# M54844P

## 8-DIGIT FLUORESCENT DISPLAY DRIVER FOR MICROCOMPUTOR

## DESCRIPTION

The M54844P, a semiconductor integrated circuit fabricated with using IIL technology, is designed for driving an 8-digit, 8-segment fluorescent display.

## FEATURES

- Can be used in either an 8-digit or 7-digit plus a decimal point.
- 4-bit data input
- Mode-input controllable display mode
- Internal clock generator
- Wide operating voltage ($V_{CC}$=5~12V)

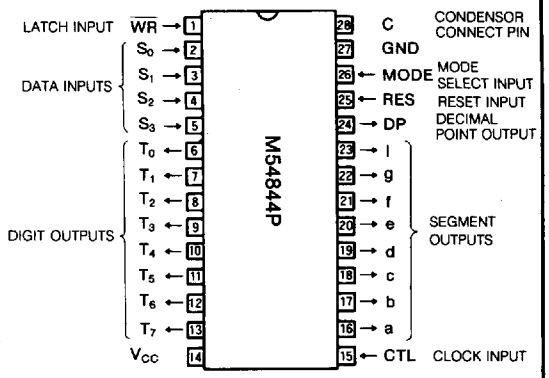
## APPLICATION

Micro computer display
Digital equipment for industrial and consumer use

## FUNCTION

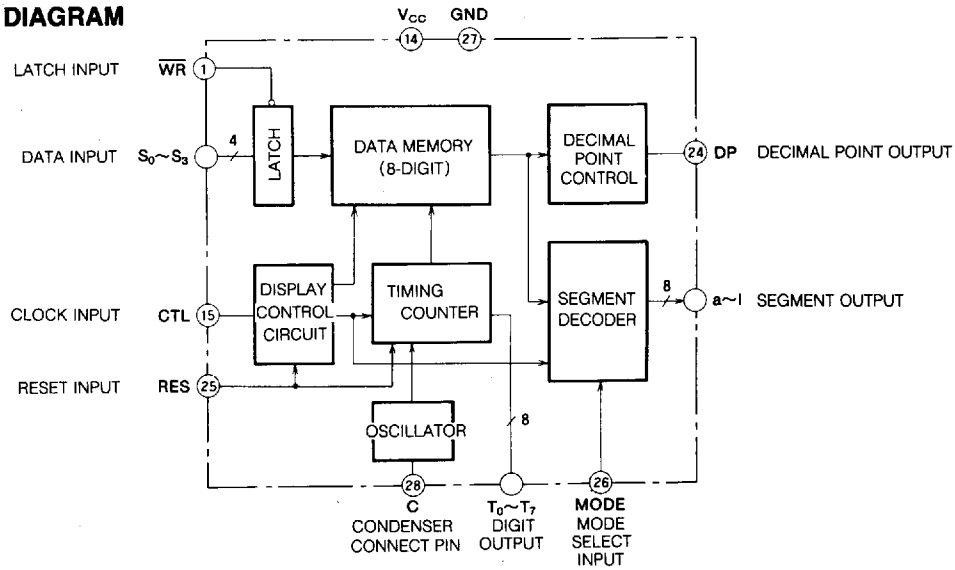
The M54844p, a decoder/driver for fluorescent displays, has a 4-bit × 8-digit memory. Employing the dynamic lighting method, it can light an 8-segment, 8-digit device. Two indication modes can be selected, by the setting of the MODE input.

## PIN CONFIGURATIONS (TOP VIEW)




Outline 28P4

## BLOCK DIAGRAM






MITSUBISHI ELECTRIC

## 8-DIGIT FLUORESCENT DISPLAY DRIVER FOR MICROCOMPUTOR

## DESCRIPTION OF OPERATION

1. Output after reset and during reset.
Outputs during reset (RES=high-state) is shown in the following chart.

| Output pin | | Output level |
|---|---|---|
| Digit output | $T_0$ | H |
| | $T_1$~$T_7$ | L |
| Segment output | a~l | L |
| | DP | L |

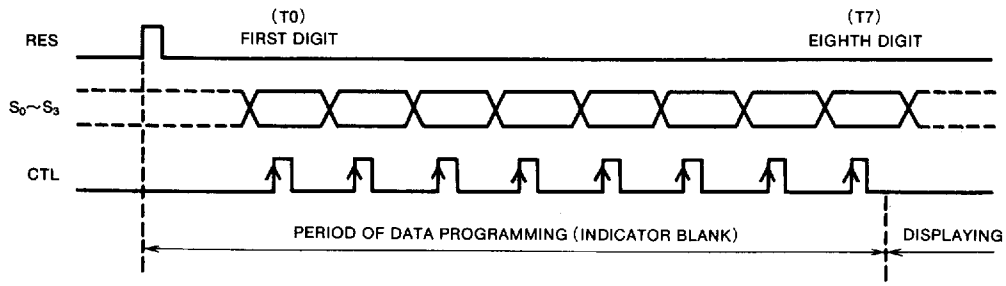
After reset, the outputs $T_0$~$T_7$ are scanned beginning with $T_0$. Outputs $S_a$~$S_l$ and DP remain in low-state until CTL has been input for 8 cycles.

2. Decimal point setting
The location of the decimal point depends on the contents of the data memory corresponding to $T_0$. When the decimal point is to be displayed, digit $T_0$ cannot be used.
The display position of the decimal point is as follows.

| Content of digit $T_0$ | Display position of decimal point |
|---|---|
| 0 or 8 | $T_1$ |
| 1 or 9 | $T_2$ |
| 2 or A | $T_3$ |
| 3 or B | $T_4$ |
| 4 or C | $T_5$ |
| 5 or D | $T_6$ |
| 6 or E | $T_7$ |
| 7 or F | $T_0$ |

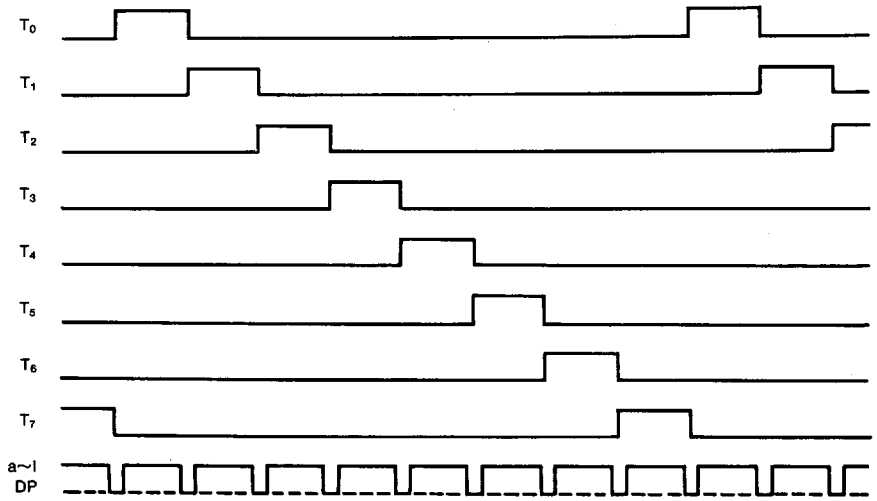
3. Operation timing

(1) Data programming




- Reset input is necessary before data programming input.
- $S_0$~$S_3$ data is read at the leading edge of the CTL.

(2) Output timing



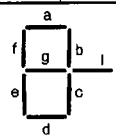
# M54844P

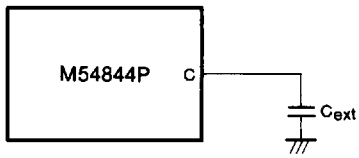
## 8-DIGIT FLUORESCENT DISPLAY DRIVER FOR MICROCOMPUTOR

## DISPLAY CHARACTERS

| Mode \ Hexadecimal code | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| I | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | - | E | C | - | o | |
| II | | | | | | | | | | | a | b | c | d | e | + |

Mode I is displayed when MODE input is low-state.
Mode II is displayed when MODE input is high-state.




## ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Conditions | Ratings | Unit |
|---|---|---|---|---|
| $V_{CC}$ | Supply voltage | | −0.3～+15 | V |
| $V_I$ | Input voltage | | −0.3～$V_{CC}$ | V |
| $V_{CC}$-$V_O$ | Voltage between the power supply and output pin | Output off-state | −0.3～+35 | V |
| Topr | Operating temperature | | −30～+85 | ℃ |
| Tstg | Storage temperature | | −55～+125 | ℃ |

## RECOMMENDED OPERATING CONDITIONS ($T_a$ = −30～+85℃, unless otherwise noted)

| Symbol | Parameter | Limits | | | Unit |
|---|---|---|---|---|---|
| | | Min | Typ | Max | |
| $V_{CC}$ | Supply voltage | 4.5 | 10 | 12 | V |
| $V_{CC}$-$V_O$ | Voltage between the power supply and output pin | | | 33 | V |

## ELECTRICAL CHARACTERISTICS ($T_a$ = −30～+85℃, $V_{CC}$ = 10V, unless otherwise noted)

| Symbol | Parameter | Test conditions | Limits | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | |
| $V_{IH}$ | High-level input voltage | | 2 | | $V_{CC}$ | V |
| $V_{IL}$ | Low-level input voltage | | 0 | | 0.7 | V |
| $I_{IH}$ | High-level input current | $V_{IH}$=10V | | | 20 | μA |
| $I_{IL}$ | Low-level input current | $V_{IL}$=0.5V | | | −200 | μA |
| $V_{OH}$ | High-level output voltage | $I_{OH}$=−10mA | 8 | | | V |
| $I_{OLK}$ | Output leak current | $V_O$=−20V | | | −30 | μA |
| $I_{CC}$ | Supply current | Display off-state | | 12 | 18 | mA |
| $t_{WS}$ | Segment output width | $C_{ext}$=1000pF | 130 | 260 | 520 | μs |
| $t_{WB}$ | Segment blank width | $C_{ext}$=1000pF | 20 | 40 | 80 | μs |
| $t_{WD}$ | Digit output width | $C_{ext}$=1000pF | 150 | 300 | 600 | μs |
| $t_{CY}$ | Digit period | $C_{ext}$=1000pF | 1.2 | 2.4 | 4.8 | ms |



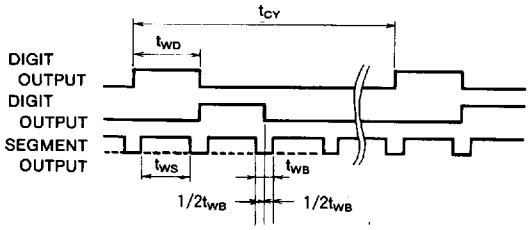
MITSUBISHI ELECTRIC

## 8-DIGIT FLUORESCENT DISPLAY DRIVER FOR MICROCOMPUTOR

## TIMING REQUIREMENTS ($T_a$ = −30~+85℃, $V_{CC}$ = 4.5~12V, unless otherwise noted)

| Symbol | Parameter | Test conditions | Limits | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | |
| $t_{ISC}$ | Input setup time in relation to CLK | | 5 | | | μs |
| $t_{IHC}$ | Input hold time in relation to CLK | | 10 | | | μs |
| $t_{WH}$ | High-level CTL width | | 5 | | | μs |
| $t_{WL}$ | Low-level CTL width | | 10 | | | μs |
| $t_{ISW}$ | Input setup time in relation to WR | | 0 | | | μs |
| $t_{IHW}$ | Input hold time in relation to WR | | 5 | | | μs |
| $t_{WW}$ | WR width | | 5 | | | μs |
| $t_{WC}$ | WR→CTL | | 5 | | | μs |
| $t_{CW}$ | CTL→WR | | 15 | | | μs |

## OUTPUT TIMING DIAGRAM




DIGIT OUTPUT WIDTH $t_{WD}=15t_{OSC}$
SEGMENT OUTPUT WIDTH $t_{WS}=13t_{OSC}$
SEGMENT BLANK WIDTH $t_{WB}=2t_{OSC}$
($t_{OSC}$ is oscillation period of the oscillator circuit.)

## INPUT TIMING DIAGRAM