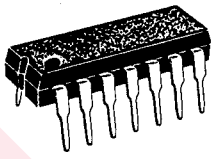
MN4541B/MN4541BS

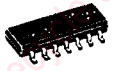
Programmable Timer

P-1



14-pin plastic DIL package

P-2



14-pin PANAFLAT package (SO-14D)

■ Outline

The MN4541B/S is a programmable timer consisting of a 16-stage binary counter, an oscillation circuit, an automatic power-on reset circuit, an output control circuit, and a logic circuit.

The time counting operation starts at the power ON time. If the set timing is within the specified range of V_{DD} at that time, the auto reset circuit gets actuated and the counter starts the operation. When the power is already ON, an external reset pulse can be impressed. When the initial reset command is released, the oscillator begins to oscillate at the frequency decided by the external RC network.

The frequency of the oscillator is divided into $1/2^N$ at each stage of the 16-stage counter.

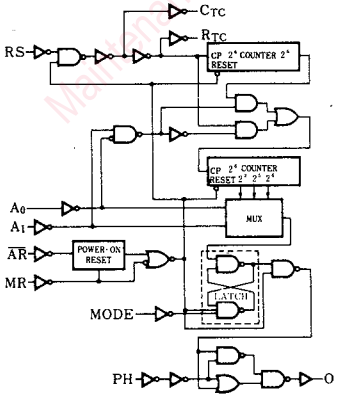
It is possible to operate the exernal master reset circuit independently of the auto reset circuit, and the clock built-in circuit makes the operation of those clocks whose rise and fall are very slow also acceptable.

This programmable timer is equivalent to Motorola's MC14541B.

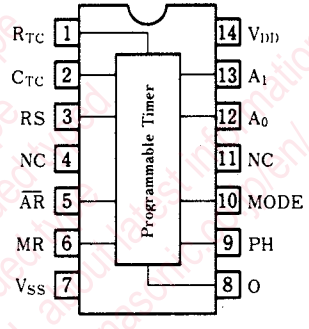
■ Truth Table

Input				Operation Mode
$\overline{AR}$	MR	PH	MODE	
H	L	×	×	Auto reset disable
L	L	×	×	Auto reset enabled
×	H	×	×	Master reset active
×	L	×	H	Recycle mode
×	L	×	L	Single-cycle mode
×	L	L	×	At first "L" output, after reset
×	L	H	×	At first "H" output, after reset

■ Logic Diagram



Pin Configuration



Pin description

A_0, O_1 : Address input
MODE : Mode select input
$\overline{AR}$: Reset input
MR : Reset input
PH : Phase input
R_{TC} : External resistance (R_t) connecting pin
C_{TC} : External (C_t) connecting pin
RS : External resistance (R_S) or external clock input

■ Frequency Selection Table

A_0	A_1	Number of count steps (n)	Count (2^n)
L	L	13	8,192
L	H	10	1,024
H	L	8	256
H	H	16	65,536

■ Absolute Maximum Ratings (Ta=25°C)

Item		Symbol	Rating	Unit
Supply voltage		V_{DD}	−0.5~+18	V
Input voltage		V_I	−0.5~V_{DD}+0.5*	V
Output pin voltage		V_O	−0.5~V_{DD}+0.5*	V
Peak input · output pin current		$\pm I_I$	max. 10	mA
Power dissipation (per package)	Ta=−40~+60°C	P_D	max. 400	mW
	Ta=+60~+80°C		Decrease to 200mW at the rate of 8mW/°C	
Power dissipation (per output pin)		P_D	max. 100	mW
Operating ambient temperature		T_{opr}	−40~+85	°C
Storage temperature		T_{stg}	−65~+150	°C

* V_{DD}+0.5V should be lower than 18V.

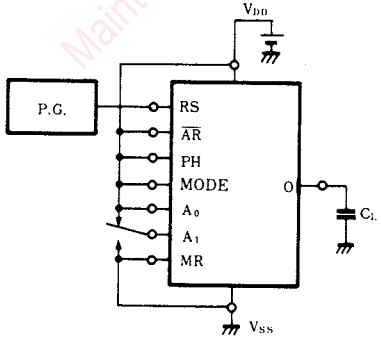
■ DC Characteristics (V_{SS}=0V)

Item	V_{DD} (V)	Symbol	Condition		Ta=−40°C min.	Ta=−40°C max.	Ta=25°C min.	Ta=25°C max.	Ta=85°C min.	Ta=85°C max.	Unit
Static supply current	5	I_{DD}	Pin 5=High, Auto Reset Disabled		—	20	—	20	—	150	μA
	10				—	40	—	40	—	300	
	15				—	80	—	80	—	600	
Static supply current	5	I_D	Pin 5=Pin 6=Low, Power On Reset Enabled		—	80	—	80	—	230	μA
	10				—	750	—	600	—	700	
	15				—	1600	—	1300	—	1500	
Output voltage low level	5	V_{OL}	V_I=V_{SS} or V_{DD}, $\|I_O\|$<1μA		—	0.05	—	0.05	—	0.05	V
	10				—	0.05	—	0.05	—	0.05	
	15				—	0.05	—	0.05	—	0.05	
Output voltage high level	5	V_{OH}	V_I=V_{SS} or V_{DD}, $\|I_O\|$<1μA		4.95	—	4.95	—	4.95	—	V
	10				9.95	—	9.95	—	9.95	—	
	15				14.95	—	14.95	—	14.95	—	
Input voltage low level	5	V_{IL}	$\|I_O\|$<1μA	V_O=0.5V or 4.5V	—	1.5	—	1.5	—	1.5	V
	10			V_O=1V or 9V	—	3	—	3	—	3	
	15			V_O=1.5V or 13.5V	—	4	—	4	—	4	
Input voltage high level	5	V_{IH}	$\|I_O\|$<1μA	V_O=0.5V or 4.5V	3.5	—	3.5	—	3.5	—	V
	10			V_O=1V or 9V	7	—	7	—	7	—	
	15			V_O=1.5V or 13.5V	11	—	11	—	11	—	
Output voltage low level (C_{TC}=R_{TC}=Low)	5	I_{OL}	V_O=0.4V, V_I=0 or 5V		0.33	—	0.27	—	0.20	—	mA
	10		V_O=0.5V, V_I=0 or 10V		1.00	—	0.85	—	0.68	—	
	15		V_O1.5V, V_I=0 or 15V		3.20	—	2.70	—	2.30	—	
Output voltage high level (C_{TC}=R_{TC}=High)	5	$-I_{OH}$	V_O=4.6V, V_I=0 or 5V		0.5	—	0.4	—	0.3	—	mA
	10		V_O=9.5V, V_I=0 or 10V		1.4	—	1.2	—	0.95	—	
	15		V_O=13.5V, V_I=0 or 15V		4.8	—	4.0	—	3.2	—	
Output current high level	5	$-I_{OH}$	V_O=2.5V, V_I=0 or 5V		1.4	—	1.2	—	0.95	—	mA
Input leakage current	15	$\pm I_I$	V_I=0 or 15V		—	0.3	—	0.3	—	1	μA

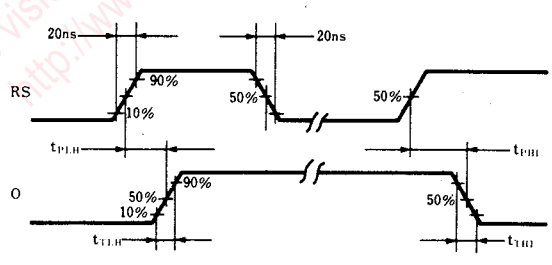
■ Switching Characteristics (Ta=25°C, V_{SS}=0V, C_L=50pF)

Item	V_{DD}(V)	Symbol	min.	typ.	max.	Unit
Output rise time	5	t_{TLH}	—	60	180	ns
	10		—	30	90	
	15		—	20	60	
Output fall time	5	t_{THL}	—	60	180	ns
	10		—	30	90	
	15		—	20	60	
Propagation time RS→O 2^8 selected	5	t_{PHL} t_{PLH}	—	375	1125	ns
	10		—	150	450	
	15		—	110	330	
Propagation time RS→O 2^{10} selected	5	t_{PHL} t_{PLH}	—	425	1275	ns
	10		—	165	495	
	15		—	120	360	
Propagation time RS→O 2^{13} selected	5	t_{PHL} t_{PLH}	—	510	1530	ns
	10		—	190	570	
	15		—	135	405	
Propagation time RS→O 2^{16} selected	5	t_{PHL} t_{PLH}	—	575	1725	ns
	10		—	210	630	
	15		—	150	450	
Minimum clock pulse width	5	t_{WRSL}	—	30	90	ns
	10		—	15	45	
	15		—	12	36	
Minimum reset pulse width	5	t_{WMRH}	—	30	90	ns
	10		—	15	45	
	15		—	12	36	
Maximum clock frequency	5	f_{max}	8	16	—	MHz
	10		15	30	—	
	15		18	36	—	
Oscillating frequency Rt=5kΩ Ct=1nF Rs=10kΩ	5	f_{OSC}	—	90	—	kHz
	10		—	90	—	
	15		—	90	—	
Oscillating frequency Rt=56kΩ Ct=1nF Rs=120kΩ	5	f_{OSC}	—	8	—	kHz
	10		—	8	—	
	15		—	8	—	
Input capacitance		C_I	—	—	7.5	pF

1. Switching time measuring circuit



2. Switching waveforms



Request for your special attention and precautions in using the technical information and semiconductors described in this book

(1) If any of the products or technical information described in this book is to be exported or provided to non-residents, the laws and regulations of the exporting country, especially, those with regard to security export control, must be observed.

(2) The technical information described in this book is intended only to show the main characteristics and application circuit examples of the products. No license is granted in and to any intellectual property right or other right owned by Panasonic Corporation or any other company. Therefore, no responsibility is assumed by our company as to the infringement upon any such right owned by any other company which may arise as a result of the use of technical information described in this book.

(3) The products described in this book are intended to be used for standard applications or general electronic equipment (such as office equipment, communications equipment, measuring instruments and household appliances).
Consult our sales staff in advance for information on the following applications:
- Special applications (such as for airplanes, aerospace, automobiles, traffic control equipment, combustion equipment, life support systems and safety devices) in which exceptional quality and reliability are required, or if the failure or malfunction of the products may directly jeopardize life or harm the human body.
- Any applications other than the standard applications intended.

(4) The products and product specifications described in this book are subject to change without notice for modification and/or improvement. At the final stage of your design, purchasing, or use of the products, therefore, ask for the most up-to-date Product Standards in advance to make sure that the latest specifications satisfy your requirements.

(5) When designing your equipment, comply with the range of absolute maximum rating and the guaranteed operating conditions (operating power supply voltage and operating environment etc.). Especially, please be careful not to exceed the range of absolute maximum rating on the transient state, such as power-on, power-off and mode-switching. Otherwise, we will not be liable for any defect which may arise later in your equipment.
 Even when the products are used within the guaranteed values, take into the consideration of incidence of break down and failure mode, possible to occur to semiconductor products. Measures on the systems such as redundant design, arresting the spread of fire or preventing glitch are recommended in order to prevent physical injury, fire, social damages, for example, by using the products.

(6) Comply with the instructions for use in order to prevent breakdown and characteristics change due to external factors (ESD, EOS, thermal stress and mechanical stress) at the time of handling, mounting or at customer's process. When using products for which damp-proof packing is required, satisfy the conditions, such as shelf life and the elapsed time since first opening the packages.

20080805