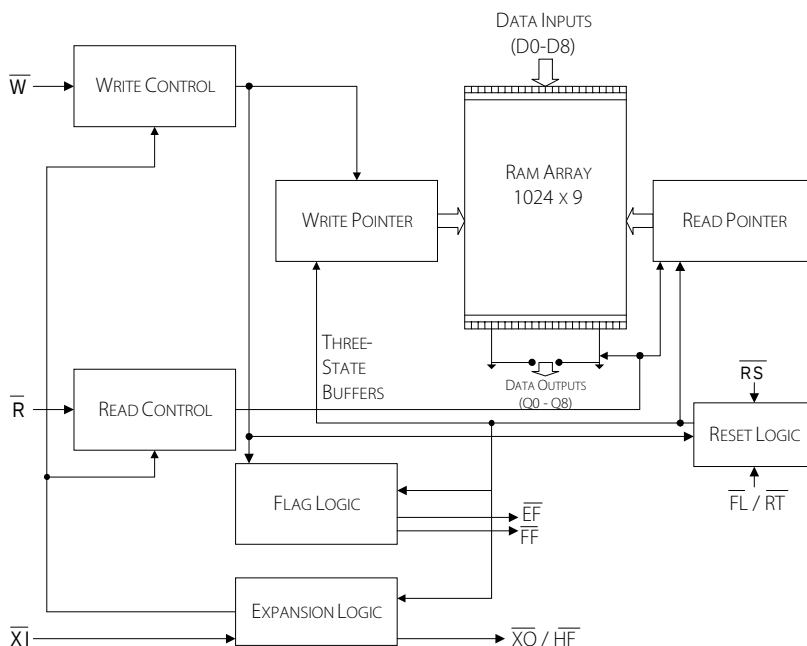
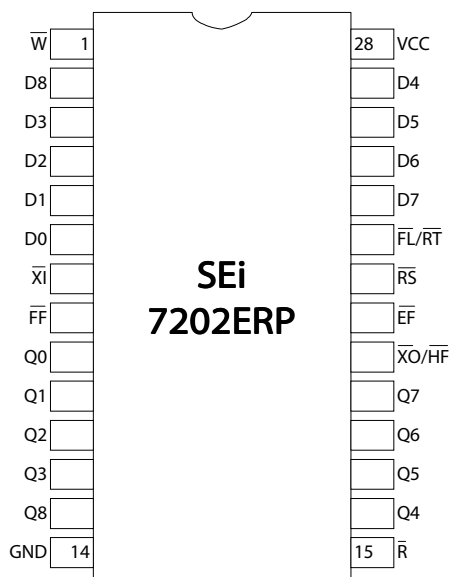




FEATURES:

- 1024 x 9-bit organization
- RAD-PAK® radiation-hardened against natural space radiation
- Manufactured on an epitaxial substrate for improved SEL performance
 - SEL_{TH} : No Latchup > 84 MeV/mg/cm²
- A total dose hardness > 100 krad (Si); dependent upon orbit
- Package:
 - 28 pin RAD-PAK® flat pack
 - 28 pin RAD-PAK® DIP
- Asynchronous read/write operation
- A high speed CMOS epi Technology
- Retransmit capability
- Propagation Time (max access time):
 - 25ns: 7202ERPx-25
 - 30ns: 7202ERPx-30
 - 40ns: 7202ERPx-40
- Status flag: empty, half-full, full fast
- Fully expandable in both word depth and width
- Bi-directional applications
- Low power
- Battery back-up operation
- TTL compatible

DESCRIPTION:

Space Electronics' 7202ERP (RP for RAD-PAK®) high speed FIFO microcircuit features a minimum 100 kilorad (Si) total dose tolerance; dependent upon orbit. It is organized such that the data is read in the same sequential order that it was written. Full and Empty flags are provided to prevent overflow and underflow. The expansion logic allows unlimited expansion capability in work size and depth with no timing penalties. Twin address pointers automatically generate internal read and write addresses, and automatically increment with the write and read pin. The 7202ERP 9-bits wide data are used in data communications applications where a parity bit for error checking is necessary. The retransmit capability allows the read pointer to be reset to its initial position without affecting the write pointer. The RAD-PAK® technology incorporates radiation shielding in the microcircuit package. It eliminates box shielding while providing lifetime in orbit. The 7202ERP features the same system performance and architecture as the commercial counterparts and is manufactured on an epitaxial substrate to enhance single event latchup performance. Capable of surviving in space environments, the 7202ERP is ideal for satellite, spacecraft, and space probe missions. This product is available with packaging and screening up to Class S.

TABLE 1. 7202ERP PINOUT DESCRIPTION

NUMBER	NAMES	DESCRIPTION
1	$\overline{W}$	Write Enable
2 - 6	D8, D3- D0	Inputs
7	$\overline{XI}$	Expansion In
8	$\overline{FF}$	Full Flag
9 - 13	Q0 - Q3, Q8	Outputs
14	GND	Ground
15	$\overline{R}$	Read Enable
16 - 19	Q4 - Q7	Outputs
20	$\overline{XO}/\overline{HF}$	Expansion Out/Half Full Flag
21	$\overline{EF}$	Empty Flag
22	$\overline{RS}$	Reset
23	$\overline{FL}/\overline{RT}$	First Load/Retransmit
24 - 27	D7 - D4	Inputs
28	V_{CC}	Power Supply

TABLE 2. 7202ERP ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN	MAX	UNIT
Positive Supply Voltage	V_{CC}	-0.3	7.0	V
Input or Output Voltage	V_{IN}	GND -0.3	$V_{CC} + 0.3$	V
Storage Temperature Range	T_S	-65	150	°C
Operating Temperature Range	T_A	-55	125	°C

TABLE 3. 7202ERP RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	MIN	MAX	UNIT
Positive Supply Voltage	V_{CC}	4.5	5.5	V
High Level Input Voltage	V_{IH}	2.2	--	V
Low Level Voltage	V_{IL}	--	0.8	V
Operating Temperature Range	T_C	-55	125	°C

TABLE 4. 7202ERP DC ELECTRICAL CHARACTERISTICS ¹

PARAMETER	SYMBOL	MIN	MAX	UNIT
Operating Supply Current 7202ERPx-25 7202ERPx-30 7202ERPx-40	I_{CCOP}^2	-- -- --	140 140 120	mA
Standby Supply Current ($\bar{R} = \bar{W} = \bar{RS} = \bar{FL}/\bar{RT} = V_{IH}$) 7202ERPx-25 7202ERPx-30 7202ERPx-40	I_{CCSB}	-- -- --	1.5 1.5 1.5	mA
Power Down Current (All input = V_{CC}) 7202ERPx-25 7202ERPx-30 7202ERPx-40	I_{CCPD}	-- -- --	800 800 800	μ A
Input Leakage Current ($0.4V \leq V_{IN} \leq V_{CC}$)	I_{LI}	-1	1	μ A
Output Leakage Current ($\bar{R} = V_{IH}, 0.4V \leq V_{OUT} \leq V_{CC}$)	I_{LO}	-10	10	μ A
Input Low Voltage ³	V_{IL}	--	0.8	V
Input High Voltage ³	V_{IH}	2.2	--	V
Output Low Voltage ($V_{CC} = \text{min}, I_{OL} = 8 \text{ mA}$)	V_{OL}	--	0.4	V
Output High Voltage ($V_{CC} = \text{min}, I_{OH} = -2 \text{ mA}$)	V_{OH}	2.4	--	V
Input Capacitance ⁴	C_{IN}	--	10	pF
Output Capacitance ⁴	C_{OUT}	--	10	pF

- $V_{CC} = 5V \pm 10\%$; $T_A = -55$ to 125°C .
- I_{CC} measurements are made with outputs open. $F = F_{MAX}$
- $V_{IH} \text{ max} = V_{CC} + 0.3V$. $V_{IL} \text{ min} = -0.3V$ or $-1V$ pulse width 50 ns.
- This parameter is sampled and not 100% tested. $T_A = 25^\circ\text{C}$, $f = 1 \text{ MHz}$.

TABLE 5. 7202ERP TIMING CHARACTERISTICS ¹

PARAMETER	SYMBOL	MIN	MAX	UNITS
READ CYCLE				
Read Cycle Time 7202ERPx-25 7202ERPx-30 7202ERPx-40	t_{RC}	35 40 50	-- -- --	ns
Access Time 7202ERPx-25 7202ERPx-30 7202ERPx-40	t_A	-- -- --	25 30 40	ns

TABLE 5. 7202ERP TIMING CHARACTERISTICS ¹

PARAMETER	SYMBOL	MIN	MAX	UNITS
Read Recovery Time 7202ERPx-25 7202ERPx-30 7202ERPx-40	t_{RR}	10 10 10	-- -- --	ns
Read Pulse Width ² 7202ERPx-25 7202ERPx-30 7202ERPx-40	t_{RPW}	25 30 40	-- -- --	ns
Read Low to Data Low ³ 7202ERPx-25 7202ERPx-30 7202ERPx-40	t_{RLZ}	5 5 5	-- -- --	ns
Write HIGH to Data Low-Z ^{3,4} 7202ERPx-25 7202ERPx-30 7202ERPx-40	t_{WLZ}	5 10 10	-- -- --	ns
Data Valid from Read High 7202ERPx-25 7202ERPx-30 7202ERPx-40	t_{DV}	5 5 5	-- -- --	ns
Read High to Data Bus High-Z ³ 7202ERPx-25 7202ERPx-30 7202ERPx-40	t_{RHZ}	-- -- --	18 20 25	ns
WRITE CYCLE				
Write Cycle Time 7202ERPx-25 7202ERPx-30 7202ERPx-40	t_{WC}	35 40 50	-- -- --	ns
Write Pulse Width ² 7202ERPx-25 7202ERPx-30 7202ERPx-40	t_{WPW}	25 30 40	-- -- --	ns
Write Recovery Time 7202ERPx-25 7202ERPx-30 7202ERPx-40	t_{WR}	10 10 10	-- -- --	ns
Data Set-up Time 7202ERPx-25 7202ERPx-30 7202ERPx-40	t_{DS}	15 18 20	-- -- --	ns
Data Hold Time 7202ERPx-25 7202ERPx-30 7202ERPx-40	t_{DH}	0 0 0	-- -- --	ns

TABLE 5. 7202ERP TIMING CHARACTERISTICS ¹

PARAMETER	SYMBOL	MIN	MAX	UNITS
RESET CYCLE				
Reset Cycle Time 7202ERPx-25 7202ERPx-30 7202ERPx-40	t_{RSC}	35 40 50	-- -- --	ns
Reset Pulse Width ² 7202ERPx-25 7202ERPx-30 7202ERPx-40	t_{RS}	25 30 40	-- -- --	ns
Reset Set-up Time ³ 7202ERPx-25 7202ERPx-30 7202ERPx-40	t_{RSS}	25 30 40	-- -- --	ns
Reset Recovery Time 7202ERPx-25 7202ERPx-30 7202ERPx-40	t_{RSR}	10 10 10	-- -- --	ns
RETRANSMIT CYCLE				
Retransmit Cycle Time 7202ERPx-25 7202ERPx-30 7202ERPx-40	t_{RTC}	35 40 50	-- -- --	ns
Retransmit Pulse Width ² 7202ERPx-25 7202ERPx-30 7202ERPx-40	t_{RT}	25 30 40	-- -- --	ns
Retransmit Set-up Time ³ 7202ERPx-25 7202ERPx-30 7202ERPx-40	t_{RTS}	25 30 40	-- -- --	ns
Retransmit Recovery Time 7202ERPx-25 7202ERPx-30 7202ERPx-40	t_{RSR}	10 10 10	-- -- --	ns
FLAGS				
Reset to $\overline{EF}$ Low 7202ERPx-25 7202ERPx-30 7202ERPx-40	t_{EFL}	-- -- --	35 40 50	ns
Reset to $\overline{HF}$ $\overline{FF}$ High 7202ERPx-25 7202ERPx-30 7202ERPx-40	t_{HFH}, t_{FFH}	-- -- --	35 40 50	ns

TABLE 5. 7202ERP TIMING CHARACTERISTICS ¹

PARAMETER	SYMBOL	MIN	MAX	UNITS
Read Low to $\overline{EF}$ Low 7202ERPx-25 7202ERPx-30 7202ERPx-40	t_{REF}	-- -- --	25 30 30	ns
Read High to $\overline{FF}$ High 7202ERPx-25 7202ERPx-30 7202ERPx-40	t_{RFF}	-- -- --	25 30 35	ns
Read Pulse Width after $\overline{EF}$ High 7202ERPx-25 7202ERPx-30 7202ERPx-40	t_{RPE}	25 30 40	-- -- --	ns
Write High to $\overline{EF}$ High 7202ERPx-25 7202ERPx-30 7202ERPx-40	t_{WEF}	-- -- --	25 30 35	ns
Write Low to $\overline{FF}$ Low 7202ERPx-25 7202ERPx-30 7202ERPx-40	t_{WFF}	-- -- --	25 30 35	ns
Write Low to $\overline{HF}$ Flag Low 7202ERPx-25 7202ERPx-30 7202ERPx-40	t_{WHF}	-- -- --	35 40 50	ns
Read High to $\overline{HF}$ Flag High 7202ERPx-25 7202ERPx-30 7202ERPx-40	t_{RHF}	-- -- --	35 40 50	ns
Write Pulse Width after $\overline{FF}$ High 7202ERPx-25 7202ERPx-30 7202ERPx-40	t_{WPF}	25 30 40	-- -- --	ns
Read/Write LOW to $\overline{XO}$ LOW 7202ERPx-25 7202ERPx-30 7202ERPx-40	t_{XOL}	-- -- --	25 30 40	ns
Read/Write HIGH to $\overline{XO}$ HIGH 7202ERPx-25 7202ERPx-30 7202ERPx-40	t_{XOH}	-- -- --	25 30 40	ns
$\overline{XI}$ Pulse Width 7202ERPx-25 7202ERPx-30 7202ERPx-40	t_{XI}	25 30 40	-- -- --	ns

TABLE 5. 7202ERP TIMING CHARACTERISTICS ¹

PARAMETER	SYMBOL	MIN	MAX	UNITS
$\overline{X1}$ Recovery Time	t_{X1R}			ns
7202ERP $\times$ -25		10	--	
7202ERP $\times$ -30		10	--	
7202ERP $\times$ -40		10	--	
$\overline{X1}$ Set-up Time	t_{X1S}			ns
7202ERP $\times$ -25		10	--	
7202ERP $\times$ -30		10	--	
7202ERP $\times$ -40		10	--	

1. $V_{CC} = 5\text{ V} \pm 10\%$; $T_A = 25^\circ\text{C}$; use switching test circuit. AC tests are performed with input rise and fall times of 5 ns or less, timing reference levels of 1.5 V, input pulse levels of 0 to 3.0 V and the output load circuit, unless otherwise specified.
2. Pulse widths less than minimum value are not allowed.
3. Values guaranteed by design, not currently tested.
4. Only applies to read data flow-through mode.

FIGURE 1. RESET

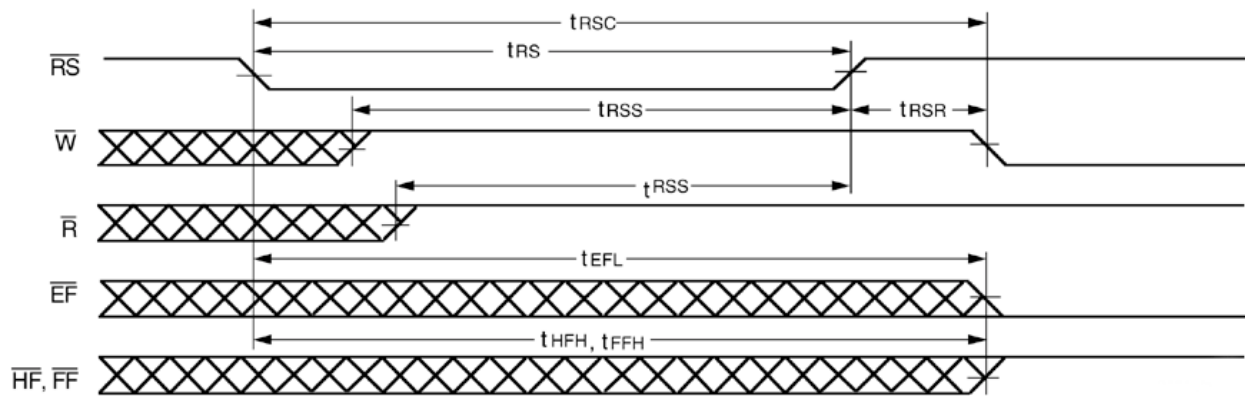


FIGURE 2. ASYNCHRONOUS WRITE AND READ OPERATION

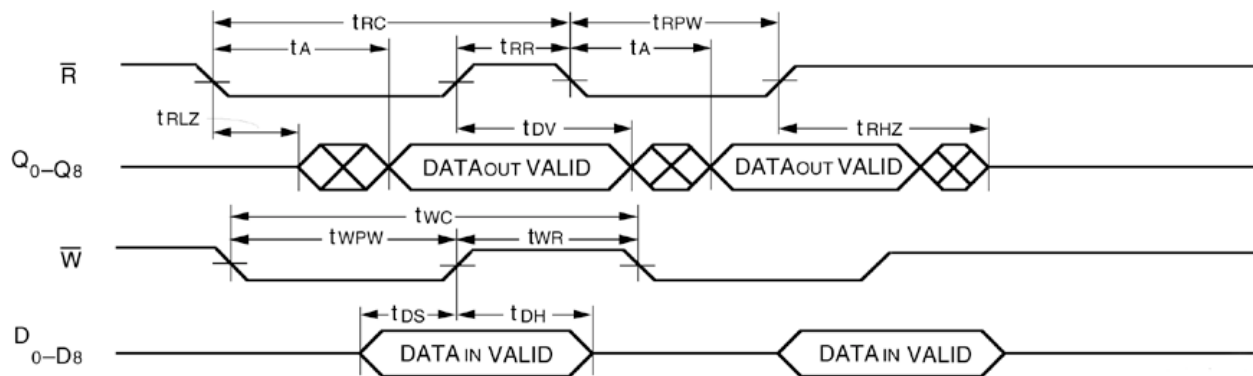


FIGURE 3. FULL FLAG TIMING FROM LAST WRITE TO FIRST READ

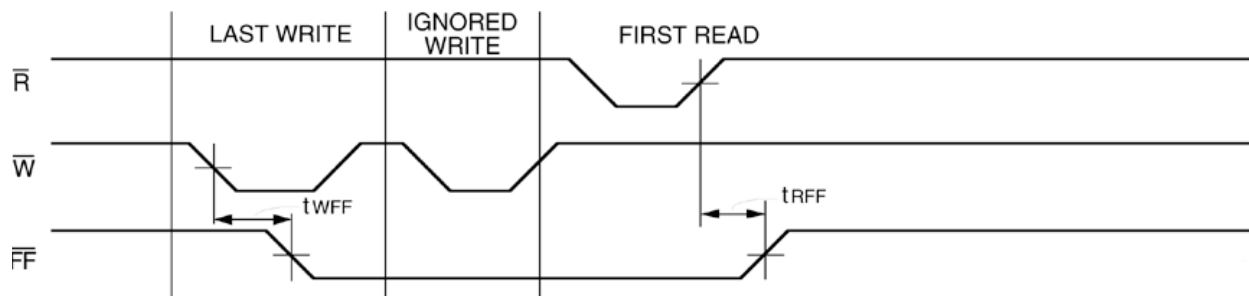


FIGURE 4. EMPTY FLAG TIMING FROM LAST READ TO FIRST WRITE

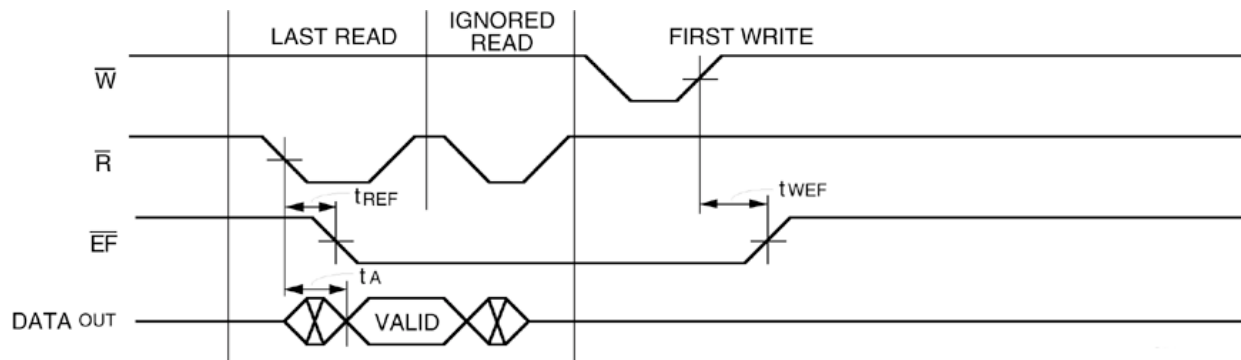


FIGURE 5. RETRANSMIT

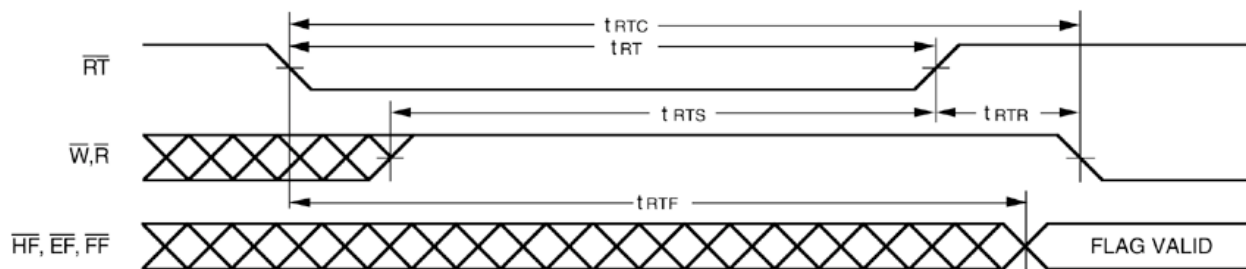


FIGURE 6. MINIMUM TIMING FOR AN EMPTY FLAG COINCIDENT READ PULSE

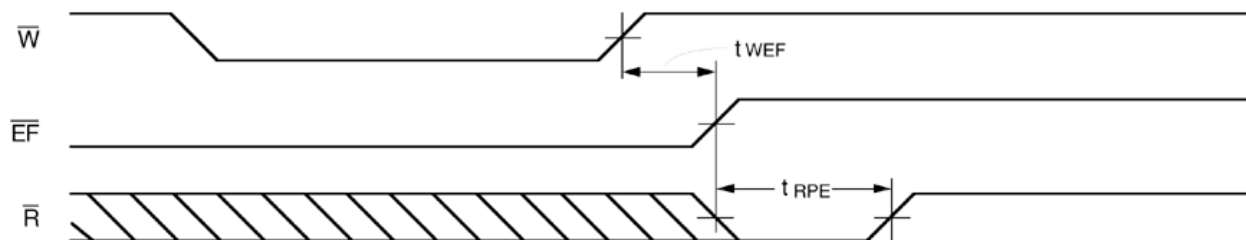
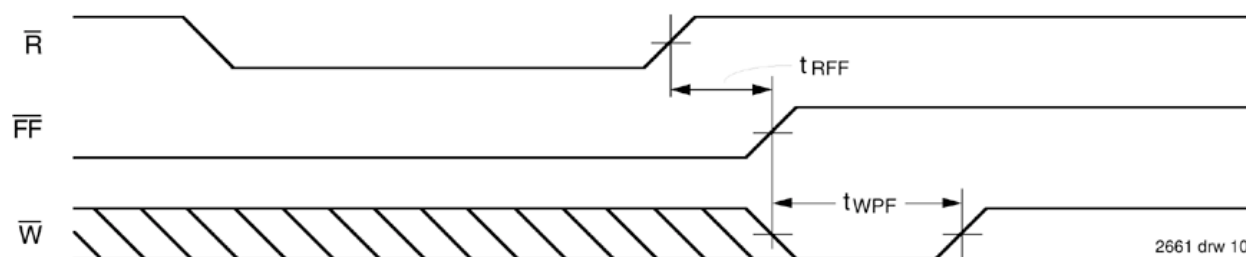


FIGURE 7. MINIMUM TIMING FOR A FULL FLAG COINCIDENT WRITE PULSE



2661 drw 10

FIGURE 8. HALF-FULL FLAG TIMING

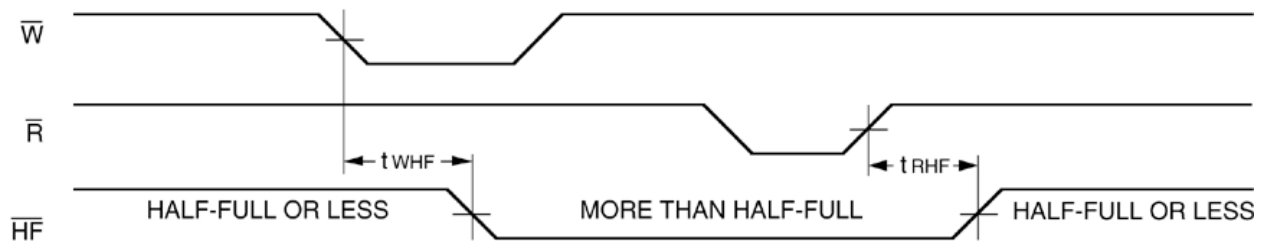


FIGURE 9. EXPANSION IN

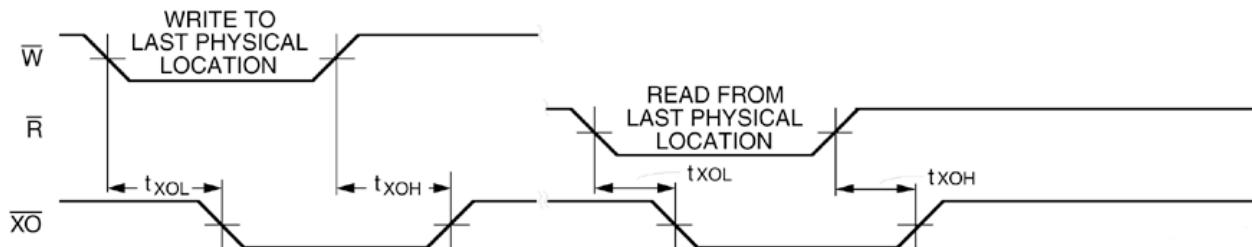
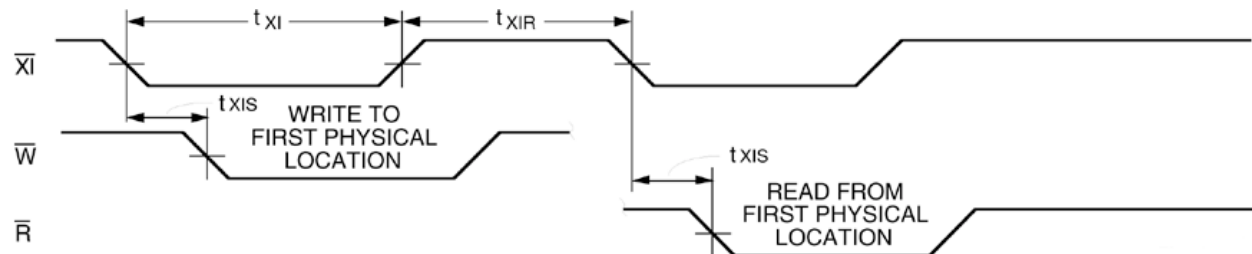


FIGURE 10. EXPANSION OUT

**Important Notice:**

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