

TOSHIBA MOS MEMORY PRODUCTS

256 WORD x 4 BIT CMOS RAM

TC5501P/-1
TC5501D/-1

DESCRIPTION

The TC5501P/D is a fully static read write memory organized as 256 words by 4 bits using CMOS technology. Because of ultra low power dissipation, the TC5501P/D can be used as battery operated portable memory system and also as a nonvolatile memory with battery back up. The TC5501P/D operates from a single 5V power supply with a static operation, so that the no refresh periods are required. This simplifies the power supply circuit design.

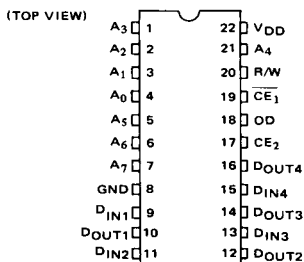
The three state outputs simplify the memory expansion making the TC5501P/D suitable for use in a microprocessor peripheral memory. Since the minimum data retention voltage is 2V, the battery back up system needs only simple circuit. By using Toshiba's original C²MOS technology, the device circuitry is not only simplified but wide operating margin and noise margin are also realized.

The TC5501P/D is offered in standard 22 pin plastic and cerdip packages, 0.4 inch in width.

FEATURES

- Low Power Dissipation
 - 55 μ W (MAX.) STANDBY
 - 83mW (MAX.) OPERATING
- Single 5V Power Supply
- Data Retention Voltage 2V to 5.5V
- Package
 - Plastic DIP : TC5501P
 - Cerdip DIP : TC5501D
- Fully static operation
- Three State Output
- Input/output, TTL Compatible
- Access Time
 - TC5501P/D ; $t_{ACC} \leq 450ns$ (MAX.)
 - TC5501P-1/D-1; $t_{ACC} \leq 650ns$ (MAX.)

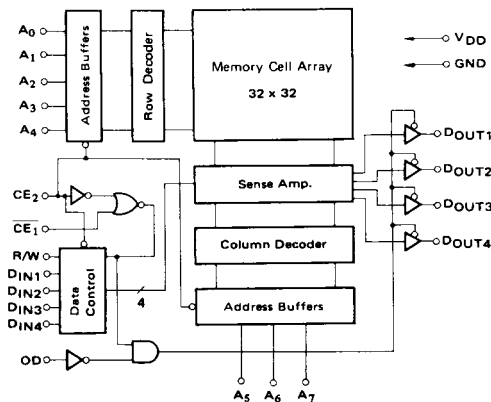
PIN CONNECTION



PIN NAMES

A ₀ ~ A ₇	Address Inputs
R/W	Read Write Input
CE ₁ , CE ₂	Chip Enable Inputs
DIN ₁ ~ 4	Data Inputs
DOUT ₁ ~ 4	Data Outputs
OD	Output Disable Input
V _{DD} /GND	Power Supply Terminals

BLOCK DIAGRAM



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MAXIMUM RATINGS

SYMBOL	ITEM	RATING	UNITS
V _{DD}	Power Supply Voltage	-0.3 ~ 7.0	V
V _{IN}	Input Voltage	-0.3 ~ V _{DD} + 0.3	V
V _{OUT}	Output Voltage	0 ~ V _{DD}	V
P _D	Power Dissipation (T _a = 85°C)	800	mW
T _{SOLDER}	Soldering Temperature - Time	260 · 10	°C · sec
T _{STG}	Storage Temperature	-55 ~ 150	°C
T _{OPR}	Operating Temperature	-30 ~ 85	°C

DC RECOMMENDED OPERATING CONDITION

SYMBOL	PARAMETER	MIN.	TYP.	MAX.	UNITS
V _{DD}	Power Supply Voltage	4.5	-	5.5	V
V _{IH}	Input High Level Voltage	2.2	-	V _{DD} + 0.3	V
V _{IL}	Input Low Level Voltage	-0.3	-	0.65	V
V _{DH}	Data Retention Voltage	2.0	-	5.5	V

DC CHARACTERISTICS (T_a = -30 ~ 85°C)

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.(1)	MAX.	UNITS
I _{IN}	Input Current	0 ≤ V _{IN} ≤ V _{DD}	-	±0.05	±1.0	μA
I _{DDs}	Standby Current	V _{DD} = 2.0V to 5.5V CE ₂ = 0.2V, Output open	-	0.2	10	μA
I _{DDO}	Operating Current	V _{DD} = 5.5V, t _{CYC} = 1μs	-	6.2	15	mA
I _{LO}	Output Leakage Current	0 ≤ V _{OUT} ≤ V _{DD}	-	±0.05	±1.0	μA
I _{OH}	Output High Current	V _{DD} = 4.5V, V _{OH} = 2.4V	-1.0	-2.0	-	mA
I _{OL}	Output Low Current	V _{DD} = 4.5V, V _{OL} = 0.4V	2.0	3.0	-	mA

Note (1) T_a = 25°C V_{DD} = 5V

CAPACITANCE (2) (T_a = 25°C)

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
C _{IN}	Input Capacitance	V _{IN} = 0V, f = 1MHz	-	5	10	pF
C _{OUT}	Output Capacitance	V _{OUT} = 0V, f = 1MHz	-	7	15	pF

Note (2) This parameter is periodically sampled and is not 100% tested.

A.C. CHARACTERISTICS● **READ CYCLE**

SYMBOL	PARAMETER	TC5501P/D		TC5501P-1/D-1		UNIT
		MIN.	MAX.	MIN.	MAX.	
t _{RC}	Read Cycle Time	450	—	650	—	ns
t _{ACC}	Address Access Time	—	450	—	650	ns
t _{ACC1}	CE ₁ Access Time	—	400	—	600	ns
t _{ACC2}	CE ₂ Access Time	—	500	—	700	ns
t _{OD0}	OD Access Time	—	250	—	350	ns
t _{COE}	Output Enable Time	0	—	0	—	ns
t _{DIS}	Output Disable Time	0	130	0	150	ns
t _{OH}	Output Data Hold Time	0	—	0	—	ns

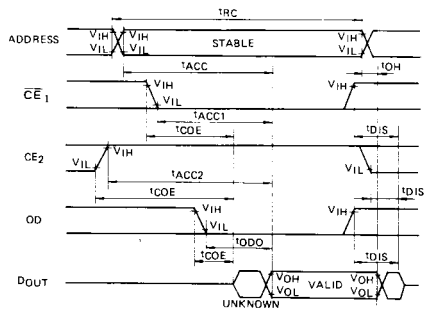
● **WRITE CYCLE**

SYMBOL	PARAMETER	TC5501P/D		TC5501P-1/D-1		UNIT
		MIN.	MAX.	MIN.	MAX.	
t _{WC}	Write Cycle Time	450	—	650	—	ns
t _{AW}	Address Setup Time	130	—	150	—	ns
t _{CW}	CE ₂ Setup Time	130	—	150	—	ns
t _{WP}	Write Pulse Width	250	—	400	—	ns
t _{DS}	Data Setup Time	250	—	400	—	ns
t _{DH}	Data Hold Time	50	—	100	—	ns
t _{WR}	Write Recovery Time	50	—	50	—	ns

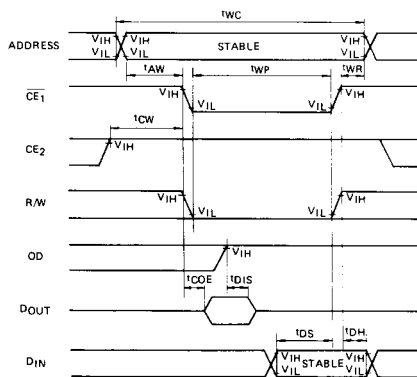
A.C. TEST CONDITIONS

- Output Load : 100 pF + 1 TTL Gate
- Input Pulse Levels : 0.45V, 2.4V
- Timing Measurement Reference Levels
 - Input : 0.65V, 2.2V
 - Output : 0.65V, 2.2V
- Input Pulse Rise and Fall Times : 10ns

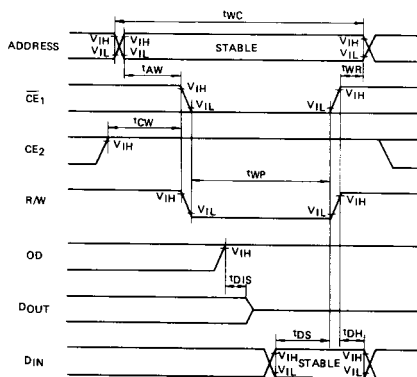
Read Cycle



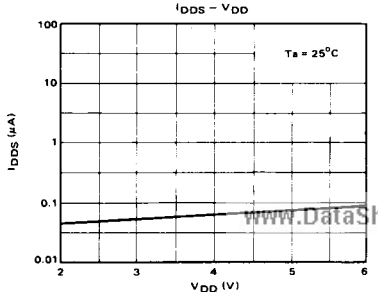
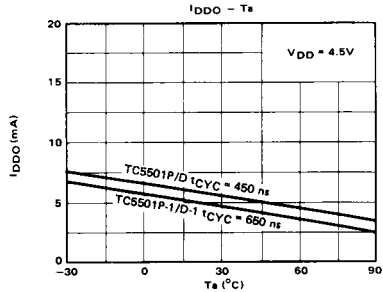
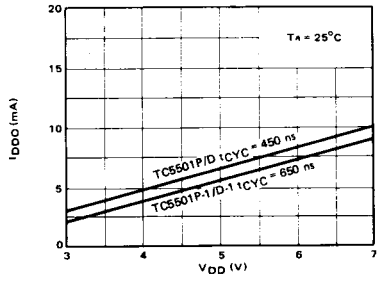
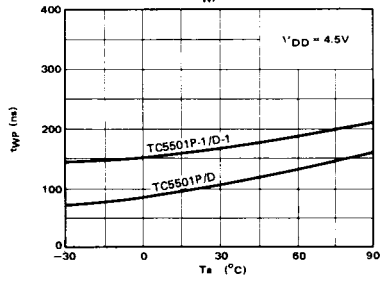
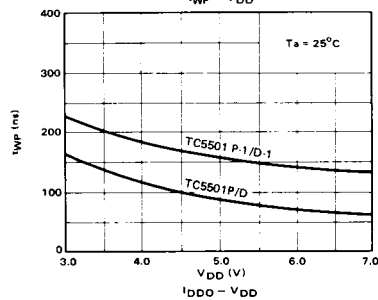
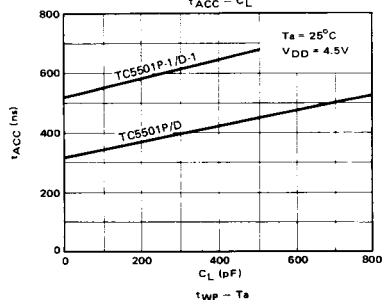
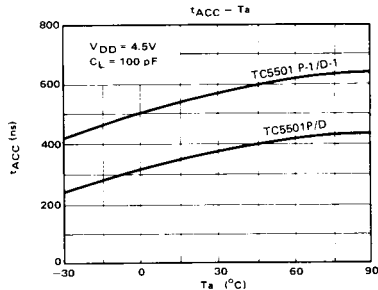
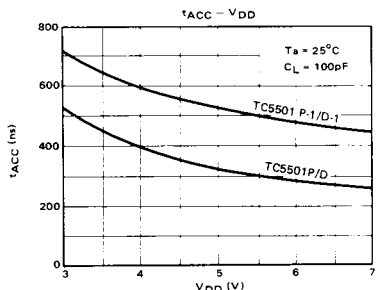
Write Cycle 1



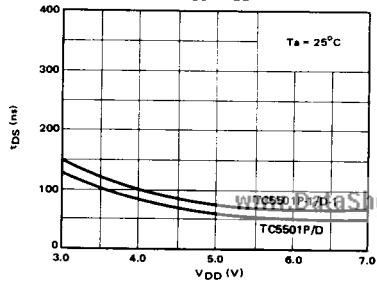
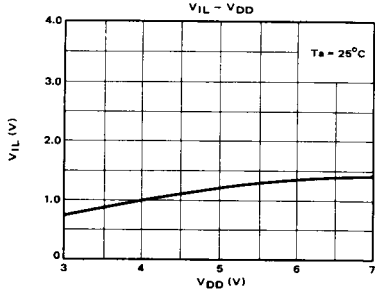
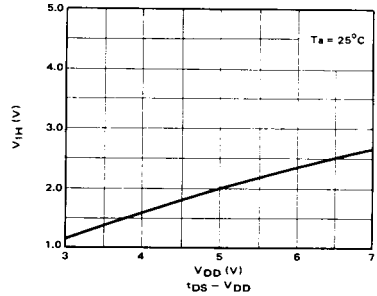
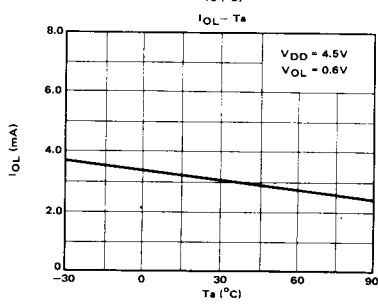
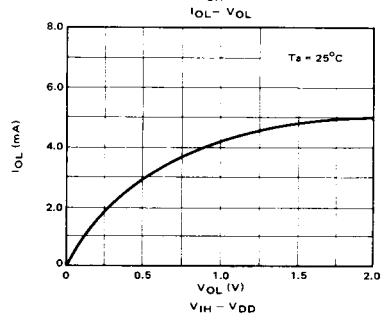
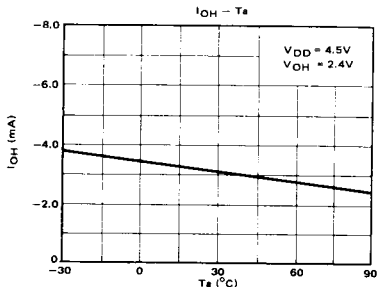
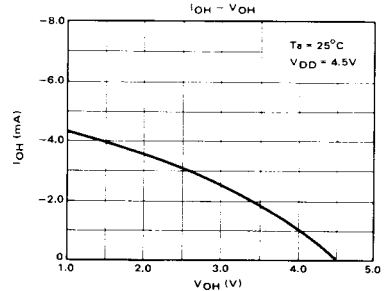
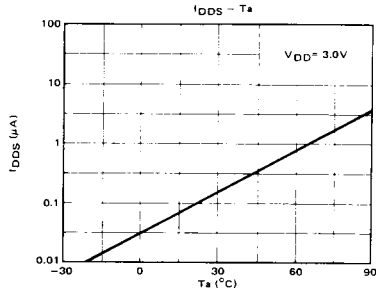
Write Cycle 2

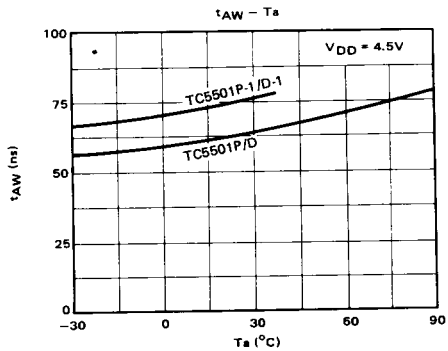
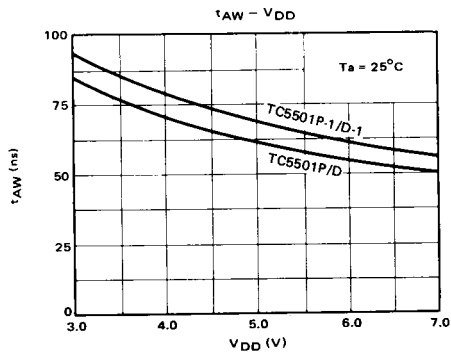
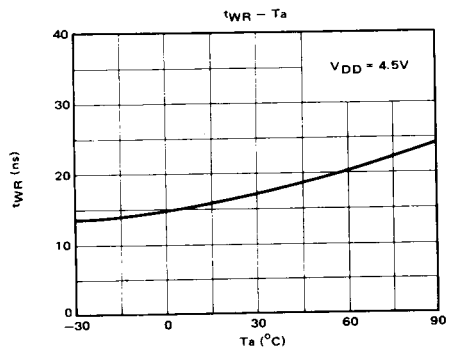
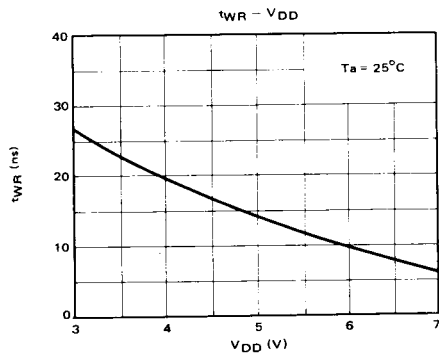
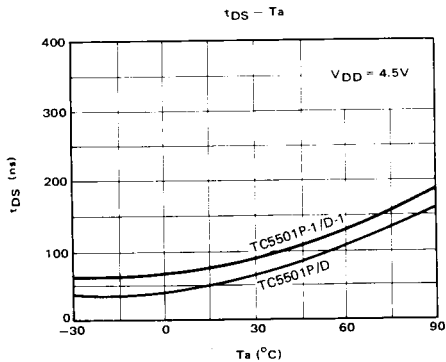


TYPICAL CHARACTERISTICS



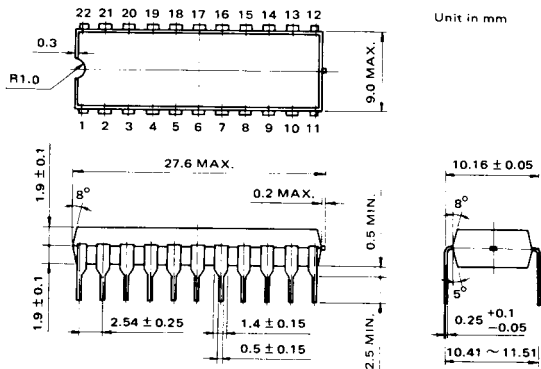
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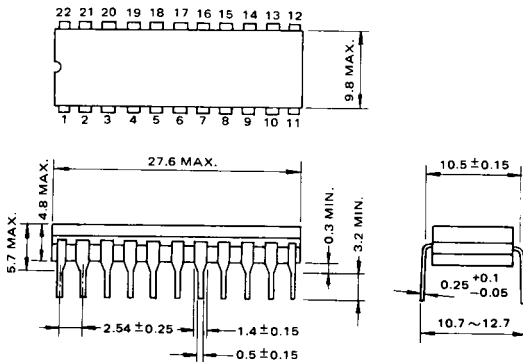


OUTLINE DRAWINGS

PLASTIC PACKAGE



CERDIP PACKAGE



Notes: Each lead pitch is 2.54 mm. All leads are located within 0.25 mm of their true longitudinal position with respect to No. 1 and No. 22 leads.

Note: Toshiba does not assume any responsibility for use of any circuitry described; no circuit patent licenses are implied, and Toshiba reserves the right, at any time without notice, to change said circuitry.
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