

# M5M5V408BFP,TP,RT,KV

## 4194304-BIT (524288-WORD BY 8-BIT) CMOS STATIC RAM

### DESCRIPTION

The M5M5V408B is a family of low voltage 4-Mbit static RAMs organized as 524,288-words by 8-bit, fabricated by Mitsubishi's high-performance 0.25µm CMOS technology.

The M5M5V408B is suitable for memory applications where a simple interfacing, battery operating and battery backup are the important design objectives.

M5M5V408B is packaged in 32-pin plastic SOP, 32-pin plastic TSOP and 32-pin 8mm x 13.4mm STSOP packages. Two types of TSOPs and two types of STSOPs are available, M5M5V408BTP (normal-lead-bend TSOP), M5M5V408BRT (reverse-lead-bend TSOP), M5M5V408BKV (normal-lead-bend STSOP) and M5M5V408BKR (reverse-lead-bend STSOP). These two types TSOPs and two types STSOPs are suitable for a surface mounting on double-sided printed circuit boards.

From the point of operating temperature, the family is divided into three versions; "Standard", "W-version", and "I-version". Those are summarized in the part name table below.

### FEATURES

- Single +2.7~+3.6V power supply
- Small stand-by current: 0.3µA(3V,typ.)
- No clocks, No refresh
- Data retention supply voltage=2.0V to 3.6V
- All inputs and outputs are TTL compatible.
- Easy memory expansion by  $\bar{S}$
- Common Data I/O
- Three-state outputs: OR-tie capability
- $\bar{OE}$  prevents data contention in the I/O bus
- Process technology: 0.25µm CMOS
- Package:
  - M5M5V408BFP: 32 pin 525 mil SOP
  - M5M5V408BTP/RT: 32 PIN 400mil TSOP(II)
  - M5M5V408BKV/KR: 32 pin 8mm x13.4mm STSOP

### PART NAME TABLE

| Version,<br>Operating<br>temperature | Part name<br>(## stands for "FP","TP",<br>"RT","KV"or"KR") | Power<br>Supply | Access<br>time<br>max. | Stand-by current I <sub>cc(PD)</sub> , V <sub>cc</sub> =3.0V |      |                |      |      |      | Active<br>current<br>I <sub>cc1</sub><br>(3.0V, typ.) |
|--------------------------------------|--|-----------------|------------------------|--|------|----------------|------|------|------|---|
|                                      |  |                 |                        | typical *  |      | Ratings (max.) |      |      |      |   |
|                                      |  |                 |                        | 25°C   | 40°C | 25°C           | 40°C | 70°C | 85°C |   |
| Standard<br>0 ~ +70°C                | M5M5V408B## -70L   | 2.7 ~ 3.6V      | 70ns                   | ---  | ---  | ---            | ---  | 30µA | ---  | 30mA<br>(10MHz)<br><br>5mA<br>(1MHz)                  |
|                                      | M5M5V408B## -85L   |                 | 85ns                   | ---  | ---  | ---            | ---  | ---  |      |   |
|                                      | M5M5V408B## -70H   | 2.7 ~ 3.6V      | 70ns                   | 0.3µA  | 1µA  | 1µA            | 3µA  | 15µA | ---  |   |
|                                      | M5M5V408B## -85H   |                 | 85ns                   | ---  | ---  | ---            | ---  | ---  |      |   |
| W-version<br>-20 ~ +85°C             | M5M5V408B## -70LW  | 2.7 ~ 3.6V      | 70ns                   | ---  | ---  | ---            | ---  | 30µA | 60µA |   |
|                                      | M5M5V408B## -85LW  |                 | 85ns                   | ---  | ---  | ---            | ---  | ---  |      |   |
|                                      | M5M5V408B## -70HW  | 2.7 ~ 3.6V      | 70ns                   | 0.3µA  | 1µA  | 1µA            | 3µA  | 15µA | 30µA |   |
|                                      | M5M5V408B## -85HW  |                 | 85ns                   | ---  | ---  | ---            | ---  | ---  |      |   |
| I-version<br>-40 ~ +85°C             | M5M5V408B## -70LI  | 2.7 ~ 3.6V      | 70ns                   | ---  | ---  | ---            | ---  | 30µA | 60µA |   |
|                                      | M5M5V408B## -85LI  |                 | 85ns                   | ---  | ---  | ---            | ---  | ---  |      |   |
|                                      | M5M5V408B## -70HI  | 2.7 ~ 3.6V      | 70ns                   | 0.3µA  | 1µA  | 1µA            | 3µA  | 15µA | 30µA |   |
|                                      | M5M5V408B## -85HI  |                 | 85ns                   | ---  | ---  | ---            | ---  | ---  |      |   |

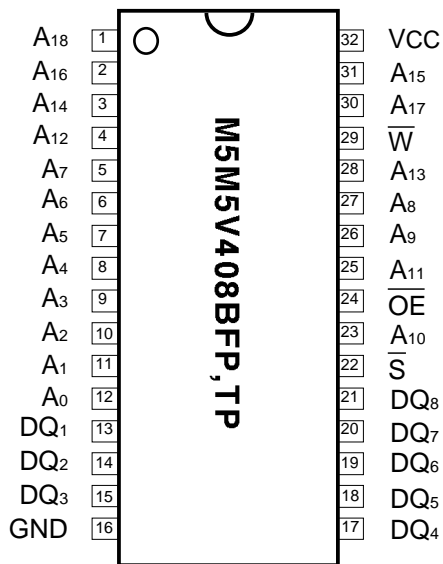
\* "typical" parameter is sampled, not 100% tested.

# M5M5V408BFP,TP,RT,KV

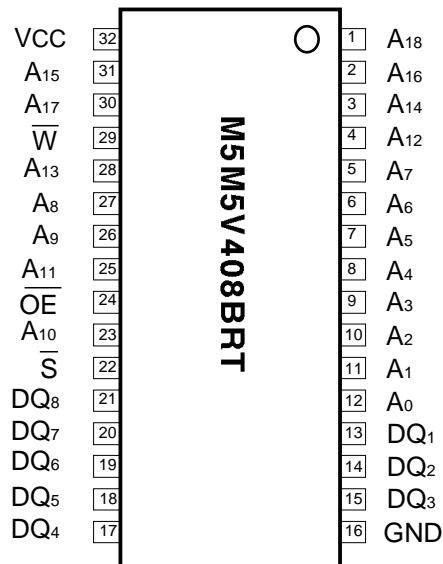
4194304-BIT (524288-WORD BY 8-BIT) CMOS STATIC RAM

## PIN CONFIGURATION (TOP VIEW)

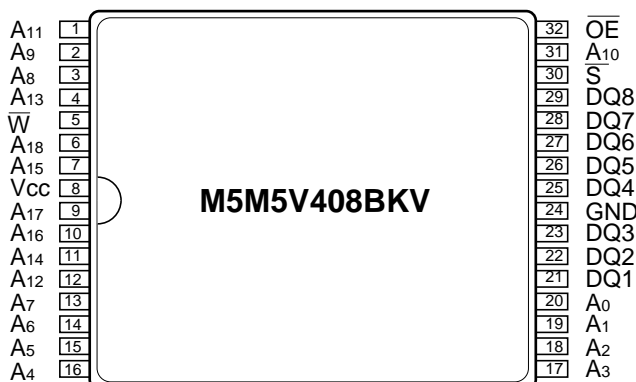
| Pin             | Function            |
|-----------------|---------------------|
| A0 ~ A18        | Address input       |
| DQ1 ~ DQ8       | Data input / output |
| $\overline{S}$  | Chip select input   |
| $\overline{W}$  | Write control input |
| $\overline{OE}$ | Output inable input |
| Vcc             | Power supply        |
| GND             | Ground supply       |



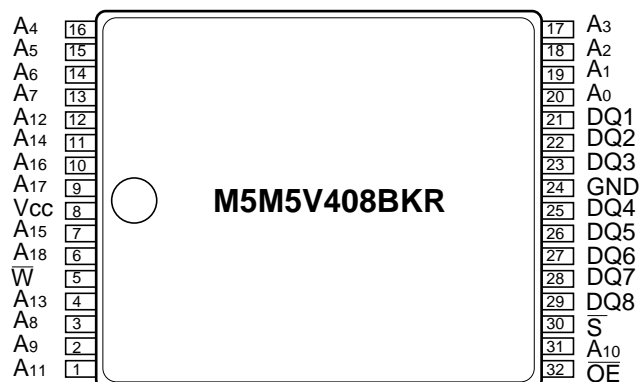
Outline 32P2M-A (FP)  
32P3Y-H (TP)



Outline 32P3Y-J (RT)



Outline 32P3K-B



Outline 32P3K-C

# M5M5V408BFP,TP,RT,KV

## 4194304-BIT (524288-WORD BY 8-BIT) CMOS STATIC RAM

### FUNCTION

The M5M5408BFP,TP,RT,KV,KR is organized as 524,288-words by 8-bit. These devices operate on a single +2.7~3.6V power supply, and are directly TTL compatible to both input and output. Its fully static circuit needs no clocks and no refresh, and makes it useful.

A write operation is executed during the  $\overline{S}$  low and  $\overline{W}$  low overlap time. The address(A0~A18) must be set up before the write cycle

A read operation is executed by setting  $\overline{W}$  at a high level and  $\overline{OE}$  at a low level while S are in an active state( $\overline{S}=L$ ).

When setting  $\overline{S}$  at a high level, the chips are in a non-selectable mode in which both reading and writing are disabled. In this mode, the output stage is in a high-impedance state, allowing OR-tie with other chips. Setting the  $\overline{OE}$  at a high level, the output stage is in a high-impedance state, and the data bus contention problem in the write cycle is eliminated.

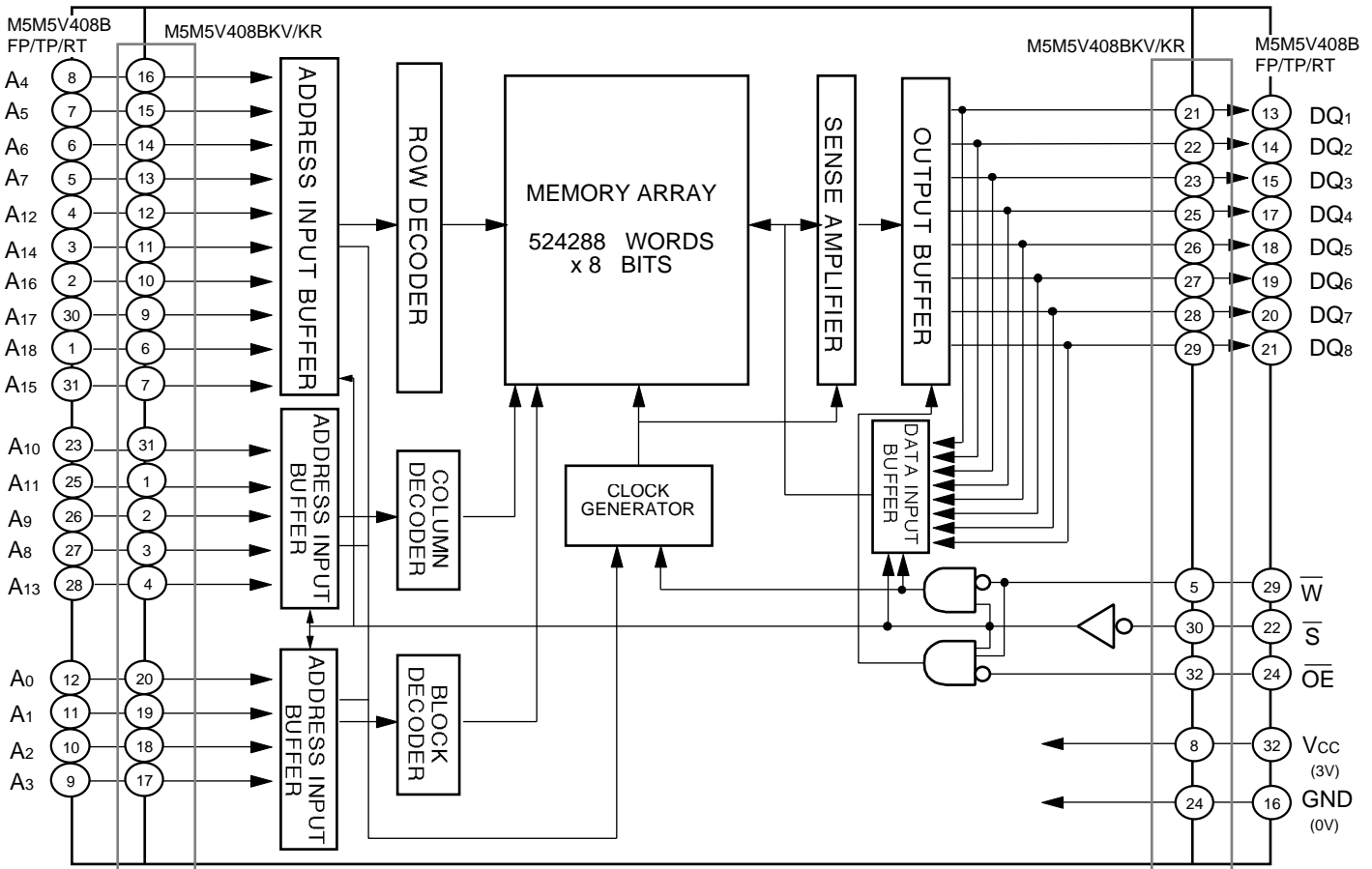
The power supply current is reduced as low as 0.3 $\mu$ A(25°C, typical), and the memory data can be held at +2V power supply, enabling battery back-up operation during power failure or power-down operation in the non-selected mode.

### FUNCTION TABLE

| $\overline{S}$ | $\overline{W}$ | $\overline{OE}$ | Mode          | DQ              | I <sub>cc</sub> |
|----------------|----------------|-----------------|---------------|-----------------|-----------------|
| H              | X              | X               | Non selection | High-impedance  | Standby         |
| L              | L              | X               | Write         | Data input (D)  | Active          |
| L              | H              | L               | Read          | Data output (Q) | Active          |
| L              | H              | H               | Read          | High-impedance  | Active          |

| Pin             | Function            |
|-----------------|---------------------|
| A0 ~ A18        | Address input       |
| DQ1 ~ DQ8       | Data input / output |
| $\overline{S}$  | Chip select input   |
| $\overline{W}$  | Write control input |
| $\overline{OE}$ | Output inable input |
| V <sub>cc</sub> | Power supply        |
| GND             | Ground supply       |

### BLOCK DIAGRAM



**M5M5V408BFP,TP,RT,KV****4194304-BIT (524288-WORD BY 8-BIT) CMOS STATIC RAM****ABSOLUTE MAXIMUM RATINGS**

| Symbol           | Parameter             | Conditions           | Ratings                       | Units |
|------------------|-----------------------|----------------------|-------------------------------|-------|
| V <sub>CC</sub>  | Supply voltage        | With respect to GND  | -0.5* ~ +4.6                  | V     |
| V <sub>I</sub>   | Input voltage         | With respect to GND  | -0.5* ~ V <sub>CC</sub> + 0.5 |       |
| V <sub>O</sub>   | Output voltage        | With respect to GND  | 0 ~ V <sub>CC</sub>           |       |
| P <sub>d</sub>   | Power dissipation     | T <sub>a</sub> =25°C | 700                           | mW    |
| T <sub>a</sub>   | Operating temperature | Standard (-L, -H)    | 0 ~ +70                       | °C    |
|                  |                       | W-version (-LW, -HW) | -20 ~ +85                     |       |
|                  |                       | I-version (-LI, -HI) | -40 ~ +85                     |       |
| T <sub>stg</sub> | Storage temperature   |                      | -65 ~ 150                     | °C    |

\* -3.0V in case of AC (Pulse width 30ns)

**DC ELECTRICAL CHARACTERISTICS**(V<sub>CC</sub>=2.7 ~ 3.6V, unless otherwise noted)

| Symbol           | Parameter                                     | Conditions   | Limits                |             |                       | Units |    |    |
|------------------|---|--|-----------------------|-------------|-----------------------|-------|----|----|
|                  |   |  | Min                   | Typ         | Max                   |       |    |    |
| V <sub>IH</sub>  | High-level input voltage                      |  | 2.2                   |             | V <sub>CC</sub> +0.3V | V     |    |    |
| V <sub>IL</sub>  | Low-level input voltage                       |  | -0.3*                 |             | 0.6                   |       |    |    |
| V <sub>OH1</sub> | High-level output voltage 1                   | I <sub>OH</sub> = -0.5mA   | 2.4                   |             |                       |       |    |    |
| V <sub>OH2</sub> | High-level output voltage 2                   | I <sub>OH</sub> = -0.05mA  | V <sub>CC</sub> -0.5V |             |                       |       |    |    |
| V <sub>OL</sub>  | Low-level output voltage                      | I <sub>OL</sub> =2mA   |                       |             | 0.4                   |       |    |    |
| I <sub>I</sub>   | Input leakage current                         | V <sub>I</sub> =0 ~ V <sub>CC</sub>  |                       |             | ±1                    | μA    |    |    |
| I <sub>O</sub>   | Output leakage current                        | $\bar{S}=V_{IH}$ or $\bar{OE}=V_{IH}$ , V <sub>I/O</sub> =0 ~ V <sub>CC</sub>                    |                       |             | ±1                    | μA    |    |    |
| I <sub>CC1</sub> | Active supply current<br>(AC, CMOS-level)     | $\bar{S}$ 0.2V Output-open<br>Other inputs 0.2V or V <sub>CC</sub> -0.2V                         | f=10MHz               | -           | 30                    | 40    | mA |    |
|                  |   |  | f=1MHz                | -           | 5                     | 7     |    |    |
| I <sub>CC2</sub> | Active supply current<br>(AC, TTL-level)      | $\bar{S}=V_{IL}$ Output-open<br>Other inputs=V <sub>IH</sub> or V <sub>IL</sub>                  | f=10MHz               | -           | 30                    | 40    | mA |    |
|                  |   |  | f=1MHz                | -           | 5                     | 7     |    |    |
| I <sub>CC3</sub> | Stand by supply current<br>(CMOS-level input) | V <sub>CC</sub> =3.6V, max.<br>$\bar{S}$ V <sub>CC</sub> -0.2V<br>Other inputs=0~V <sub>CC</sub> | -LW, -LI              | +85°C       | -                     | -     | 80 | μA |
|                  |   |  | -L, -LW, -LI          | +70°C       | -                     | -     | 40 |    |
|                  |   |  | -HW, -HI              | +85°C       | -                     | -     | 40 |    |
|                  |   |  | -H, -HW, -HI          | +70°C       | -                     | -     | 20 |    |
|                  |   |  |                       | +40°C       | -                     | 1     | 5  |    |
|                  |   |  | -H                    | 0 ~ +25°C   | -                     | 0.3   | 2  |    |
|                  |   |  | -HW                   | -20 ~ +25°C | -                     | 0.3   | 2  |    |
| I <sub>CC4</sub> | Stand by supply current<br>(TTL-level input)  | $\bar{S}=V_{IH}$ , Other inputs= 0 ~ V <sub>CC</sub>   |                       |             |                       | 0.5   | mA |    |
|                  |   |  |                       |             |                       |       |    |    |

Note 1: Direction for current flowing into IC is indicated as positive (no mark)

\* -3.0V in case of AC (Pulse width 30ns)

Note 2: Typical value is for V<sub>CC</sub>=3.0V**CAPACITANCE**(V<sub>CC</sub>=2.7 ~ 3.6V, unless otherwise noted)

| Symbol         | Parameter          | Conditions   | Limits |     |     | Units |
|----------------|--------------------|--|--------|-----|-----|-------|
|                |                    |  | Min    | Typ | Max |       |
| C <sub>I</sub> | Input capacitance  | V <sub>I</sub> =GND, V <sub>I</sub> =25mVrms, f=1MHz |        |     | 8   | pF    |
| C <sub>O</sub> | Output capacitance | V <sub>O</sub> =GND, V <sub>O</sub> =25mVrms, f=1MHz |        |     | 10  |       |



# M5M5V408BFP,TP,RT,KV

## 4194304-BIT (524288-WORD BY 8-BIT) CMOS STATIC RAM

### AC ELECTRICAL CHARACTERISTICS (V<sub>CC</sub>=2.7 ~ 3.6V, unless otherwise noted)

#### (1) TEST CONDITIONS

|                               |   |
|-------------------------------|---|
| Supply voltage                | 2.7V~3.6V   |
| Input pulse                   | V <sub>IH</sub> =2.4V, V <sub>IL</sub> =0.4V  |
| Input rise time and fall time | 5ns   |
| Reference level               | V <sub>OH</sub> =V <sub>OL</sub> =1.5V<br>Transition is measured ±500mV from steady state voltage.(for t <sub>en</sub> , t <sub>dis</sub> ) |
| Output loads                  | Fig.1, CL=30pF<br>CL=5pF (for t <sub>en</sub> , t <sub>dis</sub> )  |

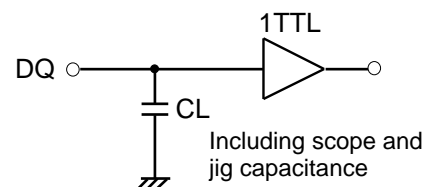


Fig.1 Output load

#### (2) READ CYCLE

| Symbol               | Parameter                                      | Limits                         |     |                                |     | Units |
|----------------------|--|--------------------------------|-----|--------------------------------|-----|-------|
|                      |  | M5M5V408B<br>FP,TP,RT,KV,KR-70 |     | M5M5V408B<br>FP,TP,RT,KV,KR-85 |     |       |
|                      |  | Min                            | Max | Min                            | Max |       |
| t <sub>CR</sub>      | Read cycle time                                | 70                             |     | 85                             |     | ns    |
| t <sub>a(A)</sub>    | Address access time                            |                                | 70  |                                | 85  | ns    |
| t <sub>a(S)</sub>    | Chip select access time                        |                                | 70  |                                | 85  | ns    |
| t <sub>a(OE)</sub>   | Output enable access time                      |                                | 35  |                                | 45  | ns    |
| t <sub>dis(S)</sub>  | Output disable time after $\bar{S}$ high       |                                | 25  |                                | 30  | ns    |
| t <sub>dis(OE)</sub> | Output disable time after $\overline{OE}$ high |                                | 25  |                                | 30  | ns    |
| t <sub>en(S)</sub>   | Output enable time after $\bar{S}$ low         | 10                             |     | 10                             |     | ns    |
| t <sub>en(OE)</sub>  | Output enable time after $\overline{OE}$ low   | 5                              |     | 5                              |     | ns    |
| t <sub>v(A)</sub>    | Data valid time after address                  | 10                             |     | 10                             |     | ns    |

#### (3) WRITE CYCLE

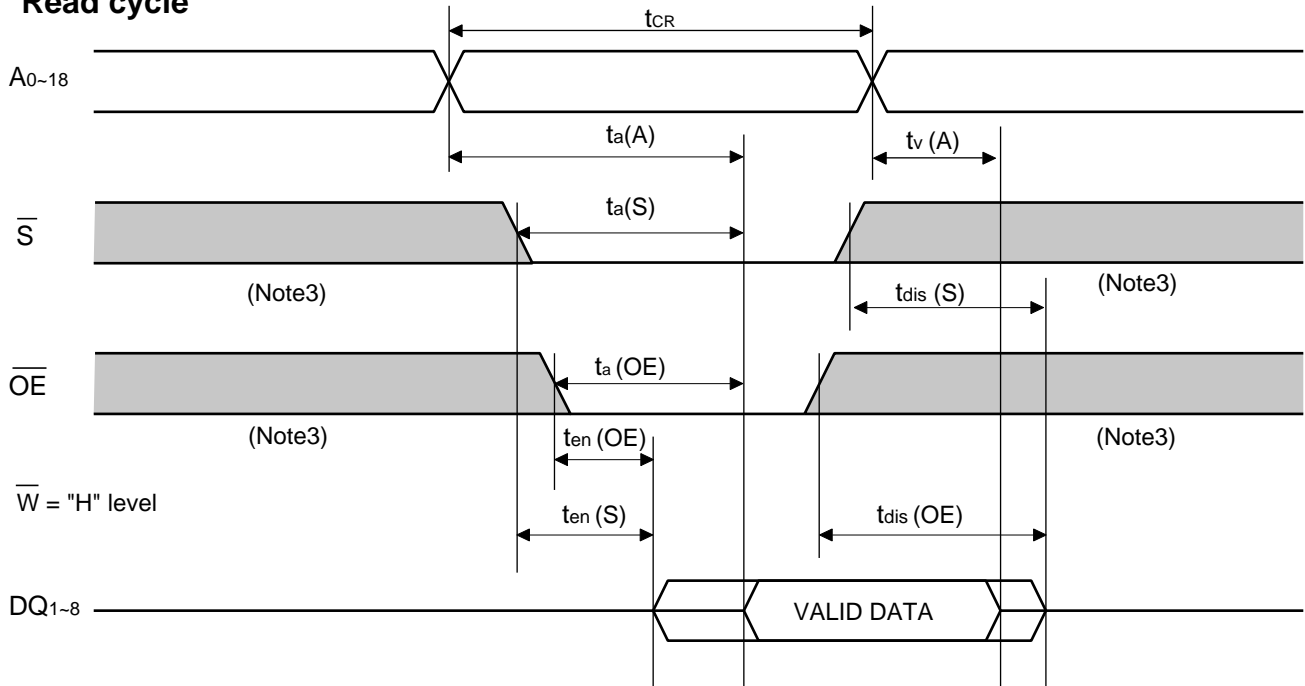
| Symbol                | Parameter  | Limits                         |     |                                |     | Units |
|-----------------------|--|--------------------------------|-----|--------------------------------|-----|-------|
|                       |  | M5M5V408B<br>FP,TP,RT,KV,KR-70 |     | M5M5V408B<br>FP,TP,RT,KV,KR-85 |     |       |
|                       |  | Min                            | Max | Min                            | Max |       |
| t <sub>CW</sub>       | Write cycle time                                   | 70                             |     | 85                             |     | ns    |
| t <sub>w(W)</sub>     | Write pulse width                                  | 55                             |     | 60                             |     | ns    |
| t <sub>su(A)</sub>    | Address set up time                                | 0                              |     | 0                              |     | ns    |
| t <sub>su(A-WH)</sub> | Address set up time with respect to $\bar{W}$ high | 65                             |     | 70                             |     | ns    |
| t <sub>su(S)</sub>    | Chip select set up time                            | 65                             |     | 70                             |     | ns    |
| t <sub>su(D)</sub>    | Data set up time                                   | 35                             |     | 35                             |     | ns    |
| t <sub>h(D)</sub>     | Data hold time                                     | 0                              |     | 0                              |     | ns    |
| t <sub>rec(W)</sub>   | Write recovery time                                | 0                              |     | 0                              |     | ns    |
| t <sub>dis(W)</sub>   | Output disable time after $\bar{W}$ low            |                                | 25  |                                | 30  | ns    |
| t <sub>dis(OE)</sub>  | Output disable time after $\overline{OE}$ high     |                                | 25  |                                | 30  | ns    |
| t <sub>en(W)</sub>    | Output enable time after $\bar{W}$ high            | 5                              |     | 5                              |     | ns    |
| t <sub>en(OE)</sub>   | Output enable time after $\overline{OE}$ low       | 5                              |     | 5                              |     | ns    |

# M5M5V408BFP,TP,RT,KV

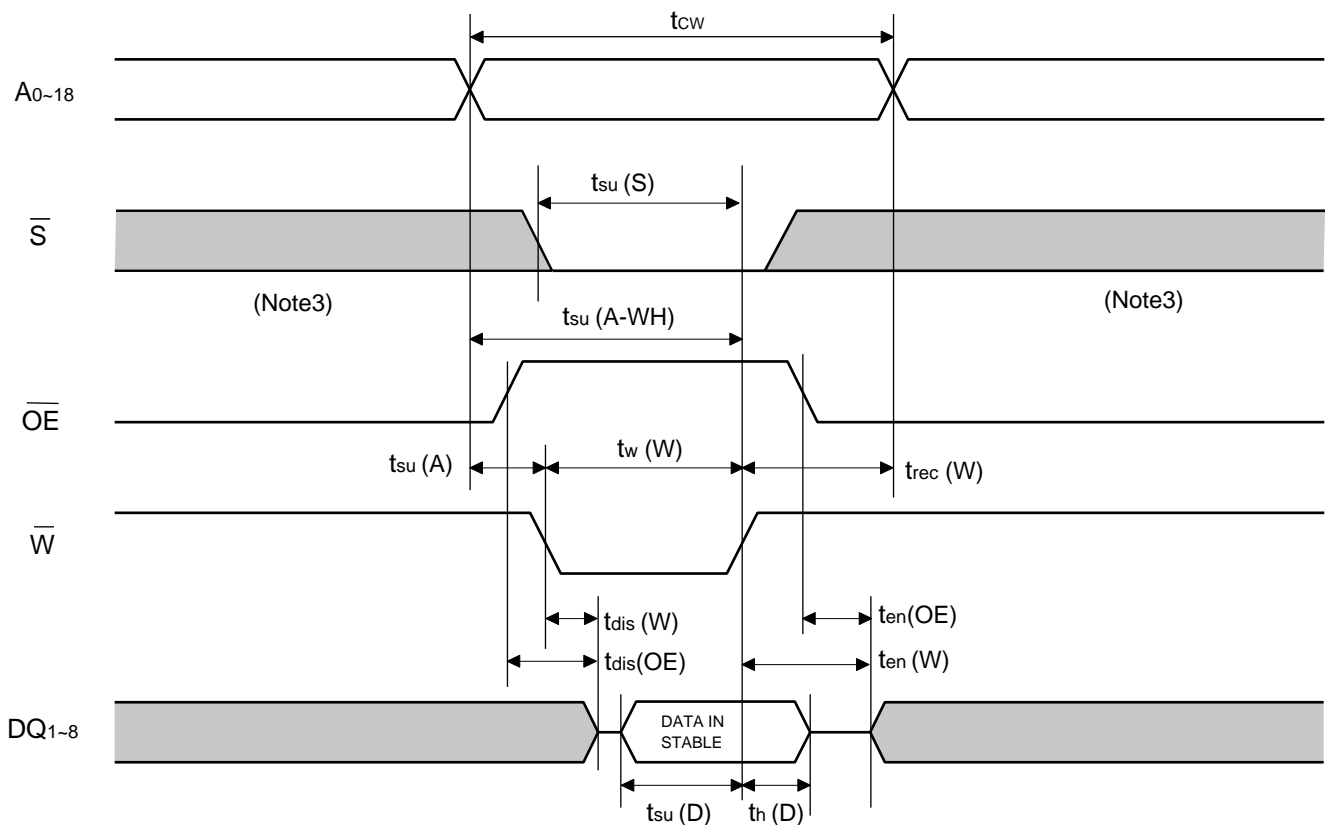
4194304-BIT (524288-WORD BY 8-BIT) CMOS STATIC RAM

## (4)TIMING DIAGRAMS

### Read cycle



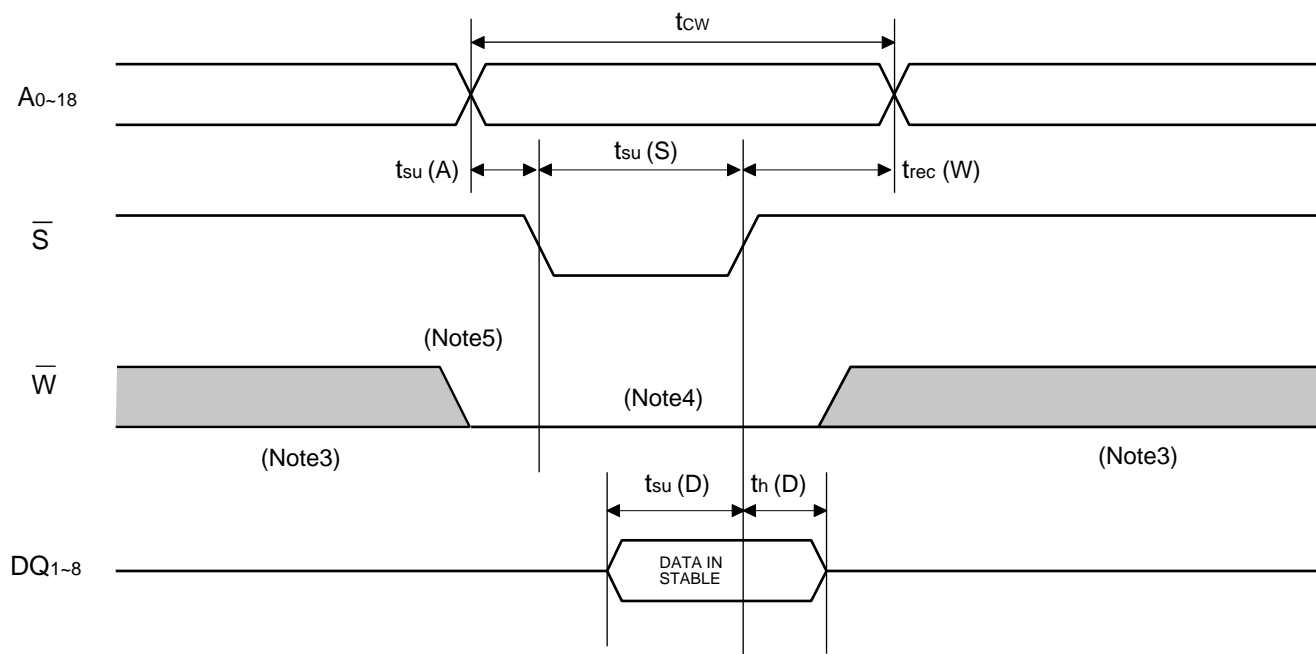
### Write cycle ( $\bar{W}$ control mode)



# M5M5V408BFP,TP,RT,KV

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## Write cycle ( $\overline{S}$ control mode)



Note 3: Hatching indicates the state is "don't care".

Note 4: A Write occurs during the overlap of a low  $\overline{S}$  and a low  $\overline{W}$ .

Note 5: If  $\overline{W}$  goes low simultaneously with or prior to  $\overline{S}$ , the output remains in the high impedance state.

Note 6: Don't apply inverted phase signal externally when DQ pin is in output mode.

# M5M5V408BFP,TP,RT,KV

4194304-BIT (524288-WORD BY 8-BIT) CMOS STATIC RAM

## POWER DOWN CHARACTERISTICS

### (1) ELECTRICAL CHARACTERISTICS

| Symbol                       | Parameter                   | Test conditions   | Limits       |             |     | Units |    |    |
|------------------------------|-----------------------------|---|--------------|-------------|-----|-------|----|----|
|                              |                             |   | Min          | Typ         | Max |       |    |    |
| V <sub>cc</sub> (PD)         | Power down supply voltage   |   | 2.0          |             |     | V     |    |    |
| V <sub>i</sub> ( $\bar{S}$ ) | Chip select input $\bar{S}$ |   | 2.0          |             |     | V     |    |    |
| I <sub>cc</sub> (PD)         | Power down supply current   | V <sub>cc</sub> =3.0V,<br>$\bar{S}$ V <sub>cc</sub> -0.2V,<br>Other inputs =<br>0 ~ V <sub>cc</sub> | -LW, -LI     | +85°C       | -   | -     | 60 | μA |
|                              |                             |   | -L, -LW, -LI | +70°C       | -   | -     | 30 | μA |
|                              |                             |   | -HW, -HI     | +85°C       | -   | -     | 30 | μA |
|                              |                             |   | -H, -HW, -HI | +70°C       | -   | -     | 15 | μA |
|                              |                             |   |              | +40°C       | -   | 1     | 3  | μA |
|                              |                             |   | -H           | 0 ~ +25°C   | -   | 0.3   | 1  | μA |
|                              |                             |   | -HW          | -20 ~ +25°C | -   | 0.3   | 1  | μA |
| -HI                          | -40 ~ +25°C                 | -   | 0.3          | 1           | μA  |       |    |    |

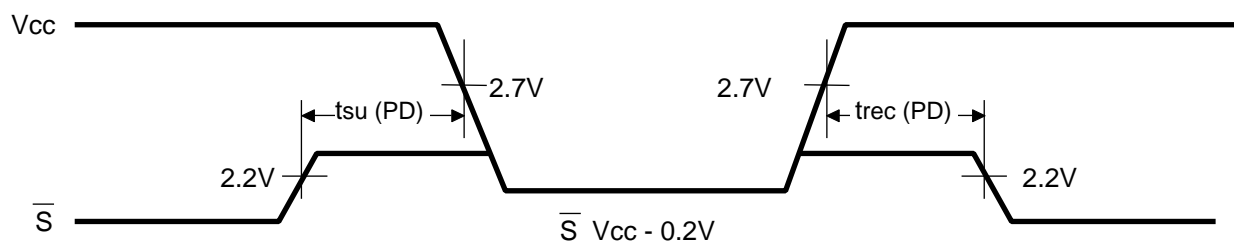
Typical value is based on sampling.

### (2) TIMING REQUIREMENTS

| Symbol                | Parameter                | Test conditions | Limits |     |     | Units |
|-----------------------|--------------------------|-----------------|--------|-----|-----|-------|
|                       |                          |                 | Min    | Typ | Max |       |
| t <sub>su</sub> (PD)  | Power down set up time   |                 | 0      |     |     | ns    |
| t <sub>rec</sub> (PD) | Power down recovery time |                 | 5      |     |     | ms    |

### (3) TIMING DIAGRAM

$\bar{S}$  control mode





# M5M5V408BFP,TP,RT,KV

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4194304-BIT (524288-WORD BY 8-BIT) CMOS STATIC RAM

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## Revision History

| <u>Revision No.</u> | <u>History</u>  | <u>Date</u> | <u>Remarks</u> |
|---------------------|---|-------------|----------------|
| K0.1e               | The first edition                                       | '98.3.05    | Preliminary    |
| K0.2e               | Added M5M5V408BFP/TP/RT                                 | '98.7.30    | Preliminary    |
| K1.0e               | The first product version                               | '98.9.7     | ---            |
| K2.0e               | 1) Speed items revised:<br>70ns added and 100ns deleted |             |                |
|                     | 2) lcc3 and lcc(PD) limits revised                      | '99.3.10    | ---            |

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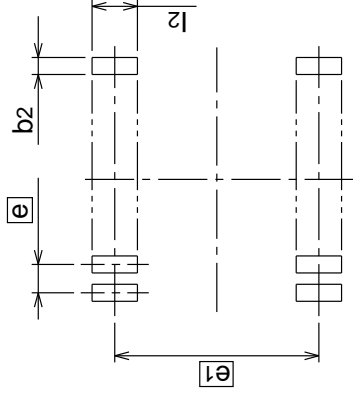
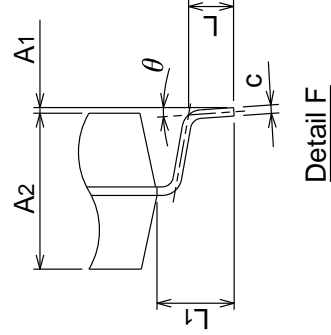
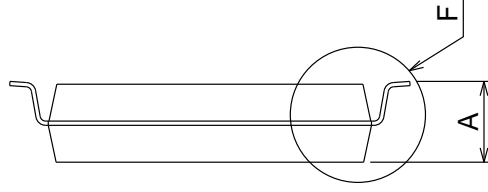
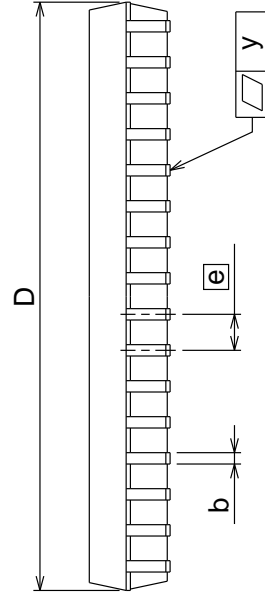
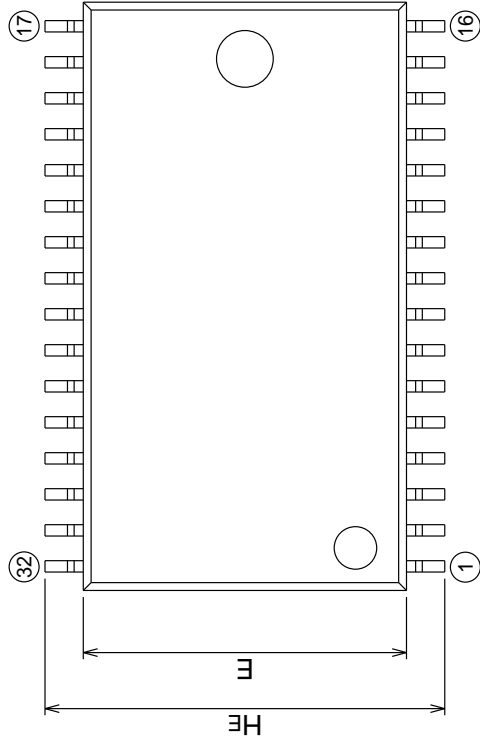
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# 32P2M-A

# Plastic 32pin 525mil SOP

|                                       |                 |                   |                           |
|---------------------------------------|-----------------|-------------------|---------------------------|
| EIAJ Package Code<br>SOP32-P-525-1.27 | JEDEC Code<br>- | Weight(g)<br>1.29 | Lead Material<br>Alloy 42 |
|---------------------------------------|-----------------|-------------------|---------------------------|



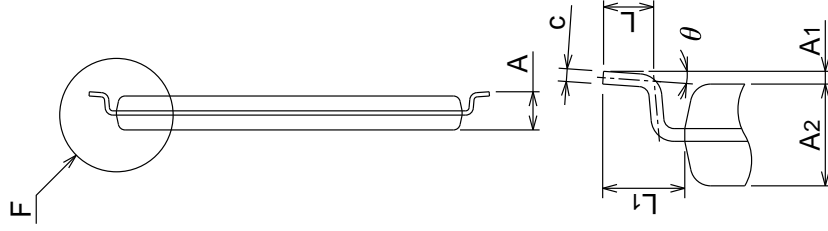
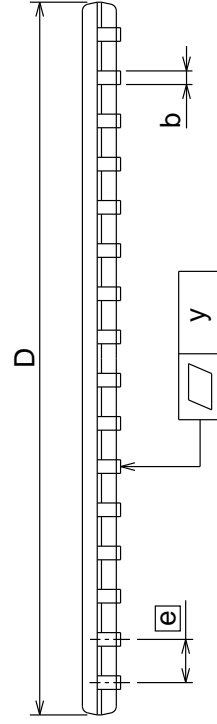
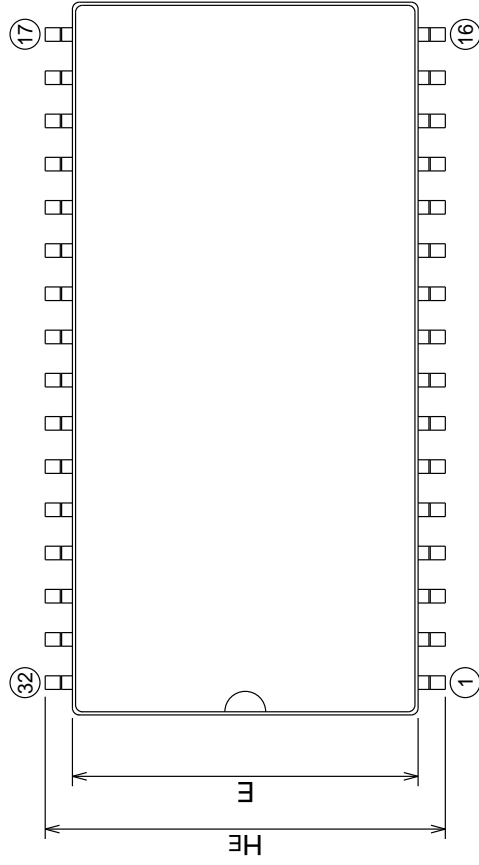
Recommended Mount Pad

| Symbol   | Dimension in Millimeters |       |       |
|----------|--------------------------|-------|-------|
|          | Min                      | Nom   | Max   |
| A        | -                        | -     | 3.05  |
| A1       | 0                        | 0.1   | 0.2   |
| A2       | -                        | 2.75  | -     |
| b        | 0.35                     | 0.4   | 0.5   |
| c        | 0.13                     | 0.15  | 0.2   |
| D        | 20.55                    | 20.75 | 20.95 |
| E        | 11.3                     | 11.4  | 11.5  |
| e        | -                        | 1.27  | -     |
| HE       | 13.8                     | 14.1  | 14.4  |
| L        | 0.6                      | 0.8   | 1.0   |
| L1       | -                        | 1.35  | -     |
| y        | -                        | -     | 0.15  |
| $\theta$ | 0°                       | -     | 8°    |
| b2       | -                        | 0.76  | -     |
| e1       | -                        | 13.34 | -     |
| l2       | 1.27                     | -     | -     |

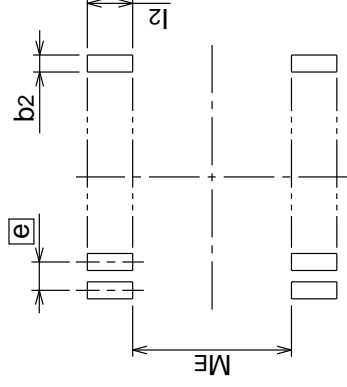
# 32P3Y-H

# Plastic 32pin 400mil TSOP (II)

|  |                 |                   |                           |
|--|-----------------|-------------------|---------------------------|
| EIAJ Package Code<br>TSOPII32-P-400-1.27 | JEDEC Code<br>- | Weight(g)<br>0.53 | Lead Material<br>Alloy 42 |
|--|-----------------|-------------------|---------------------------|



Detail F



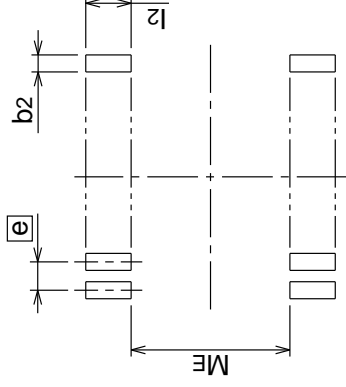
Recommended Mount Pad

| Symbol   | Dimension in Millimeters |       |       |
|----------|--------------------------|-------|-------|
|          | Min                      | Nom   | Max   |
| A        | -                        | -     | 1.2   |
| A1       | 0.05                     | 0.125 | 0.2   |
| A2       | -                        | 1.0   | -     |
| b        | 0.35                     | 0.4   | 0.5   |
| c        | 0.105                    | 0.125 | 0.175 |
| D        | 20.85                    | 20.95 | 21.05 |
| E        | 10.06                    | 10.16 | 10.26 |
| e        | -                        | 1.27  | -     |
| HE       | 11.56                    | 11.76 | 11.96 |
| L        | 0.4                      | 0.5   | 0.6   |
| L1       | -                        | 0.8   | -     |
| y        | -                        | -     | 0.1   |
| $\theta$ | 0°                       | -     | 10°   |
| ME       | -                        | 10.36 | -     |
| l2       | 0.9                      | -     | -     |
| b2       | -                        | 0.76  | -     |

# 32P3Y-J

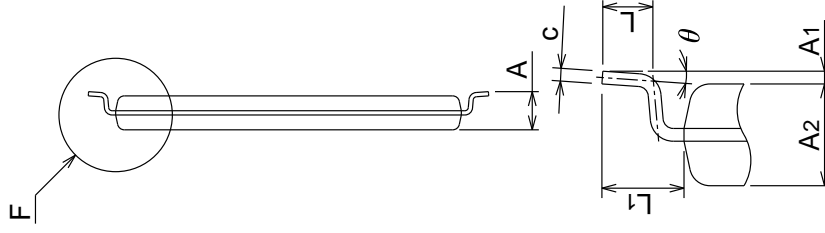
# Plastic 32pin 400mil TSOP (II)

|  |                 |                   |                           |
|--|-----------------|-------------------|---------------------------|
| EIAJ Package Code<br>TSOPII32-P-400-1.27 | JEDEC Code<br>- | Weight(g)<br>0.53 | Lead Material<br>Alloy 42 |
|--|-----------------|-------------------|---------------------------|

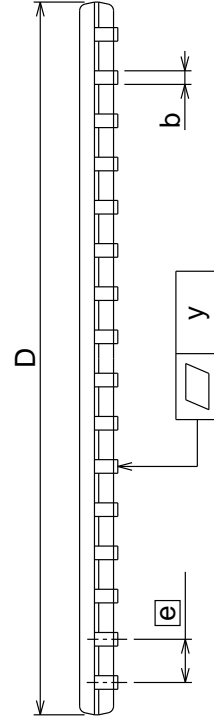
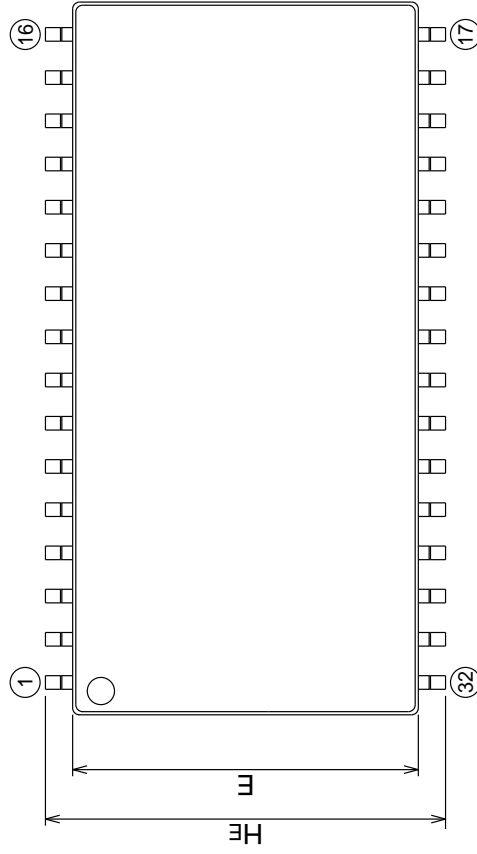


Recommended Mount Pad

| Symbol   | Dimension in Millimeters |       |       |
|----------|--------------------------|-------|-------|
|          | Min                      | Nom   | Max   |
| A        | -                        | -     | 1.2   |
| A1       | 0.05                     | 0.125 | 0.2   |
| A2       | -                        | 1.0   | -     |
| b        | 0.35                     | 0.4   | 0.5   |
| c        | 0.105                    | 0.125 | 0.175 |
| D        | 20.85                    | 20.95 | 21.05 |
| E        | 10.06                    | 10.16 | 10.26 |
| e        | -                        | 1.27  | -     |
| HE       | 11.56                    | 11.76 | 11.96 |
| L        | 0.4                      | 0.5   | 0.6   |
| L1       | -                        | 0.8   | -     |
| y        | -                        | -     | 0.1   |
| $\theta$ | 0°                       | -     | 10°   |
| ME       | -                        | 10.36 | -     |
| l2       | 0.9                      | -     | -     |
| b2       | -                        | 0.76  | -     |



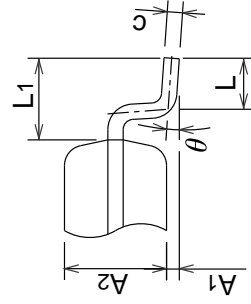
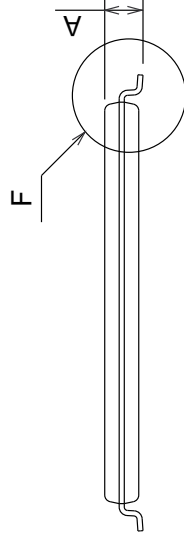
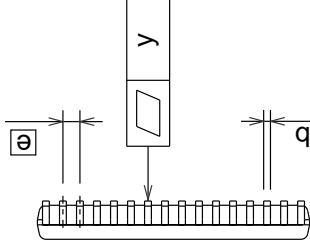
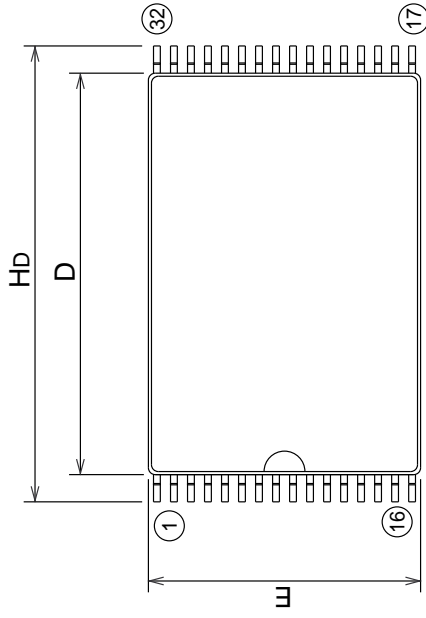
Detail F



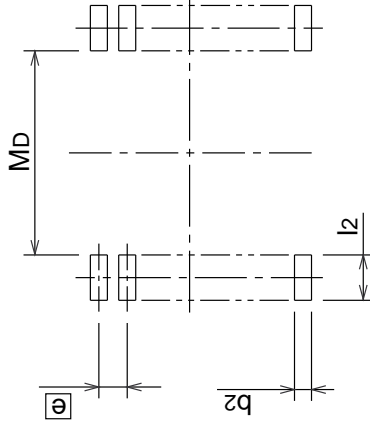
# 32P3K-B

# Plastic 32pin 8X13.4mm TSOP(I)

|                   |            |           |               |
|-------------------|------------|-----------|---------------|
| EIAJ Package Code | JEDEC Code | Weight(g) | Lead Material |
| -                 | -          | -         | Alloy 42      |



Detail F



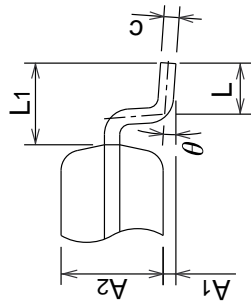
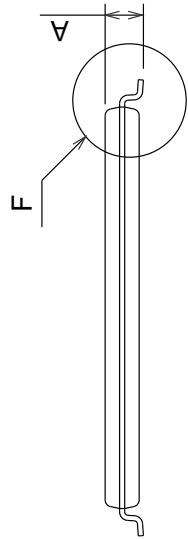
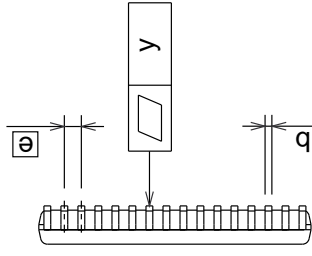
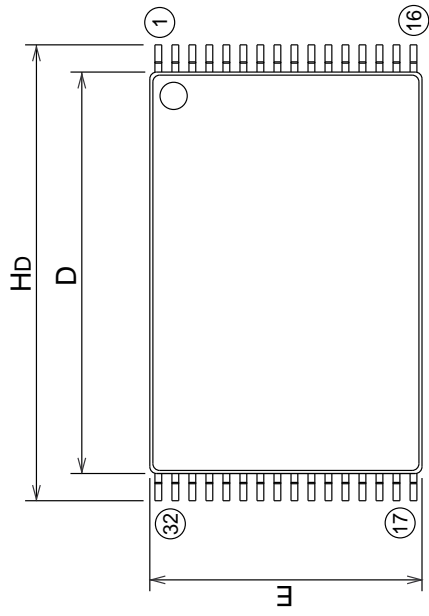
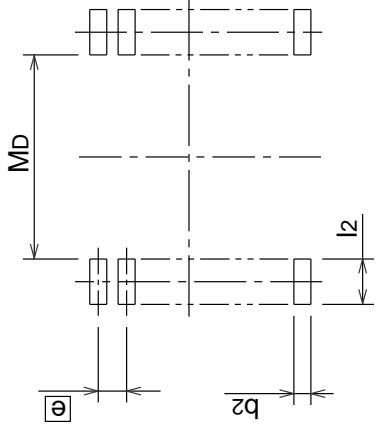
Recommended Mount Pad

| Symbol   | Dimension in Millimeters |       |      |
|----------|--------------------------|-------|------|
|          | Min                      | Nom   | Max  |
| A        | -                        | -     | 1.2  |
| A1       | 0.05                     | 0.125 | 0.2  |
| A2       | -                        | 1.0   | -    |
| b        | 0.15                     | 0.2   | 0.3  |
| c        | 0.13                     | 0.15  | 0.2  |
| D        | 11.7                     | 11.8  | 11.9 |
| E        | 7.9                      | 8.0   | 8.1  |
| e        | -                        | 0.5   | -    |
| HD       | 13.2                     | 13.4  | 13.6 |
| L        | 0.4                      | 0.5   | 0.6  |
| L1       | -                        | 0.8   | -    |
| y        | -                        | -     | 0.1  |
| $\theta$ | 0°                       | -     | 10°  |
| b2       | -                        | 0.225 | -    |
| l2       | 0.9                      | -     | -    |
| MD       | -                        | 12.0  | -    |

# 32P3K-C

# Plastic 32pin 8X13.4mm TSOP(I)

|                   |            |           |               |
|-------------------|------------|-----------|---------------|
| EIAJ Package Code | JEDEC Code | Weight(g) | Lead Material |
| -                 | -          | -         | Alloy 42      |



Recommended Mount Pad

| Symbol   | Dimension in Millimeters |       |      |
|----------|--------------------------|-------|------|
|          | Min                      | Nom   | Max  |
| A        | -                        | -     | 1.2  |
| A1       | 0.05                     | 0.125 | 0.2  |
| A2       | -                        | 1.0   | -    |
| b        | 0.15                     | 0.2   | 0.3  |
| c        | 0.13                     | 0.15  | 0.2  |
| D        | 11.7                     | 11.8  | 11.9 |
| E        | 7.9                      | 8.0   | 8.1  |
| e        | -                        | 0.5   | -    |
| HD       | 13.2                     | 13.4  | 13.6 |
| L        | 0.4                      | 0.5   | 0.6  |
| L1       | -                        | 0.8   | -    |
| y        | -                        | -     | 0.1  |
| $\theta$ | 0°                       | -     | 10°  |
| b2       | -                        | 0.225 | -    |
| l2       | 0.9                      | -     | -    |
| MD       | -                        | 12.0  | -    |