

1M BIT (65,536 WORD × 16 BIT) CMOS MASK ROM

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## DESCRIPTION

The TC531024P/F is a 1,048,576 bits read only memory organized as 65,536 words by 16 bits.

The TC531024P/F is fabricated using Toshiba's advanced CMOS technology which provides the high speed and low power features with access time of 120ns/150ns, an operation current of 40mA at 8.3MHz and a standby current of 20μA.

The TC531024P/F is packaged in a standard 600mil 40pin DIP, or 525mil 40pin SOP.

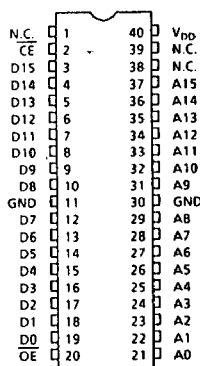
## FEATURES

| TC531024P/F                                  | - 12    | - 15     |
|----------------------------------------------|---------|----------|
| Power Supply                                 | 5V ± 5% | 5V ± 10% |
| Access Time (Max.)                           | 120ns   | 150ns    |
| Power Dissipation : Operating Current (Max.) | 40mA    | 35mA     |
| Power Dissipation : Standby Current (Max.)   | 20μA    | 20μA     |

- Single 5V Power Supply
- Fully Static Operation
- All Input and Output : TTL Compatible
- Three State Output
- 40pin 600mil width Plastic DIP
- 40pin 525mil width Plastic SOP

## PIN CONNECTION

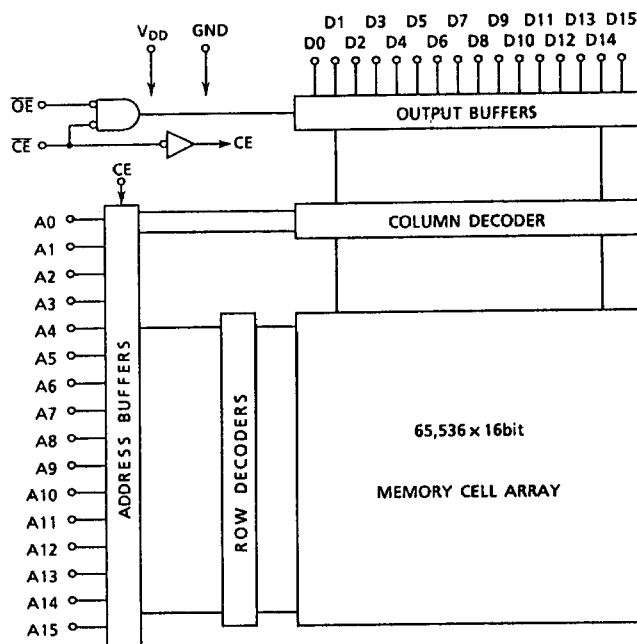
(TOP VIEW)



## PIN NAMES

|        |                     |
|--------|---------------------|
| A0~A15 | Address inputs      |
| D0~D15 | Data Outputs        |
| OE     | Output Enable Input |
| CE     | Chip Enable Input   |
| VDD    | Power Supply        |
| GND    | Ground              |
| N.C.   | No Connection       |

## BLOCK DIAGRAM



# TC531024P-12, TC531024P-15

## TC531024F-12, TC531024F-15

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### MAXIMUM RATINGS

| SYMBOL       | ITEM                         | RATING         | UNIT     |
|--------------|------------------------------|----------------|----------|
| $V_{DD}$     | Power Supply Voltage         | -0.5~7.0       | V        |
| $V_{IH}$     | Input Voltage                | -0.5~ $V_{DD}$ | V        |
| $V_{OUT}$    | Output Voltage               | 0~ $V_{DD}$    | V        |
| $P_D$        | Power Dissipation            | 1.0/0.6*       | W        |
| $T_{STG}$    | Storage Temperature          | -55~150        | °C       |
| $T_{OPR}$    | Operating Temperature        | 0~70           | °C       |
| $T_{SOLDER}$ | Soldering Temperature - Time | 260 · 10       | °C · sec |

Note : \* Plastic FP.

### D.C. OPERATING CONDITIONS ( $T_a = 0 \sim 70^\circ\text{C}$ )

| SYMBOL   | PARAMETER            | MIN. | MAX.           | UNIT |
|----------|----------------------|------|----------------|------|
| $V_{DD}$ | Power Supply Voltage | 4.5  | 5.5            | V    |
| $V_{IH}$ | Input High Voltage   | 2.2  | $V_{DD} + 0.3$ | V    |
| $V_{IL}$ | Input Low Voltage    | -0.3 | 0.8            | V    |

### D.C. OPERATING CHARACTERISTICS ( $T_a = 0 \sim 70^\circ\text{C}$ , $V_{DD} = 5V \pm 10\%$ )

| SYMBOL     | PARAMETER              | CONDITIONS                                                               |                     | MIN. | MAX.      | UNIT    |
|------------|------------------------|--------------------------------------------------------------------------|---------------------|------|-----------|---------|
| $I_{IL}$   | Input Leakage Current  | $0V \leq V_{IN} \leq V_{DD}$                                             |                     | -    | $\pm 1.0$ | $\mu A$ |
| $I_{LO}$   | Output Leakage Current | $0V \leq V_{OUT} \leq V_{DD}$                                            |                     | -    | $\pm 5.0$ |         |
| $I_{OH}$   | Output High Current    | $V_{OH} = 2.4V$                                                          |                     | -1.0 | -         | mA      |
| $I_{OL}$   | Output Low Current     | $V_{OL} = 0.4V$                                                          |                     | 3.2  | -         |         |
| $I_{DD51}$ | Standby Current        | $\overline{CE} = 2.2V$                                                   |                     | -    | 2.0       | $\mu A$ |
| $I_{DD52}$ |                        | $\overline{CE} = V_{DD} - 0.2V$                                          |                     | -    | 20        |         |
| $I_{DDO1}$ | Operating Current      | $\overline{CE} = V_{IL}, V_{IN} = V_{IH} / V_{IL}$<br>$I_{OUT} = 0mA$    | $t_{cycle} = 120ns$ | -    | 50        | mA      |
|            |                        |                                                                          | $t_{cycle} = 150ns$ | -    | 45        |         |
| $I_{DDO2}$ |                        | $\overline{CE} = 0.2V, V_{IN} = V_{DD} - 0.2V / 0.2V$<br>$I_{OUT} = 0mA$ | $t_{cycle} = 120ns$ | -    | 40        |         |
|            |                        |                                                                          | $t_{cycle} = 150ns$ | -    | 35        |         |

### CAPACITANCE

| SYMBOL    | PARAMETER          | CONDITIONS                                | MIN. | MAX. | UNIT |
|-----------|--------------------|-------------------------------------------|------|------|------|
| $C_{IN}$  | Input Capacitance  | $f = 1\text{MHz}, T_a = 25^\circ\text{C}$ | -    | 10   | pF   |
| $C_{OUT}$ | Output Capacitance | $f = 1\text{MHz}, T_a = 25^\circ\text{C}$ | -    | 10   | pF   |

Note : This Parameter is periodically sampled and is not 100% tested.

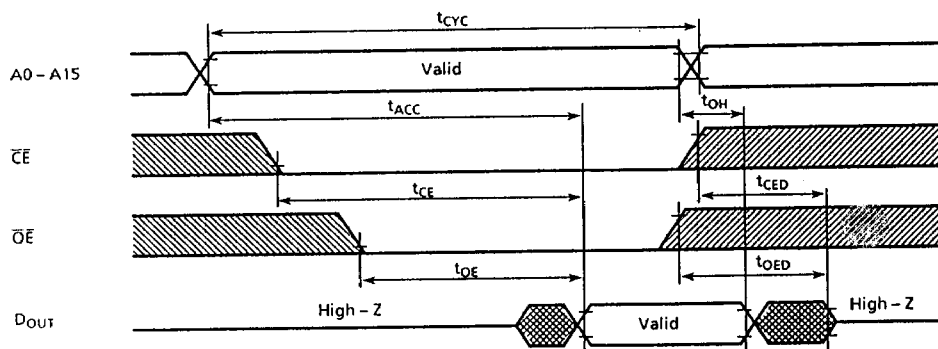
# A.C. CHARACTERISTICS (Ta = 0°C~70°C)

| SYMBOL           | PARAMETER                                | V <sub>DD</sub> = 5V ± 5% |      | V <sub>DD</sub> = 5V ± 10% |      | UNIT |
|------------------|------------------------------------------|---------------------------|------|----------------------------|------|------|
|                  |                                          | MIN.                      | MAX. | MIN.                       | MAX. |      |
| t <sub>ACC</sub> | Access Time                              | –                         | 120  | –                          | 150  | ns   |
| t <sub>CE</sub>  | Chip Enable Access Time                  | –                         | 120  | –                          | 150  | ns   |
| t <sub>OE</sub>  | Output Enable Access Time                | –                         | 70   | –                          | 70   | ns   |
| t <sub>CED</sub> | Output Disable Time from $\overline{CE}$ | 0                         | 60   | 0                          | 60   | ns   |
| t <sub>OED</sub> | Output Disable Time from $\overline{OE}$ | 0                         | 60   | 0                          | 60   | ns   |
| t <sub>OH</sub>  | Output Hold Time                         | 5                         | –    | 5                          | –    | ns   |
| t <sub>CYC</sub> | Cycle Time                               | 120                       | –    | 150                        | –    | ns   |

## A.C. TEST CONDITIONS

|                                     |                      |
|-------------------------------------|----------------------|
| Output Load                         | : 100pF + 1TTL       |
| Input Levels                        | : 0.6V / 2.4V        |
| Timing Measurement Reference Levels | Input : 0.8V / 2.2V  |
|                                     | Output : 0.8V / 2.0V |
| Input Rise and Fall Time (10%~90%)  | : 5ns                |

## TIMING WAVEFORMS



## OPERATION MODE

| MODE            | $\overline{CE}$ | $\overline{OE}$ | A0~A15 | Outputs  | Power     |
|-----------------|-----------------|-----------------|--------|----------|-----------|
| Read            | L               | L               | Valid  | Data Out | Operating |
| Standby         | H               | *               | *      | High-Z   | Standby   |
| Output Deselect | L               | H               | *      | High-Z   | Operating |

H : VIH L : VIL \* : VIH or VIL

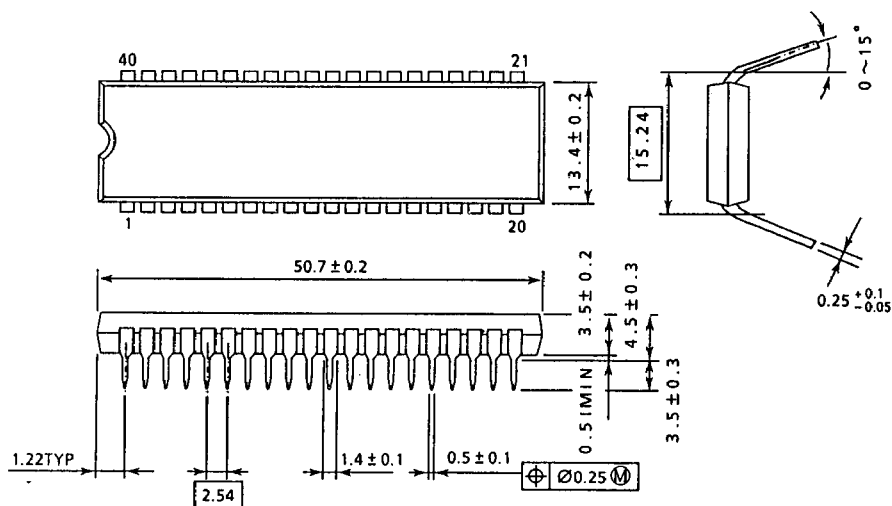
# TC531024P-12, TC531024P-15 TC531024F-12, TC531024F-15

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## OUTLINE DRAWINGS

Plastic DIP (DIP40-P-600)

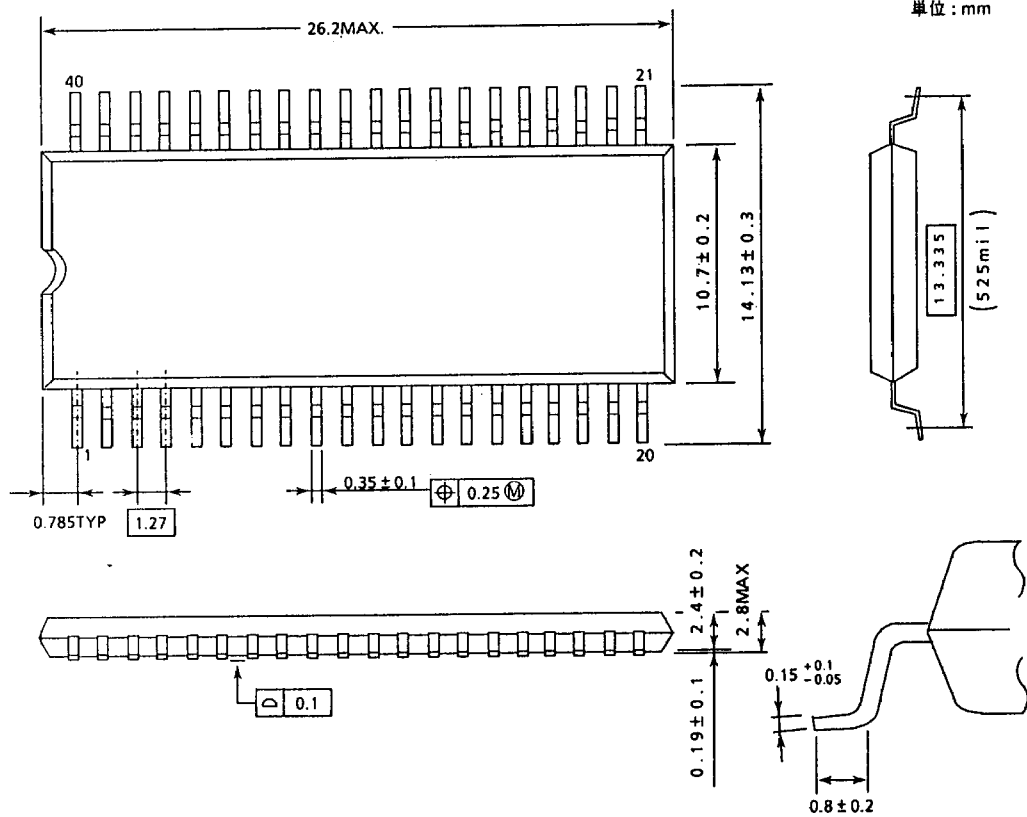
単位 : mm



Note: Package width and length do not include mold protrusion, allowable mold protrusion is 0.15mm.

OUTLINE DRAWINGS

Plastic FP ( SOP40-P-525 )



Note : Package width and length do not include mold protrusion , allowable mold protrusion is 0.15mm.