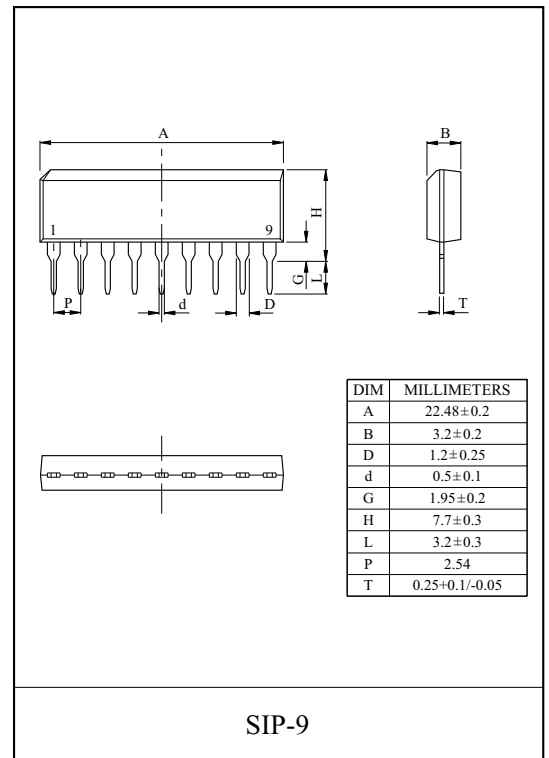


## 5V VOLTAGE REGULATOR WITH WATCHDOG TIMER

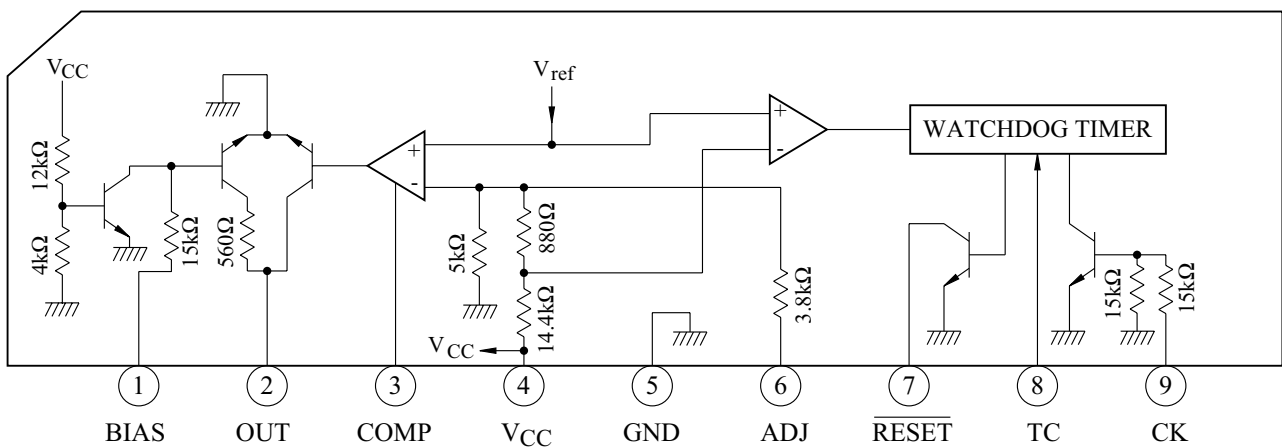
The KIA8000S is an IC specially designed for automotive microcomputer systems. It produces an output voltage of  $5 \pm 0.25V$  without need for adjustment from its accurate reference voltage and amplifier circuit. At power-on, it outputs a reset signal to reset the system. It will also output a reset signal when the 5V output voltage drops below 85% 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.

### FEATURES

- Accurate output :  $5 \pm 0.25V$ .
- Output voltage adjusting pin attached.
- Power-on reset timer incorporated.
- Watchdog timer incorporated.
- Wide operating voltage range : 40V (Max.).
- Wide operating temperature range : from  $-40 \sim 85^\circ C$ .
- Load dump protection : 80V (Max.) (1 second).
- Small SIP-9 pin.

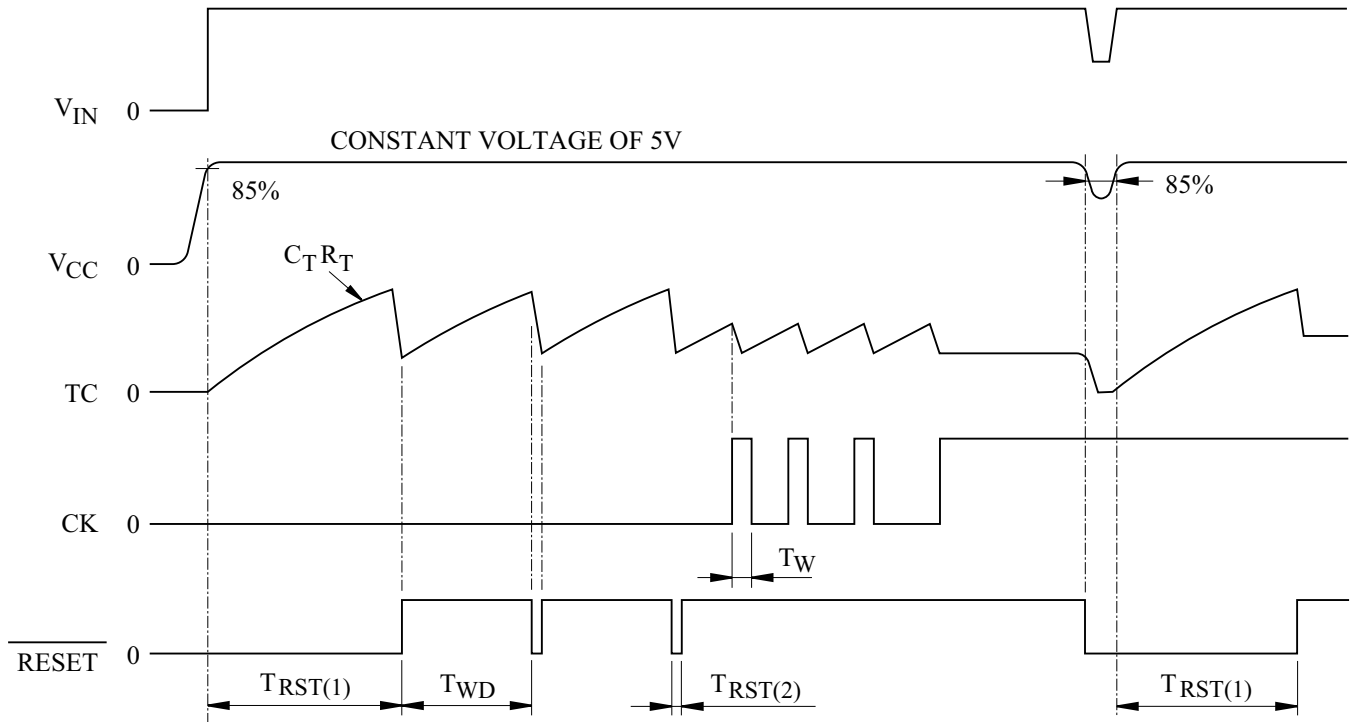


### BLOCK DIAGRAM AND PIN ASSIGNMENT



# KIA8000S

## TIMING CHART



## MAXIMUM RATINGS (Ta=25 °C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Input Voltage	$V_{IN1}$	80 (1s)	V
	$V_{IN2}$	-5 ~ +16	
Output Current	$I_{OUT1}$	10	mA
	$I_{OUT2}$	4	
Output Voltage	$V_{OUT1}$	80 (1s)	V
	$V_{OUT2}$	16	
Power Dissipation	$P_D$	500	mW
Operating Temperature	$T_{opr}$	-40 ~ 85	°C
Storage Temperature	$T_{stg}$	-55 ~ 150	°C
Lead Temperature-time	$T_{so1}$	260 (10 s)	°C

Note )  $V_{IN1}$  : BIAS Input

$V_{IN2}$  : CK Input

$I_{OUT1}$ ,  $V_{OUT1}$  : OUT Output

$I_{OUT2}$ ,  $V_{OUT2}$  :  $\overline{RESET}$  Output

# KIA8000S

## ELECTRICAL CHARACTERISTICS ( $V_{IN}=6 \sim 17V$ , $T_a=-40 \sim 85^\circ C$ )

CHARACTERISTIC	SYMBOL	PIN	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Output Voltage	$V_{REG}$	$V_{CC}$	1	-	4.75	5.0	5.25	V	
Line Regulation	-	$V_{CC}$	-	$V_{IN}=6 \sim 40V$	-	0.1	0.5	%	
Load Regulation	-	$V_{CC}$	-	$I_{LOAD}=1 \sim 50mA$	-	0.1	0.5	%	
Temperature Coefficient	-	$V_{CC}$	-	-	-	0.01	-	%/°C	
Output Voltage	$V_{OL}$	$\overline{RESET}$	2	$I_{OL}=2mA$	-	-	0.5	V	
Output Leakage Current	$I_{LEAK}$	$\overline{RESET}$	3	$V_{OUT}=10V$	-	-	5	$\mu A$	
Input Current	$I_{IN}$	TC	4	$V_{IN}=0 \sim 3.5V$	-3	-	3	$\mu A$	
Threshold Voltage	$V_{IH}$	TC	5	$\overline{RESET}$ "High" to "Low"	-	$80\% \times V_{REG}$	-	V	
	$V_{IL}$			$\overline{RESET}$ "Low" to "High"	-	$40\% \times V_{REG}$	-		
Input Current	$I_{IN}$	CK	6	$V_{IN}=5V$	-	0.3	0.7	mA	
Input Voltage	$V_{IH}$	CK	5	-	2	-	-	V	
	$V_{IL}$			-	-	0.5			
Reset Detecting Voltage	-	$V_{CC}$	-	-	$82\% \times V_{REG}$	$85\% \times V_{REG}$	$88\% \times V_{REG}$	V	
Standby Current	$I_S$	$V_{CC}$	8	$V_{IN}=14V$	-	5	6.5	mA	
WatchDog Timer	$T_{WD}$	$\overline{RESET}$	7	-	$0.9 \times C_T R_T$	$1.1 \times C_T R_T$	$1.3 \times C_T R_T$	-	
Reset Timer	1	$T_{RST(1)}$	$\overline{RESET}$	7	-	$1.3 \times C_T R_T$	$1.6 \times C_T R_T$	$1.9 \times C_T R_T$	-
	2	$T_{RST(2)}$	$\overline{RESET}$	7	-	$150 \times C_T$	$300 \times C_T$	$600 \times C_T$	-
Clock Pulse Width	$T_W$	CK	-	-	3	-	-	$\mu S$	

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

Reset timer (2) : Watchdog reset time.

# KIA8000S

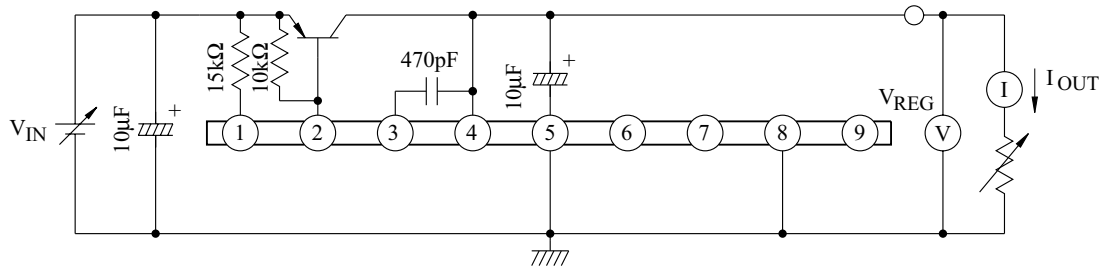
## DESCRIPTION OF PIN

PIN No.	SYMBOL	DESCRIPTION
1	BIAS	Used to start power supply. The starting current is supplied through a resistor by the input voltage. The output current from this starting current is as follows : $I_{OUT(2PIN)} \geq 30 \times (V_{IN} - 0.7) / (15 + R_1) \text{ (mA)}$ $R_1 : \text{Resistor (k } \Omega \text{) installed outside pin 1.}$ This current, if $V_{CC}$ exceeds 2.7V, is absorbed by the internal circuit, and $I_{OUT}$ is supplied by $V_{CC}$ .
2	OUT	The base of a PNP transistor mounted outside is connected to this pin, which stabilizes output voltage. Therefore, power supply can be designed in accordance with load capacity. Since the recommended current of $I_{OUT}$ is 5mA, an output current of 300mA can be obtained so long as $h_{FE}$ of the transistor mounted outside is 60.
3	COMP	Phase compensation pin used to stabilize output.
4	Vcc	Supplies power to the internal circuit and also detects output Voltage.
5	GND	Ground pin.
6	ADJ	Output voltage adjusting pin. Voltage can be increased with a resistor inserted between pins ADJ and GND, and decreased with a resistor inserted between pins ADJ and $V_{CC}$ . The maximum variable voltage is $\pm 1$ volt.
7	<u>RESET</u>	Open collector output of an NPN transistor (1) The pin goes low if output voltage is 85% or less of normal output voltage. (2) The pin generates a reset signal that is determined by CR of pin TC. (3) If no clock pulse is input to the input of pin CK, reset pulses are intermittently generated. This function can be used as a watch dog timer for the microcomputer system.
8	TC	Used to set the reset timer and the watch dog timer.
9	CK	Input pin for the watch dog timer. The pin should be pulled up to $V_{CC}$ if it is used only for the power-on reset timer.

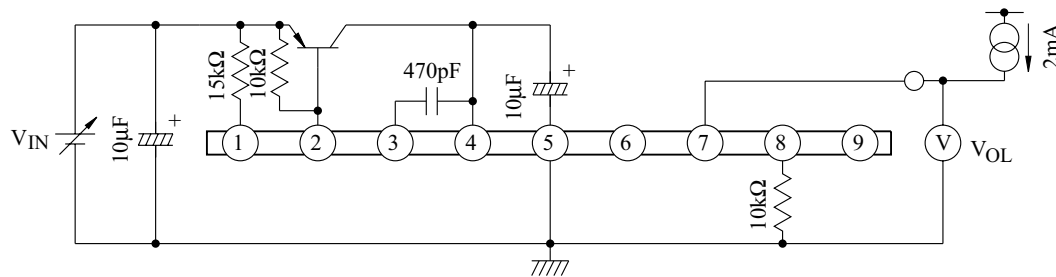
# KIA8000S

## TEST CIRCUIT

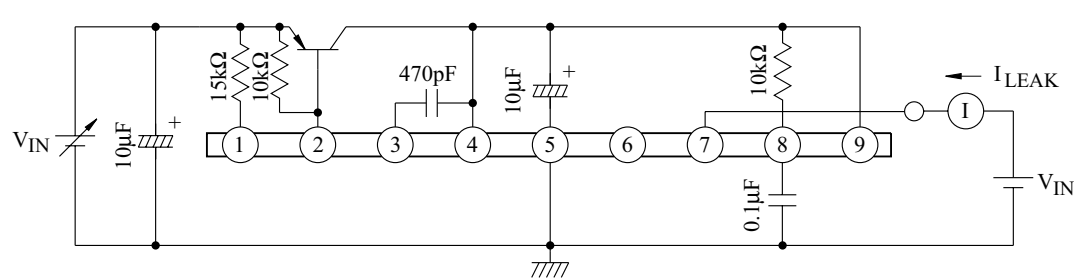
### 1. $V_{REG}$



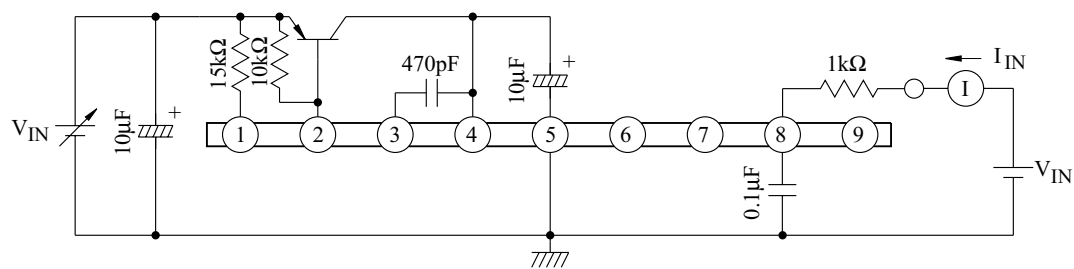
### 2. $V_{OL(RESET)}$



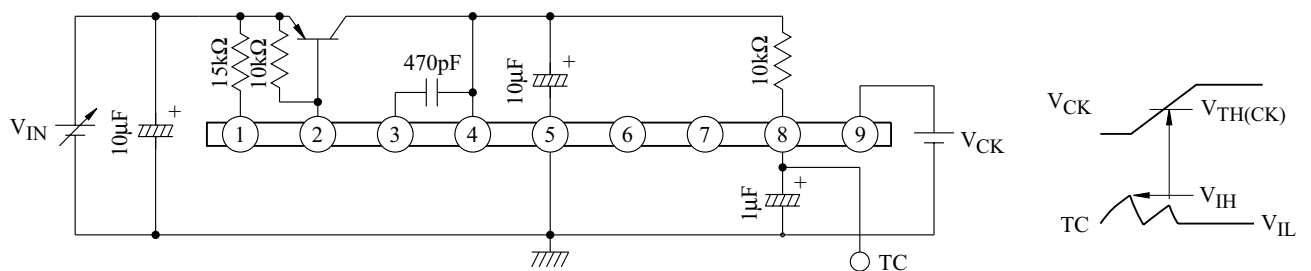
### 3. $I_{LEAK(RESET)}$



### 4. $I_{IN(TC)}$



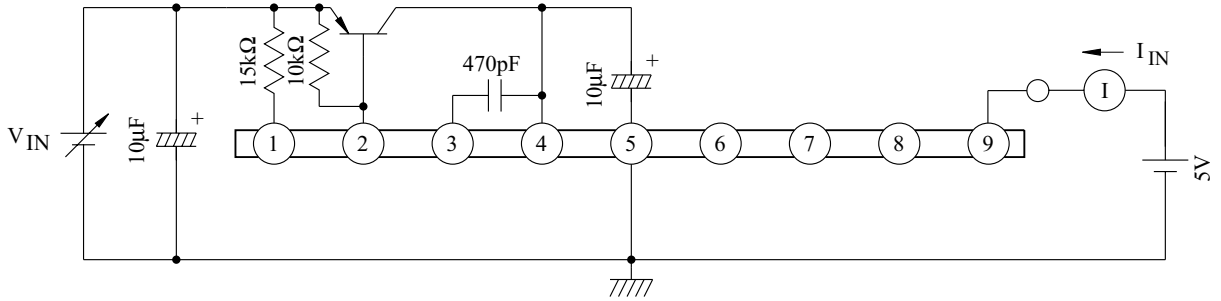
### 5. $V_{IH}$ , $V_{IL(TC)}$ , $V_{IH}$ , $V_{IL(CK)}$



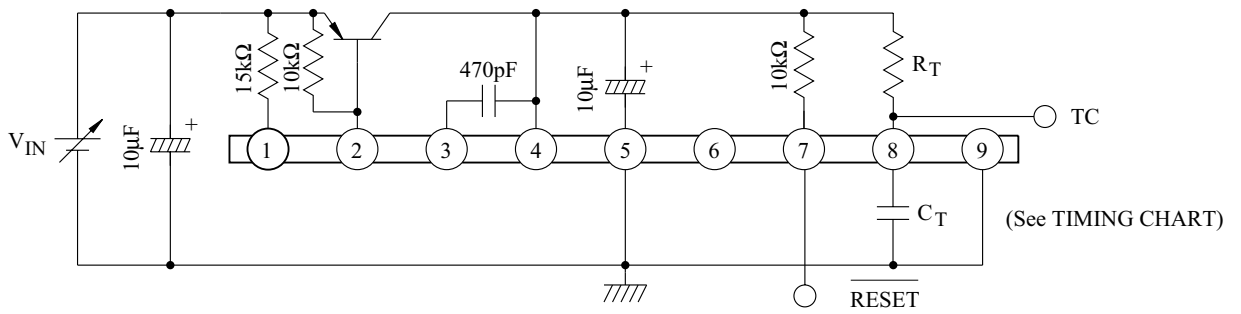
# KIA8000S

## TEST CIRCUIT

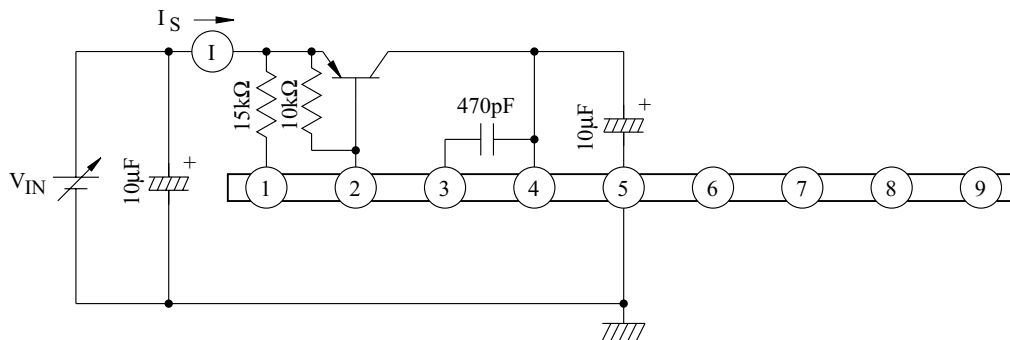
### 6. $I_{IN(CK)}$



### 7. $V_{RESET}$ , $T_{WD}$ , $T_{RST(1)}$ , $T_{RST(2)}$

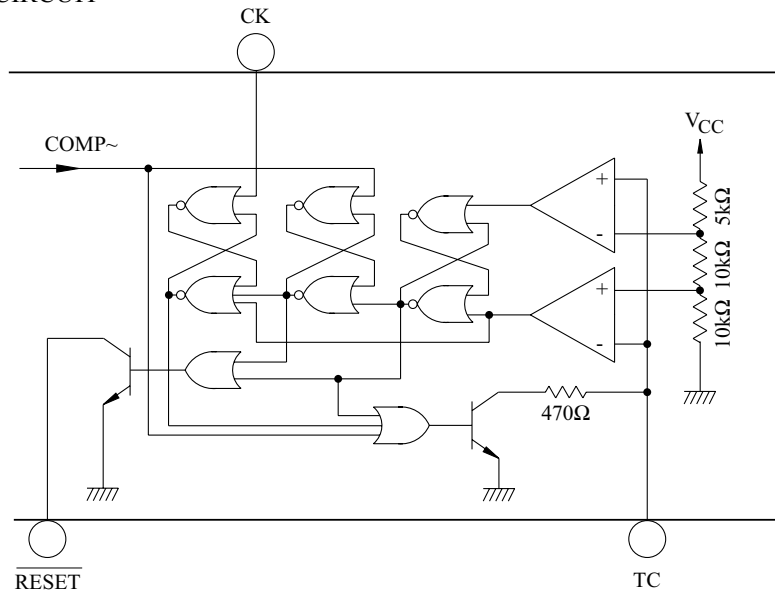


### 8. $I_S$

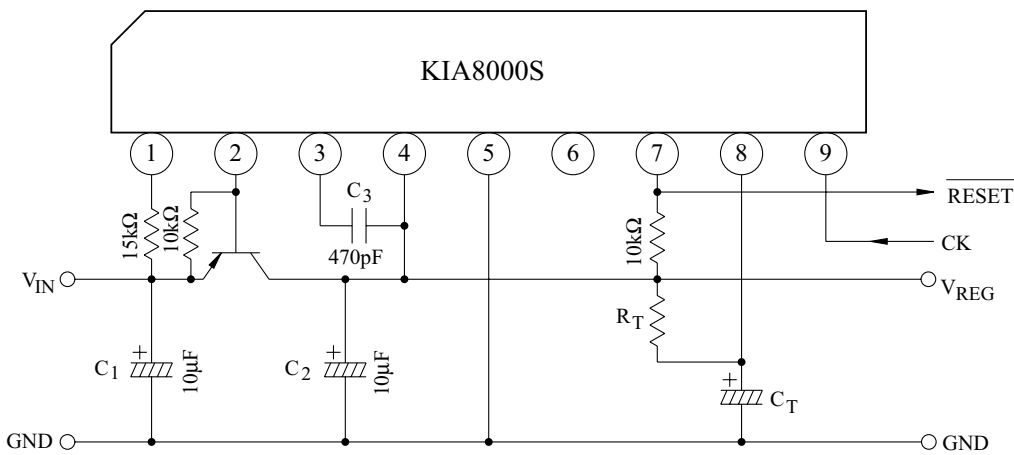


# KIA8000S

## RESET TIMER EQUIVALENT CIRCUIT



## EXAMPLE OF APPLICATION CIRCUIT



### \* Cautions for wiring

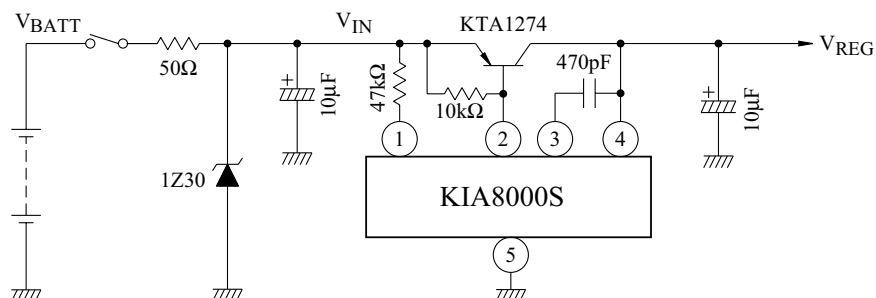
1.  $C_1$  and  $C_2$  are for absorbing disturbance, noise, etc. Connect them as close to the IC as possible.
2.  $C_3$  is for phase compensation. Also, connect  $C_3$  close to the IC.

## 120V $V_{peak}$ LOAD DUMP

Note : No protection is needed if a voltage above 80V is not applied.

### 1. Low output current circuit

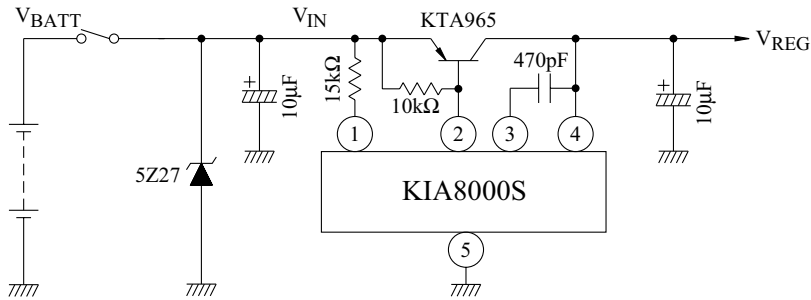
$I_{LOAD}=10\text{mA Max. } V_{BATT}=6 \sim 17\text{V}$



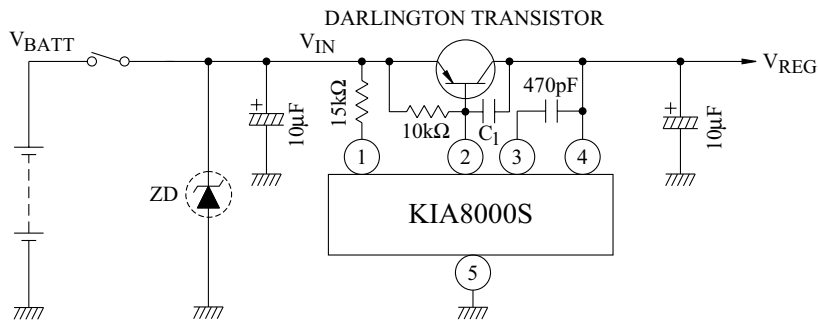
# KIA8000S

## 2. High output current circuit.

$I_{LOAD}=300mA$  Max.  $V_{BATT}=6 \sim 17V$



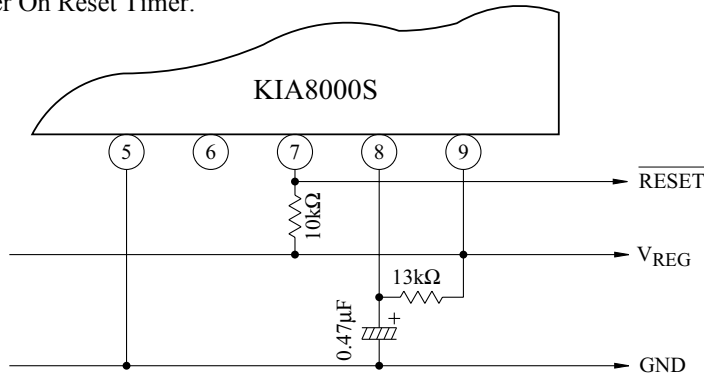
## EXAMPLE OF APPLICATION CIRCUIT USING DARLINGTON TRANSISTOR



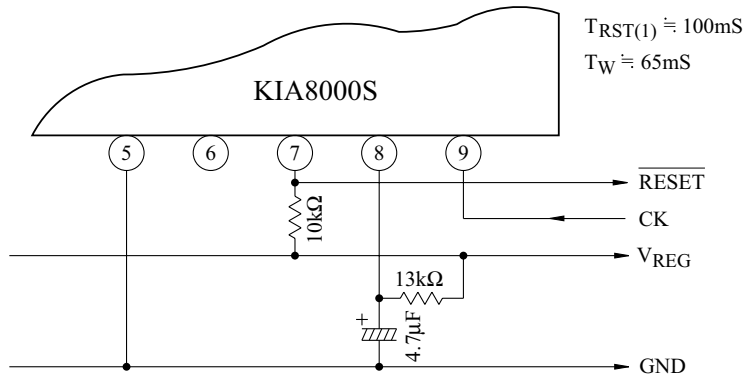
- \* · Select a C1 value according to the working condition : typically above 2000pF.
- Insert ZD when necessary.

## APPLICATION CIRCUIT OF WATCHDOG/RESET TIMER

1.  $T_{RST(1)} \cong 10mS$  ..... Power On Reset Timer.



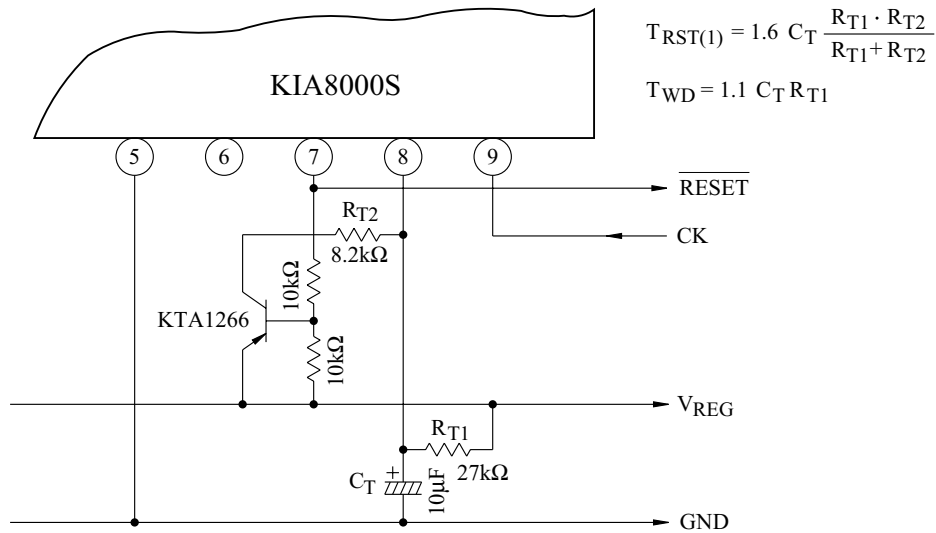
2.  $T_{RST(1)} \cong 1.5T_{WD}$





# KIA8000S

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

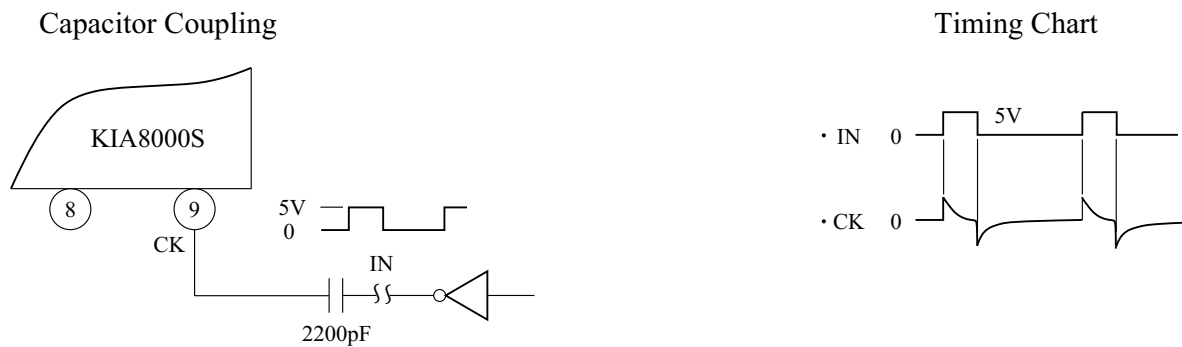


## 4. RECOMMENDED CONDITIONS

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

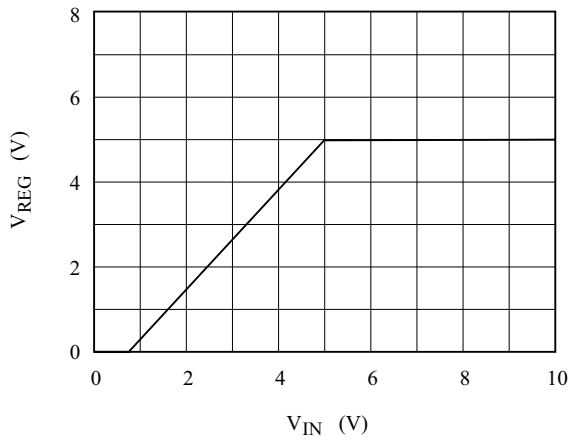
## APPLICATION CIRCUIT OF CK INPUT



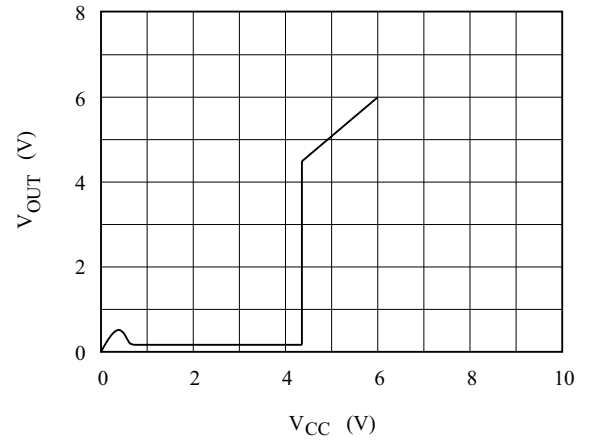
The capacitor coupling allows reset pulses to be supplied intermittently from the  $\overline{\text{RESET}}$  pin whether the input level (IN) is high or low.

# KIA8000S

## 1. Input-output characteristic ( $R_L=25\Omega$ , external transistor KTA965)



## 2. Reset Output Characteristic



## 3. Output Adjusting Resistance Characteristic

