TC5589P/J-15,-20,-25,-35

8,192 WORD × 9 BIT CMOS STATIC RAM

DESCRIPTION

The TC5589P/J is a 73,728 bits high speed static random access memory organized as 8,192 words by 9 bits using CMOS technology, and operated from a single 5-volt supply. Toshiba's CMOS technology and advanced circuit from provides high speed feature.

The TC5589P/J has low power feature with device control using Chip Enable ($\overline{CE1}$/CE2), and has Output Enable Input ($\overline{OE}$) for fast memory access. Also the device power at memory access is reduced by automatic power down circuit form.

The TC5589P/J is suitable for use in cache memory where high speed is required, and high speed storage. All Inputs and Outputs are directly TTL compatible.

The TC5589P/J is moulded in 28 pin standard DIP and SOJ with 300 mil width for high density surface assembly.

FEATURES

- Fast access time:

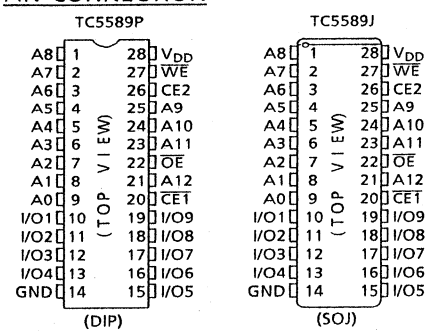
	TC5589P/J-15	15ns (MAX.)
	TC5589P/J-20	20ns (MAX.)
	TC5589P/J-25	25ns (MAX.)
	TC5589P/J-35	35ns (MAX.)

- Low power dissipation:

Operation	TC5589P/J-15	135mA (MAX.)
	TC5589P/J-20	115mA (MAX.)
	TC5589P/J-25	115mA (MAX.)
	TC5589P/J-35	115mA (MAX.)
Standby		1mA (MAX.)

- 5V single power supply : 5V ± 10%
- Fully static operation
- Directly TTL compatible : All Input and Output
- Output buffer control : $\overline{OE}$
- Package
  - TC5589P : DIP28-P-300B
  - TC5589J : SOJ28-P-300A

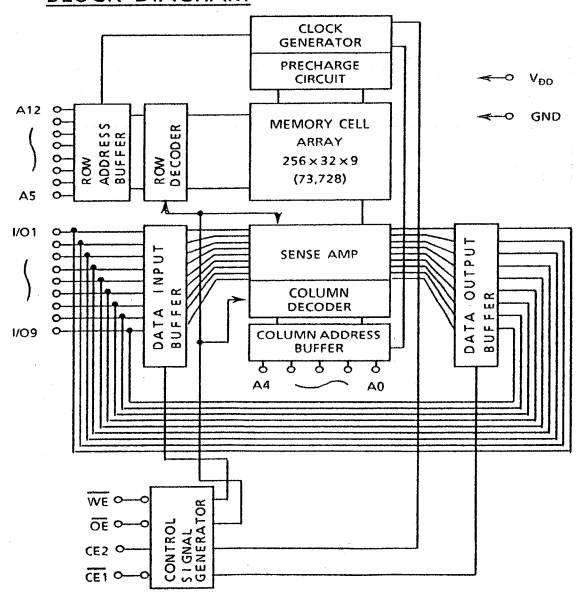
PIN CONNECTION



PIN NAMES

A0~A12	Address Inputs
I/O1~I/O9	Data Inputs/Outputs
$\overline{CE1}$, CE2	Chip Enable Inputs
$\overline{WE}$	Write Enable Input
$\overline{OE}$	Output Enable Input
V_{DD}	Power (+5V)
GND	Ground

BLOCK DIAGRAM



MAXIMUM RATINGS

SYMBOL	ITEM	RATING	UNITS
V_{DD}	Power Supply Voltage	−0.5~7.0	V
V_{IN}	Input Voltage	−2.0~7.0	V
V_{OUT}	Output Voltage	−0.5~V_{DD}+0.5	V
P_D	Power Dissipation	1.0	W
Tsolder	Soldering Temperature · Time	260 · 10	°C · sec
Tstrg	Storage Temperature	−65~150	°C
Topr	Operating Temperature	-10~85	°C

DC RECOMMENDED OPERATING CONDITIONS (Ta = 0~70°C)

SYMBOL	PARAMETER	MIN.	TYP.	MAX.	UNIT
V_{DD}	Power Supply Voltage	4.5	5.0	5.5	V
V_{IH}	Input High Voltage	2.2	−	V_{DD}+0.5	V
V_{IL}	Input Low Voltage	*−3.0	−	0.8	V

* Pulse width ≦ 10ns, DC : −0.5V (min)

DC CHARACTERISTICS (Ta = 0~70°C, V_{DD} = 5V ± 10%)

SYMBOL	PARAMETER	TEST CONDITION		MIN.	TYP.	MAX.	UNITS
I_{IL}	Input Leakage Current	V_{IN} = 0~V_{DD}		−	−	±1	μA
I_{OH}	Output High Current	V_{OH} = 2.4V		−4	−	−	mA
I_{OL}	Output Low Current	V_{OL} = 0.4V		8	−	−	mA
I_{LO}	Output Leakage Current	$\overline{CE1}$ = V_{IH} or CE2 = V_{IL} or $\overline{WE}$ = V_{IL} or $\overline{OE}$ = V_{IH}, V_{OUT} = 0~V_{DD}		−	−	±1	μA
I_{DDO}	Operating Current	V_{DD} = 5.5V tcycle = Min cycle $\overline{CE1}$ = V_{IL} and CE2 = V_{IH} Other Inputs = V_{IH}/V_{IL} I_{OUT} = 0mA	−15	−	−	135	mA
			−20				
			−25	−	−	115	
			−35				
I_{DDS1}	Standby Current	V_{DD} = 5.5V tcycle = Min cycle $\overline{CE1}$ = V_{IH} or CE2 = V_{IL} Other Inputs = V_{IH}/V_{IL}		−	−	25	mA
I_{DDS2}*		$\overline{CE1}$ = V_{DD} − 0.2V or CE2 = 0.2V Other Inputs = V_{DD} − 0.2V or 0.2V		−	−	1	

* : In standby mode with $\overline{CE1} \geqq V_{DD} - 0.2V$, these specification limits are guaranteed under the condition of $CE2 \geqq V_{DD} - 0.2V$ or $CE2 \leqq 0.2V$.

CAPACITANCE (Ta = 25°C, f = 1.0MHz)

SYMBOL	PARAMETER	TEST CONDITION	MAX.	UNIT
C_{IN}	Input Capacitance	V_{IN} = GND	5	pF
C_{OUT}	Output Capacitance	V_{OUT} = GND	7	pF

NOTE : This parameter periodically sampled is not 100% tested.

AC CHARACTERISTICS (Ta = 0~70°C [1], V_{DD} = 5V ± 10%)

READ CYCLE

SYMBOL	PARAMETER	TC5589P/J-15		TC5589P/J-20		TC5589P/J-25		TC5589P/J-35		UNIT
		MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	
t_{RC}	Read Cycle Time	15	–	20	–	25	–	35	–	ns
t_{ACC}	Address Access Time	–	15	–	20	–	25	–	35	
t_{CO1}	$\overline{CE1}$ Access Time	–	15	–	20	–	25	–	35	
t_{CO2}	CE2 Access Time	–	15	–	20	–	25	–	35	
t_{OE}	$\overline{OE}$ Access Time	–	9	–	10	–	12	–	12	
t_{OH}	Output Data Hold Time From Address Change	5	–	5	–	5	–	5	–	
t_{COE}	Output Enable Time from $\overline{CE1}$ or CE2	5	–	5	–	5	–	5	–	
t_{COD}	Output Disable Time from $\overline{CE1}$ or CE2	–	6	–	6	–	6	–	6	
t_{OEE}	Output Enable Time from $\overline{OE}$	0	–	0	–	0	–	0	–	
t_{ODO}	Output Disable Time from $\overline{OE}$	–	5	–	5	–	5	–	5	
t_{PU}	Chip Selection to Power Up Time	0	–	0	–	0	–	0	–	
t_{PD}	Chip Deselection to Power Down Time	–	15	–	20	–	25	–	35	

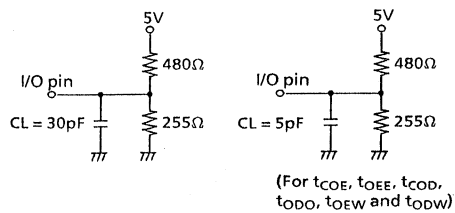
WRITE CYCLE

SYMBOL	PARAMETER	TC5589P/J-15		TC5589P/J-20		TC5589P/J-25		TC5589P/J-35		UNIT
		MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	
t_{WC}	Write Cycle Time	15	–	20	–	25	–	35	–	ns
t_{CW}	Chip Enable to End of Write	12	–	13	–	15	–	15	–	
t_{AS}	Address Set Up Time	0	–	0	–	0	–	0	–	
t_{WP}	Write Pulse Width	12	–	13	–	15	–	15	–	
t_{WR}	Write Recovery Time	0	–	0	–	0	–	0	–	
t_{DS}	Data Set Up Time	9	–	10	–	12	–	12	–	
t_{DH}	Data Hold Time	0	–	0	–	0	–	0	–	
t_{OEW}	Output Enable Time from $\overline{WE}$	0	–	0	–	0	–	0	–	
t_{ODW}	Output Disable Time from $\overline{WE}$	–	6	–	6	–	6	–	6	

AC TEST CONDITIONS

Input Pulse Levels	3.0V/0.0V
Input Pulse Rise and Fall Time	3ns
Input Timing Measurement Reference Levels	2.2V/0.8V
Output Timing Measurement Reference Levels	2.0V/0.8V
Output Load	Fig. 1

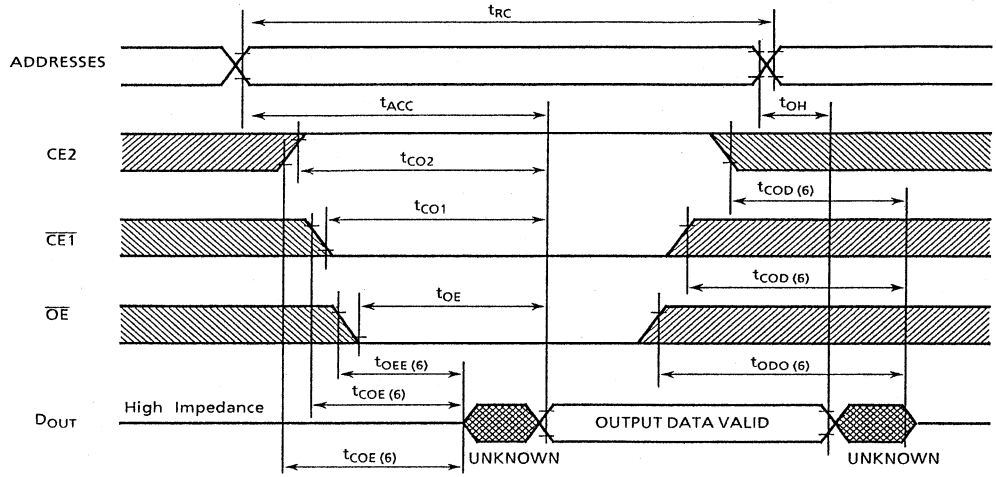
Fig. 1



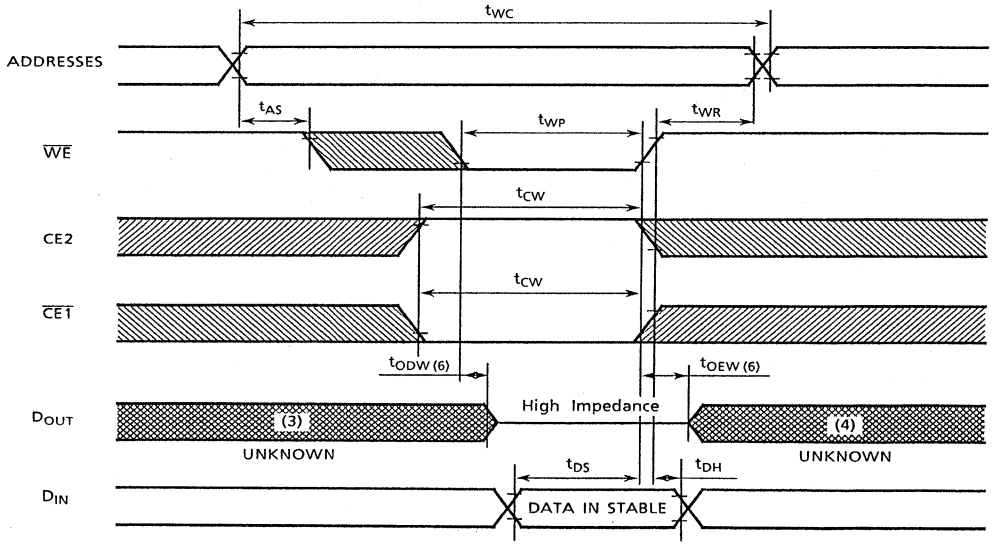
(For t_{COE}, t_{OEE}, t_{COD}, t_{ODO}, t_{OEW} and t_{ODW})

TIMING WAVEFORMS

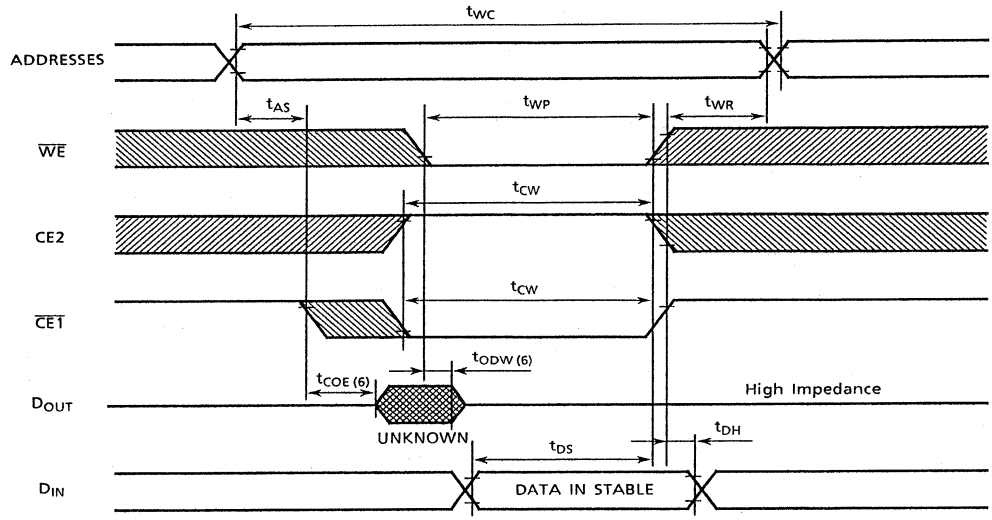
READ CYCLE (2)



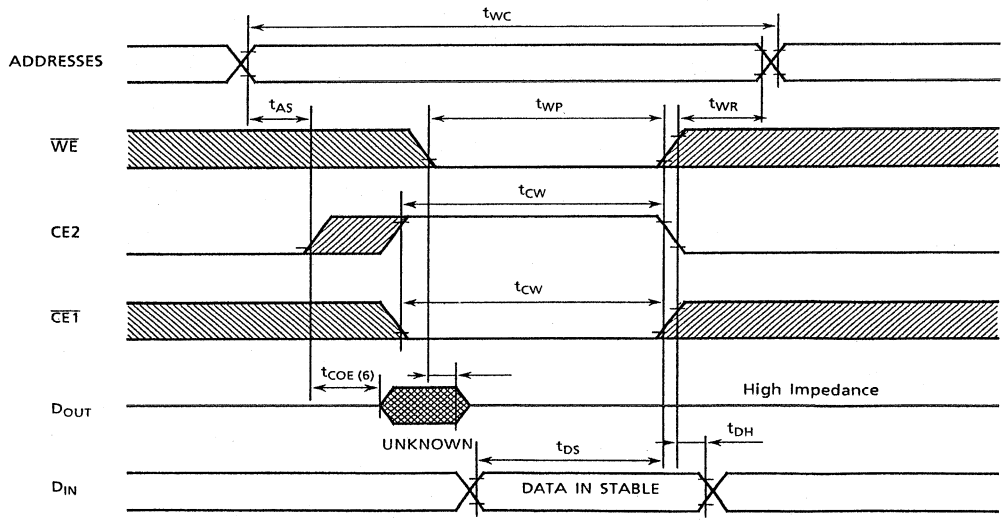
WRITE CYCLE 1 (5) ($\overline{WE}$ Controlled Write)



WRITE CYCLE 2 (5) ($\overline{CE1}$ Controlled Write)



WRITE CYLCE 3 (5) (CE2 Controlled Write)



NOTES: 1. The operating temperature (Ta) is guaranteed with transverse air flow exceeding 400 linear feet per minute.

2. $\overline{WE}$ is High for Read Cycle.

3. Assuming that $\overline{CE1}$ Low transition or CE2 High t ransition occurs coincident with or after $\overline{WE}$ Low transition, Outputs remain in a high impedance state.

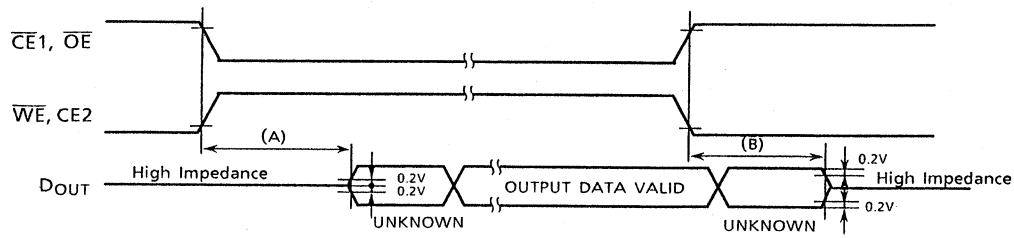
4. Assuming that $\overline{CE1}$ High transition or CE2 Low transition occurs coincident with or prior to $\overline{WE}$ High transition, Outputs remain in a high impedance state.

5. Assuming that $\overline{OE}$ is High for Write Cycle, Outputs are in a high impedance state during this period.

6. These parameters are specified as follows and measured by using the load shown in Fig. 1.

   (A) t_{COE}, t_{OEE}, t_{OEW} ..... Output Enable Time

   (B) t_{COD}, t_{ODO}, t_{ODW} ..... Output Disable Time



TOSHIBA

DATA BOOK

MOS MEMORY

(VRAM, SRAM)

1991

INTRODUCTION

We continually venture at the leading edge of technology so that we may develop and offer to you a diverse array of semiconductor memory products which may be used in many commercial and industrial applications. At this time, we offer three data books; "MOS-Memory Dynamic RAM and Module", "MOS-Memory Video RAM and Static RAM" and "MOS-Memory ROM".

Particularly, this data book is "MOS-Memory Video RAM and Static RAM" edition.

These data books represent our current culminations of electrical characteristics, timing waveforms and package data for our line of semiconductor memory products.

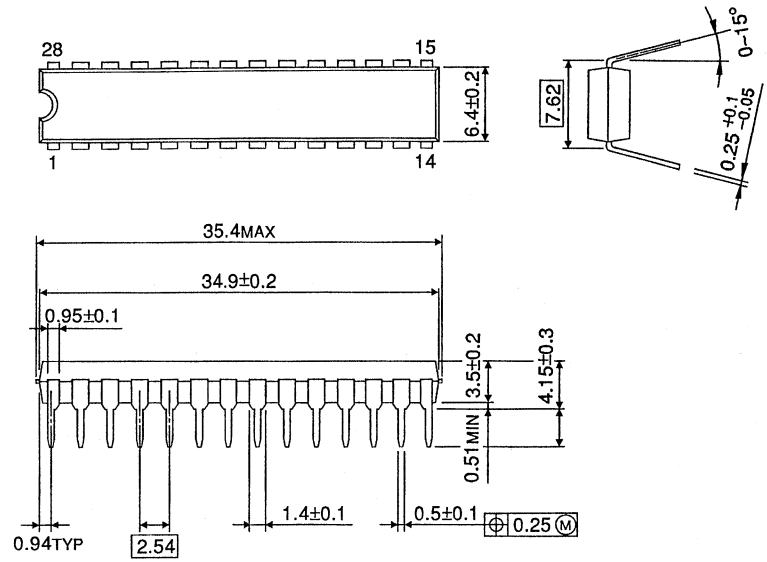
We hope this information will be very useful for you.

Nov. 1991

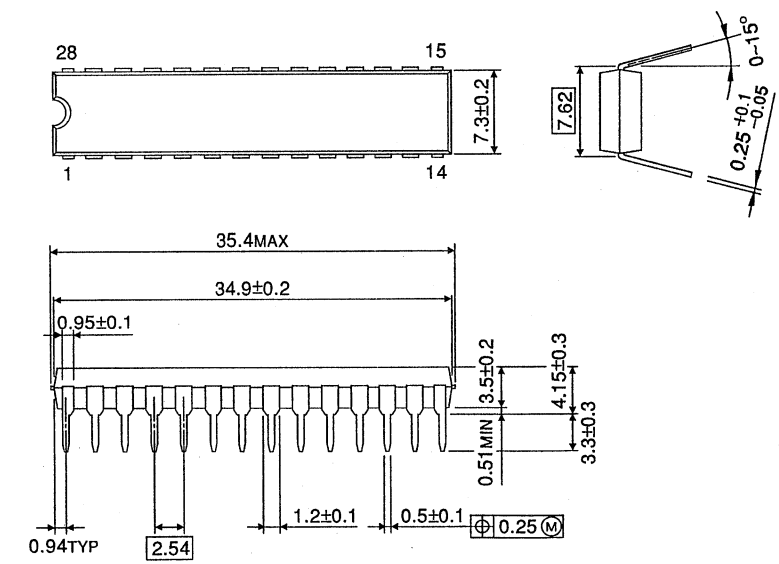
TOSHIBA CORPORATION
Semiconductor Group

Unit in mm

DIP28-P-300A

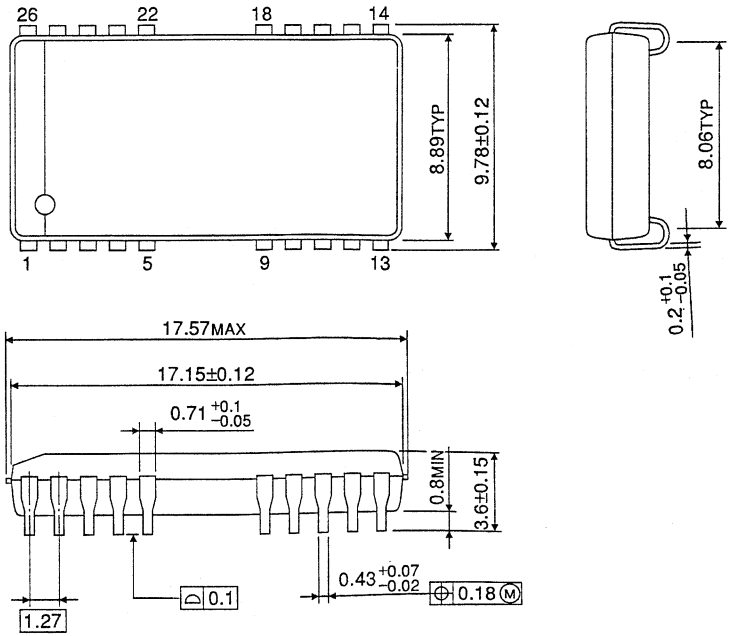


DIP28-P-300B



Unit in mm

SOJ26-P-350



SOJ28-P-300A