

**DESCRIPTION**

The M66252P/FP is a high-speed line memory with a FIFO (First In First Out) structure of 1152-word x 8-bit configuration which uses high-performance silicon gate CMOS process technology.

It has separate clock, enable and reset signals for write and read and is most suitable as a buffer memory between devices with different data processing throughput.

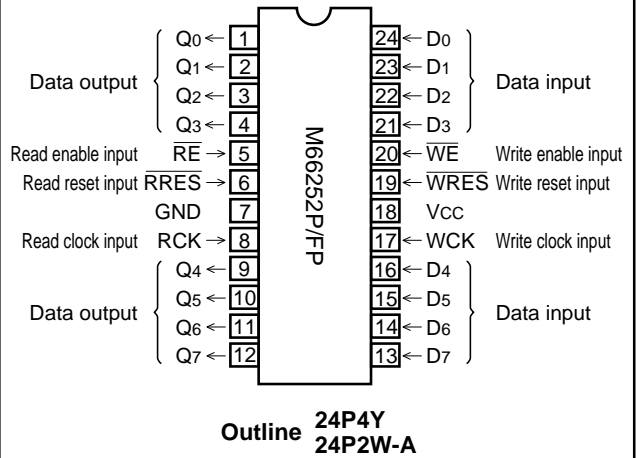
**FEATURES**

- Memory construction ..... 1152words x 8bits (dynamic memory)
- High-speed cycle ..... 50ns (min.)
- High-speed access ..... 40ns (max.)
- Output hold ..... 5ns (min.)
- Fully independent, asynchronous write and read operations
- Variable-length delay bit
- Output ..... 3-state

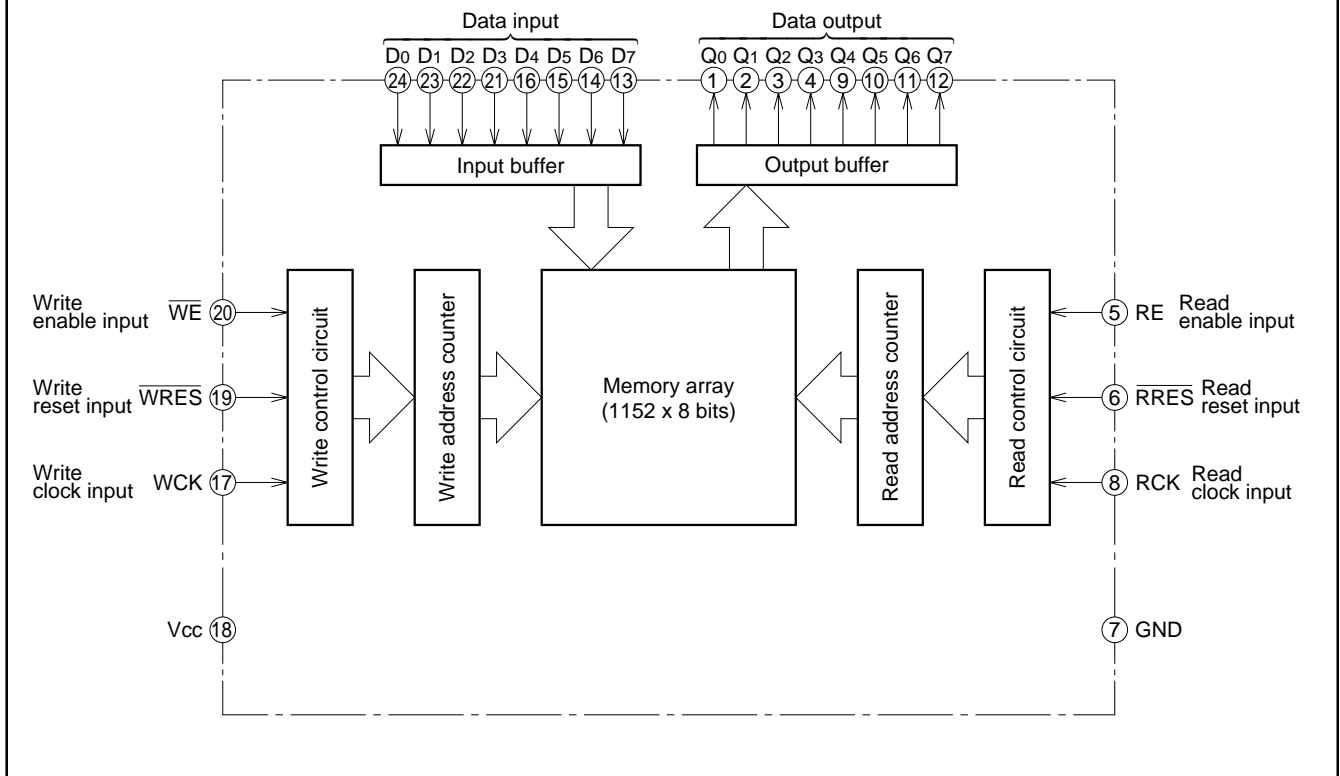
**APPLICATION**

Digital photocopiers, high-speed facsimiles, laser beam printers.

**PIN CONFIGURATION (TOP VIEW)**



**BLOCK DIAGRAM**



**FUNCTION**

When the status of write enable input  $\overline{WE}$  is "L," data on Do thru D7 are written on the memory synchronously with write clock input WCK rise edges. At this time, write address counter executes counting.  
 The following write-related operations are also performed synchronously with WCK rise edges.  
 When  $\overline{WE}$  is "H," writing on memory is inhibited, and write address counter stops counting.  
 When write reset input  $\overline{WRES}$  is "L," write address counter is initialized.

When read enable input  $\overline{RE}$  is "L," data on memory are output to Q0 thru Q7 synchronously with read clock input RCK rise edges. At this time, read address counter executes counting.  
 The following read-related operations are also performed synchronously with RCK rise edges.  
 When  $\overline{RE}$  is "H," reading from memory is inhibited, and read address counter stops counting. The status of Q0 thru Q7 becomes high-impedance.  
 When read reset input  $\overline{RRES}$  is "L," read address counter is initialized.

**ABSOLUTE MAXIMUM RATINGS** ( $T_a = -20 \sim 70^\circ\text{C}$  unless otherwise noted)

Symbol	Parameter	Conditions	Ratings	Unit
VCC	Supply voltage	Reference pin: GND	-0.5 ~ +7.0	V
Vi	Input voltage		-0.5 ~ VCC + 0.5	V
Vo	Output voltage		-0.5 ~ VCC + 0.5	V
Pd	Power dissipation	$T_a = 25^\circ\text{C}$	550 (Note 1)	mW
Tstg	Storage temperature		-65 ~ 150	$^\circ\text{C}$

Note 1:  $T_a \geq 62^\circ\text{C}$  are derated at  $-8.8\text{mW}/^\circ\text{C}$  (24P4Y)  
 $T_a \geq 51^\circ\text{C}$  are derated at  $-7.5\text{mW}/^\circ\text{C}$  (24P2W)

**RECOMMENDED OPERATIONAL CONDITIONS**

Symbol	Parameter	Limits			Unit
		Min.	Typ.	Max.	
VCC	Supply voltage	4.5	5	5.5	V
GND	Supply voltage		0		V
Topr	Ambient temperature	-20		70	$^\circ\text{C}$

**ELECTRICAL CHARACTERISTICS** ( $T_a = -20 \sim 70^\circ\text{C}$ ,  $V_{CC} = 5V \pm 10\%$ ,  $GND = 0V$ )

Symbol	Parameter	Test conditions	Limits			Unit
			Min.	Typ.	Max.	
VIH	"H" input voltage		2.0			V
VIL	"L" input voltage				0.8	V
VOH	"H" output voltage	$I_{OH} = -4\text{mA}$	$V_{CC} - 0.8$			V
VOL	"L" output voltage	$I_{OL} = 4\text{mA}$	0.55			V
IiH	"H" input current	$V_i = V_{CC}$	$\overline{WE}, \overline{WRES}, WCK, \overline{RE}, \overline{RRES}, RCK$ D0~D7			$\mu\text{A}$
IiL	"L" input current	$V_i = GND$	$\overline{WE}, \overline{WRES}, WCK, \overline{RE}, \overline{RRES}, RCK$ D0~D7			$\mu\text{A}$
IOZH	"H" output current under "off" condition	$V_O = V_{CC}$	5.0			$\mu\text{A}$
IOZL	"L" output current under "off" condition	$V_O = GND$	-5.0			$\mu\text{A}$
ICC	Average supply current during operation	$V_i = V_{IH}, V_{iL}$ , Outputs are open $t_{WCK}, t_{RCK} = 100\text{ns}$	100			mA
CI	Input capacitance	$f = 1\text{MHz}$	10			pF
CO	Output capacitance under "off" condition	$f = 1\text{MHz}$	15			pF

**SWITCHING CHARACTERISTICS** ( $T_a = -20 \sim 70^\circ\text{C}$ ,  $V_{CC} = 5V \pm 10\%$ ,  $GND = 0V$ )

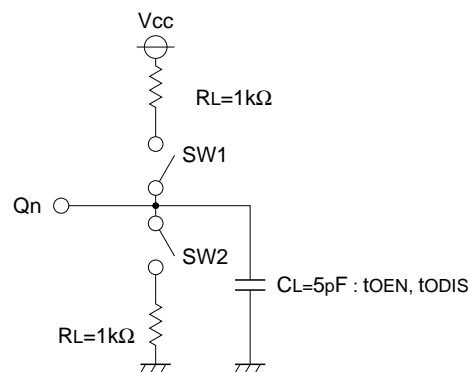
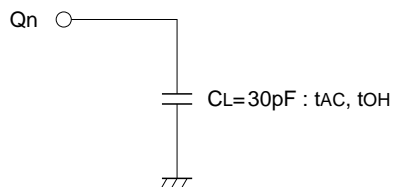
Symbol	Parameter	Limits			Unit
		Min.	Typ.	Max.	
tAC	Access time			40	ns
tOH	Output hold time	5			ns
tOEN	Output enable time	5		40	ns
tODIS	Output disable time	5		40	ns

**TIMING CHARACTERISTICS** ( $T_a = -20 \sim 70^\circ\text{C}$ ,  $V_{CC} = 5V \pm 10\%$ ,  $GND = 0V$ )

Symbol	Parameter	Limits			Unit
		Min.	Typ.	Max.	
twCK	Write clock (WCK) cycle time	50			ns
twCKH	Write clock (WCK) "H" pulse width	25			ns
twCKL	Write clock (WCK) "L" pulse width	25			ns
trCK	Read clock (RCK) cycle time	50			ns
trCKH	Read clock (RCK) "H" pulse width	25			ns
trCKL	Read clock (RCK) "L" pulse width	25			ns
tDS	Input data setup time (in response to WCK)	15			ns
tDH	Input data hold time (in response to WCK)	5			ns
tRESS	Reset setup time (in response to WCK and RCK)	15			ns
tRESH	Reset hold time (in response to WCK and RCK)	5			ns
tnRESS	Reset non-select setup time (in response to WCK and RCK)	15			ns
tnRESH	Reset non-select hold time (in response to WCK and RCK)	5			ns
twES	$\overline{WE}$ setup time (in response to WCK)	15			ns
tWEH	$\overline{WE}$ hold time (in response to WCK)	5			ns
tnWES	$\overline{WE}$ non-select setup time (in response to WCK)	15			ns
tnWEH	$\overline{WE}$ non-select hold time (in response to WCK)	5			ns
tRES	$\overline{RE}$ setup time (in response to RCK)	15			ns
tREH	$\overline{RE}$ hold time (in response to RCK)	5			ns
tnRES	$\overline{RE}$ non-select setup time (in response to RCK)	15			ns
tnREH	$\overline{RE}$ non-select hold time (in response to RCK)	5			ns
tr, tf	Input pulse rise time and fall time			35	ns
tH	Data hold time (Note 1)			20	ms

Note 1. The following conditions should be met for each line access:  
 $\overline{WE}$  "H" level period  $\leq 20\text{ms} - 1152 \cdot twCK - \overline{WRES}$  "L" level period  
 $\overline{RE}$  "H" level period  $\geq 20\text{ms} - 1152 \cdot trCK - \overline{RRES}$  "L" level period  
 2. Perform reset operation after turning on power supply.

**TEST CIRCUIT**

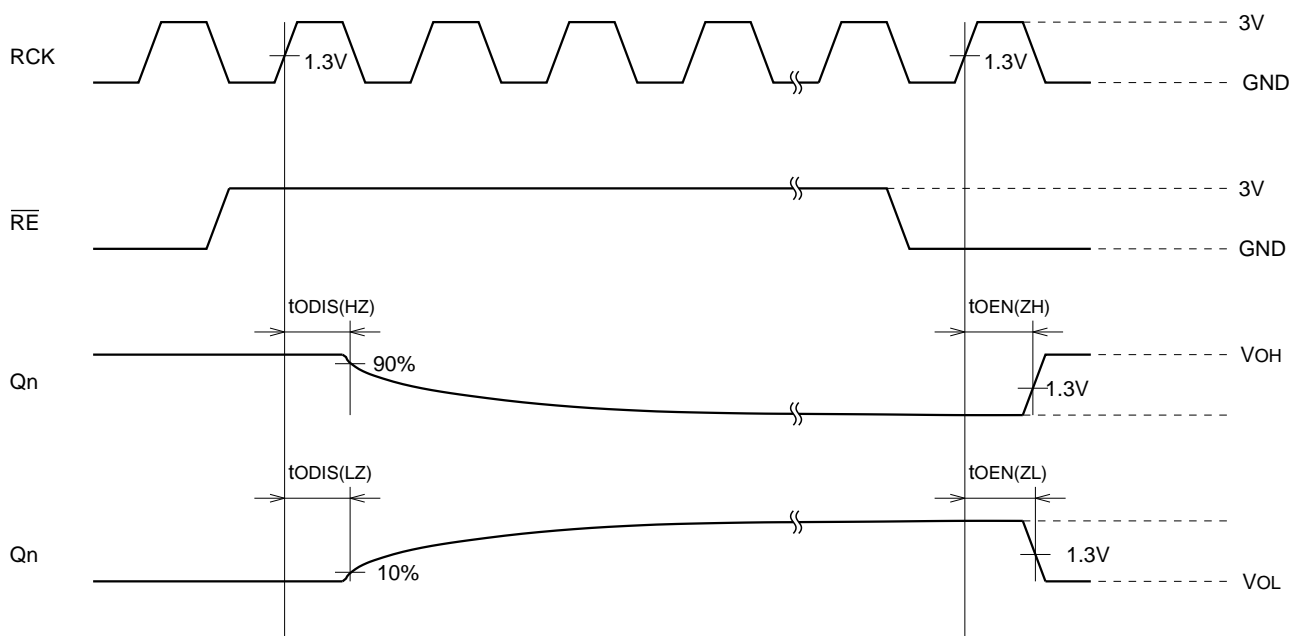


Input pulse level: 0 ~ 3V  
 Input pulse rise time and fall time: 3ns  
 Measurement reference level, input: 1.3V  
 Measurement reference level, output: 1.3V (Note: tODIS (LZ) is tested at 10% output amplitude, and tODIS (HZ) is tested at 90% output amplitude.)

Parameter	SW1	SW2
tODIS(LZ)	Closed	Open
tODIS(HZ)	Open	Closed
tOEN(ZL)	Closed	Open
tOEN(ZH)	Open	Closed

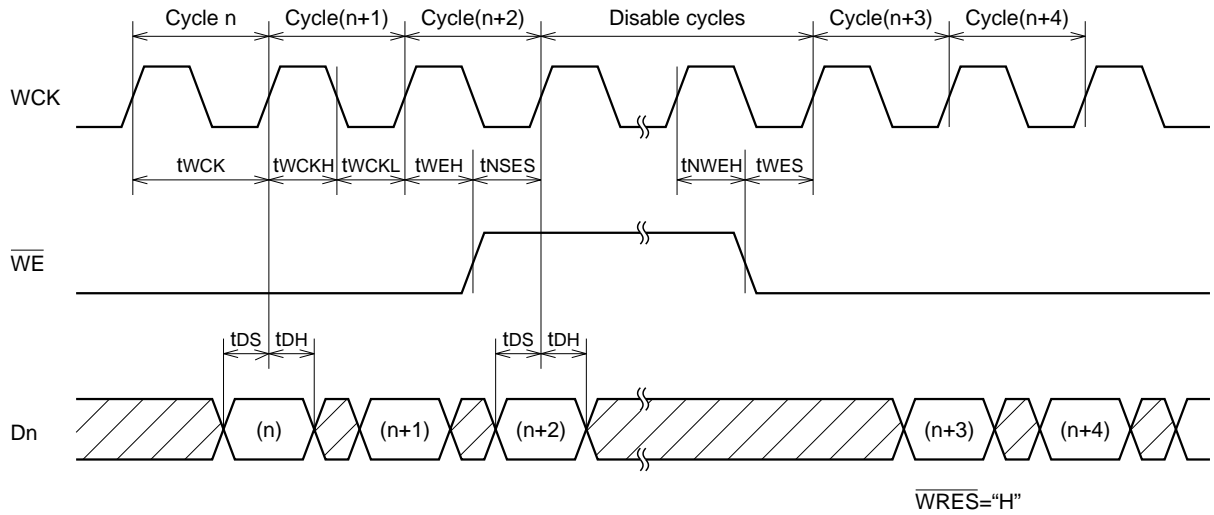
Load capacitance CL includes floating capacitance and probe input capacitance.

**TEST CONDITIONS FOR OUTPUT DISABLE TIME tODIS AND OUTPUT ENABLE TIME tOEN**

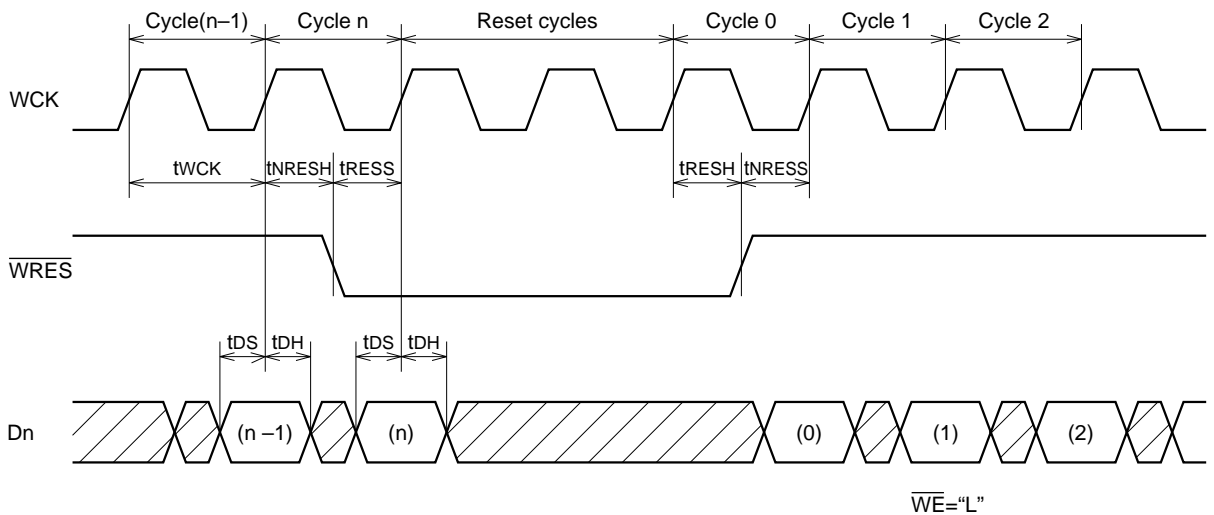


**TIMING CHARTS**

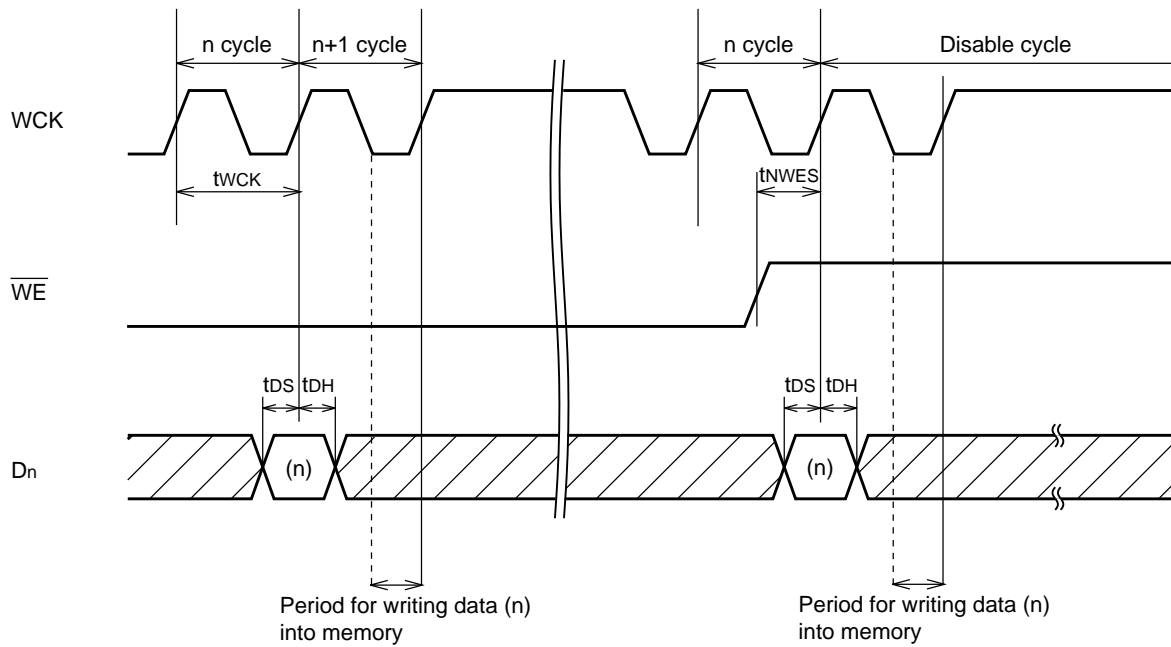
• Write Cycles



• Write Reset Cycles



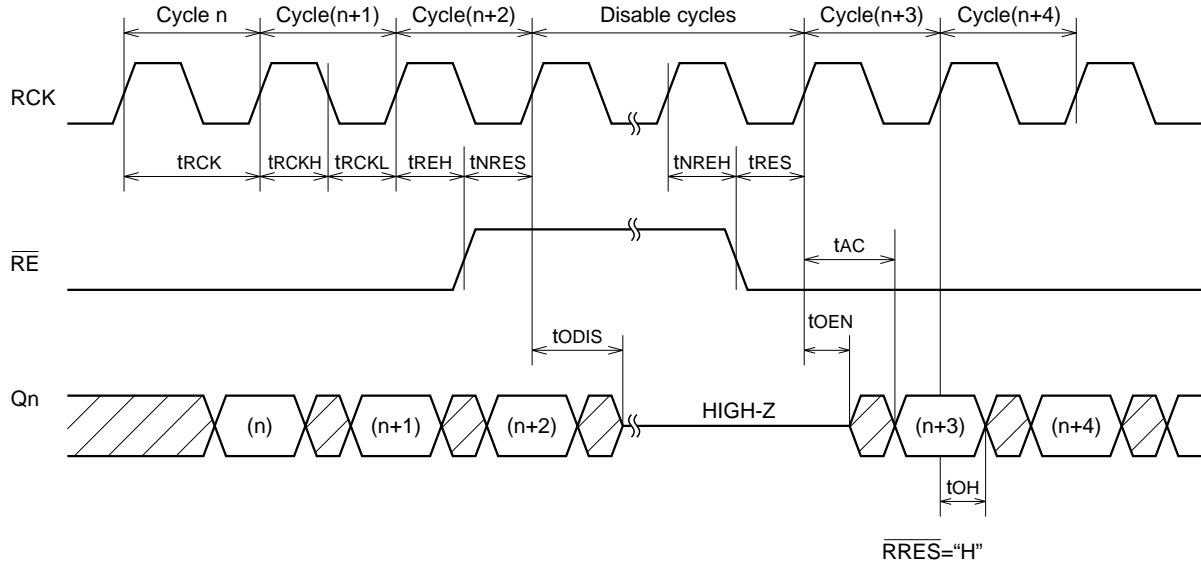
- Matters that needs attention when WCK stops



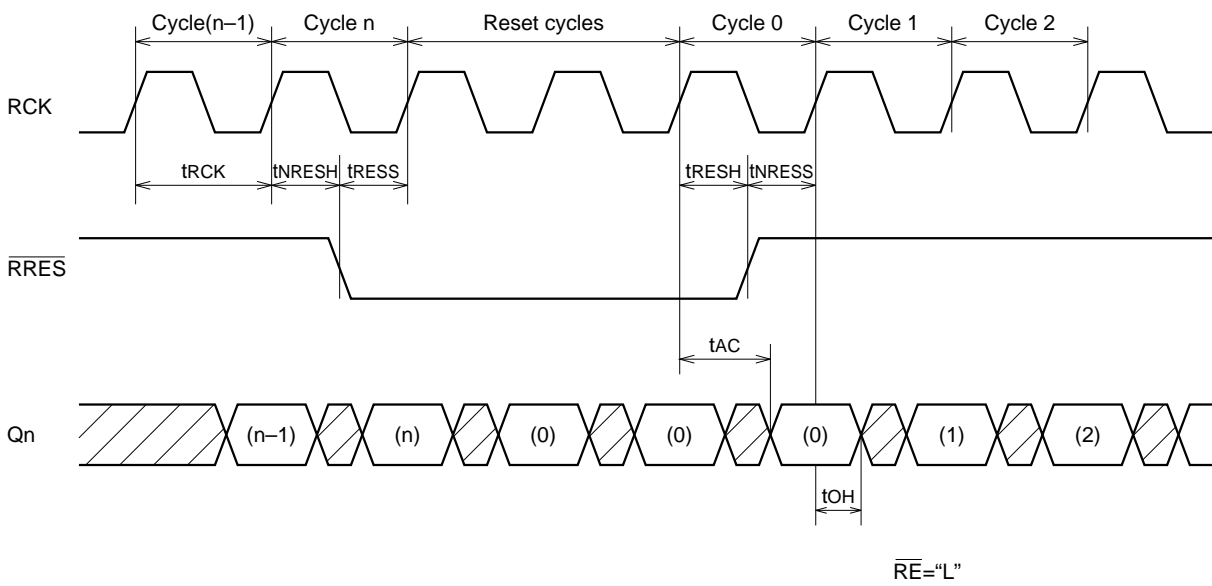
$\overline{WRES} = \text{"H"}$

Input data of n cycle is read at the rising edge after WCK of n cycle and writing operation starts in the WCK low-level period of n+1 cycle. The writing operation is complete at the falling edge after n+1 cycle. To stop reading write data at n cycle, enter WCK before the rising edge after n+1 cycle. When the cycle next to n cycle is a disable cycle, WCK for a cycle requires to be entered after the disable cycle as well.

• Read Cycles



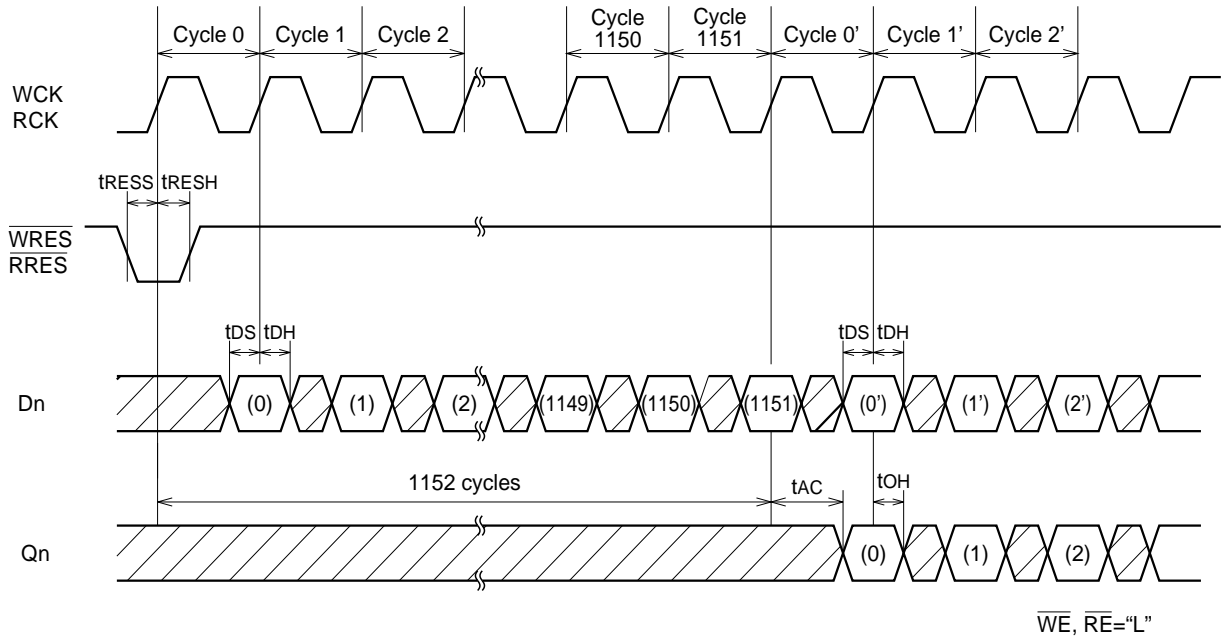
• Read Reset Cycles



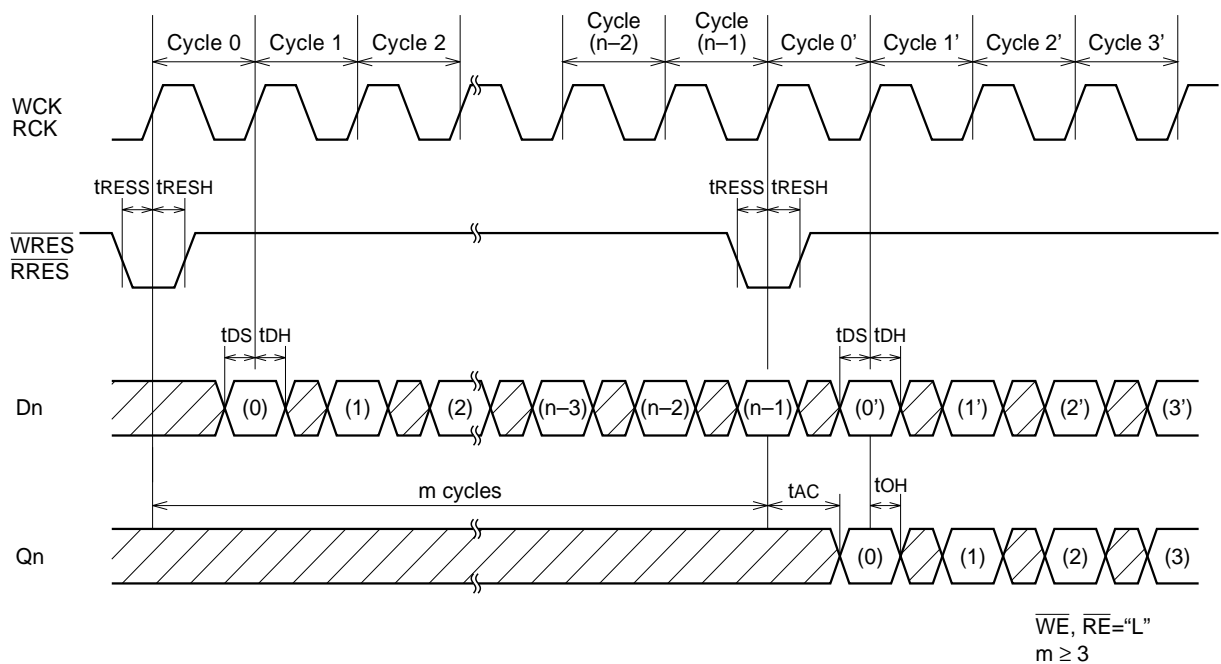
**VARIABLE-LENGTH DELAY BITS**

- 1-line (1152-bit) delay

A write input data is written into memory at the second rise edge of WCK in the cycle, and a read output data is output from memory at the first rise edge of RCK in the cycle, so that 1-line delay can be made easily.

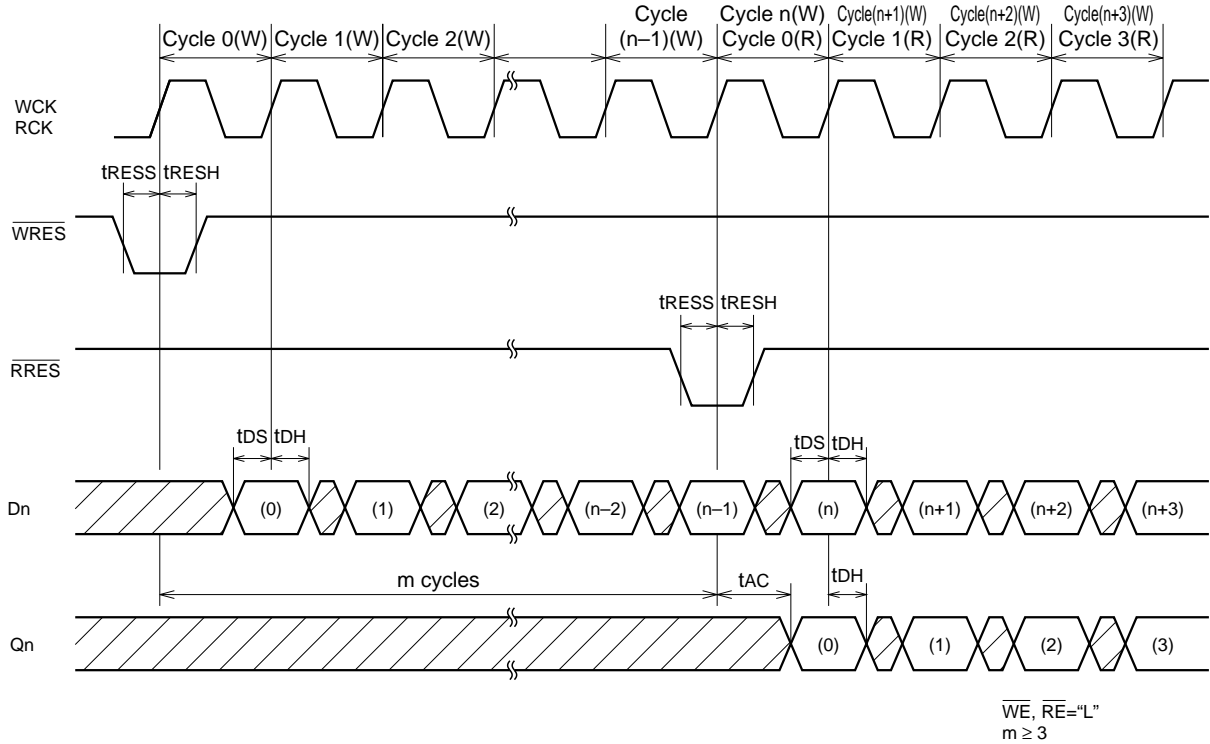


- n-bit delay 1  
(Making a reset at a cycle corresponding to delay length)

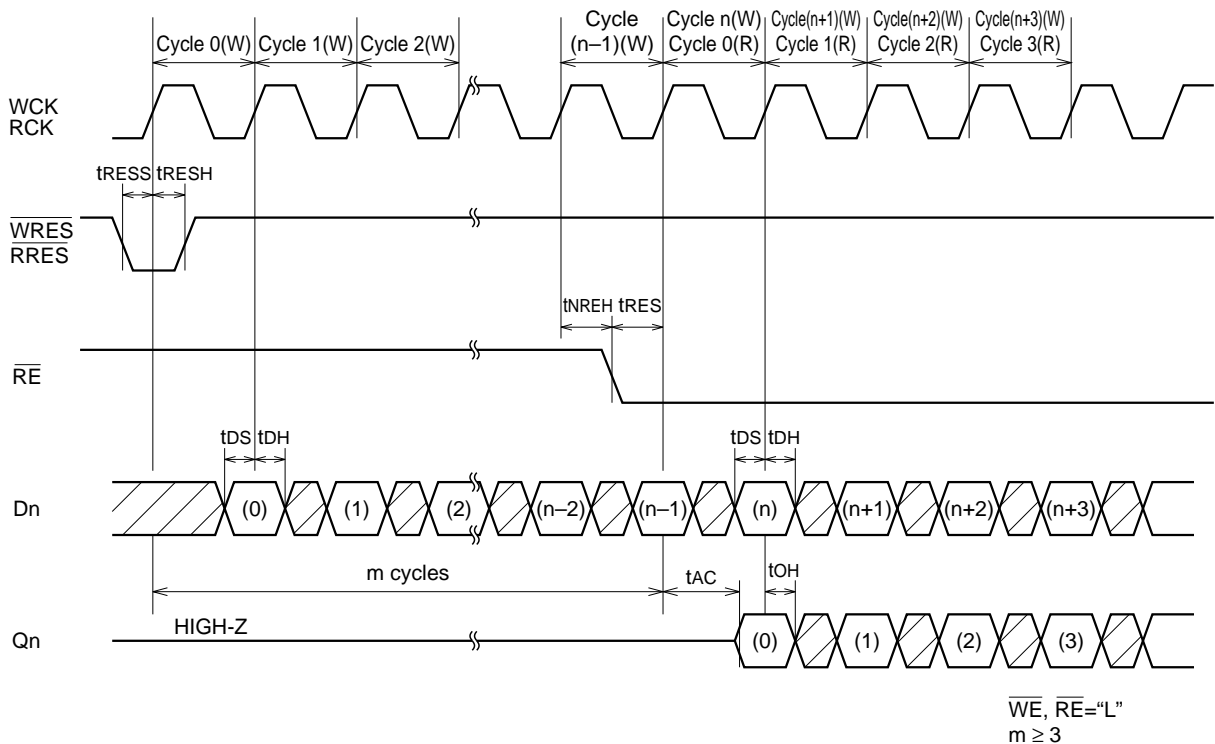




- n-bit delay 2  
(Sliding  $\overline{WRES}$  and  $\overline{RRES}$  at a cycle corresponding to delay length)

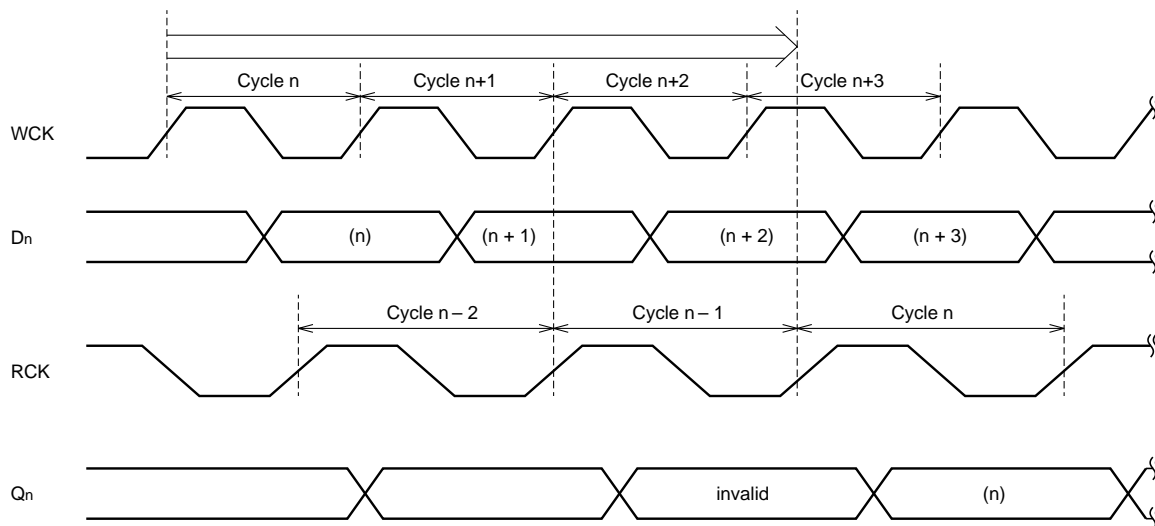


- n-bit delay 3  
(Disabling  $\overline{RE}$  at a cycle corresponding to delay length)



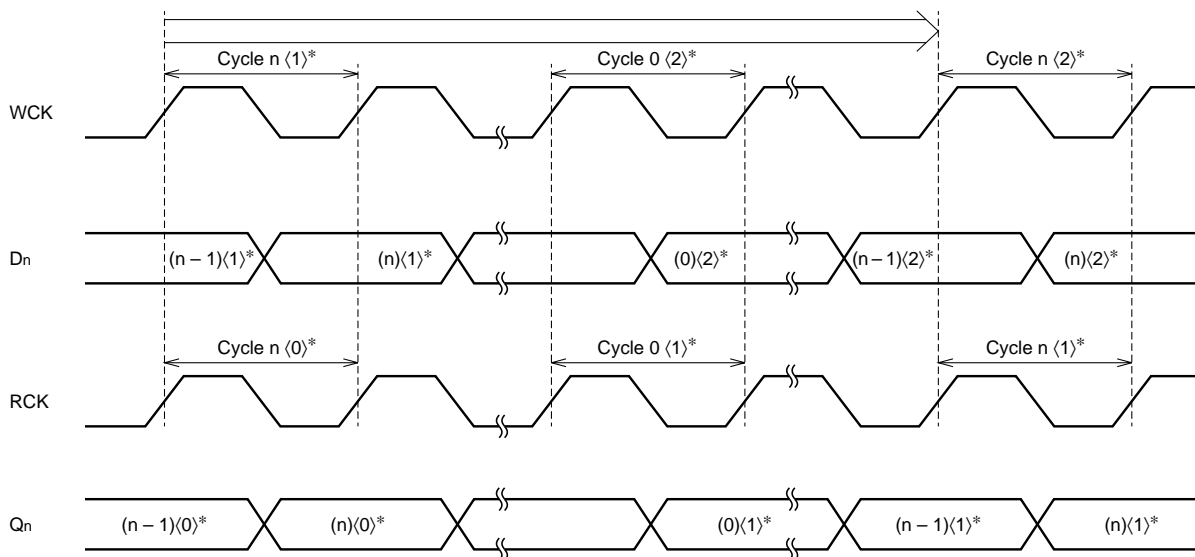
- Shortest read of data "n" written in cycle n

Cycle n-1 on read side should be started after end of cycle n+1 on write side  
 When the start of cycle n-1 on read side is earlier than the end of cycle n+1 on write side, output Qn of cycle n becomes invalid.  
 In the figure shown below, the read of cycle n-1 is invalid.



- Longest read of data "n" written in cycle n: 1-line delay

Cycle n <1>\* on read side should be started when cycle n <2>\* on write is started  
 Output Qn of n cycle <1>\* can be read until the start of reading side n cycle <1>\* and the start of writing side n cycle <2>\* overlap each other.



<0>\*, <1>\* and <2>\* indicates a line value.

**APPLICATION EXAMPLE**

Laplacian Filter Circuit for Correction of Resolution in the Secondary Scanning Direction.

