width	$V_{WD}$		—	0.4	—	V

\* TEST, RESET,  $P_{01}$  to  $P_{03}$ ,  $P_{10}$ ,  $P_{11}$ ,  $P_{13}$ ,  $P_{20}$  to  $P_{22}$

4. S-14L63AF

•  $V_{CC} = 3.0\text{ V}$

( $T_a = -10^\circ\text{C}$  to  $+70^\circ\text{C}$ )

Parameter	Symbol	Conditions(applicable terminals)	Min.	Typ.	Max.	Unit
Operating current consumption	$I_{CCO}$	$f_{osc} = 1\text{ MHz}$ , no load	—	0.5	1.0	mA
Standby current consumption	$I_{CCS}$	OFF mode	—	1	15	$\mu\text{A}$
High level input voltage	$V_{IH}$		$0.8 \times V_{CC}$	—	—	V
Low level input voltage	$V_{IL}$		—	—	$0.2 \times V_{CC}$	V
High level input leakage current	$I_{LH}$	All input pins* $V_{IN} = V_{CC}$	—	—	1	$\mu\text{A}$
Low level input leakage current	$I_{LL}$	Without pull-up resistor $P_{01}$ to $P_{03}$ $V_{IN} = V_{SS}$	-1	—	—	$\mu\text{A}$
High level input current	$I_{IH}$	$\overline{\text{RESET}}$ , $V_{IN} = V_{CC} - 0.3\text{ V}$	-8	—	-2	$\mu\text{A}$
Low level input current 1	$I_{IL1}$	With pull-up resistor, $P_{01}$ to $P_{03}$ , $P_{10}$ , $P_{11}$ , $P_{13}$ , $P_{20}$ to $P_{22}$ , $V_{IN} = V_{SS}$	-120	-50	-20	$\mu\text{A}$
Low level input current 2	$I_{IL2}$	$\overline{\text{RESET}}$ , $V_{IN} = V_{SS}$	-10	-4	-1.5	$\mu\text{A}$
Low level input current 3	$I_{IL3}$	$\overline{\text{TEST}}$ , $V_{IN} = V_{SS}$	-40	-16	-6	$\mu\text{A}$
High level output current 1	$I_{OH1}$	RMO, $V_{OUT} = 2.6\text{ V}$	—	—	-3	mA
High level output current 2	$I_{OH2}$	$P_{01}$ to $P_{03}$ , $P_{30}$ to $P_{33}$ , $P_{40}$ to $P_{42}$ , $V_{OUT} = 2.6\text{ V}$	—	—	-200	$\mu\text{A}$
Low level output current 1	$I_{OL1}$	RMO, $V_{OUT} = 0.4\text{ V}$	400	—	—	$\mu\text{A}$
Low level output current 2	$I_{OL2}$	$P_{01}$ to $P_{03}$ , $P_{30}$ to $P_{33}$ , $P_{40}$ to $P_{42}$ , $V_{OUT} = 0.4\text{ V}$	1.0	—	—	mA
Schmitt hyseresis width	$V_{WD}$		—	1.0	—	V

\* TEST, RESET,  $P_{01}$  to  $P_{03}$ ,  $P_{10}$ ,  $P_{11}$ ,  $P_{13}$ ,  $P_{20}$  to  $P_{22}$

# CMOS 4-bit 1-chip MICROCOMPUTER S-1463AF/14L63AF

## ■ Instructions

- 1 . Instructions are 16-bit length, and executed in a single instruction cycle(4 clocks).
- 2 . The S-1463AF has 6 addressing modes.
  - 1) Direct addressing mode
  - 2) Relative addressing mode
  - 3) Immediate addressing mode
  - 4) Register addressing mode
  - 5) Accumulator indirect addressing mode
  - 6) Accumulator indexed addressing mode
- 3 . Number of instructions

	Basic	Including addressing modes
Transfer instruction	6	15
Arithmetic operation instruction	9	57
Logical operation instruction	8	66
Branch instruction	7	19
Rotate/shift instruction	2	6
CPU control instruction	3	3
Total	35	166

## ■ Application Example (S-1463AF)

