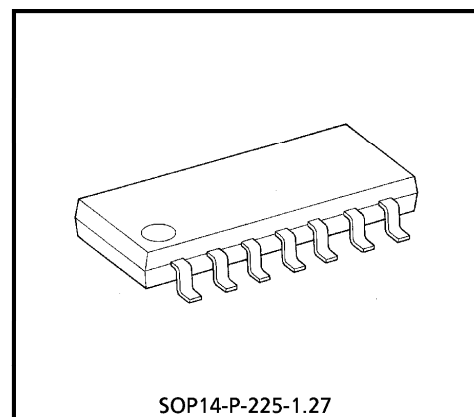


# TA7900F

## 5V VOLTAGE REGULATOR WITH WATCHDOG TIMER

The TA7900F is an IC specially designed for micro-computer systems. It produces an output voltage of  $5 \pm 0.25V$  without need for adjustment from its accurate reference voltage and amplifier circuit.

At power-on, it outputs a reset signal to reset the system. It will also output a reset signal when the 5V output voltage drops below 92% because of external disturbance or other problem. It also incorporates a watchdog timer for self-diagnosing the system. When the system malfunctions, the IC generates reset pulses intermittently to prevent the system from running away.



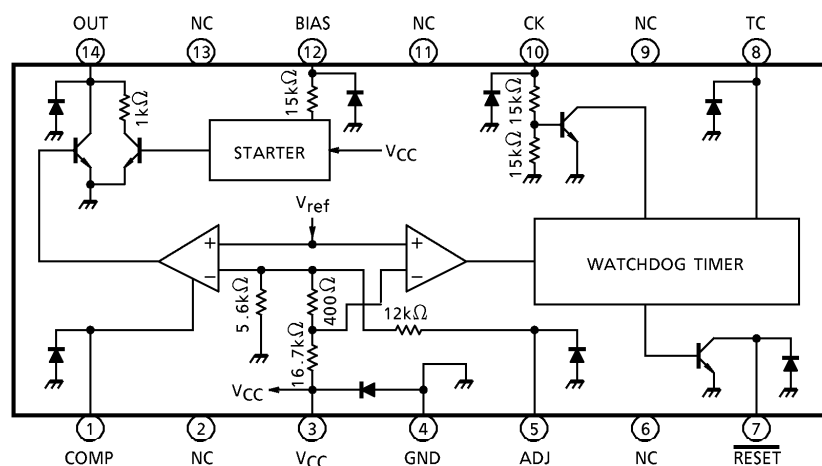
SOP14-P-225-1.27

Weight : 0.2g (Typ.)

### FEATURES

- Accurate output :  $5 \pm 0.25V$
- Output voltage adjusting pin attached
- Power-on reset timer incorporated
- Watchdog timer incorporated
- Operating temperature range : from  $-40$  to  $85^{\circ}C$
- Wide operating voltage range :  $40V$  (max.)
- SOP-14 pin

### BLOCK DIAGRAM AND PIN LAYOUT



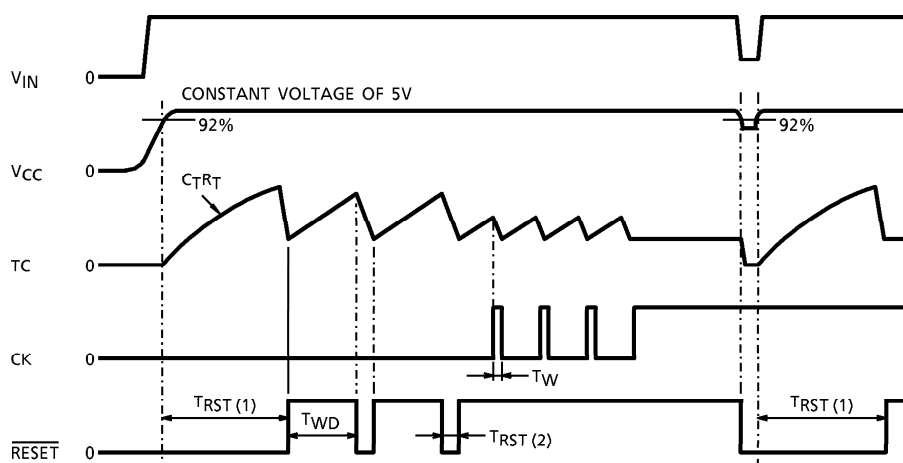
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## PIN DESCRIPTION

| PIN No.            | SYMBOL                    | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1                  | COMP                      | Phase compensation pin for output stabilization                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 3                  | V <sub>CC</sub>           | Power supply pin for internal circuit. The output voltage can also be detected at this pin.                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 4                  | GND                       | Grounded                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 5                  | ADJ                       | Output voltage adjusting pin. The voltage will increase when a resistor is inserted between ADJ and GND. It will reduce when a resistor is inserted between ADJ and V <sub>CC</sub> . The maximum variable range is $\pm 1V$ .                                                                                                                                                                                                                                                                                     |
| 7                  | $\overline{\text{RESET}}$ | NPN transistor open-collector output.<br>(1) The signal goes low when the output drops below 92% of the specified level.<br>(2) The pin supplies a reset signal determined by the CR combination connected to the TC pin.<br>(3) The pin supplies reset pulses intermittently if no clock is given to the CK pin. This function is useful when the IC is used as a watchdog timer for a microcomputer system.                                                                                                      |
| 8                  | TC                        | Time setting pin for the reset and watchdog timers                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 10                 | CK                        | Input pin for watchdog timer. The pin is pulled up to V <sub>CC</sub> if the IC is used only as a power-on reset timer.                                                                                                                                                                                                                                                                                                                                                                                            |
| 12                 | BIAS                      | Power supply starting pin. The starting current is supplied through a resistor to which the input voltage is applied. The output current from this starting current is as follows :<br>$I_{OUT}(\text{pin } 12) \geq 30 \times (V_{IN} - 0.7) / (15 + R_1) \text{ (mA)}$ where $R_1$ is the external resistance attached to pin 12 (k $\Omega$ ).<br>When V <sub>CC</sub> rises above 2.7V, the starting current is absorbed in the internal circuit ; instead, I <sub>OUT</sub> is supplied via V <sub>CC</sub> . |
| 14                 | 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.<br>Since the recommended maximum I <sub>OUT</sub> is 5mA, an output current of 300mA is assured if the external transistor has an H <sub>FE</sub> of 60 or more.                                                                                                                                                                       |
| 2, 6, 9,<br>11, 13 | N.C                       | Not connected                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

## TIMING CHART

MAXIMUM RATINGS ( $T_a = 25^\circ\text{C}$ )

| CHARACTERISTIC        | SYMBOL     | RATING      | UNIT             |
|-----------------------|------------|-------------|------------------|
| Input Voltage         | $V_{IN1}$  | 40          | V                |
|                       | $V_{IN2}$  | -0.3 to +16 |                  |
| Output Current        | $I_{OUT1}$ | 10          | mA               |
|                       | $I_{OUT2}$ | 4           |                  |
| Output Voltage        | $V_{OUT1}$ | 40          | V                |
|                       | $V_{OUT2}$ | 16          |                  |
| Power Dissipation     | $P_D$      | 280         | mW               |
| Operating Temperature | $T_{opr}$  | -40 to 85   | $^\circ\text{C}$ |
| Storage Temperature   | $T_{stg}$  | -55 to 150  | $^\circ\text{C}$ |
| Lead Temperature-time | $T_{sol}$  | 260 (10 s)  | $^\circ\text{C}$ |

$V_{IN1}$  : BIAS input  
 $V_{IN2}$  : CK input  
 $I_{OUT1}, V_{OUT1}$  : OUT output  
 $I_{OUT2}, V_{OUT2}$  :  $\overline{\text{RESET}}$  output

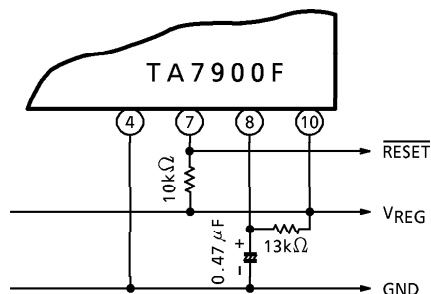
ELECTRICAL CHARACTERISTICS ( $V_{IN} = 7$  to 17V,  $T_a = -40$  to 85°C)

| CHARACTERISTIC          | SYMBOL       | PIN                | TEST CIRCUIT | TEST CONDITION                     | MIN.                  | TYP.                  | MAX.                  | UNIT    |
|-------------------------|--------------|--------------------|--------------|------------------------------------|-----------------------|-----------------------|-----------------------|---------|
| Output Voltage          | $V_{REG}$    | $V_{CC}$           | —            | —                                  | 4.75                  | 5.0                   | 5.25                  | V       |
| Line Regulation         | —            | $V_{CC}$           | —            | $V_{IN} = 7$ to 40V                | —                     | 0.1                   | 0.5                   | %       |
| Load Regulation         | —            | $V_{CC}$           | —            | $I_{LOAD} = 1$ to 50mA             | —                     | 0.1                   | 0.5                   | %       |
| Temperature Coefficient | —            | $V_{CC}$           | —            | —                                  | —                     | 0.01                  | —                     | % / °C  |
| Output Voltage          | $V_{OL}$     | $\overline{RESET}$ | —            | $I_{OL} = 2mA$                     | —                     | —                     | 0.5                   | V       |
| Output Leakage Current  | $I_{LEAK}$   | $RESET$            | —            | $V_{OUT} = 10V$                    | —                     | —                     | 5                     | $\mu A$ |
| Input Current           | $I_{IN}$     | TC                 | —            | $V_{IN} = 0$ to 3.5V               | -3                    | —                     | 3                     | $\mu A$ |
| Threshold Voltage       | $V_{IH}$     | TC                 | —            | $\overline{RESET}$ "High" to "Low" | —                     | $80\% \times V_{REG}$ | —                     | V       |
|                         | $V_{IL}$     |                    | —            | $\overline{RESET}$ "Low" to "High" | —                     | $40\% \times V_{REG}$ | —                     |         |
| Input Current           | $I_{IN}$     | CK                 | —            | $V_{IN} = 5V$                      | —                     | 0.3                   | 0.7                   | mA      |
| Input Voltage           | $V_{IH}$     | CK                 | —            | —                                  | 2                     | —                     | —                     | V       |
|                         | $V_{IL}$     | CK                 | —            | —                                  | —                     | —                     | 0.5                   |         |
| Reset Detect Voltage    | —            | $V_{CC}$           | —            | —                                  | $89\% \times V_{REG}$ | $92\% \times V_{REG}$ | $95\% \times V_{REG}$ | V       |
| Standby Current         | $I_S$        | $V_{CC}$           | —            | $V_{IN} = 14V$                     | —                     | 5                     | 6.5                   | mA      |
| Watchdog Timer          | $T_{WD}$     | $\overline{RESET}$ | —            | —                                  | $0.9 \times C_{TRT}$  | $1.1 \times C_{TRT}$  | $1.3 \times C_{TRT}$  | —       |
| Reset Timer (1)         | $T_{RST(1)}$ | $\overline{RESET}$ | —            | —                                  | $1.3 \times C_{TRT}$  | $1.6 \times C_{TRT}$  | $1.9 \times C_{TRT}$  | —       |
| Reset Timer (2)         | $T_{RST(2)}$ | $\overline{RESET}$ | —            | —                                  | $150 \times C_T$      | $300 \times C_T$      | $600 \times C_T$      | —       |
| Clock Pulse Width       | $T_W$        | CK                 | —            | —                                  | 3                     | —                     | —                     | $\mu s$ |

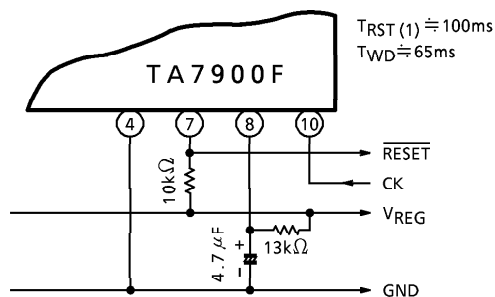
Note : Reset timer (1) : Power-on reset time  
Reset timer (2) : Watchdog reset time

## APPLICATION CIRCUIT OF WATCHDOG / RESET TIMER

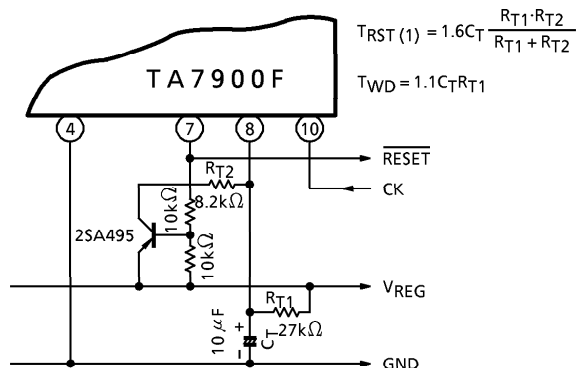
- 1.
- $T_{RST}(1) \doteq 10\text{ms}$
- .....Power-On Reset Timer



- 2.
- $T_{RST}(1) \doteq 1.5T_{WD}$



- 3.
- $T_{RST}(1) \doteq 100\text{ms}$
- ,
- $T_{WD} \doteq 300\text{ms}$



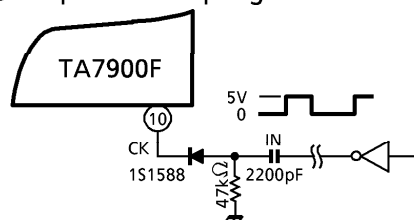
## 4. Recommended Conditions

| PART NAME                 | MIN. | MAX. | UNIT             |
|---------------------------|------|------|------------------|
| $C_T$                     | 0.01 | 100  | $\mu\text{F}$    |
| $R_T$                     | 5    | 100  | $\text{k}\Omega$ |
| $R_{T1}$                  | —    | 100  | $\text{k}\Omega$ |
| $R_{T1} // R_{T2}$ (Note) | 5    | —    | $\text{k}\Omega$ |

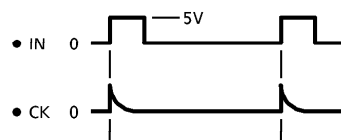
(Note)  $R_{T1} // R_{T2} = (R_{T1} \times R_{T2}) / (R_{T1} + R_{T2})$

### CK INPUT APPLICATION CIRCUIT

- **Capacitor Coupling**



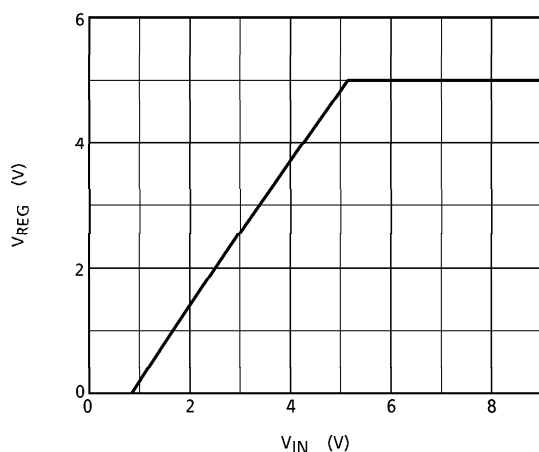
- Timing Chart



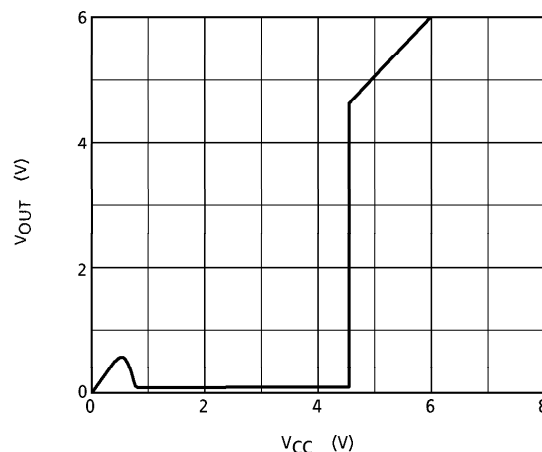
The capacitor coupling allows reset pulses to be supplied intermittently from the  $\overline{\text{RESET}}$  pin whether the input level (IN) is high or low.

## TYPICAL CHARACTERISTICS

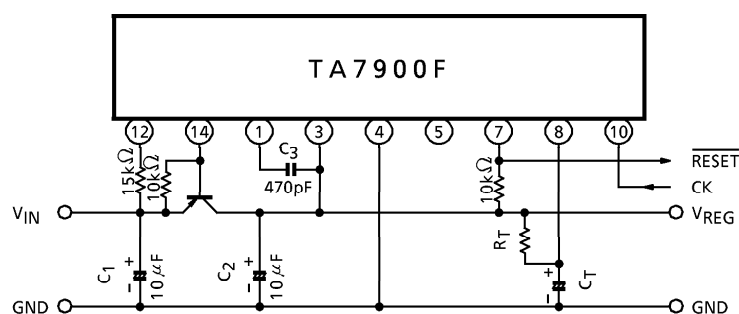
1. Input-output characteristic  
( $R_l = 25\Omega$ , external transistor 2SA968-Y)



- ## 2. Reset Output Characteristic



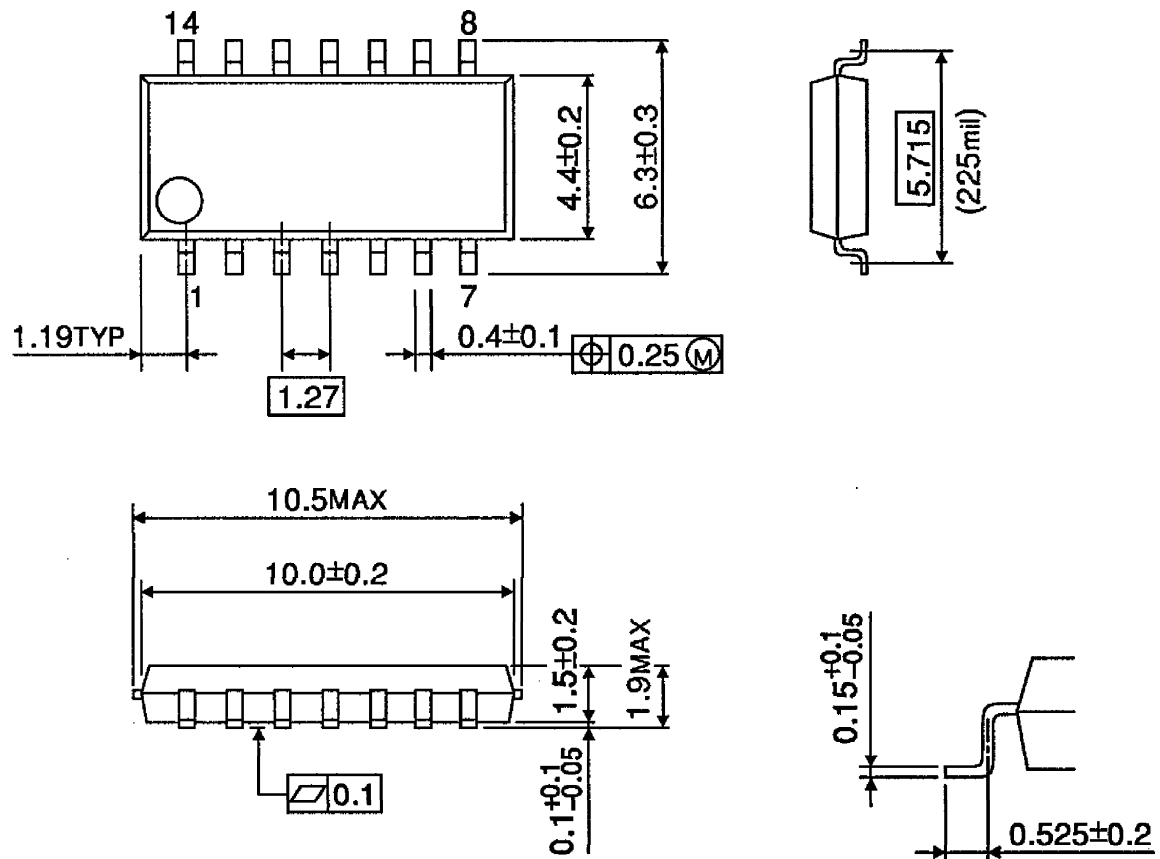
### EXAMPLE OF APPLICATION CIRCUIT



- \* Cautions for Wiring
  1.  $C_1$  and  $C_2$  are for absorbing disturbance, noise, etc. Connect them as close to the IC as possible.
  2.  $C_3$  is for phase compensation. Also, connect  $C_3$  close to the IC.

**OUTLINE DRAWING**  
SOP14-P-225-1.27

Unit : mm



Weight : 0.2g (Typ.)