FUJITSU SEMICONDUCTOR
DATA SHEET

DS04-12103-4E

*ASSP*

# DUAL COMPARATOR

# MB47393

## ■ DESCRIPTION

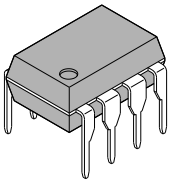
The Fujitsu MB47393 is a dual comparator which is designed to operate from a single power supply over a wide range of voltage. The input characteristics is equivalent of current industry standard comparator. Even though operated from a single power supply, the input common mode voltage range includes ground. Owing to adoption of clamp circuitry in input pins, mis-operation is prevented by negative input. The MB47393 is compatible with LM393.

## ■ FEATURES

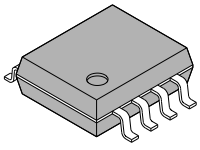
- Wide power supply voltage range
  Single power supply —— 2V to 30V
  Dual power supplies —— ±1V to ±15V
- Wide input common-mode voltage range
  0V to ($V_{CC}$ – 1.5)V
- Low input bias current —— 25nA typ.
- High sink current capability because of open collector output 40mA min.
- Package
  Plastic 8 pin DIP package (Suffix: –P)
  Plastic 8 pin FPT package (Suffix: –PF)
  Plastic 9 pin SIP package (Suffix: –PS)

## ■ PACKAGE

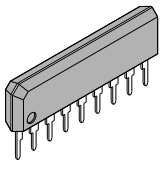
PLAPMSTIC PACKAGE
DIP-08P-M01



PLAPMSTIC PACKAGE
FPT-08P-M01



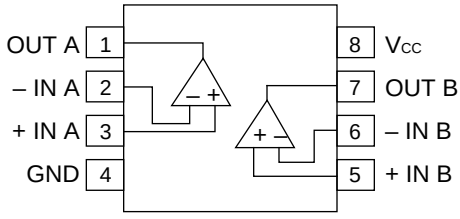
PLAPMSTIC PACKAGE
SIP-09P-M01



# MB47393

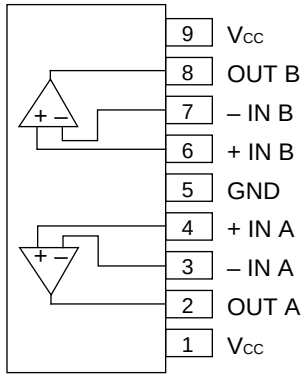
## ■ PIN ASSIGNMENT

(TOP VIEW)




(DIP-8P-M01)
(FPT-8P-M01)

(TOP VIEW)




(SIP-9P-M01)

## ■ ABSOLUTE MAXIMUM RATINGS (see NOTE)

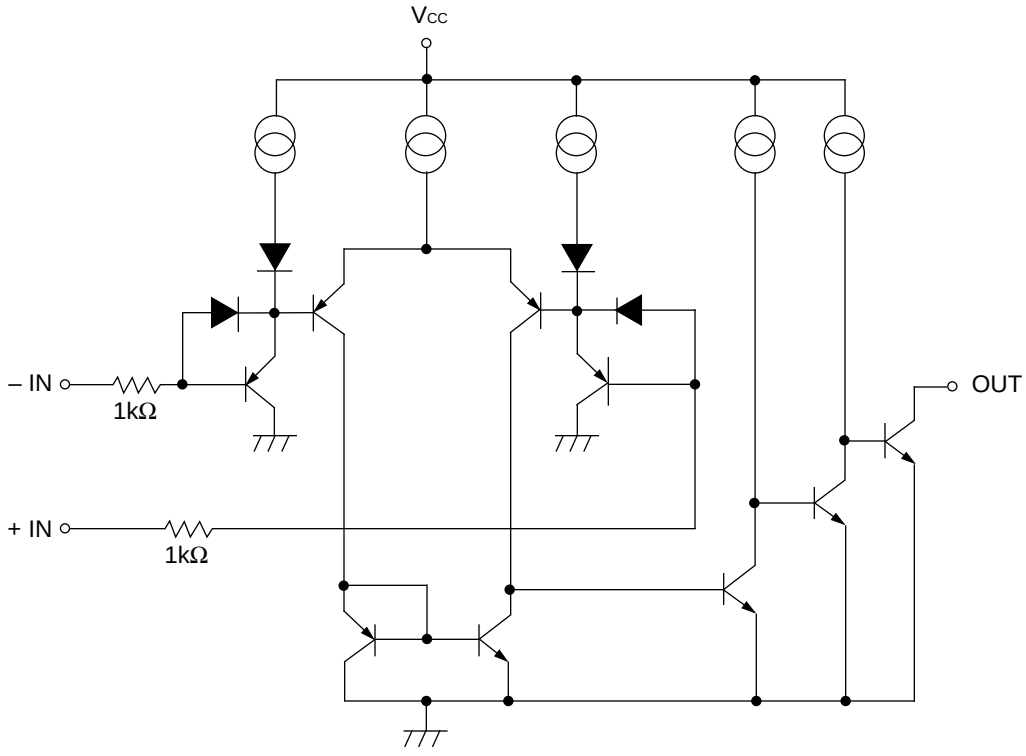
Ta = 25°C

| Rating | Symbol | Value | Unit |
|---|---|---|---|
| Power Supply Voltage | $V_{CC}$ | 36 | V |
| Differential Input Voltage | $V_{ID}$ | 36 | V |
| Common-Mode Input Voltage | $V_I$ | –5 to +36 | V |
| Output Short Current to GND | — | Infinite* | — |
| Power Dissipation | $P_D$ | 350 (Ta ≤ 55°C) | mW |
| Operating Temperature | Ta | –20 to +75 | °C |
| Storage Temperature | $T_{STG}$ | –55 to +125 | °C |

* : This value is specified with respect to the short circuit from output to GND. However, short circuit from the output to $V_{CC}$ cause device destruction.

Note: Permanent device damage may occur if the above Absolute Maximum Ratings are exceeded. Functional operation should be restricted to the conditions as detailed in the operational sections of this data sheet. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

**Figure 1 MB47393 EQUIVALENT CIRCUIT**




## ■ RECOMMENDED OPERATING CONDITIONS

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Power Supply Voltage | $V_{CC}$ | 2 to 30 | V |
| | | ±1.0 to ±15 | |
| Operating Temperature | Ta | –20 to +75 | °C |
| Output Sink Current | $I_{SINK}$ | ≤40 | mA |

# MB47393

## ■ ELECTRICAL CHARACTERISTICS

(Ta = 25°C, $V_{CC}$ = 5V)

| Parameter | Symbol | Condition | Value | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| Input Offset Voltage | $V_{IO}$ | $V_O = V_{REF}$ = 1.4V | — | 2 | 5 | mV |
| Input Offset Current | $I_{IO}$ | — | — | 5 | 50 | nA |
| Input Bias Current | $I_{IN*1}$ | — | — | 25 | 250 | nA |
| Common-Mode Input Voltage | $V_{CM*2}$ | — | 0 | — | $V_{CC}$–1.5 | V |
| Power Supply Current | $I_{CC}$ | $R_L = \infty$ | — | 2 | 3 | mA |
| Voltage Gain | $A_V$ | $R_L$ = 15kΩ, $V_{CC}$ = 15V | — | 200 | — | V/mV |
| Response Time | — | $R_L$ = 1kΩ | — | 2 | — | µs |
| Output Sink Current | $I_{SINK}$ | $V_{IN(+)}$ = 0, $V_{IN(–)}$ = 1V, $V_{OL} \leq$ 1.5V | 40 | — | — | mA |
| Output Saturation Voltage | $V_{OL}$ | $V_{IN(+)}$ = 0, $V_{IN(–)}$ = 1V, $I_{SINK}$ = 30mA | — | 0.2 | 0.4 | V |
| Output Leakage Current | $I_{LEAK}$ | $V_{IN(+)}$ = 1V, $V_{IN(–)}$ = 0V, $V_O$ = 30V | — | — | 1 | µA |

Notes:

*1: $I_{IN}$ is measured when $V_I \geq 0$ and direction of the input current flows from IC. When negative voltage is applied to input pin, the pin is equivalently connected the GND through a 1kΩ of resistor.
When low voltage below than –5V is applied, please connect a resistor serially to input pin in order to prevent the high current flow.

*2: Positive input voltage may exceed the power supply voltage. As long as the other voltage remains in the common-mode input voltage range, the comparator will provide a proper output state.
When $V_{CC}$ = 5V, your are requested to use $V_{IN}$ below 25V.

## ■ TYPICAL CHARACTERISTIC CURVES

**Figure 2 POWER SUPPLY CURRENT vs POWER SUPPLY VOLTAGE**

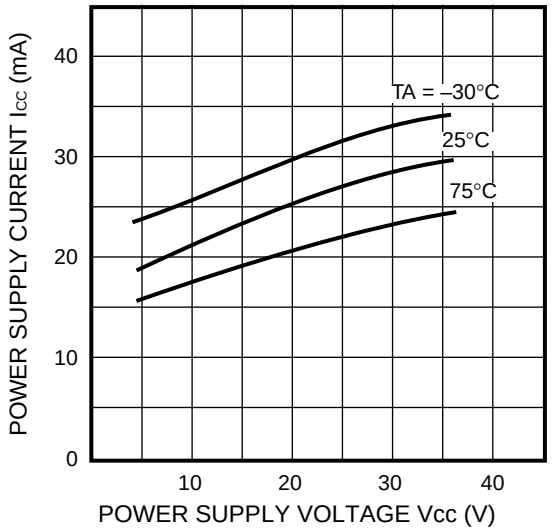
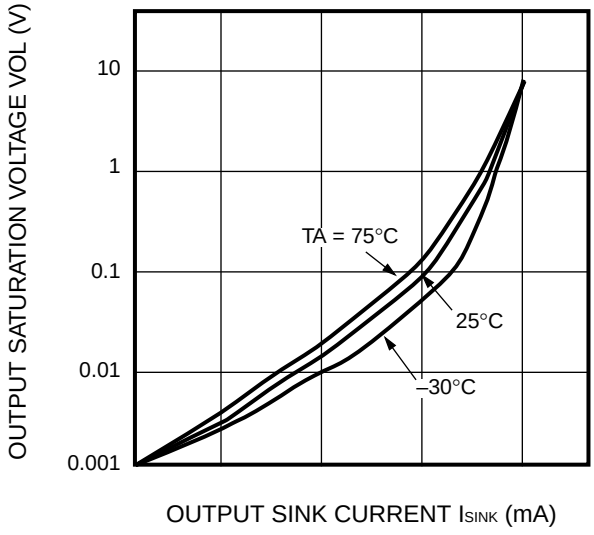



**Figure 3 OUTPUT SATURATION VOLTAGE vs OUTPUT SINK CURRENT**



## ■ TYPICAL CHARACTERISTIC CURVES (Continued)

**Figure 4 INPUT CURRENT vs INPUT VOLTAGE**

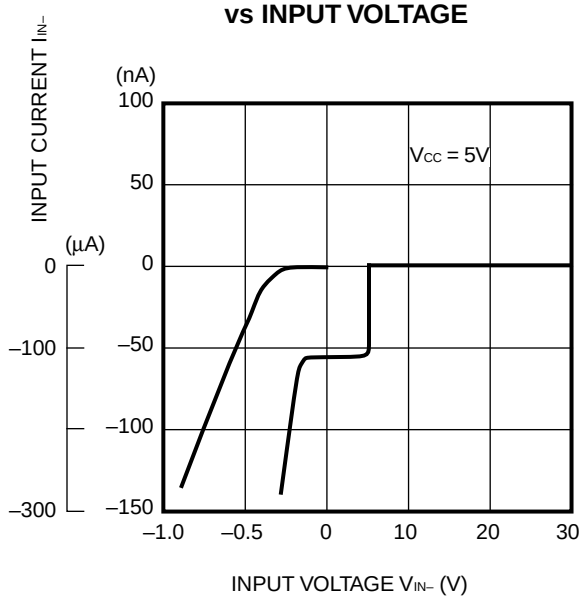



**Figure 5 INPUT VOLTAGE/OUTPUT VOLTAGE vs RESPONSE TIME**

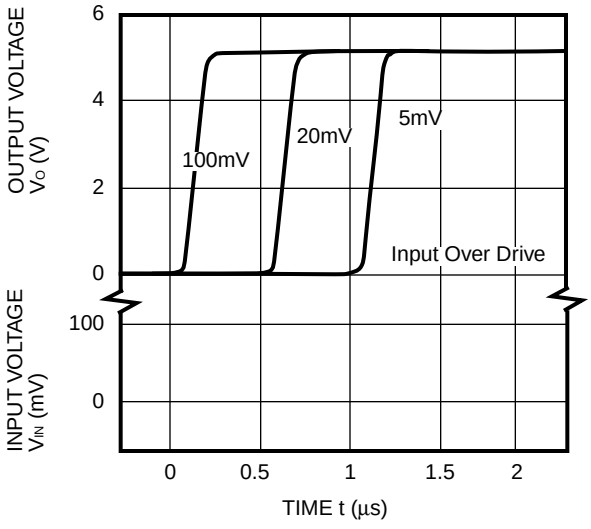



**Figure 6 INPUT VOLTAGE/OUTPUT VOLTAGE vs RESPONSE TIME**

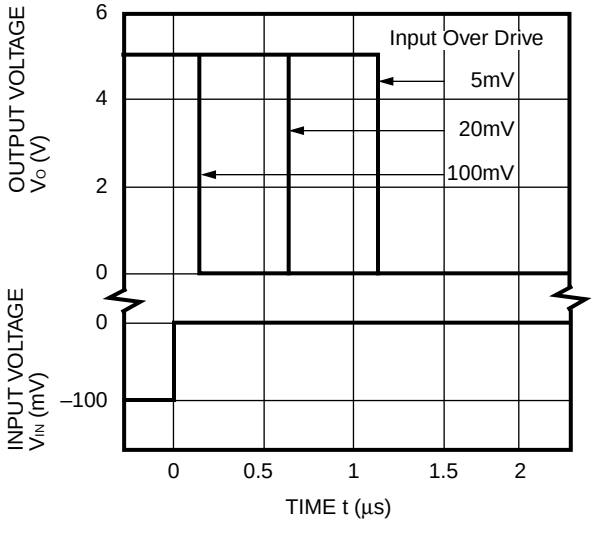
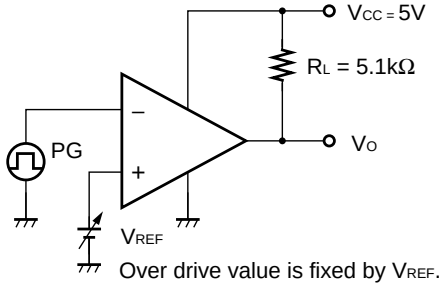


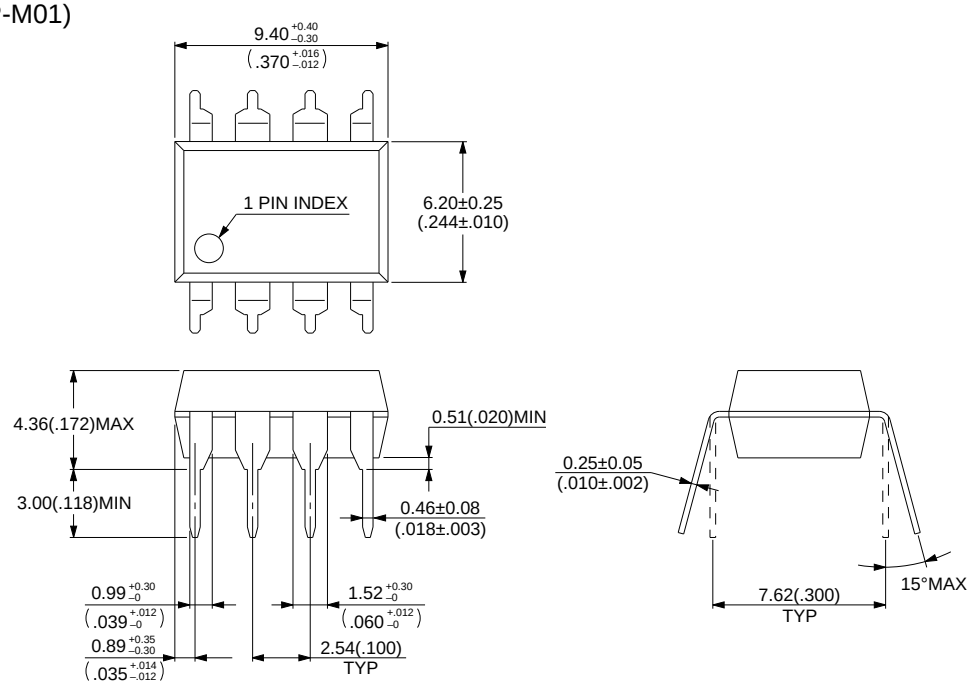

**Figure 7 TEST CIRCUIT**



# MB47393

## ■ PACKAGE DIMENSIONS

8 pin, Plastic DIP
(DIP-8P-M01)



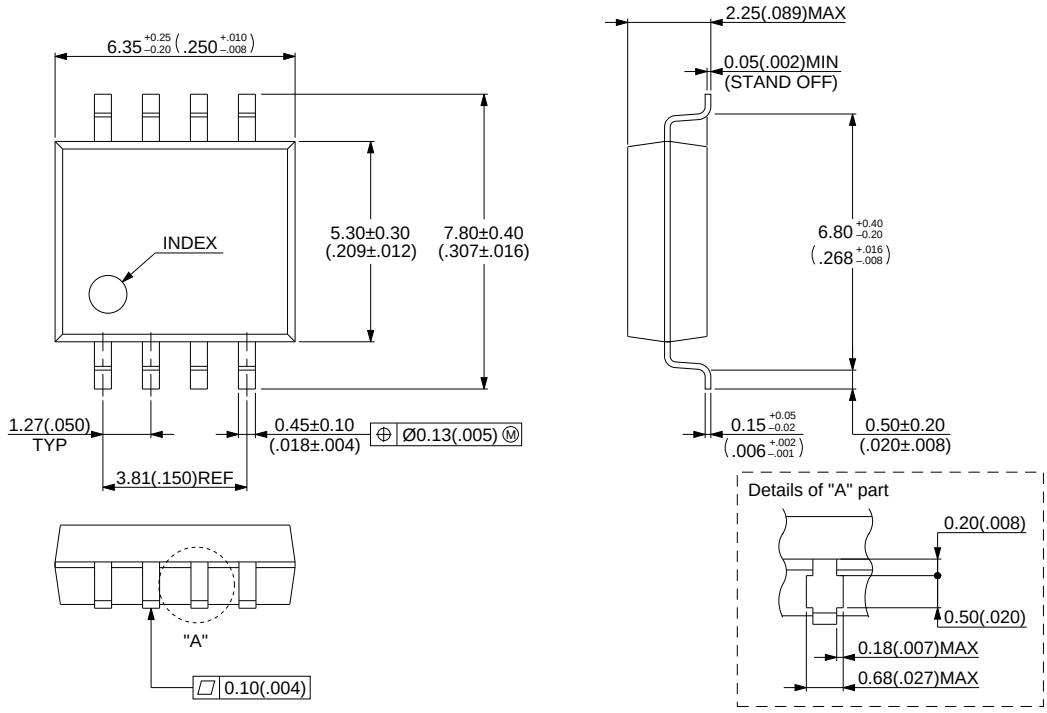



Dimensions in mm (inches).

# MB47393

## ■ PACKAGE DIMENSIONS (Continued)

8 pin, Plastic SOP
(FPT-8P-M01)



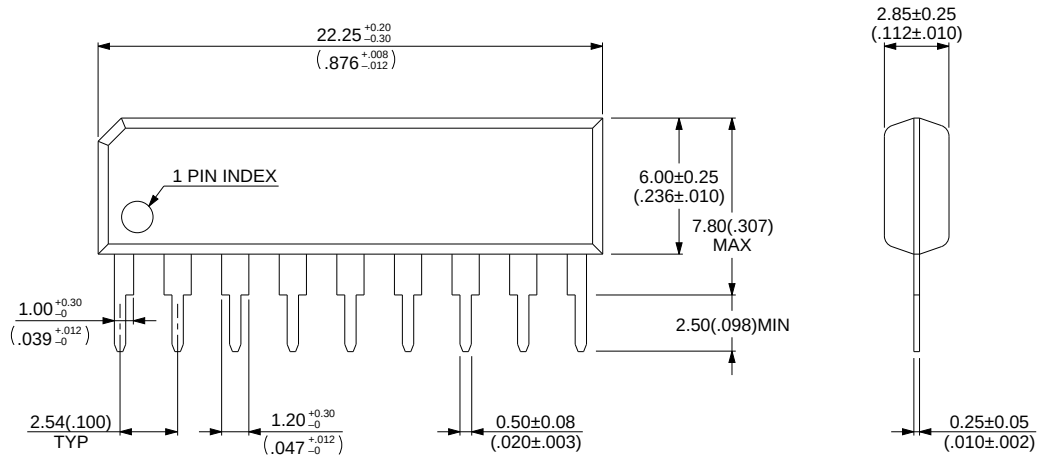



Dimensions in mm (inches).

# MB47393

## ■ PACKAGE DIMENSIONS (Continued)

9 pin, Plastic SIP
(SIP-9P-M01)






Dimensions in mm (inches).

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