TENTATIVE TOSHIBA MOS DIGITAL INTEGRATED CIRCUIT SILICON GATE CMOS

65,536-WORD BY 16-BIT CMOS STATIC RAM

DESCRIPTION

The TC55V1664BJI/BFTI is a 1,048,576 bits high speed static random access memory organized as 65,536 words by 16 bits using CMOS technology, and operated from a single 3.3V supply. Toshiba's CMOS technology and advanced circuit form provide high speed feature.

The TC55V1664BJI/BFTI has low power feature with device control using chip enable ($\overline{CE}$), and has output enable ($\overline{OE}$) for fast memory access. Also it allows lower and upper byte access by data byte control ($\overline{LB}$, $\overline{UB}$). The TC55V1664BJI/BFTI is suitable for use in cache memory where high speed is required, and high speed strage. All inputs and outputs are directly LVTTL compatible. It guarantees −40° to 85°C operating temperature so it is suitable for use in wide operating temperature system.

The TC55V1664BJI/BFTI is packaged in 44-pin plastic SOJ and TSOP with 400 mil width for high density surface assembly.

FEATURES

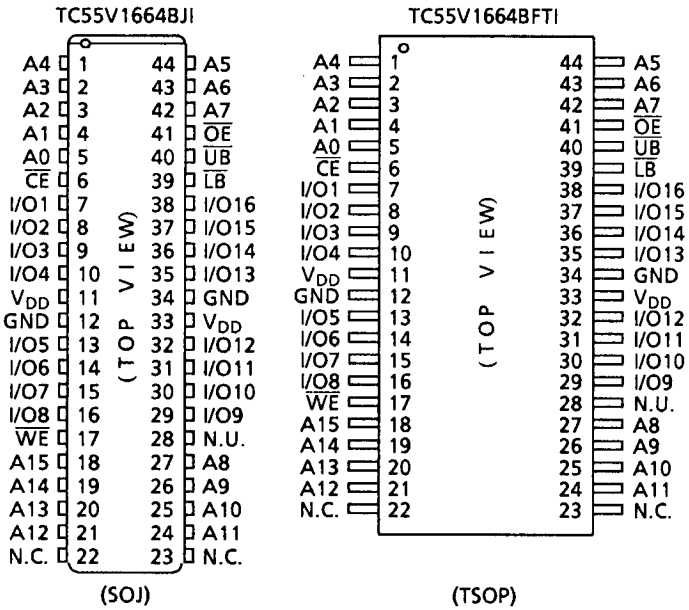
- Fast access time :
  - TC55V1664BJI/BFTI−10 10ns (MAX)
  - TC55V1664BJI/BFTI−12 12ns (MAX)
- Low power dissipation

Cycle Time	10	12	15	20	ns
Operation (MAX)	240	200	180	160	mA

Standby : 2mA (MAX)

- 3.3V single power supply : 3.3V±0.3V
- Operating temperature range : −40 to 85°C
- Fully static operation
- All Inputs and Outputs : LVTTL compatible
- Output buffer control : $\overline{OE}$
- Data byte control
  $\overline{LB}$ (I/O1 to I/O8), $\overline{UB}$ (I/O9 to I/O16)
- Package:
  SOJ44-P-400-1.27 (BJ) (Weight : 1.64gm Typ)
  TSOP II 44-P-400-0.80 (BFT) (Weight : 0.45gm Typ)

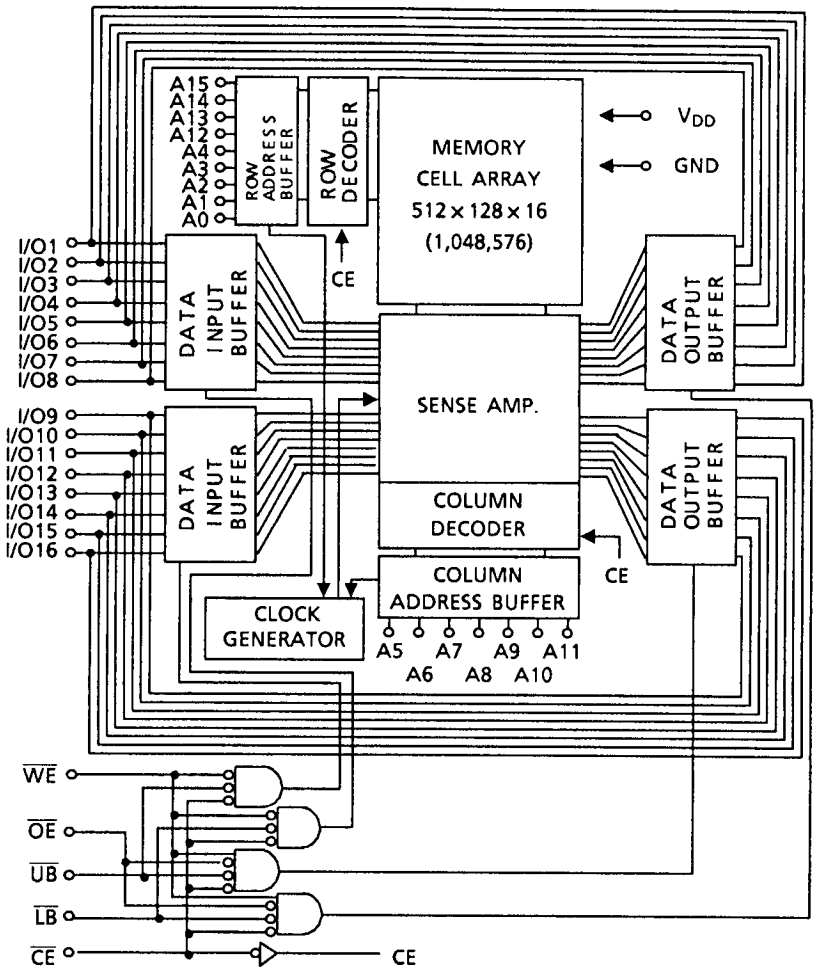
PIN CONNECTION



PIN NAMES

A0 to A15	Address Inputs
I/O1 to I/O16	Data Inputs / Outputs
$\overline{CE}$	Chip Enable Input
$\overline{WE}$	Write Enable Input
$\overline{OE}$	Output Enable Input
$\overline{LB}$, $\overline{UB}$	Data Byte Control Inputs
V_{DD}	Power (+3.3V)
GND	Ground
N.C.	No Connection
N.U.	Not Usable (Input)

BLOCK DIAGRAM



MAXIMUM RATINGS

SYMBOL	RATING	VALUE	UNIT
V_{DD}	Power Supply Voltage	−0.5 to 4.6	V
V_{IN}	Input Terminal Voltage	−0.5 * to 4.6	V
$V_{I/O}$	Input / Output Terminal Voltage	−0.5 * to VDD + 0.5**	V
P_D	Power Dissipation	0.95	W
T_{solder}	Soldering Temperature (10s)	260	°C
T_{strg}	Storage Temperature	−65 to 150	°C
T_{opr}	Operating Temperature	−40 to 100	°C

* : −1.5V with a pulse width of 20% · tRC min (4ns max)
** : V_{DD} + 1.5V with a pulse width of 20% · tRC min (4ns max)

DC RECOMMENDED OPERATING CONDITIONS (Ta = −40° to 85°C)

SYMBOL	PARAMETER	MIN	TYP	MAX	UNIT
V_{DD}	Power Supply Voltage	3.0	3.3	3.6	V
V_{IH}	Input High Voltage	2.0	−	V_{DD} + 0.3**	V
V_{IL}	Input Low Voltage	− 0.3 *	−	0.8	V

* : −1.0V with a pulse width of 20% · tRC min (4ns max)
** : V_{DD} + 1.0V with a pulse width of 20% · tRC min (4ns max)

DC and OPERATING CHARACTERISTICS (Ta = −40° to 85°C, V_{DD} = 3.3V ± 0.3V)

SYMBOL	PARAMETER	TEST CONDITION		MIN	TYP	MAX	UNIT
I_{IL}	Input Leakage Current (Except NU pin)	V_{IN} = 0 to V_{DD}		− 1	−	1	μA
I_{LO}	Output Leakage Current	$\overline{CE}$ = V_{IH} or $\overline{WE}$ = V_{IL} or $\overline{OE}$ = V_{IH} V_{OUT} = 0 to VDD		− 1	−	1	μA
$I_{I(NU)}$	Input Current (NU pin)	V_{IN} = 0 to 0.8V		− 1	−	20	μA
		V_{IN} = 0 to 0.2V		− 1	−	1	
V_{OH}	Output High Voltage	I_{OH} = − 2mA		2.4	−	−	V
		I_{OH} = − 100μA		V_{DD} − 0.2	−	−	
V_{OL}	Output Low Voltage	I_{OL} = 2mA		−	−	0.4	
		I_{OL} = 100μA		−	−	0.2	
I_{DDO}	Operating Current	$\overline{CE}$ = V_{IL}, Iout = 0mA Other Inputs = V_{IH} / V_{IL}	tcycle = 10ns	−	−	240	mA
			tcycle = 12ns	−	−	200	
			tcycle = 15ns	−	−	180	
			tcycle = 20ns	−	−	160	
I_{DDS1}	Standby Current	$\overline{CE}$ = V_{IH}, Other Inputs = V_{IH} / V_{IL}		−	−	50	mA
I_{DDS2}		$\overline{CE}$ = V_{DD} − 0.2V Other Inputs = V_{DD} − 0.2V or 0.2V		−	−	2	

CAPACITANCE (Ta = 25°C, f = 1.0MHz)

SYMBOL	PARAMETER	TEST CONDITION	MAX	UNIT
C_{IN}	Input Capacitance	V_{IN} = GND	6	pF
$C_{I/O}$	Input/Output Capacitance	$V_{I/O}$ = GND	8	pF

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

OPERATING MODE

MODE	$\overline{CE}$	$\overline{OE}$	$\overline{WE}$	$\overline{LB}$	$\overline{UB}$	I/O1 to I/O8	I/O9 to I/O16	POWER
Read	L	L	H	L	L	Output	Output	I_{DDO}
				H	L	High Impedance	Output	I_{DDO}
				L	H	Output	High Impedance	I_{DDO}
Write	L	X	L	L	L	Input	Input	I_{DDO}
				H	L	High Impedance	Input	I_{DDO}
				L	H	Input	High Impedance	I_{DDO}
Outputs Disable	L	H	H	X	X	High Impedance	High Impedance	I_{DDO}
	L	X	X	H	H			
Standby	H	X	X	X	X	High Impedance	High Impedance	I_{DDS}

X : H or L

NOTE : N.U. pin must be kept open electrically or pulled down to GND level or less than 0.8V. Applying a voltage more than 0.8V to N.U. pin is prohibited.

AC CHARACTERISTICS (Ta = −40° to 85°C [1], V_{DD} = 3.3V ± 0.3V)

READ CYCLE

SYMBOL	PARAMETER	TC55V1664BJI/BFTI-10		TC55V1664BJI/BFTI-12		UNIT
		MIN	MAX	MIN	MAX	
t_{RC}	Read Cycle Time	10	–	12	–	ns
t_{ACC}	Address Access Time	–	10	–	12	
t_{CO}	$\overline{CE}$ Access Time	–	10	–	12	
t_{OE}	$\overline{OE}$ Access Time	–	5	–	6	
t_{BA}	$\overline{UB}$, $\overline{LB}$ Access Time	–	5	–	6	
t_{OH}	Output Data Hold Time from Address Change	3	–	3	–	
t_{COE}	Output Enable Time from $\overline{CE}$	3	–	3	–	
t_{OEE}	Output Enable Time from $\overline{OE}$	1	–	1	–	
t_{BE}	Output Enable Time from $\overline{UB}$, $\overline{LB}$	1	–	1	–	
t_{COD}	Output Disable Time from $\overline{CE}$	–	6	–	7	
t_{ODO}	Output Disable Time from $\overline{OE}$	–	6	–	7	
t_{BD}	Output Disable Time from $\overline{UB}$, $\overline{LB}$	–	6	–	7	

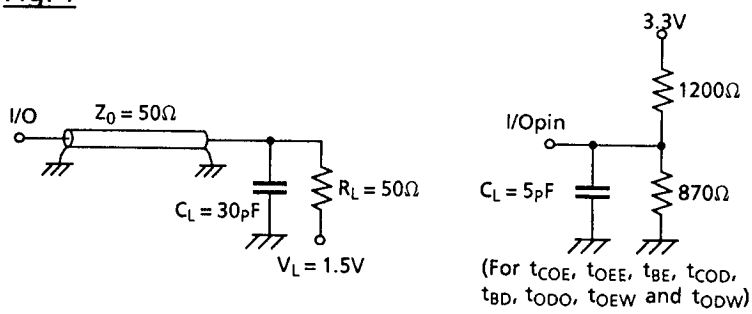
WRITE CYCLE

SYMBOL	PARAMETER	TC55V1664BJI/BFTI-10		TC55V1664BJI/BFTI-12		UNIT
		MIN	MAX	MIN	MAX	
t_{WC}	Write Cycle Time	10	–	12	–	ns
t_{WP}	Write Pulse Width	7	–	8	–	
t_{CW}	Chip Enable to End of Write	8	–	8	–	
t_{BW}	$\overline{UB}$, $\overline{LB}$ Enable to End of Write	8	–	8	–	
t_{AW}	Address Valid to End of Write	8	–	8	–	
t_{AS}	Address Set Up Time	0	–	0	–	
t_{WR}	Write Recovery Time	0	–	0	–	
t_{DS}	Data Set Up Time	6	–	7	–	
t_{DH}	Data Hold Time	0	–	0	–	
t_{OEW}	Output Enable Time from $\overline{WE}$	1	–	1	–	
t_{ODW}	Output Disable Time from $\overline{WE}$	–	6	–	7	

AC TEST CONDITIONS

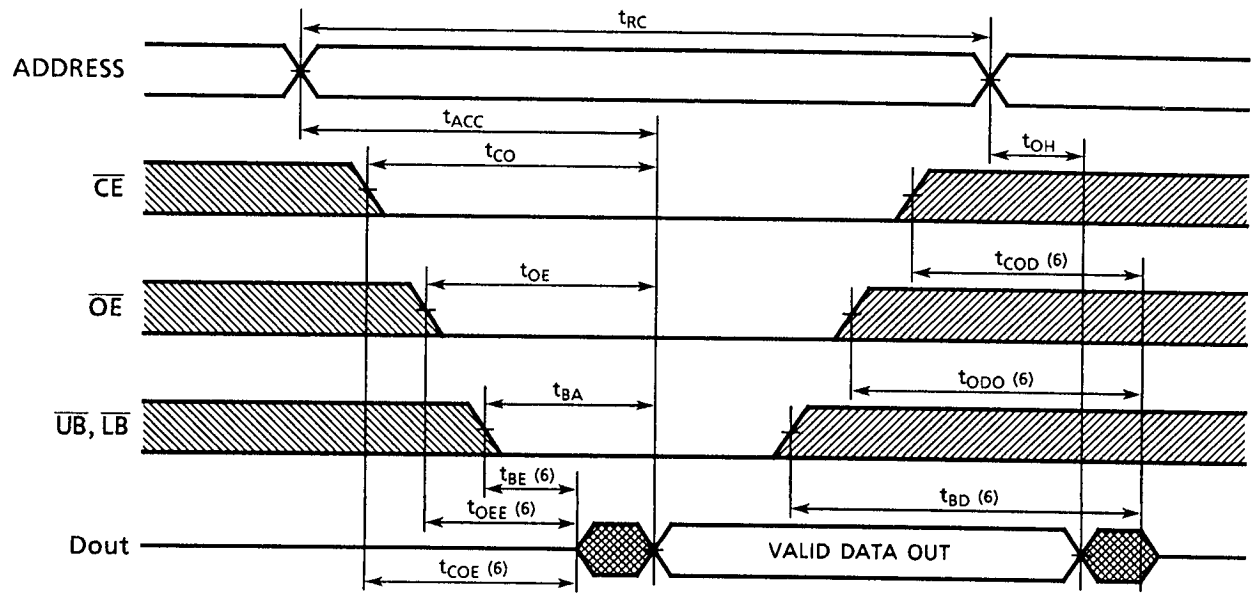
Input Pulse Level	3.0V/0.0V
Input Pulse Rise and Fall Time	2ns
Input Timing Measurement Reference Level	1.5V
Output Timing Measurement Reference Level	1.5V
Output Load	Fig. 1

Fig. 1

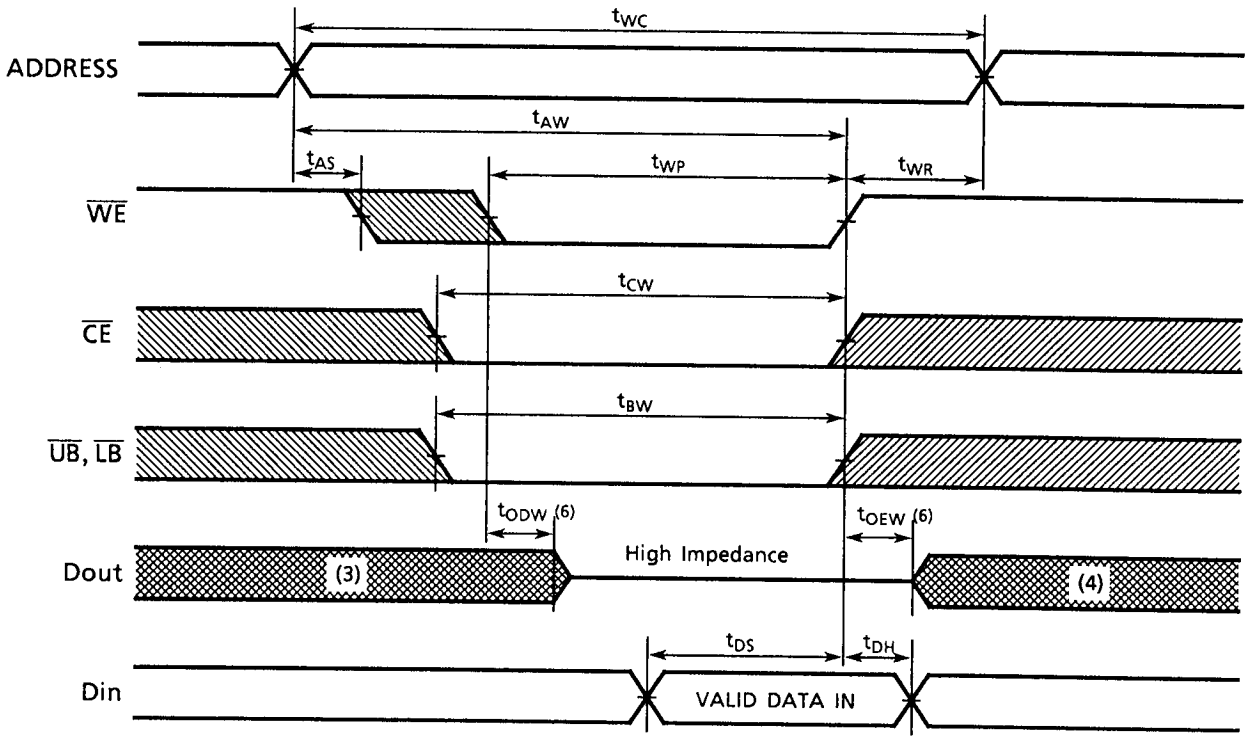


TIMING WAVEFORMS

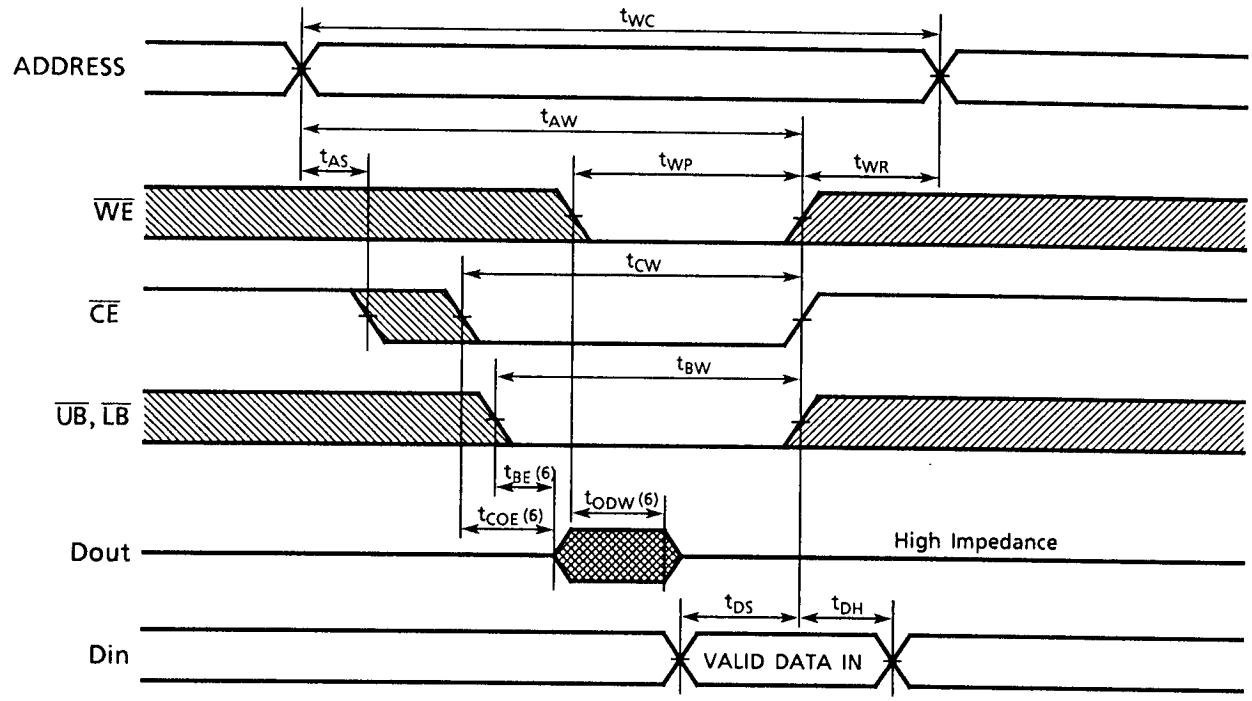
READ CYCLE (2)



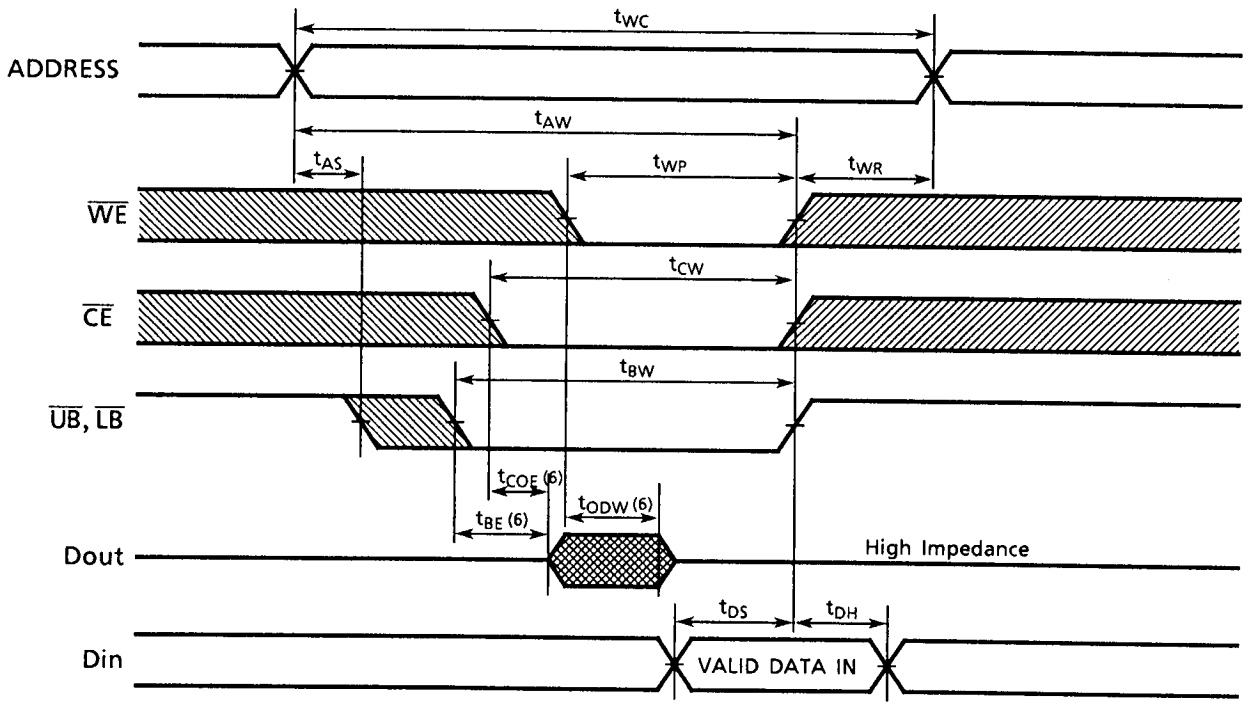
WRITE CYCLE 1 (5) ($\overline{WE}$ Controlled)



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



WRITE CYCLE 3 (5) ($\overline{UB}$, $\overline{LB}$ Controlled)

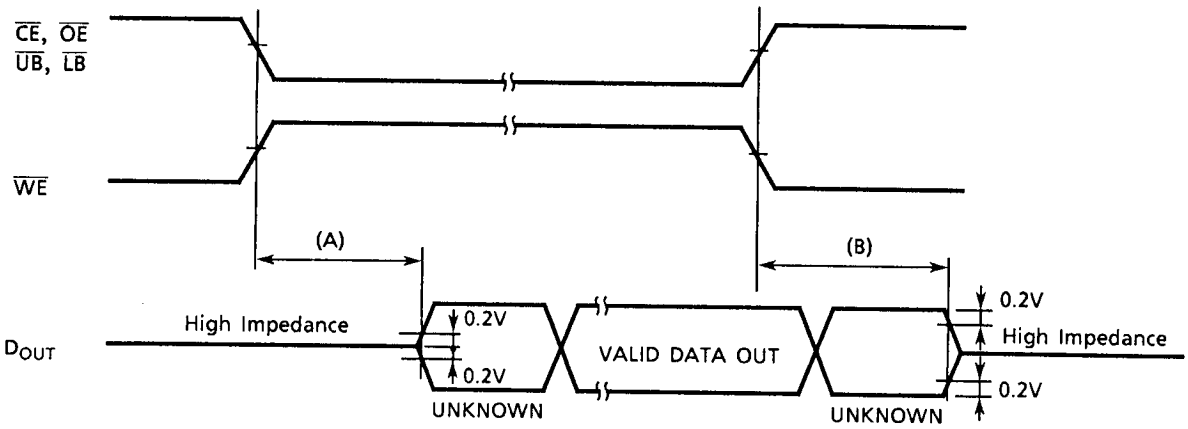


NOTE :

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 $\overline{CE}$ Low transition occurs coincident with or after $\overline{WE}$ Low transition, Outputs remain in a high impedance state.
4. Assuming that $\overline{CE}$ High transition occurs coincident with or prior $\overline{WE}$ 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_{BE}, t_{OEW} ····· Output Enable Time

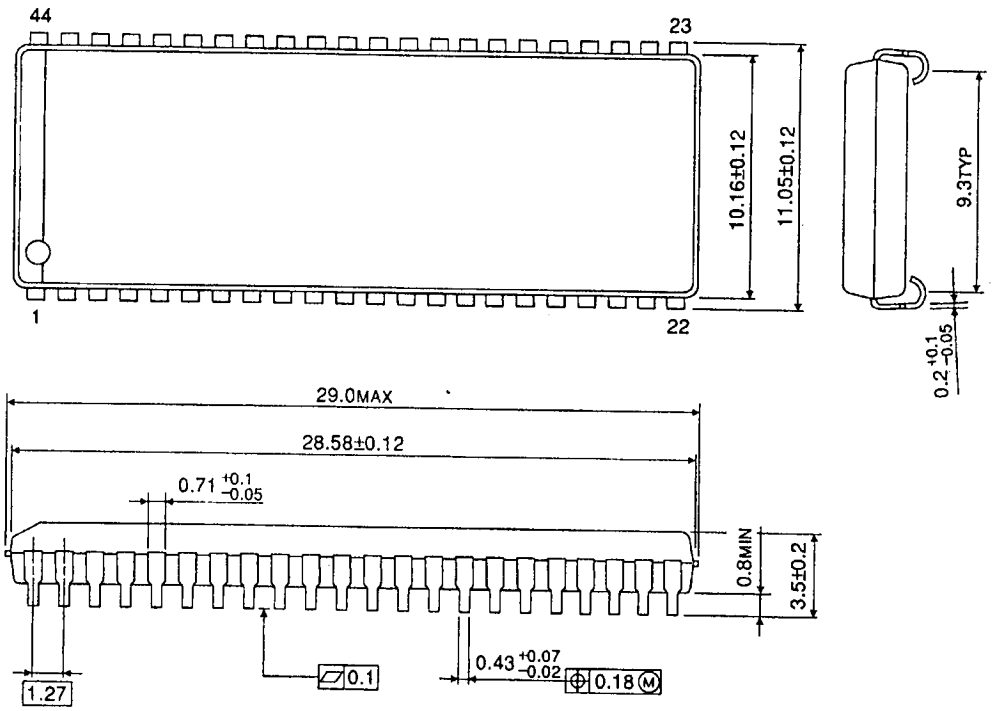
   (B) t_{COD}, t_{ODO}, t_{BD}, t_{ODW} ····· Output Disable Time



PACKAGE DIMENSIONS

Plastic SOJ (SOJ44-P-400-1.27)

Unit in mm

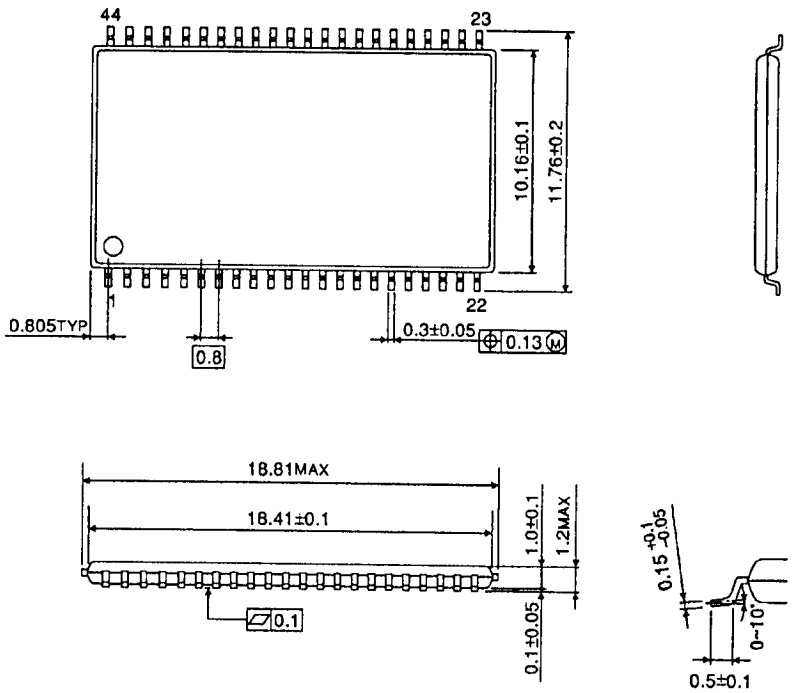


Weight : 1.64g (Typ)

PACKAGE DIMENSIONS

Plastic TSOP (TSOP II 44-P-400-0.80)

Unit in mm



Weight : 0.45g (Typ)