

TC55257BPI/BFI/BSPI/BFTI/BTRI-10L

SILICON GATE CMOS

32,768 WORD x 8 BIT STATIC RAM

Description

The TC55257BPI is a 262,144 bit CMOS static random access memory organized as 32,768 words by 8 bits and operated from a single 5V power supply. Advanced circuit techniques provide both high speed and low power features with an operating current of 5mA/MHz (typ.) and a minimum cycle time of 100ns.

When \overline{CE} is a logical high, the device is placed in a low power standby mode in which the standby current is 2 μ A at room temperature. The TC55257BPI has two control inputs. Chip enable (\overline{CE}) allows for device selection and data retention control, while an output enable input (\overline{OE}) provides fast memory access. The TC55257BPI is suitable for use in microprocessor systems where high speed, low power, and battery backup are required. The TC55257BPI has an operating temperature range of -40 ~ 85°C so it is suitable for use in wide operating temperature systems.

The TC55257BPI is offered in a standard dual-in-line 28-pin plastic package (0.6/0.3 inch width), a small outline plastic package, and a thin small outline plastic package (forward type, reverse type).

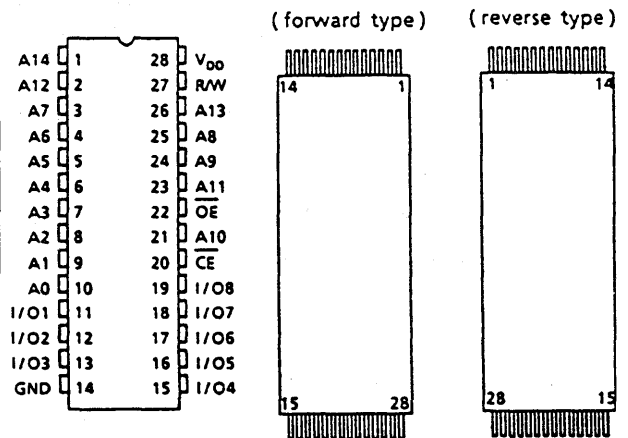
Features

- Low power dissipation: 27.5mW/MHz (typ.)
- Standby current: 2 μ A at Ta = 25°C (max.)
- Single 5V power supply
- Access time (max.)

	TC55257BPI/BFI/BSPI/BFTI/BTRI-10L
Access Time	100ns
Chip Enable Access Time	100ns
Output Enable Time	50ns

- Power down feature: \overline{OE}
- Data retention supply voltage: 2.0 ~ 5.5V
- Wide operating temperature: -40 ~ 85°C
- Inputs and outputs TTL compatible
- Package
 - TC55257BPI : DIP28-P-600
 - TC55257BFI : SOP28-P-450
 - TC55257BSPI : DIP28-P-300B
 - TC55257BFTI : TSOP28-P
 - TC55257BTRI : TSOP28-P-A

Pin Connection (Top View)

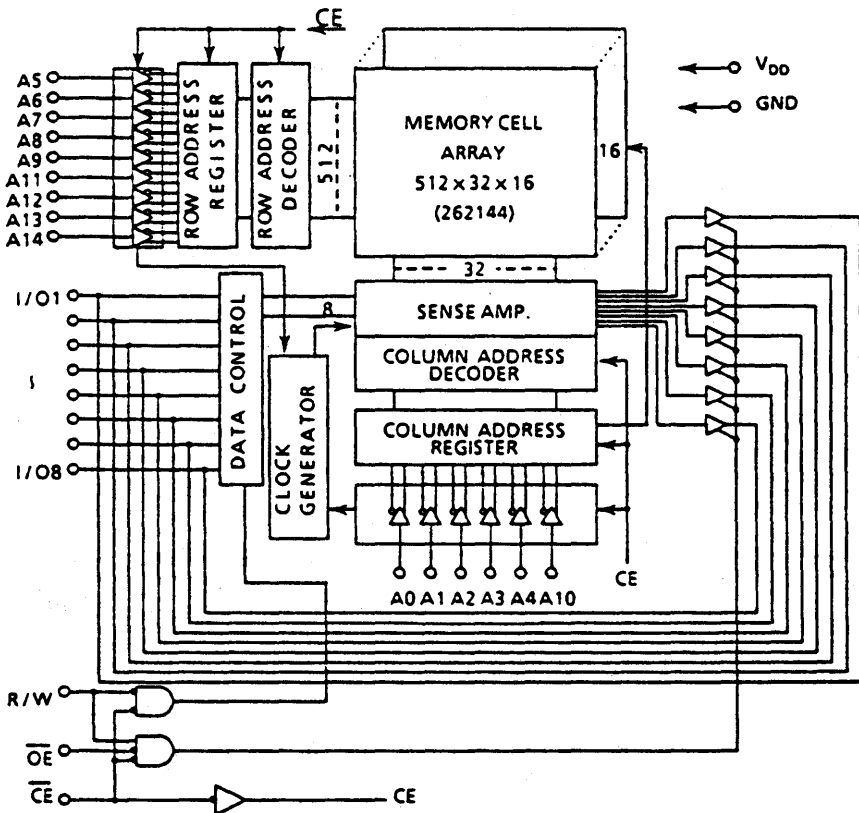


Pin Names

A0 ~ A14	Address Inputs
R/W	Read/Write Control Input
\overline{OE}	Output Enable Input
\overline{CE}	Chip Enable Input
I/O1 ~ I/O8	Data Input/Output
V _{DD}	Power (+5V)
GND	Ground

PIN NO.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
PIN NAME	\overline{OE}	A ₁₁	A ₉	A ₈	A ₁₃	R/W	V _{DD}	A ₁₄	A ₁₂	A ₇	A ₆	A ₅	A ₄	A ₃
PIN NO.	15	16	17	18	19	20	21	22	23	24	25	26	27	28
PIN NAME	A ₂	A ₁	A ₀	I/O1	I/O2	I/O3	GND	I/O4	I/O5	I/O6	I/O7	I/O8	\overline{CE}	A ₁₀

Block Diagram



Operating Mode

MODE	PIN	\overline{CE}	\overline{OE}	R/W	I/O1 ~ I/O8	POWER
Read		L	L	H	D _{OUT}	I _{DDO}
Write		L	*	L	D _{IN}	I _{DDO}
Output Deselect		L	H	H	High-Z	I _{DDO}
Standby		H	*	*	High-Z	I _{DDS}

* H or L

Maximum Ratings

SYMBOL	ITEM	RATING	UNIT
V _{DD}	Power Supply Voltage	-0.3 ~ 7.0	V
V _{IN}	Input Voltage	-0.3* ~ 7.0	V
V _{I/O}	Input and Output Voltage	-0.5* ~ V _{DD} + 0.5	V
P _D	Power Dissipation	1.0/0.8/0.6**	W
T _{SOLDER}	Soldering Temperature • Time	260 • 10	°C • sec
T _{STRG}	Storage Temperature	-55 ~ 150	°C
T _{OPR}	Operating Temperature	-40 ~ 85	°C

* -3.0V with a pulse width of 50ns

** Package dependent: 0.6 inch 1.0W, 0.3 inch 0.8W, 0.45 inch 0.6W

DC Recommended Operating Conditions

SYMBOL	PARAMETER	MIN.	TYP.	MAX.	UNIT
V_{DD}	Power Supply Voltage	4.5	5.0	5.5	V
V_{IH}	Input High Voltage	2.4	–	$V_{DD} + 0.3$	
V_{IL}	Input Low Voltage	-0.3*	–	0.6	
V_{DH}	Data Retention Supply Voltage	2.0	–	5.5	

* -3.0V with a pulse width of 50ns

DC Characteristics ($T_a = -40 \sim 85^\circ\text{C}$, $V_{DD} = 5V \pm 10\%$)

SYMBOL	PARAMETER	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
I_{LI}	Input Leakage Current	$V_{IN} = 0 \sim V_{DD}$	–	–	± 1.0	μA	
I_{LO}	Output Leakage Current	$\overline{CE} = V_{IH}$ or $R/W = V_{IL}$ or $\overline{OE} = V_{IH}$ $V_{OUT} = 0 \sim V_{DD}$	–	–	± 1.0	μA	
I_{OH}	Output High Current	$V_{OH} = 2.4V$	-1.0	–	–	mA	
I_{OL}	Output Low Current	$V_{OL} = 0.4V$	4.0	–	–	mA	
I_{DDO1}	Operating Current	$\overline{CE} = V_{IL}$ $R/W = V_{IH}$ Other Input = V_{IH}/V_{IL} $I_{OUT} = 0\text{mA}$	$t_{\text{cycle}} = 1\mu\text{s}$	–	10	–	mA
I_{DDO2}		$\overline{CE} = 0.2V$ $R/W = V_{DD} - 0.2V$ Other Input = $V_{DD} - 0.2V/0.2V$ $I_{OUT} = 0\text{mA}$	$t_{\text{cycle}} = \text{Min. cycle}$	–	–	70	
I_{DDO1}	Operating Current	$\overline{CE} = 0.2V$ $R/W = V_{DD} - 0.2V$ Other Input = $V_{DD} - 0.2V/0.2V$ $I_{OUT} = 0\text{mA}$	$t_{\text{cycle}} = 1\mu\text{s}$	–	5	–	mA
I_{DDO2}		$\overline{CE} = 0.2V$ $R/W = V_{DD} - 0.2V$ Other Input = $V_{DD} - 0.2V/0.2V$ $I_{OUT} = 0\text{mA}$	$t_{\text{cycle}} = \text{Min. cycle}$	–	–	60	
I_{DDS1}	Standby Current	$\overline{CE} = V_{IH}$	–	–	3	mA	
I_{DDS2}		$\overline{CE} = V_{DD} - 0.2V$ $V_{DD} = 2.0V \sim 5.5V$	$T_a = -40 \sim 85^\circ\text{C}$	–	–	50	μA
		$T_a = 25^\circ\text{C}$	–	–	2		

Capacitance* ($T_a = 25^\circ\text{C}$, $f = 1\text{MHz}$)

SYMBOL	PARAMETER	TEST CONDITION	MAX.	UNIT
C_{IN}	Input Capacitance	$V_{IN} = \text{GND}$	10	pF
C_{OUT}	Output Capacitance	$V_{OUT} = \text{GND}$	10	

*This parameter is periodically sampled and is not 100% tested.

AC Characteristics (Ta = -40 ~ 85°C, V_{DD} = 5V±10%)

Read Cycle

SYMBOL	PARAMETER	TC55257BPI/BFI/BSPI/BFTI/BTRI-10L		UNIT
		MIN.	MAX.	
t _{RC}	Read Cycle Time	100	–	ns
t _{ACC}	Address Access Time	–	100	
t _{CO}	\overline{CE} Access Time	–	100	
t _{OE}	Output Enable to Output in Valid	–	50	
t _{COE}	Chip Enable (\overline{CE}) to Output in Low-Z	5	–	
t _{OEE}	Output Enable to Output in Low-Z	0	–	
t _{OD}	Chip Enable (\overline{CE}) to Output in High-Z	–	50	
t _{ODO}	Output Enable to Output in High-Z	–	40	
t _{OH}	Output Data Hold Time	10	–	

Write Cycle

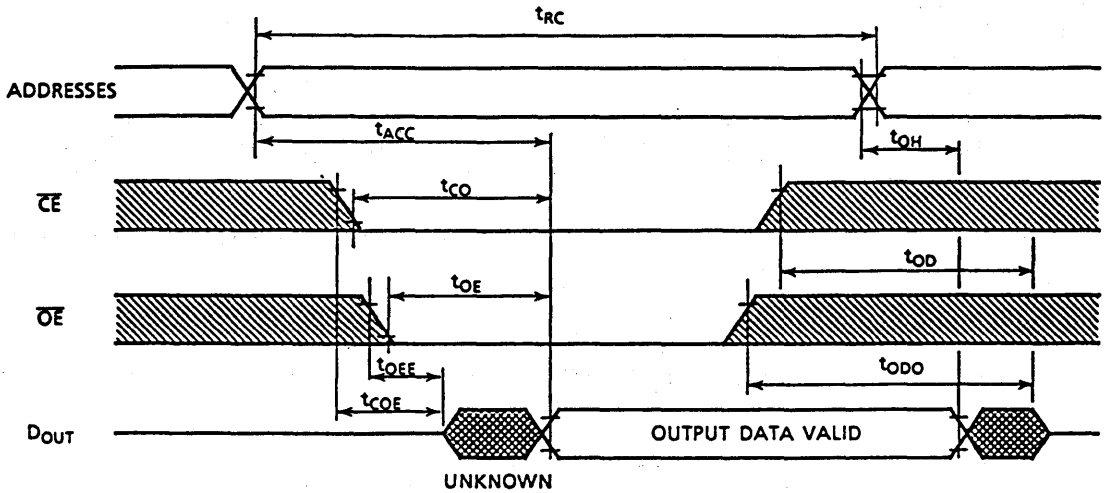
SYMBOL	PARAMETER	TC55257BPI/BFI/BSPI/BFTI/BTRI-10L		UNIT
		MIN.	MAX.	
t _{WC}	Write Cycle Time	100	–	ns
t _{WP}	Write Pulse Width	70	–	
t _{CW}	Chip Selection to End of Write	90	–	
t _{AS}	Address Setup Time	0	–	
t _{WR}	Write Recovery Time	5	–	
t _{ODW}	R/W to Output in High-Z	–	50	
t _{OEW}	R/W to Output in Low-Z	0	–	
t _{DS}	Data Setup Time	40	–	
t _{DH}	Data Hold Time	0	–	

AC Test Conditions

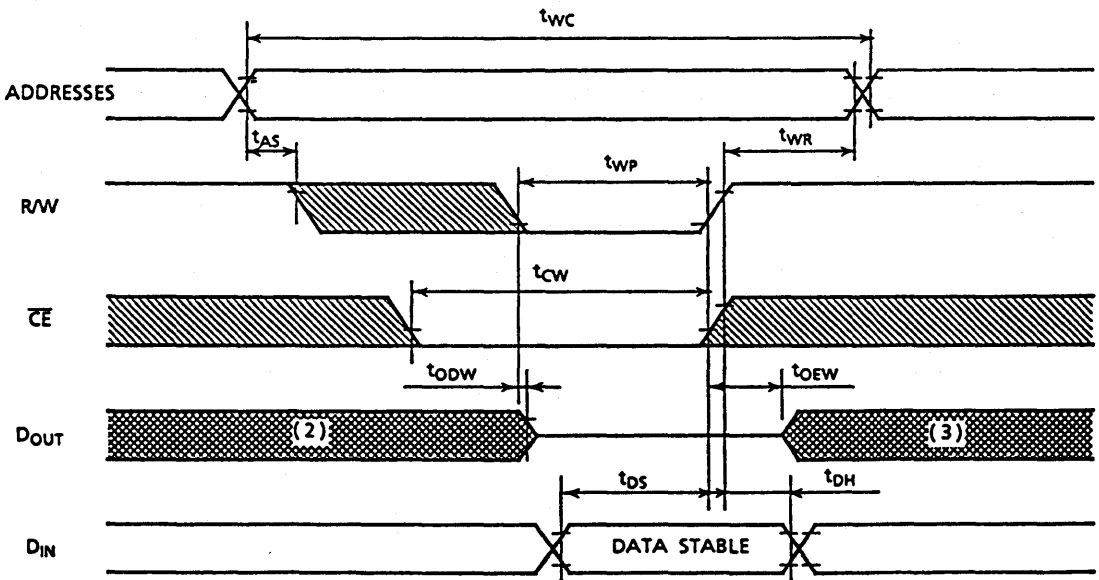
Input Pulse Levels	2.6V/0.4V
Input Pulse Rise and Fall Time	5ns
Input Timing Measurement Reference Levels	2.4V/0.6V
Output Timing Measurement Reference Levels	2.2V/0.8V
Output Load	1 TTL Gate and C _L = 100pF

Timing Waveforms

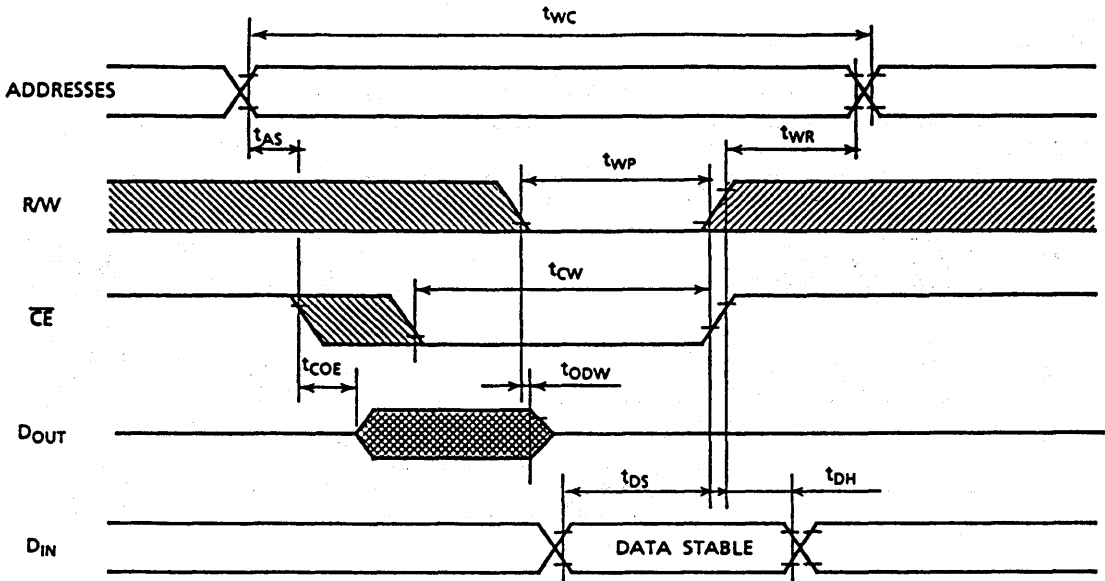
Read Cycle ⁽¹⁾



Write Cycle 1 ⁽⁴⁾ (R/W Controlled Write)



Write Cycle 2 ⁽⁴⁾ (\overline{CE} Controlled Write)



Notes:

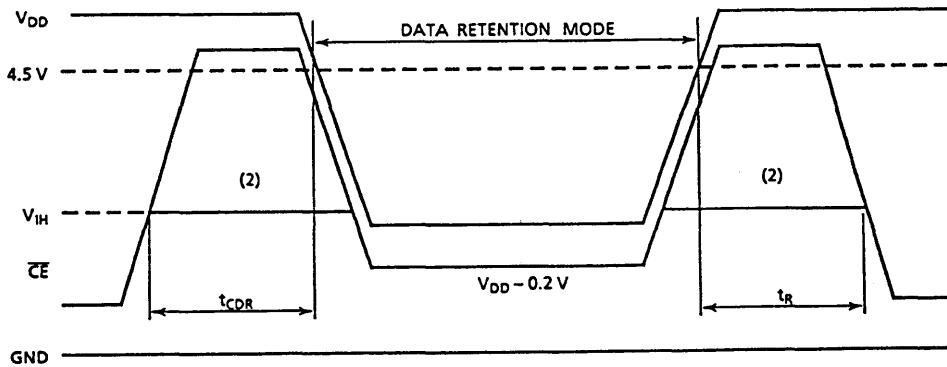
1. R/W is high for read cycles.
2. If the \overline{CE} low transition occurs coincident with or after the R/W low transition, outputs remain in a high impedance state.
3. If the \overline{CE} high transition occurs coincident with or prior to the R/W high transition, outputs remain in a high impedance state.
4. If \overline{OE} is high during a write cycle, the outputs are in a high impedance state during this period.

Data Retention Characteristics (Ta = -40 ~ 85°C)

SYMBOL	PARAMETER	MIN.	TYP.	MAX.	UNIT
V_{DH}	Data Retention Supply Voltage	2.0	-	5.5	V
I_{DD52}	Standby Current	$V_{DH} = 3.0V$	-	30	μA
		$V_{DH} = 5.5V$	-	50	
t_{CDR}	Chip Deselect to Data Retention Mode	0	-	-	μs
t_R	Recovery Time	$t_{RC(1)}$	-	-	

Note (1): Read Cycle Time

\overline{CE} Controlled Data Retention Mode



Note (2): If the V_{IH} of \overline{CE} is 2.4V in operation, I_{DD51} current flows during the period that the V_{DD} voltage is going down from 4.5V to 2.6V.