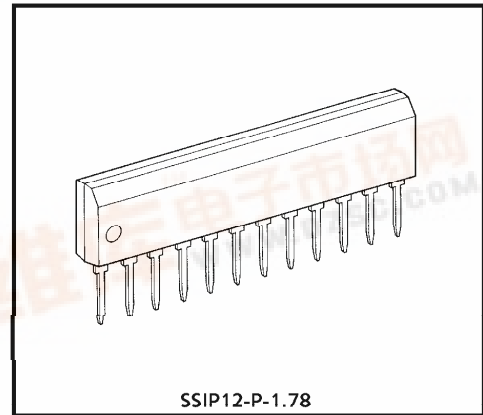


TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

# TA8006SN

## 5V VOLTAGE REGULATOR WITH WATCHDOG TIMER

The TA8006SN is an IC specially designed for microcomputer systems. It incorporates a highly accurate constant-voltage power supply ( $5 \pm 0.1V$ ) and various system reset functions. For system reset, it monitors two voltages-84% and 92% of  $V_{REG}$ -and has a watchdog timer which can self-diagnose the microcomputer system so that program runaway can be prevented. It also has an overvoltage protection function and a current limiter. Since its standby current is as small as 0.7mA (max.), it can be connected directly to an automotive battery.

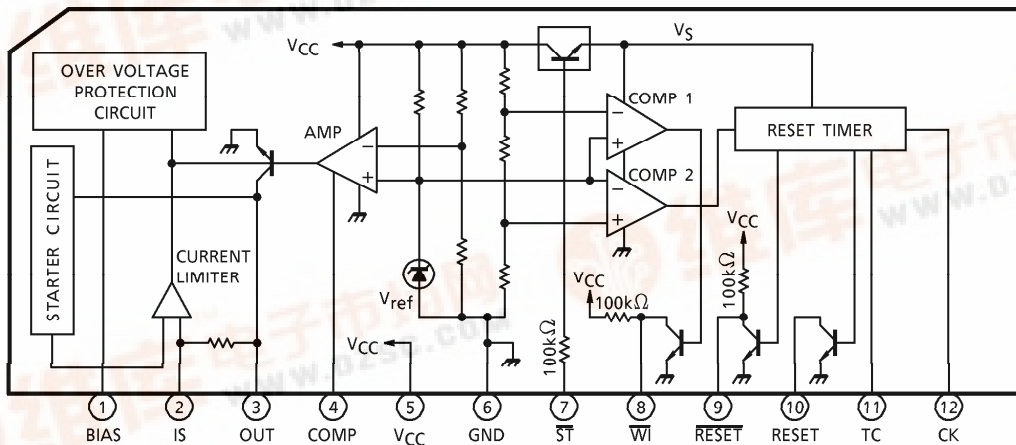


Weight : 0.71g (Typ.)

### FEATURES

- Accurate output :  $5 \pm 0.1V$  ( $T_a = 25^\circ C$ )
- Low standby current : 0.7mA (max.)
- Watchdog timer and power-on reset timer incorporated : RESET,  $\overline{RESET}$ ,  $\overline{WI}$
- Current limiter and overvoltage protection circuit incorporated.
- Wide operating voltage range : 40V (max.)
- Wide operating temperature :  $-40 \sim 105^\circ C$
- Small shrink SIP-12pin.

### BLOCK DIAGRAM AND PIN LAYOUT



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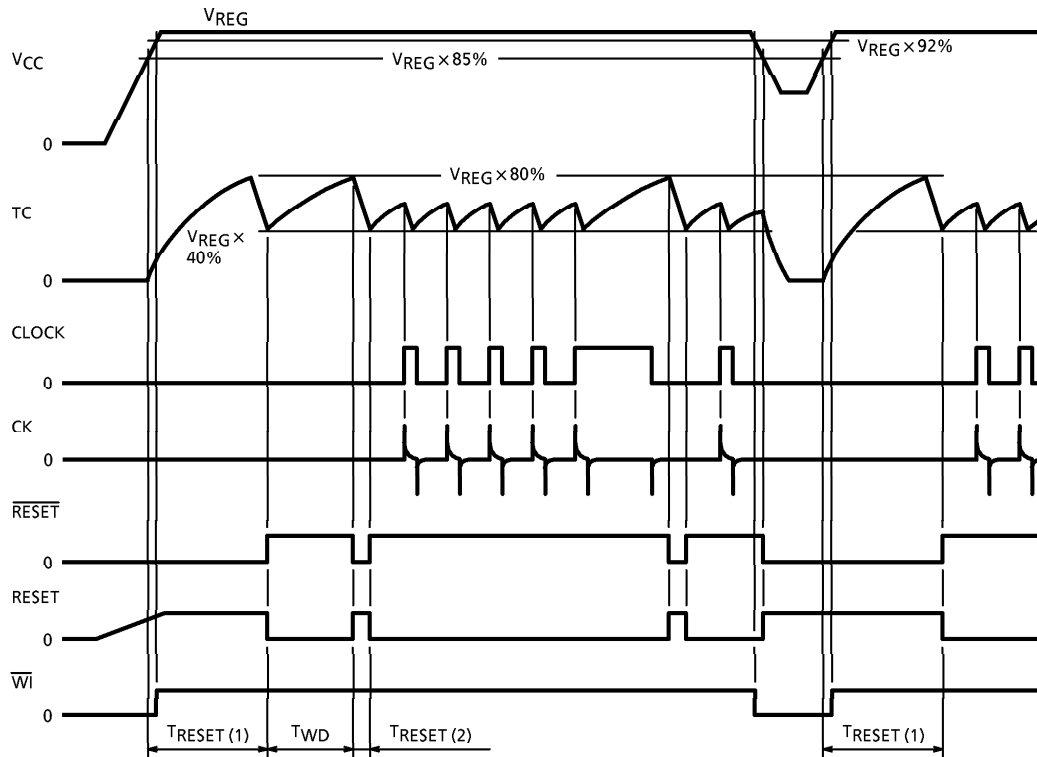
● The information contained herein is subject to change without notice.



## PIN DESCRIPTION

PIN No.	SYMBOL	DESCRIPTION
1	BIAS	Power supply pin for the current limiter, the overvoltage detector, the startup circuit which turns on 5V power.
2	IS	Detection pin for the current limiter. The voltage drop across external detection resistor $R_S$ between pins 1 and 2 is monitored. A voltage exceeding 0.3V activates the current limiter. Example : If the load current 300mA, the value of $R_S$ is $0.3V / 300mA = 1\Omega$
3	OUT	Connected to the base of an external PNP transistor so that the output voltage is stabilized. Power supply design suitable for particular load capacities is thus possible. Since the recommended maximum $I_{OUT}$ is 5mA, an output current of 300mA is assured if the external transistor has an $h_{FE}$ of 60 or more.
4	COMP	Phase compensation pin for output stabilization.
5	$V_{CC}$	Power supply pin for the power supply and the reset timer. The output voltage $V_{REG}$ is also detected.
6	GND	Grounded.
7	$\overline{ST}$	Standby mode setup pin. When the signal is low, the system is in standby mode in which the reset timer is off and the power current is limited to 0.7mA or less. When the signal is high, the system is in active mode in which the power supply and reset timer are active.
8	$\overline{WI}$	Reset detect voltage $V_{TH1}$ output pin. The reset detect voltage has a hysteresis of 0.2V. It is the output from the collector of an NPN transistor with 2 pull-up resistor.
9	$\overline{RESET}$	Watchdog timer reset pin. - Generates a reset signal which is determined by the CR combination of the TC pin. - Intermittently generates reset pulses if no clock is supplied to the CK pin. The $\overline{RESET}$ signal is the output from the collector of an NPN transistor with a pull-up resistor.
10	RESET	Output pin of the inversion of pin 9 ( $\overline{RESET}$ ). It is the open-collector output of an NPN transistor.
11	TC	Pin for setting a time for the reset timer and watchdog timer. It connects to a resistor $R_T$ which leads to $V_{CC}$ and a capacitor $C_T$ which is grounded.
12	CK	Clock input pin for the watchdog timer. If it is used for a Power-on reset timer only, it is pulled up to $V_{CC}$ .

**TIMING CHART**



**MAXIMUM RATINGS (Ta = 25°C)**

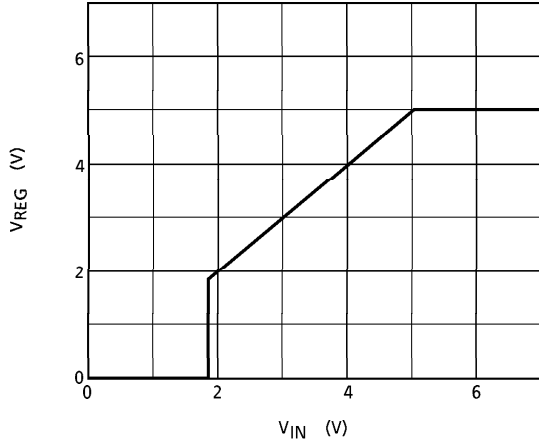
CHARACTERISTIC	SYMBOL	PIN	RATING	UNIT
Input Voltage	V <sub>IN1</sub>	BIAS, IS	60 (1s)	V
	V <sub>IN2</sub>	CK	-5~V <sub>CC</sub>	
	V <sub>IN3</sub>	ST	-0.5~V <sub>IN</sub>	
Output Current	I <sub>OUT1</sub>	OUT	10	mA
	I <sub>OUT2</sub>	RESET, RESET, WI	2	
Output Voltage	V <sub>OUT1</sub>	OUT	60 (1s)	V
	V <sub>OUT2</sub>	RESET	16	
Power Dissipation	P <sub>D</sub>	—	500	mW
Operating Temperature	T <sub>opr</sub>	—	-40~105	°C
Storage Temperature	T <sub>stg</sub>	—	-55~150	°C
Lead Temperature-time	T <sub>sol</sub>	—	260 (10s)	°C

**ELECTRICAL CHARACTERISTICS** ( $V_{IN} = 6 \sim 18V$ ,  $I_{LOAD} = 10mA$ ,  $T_a = -40 \sim 105^\circ C$ )

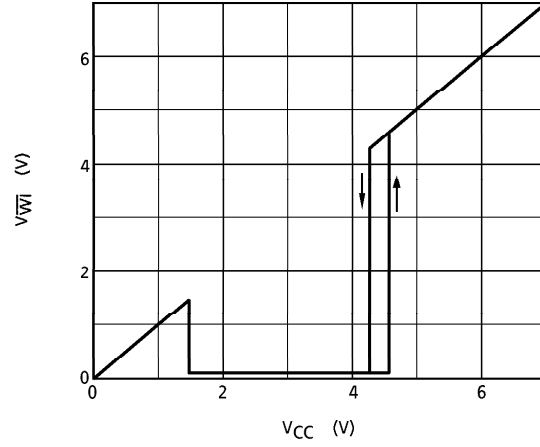
CHARACTERISTIC	SYMBOL	PIN	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Output Voltage	$V_{REG}$	$V_{CC}$	—	$T_a = 25^\circ C$	4.90	5.0	5.10	V
				$T_a = -40 \sim 105^\circ C$	4.85	5.0	5.15	
Line Regulation	—	$V_{CC}$	—	$V_{IN} = 5.5 \sim 40V$	—	0.1	0.5	%
Load Regulation	—	$V_{CC}$	—	$I_{LOAD} = 1 \sim 50mA$	—	0.1	0.5	%
Temperature Coefficient	—	$V_{CC}$	—	—	—	0.01	—	% / $^\circ C$
Input Current	$I_{IN}$	$\overline{ST}$	—	$V_{IN} = 5V$	—	40	80	$\mu A$
Input Voltage	$V_{IH}$	$\overline{ST}$	—	—	2	—	—	V
	$V_{IL}$				—	—	0.3	
Output Voltage	$V_{OL}$	RESET, RESET, $\overline{WI}$	—	$I_{OL} = 1mA$	—	—	0.5	V
Output Leakage Current	$I_{LEAK}$	RESET	—	$V_{OUT} = 10V$	—	—	5	$\mu A$
Input Current	$I_{IN}$	TC	—	$V_{IN} = 0 \sim 3.5V$	-3	—	3	$\mu A$
Threshold Voltage	$V_{IH}$	TC	—	—	—	$V_{REG} \times 80\%$	—	V
	$V_{IL}$				—	$V_{REG} \times 40\%$	—	
Input Current	$I_{IN}$	CK	—	$V_{IN} = 5V$	—	0.17	0.35	mA
Input Voltage	$V_{IH}$	CK	—	—	2	—	—	V
	$V_{IL}$				—	—	0.5	
Reset Detect Voltage	$V_{TH1}$	$V_{CC}$	—	—	$V_{REG} \times 89\%$	$V_{REG} \times 92\%$	$V_{REG} \times 95\%$	V
	$V_{TH2}$				$V_{REG} \times 81\%$	$V_{REG} \times 84\%$	$V_{REG} \times 87\%$	
Standby Current	$I_{ST}$	$V_{CC}$	—	$V_{IN} = 14V$ $\overline{ST} = "L"$	—	0.3	0.7	mA
Current Consumption	$I_{CC}$	$V_{CC}$	—	$V_{IN} = 14V$ $\overline{ST} = V_{CC}$	—	0.9	1.8	mA
Current Limiter Detection	$V_{LMT}$	IS	—	—	—	0.3	—	V
Overvoltage Detection	$V_{SD}$	BIAS	—	—	—	43	—	V
Watchdog Timer	$T_{WD}$	RESET / RESET	—	—	$0.9 \times C_{TRT}$	$1.1 \times C_{TRT}$	$1.3 \times C_{TRT}$	—
Reset Timer (1)	$T_{RESET(1)}$				$1.3 \times C_{TRT}$	$1.6 \times C_{TRT}$	$1.9 \times C_{TRT}$	—
Reset Timer (2)	$T_{RESET(2)}$				$300 \times C_T$	$700 \times C_T$	$1500 \times C_T$	—
Clock Pulse Width	$T_W$	CK	—	—	3	—	—	$\mu S$

TYPICAL CHARACTERISTICS

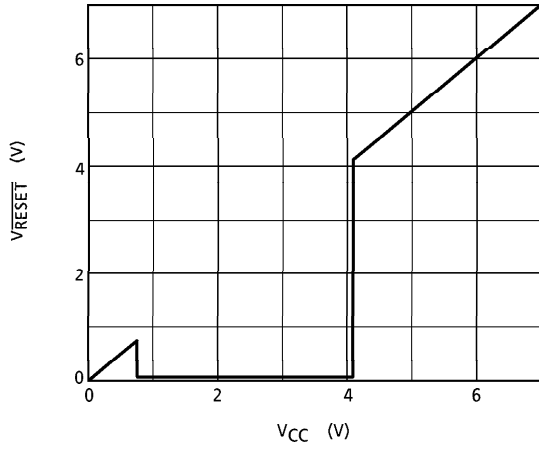
INPUT-OUTPUT CHARACTERISTICS



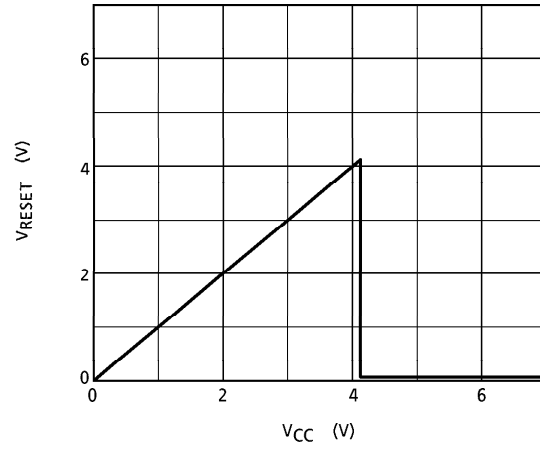
RESET OUTPUT CHARACTERISTICS ( $\overline{WI}$ )



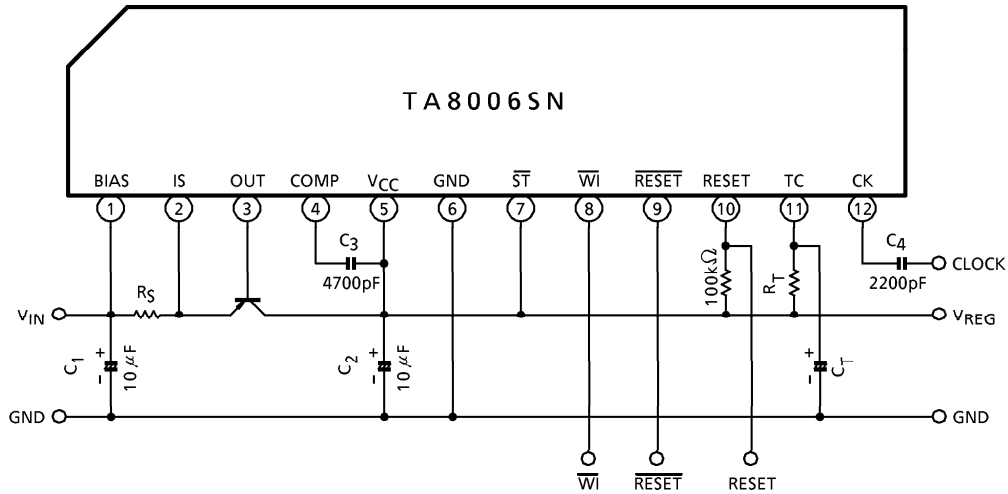
RESET OUTPUT CHARACTERISTICS ( $\overline{RESET}$ )



RESET OUTPUT CHARACTERISTICS (RESET)



EXAMPLE OF APPLICATION CIRCUIT



(\*) Cautions for Wiring

1. C<sub>1</sub> and C<sub>2</sub> are for absorbing disturbance, noise, etc. Connect them as close to the IC as possible.
2. C<sub>3</sub> is for phase compensation. Also, connect C<sub>3</sub> close to the IC.

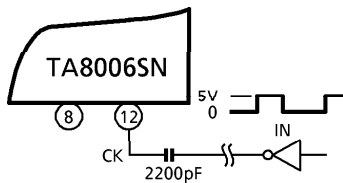
Recommended Conditions

PART NAME	MIN.	MAX.	UNIT
C <sub>T</sub>	0.01	100	µF
R <sub>T</sub>	5	100	kΩ

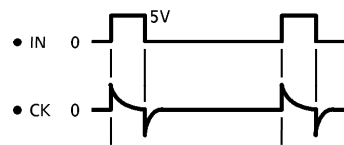
Note :  $R_{T1} // R_{T2} = (R_{T1} \times R_{T2}) / (R_{T1} + R_{T2})$

CK INPUT APPLICATION CIRCUIT

Capacitor Coupling



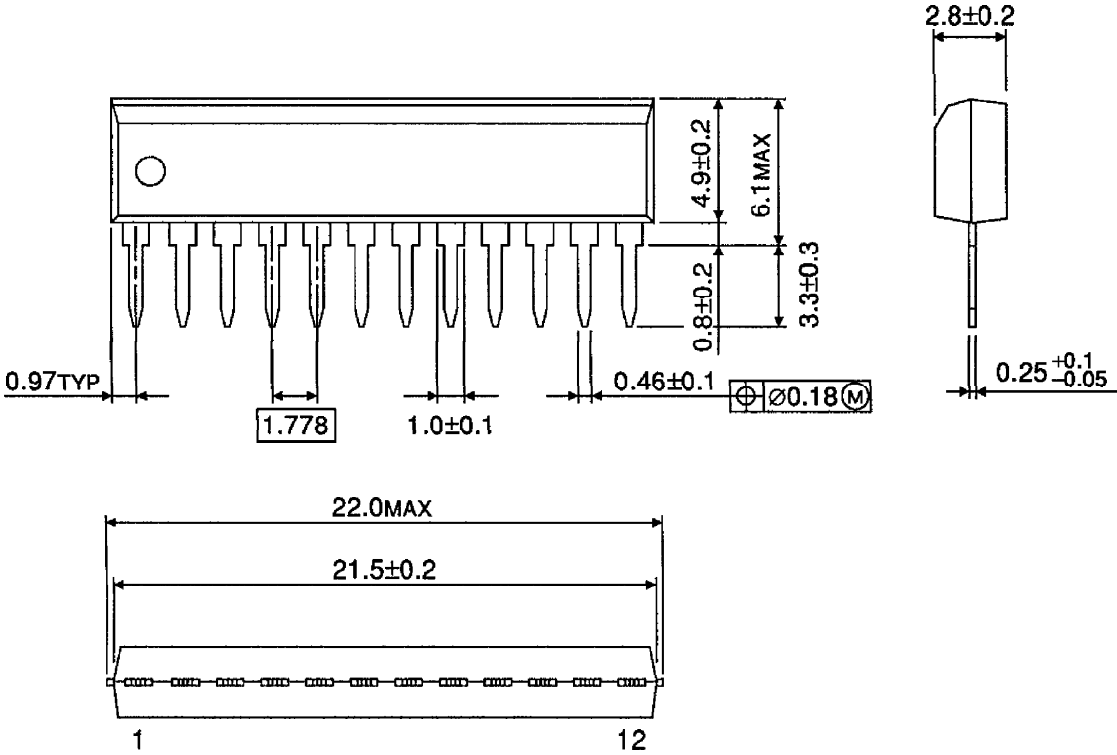
Timing Chart



The capacitor coupling allows reset pulses to be supplied intermittently from the  $\overline{\text{RESET}}$  pin whether the input level (IN) is high or low.

OUTLINE DRAWING  
SSIP12-P-1.78

Unit : mm



Weight : 0.71g (Typ.)