

To all our customers

Regarding the change of names mentioned in the document, such as Mitsubishi Electric and Mitsubishi XX, to Renesas Technology Corp.

The semiconductor operations of Hitachi and Mitsubishi Electric were transferred to Renesas Technology Corporation on April 1st 2003. These operations include microcomputer, logic, analog and discrete devices, and memory chips other than DRAMs (flash memory, SRAMs etc.) Accordingly, although Mitsubishi Electric, Mitsubishi Electric Corporation, Mitsubishi Semiconductors, and other Mitsubishi brand names are mentioned in the document, these names have in fact all been changed to Renesas Technology Corp. Thank you for your understanding. Except for our corporate trademark, logo and corporate statement, no changes whatsoever have been made to the contents of the document, and these changes do not constitute any alteration to the contents of the document itself.

Note : Mitsubishi Electric will continue the business operations of high frequency & optical devices and power devices.

Renesas Technology Corp.
Customer Support Dept.
April 1, 2003

DESCRIPTION

The M66281FP is high speed line memory that uses high performance silicon gate CMOS process technology and adopts the FIFO (First In First Out) structure consisting of 5120 words x 8 bits x 2.

Since memory is available to simultaneously output 1 line delay and 2 line delay data, the M66281FP is optimal for the compensation of data of multiple lines.

FEATURES

- Memory configuration 5120 words x 8 bits x 2 (dynamic memory)
- High speed cycle 25 ns (Min.)
- High speed access 18 ns (Max.)
- Output hold 3 ns (Min.)
- Reading and writing operations can be completely carried out independently and asynchronously.
- Variable length delay bit
- Input/output TTL direct connection allowable
- Output 3 states
- Q00 – Q07 1 line delay
- Q10 – Q17 2 line delay

APPLICATION

- Digital copying machine, laser beam printer, high speed facsimile, etc.

FUNCTION

When write enable input WEB is set to "L", the contents of data inputs D0 to D7 are written into memory only for 1 line delay data in synchronization with a rising edge of write clock input WCK to perform writing operation. When this is the case, the write address counter of memory only for 1 line delay data is incremented simultaneously.

When WEB is set to "H", the writing operation is inhibited and the write address counter of memory only for 1 line delay data stops.

When write reset input WRESB is set to "L", the write address counter of memory only for 1 line delay data is initialized.

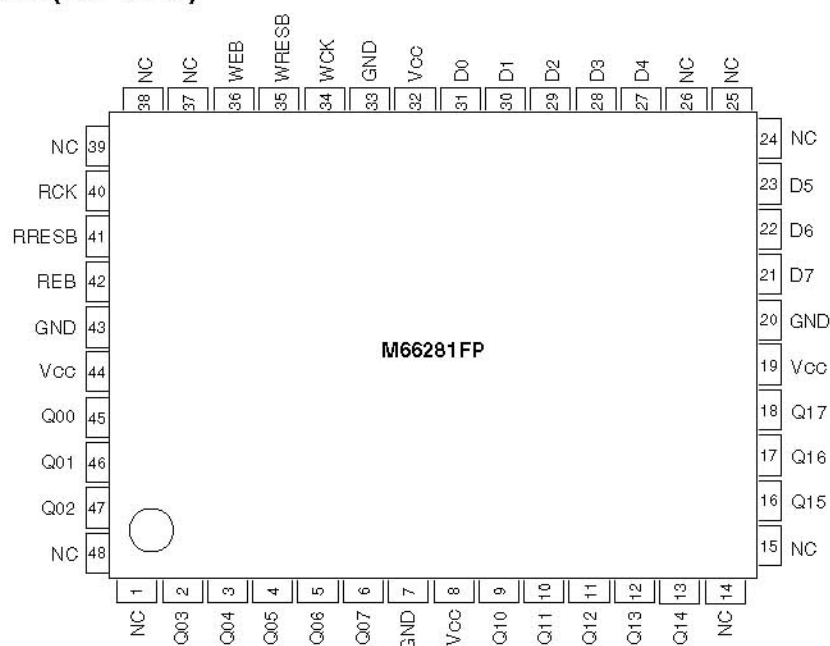
When read enable input REB is set to "L", the contents of memory only for 1 line delay data are output to data outputs Q00 to Q07 and the contents of memory only for 2 line delay data are output to Q10 to Q17 in synchronization with a rising edge of read clock input RCK to perform reading operation.

When this is the case, the read address counters of memory only for 1 line delay data and memory only for 2 line delay data are incremented simultaneously.

In addition, data of Q00 to Q07 is written into memory only for 2 line delay data in synchronization with a rising edge of RCK. When this is the case, the write address counter of memory only for 2 line delay data is then incremented.

When REB is set to "H", operation for reading data from memory only for 1 line delay and from memory only for 2 line delay data is inhibited and the read address counter of each memory stops. Outputs Q00 to Q07 and Q10 to Q17 are placed in a high impedance state. In addition, the write address counter of memory only for 2 line delay data then stops.

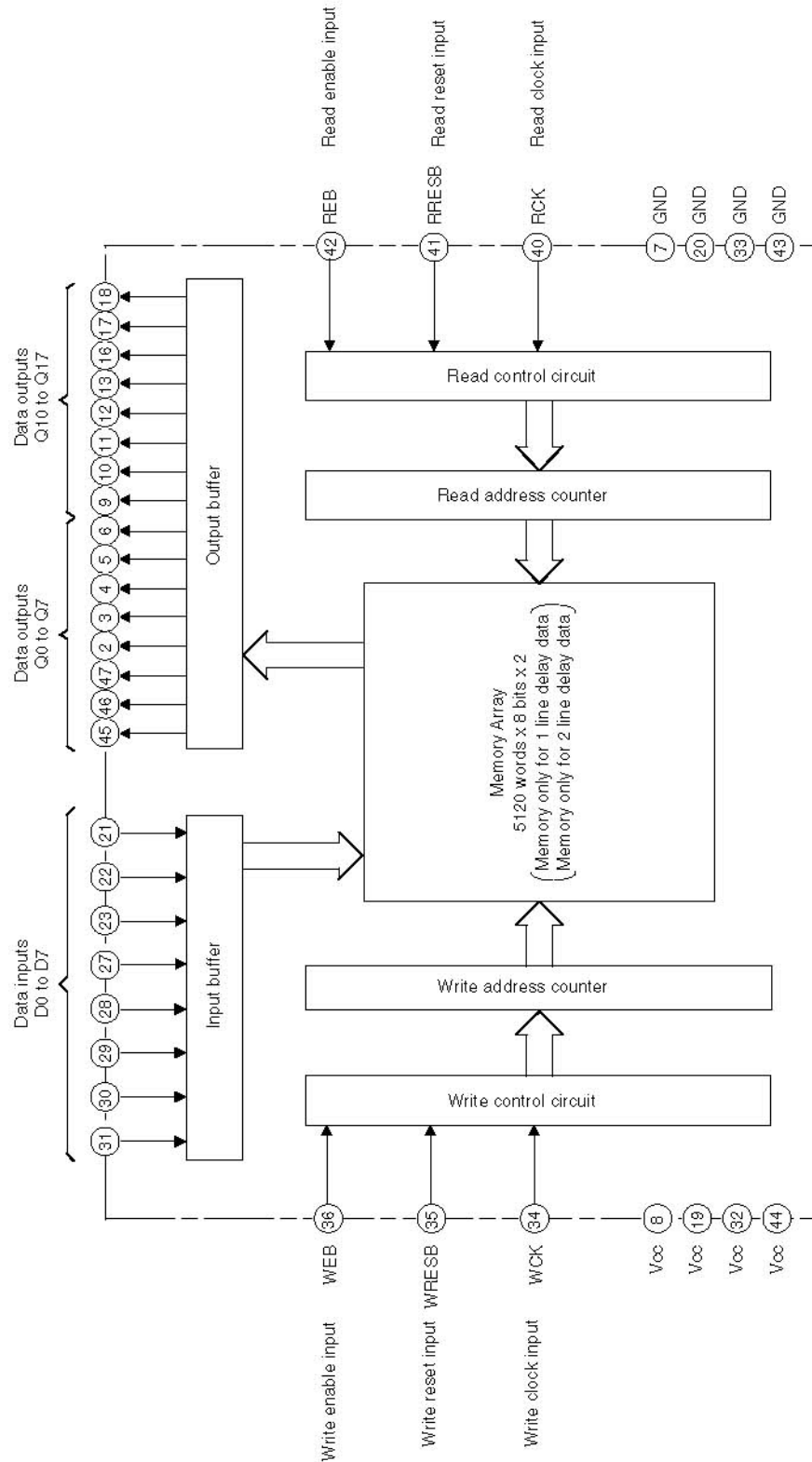
When read reset input RRESB is set to "L", the read address counters of memory only for 1 line delay data as well as the write address counter and read address counter of memory only for 2 line delay data are then initialized.

PIN CONFIGURATION (TOP VIEW)

Outline 48P6S-A(QFP)

NC : No connection

BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS (Ta=0 – 70 °C unless otherwise noted)

Symbol	Parameter	Conditions	Ratings	Unit
Vcc	Supply voltage	Value based on the GND pin	-0.3 – +4.6	V
Vi	Input voltage		-0.3 – Vcc+0.3	V
Vo	Output voltage		-0.3 – Vcc+0.3	V
Pd	Power dispersion	Note	540	mW
Tstg	Storage temperature		-55 – 150	°C

Note : Ta=0 – 63°C. Ta > 63°C are derated at -9mW/°C

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Limits			Unit
		Min.	Typ.	Max.	
Vcc	Supply voltage	2.7	3.15	3.6	V
GND	Supply voltage		0		V
Topr	Operating temperature	0		70	°C

ELECTRICAL CHARACTERISTICS (Ta=0 – 70 °C, Vcc=2.7 – 3.6V, GND=0V unless otherwise noted)

Symbol	Parameter	Conditions	Limits			Unit
			Min.	Typ.	Max.	
VIH	High-level input voltage		2.0			V
VIL	Low-level input voltage				0.8	V
VOH	High-level output voltage	IOH = -4mA	Vcc-0.4			V
VOL	Low-level output voltage	IOL = 4mA			0.4	V
IiH	High-level input current	Vi = Vcc			1.0	μA
IiL	Low-level input current	Vi = GND			-1.0	μA
IOZH	Off-state high-level output current	Vo = Vcc			5.0	μA
IOZL	Off-state low-level output current	Vo = GND			-5.0	μA
ICC	Average supply current during operation	Vi = Vcc, GND, output open twck, trck = 25ns			150	μA
CI	Input capacitance	f = 1 MHz			10	pF
CO	Off-time output capacitance	f = 1 MHz			15	pF

SWITCHING CHARACTERISTICS (Ta=0 – 70 °C, Vcc=2.7 – 3.6V, GND=0V unless otherwise noted)

Symbol	Parameter	Limits			Unit
		Min.	Typ.	Max.	
tAC	Access time			18	ns
tOH	Output hold time	3			ns
tOEN	Output enable time	3		18	ns
tODIS	Output disable time	3		18	ns

TIMING REQUIREMENTS (Ta=0 – 70 °C, Vcc=2.7 – 3.6V, GND=0V unless otherwise noted)

Symbol	Parameter	Limits			Unit
		Min.	Typ.	Max.	
twck	Write clock (WCK) cycle	25			ns
twckH	Write clock (WCK) "H" pulse width	11			ns
twckL	Write clock (WCK) "L" pulse width	11			ns
trck	Read clock (RCK) cycle	25			ns
trckH	Read clock (RCK) "H" pulse width	11			ns
trckL	Read clock (RCK) "L" pulse width	11			ns
tds	Input data set up time for WCK	7			ns
tDH	Input data hold time for WCK	3			ns
tres	Reset set up time for WCK/RCK	7			ns
tresh	Reset hold time for WCK/RCK	3			ns
tnres	Reset non-selection set up time for WCK/RCK	7			ns
tnresh	Reset non-selection hold time for WCK/RCK	3			ns
twes	WEB set up time for WCK	7			ns
tweh	WEB hold time for WCK	3			ns
tnwes	WEB non-selection set up time for WCK	7			ns
tnweh	WEB non-selection hold time for WCK	3			ns
tres	REB set up time for RCK	7			ns
treh	REB hold time for RCK	3			ns
tnres	REB non-selection set up time for RCK	7			ns
tnreh	REB non-selection hold time for RCK	3			ns
tr, tr	Input pulse up/down time			20	ns
tH	Data hold time (Note 1)			20	ms

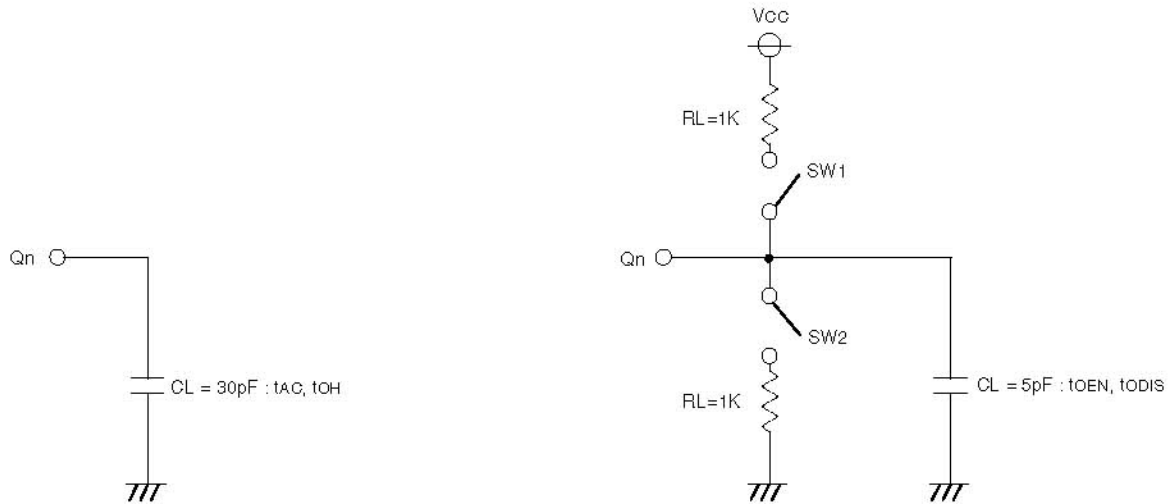
Note 1: For 1 line access, the following conditions must be satisfied:

WEB high-level period 20 ms - 5120 • twck - WRESB low-level period

REB high-level period 20 ms - 5120 • trck - RRESB low-level period

2: Perform reset operation after turning on power supply.

SWITCHING CHARACTERISTICS MEASUREMENT CIRCUIT

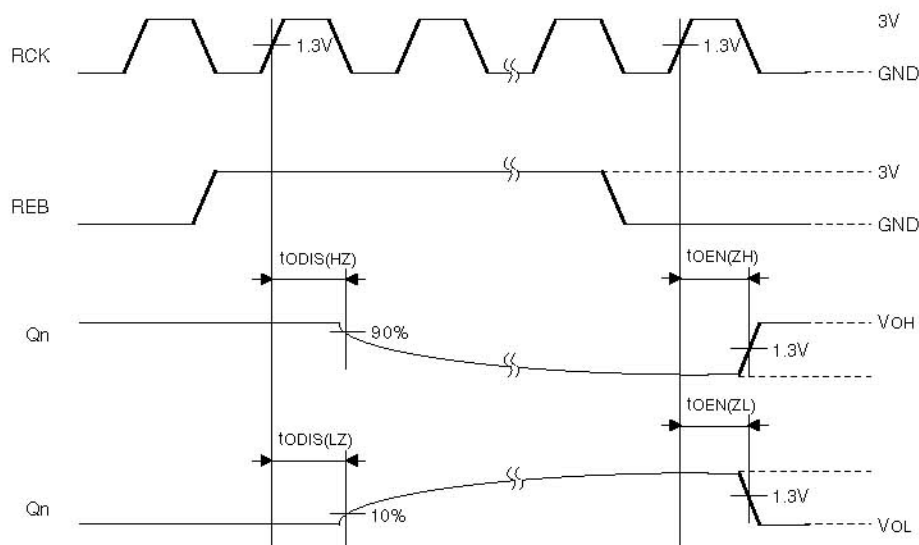


Input pulse level : 0 – 3V
 Input pulse up/down time : 3 ns
 Judging voltage Input : 1.3V
 Output : 1.3V(However, tODIS(LZ) is judged with 10% of the output amplitude, while tODIS(HZ) is judged with 90% of the output amplitude.)

Load capacitance CL includes the floating capacity of connected lines and input capacitance of probe.

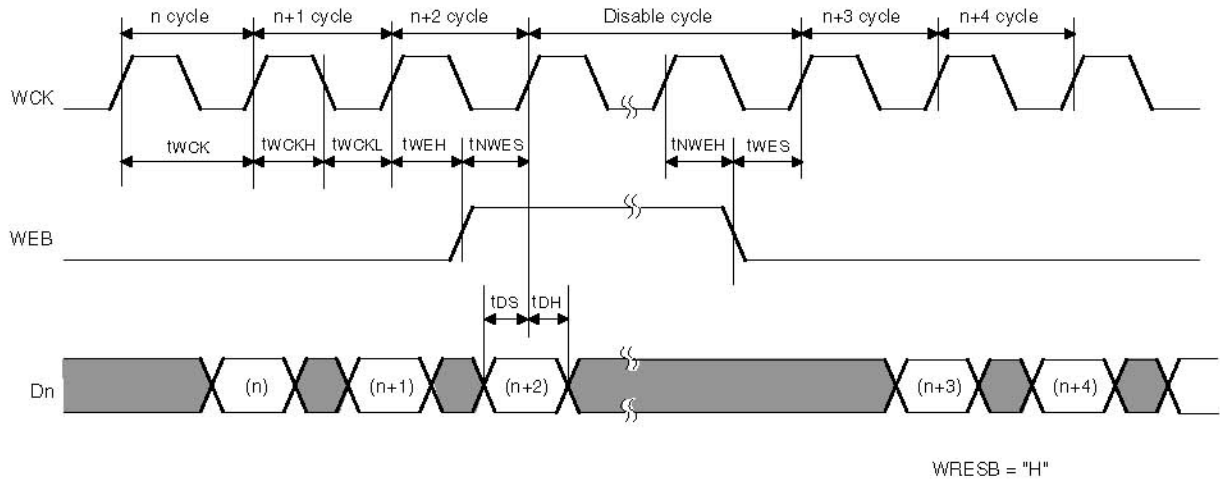
Item	SW1	SW2
tODIS(LZ)	Close	Open
tODIS(HZ)	Open	Close
tOEN(ZL)	Close	Open
tOEN(ZH)	Open	Close

tODIS and tOEN measurement condition

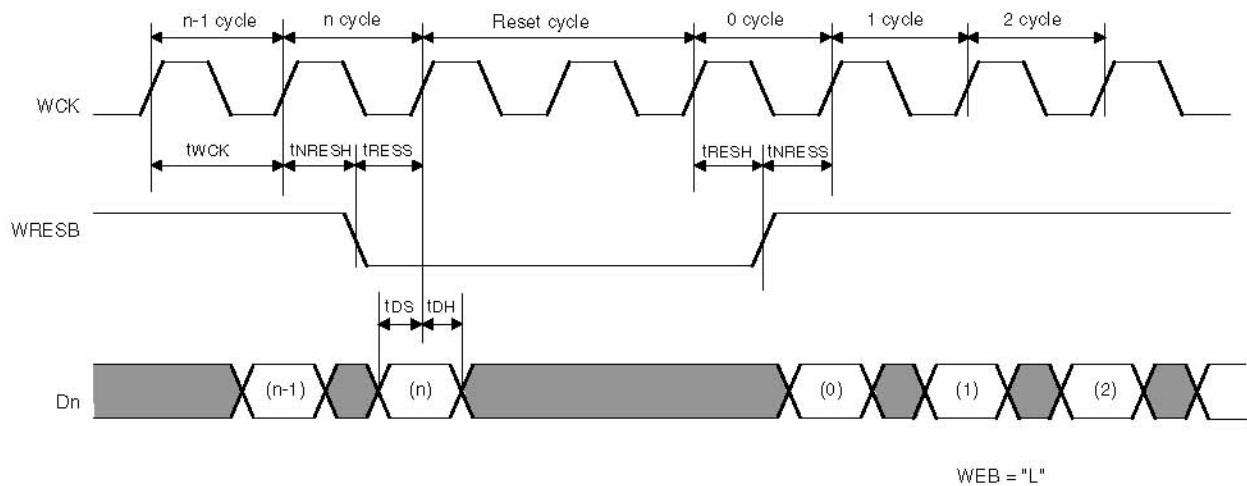


OPERATION TIMING

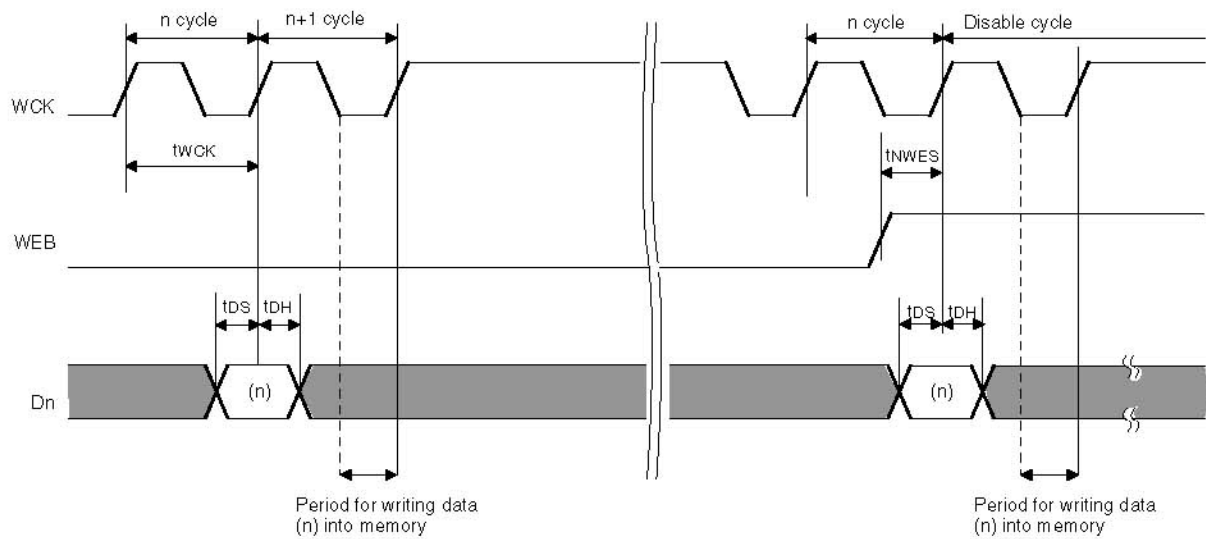
• Write cycle



• Write reset cycle



- ♦ Matters that needs attention when WCK stops



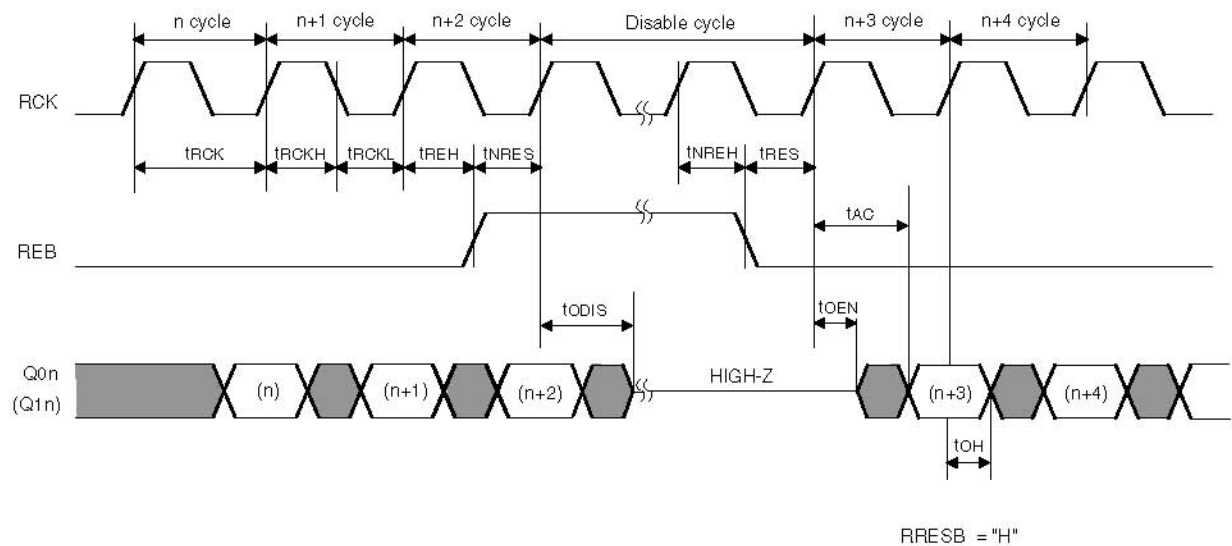
WRESB = "H"

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.

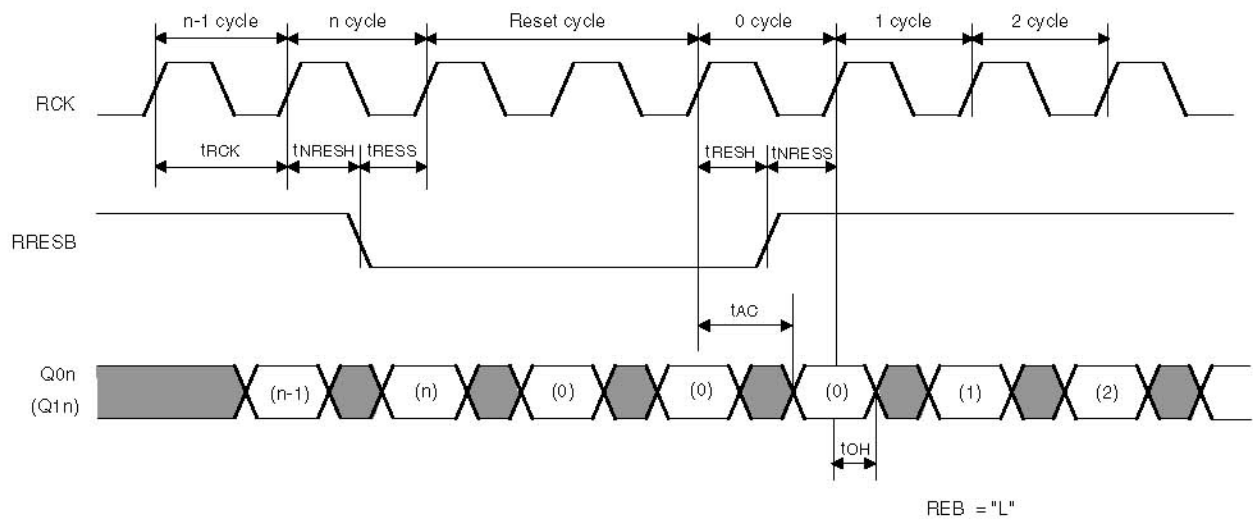
To stop reading write data at n cycle, enter WCK before the rising edge after $n+1$ cycle.

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 cycle

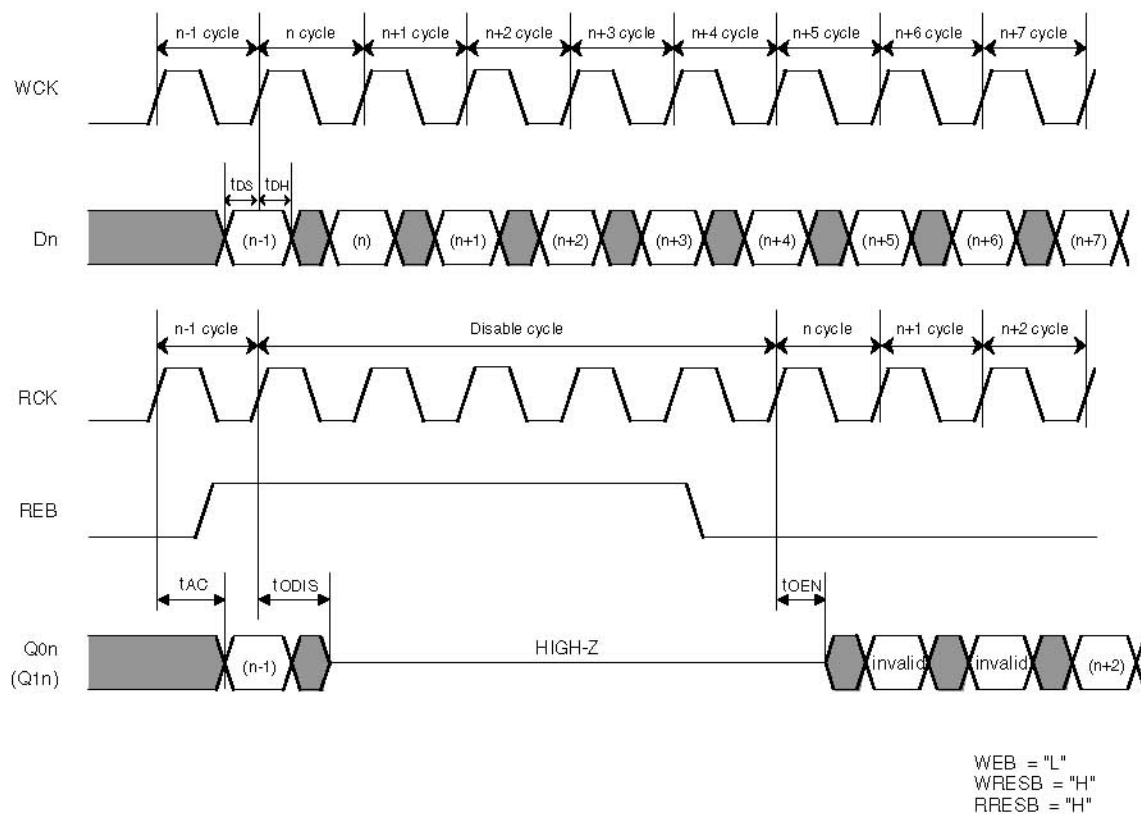


• Read reset cycle



◆ Notes on reading of written data in read disable

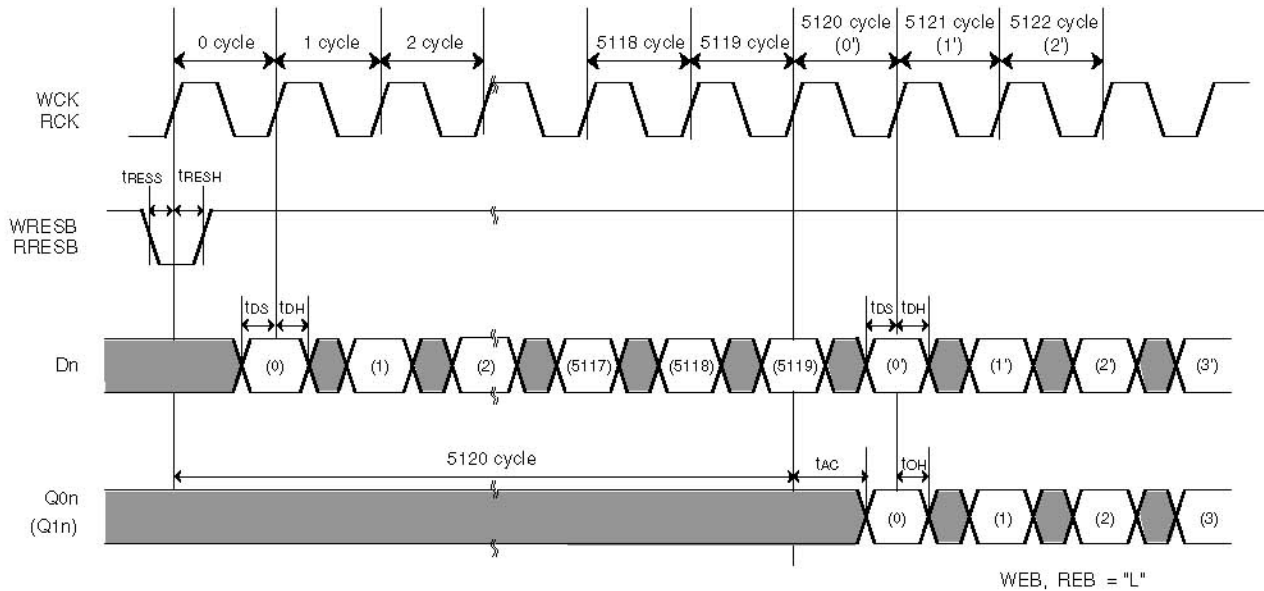
When writing operation is performed at n cycle and $n+1$ cycle on the writing side in the read disable period after $n-1$ cycle on the reading side, output at n cycle and $n+1$ cycle after read enable is invalid. For output at $n+2$ cycle and after, however, data written in the read disable period is to be output.



VARIABLE LENGTH DELAY BIT

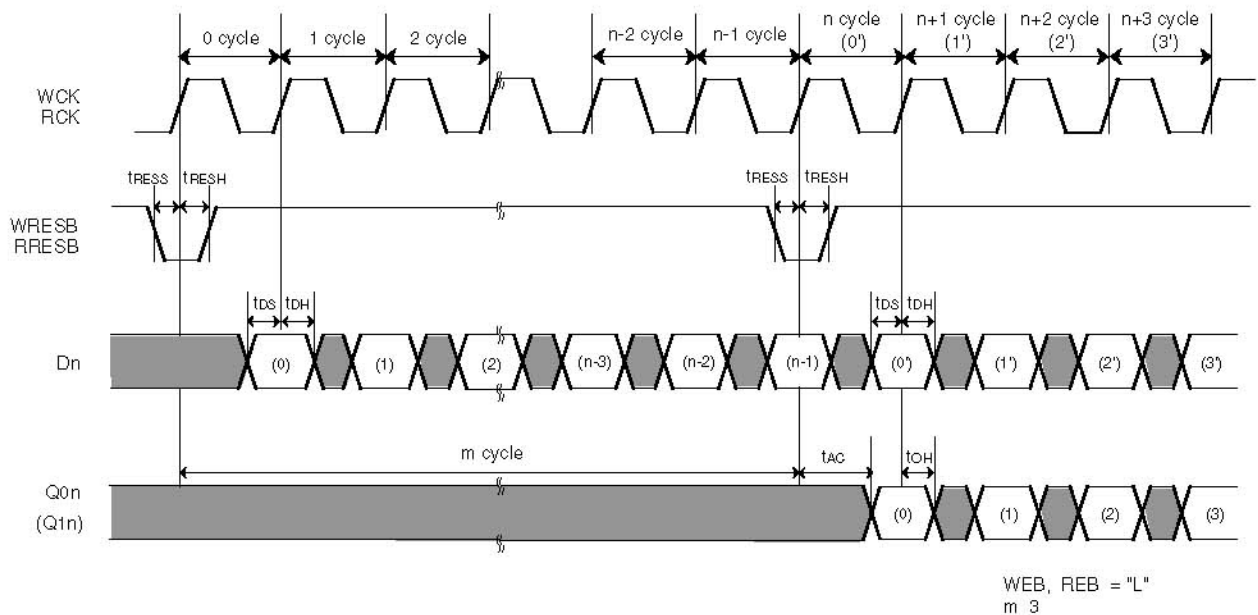
- 1 line (5120 bits) delay

Input data can be written at the rising edge of WCK after write cycle and output data is read at the rising edge of RCK before read cycle to easily make 1 line delay.



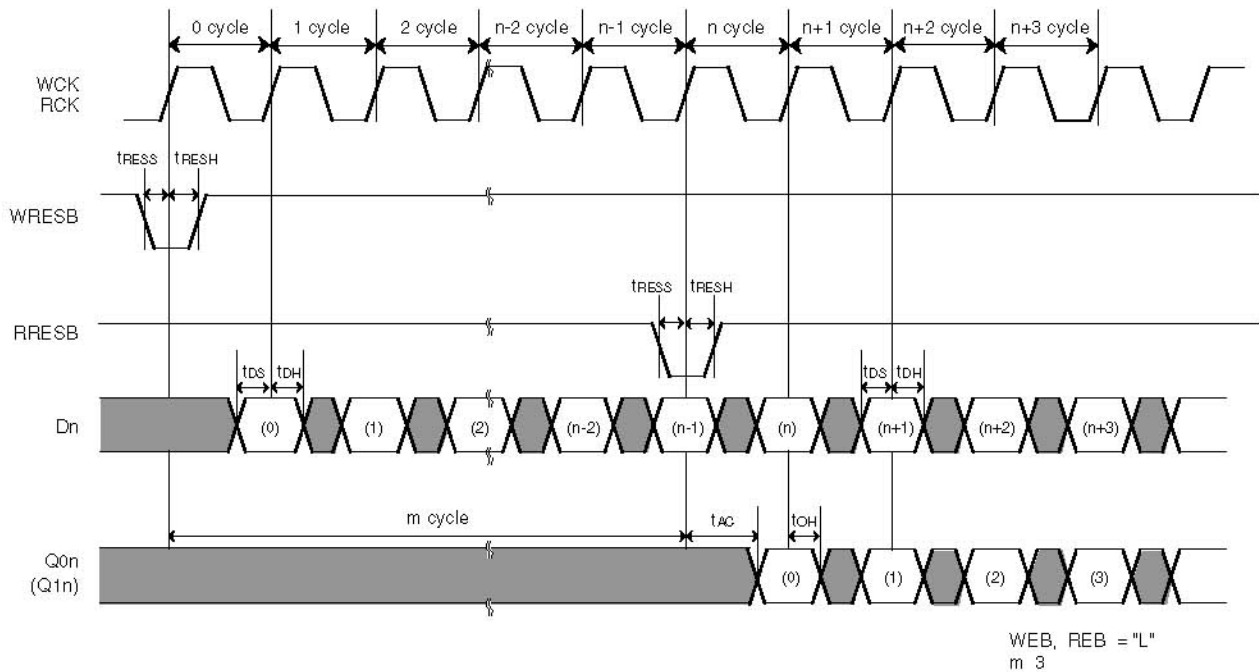
- n-bit delay bit

(Reset at cycles according to the delay length)



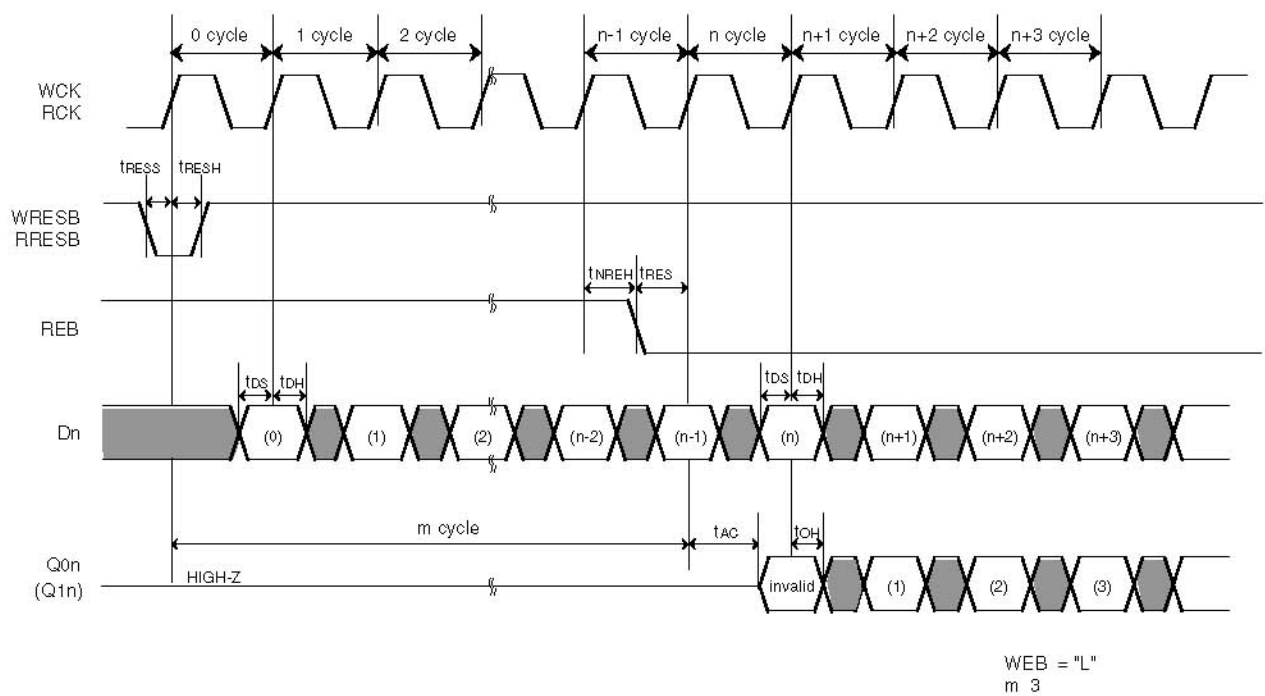
• n-bit delay 2

(Slides input timings of WRESB and RRESB at cycles according to the delay length.)



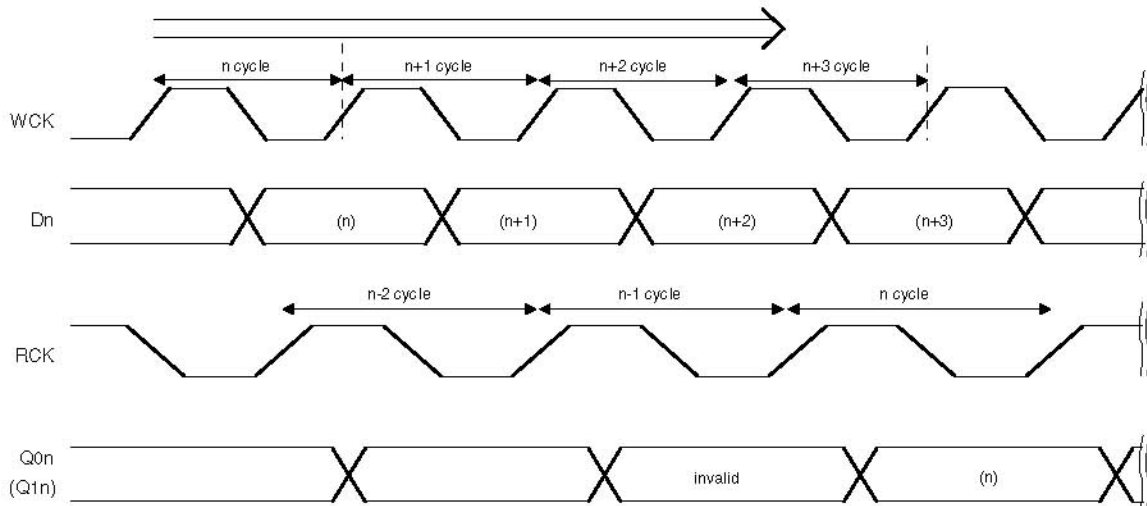
• n-bit delay 3

(Slides address by disabling REB in the period according to the delay length.)



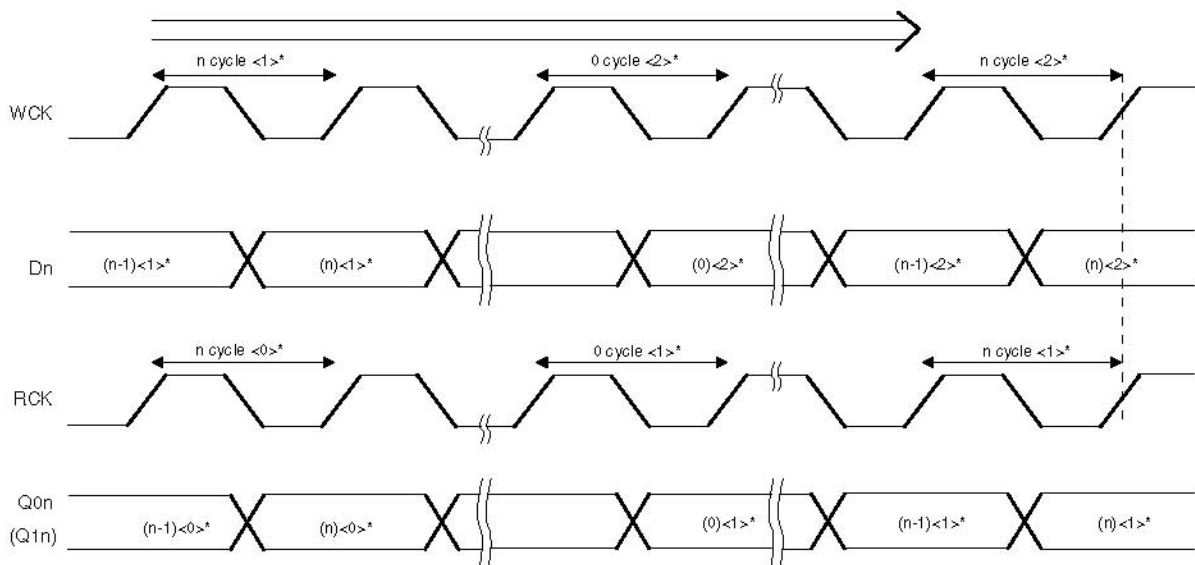
- Reading shortest n-cycle write data "n"
(Reading side n-2 cycle ends after the end of writing side n+1 cycle.)

When the reading side n-2 cycle ends before the end of the writing side n+1 cycle, output Qn of n cycle is made invalid.
In the following diagram, end of reading side n-2 cycle and end of writing side n+1 cycle overlap each other. This example can read n cycle data in the shortest time. When this is the case, reading operation at n-1 cycle is invalid.



- Reading longest n-cycle write data "n": 1 line delay
(When writing side n-cycle <2> starts, reading side n cycle <1> then starts.)

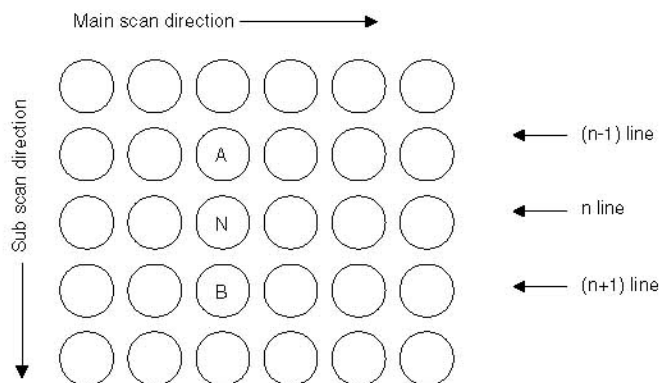
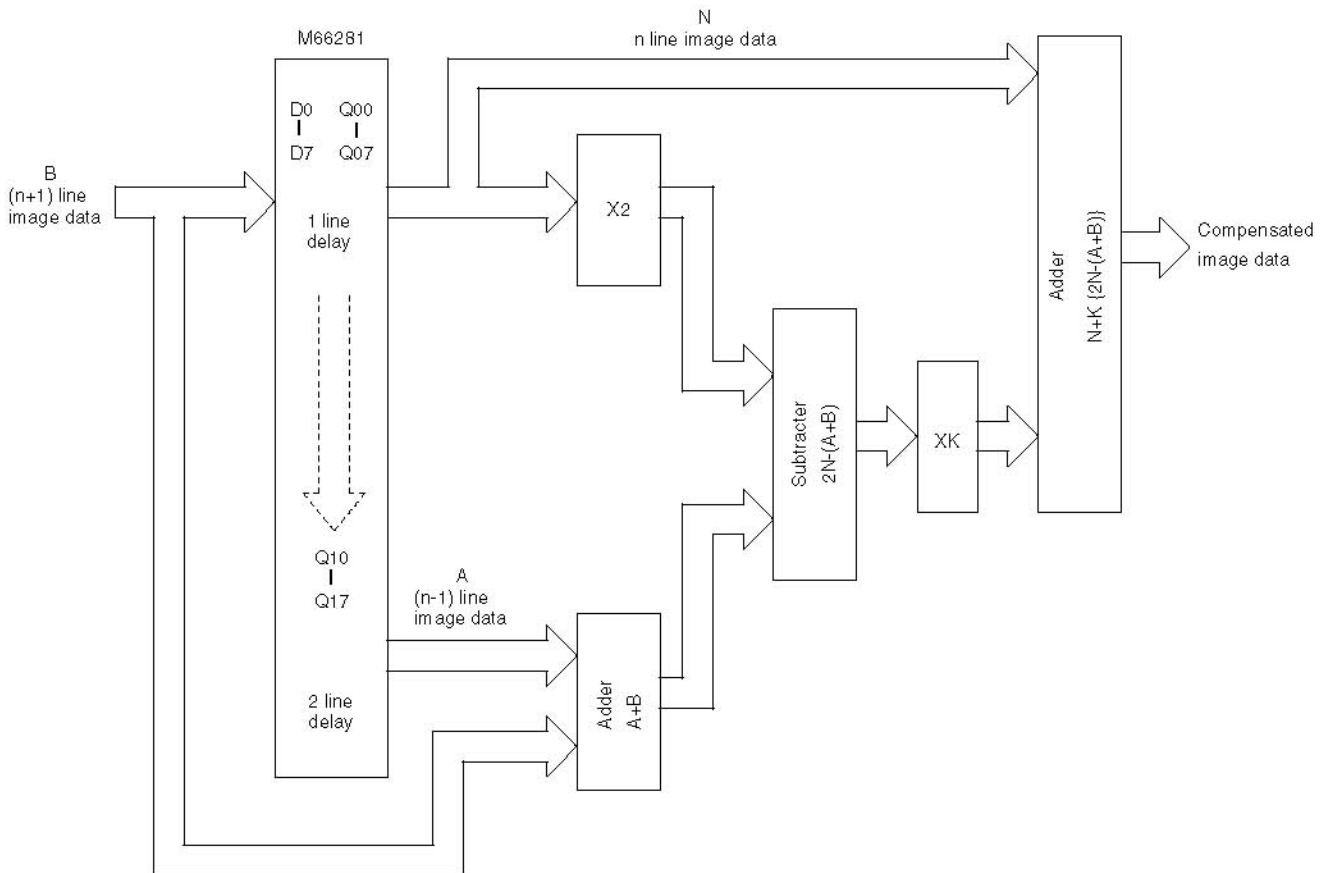
Output Qn of n cycle <1>* can be read until the start of reading side n cycle <1> and the start of writing side n cycle <2>* overlap each other.



<0>*, <1>* and <2>* indicate value of lines.

APPLICATION EXAMPLE

Sub Scan Resolution Compensation Circuit with Laplacean Filter



$$N' = N + K \{ (N-A) + (N-B) \}$$

$$= N + K \{ 2N - (A+B) \}$$

K: Laplacean coefficient