

TOSHIBA MOS DIGITAL INTEGRATED CIRCUIT SILICON GATE CMOS

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

DESCRIPTION

The TC55VZM216AJJI/AFTI 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 TC55VZM216AJJI/AFTI is available in plastic 44-pin SOJ and TSOP with 400mil width for high density surface assembly. The TC55VZM216AJJI/AFTI guarantees -40° to 85°C operating temperature so it is suitable for use in wide operating temperature system.

FEATURES

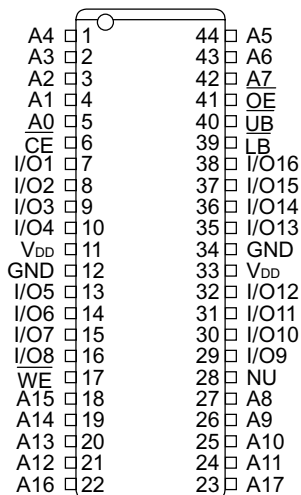
- Fast access time (the following are maximum values)
 - TC55VZM216AJJI/AFTI08:8 ns
 - TC55VZM216AJJI/AFTI10:10 ns
 - TC55VZM216AJJI/AFTI12:12 ns
- Low-power dissipation (I_{DD02}) (the following are maximum values)

Cycle Time	8	10	12	ns
Operation (max)	150	140	130	mA

Standby:10 mA (both devices)
- Single power supply voltage of $3.3\text{ V} \pm 0.3\text{ V}$
- Fully static operation
- Operating temperature range of -40° to 85°C
- 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 (AJJI) (Weight: 1.64 g typ)
 - TSOP II44-P-400-0.80 (AFTI) (Weight: 0.45 g typ)

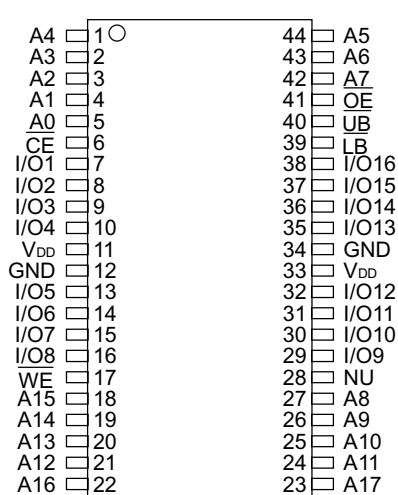
PIN ASSIGNMENT (TOP VIEW)

44 PIN SOJ



(TC55VZM216AJJI)

44 PIN TSOP

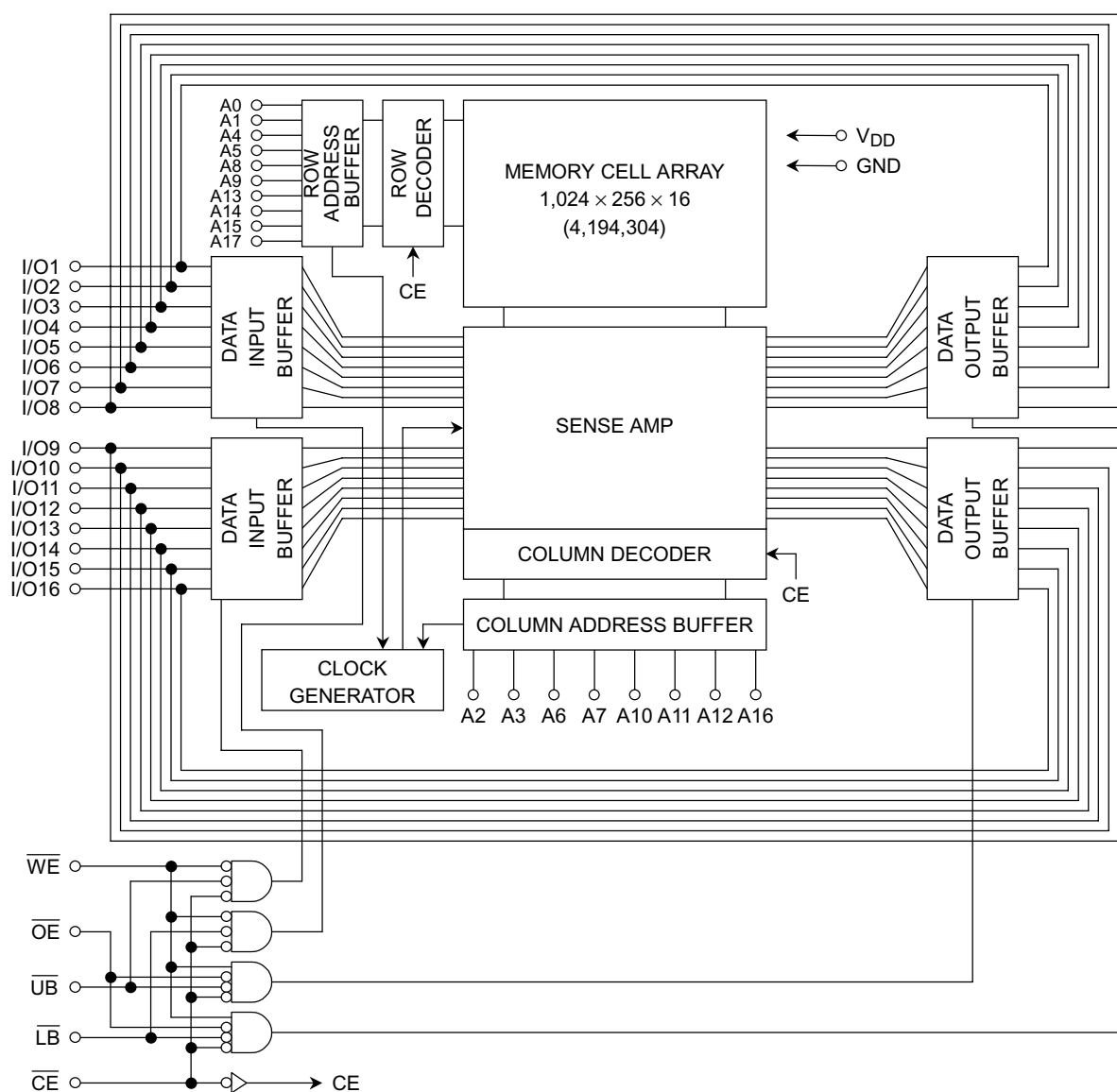


(TC55VZM216AFTI)

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% of t_{BC} min (4 ns max)

** : $V_{DD} + 1.5\text{ V}$ with a pulse width of 20% of $t_{BC\text{ min}}$ (4 ns 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

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

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

DC CHARACTERISTICS (Ta = -40° to 85°C, V_{DD} = 3.3 V ± 0.3 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 Leakage Current (NU pin)	V _{IN} = 0 V		-1	—	1	μA
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 _{DDO1}	Operating Current	$\overline{CE} = V_{IL}$, I _{OUT} = 0 mA, $\overline{OE} = V_{IH}$, Other Input = V _{IH} /V _{IL}	t _{cycle} = 8 ns	—	—	180	mA
			t _{cycle} = 10 ns	—	—	170	
			t _{cycle} = 12 ns	—	—	160	
I _{DDO2}		$\overline{CE} = 0.2$ V, I _{OUT} = 0 mA, $\overline{OE} = V_{DD} - 0.2$ V, Other Input = V _{DD} - 0.2 V/0.2 V	t _{cycle} = 8 ns	—	—	150	
			t _{cycle} = 10 ns	—	—	140	
			t _{cycle} = 12 ns	—	—	130	
I _{DDS1}	Standby Current	$\overline{CE} = V_{IH}$, Other Input = V _{IH} or V _{IL}		—	—	65	mA
I _{DDS2}		$\overline{CE} = V_{DD} - 0.2$ V, Other Input = V _{DD} - 0.2 V or 0.2 V		—	—	10	

CAPACITANCE (Ta = 25°C, f = 1.0 MHz)

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	*	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.
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	TC55VZM216AJJI/AFTI						UNIT
		08		10		12		
		MIN	MAX	MIN	MAX	MIN	MAX	
t _{RC}	Read Cycle Time	8	—	10	—	12	—	ns
t _{ACC}	Address Access Time	—	8	—	10	—	12	
t _{CO}	Chip Enable Access Time	—	8	—	10	—	12	
t _{OE}	Output Enable Access Time	—	4	—	5	—	6	
t _{BA}	Upper Byte, Lower Byte Access Time	—	4	—	5	—	6	
t _{OH}	Output Data Hold Time from Address Change	3	—	3	—	3	—	
t _{COE}	Output Enable Time from Chip Enable	3	—	3	—	3	—	
t _{OEE}	Output Enable Time from Output Enable	0	—	0	—	0	—	
t _{BE}	Output Enable Time from Upper Byte, Lower Byte	0	—	0	—	0	—	
t _{COD}	Output Disable Time from Chip Enable	—	4	—	5	—	6	
t _{ODO}	Output Disable Time from Output Enable	—	4	—	5	—	6	
t _{BD}	Output Disable Time from Upper Byte, Lower Byte	—	4	—	5	—	6	

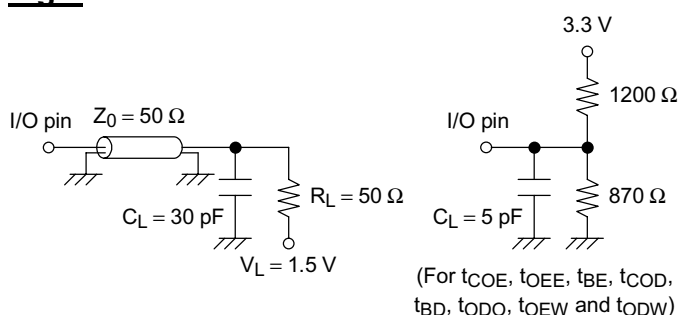
WRITE CYCLE

SYMBOL	PARAMETER	TC55VZM216AJJI/AFTI						UNIT
		08		10		12		
		MIN	MAX	MIN	MAX	MIN	MAX	
t _{WC}	Write Cycle Time	8	—	10	—	12	—	ns
t _{WP}	Write Pulse Width	6	—	7	—	8	—	
t _{CW}	Chip Enable to End of Write	6	—	7	—	8	—	
t _{BW}	Upper Byte, Lower Byte Enable to End of Write	6	—	7	—	8	—	
t _{AW}	Address Valid to End of Write	6	—	7	—	8	—	
t _{AS}	Address Setup Time	0	—	0	—	0	—	
t _{WR}	Write Recovery Time	0	—	0	—	0	—	
t _{DS}	Data Setup Time	4	—	5	—	6	—	
t _{DH}	Data Hold Time	0	—	0	—	0	—	
t _{OEw}	Output Enable Time from Write Enable	3	—	3	—	3	—	
t _{ODw}	Output Disable Time from Write Enable	—	4	—	5	—	6	

AC TEST CONDITIONS

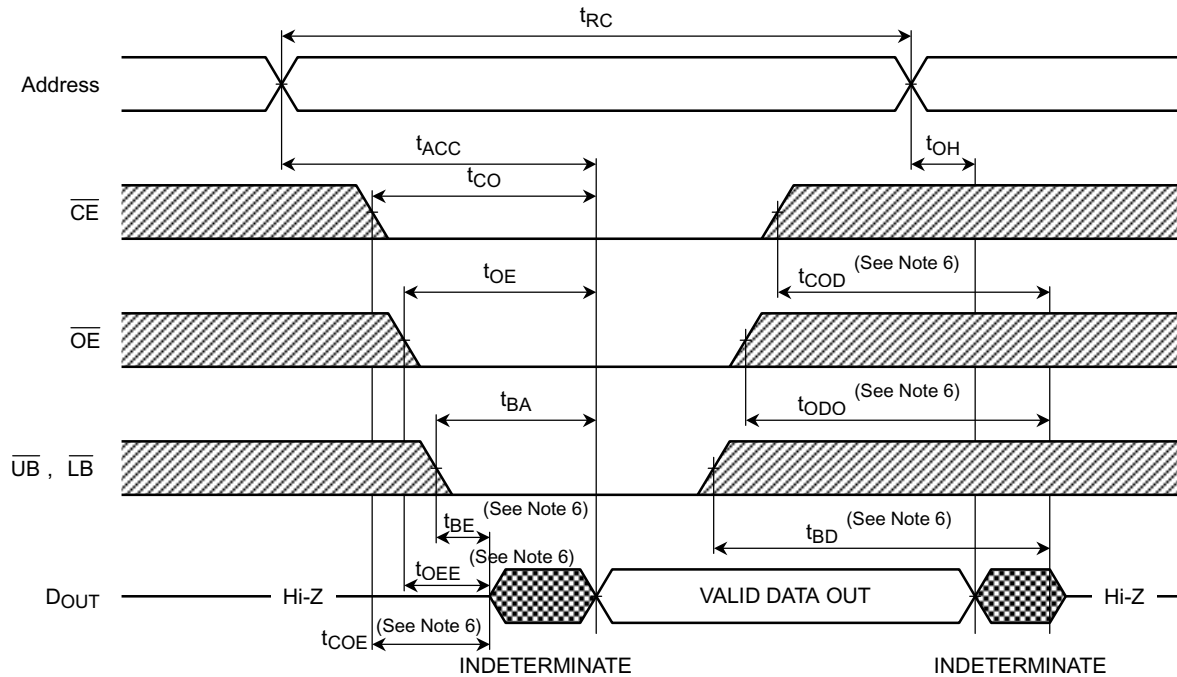
PARAMETER	TEST CONDITION
Input Pulse Level	3.0 V/ 0.0 V
Input Pulse Rise and Fall Time	2 ns
Input Timing Measurement Reference Level	1.5 V
Output Timing Measurement Reference Level	1.5 V
Output Load	Fig.1

Fig.1

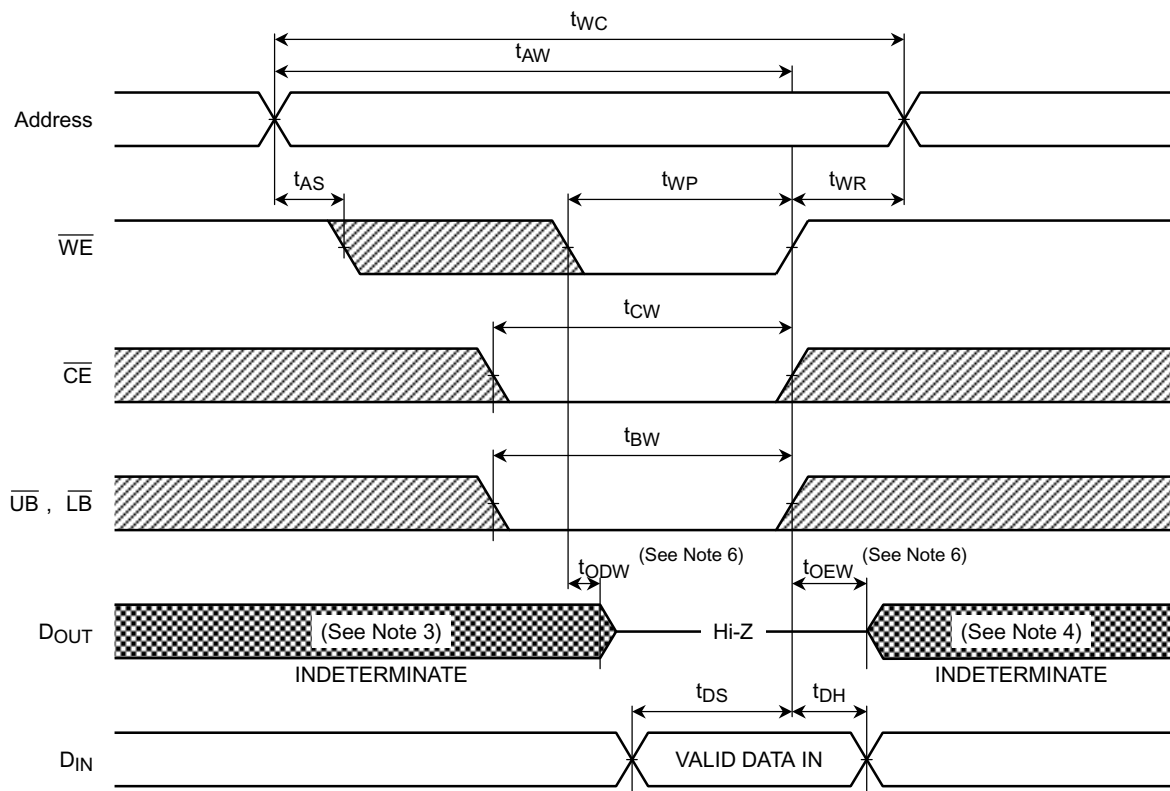


TIMING DIAGRAMS

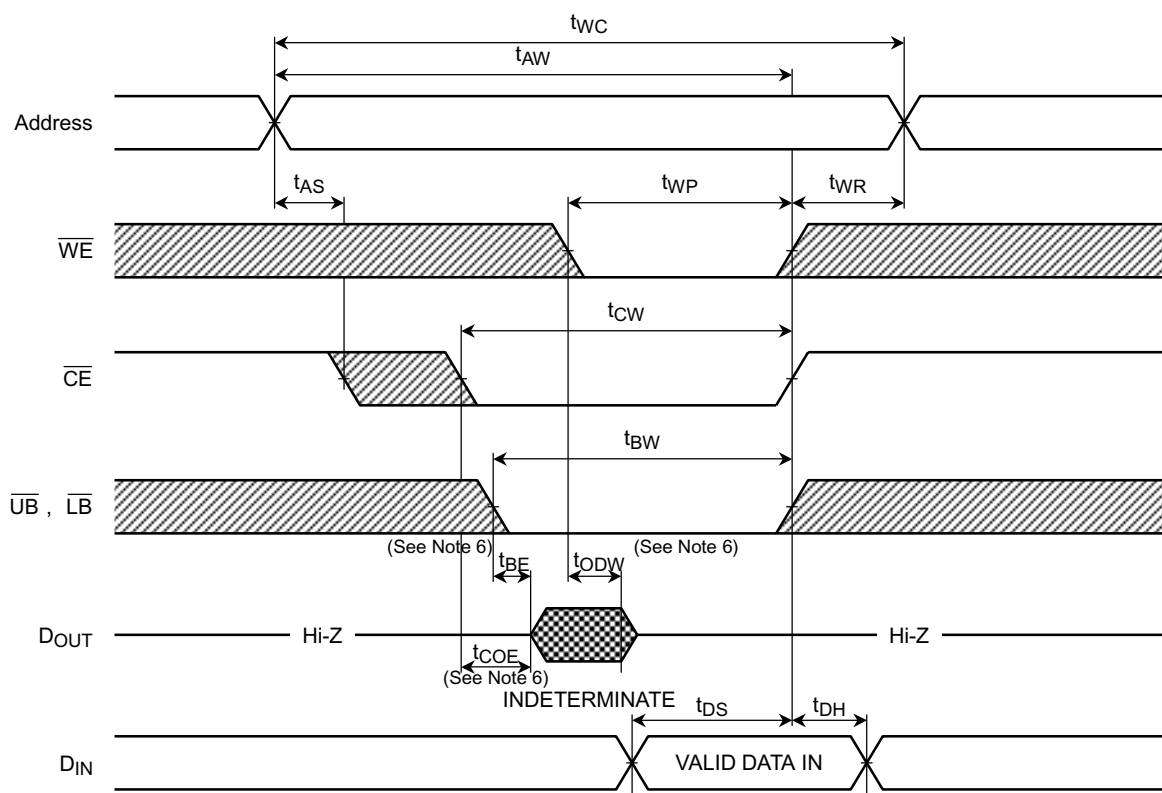
READ CYCLE (See Note 2)



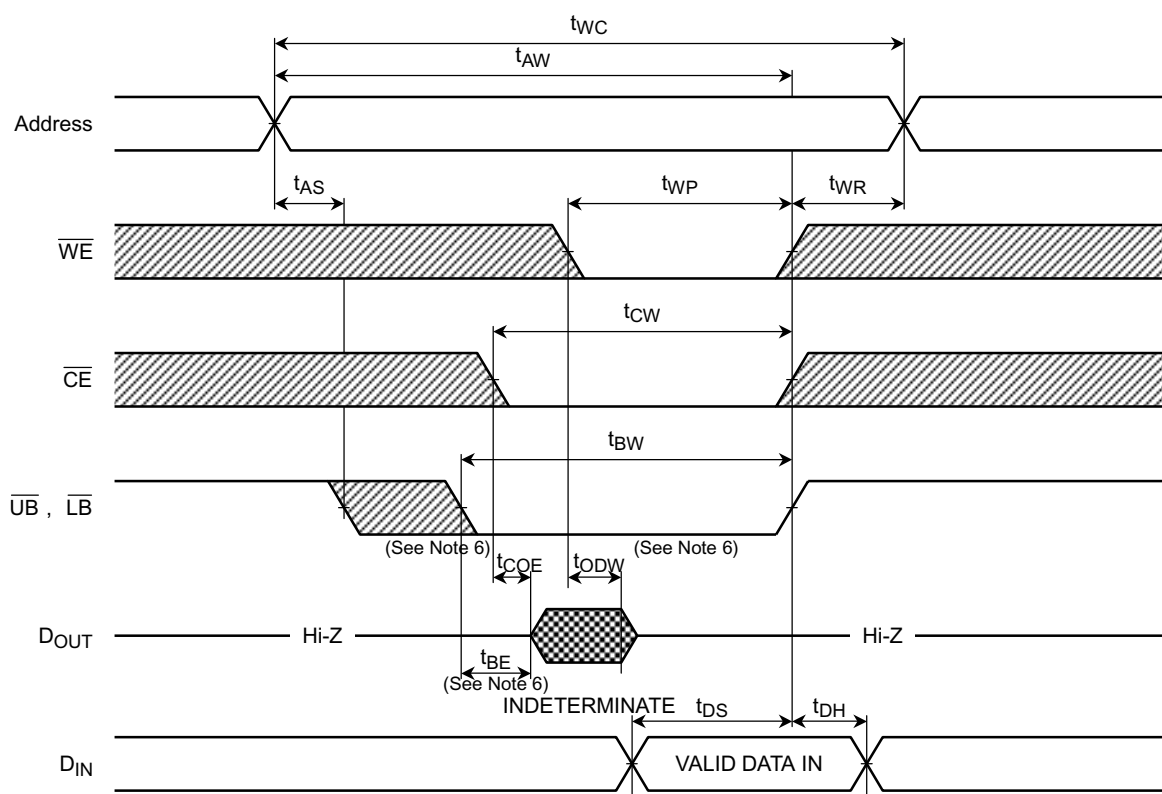
WRITE CYCLE 1 ($\overline{WE}$ CONTROLLED) (See Note 5)



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



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

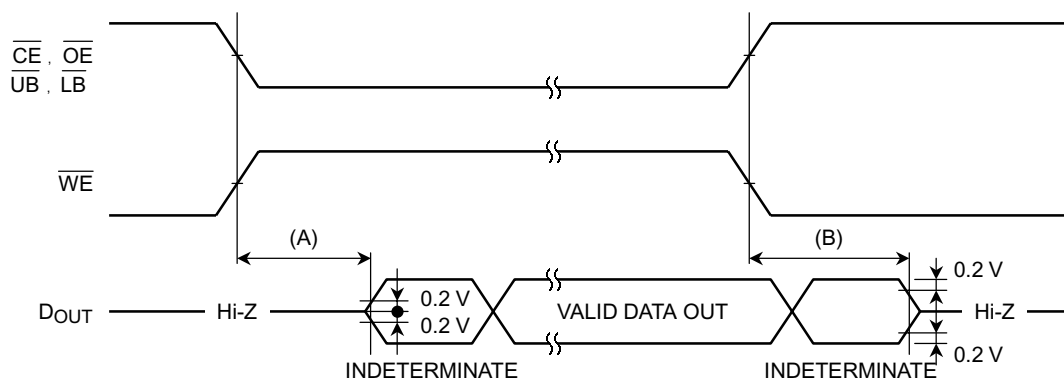


Note:

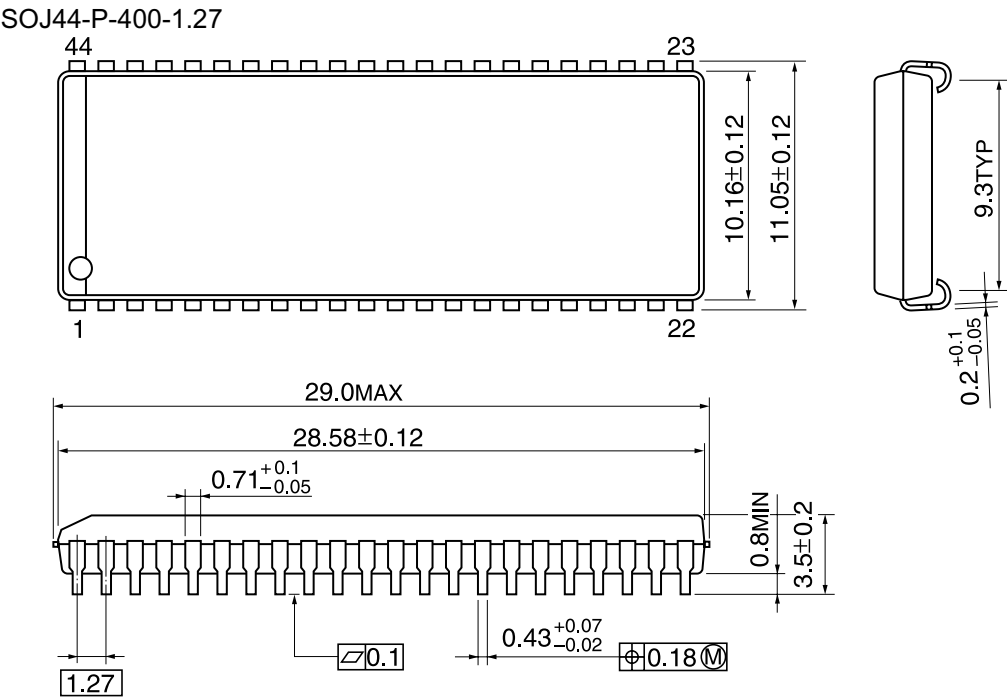
- (1) Operating temperature (T_a) is guaranteed for transverse air flow exceeding 400 linear feet per minute.
- (2) $\overline{WE}$ remains HIGH for the Read Cycle.
- (3) If $\overline{CE}$ goes LOW coincident with or after $\overline{WE}$ goes LOW, the outputs will remain at high impedance.
- (4) If $\overline{CE}$ 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

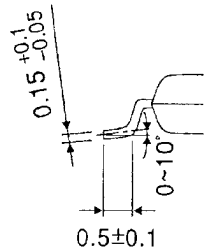
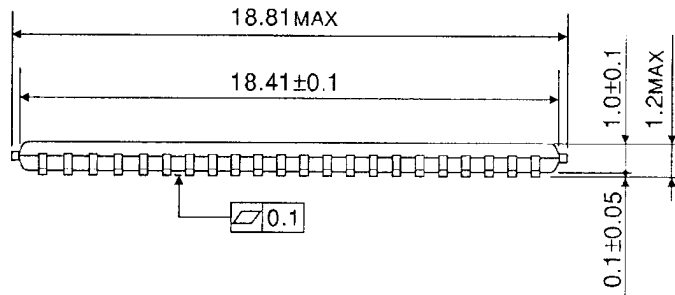
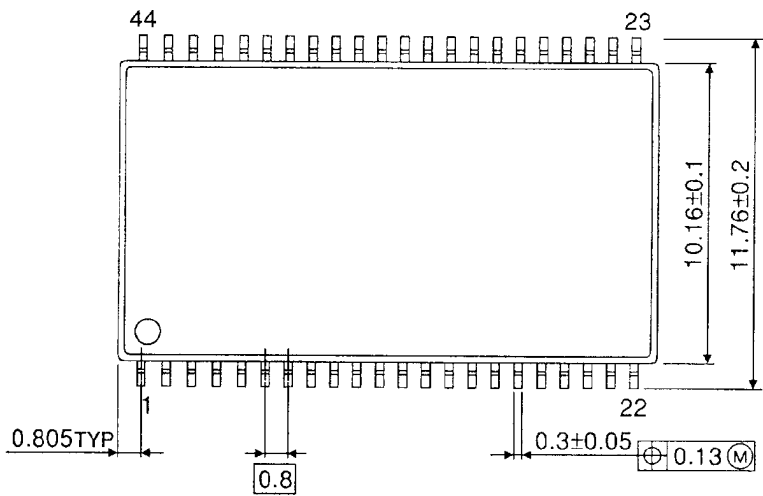


Weight: 1.64 g (typ)

PACKAGE DIMENSIONS

TSOPII 44-P-400-0.80

Unit : mm



Weight: 0.45 g (typ)

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