

M58434P, M58435P M58436-001P, M58437-001P

CMOS ANALOG CLOCK CIRCUITS

DESCRIPTION

This family of CMOS circuits is particularly suited for crystal-controlled clocks where induction motors or stepping motors are used.

Type	Process	Crystal oscillator	Motor	Alarm sound
M58434P	Silicon-gate CMOS	4.1943MHz	Induction motor	1024Hz
M58435P	Silicon-gate CMOS	4.1943MHz	Stepping motor	1024Hz
M58436-001P	Aluminum-gate CMOS	4.1943MHz	Stepping motor	$4096 \times 8 \times 1\text{Hz}$
M58437-001P	Aluminum-gate CMOS	32.768KHz	Stepping motor	$4096 \times 8 \times 1\text{Hz}$

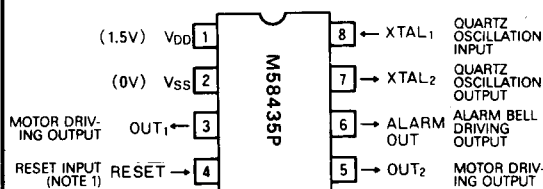
FEATURES

- Low power dissipation:
 - M58434P, M58435P: $30\mu\text{A}$ (typ)
 - M58436-001P: $35\mu\text{A}$ (typ)
 - M58437-001P: $2\mu\text{A}$ (typ)
- Low voltage operation:
 - M58434P, M58435P: 1.2V (min)
 - M58436-001P: 1.1V (min)
- Direct drive of ceramic resonator (M58436-001P and M58437-001P only)

APPLICATIONS

- Crystal-controlled alarm clock
- Precision timepiece for electronic apparatus
- Frequency divider for electronic apparatus

PIN CONFIGURATION (TOP VIEW)



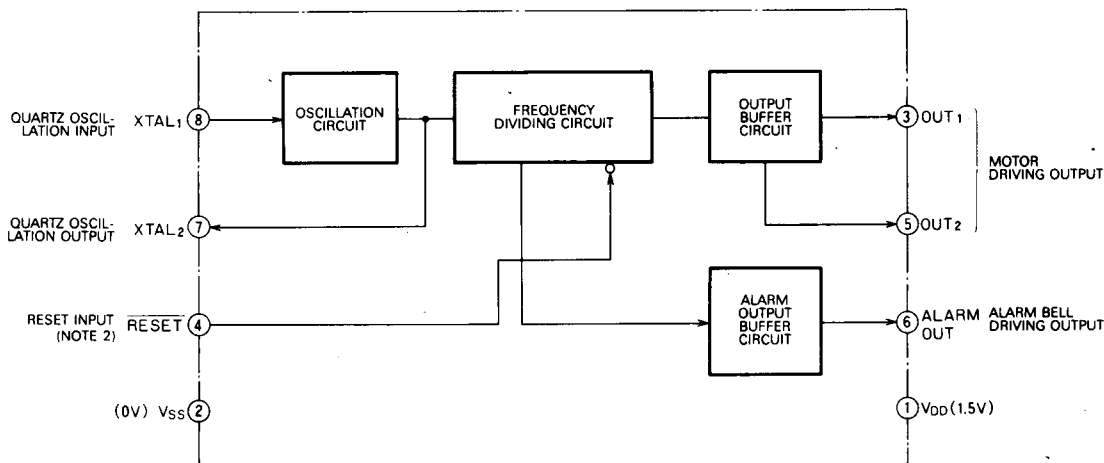
Note 1: This pin is non-connected for M58434P.

Outline 8P1(M58434P)
(M58435P)
(M58436-001P)
(M58437-001P)

FUNCTION

Circuitry consists of an oscillator, frequency divider, bridge-type driver circuit for an induction motor (M58434P) or a stepping motor (M58435P, M58436-001P, M58437-001P), and an alarm bell driver circuit. The oscillator frequency is 32.768 kHz for the M58437-001P and 4.1943 MHz for the other types.

BLOCK DIAGRAM



Note 2: M58434P has no reset input pin.

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FUNCTIONAL DESCRIPTION

Oscillation Circuit

This circuit is completed by connecting a crystal between XTAL₁ (oscillation input) and XTAL₂ (oscillation output) and capacitances between both terminals and GND.

Motor Driver Circuit

This circuit amplifies motor driving current at the output frequency of the last divider. In M58434P and M58435P, Outputs OUT₁ and OUT₂ are always in a mutually reversed phase, while in the M58436-001P and M58437-001P, OUT₁ has a wave-form delayed 1sec from OUT₂. It is realized by continuous movement or stepped movement when the M58434P is connected to an induction motor (M58434), to a stepping motor with series-connected capacitance (M58435P) or a stepping motor (M58436-001P and M58437-001P). The size of the capacitance for M58435P is determined by the total current consumption and the required motor torque, and with a 47μF capacitor, SUM-2 manganese dry cells will last for about one year.

Reset Input (RESET)

When the RESET terminal of the M58435P is held at V_{SS} level, outputs OUT₁ and OUT₂ hold their current states of

that time, and invert 0.97~1.0sec after the reset terminal is released from the V_{SS} level. In the M58436-001P and M58437-001P, OUT₁ and OUT₂ go to the V_{SS} level, and 0.97~1.0sec after the reset terminal is released from V_{SS} level, a 31ms pulse is generated from the output opposite to the one that emitted a 31ms pulse immediately before the reset. If the RESET terminal is connected with the V_{SS} during the 31ms pulse, the reset will be started completely after the pulse ends. This prevents inadvertent interruption of complete action of the motor owing to the reset function. The M58434P has no reset function.

Alarm Output Buffer Circuit

This circuit consists of an N-channel open-drain MOS transistor and generates a signal to drive a ceramic resonator or magnetic speaker (see p. 10-14). The alarm output is a 1024 Hz signal, with a duty cycle of 50% for M5843P and M58435P, and burst signals of 4096Hz, 8Hz, and 1Hz, each of 50% duty, for M58436-001P and M58437-001P. Direct drive of the ceramic resonator by M58436-001P and M58437-001P is possible because of the high alarm output breakdown voltage.

Table 1 Output Waveforms on the OUT₁, OUT₂, and ALARM OUT terminals

Type	OUT ₁ and OUT ₂ waveform	Pulse width (ms)	ALARM OUT waveform
M58434P		—	
M58435P		—	
M58436-001P M58437-001P		31	

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CMOS ANALOG CLOCK CIRCUITS

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Conditions	Limits	Unit
V_{DD}	Supply voltage	With respect to V_{SS}	-0.3 ~ 5	V
P_d	Maximum power dissipation	$T_a = 25^\circ\text{C}$	300	mW
T_{opr}	Operating free-air ambient temperature range		-20 ~ 70	$^\circ\text{C}$
T_{stg}	Storage temperature range		-40 ~ 125	$^\circ\text{C}$

RECOMMENDED OPERATING CONDITIONS ($T_a = 25^\circ\text{C}$, unless otherwise noted)

Symbol	Parameter		Limits			Unit
			Min	Nom	Max	
V_{DD}	Supply voltage			1.5		V
V_{SS}	Supply voltage (GND)			0		V
f_{osc}	Crystal oscilation frequency	M58434P		4.1943		-MHz
		M58435P				
		M58436-001P				
		M58437-001P		32.768		kHz
R_O	Crystal impedance of crystal oscillator	M58434P		30	60	Ω
		M58435P				
		M58436-001P				
		M58437-001P		20	30	k Ω
C_{IN}	External input capacity			20		pF
C_{OUT}	External output capacity			20		pF

ELECTRICAL CHARACTERISTICS ($T_a = 25^\circ\text{C}$, $V_{SS} = 0\text{ V}$, unless otherwise noted)

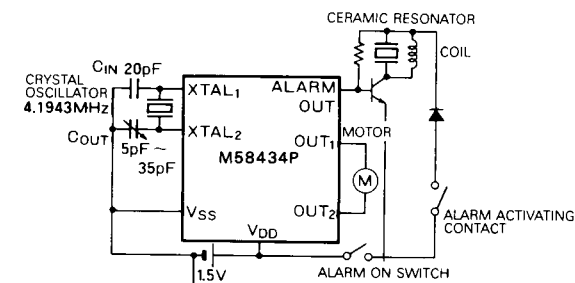
Symbol	Parameter		Test conditions	Limits			Unit
				Min	Typ	Max	
V_{DD}	Supply voltage	M58434P	$C_{IN} = C_{OUT} = 20\text{pF}$, $R_O = 30\Omega$	1.2	1.5	1.9	V
		M58435P					
		M58436-001P	$C_{IN} = C_{OUT} = 20\text{pF}$, $R_O = 30\Omega$	1.1	1.5	1.9	V
		M58437-001P	$C_{IN} = C_{OUT} = 20\text{pF}$, $R_O = 20\text{k}\Omega$				
I_{DD}	Supply current	M58434P	$V_{DD} = 1.5\text{V}$, $C_{IN} = C_{OUT} = 20\text{pF}$, $R_O = 30\Omega$		30	50	μA
		M58435P					
		M58436-001P	$V_{DD} = 1.5\text{V}$, $C_{IN} = C_{OUT} = 20\text{pF}$, $R_O = 30\Omega$		35	70	μA
		M58437-001P	$V_{DD} = 1.5\text{V}$, $C_{IN} = C_{OUT} = 20\text{pF}$, $R_O = 20\text{k}\Omega$				
$R_{ON(P+N)}$	Motor driving output saturation resistance (P-channel + N-channel)	M58434P	$V_{DD} = 1.5\text{V}$, $I_{OUT} = \pm 3\text{mA}$		150	300	Ω
		M58435P					
		M58436-001P	$V_{DD} = 1.5\text{V}$, $I_{OUT} = \pm 3\text{mA}$		100	200	Ω
		M58437-001P					
$R_{ON(AL)}$	Alarm bell driving output saturation resistance (N-channel)	M58434P	$V_{DD} = 1.5\text{V}$, $I_{OUT} = 3\text{mA}$		0.5	1	k Ω
		M58435P					
		M58436-001P	$V_{DD} = 1.5\text{V}$, $I_{OUT} = 3\text{mA}$		100	200	Ω
		M58437-001P					
I_{SW}	Reset input current	M58435P	$V_{DD} = 1.5\text{V}$			1	μA
		M58436-001P					
		M58437-001P					

**M58434P, M58435P
 M58436-001P, M58437-001P**

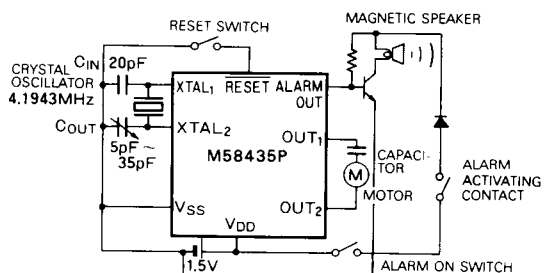
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TYPICAL APPLICATION CIRCUITS

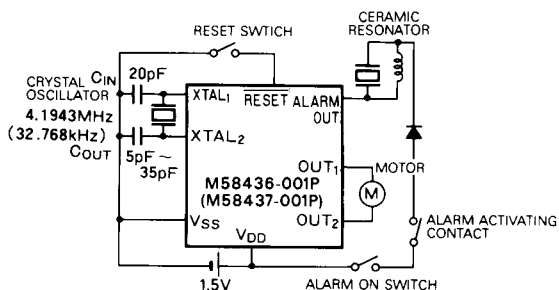
1. Ceramic resonator with M58434P



2. Magnetic speaker with M58435P



3. Ceramic buzzer with M58436-001P or M58437-001P



4. Magnetic speaker with M58436-001P or M58437-001P

