

DATA SHEET

Part No.	AN6784
Package Code No.	SIP007-P-0000I

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Contents

■ Overview	3
■ Features	3
■ Applications	3
■ Package	3
■ Type	3
■ Application Circuit Example / Block Diagram	4
■ Pin Descriptions	6
■ Absolute Maximum Ratings	7
■ Operating Supply Voltage Range	7
■ Current and Voltage Range	8
■ Electrical Characteristics	9
■ Electrical Characteristics (Reference values for design)	10
■ Electrical Characteristics Test Procedures	11
■ Technical Data	12
■ Usage Notes	13

AN6784

IC for long interval timer

■ Overview

AN6784 is an IC designed for long interval timer. It is oscillated by using the external resistor and capacitor, and the oscillation frequency divided by a 15-stage F.F is provided as the output.

It is frequency divider type, so that a long interval timer can be constructed by using a capacitor with small capacitance.

■ Features

- Oscillation frequency dispersion of IC itself is small ($\pm 5\%$)
- Wide operating supply voltage range (3.2 V to 18 V)
- Small consumption current (3 mA typ.)

■ Applications

- Long interval timer

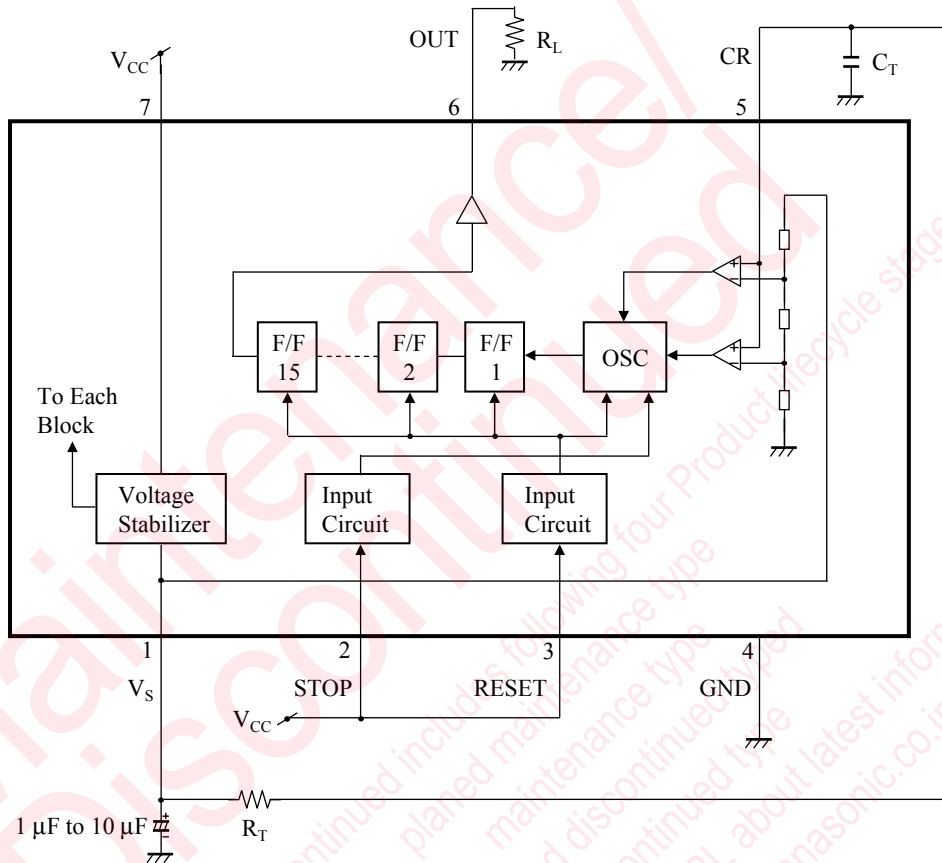
■ Package

- 7 pin Plastic Single Inline Package (SIP Type)

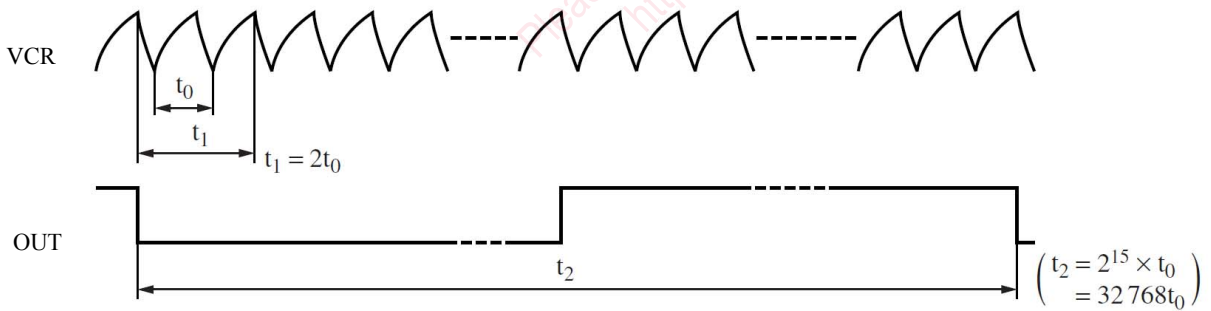
■ Type

- Silicon monolithic bipolar IC

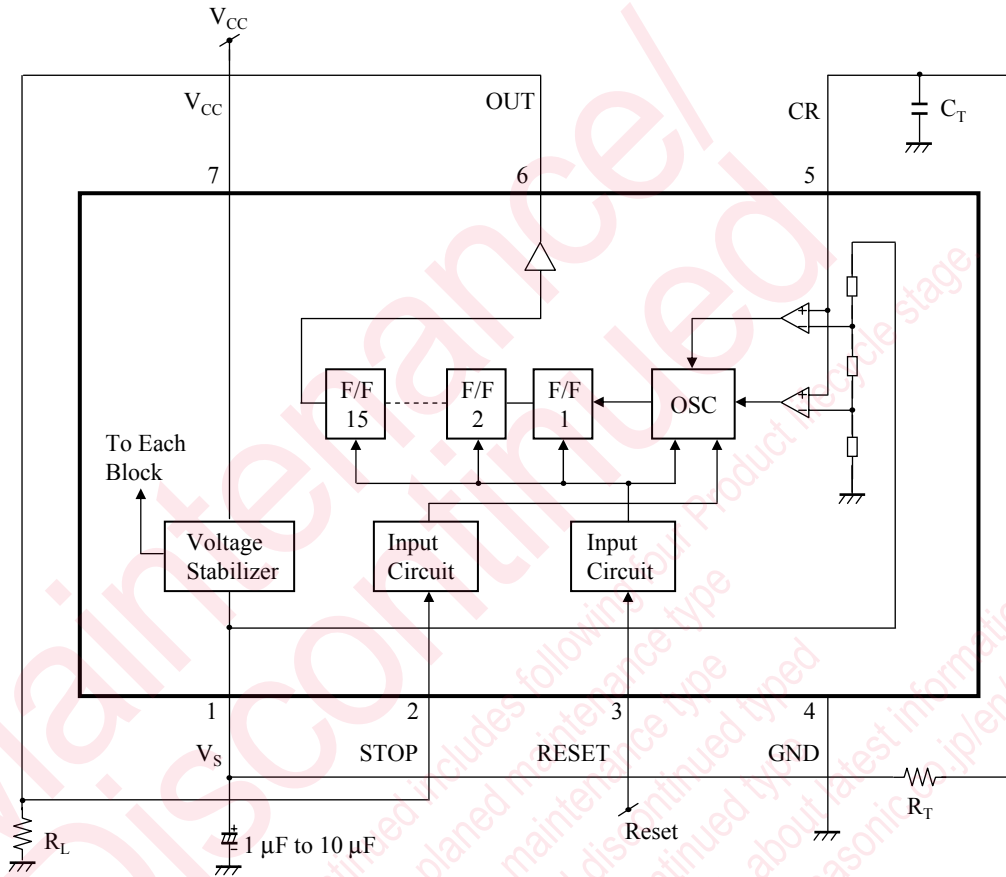
■ Application Circuit Example / Block Diagram
 1. Ultra low frequency oscillation circuit



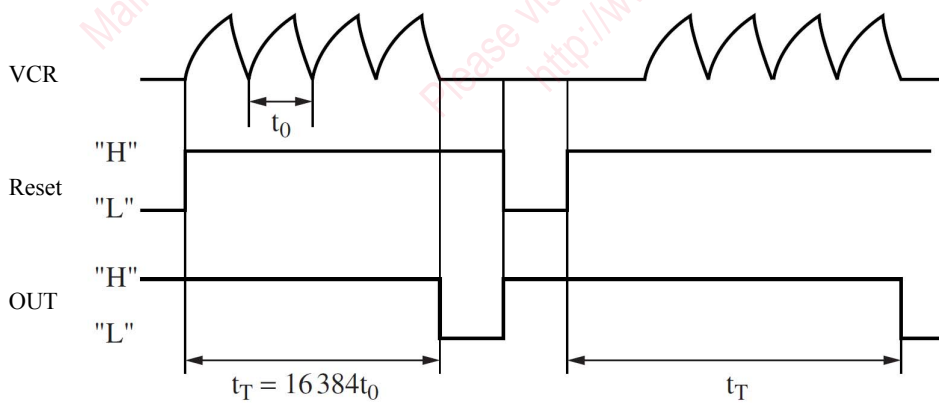
- Oscillation frequency
 $t_0(S) \cong 0.947R_T(\Omega) \cdot C_T(F)$
- Output period
 $t_2(S) \cong t_0 \times 32\,768 \cong 31.03R_T(k\Omega) \cdot C_T(\mu F)$



■ Application Circuit Example/Block Diagram (continued)
 2. Timer



• Timer interval
 $t_2(S) \cong 16\,384t_0 \cong 16\,384 \times 0.947R_T(\Omega) \cdot C_T(F) \cong 15.52R_T(k\Omega) \cdot C_T(\mu F)$



■ Pin Descriptions

Pin No.	Pin name	Type	Descriptions
1	V _S	Output	Reference voltage
2	STOP	Input	Oscillation stop input
3	RESET	Input	Reset input
4	GND	Ground	GND
5	CR	—	C, R connection
6	OUT	Output	Output
7	V _{CC}	Power supply	Power supply

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■ Absolute Maximum Ratings

A No.	Parameter	Symbol	Rating	Unit	Notes
1	Supply voltage	V_{CC}	20	V	*1
2	Supply current	I_{CC}	7	mA	—
3	Power dissipation	P_D	140	mW	—
4	Operating ambient temperature	T_{opr}	-35 to +85	°C	*2
5	Storage temperature	T_{stg}	-55 to +150	°C	*2

Notes) *1: The values under the condition not exceeding the above absolute maximum ratings and the power dissipation.

*2: Except for the power dissipation, operating ambient temperature, and storage temperature, all ratings are for $T_a = 25^\circ\text{C}$.

■ Operating supply voltage range

Parameter	Symbol	Range	Unit	Notes
Supply voltage range	V_{CC}	3.2 to 18.0	V	*

Note) *: The values under the condition not exceeding the above absolute maximum ratings and the power dissipation.

■ Current and Voltage Range

Notes) Do not apply external currents or voltages to any pin not specifically mentioned.

For the circuit currents, '+' denotes current flowing into the IC, and '-' denotes current flowing out of the IC.

Pin No.	Symbol	Rating	Unit	Note
2	STOP	0 to 18	V	
3	RESET	0 to 18	V	
5	CR	0 to 3	V	

Pin No.	Symbol	Rating	Unit	Note
6	OUT	-15 to +15	mA	

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■ Electrical Characteristics

Note) $T_a = 25^\circ\text{C} \pm 2^\circ\text{C}$ unless otherwise specified.

B No.	Parameter	Symbol	Test circuits	Conditions	Limits			Unit	Notes
					Min	Typ	Max		
1	Quiescent supply current	I_{CC}	1	$V_{CC} = 5\text{ V}$	2.0	4.0	5.0	mA	
2	Internal reference voltage	V_S	2	$V_{CC} = 5\text{ V}, I_S = -3\text{ mA}$	2.40	2.55	2.70	V	
3	High-level input current	I_{IH}	3	$V_{CC} = 18\text{ V}, V_{IH} = 18\text{ V}$	—	—	10	μA	
4	Low-level input current	I_{IL}	4	$V_{CC} = 18\text{ V}, V_{IL} = 0\text{ V}$	-100	—	—	μA	
5	High-level OUT pin voltage	V_{OH}	5	$V_{CC} = 18\text{ V}, I_{OH} = -10\text{ mA}$	14.0	16.0	18.0	V	
6	Low-level OUT pin voltage	V_{OL}	6	$V_{CC} = 3.2\text{ V}, I_{OL} = 10\text{ mA}$	—	—	0.4	V	
7	Oscillation frequency precision	f_{OSC}	7	$V_{CC} = 5\text{ V}, R_T = 1\text{ k}\Omega$ $C_T = 0.1\text{ }\mu\text{F}$	9.0	9.5	10.0	kHz	
8	Oscillation frequency fluctuation with supply voltage	Δf_v	7	3.2 V to 5V or 5V to 18 V	-5.0	—	+5.0	%	
9	High-level input voltage	V_{IH}	8	$V_{CC} = 5\text{ V}$	2.0	—	—	V	
10	Low-level input voltage	V_{IL}	8	$V_{CC} = 5\text{ V}$	—	—	0.8	V	

■ Electrical Characteristics (Reference values for design)

Note) $T_a = 25^\circ\text{C} \pm 2^\circ\text{C}$ unless otherwise specified.

B No.	Parameter	Symbol	Test circuits	Conditions	Reference values			Unit	Notes
					Min	Typ	Max		
11	Oscillation frequency-temperature dependency	Δf_r	7	$V_{CC} = 5\text{ V}$, $R_T = 1\text{ k}\Omega$ $C_T = 0.1\text{ }\mu\text{F}$	-5.0	—	+5.0	%	*1

Note) The data show the changing amount within $T_a = -30^\circ\text{C}$ to $+85^\circ\text{C}$ when the values at $T_a = +25^\circ\text{C}$ is taken as the reference.

The above characteristics are reference values for design of the IC and are not guaranteed by inspection.

If a problem does occur related to these characteristics, Panasonic will respond in good faith to user concerns.

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■ Electrical Characteristics Test Procedures

• Truth Table

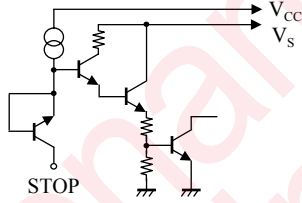
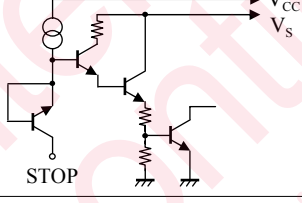

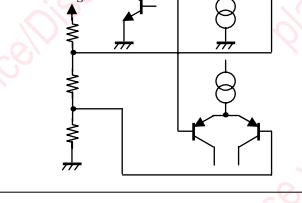
Mode	VRESET	VSTOP	Oscillation(VCR)	frequency division:(count)	VOUT
Reset	L	—	Stop(H)	Cleared	H
Stop	H	L	Stop(H)	Stop Holds the previous state	Stop Holds the previous state
Operation	H	H	Oscillation	Counting	1/32768-frequency division pulse output

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■ Technical Data

- I/O block circuit diagrams and pin function descriptions

Note) The characteristics listed below are reference values based on the IC design and are not guaranteed.

Pin No.	Pin name	DC voltage	Internal circuit	Description
1	V _S	2.55 V	—	Stabilized power supply output pin. Reference voltage source for oscillation circuit
2	STOP	—		Oscillation stop input pin. Only the oscillation circuit stops when this pin becomes low-level. (F.F. is not cleared) When not used, this pin should be open or connected to V _{CC} .
3	RESET	—		Reset input pin F.F. is reset when the pin becomes low-level and is set in the initial state. When not used, this pin should be open or connected to V _{CC} . The reset is applied by rising V _{CC} from a voltage below 0.8 V (power-on reset function)
4	GND	0 V	—	GND pin
5	CR	0.7 V to 1.8 V		Capacitor and resistor connection pin The oscillation period is determined by an external resistor and capacitor. When applying a pulse to this pin from the outside the voltage should be within the range of 0 V to 3 V.
6	OUT	High level V _{CC} -1.4 V Low level < 0.4 V		Output pin. A frequency which is 1/32768 of the oscillation frequency is output. Should be used with output current within ±10 mA
7	V _{CC}	—	—	Supply voltage pin

■ Usage Notes

Pay attention to the followings in order to prevent the destruction during the use and to increase the reliability.

1. In the application circuit example, the calculated value by the theoretical equation for timer interval calculation and such matter of the above into consideration.
Also, the proportional constant "a" depends on the kinds and characteristics of the time interval and time interval capacitor. Make a final confirmation with the finished products.
In the case when a high precision is required, adjust the value by using a variable resistor as the time interval resistor.
2. Use a time interval resistor in the range of $1k\Omega$ to $1M\Omega$, and a time interval capacitor in the range of $0.1\mu F$ to $100\mu F$ which is polyester or tantalum electronic capacitor with a small $\tan\delta$ value.
3. Connect a capacitor ($1\mu F$ to $10\mu F$) to the V_S pin in order to protect the IC from an external noise and to stabilize its operation.
4. If turning on power again after an extremely short-time supply off state during the normal operation, be careful that there may be a case that the automatic reset (power-on reset) fails due to residual potential of the external capacitance.
5. Take measures against noise in order to prevent malfunction caused by external noise. Particularly, when setting a long interval, pay attention to the external noises.
6. When a plunger or relay is connected to the output circuit, connect diodes to both ends of the coil in order to protect the IC against counter electromotive power generated after power-off.
7. Do not short circuit the V_S pin with V_{CC} pin in order to avoid malfunction.

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