M58479P, M58482P

CMOS COUNTER/TIMERS

GENERAL DESCRIPTION

The M58479P and M58482P are electronic timer ICs developed by aluminum-gate CMOS technology. Use of these ICs makes possible timer devices without mechanical elements, which have reduced power dissipation, superior reliability, and higher noise immunity. The M58479P is specifically designed for high noise immunity while the M58482P particularly features low power dissipation.

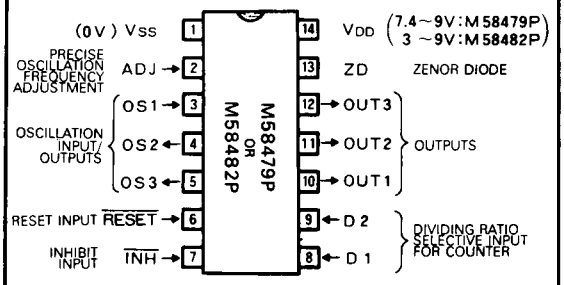
FEATURES

- Low power dissipation
  M58479P: 2mW (typ), 7.5mW (max)
  M58482P: 200μW (typ), 750μW (max)
- Superior noise immunity
- Single power supply with a zenor diode
- Internal RC oscillator
- Precise oscillation frequency regulating capability
- Extremely broad time-delay range (50ms~4800h)
- Time-delay settable to 10, 60, or 600 times fundamental time (1024 times oscillation period)
- M58479P has automatic-reset function during power engagement
- Built-in reset and inhibit functions
- Residual time display possible by adding Mitsubishi's M53290P and M53242P IC

APPLICATIONS

- Electronic timer or counter with broad time-delay range (50ms~4800h)

PIN CONFIGURATION (TOP VIEW)



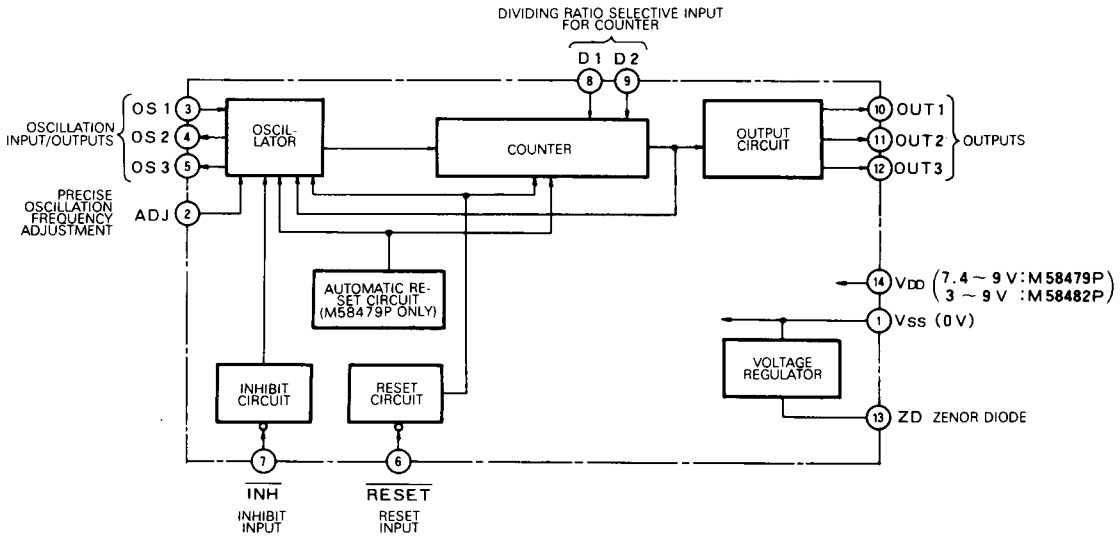
Outline 14P4

SUMMARY OF FUNCTIONS

These devices make possible extremely long clock performance, by counting pulse signals from the RC oscillator. It has precise oscillation frequency adjustment, automatic-reset, reset, and inhibit functions.

There are three outputs. When the time duration is up, OUT1 turns from low to high and OUT2 from high to low. OUT3 can be connected to M53290P and M53242P TTLs for residual time display.

BLOCK DIAGRAM



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CMOS COUNTER/TIMERS

FUNCTIONAL DESCRIPTION

Voltage Regulator

A zenor diode is on-chip, making it easy to obtain a constant voltage regulator circuit. Since the zenor diode terminal (ZD) is independent of the power terminal (V_{DD}), it can be used as a constant voltage power supply for the total system.

Oscillator

Oscillation is obtained by connecting an external resistor (feedback resistor R_{FC}) between terminals OS1 and OS3 and an external capacitor (oscillation capacitor C_{FC}) between terminals OS1 and OS2. The values of the external resistor and capacitor can then be changed to vary the oscillation period and thus change the time delay. Oscillation period T_0 is obtained by the following equation:

$$T_0 = -R_{FC} \cdot C_{FC} \left\{ \left| n \frac{V_{TR}}{V_{DD}+V_{BE}} + \left| n \frac{V_{DD}-V_{TR}}{V_{DD}+V_{BE}} \right\} \cdots (1) \right.$$

Where,

- R_{FC} : Resistance of external resistor
- C_{FC} : Capacitance of external capacitor
- V_{TR} : Transition voltage of the first inverter in the oscillation circuit
- V_{DD} : Supply voltage
- V_{BE} : Forward rising voltage of the diode in terminal OS1 (0.3~0.7V)

Automatic-Reset Function

The M58479P has a power-supply voltage-detection circuit on-chip, so that the counter is automatically reset by the rising edge of the supply voltage when power is turned on. The reset is then released, making the oscillator ready to function and the counter ready to start counting.

The M58482P can also be provided with the same automatic-reset function by connecting capacitor between terminals $\overline{RESET}$ and V_{SS}.

Reset Function

When the $\overline{RESET}$ input turns low (V_{SS}), oscillation of the oscillator can be stopped and the counter reset.

Inhibit Function

When terminal $\overline{INH}$ turns low (V_{SS}) while the timer is in action, the oscillation halts. When input $\overline{INH}$ is turned high or returned to OPEN afterwards, it starts to count residual time.

Counter

This counter consists of an 11-stage 1/2 frequency divider, a 2-stage 1/10 frequency divider and a 1-stage 1/6 frequency divider. As shown in the table below, timer duration can be changed by varying the number of pulses counted according to the combination of the input levels on terminals D1 and D2.

D1	D2	Number of pulses counted	Time delay	Typical time delay applied
H	H	1024	T_1	1 min
L	H	1024×10	$T_1 \times 10$	10 min
H	L	$1024 \times 10 \times 6$	$T_1 \times 10 \times 6$	1h
L	L	$1024 \times 10 \times 6 \times 10$	$T_1 \times 10 \times 6 \times 10$	10h

Where, $T_1 = T_0 \times 1024$

T_0 is the value obtained from equation (1)

Output Circuits

The chips have three outputs: OUT1 changes from low to high and OUT2 from high to low as soon as the time duration is up. Either can be used to drive a transistor by connecting it to the transistor base. OUT1 can drive a thyristor when connected to the thyristor gate.

OUT3 is an open-drain output with period 1/8 of the time delay, and can be used to drive a TTL in a separate (5V) power supply line. Thus, if a M53290P counter and a M53242P binary-to-decimal decoder are connected to OUT3, with their output connected to a light-emitting diode, residual time will be displayed on the LED. When not in use, OUT3 should be connected to V_{SS}.

Fine Adjustment of Oscillation Period

A variable resistor can be connected between terminals ADJ and V_{SS}, enabling precise adjustment of the period of the oscillator. However, when not used for fine adjustment, ADJ should be connected to V_{SS}.

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Conditions	Limits	Unit
V_{DD}	Supply voltage	With respect to V_{SS}	−0.3 ~ 9.5	V
V_I	Input voltage		$V_{SS} \leqq V_I \leqq V_{DD}$	V
Pd	Maximum power dissipation	Ta = 25°C	250	mW
Topr	Operating free-air temperature range		−30 ~ 75	°C
Tstg	Storage temperature range		−40 ~ 125	°C

RECOMMENDED OPERATING CONDITIONS (Ta = −30 ~ 75°C, unless otherwise noted.)

Symbol	Parameter		Limits			Unit
			Min	Nom	Max	
V_{DD}	Supply voltage	M58479P	7.4		9	V
		M58482P	3		9	V
I_{ZD}	Zenor current				10	mA
R_{FC}	Feedback resistance		0.005		10	MΩ
C_{FC}	Oscillation capacitance		0.001		1	μF
R_{ADJ}	Resistance for fine-adjustment of oscillation frequency		0		100	kΩ

ELECTRICAL CHARACTERISTICS (Ta = 25°C, unless otherwise noted.)

Symbol	Parameter		Test conditions	Limits			Unit
				Min	Typ	Max	
V_{ZD}	Zenor voltage		I_{ZD} = 2mA	7.4	8.2	9	V
			I_{ZD} = 10mA	7.5	8.2	9	V
I_{DD}	Supply current	M58479P	V_{DD} = 7.5V, C_{FC} = 0.01μF, R_{FC} = 1MΩ, R_{ADJ} = 0Ω, Input/output open		0.25	1	mA
		M58482P	V_{DD} = 7.5V, C_{FC} = 0.01μF, R_{FC} = 1MΩ, R_{ADJ} = 0Ω, Input/output open		25	100	μA
V_{RE}	Supply voltage at the time of automatic-reset release	M58479P		3.1		5.4	V
V_{TR}	Transition voltage of first inverter in the oscillator		V_{DD} = 7.5V, R_{ADJ} = 0Ω	2.9		4.8	V
R_I	Pull-up resistance, $\overline{RESET}$, $\overline{INH}$, D1, D2 inputs	M58479P		10	20	30	kΩ
		M58482P		25	50	75	kΩ
I_{OH}	High-level output current, OUT1 and OUT2 outputs		V_{DD} = 7.5V, V_O = 0V	5	10		mA
I_{OL}	Low-level output current, OUT1, OUT2, and OUT3 outputs		V_{DD} = 7.5V, V_O = 7.5V	10	20		mA
I_{OZH}	Off-state output current, OUT3 output		V_{DD} = 7.5V, V_O = 7.5V			1	μA
I_{OL}	Low-level output current: OUT1, OUT2, and OUT3 outputs		V_{DD} = 7.5V, V_O = 0.4V	1.6			mA
I_{OL}	Low-level output current, OUT1, OUT2, and OUT3 outputs	M58482P	V_{DD} = 4.5V, V_O = 0.4V	1.6			mA
V_{OL}	Low-level output voltage, OUT1, OUT2, and OUT3 outputs		V_{DD} = 7.5V			0.1	V

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TYPICAL APPLICATION CIRCUIT