TC554161FTL/TRL-70L/85L/10L

SILICON GATE CMOS

PRELIMINARY

262,144 WORD x 16 BIT STATIC RAM

Description

The TC554161FTL/TRL is a 4,194,304 bit CMOS static random access memory organized as 262,144 words by 16 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 10mA/MHz (typ.) and a minimum cycle time of 70ns. When $\overline{CE}$ is a logical high, the device is placed in a low power standby mode in which the standby current is 60μA (max.). The TC554161FTL/TRL has two control inputs. A chip enable input ($\overline{CE}$) allows for device selection and data retention control, while an output enable input ($\overline{OE}$) provides fast memory access. Byte access is supported by upper and lower byte controls. The TC554161FTL/TRL is suitable for use in microprocessor systems where high speed, low power, and battery backup are required. The TC554161FTL/TRL is offered in a 54-pin thin small outline plastic package (forward type, reverse type).

Features

- Low power dissipation: 55mW/MHz (typ.)
- Standby current: 8μA (max.) at Ta = 25°C
- Single 5V power supply
- Access time (max.)

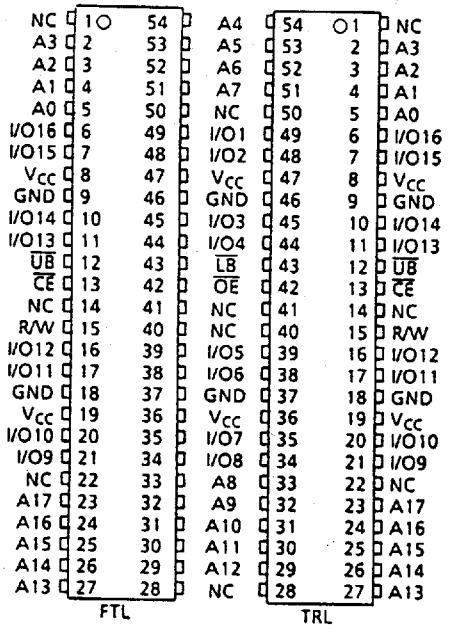
	TC554161FTL/TRL		
	-70L	-85L	-10L
Access Time	70ns	85ns	100ns
$\overline{CE}$ Access Time	70ns	85ns	100ns
$\overline{OE}$ Access Time	35ns	45ns	50ns

- Power down feature: $\overline{CE}$
- Data retention supply voltage: 2.0 ~ 5.5V
- Inputs and outputs TTL compatible
- Package TC554161FTL : TSOP54-P-400
  TC554161TRL : TSOP54-P-400A

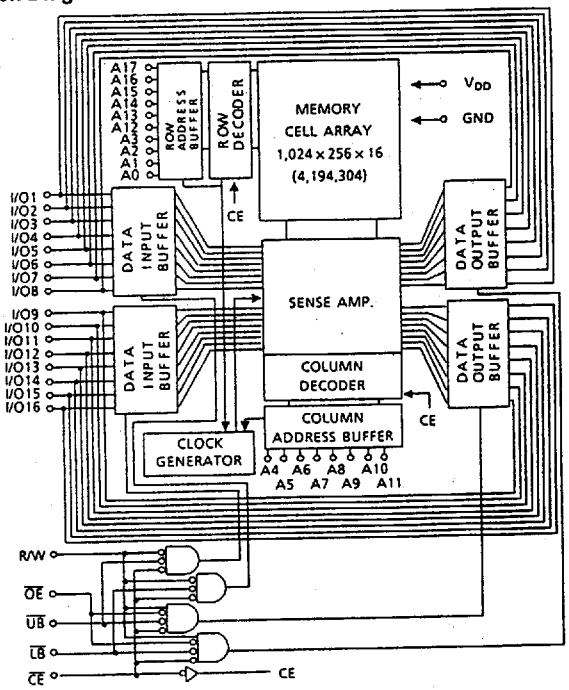
Pin Names

A0 ~ A17	Address Inputs
I/O1 ~ I/O16	Data Input/Output
$\overline{CE}$	Chip Enable Input
R/W	Read/Write Control Input
$\overline{OE}$	Output Enable Input
$\overline{LB}$, $\overline{UB}$	Data Byte Control Input
V_{DD}	Power (+5V)
GND	Ground
NC	No Connection

Pin Connection (Top View)



Block Diagram



Operating Mode

MODE \ PIN	CE	OE	R/W	LB	UB	I/01 ~ I/08	I/09 ~ I/016	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}
Output Deselect	L	H	H	*	*	High Impedance	High Impedance	I_{DDO}
	L	*	*	H	H			
Standby	H	*	*	*	*	High Impedance	High Impedance	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	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 30ns

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 30ns

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			2.1	–	–	mA
I_{DDO1}	Operating Current	$\overline{CE}$ = V_{IL}, I_{OUT} = 0mA Other Inputs = V_{IH}/V_{IL}	t_{cycle}	Min.	–	–	100	mA
				1μs	–	15	–	
I_{DDO2}		$\overline{CE}$ = 0.2V, I_{OUT} = 0mA Other Inputs = V_{IH}/V_{IL}	t_{cycle}	Min.	–	–	90	
				1μs	–	10	–	
I_{DDS1}	Standby Current	$\overline{CE}$ = V_{IH}, Other Inputs = V_{IH}/V_{IL}			–	–	3	mA
I_{DDS2}		$\overline{CE}$ = V_{DD} - 0.2V V_{DD} = 2.0V ~ 5.5V	Ta = 0 ~ 70°C		–	–	60	μA
			Ta = 25°C		–	4	8	

Capacitance* (Ta = 25°C, f = 1.0MHz)

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	TC554161FTL/TRL						UNIT
		-70L		-85L		-10L		
		MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	
t_{RC}	Read Cycle Time	70	–	85	–	100	–	ns
t_{ACC}	Address Access Time	–	70	–	85	–	100	
t_{CO}	$\overline{CE}$ Access Time	–	70	–	85	–	100	
t_{OE}	$\overline{OE}$ Access Time	–	35	–	45	–	50	
t_{BA}	$\overline{UB}$, $\overline{LB}$ Access Time	–	35	–	45	–	50	
t_{OH}	Output Data Hold Time from Address Change	10	–	10	–	10	–	
t_{COE}	Output Enable Time from $\overline{CE}$	10	–	10	–	10	–	
t_{OEE}	Output Enable Time from $\overline{OE}$	5	–	5	–	5	–	
t_{BE}	Output Enable Time from $\overline{UB}$, $\overline{LB}$	5	–	5	–	5	–	
t_{OD}	Output Disable Time from $\overline{CE}$	–	25	–	30	–	35	
t_{ODO}	Output Disable Time from $\overline{OE}$	–	25	–	30	–	35	
t_{BD}	Output Disable Time from $\overline{UB}$, $\overline{LB}$	–	25	–	30	–	35	

Write Cycle

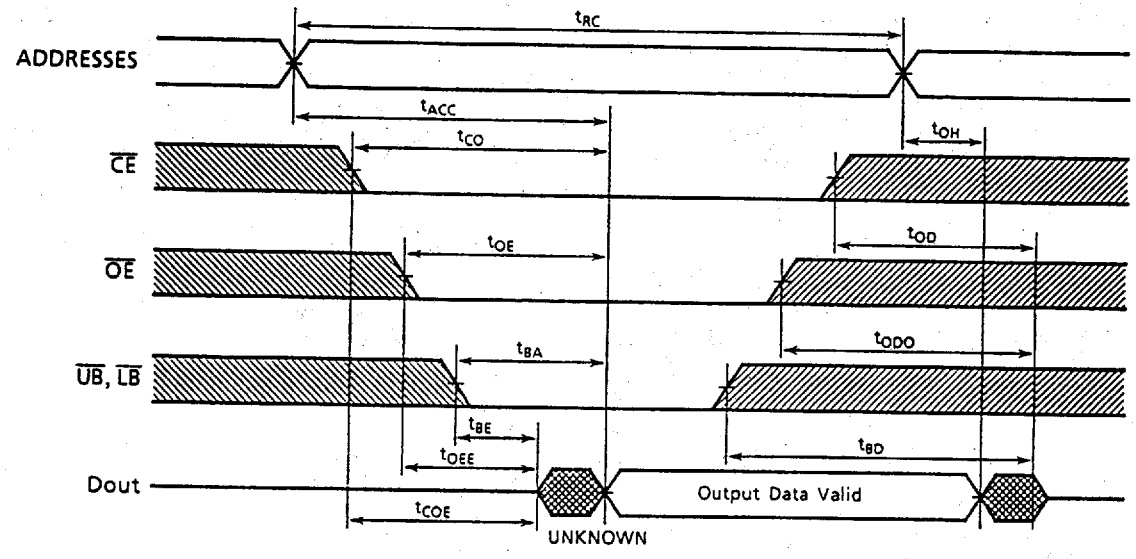
SYMBOL	PARAMETER	TC554161FTL/TRL						UNIT
		-70L		-85L		-10L		
		MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	
t_{WC}	Write Cycle Time	70	–	85	–	100	–	ns
t_{WP}	Write Pulse Width	50	–	55	–	60	–	
t_{CW}	Chip Enable to End of Write	60	–	70	–	80	–	
t_{BW}	$\overline{UB}$, $\overline{LB}$ Enable to End of Write	50	–	55	–	60	–	
t_{AS}	Address Setup Time	0	–	0	–	0	–	
t_{WR}	Write Recovery Time	0	–	0	–	0	–	
t_{DS}	Data Setup Time	30	–	35	–	40	–	
t_{DH}	Data Hold Time	0	–	0	–	0	–	
t_{OEW}	Output Enable Time from R/W	5	–	5	–	5	–	
t_{ODW}	Output Disable Time from R/W	–	25	–	30	–	35	

AC Test Conditions

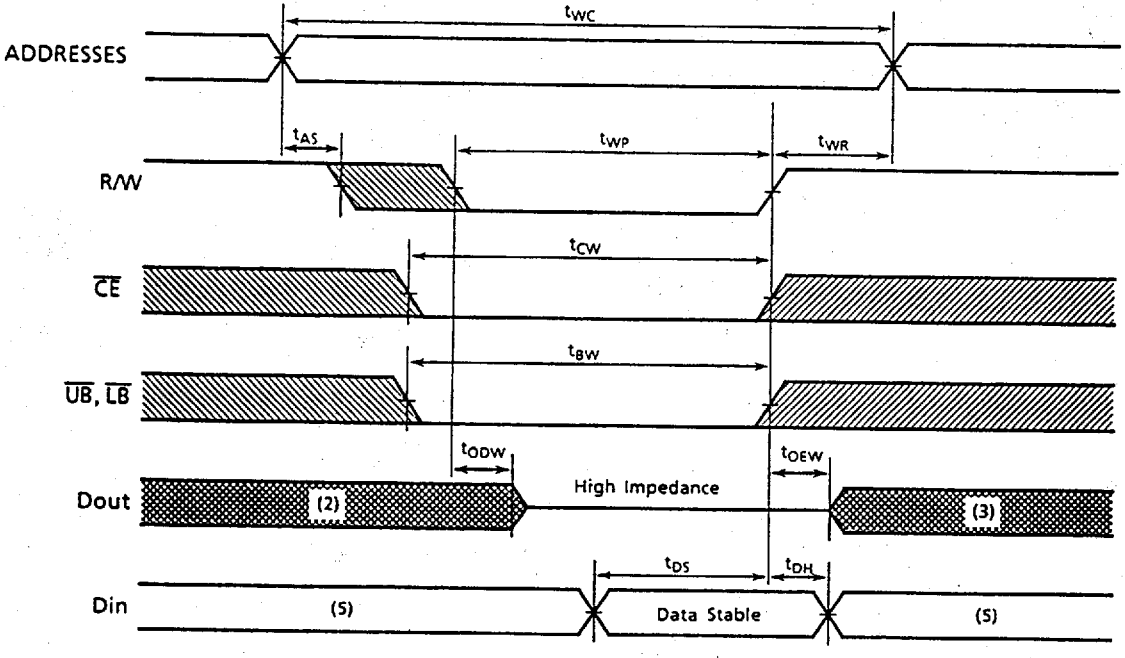
Input Pulse Levels	2.4V/0.6V
Input Pulse Rise and Fall Time	5ns
Input Timing Measurement Reference Levels	1.5V
Output Timing Measurement Reference Levels	1.5V
Output Load	1 TTL Gate and C_L = 100pF

Timing Waveforms

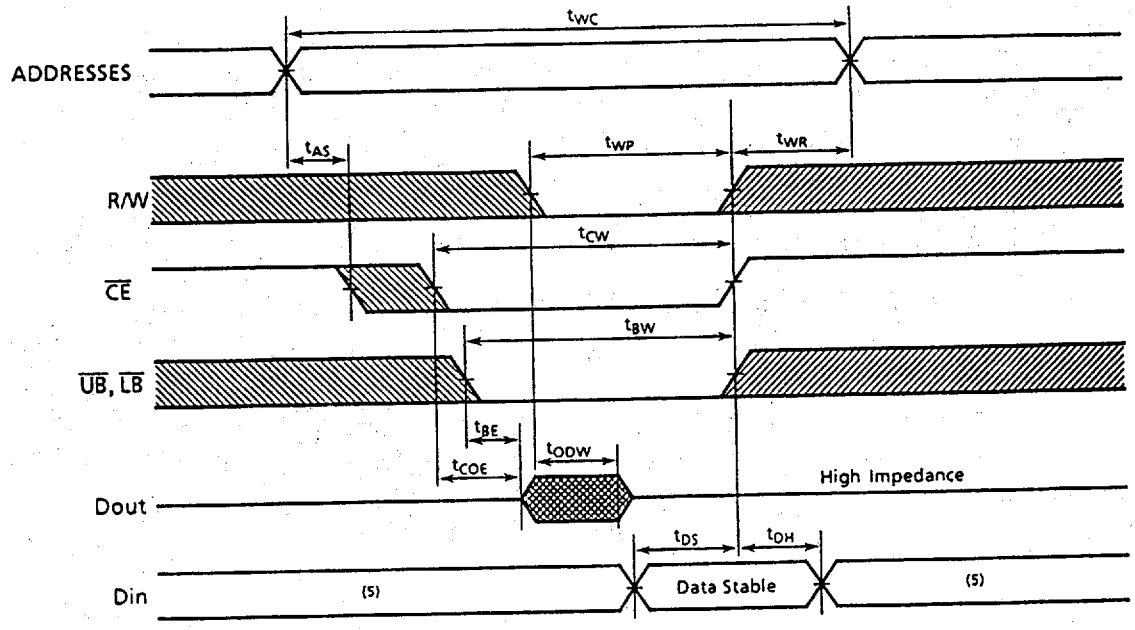
Read Cycle (1)



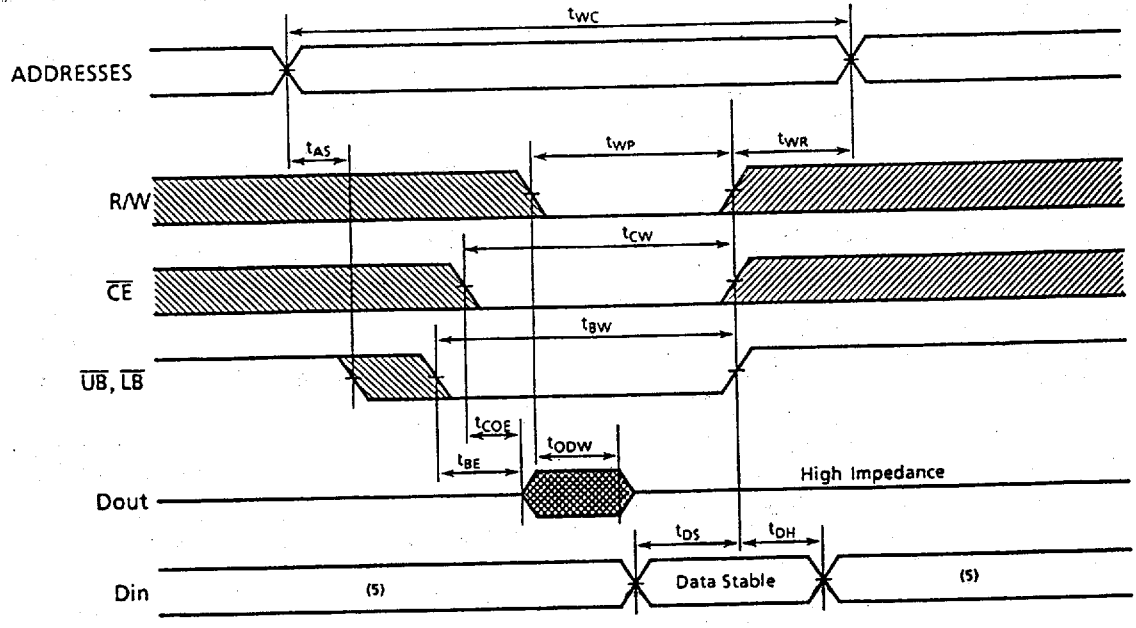
Write Cycle 1 (4) (R/W Controlled Write)



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



Write Cycle 3 (4) ($\overline{UB}$, $\overline{LB}$ 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.

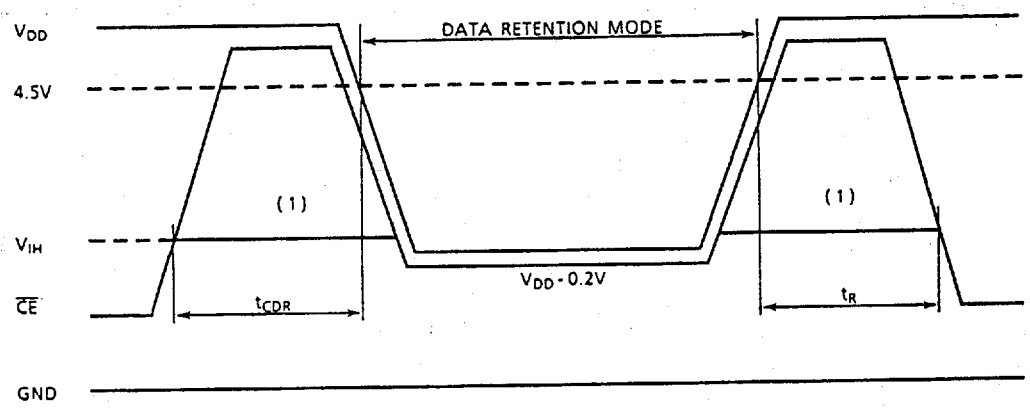
5. The I/O may be in the output state during this time; therefore input signals of opposite phase must not be applied.

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	–	–	30*	µA
		V_{DH} = 5.5V	–	–	60	
t_{CDR}	Chip Deselect to Data Retention Mode		0	–	–	ns
t_R	Recovery Time		5	–	–	ms

*6µA (max.) Ta = 0 ~ 40°C

$\overline{CE}$ Controlled Data Retention Mode



Note:

1. If the V_{IH} of $\overline{CE}$ is 2.2V in operation, during the period that the V_{DD} voltage is going down from 4.5V to 2.4V, I_{DDS1} current flows.