

TOSHIBA MOS DIGITAL INTEGRATED CIRCUIT SILICON GATE CMOS

262,144-WORD BY 16-BIT CMOS STATIC RAM

DESCRIPTION

The TC55V16256JI/FTI is a 4,194,304-bit high-speed static random access memory (SRAM) organized as 262,144 words by 16 bits. Fabricated using CMOS technology and advanced circuit techniques to provide high speed, it operates from a single 3.3 V power supply. Chip enable ($\overline{CE}$) can be used to place the device in a low-power mode, and output enable ($\overline{OE}$) provides fast memory access. Data byte control signals ($\overline{LB}$, $\overline{UB}$) provide lower and upper byte access. This device is well suited to cache memory applications where high-speed access and high-speed storage are required. All inputs and outputs are directly LVTTL compatible. The TC55V16256JI/FTI is available in plastic 44-pin SOJ and 44-pin TSOP with 400mil width for high density surface assembly. The TC55V16256JI/FTI guarantees -40° to 85°C operating temperature so it is suitable for use in wide operating temperature system.

FEATURES

- Fast access time (the following are maximum values)
TC55V16256JI/FTI-12:12 ns
TC55V16256JI/FTI-15:15 ns
- Low-power dissipation
(the following are maximum values)

Cycle Time	12	15	20	25	ns
Operation (max)	230	200	170	150	mA

Standby:10 mA (both devices)

- Single power supply voltage of $3.3\text{ V} \pm 0.3\text{ V}$
- Fully static operation
- All inputs and outputs are LVTTL compatible
- Output buffer control using $\overline{OE}$
- Data byte control using $\overline{LB}$ (I/O1 to I/O8) and $\overline{UB}$ (I/O9 to I/O16)
- Package:
SOJ44-P-400-1.27 (JI) (Weight: 1.64 g typ)
TSOP II44-P-400-0.80 (FTI) (Weight: 0.45 g typ)

PIN ASSIGNMENT (TOP VIEW)**44 PIN SOJ**

A4	1	44	A5
A3	2	43	A6
A2	3	42	A7
A1	4	41	$\overline{OE}$
A0	5	40	$\overline{UB}$
$\overline{CE}$	6	39	$\overline{LB}$
I/O1	7	38	I/O16
I/O2	8	37	I/O15
I/O3	9	36	I/O14
I/O4	10	35	I/O13
V_{DD}	11	34	GND
GND	12	33	V_{DD}
I/O5	13	32	I/O12
I/O6	14	31	I/O11
I/O7	15	30	I/O10
I/O8	16	29	I/O9
$\overline{WE}$	17	28	NU
A15	18	27	A8
A14	19	26	A9
A13	20	25	A10
A12	21	24	A11
A16	22	23	A17

(TC55V16256JI)

44 PIN TSOP

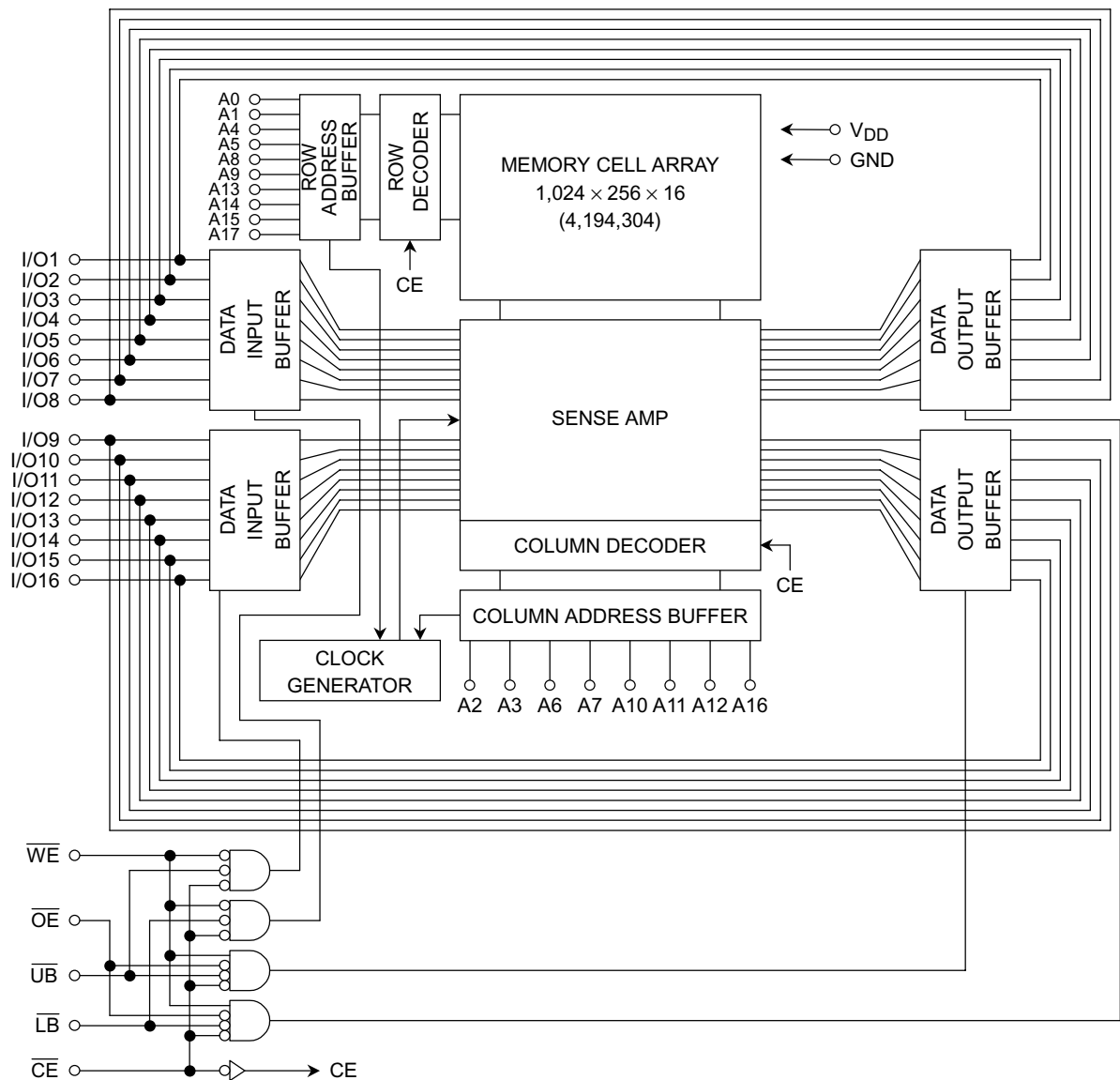
A4	1	44	A5
A3	2	43	A6
A2	3	42	A7
A1	4	41	$\overline{OE}$
A0	5	40	$\overline{UB}$
$\overline{CE}$	6	39	$\overline{LB}$
I/O1	7	38	I/O16
I/O2	8	37	I/O15
I/O3	9	36	I/O14
I/O4	10	35	I/O13
V_{DD}	11	34	GND
GND	12	33	V_{DD}
I/O5	13	32	I/O12
I/O6	14	31	I/O11
I/O7	15	30	I/O10
I/O8	16	29	I/O9
$\overline{WE}$	17	28	NU
A15	18	27	A8
A14	19	26	A9
A13	20	25	A10
A12	21	24	A11
A16	22	23	A17

(TC55V16256FTI)

PIN NAMES

A0 to A17	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 (+3.3 V)
GND	Ground
NU	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 V _{DD} + 0.5**	V
P _D	Power Dissipation	1.4	W
T _{solder}	Soldering Temperature (10s)	260	°C
T _{stg}	Storage Temperature	-65 to 150	°C
T _{opr}	Operating Temperature	-40 to 100	°C

*: -1.5 V with a pulse width of 20% · t_{RC} min (4 ns max)

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

DC RECOMMENDED OPERATING CONDITIONS ($T_a = -40^\circ$ 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

*: -1.0 V with a pulse width of $20\% \cdot t_{RC}$ min (4 ns max)

**: $V_{DD} + 1.0$ V with a pulse width of $20\% \cdot t_{RC}$ min (4 ns max)

DC CHARACTERISTICS ($T_a = -40^\circ$ to 85°C , $V_{DD} = 3.3 \text{ V} \pm 0.3 \text{ V}$)

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 V _{DD}		−1	—	1	μA
I _I (NU)	Input Current (NU pin)	V _{IN} = 0 to 0.8 V		−1	—	20	μA
		V _{IN} = 0 to 0.2 V		−1	—	1	
V _{OH}	Output High Voltage	I _{OH} = −2 mA		2.4	—	—	V
		I _{OH} = −100 μA		V _{DD} − 0.2	—	—	
V _{OL}	Output Low Voltage	I _{OL} = 2 mA		—	—	0.4	
		I _{OL} = 100 μA		—	—	0.2	
I _{DDO}	Operating Current	$\overline{CE} = V_{IL}$, I _{OUT} = 0 mA, $\overline{OE} = V_{IH}$, Other Input = V _{IH} /V _{IL}	t _{cycle} = 12 ns	—	—	230	mA
			t _{cycle} = 15 ns	—	—	200	
			t _{cycle} = 20 ns	—	—	170	
			t _{cycle} = 25 ns	—	—	150	
I _{DDS1}	Standby Current	$\overline{CE} = V_{IH}$, Other Input = V _{IH} or V _{IL}		—	—	55	mA
I _{DDS2}		$\overline{CE} = V_{DD} - 0.2 \text{ V}$, Other Input = V _{DD} − 0.2 V or 0.2 V		—	—	10	

CAPACITANCE ($T_a = 25^\circ\text{C}$, $f = 1.0 \text{ MHz}$)

SYMBOL	PARAMETER	TEST CONDITION	MAX	UNIT
C_{IN}	Input Capacitance	$V_{IN} = \text{GND}$	6	pF
$C_{I/O}$	Input/Output Capacitance	$V_{I/O} = \text{GND}$	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	*	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	*	*	High Impedance	High Impedance	I _{DDO}
	L	*	*	H	H			
Standby	H	*	*	*	*	High Impedance	High Impedance	I _{DDS}

* : Don't care

Note: The NU pin must be left unconnected or tied to GND or a voltage level of less than 0.8 V.
You must not apply a voltage of more than 0.8 V to the NU.

AC CHARACTERISTICS (Ta = -40° to 85°C (See Note 1), VDD = 3.3 V ± 0.3 V)

READ CYCLE

SYMBOL	PARAMETER	TC55V16256JI/FTI				UNIT
		-12		-15		
		MIN	MAX	MIN	MAX	
t _{RC}	Read Cycle Time	12	—	15	—	ns
t _{ACC}	Address Access Time	—	12	—	15	
t _{CO}	Chip Enable Access Time	—	12	—	15	
t _{OE}	Output Enable Access Time	—	6	—	8	
t _{BA}	Upper Byte, Lower Byte Access Time	—	6	—	8	
t _{OH}	Output Data Hold Time from Address Change	3	—	4	—	
t _{COE}	Output Enable Time from Chip Enable	3	—	4	—	
t _{OEE}	Output Enable Time from Output Enable	1	—	1	—	
t _{BE}	Output Enable Time from Upper Byte, Lower Byte	1	—	1	—	
t _{COD}	Output Disable Time from Chip Enable	—	7	—	8	
t _{ODO}	Output Disable Time from Output Enable	—	7	—	8	
t _{BD}	Output Disable Time from Upper Byte, Lower Byte	—	7	—	8	

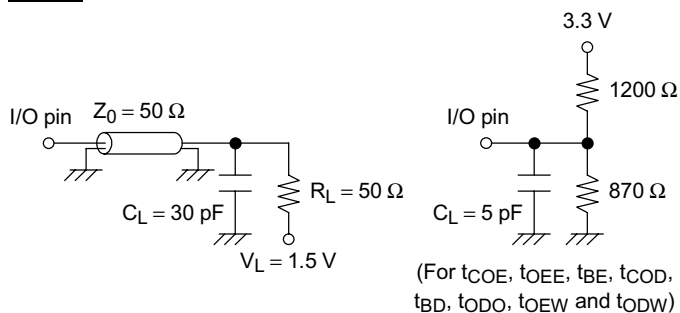
WRITE CYCLE

SYMBOL	PARAMETER	TC55V16256JI/FTI				UNIT
		-12		-15		
		MIN	MAX	MIN	MAX	
t _{WC}	Write Cycle Time	12	—	15	—	ns
t _{WP}	Write Pulse Width	8	—	9	—	
t _{CW}	Chip Enable to End of Write	10	—	12	—	
t _{BW}	Upper Byte, Lower Byte Enable to End of Write	10	—	12	—	
t _{AW}	Address Valid to End of Write	10	—	12	—	
t _{AS}	Address Setup Time	0	—	0	—	
t _{WR}	Write Recovery Time	0	—	0	—	
t _{DS}	Data Setup Time	7	—	8	—	
t _{DH}	Data Hold Time	0	—	0	—	
t _{OE_W}	Output Enable Time from Write Enable	1	—	1	—	
t _{ODW}	Output Disable Time from Write Enable	—	7	—	8	

AC TEST CONDITIONS

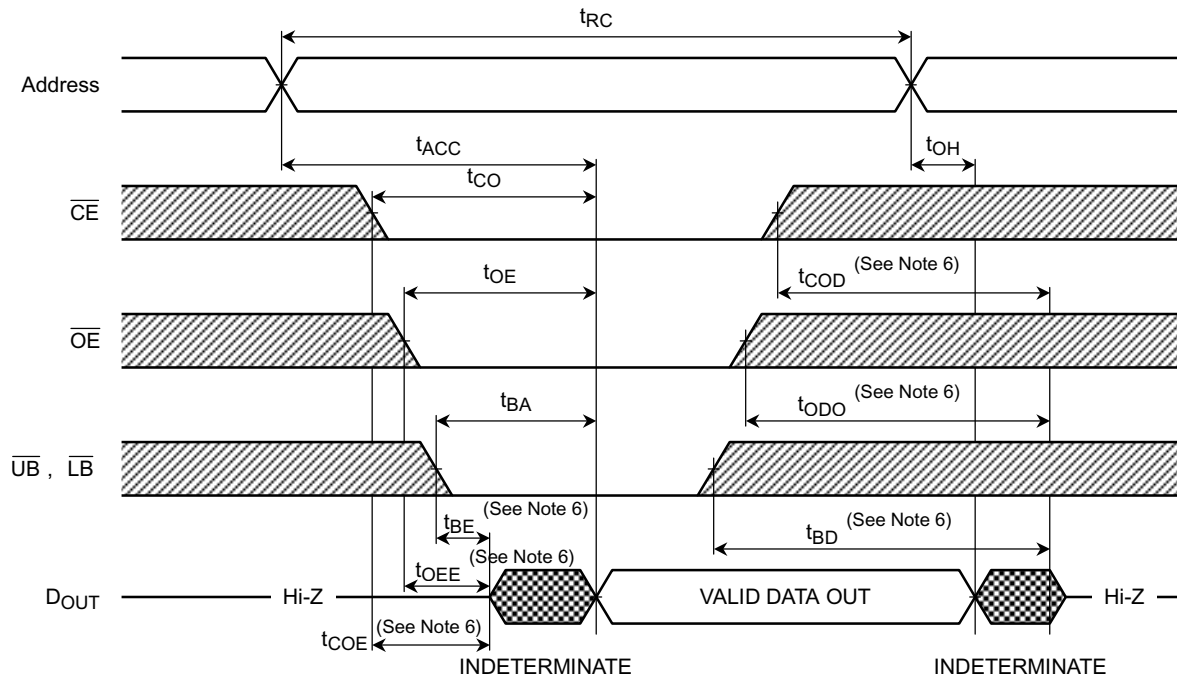
PARAMETER	TEST CONDITION
Input Pulse Level	3.0 V/ 0.0 V
Input Pulse Rise and Fall Time	2 ns
Input Timing Measurement Reference Level	1.5 V
Output Timing Measurement Reference Level	1.5 V
Output Load	Fig.1

Fig.1

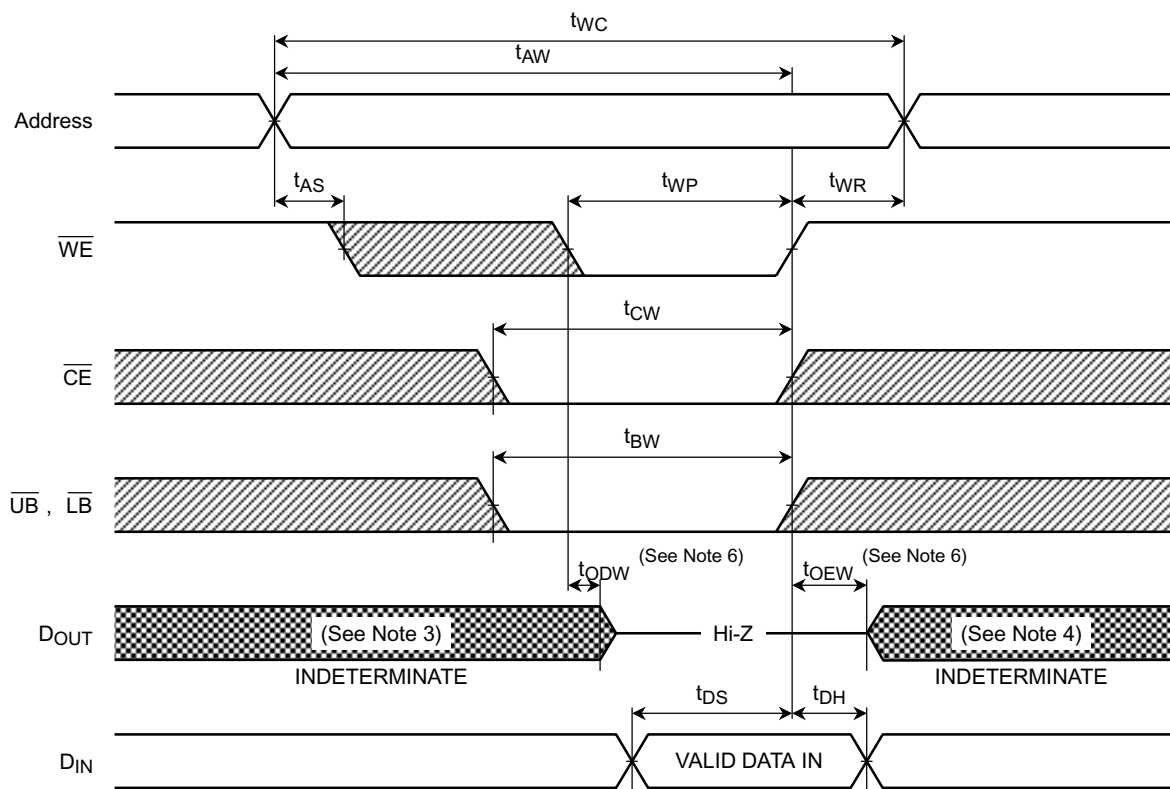


TIMING DIAGRAMS

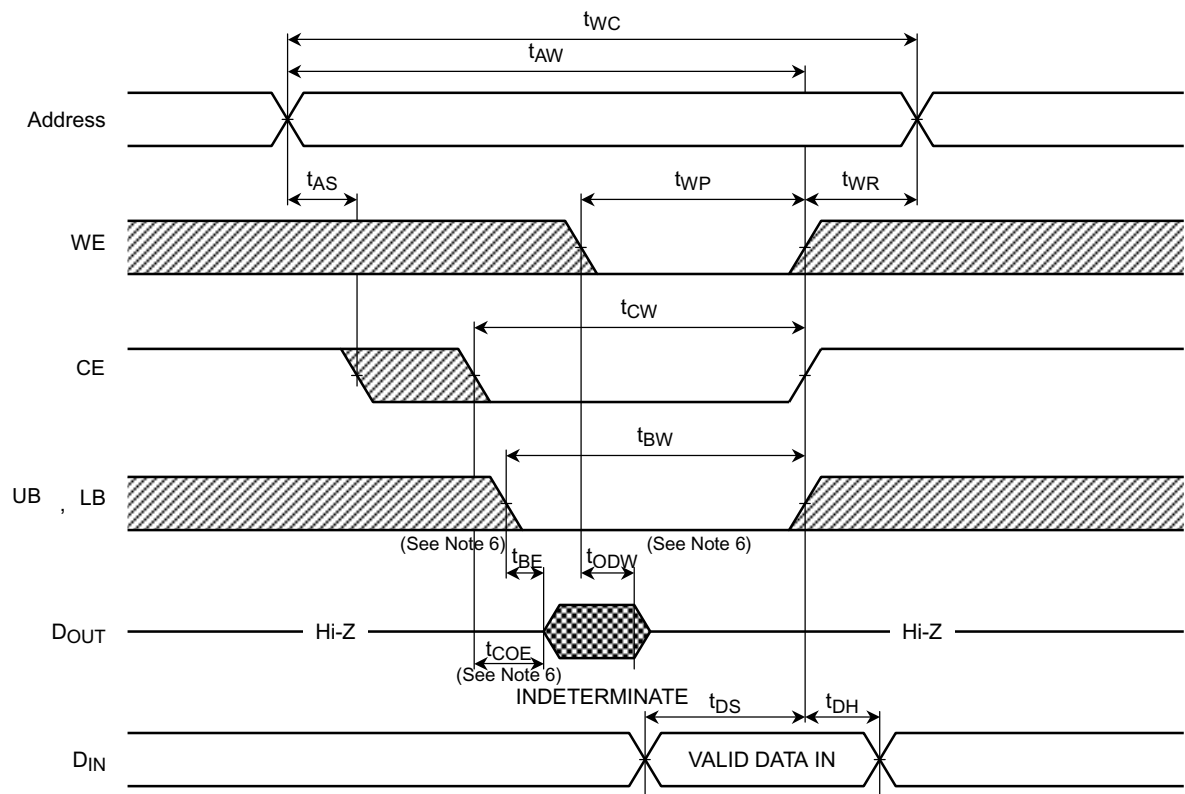
READ CYCLE (See Note 2)



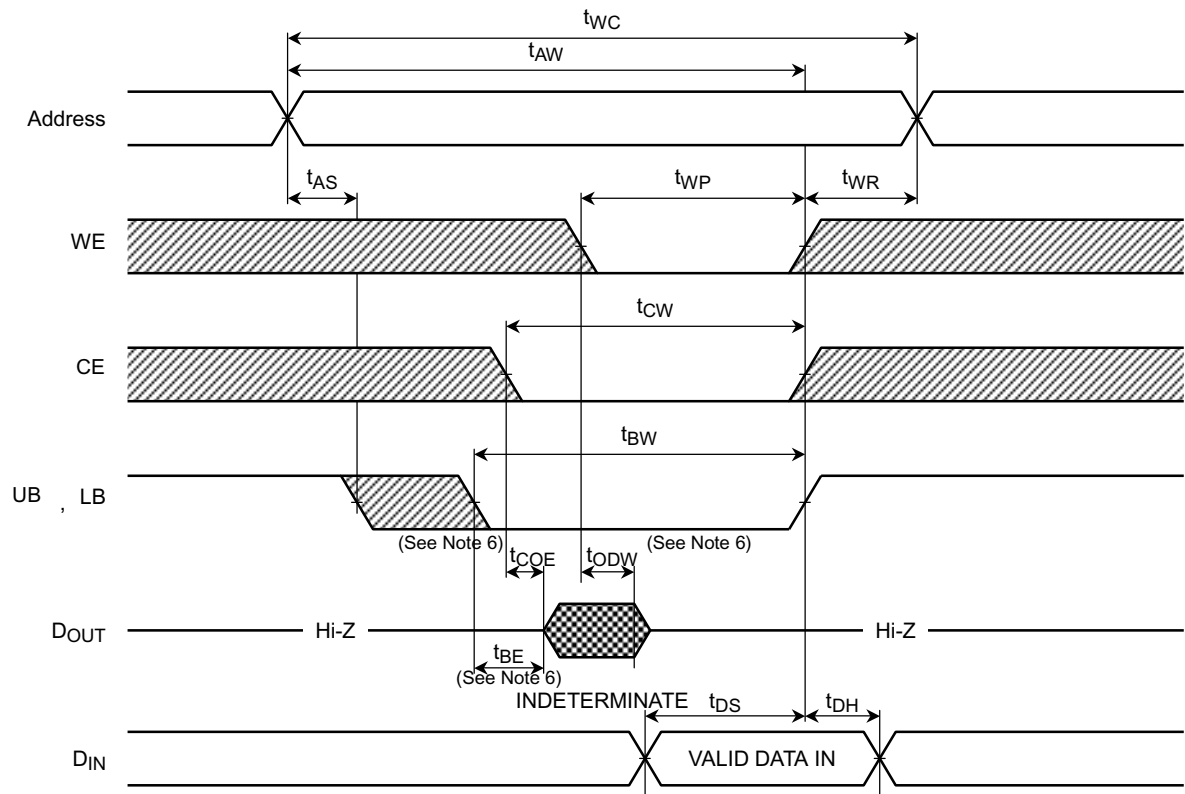
WRITE CYCLE 1 ($\overline{WE}$ CONTROLLED) (See Note 5)



WRITE CYCLE 2 ($\overline{CE}$ CONTROLLED) (See Note 5)



WRITE CYCLE 2 ($\overline{UB}$, $\overline{LB}$ CONTROLLED) (See Note 5)

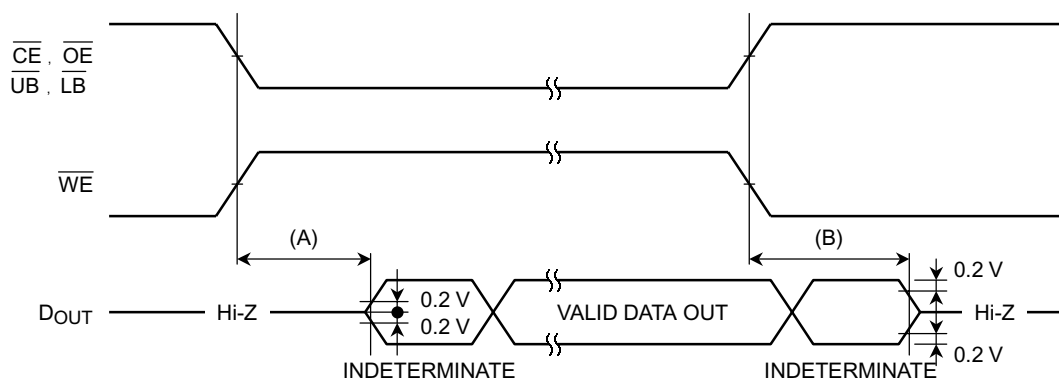


Note:

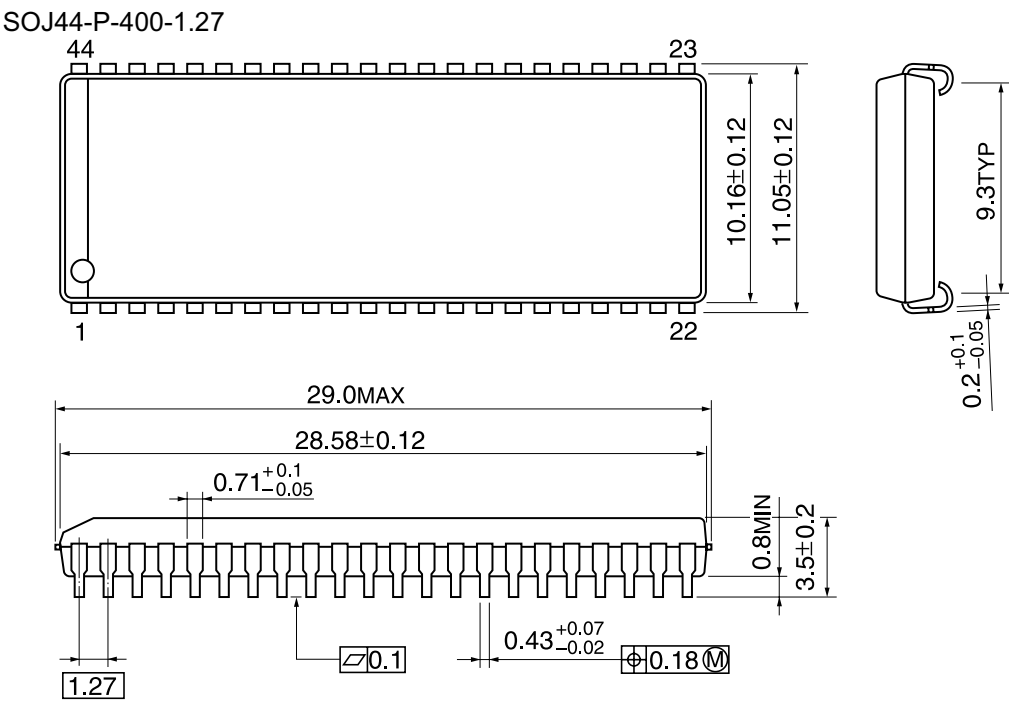
- (1) Operating temperature (T_a) is guaranteed for transverse air flow exceeding 400 linear feet per minute.
- (2) $\overline{WE}$ remains HIGH for the Read Cycle.
- (3) If $\overline{CE}$ goes LOW coincident with or after $\overline{WE}$ goes LOW, the outputs will remain at high impedance.
- (4) If $\overline{CE}$ goes HIGH coincident with or before $\overline{WE}$ goes HIGH, the outputs will remain at high impedance.
- (5) If $\overline{OE}$ is HIGH during the write cycle, the outputs will remain at high impedance.
- (6) The parameters specified below are measured 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

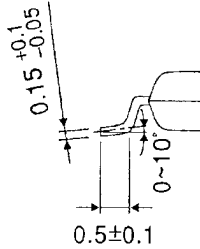
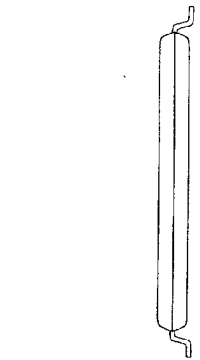
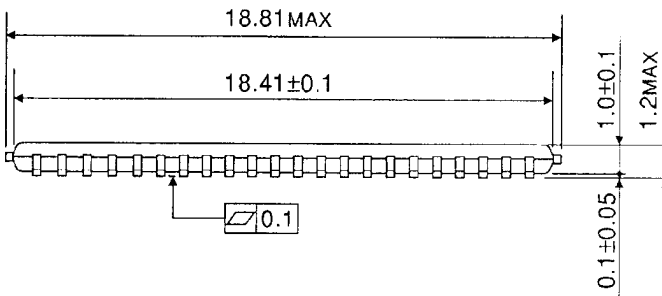
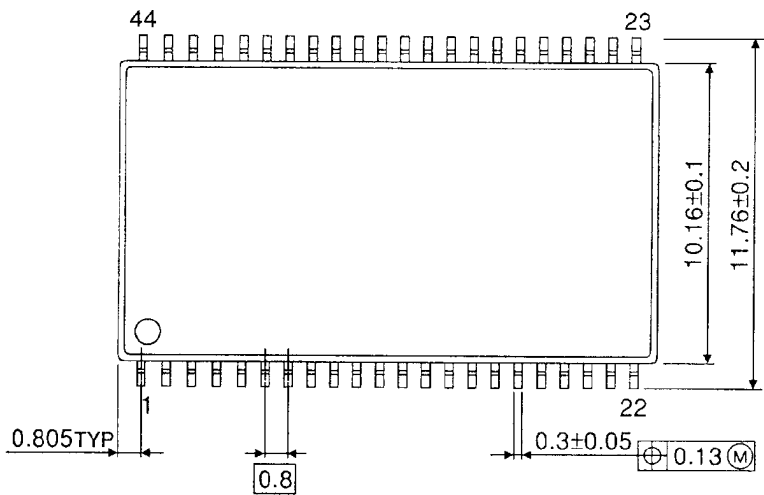


Weight: 1.64 g (typ)

PACKAGE DIMENSIONS

TSOPII 44-P-400-0.80

Unit : mm



Weight: 0.45 g (typ)

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