# M5174P

## FLAME DETECTOR

## DESCRIPTION

Monolithic integrated circuit M5174P is designed for the use of the flame detection circuit.

It is composed of current amplifiers, a thyristor circuit, a couple of the relay drivers and a internal voltage regulator.

The current limiting circuit of the driver and internal two sets of shunt circuits parallely connected with relay protect the relay against the danger in an abnormal state of no signal flame. A differential amplifier configuration and a temperature-independent reference voltage source minimize the variation of the operating threshold level of the flame current detector.

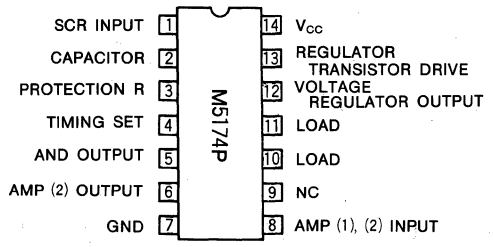
## FEATURES

- Fail-safe system (The operating mode of two degrees of redundancy.)
- Available input flame current ..... 50$\mu$A(max.)
- Minimum tollelance for operating threshold input current ..... ±20%($T_a$=−20~+60℃)

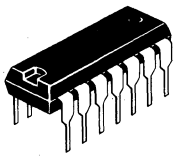
## APPLICATION

Flame detection circuit for a gaseous appliance

## PIN CONFIGURATION (TOP VIEW)

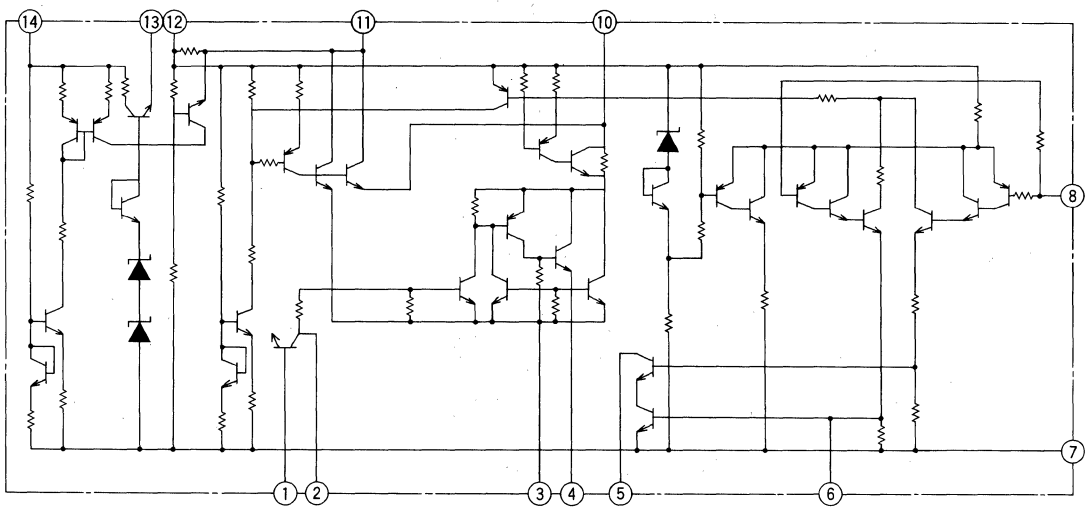



Outline 14P4



14-pin molded plastic DIL

## SCHEMATIC DIAGRAM



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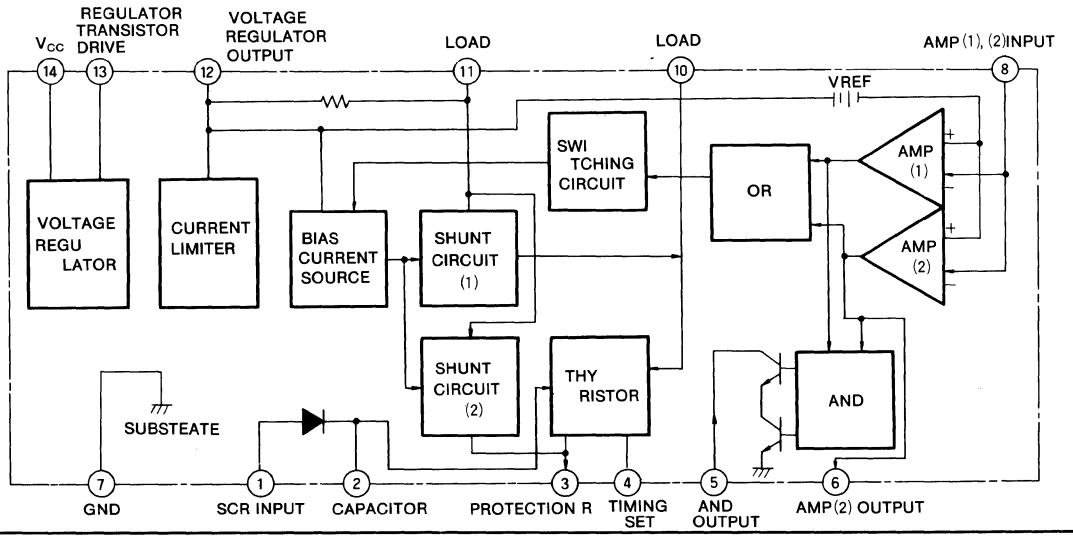
## BLOCK DIAGRAM



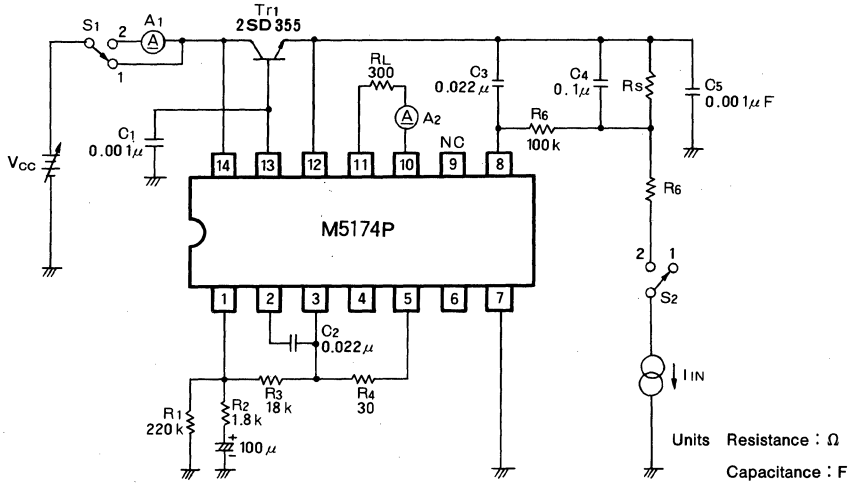

## ABSOLUTE MAXIMUM RATINGS ($T_a$=+25℃, unless otherwise noted)

| Symbol | Parameter | Conditions | Limits | Unit |
|---|---|---|---|---|
| $V_{CC}$ | Supply voltage | $I_8$=0μA | 20 | V |
| $I_{CC}$ | Circuit current | | 40 | mA |
| $I_{IN}$ | Maximum input current | | 50 | μA |
| Pd | Power dissipation | | 650 | mW |
| $K_\theta$ | Power derating rate | $T_a$≧25℃ | −6.5 | mW/℃ |
| Topg | Operating ambient temperature | | −20∼+60 | ℃ |
| Tstg | Storage temperature | | −40∼+125 | ℃ |

## ELECTRICAL CHARACTERISTICS ($T_a$=25℃)

| Symbol | Parameter | Test conditions | Limits | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | |
| $V_{CC1}$ | Supply voltage | $I_8$=0μA | 12 | 15 | 20 | V |
| $V_{CC2}$ | | $I_8$=1μA, $I_{CC}$=36mA | 12 | 15 | 17 | V |
| $I_{CC1}$ | Quiescent circuit current | $V_{CC}$=15V | 7 | 10 | 14 | mA |
| $I_{CC2}$ | Circuit current | $I_L$=20mA, $V_{CC}$=17V | | 30 | 36 | mA |
| $I_L$ | Drive current | $R_L$=300Ω, $V_{CC}$=17V | 15 | | | mA |
| $V_{O1}$ | Stabilizer output voltage | $I_8$=0μA, $V_{CC}$=12V | 9.5 | 10.3 | 11.5 | V |
| $V_{O2}$ | | $I_8$=1μA, $V_{CC}$=12V | 9.2 | 10 | 11.5 | V |
| $I_{IN}$ | Threshold input current | $R_L$=300, $V_{CC}$=17V, $R_S$=4.7MΩ | 0.58 | 0.60 | 0.72 | μA |
| $I_{IN'}$ | Maximum input current | $V_{CC}$=17V | 50 | | | μA |
| $I_{LS2}$ | Drive current at Pin 5-GND shorted | $I_8$=0μA $V_{CC}$=15V | | | 5 | mA |
| $I_{LS2}$ | Drive current at Pin 5-GND shorted and Pin 5-Pin 10 shorted | $I_8$=1μA, $V_{CC}$=15V | | | 8 | mA |

## TEST CIRCUIT

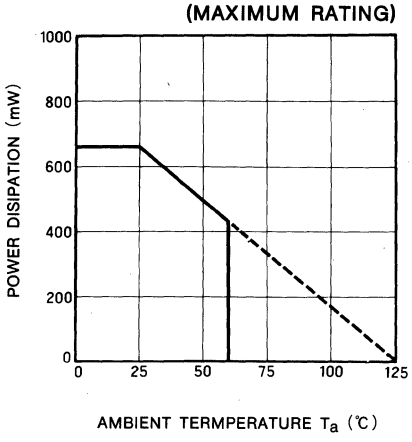



## TEST CIRCUIT

| Parameter | $S_1$ | $S_2$ | Measuring Point | Note |
|---|---|---|---|---|
| $I_{CC1}$ | 2 | 1 | $A_1$ *1 | $V_{CC}$=15V |
| $I_{CC2}$ | 2 | 2 | $A_1$ | $V_{CC}$=17V, $I_L$=20mA, $I_{IN}$=1μA |
| $I_L$ | 1 | 2 | $A_2$ *2 | $V_{CC}$=17V, $R_5$=300Ω, $I_{IN}$=1μA |
| $V_{O1}$ | 1 | 1 | pin 12 | $V_{CC}$=12V |
| $V_{O2}$ | 1 | 2 | pin 12 | $V_{CC}$=12V, $I_{IN}$=1μA |
| $I_{IN}$ | 1 | 2 | $A_2$ | $V_{CC}$=17V, $I_{IN}$=0.58~0.78μA |
| $I_{IN(max)}$ | 1 | 2 | $A_2$ | $V_{CC}$=17V, $I_{IN}$=50μA |
| $I_{LS1}$ *3 | 1 | 1 | $A_2$ | $V_{CC}$=15V |
| $I_{LS2}$ *4 | 1 | 1 | $A_2$ | $V_{CC}$=15V |

* 1 ···Supply current from $V_{CC}$ (pin 14)
* 2 ···Supply current to pin 10 from pin 11.
* 3 ···Short circuit condition between pin 5 and pin 7.
* 4 ···Short circuit condition between pin 5 and pin 7, and between pin 10 and pin 5.

## THERMAL DELATING (MAXIMUM RATING)

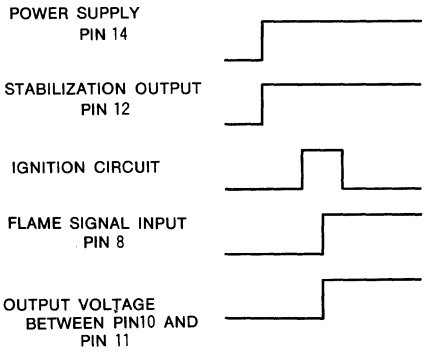


## ABSOLUTE MAXIMUM VOLTAGE RATINGS

(Voltage values are reffered to the ground (pin 7 ). )

| Pin | Limit | | Conditions | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | + | − | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| 1 | 50V | 80V | Connect to GND through 1.8kΩ. 100μF. | Connect to pin 3 through 0.022μF. | Connect to pin 1 through 18KΩ. | Open | Connect to pin 3 through 30Ω. | Open | GND | Connect to pin 12 through 0.022μF. | N. C. | Connect to GND through 0.022μF. | Connect to pin 10 through 300Ω. | Connect to pin 8 through 0.022μF. | Connect to GND through 0.001μF. | Open |
| 2 | 60V | 20V | | | | | | | | | | | | | | |
| 3 | 30V | 20V | | | | | | | | | | | | | | |
| 4 | 70V | 40V | | | | | | | | | | | | | | |
| 5 | 40V | 15V | | | | | | | | | | | | | | |
| 6 | 10V | 15V | | | | | | | | | | | | | | |
| 7 | GND | | | | | | | | | | | | | | | |
| 8 | 70V | 80V | | | | | | | | | | | | | | |
| 9 | N. C. | | | | | | | | | | | | | | | |
| 10 | 20V | 20V | | | | | | | | | | | | | | |
| 11 | 20V | 20V | | | | | | | | | | | | | | |
| 12 | 20V | 10V | | | | | | | | | | | | | | |
| 13 | 30V | 20V | | | | | | | | | | | | | | |
| 14 | 50V | 20V | | | | | | | | | | | | | | |

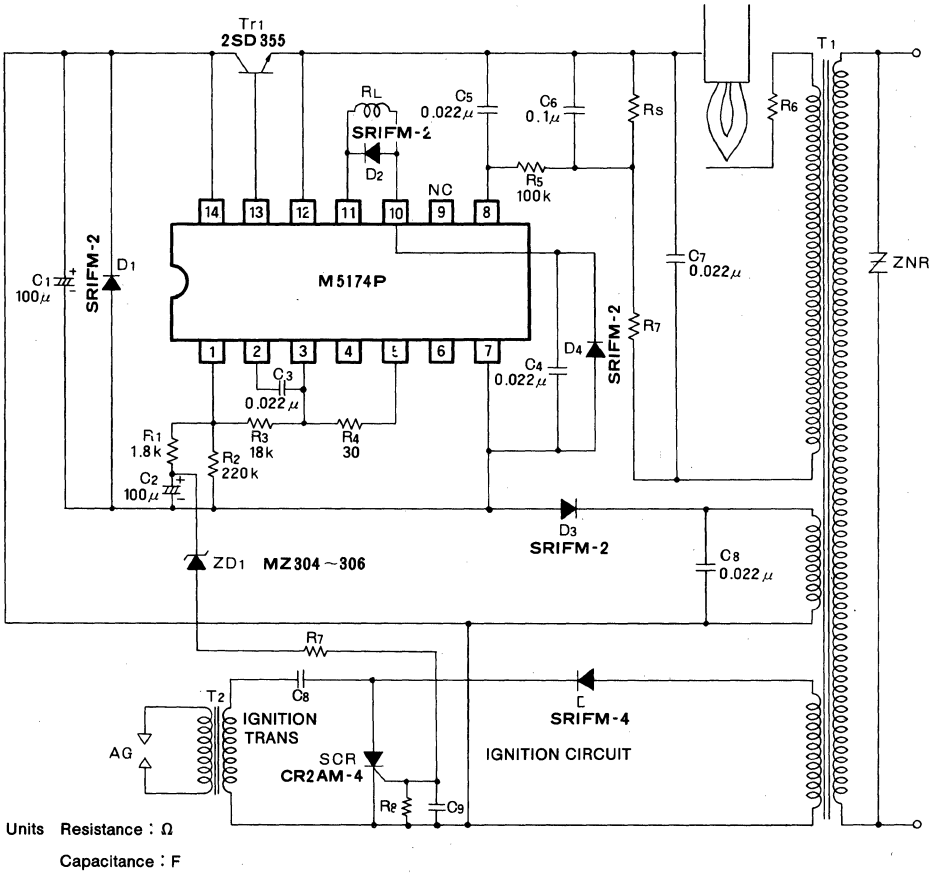
## TIME SEQUENTIAL DIAGRAM




Fail-safe system in the M5174P is considered as follows.
Flame signal detector is composed of the two independent amplifiers operating by the additional logic.

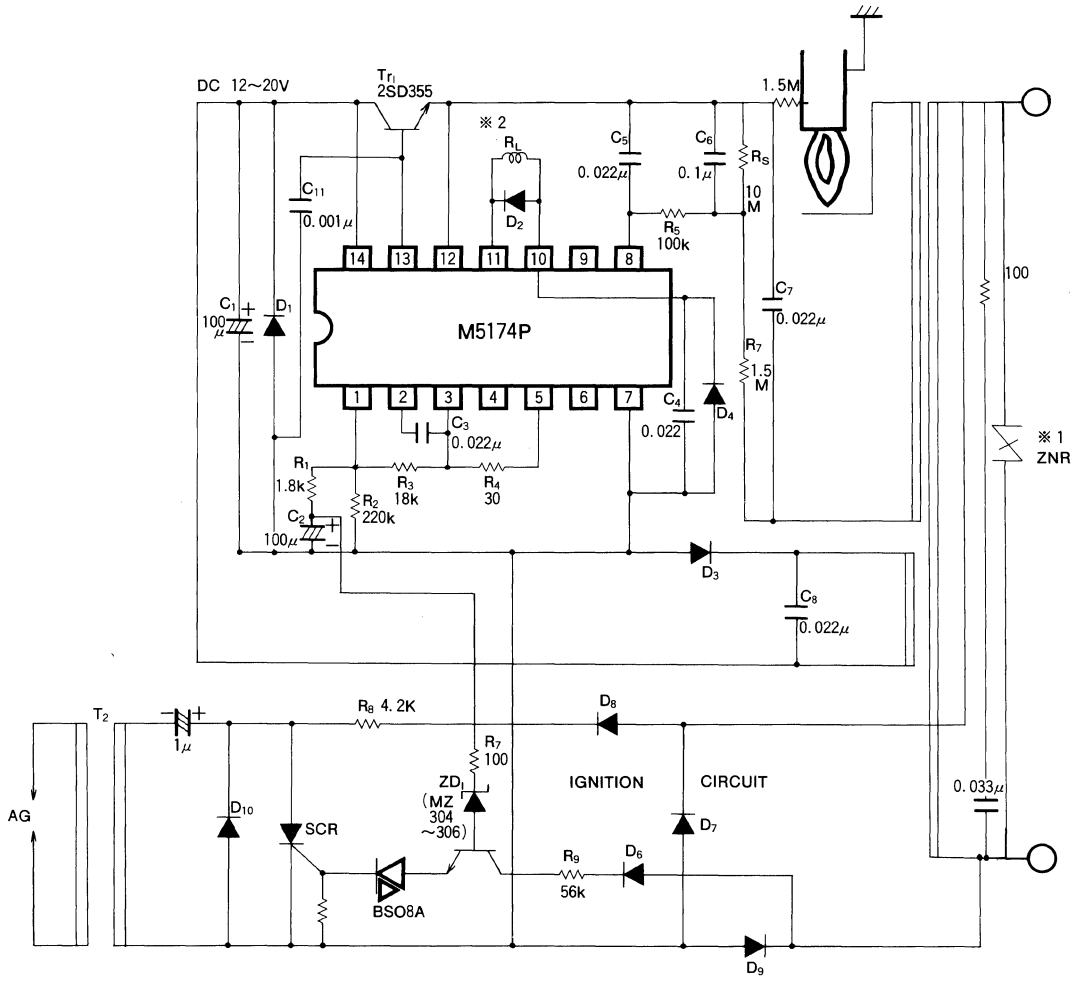
## APPLICATION EXAMPLE

(1) FLAME DETECTOR USING FLAME CURRENT (1)



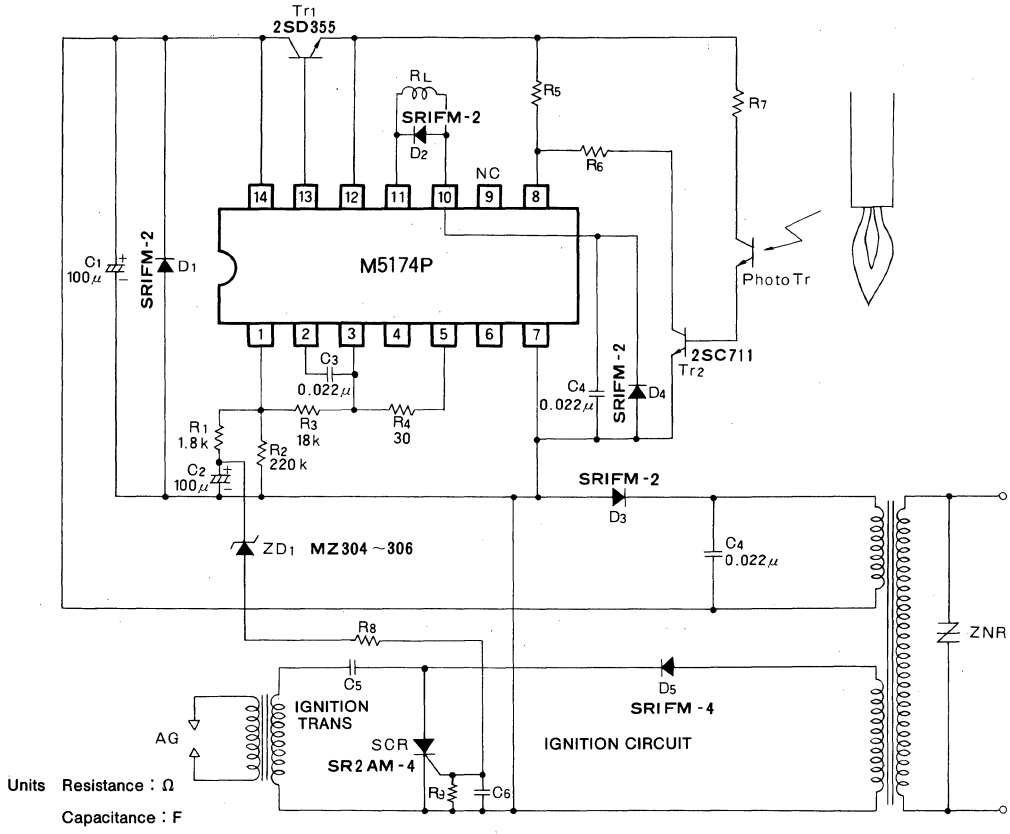

Units Resistance : Ω
Capacitance : F

## (2) FLAME DETECTOR USING FLAME CURRENT (2)




$D_1$~$D_4$ SRIFM−2
$D_6$~$D_{10}$ SRIFM−4
※1 ZNR (Z10L-221)
※2 RL (RELAY 300Ω, 20mA, 6V)

## (3) FLAME DETECTOR USING A PHOTO TRANSISTOR



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