# M51743P

## SEQUENCE CONTROLLER

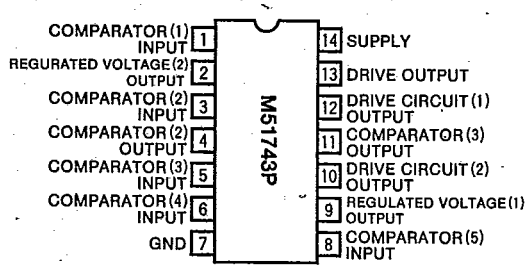
## DESCRIPTION

The M51743P is a semiconductor integrated circuit designed for use as sequence controller for oil combustion systems. It consists of five comparators and two voltage regulation circuits.

Three of the comparators can be used for sensor signal monitoring and two can be used for driving relays, etc.

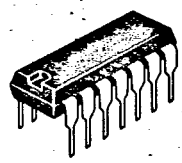
Since one of the comparators for drive applications has a redundant "2" structure, the M51743P is especially suitable for use in oil combustion system, for which safety operation is required.

## PIN CONFIGURATION (TOP VIEW)




## FEATURES

- Includes five comparators (three for signal monitoring and two for drive purposes)
- Includes two voltage regulation circuits ·····5.5V (typ), 6.2V (typ)
- Can directly drive relays, lamps, etc,
- Built-in memory function (comparator (2))
- Built-in hysteresis function (comparators (1), (4), (5))
- Redundancy "2" safety circuit design (comparator (5))
- Built-in reference power supply reduces the number of external parts
- Wide supply voltage range ····· 8.5~20V



14-pin molded plastic DIP

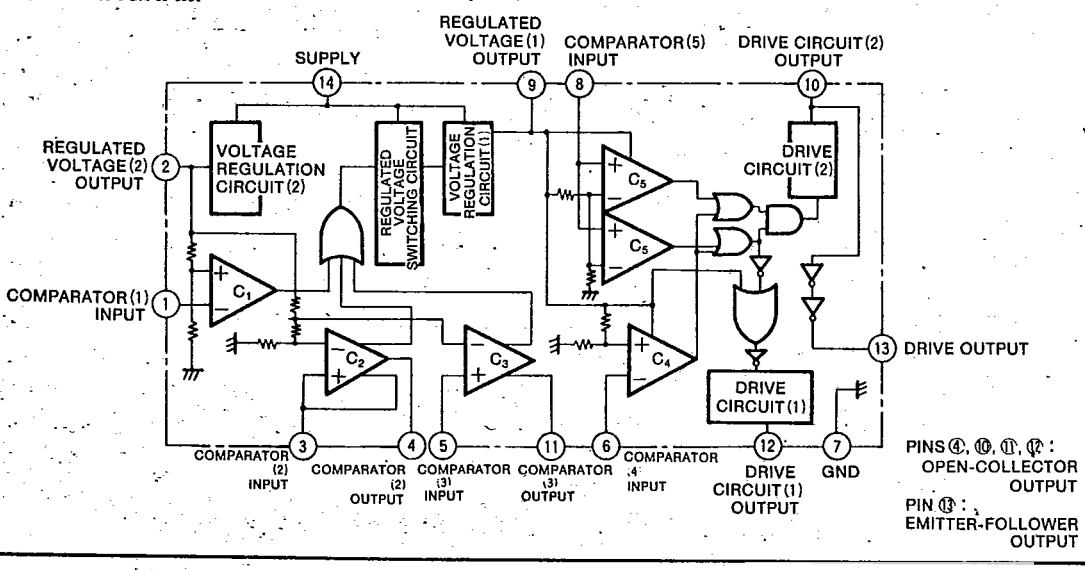
## APPLICATION

Sequence controller (in oil and gas combustion systems), flame detection circuits.

## RECOMMENDED OPERATING CONDITIONS

Supply voltage range ····· 8.5~20V
Rated supply voltage ····· 12V

## BLOCK DIAGRAM



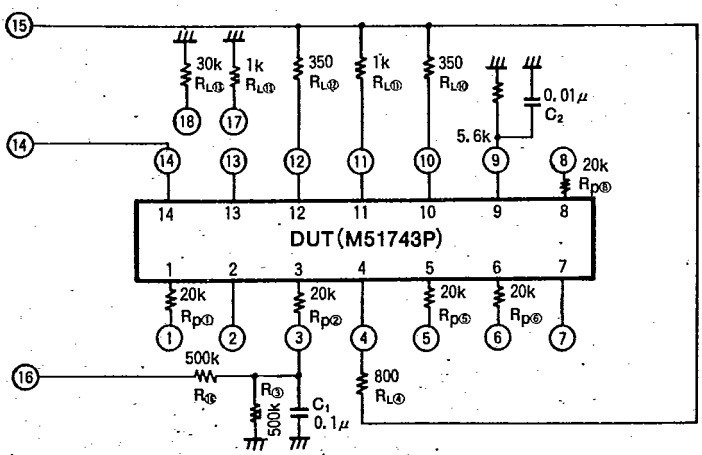
## ABSOLUTE MAXIMUM RATINGS ($T_a$=25℃, unless otherwise noted)

| Symbol | Parameter | Conditions | Ratings | Unit |
|---|---|---|---|---|
| $V_{CC}$ | Supply voltage | | 20 | V |
| $I_{CC}$ | Circuit current | | 22 | mA |
| $I_{L④}$ | Pin ④ maximum current | *Instantaneous peak value | 70 | mA |
| $I_{L⑩}$ | Pin ⑩ maximum current | | 60 | mA |
| $I_{L⑫}$ | Pin ⑫ maximum current | | 60 | mA |
| $P_d$ | Power dissipation | | 900 | mW |
| $K_\theta$ | Thermal derating | $T_a$≧25℃ | 9 | mW/℃ |
| Topr | Operating temperature range | | −20～+65 | ℃ |
| Tstg | Storage temperature range | | −40～+125 | ℃ |

## ELECTRICAL CHARACTERISTICS ($T_a$=25℃, $V_{CC}$=15V)

| Symbol | Parameter | Test conditions | Limits | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | |
| $V_{O(1)}$ | Voltage regulation circuit (1) output | Pin ⑬, pin ⑫ ON state | 5.0 | 5.5 | 6.3 | V |
| $V_{O(2)}$ | Voltage regulation circuit (2) output | | 5.0 | 6.1 | 6.9 | V |
| $I_{CC(I)}$ | Circuit current (Ⅰ) | $V_⑥$=1.2V, $V_⑤$=3V | 6 | 14 | 20 | mA |
| $I_{CC(II)}$ | Circuit current (Ⅱ) | $V_⑥$=4.5V | 2 | 10 | 17 | mA |
| $V_{ON(1)}$ | Comparator (1) ON voltage | | 3.8 | 4.4 | 5.3 | V |
| $V_{OFF(1)}$ | Comparator (1) OFF voltage | | 3.0 | 3.5 | 4.6 | V |
| $I_{IN(1)}$ | Comparator (1) input current | $V_①$=5.1V | | 0.15 | 0.6 | μA |
| $V_{ON(2)}$ | Comparator (2) ON voltage | | 1.5 | 2.0 | 2.8 | V |
| $V_③$ | Pin ③ clmp voltage | $R_③$=500kΩ | 4.9 | 5.75 | 6.3 | V |
| $V_{sat④}$ | Pin ④ output saturation voltage | $R_{L④}$=800Ω | 0.9 | 1.12 | 1.5 | V |
| $V_{ON(3)}$ | Comparator (3) ON voltage | | 2.5 | 3.3 | 4.1 | V |
| $I_{IN(3)}$ | Comparator (3) input current | $V_⑤$=4V | | 0.15 | 0.5 | μA |
| $V_{sat⑪}$ | Pin ⑪ output saturation voltage | $R_{L⑪}$=1kΩ, $V_⑤$=4.1V | 1.3 | 1.83 | 3.0 | V |
| $V_{REF\,I(4)}$ | Comparator (4) reference voltage (Ⅰ) | | 3.3 | 3.84 | 4.5 | V |
| $V_{REF\,II(4)}$ | Comparator (4) reference voltage (Ⅱ) | | 2.9 | 3.55 | 3.9 | V |
| $I_{IA(4)}$ | Comparator (4) input current | $V_⑤$=2.5V | | 50 | 250 | nA |
| $V_{ON(5)}$ | Comparator (5) ON voltage | | 2.0 | 2.3 | 2.7 | V |
| $V_{OFF(5)}$ | Comparator (5) OFF voltage | | 1.6 | 2.0 | 2.3 | V |
| $I_{IN(5)}$ | Comparator (5) input current | $V_⑨$=2.5V | | 0.1 | 0.35 | μA |
| $V_{sat⑩(1)}$ | Pin ⑩ output saturation voltage (1) | $R_{L⑩}$=350Ω, $V_{CC}$=10V | | 0.3 | 0.9 | V |
| $V_{sat⑫(1)}$ | Pin ⑫ output spturation voltage (1) | $R_{L⑫}$=350Ω, $V_{CC}$=10V | | 0.3 | 0.9 | V |
| $V_{OH⑬}$ | Pin ⑬ output voltage | $R_{L⑬}$=1kΩ | 7.5 | | | V |

## TEST CIRCUIT




Unit

Resistance : Ω

Capacitance : F

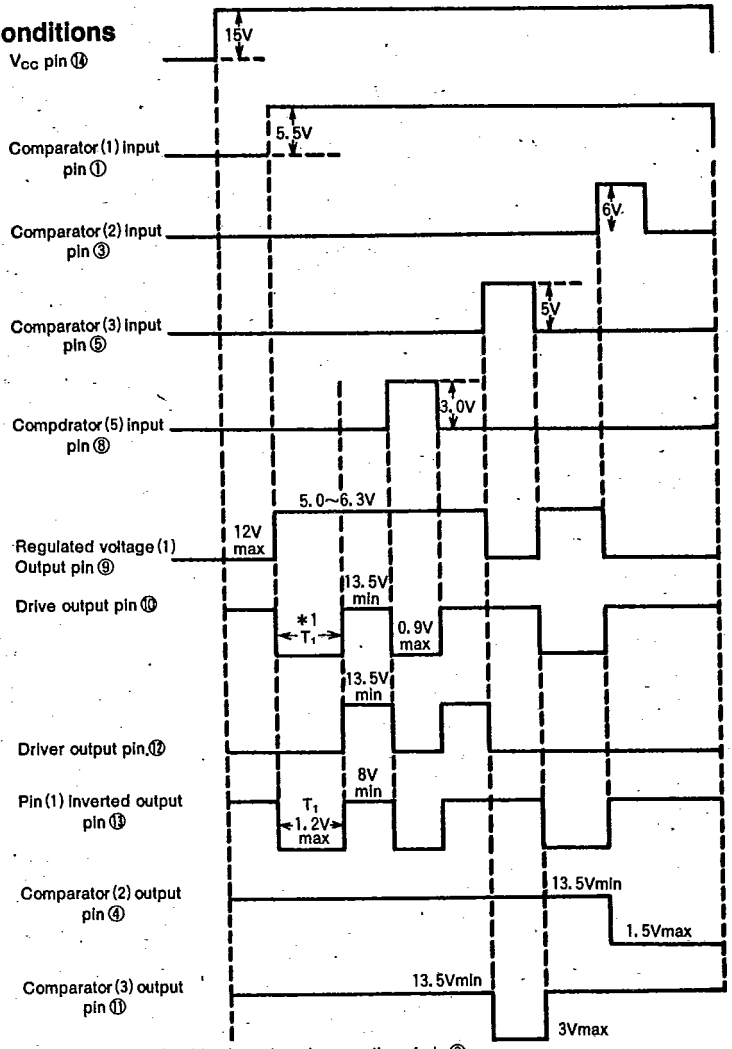
## TEST METHODS

| Symbol | Pin No. 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | Measurement point |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $V_{O(1)}$ | ②*1 | ① | GND | | GND | 1.2V | GND | GND | Ⓜ*2 | | | | ⑰ | 15V | 15V | | ⑬ | | ⑨ |
| $V_{O(2)}$ | 5.2 | Ⓜ | | | | 1.2V | | | | | | | ⑰ | 15V | | | ⑬ | | ② |
| $I_{CC(1)}$ | | | | | | 1.2V | | 3V | | | | | ⑱ | Ⓜ 15V | | | | ⑬ | ⑭ |
| $I_{CC(II)}$ | | | | | | 4.5V | | | | | | | ⑱ | Ⓜ 15V | | | | ⑬ | ⑭ |
| $V_{ON(1)}$ | 1.3V 3.8V | | | | | 1.2V | | | Ⓜ | | | | ⑰ | 15V | | | ⑬ | | ⑨ |
| $V_{OFF(1)}$ | 4.6V 3.0V | | | | | | | | Ⓜ | | | | | | | | | | ⑨ |
| $I_{IN(1)}$ | Ⓜ 5.1V | | GND | | | | | | | | | | | | | | | | ① |
| $V_{ON(2)}$ | ② | ① | | | | 1.2V | | | Ⓜ | | | | | | | | | | ⑨ |
| $V_{③}$ | | | Ⓜ | | | | | GND | | | | | | | | | | | ③ |
| Vsat ④ | | | | Ⓜ | GND | 1.2V | | GND | | | | | | | | | | | ④ |
| $V_{ON(3)}$ | | | GND | | 4.1V 2.5V | | | | Ⓜ | | | | | | | | | | ⑨ |
| $I_{IN(3)}$ | | | | | Ⓜ 4V | | | | | | | | | | | | | | ③ |
| Vsat ⑪ | | | | | 4V | 1.2V | | | | | Ⓜ | | | | | | | | ⑪ |
| $V_{REF\,I(4)}$ | | | | | GND | 4.1V 3.3V | | | | Ⓜ | | | | | | | | | ⑩ |
| $V_{REF\,II(4)}$ | | | | | | 3.9V 2.9V | | | | Ⓜ | | | | 15V | | | | | ⑩ |
| Vsat ⑫ (1) | | | | | | 4.5V | | 2.6V | | | | Ⓜ | ⑰ | 10V | | | | | ⑫ |
| $V_{OH}$ ⑬ | | | | | | | | 2.6V | | | | | ⑰ Ⓜ | 15V | | | | | ⑬ |
| $I_{IN(4)}$ | | | | | | Ⓜ 2.5V | | | | | | | ⑰ | | | | | | ④ |
| $V_{ON(5)}$ | | | | | | 4.5V | | 2.7V 2.0V | | | | Ⓜ | | | | | | | ⑫ |
| $V_{OFF(5)}$ | | | | | | | | 2.3V 1.6V | | | | Ⓜ | | | | | | | ⑫ |
| $I_{IN(5)}$ | | | | | | | | 2.5V | | | | | | 15V | | | | | ⑤ |
| Vsat ⑩ (1) | ② | ① | GND | | GND | 4.5V | GND | 2.6V | | Ⓜ | | | ⑰ | 10V | 15V | | ⑬ | | ⑩ |

*1 : ○ Indicates pin number
*2 : Ⓜ Indicates measurement pin

## M51743P OPERATION TIME CHART

### Input application conditions




* 1 : $T_1$ is the timer output determined by the external connection of pin ⑥

## M51743P INPUT/OUTPUT TRUTH TABLE

### Operation comparators (1), (2), (3)

| | Pin No. | State | | | |
|---|---|---|---|---|---|
| Input | Pin ① | 0*1 | 1 | 1 | 1 |
| | Pin ③ | 0 | 0 | 1 | 0 |
| | Pin ⑤ | 0 | 0 | 0 | 1 |
| Output | Pin ⑨ | 0 | 1 | 0 | 0 |
| | Pin ⑩ | 1*2 | 0*4 | 1 | 1 |
| | Pin ⑫ | 0*2 | 0*4 | 0 | 0 |
| | Pin ⑬ | 1*3 | 0*4 | 1 | 1 |
| | Pin ④ | 1*2 | 1 | 0 | 1 |
| | Pin ⑪ | 1*2 | 1 | 1 | 0 |

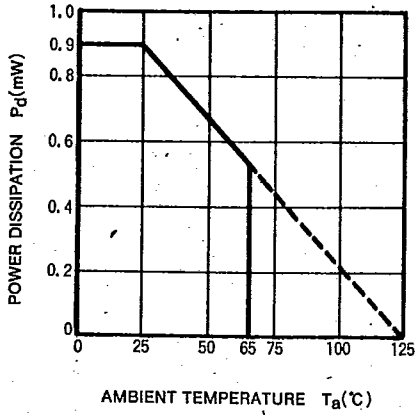
### Operation comparators (4), (5)

| | Pin No. | State | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Input | Pin ⑨ | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 |
| | Pin ⑥ | 0 | 1 | 0 | 1 | 0 | 1 | — | — |
| | Pin ⑧ | 0 | 0 | 1 | 1 | — | — | 0 | 1 |
| Output | Pin ⑩ | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 1 |
| | Pin ⑫ | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Pin ⑬ | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 1 |

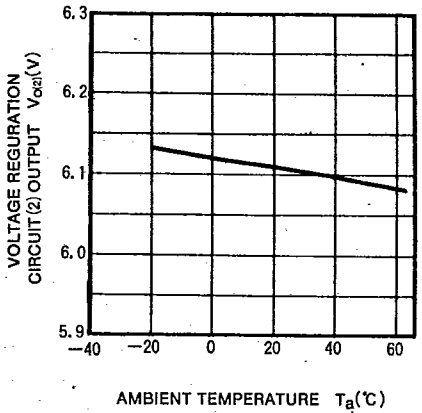
* 1 : "1" and "0" indicate the "H" and "L" voltage levels of the pins.
* 2 : Pins ⑩, ⑫, ④, ⑪ are ON at "0" and OFF at "1" (open-collector output).
* 3 : Pin ⑬ is ON at "1" and OFF at "0" (emitter-follower output).
* 4 : Will be 0 or 1 depending on the condition of comparators (4) and (5).

## TYPICAL CHARACTERISTICS ($T_a$=25℃, $V_{CC}$=9V, unless otherwise noted)

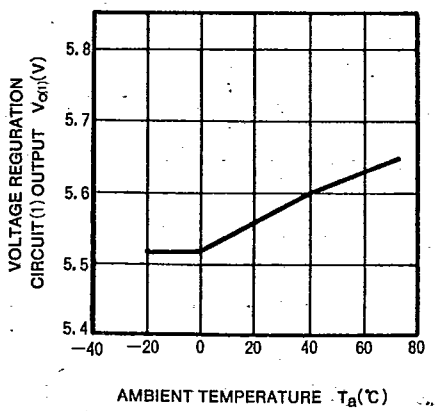
### THERMAL DERATING (MAXIMUM RATING)



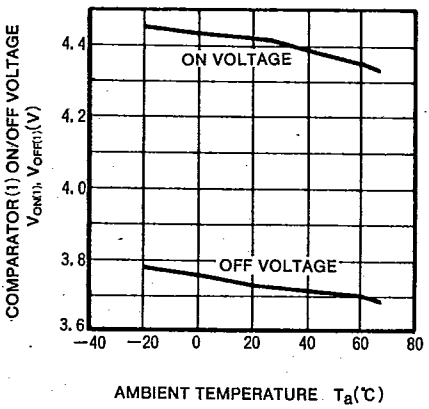

### VOLTAGE REGULATION CIRCUIT (2) VS. AMBIENT TEMPERATURE



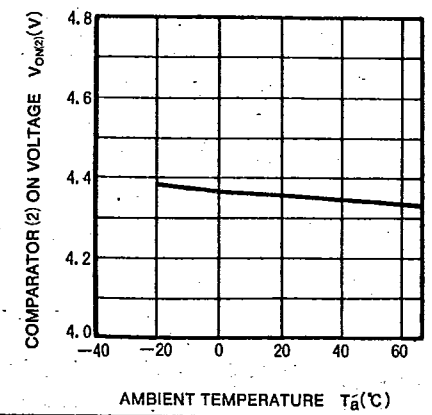

### VOLTAGE REGULATION CIRCUIT (1) AMBIENT TEMPERATURE



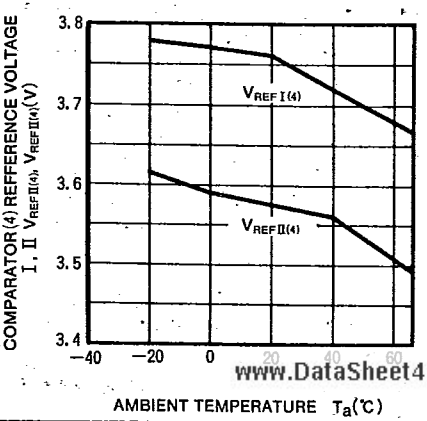

### COMPARATOR ON/OFF VOLTAGE VS. AMBIENT TEMPERATURE



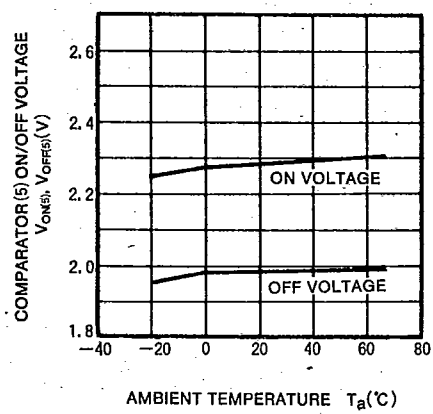

### COMPARATOR (2) ON VOLTAGE VS. AMBIENT TEMPERATURE



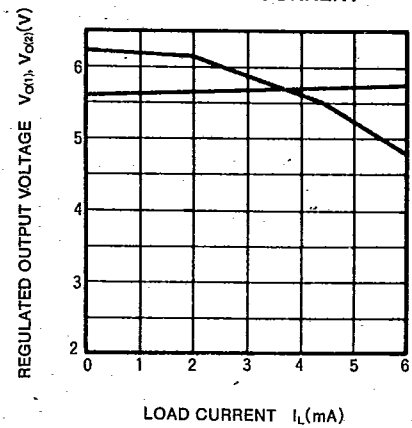

### COMPARATOR (4) REFFERENCE VOLTAGE I, II VS. AMBIENT TEMPERATURE



COMPARATOR (5) ON/OFF VOLTAGE VS. AMBIENT TEMPERATURE




REGULATED OUTPUT VOLTAGE VS. LOAD CURRENT




## APPLICATION EXAMPLE

Example of using comparator (4) as timer operation