TC55257BPL/BFL/BSPL/BFTL/BTRL-85L/10L(LV)

SILICON GATE CMOS

32,768 WORD x 8 BIT STATIC RAM

Description

The TC55257BPL 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 85ns.

When $\overline{CE}$ is a logical high, the device is placed in a low power standby mode in which the standby current is 2μA at room temperature. The TC55257BPL 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 TC55257BPL is suitable for use in microprocessor systems where high speed, low power, and battery backup are required.

The TC55257BPL 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).

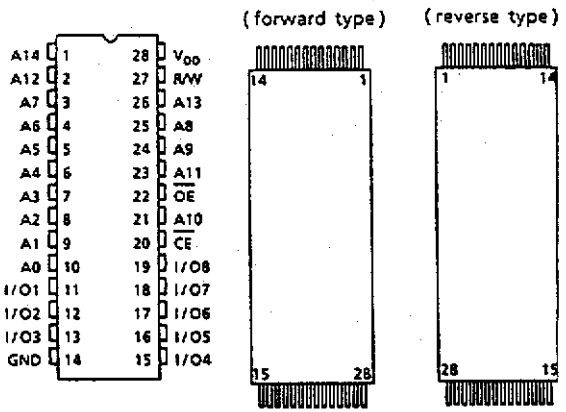
Features

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

	TC55257BPL/BFL/BSPL/BFTL/BTRL	
	-85L(LV)	-10L(LV)
Access Time	85ns	100ns
Chip Enable Access Time	85ns	100ns
Output Enable Time	45ns	50ns

- Power down feature: $\overline{CE}$
- Data retention supply voltage: 2.0 ~ 5.5V
- Inputs and outputs TTL compatible
- Package
  - TC55257BPL : DIP28-P-600
  - TC55257BFL : SOP28-P-450
  - TC55257BSPL : DIP28-P-300B
  - TC55257BFTL : TSOP28-P
  - TC55257BTRL : TSOP28-P-A

Pin Connection (Top View)

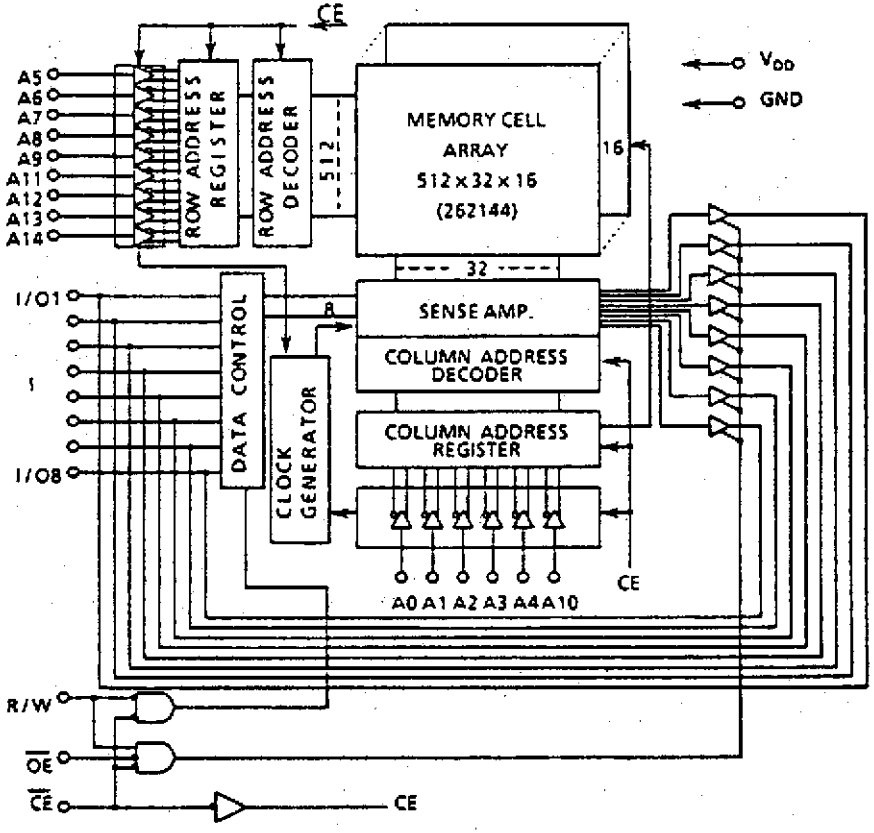


Pin Names

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	0 ~ 70	°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	2.2	–	V_{DD} + 0.3	
V_{IL}	Input Low Voltage	-0.3*	–	0.8	
V_{DH}	Data Retention Supply Voltage	2.0	–	5.5	

* -3.0V with a pulse width of 50ns

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

SYMBOL	PARAMETER	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
I_{LI}	Input Leakage Current	V_{IN} = 0 ~ 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 ~ 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} = 0mA	t_{cycle} = 1μs	–	10	–	mA
			t_{cycle} = Min. cycle	–	–	70	
I_{DDO2}		$\overline{CE}$ = 0.2V R/W = V_{DD} - 0.2V Other Input = V_{DD} - 0.2V/0.2V I_{OUT} = 0mA	t_{cycle} = 1μs	–	5	–	
			t_{cycle} = 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 ~ 5.5V	Ta = 0 ~ 70°C	–	–	30	μA
			Ta = 25°C	–	–	2	

Capacitance* (Ta = 25°C, f = 1MHz)

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

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

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

Read Cycle

SYMBOL	PARAMETER	TC55257BPL/BFL/BSPL/BFTL/BTRL				UNIT
		-85L(LV)		-10L(LV)		
		MIN.	MAX.	MIN.	MAX.	
t_{RC}	Read Cycle Time	85	–	100	–	ns
t_{ACC}	Address Access Time	–	85	–	100	
t_{CO}	$\overline{CE}$ Access Time	–	85	–	100	
t_{OE}	Output Enable to Output in Valid	–	45	–	50	
t_{COE}	Chip Enable ($\overline{CE}$) to Output in Low-Z	10	–	10	–	
t_{OEE}	Output Enable to Output in Low-Z	5	–	5	–	
t_{OD}	Chip Enable ($\overline{CE}$) to Output in High-Z	–	30	–	50	
t_{ODO}	Output Enable to Output in High-Z	–	30	–	40	
t_{OH}	Output Data Hold Time	10	–	10	–	

Write Cycle

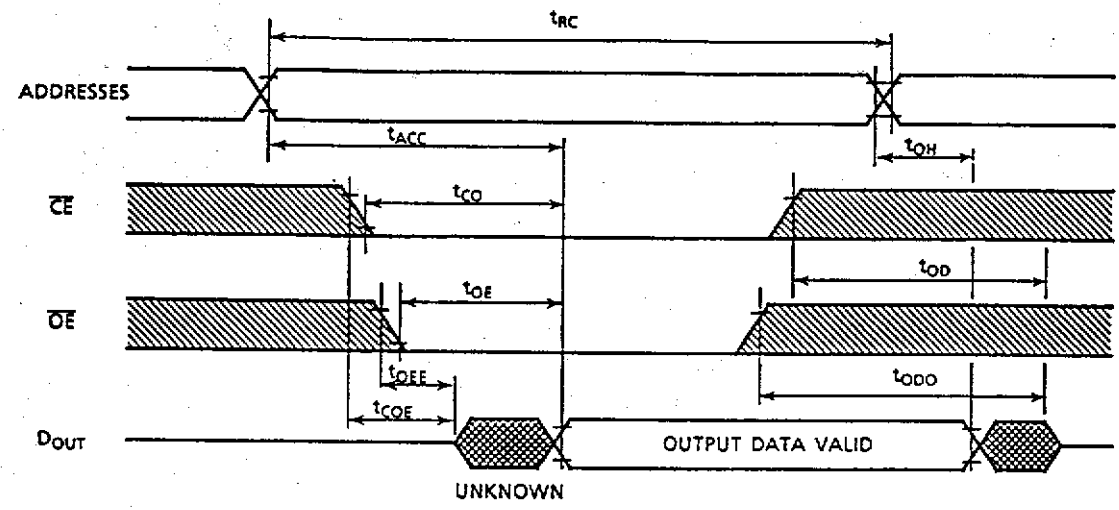
SYMBOL	PARAMETER	TC55257BPL/BFL/BSPL/BFTL/BTRL				UNIT
		-85L(LV)		-10L(LV)		
		MIN.	MAX.	MIN.	MAX.	
t_{WC}	Write Cycle Time	85	–	100	–	ns
t_{WP}	Write Pulse Width	60	–	70	–	
t_{CW}	Chip Selection to End of Write	65	–	90	–	
t_{AS}	Address Setup Time	0	–	0	–	
t_{WR}	Write Recovery Time	5	–	5	–	
t_{ODW}	R/W to Output in High-Z	–	30	–	50	
t_{OEW}	R/W to Output in Low-Z	5	–	5	–	
t_{DS}	Data Setup Time	40	–	40	–	
t_{DH}	Data Hold Time	0	–	0	–	

AC Test Conditions

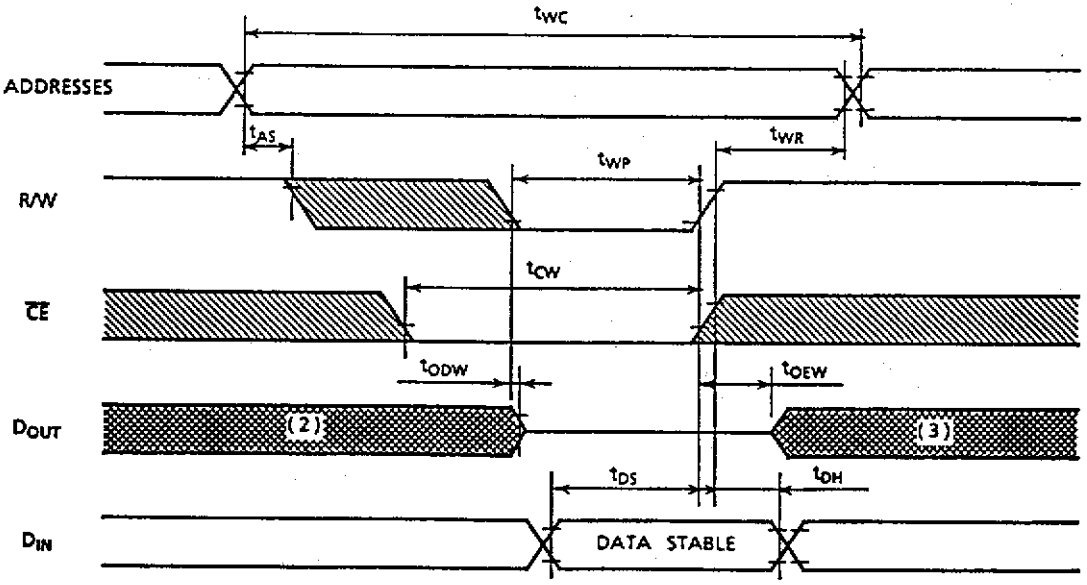
Input Pulse Levels	2.4V/0.6V
Input Pulse Rise and Fall Time	5ns
Input Timing Measurement Reference Levels	2.2V/0.8V
Output Timing Measurement Reference Levels	2.2V/0.8V
Output Load	1 TTL Gate and C_L = 100pF

Timing Waveforms

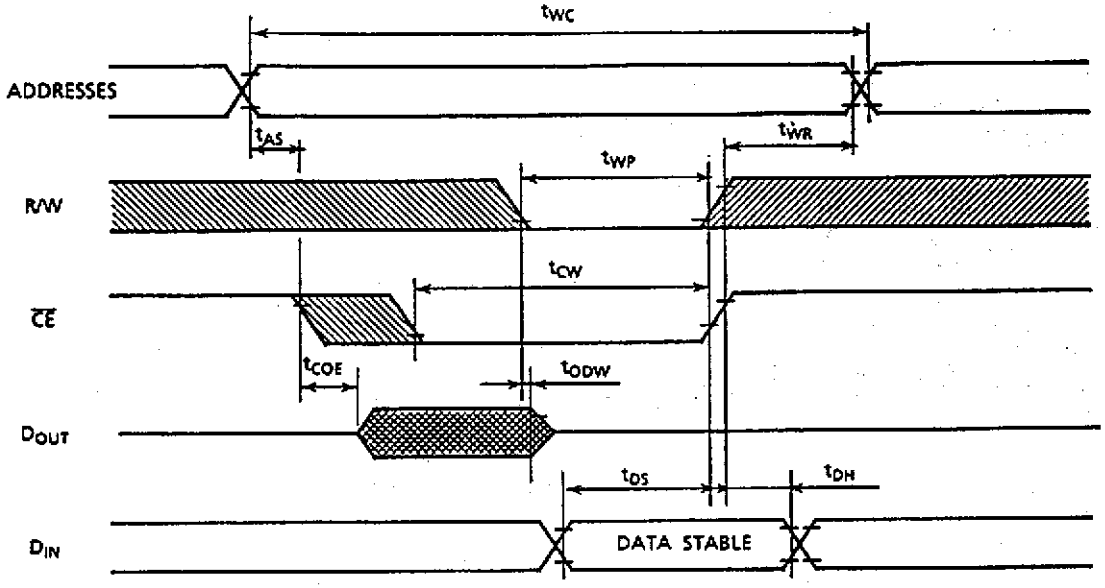
Read Cycle (1)



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



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



Notes:

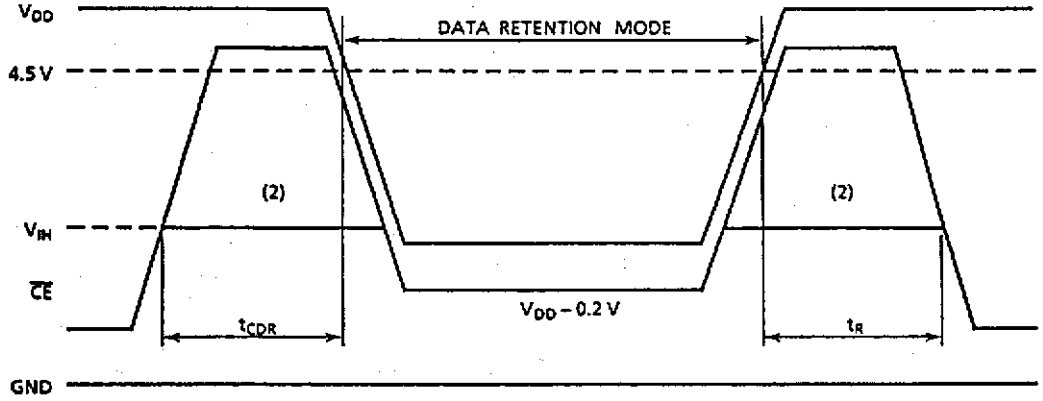
1. R/W is high for read cycles.
2. If the $\overline{CE}$ low transition occurs coincident with or after the R/W low transition, outputs remain in a high impedance state.
3. If the $\overline{CE}$ high transition occurs coincident with or prior to the R/W high transition, outputs remain in a high impedance 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 = 0 ~ 70°C)

SYMBOL	PARAMETER		MIN.	TYP.	MAX.	UNIT
V_{DH}	Data Retention Supply Voltage		2.0	–	5.5	V
I_{DDS2}	Standby Current	V_{DH} = 3.0V	–	–	20	µA
		V_{DH} = 5.5V	–	–	30	
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 2.2V in operation, I_{DDS1} current flows during the period that the V_{DD} voltage is going down from 4.5V to 2.4V.

3V Operation

DC Recommended Operating Conditions

SYMBOL	PARAMETER	MIN.	TYP.	MAX.	UNIT
V_{DD}	Power Supply Voltage	2.7	3.0	3.3	V
V_{IH}	Input High Voltage	V_{DD} - 0.2	–	V_{DD} + 0.3	
V_{IL}	Input Low Voltage	-0.3	–	0.2	

DC Characteristics (Ta = 0 ~ 70°C, V_{DD} = 3V±10%)

SYMBOL	PARAMETER	TEST CONDITION			MIN.	TYP.	MAX.	UNIT
I_{LI}	Input Leakage Current	V_{IN} = 0 ~ 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 ~ V_{DD}			–	–	±1.0	µA
I_{OH}	Output High Current	V_{OH} = V_{DD} - 0.2V			-0.1	–	–	mA
I_{OL}	Output Low Current	V_{OL} = 0.2V			0.1	–	–	mA
I_{DDO2}	Operating Current	$\overline{CE}$ = 0.2V R/W = V_{DD} - 0.2V I_{OUT} = 0mA Other Inputs = V_{DD} - 0.2V/0.2V	t_{cycle}	Min.	–	–	20	mA
				1µs	–	–	5	
I_{DDS2}	Standby Current	$\overline{CE}$ = V_{DD} - 0.2V	Ta = 0 ~ 70°C		–	–	20	µA
			Ta = 25°C		–	1	2	

Capacitance* (Ta = 25°C, f = 1MHz)

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

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

3V Operation

DC Characteristics (Ta = 0 ~ 70°C, V_{DD} = 3V±10%)

Read Cycle

SYMBOL	PARAMETER	MIN.	MAX.	UNIT
t_{RC}	Read Cycle Time	200	–	ns
t_{ACC}	Address Access Time	–	200	
t_{CO}	$\overline{CE}$ Access Time	–	200	
t_{OE}	Output Enable to Output in Valid	–	100	
t_{COE}	Chip Enable ($\overline{CE}$) to Output in Low-Z	10	–	
t_{OEE}	Output Enable to Output in Low-Z	5	–	
t_{OD}	Chip Enable ($\overline{CE}$) to Output in High-Z	–	100	
t_{ODO}	Output Enable to Output in High-Z	–	80	
t_{OH}	Output Data Hold Time	10	–	

Write Cycle

SYMBOL	PARAMETER	MIN.	MAX.	UNIT
t_{WC}	Write Cycle Time	200	–	ns
t_{WP}	Write Pulse Width	150	–	
t_{CW}	Chip Selection to End of Write	180	–	
t_{AS}	Address Setup Time	0	–	
t_{WR}	Write Recovery Time	5	–	
t_{ODW}	R/W to Output in High-Z	–	100	
t_{OEW}	R/W to Output in Low-Z	5	–	
t_{DS}	Data Setup Time	90	–	
t_{DH}	Data Hold Time	0	–	

AC Test Conditions

Input Pulse Levels	V_{DD} - 0.2V/0.2V
Input Pulse Rise and Fall Time	5ns
Input Timing Measurement Reference Levels	1.5V
Output Timing Measurement Reference Levels	1.5V
Output Load	C_L = 100pF