

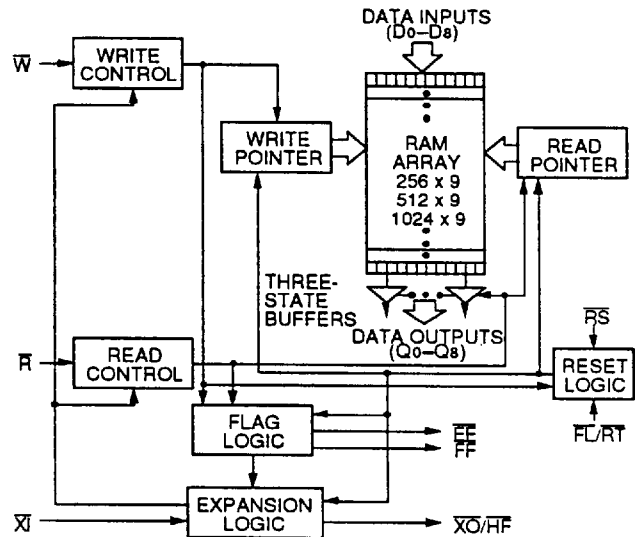
1024 x 9-Bit FIFO - Radiation Hardened 7202ERP

CMOS epi Parallel
Cascadeable FIFO

For Space Applications

SEI's 7202ERP (RP for RAD-PAK®) high speed FIFO microcircuit features a minimum 100 kilorad (Si) total dose tolerance. Using SEI's radiation hardened RAD-PAK® packaging technology, the 7202ERP is fully equivalent to the commercial 7202

(IDT) and the CY7C424 (Cypress Semiconductor). The 7202ERP is a dual port memory that load and empty data on a first-in/first-out basis. This device uses Full and Empty flags to prevent data overflow and underflow and expansion logic to allow for unlimited expansion capability in both word size and depth. It also utilizes a 9-bit wide data array to allow for control and parity bits at the user's option. This feature is very beneficial in data communications applications where it is necessary to use a parity bit for transmission/reception error checking. Utilizing high-speed CMOS technology, the 7202ERP is designed for applications requiring asynchronous and simultaneous read/writes in multiprocessing and rate buffer applications. Capable of surviving space environments; the 7202ERP is ideal for satellite, spacecraft, and space probe missions. The RAD-PAK® technology incorporates radiation shielding in the microcircuit package. It eliminates box shielding while providing lifetime in orbit. It has a 100 krad (Si) total dose survivability, mitigation of dose enhancement, and a high-rel die attachment. 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. It is available in Class S packaging and screening.



SEI 7202ERP RAD HARD 1Kx9 FIFO MICROCIRCUIT



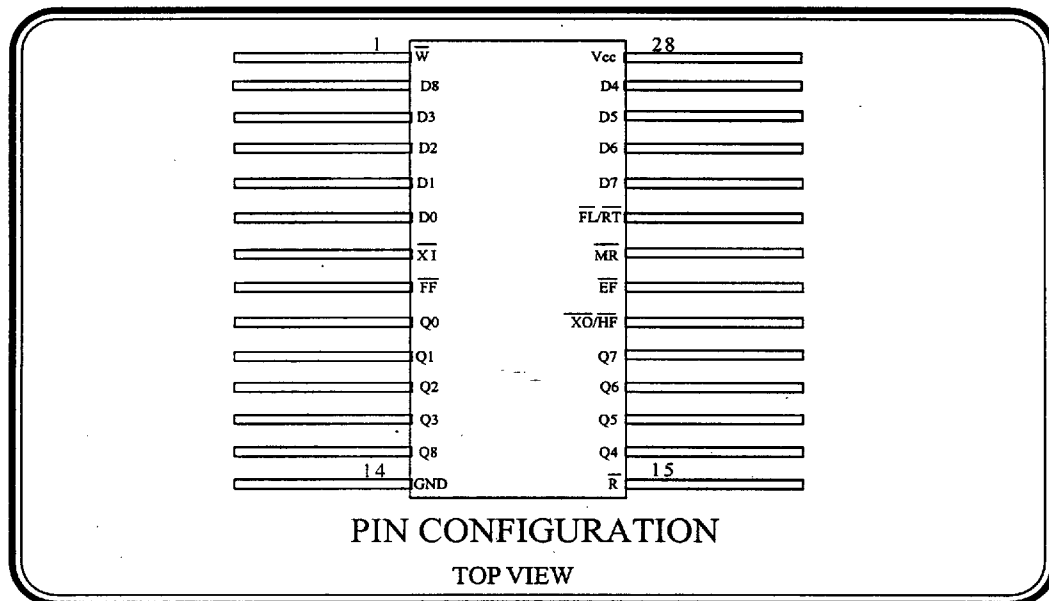
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INCORPORATED**

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Radiation Hardened 7202ERP

CMOS 28 Pin
Cascadeable FIFO



Features

- 1024 x 9-bit Organization
- Pin Compatible with IDT7202/ CY7C424
- RAD-PAK® Radiation Hardened
Against Natural Space Radiation
- Total Dose Hardness >100 krad (Si)
- Package:
 - 28 Pin RAD-PAK® flat pack
(410 mils x 720 mils)
 - Weight - 5.2 grams
 - 28 Pin RAD-PAK® DIP
(410 mils x 720 mils)
 - Weight - 5.2 grams
- Fast Propagation Time (Max access time):
 - 30 ns :7202ERPx-30
 - 25 ns :7202ERPx-25
 - 20 ns :7202ERPx-20
- Asynchronous read/write
- High Speed CMOS Technology
 - Page Write Mode fully expandable by both word depth and/or bit width
 - Half-Full Flag capability in single device mode
 - Master/Slave multiprocessing applications
 - Bidirectional and rate buffer applications
 - Empty and Full warning flags
 - Auto retransmit capability
- Low Power
 - Input leakage <10uA
 - Active P.S. current <100mA
 - Standby current <15mA
- Screening per TM 5004
- QCI per TM5005

Specifications and design are subject to change without notice.



Aug. 1995

For Further Information Contact::

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7202ERP ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN	MAX	UNITS
Positive Supply Voltage	V_{CC}	-0.5	7.0	V
DC Voltage to Outputs: (During High-Z State)		-0.5	7.0	V
Output Current into Outputs: (Low)			20	mA
DC Input Voltage	V_{IN}	-0.5	7.0	V
Power Dissipation	P_d		1000	mW
Storage Temperature Range	T_s	-65	+150	°C
Operating Temperature Range	T_A	-55	+125	°C

7202ERP RECOMMENDED OPERATING CONDITIONS

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



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7202ERP DC ELECTRICAL CHARACTERISTICS¹

PARAMETER	SYMBOL	MIN	MAX	UNITS
Input Low Voltage	V_{IL}		0.8	V
Input High Voltage	V_{IH}	2.2		V
Output Low Voltage $V_{CC} = 4.5 \text{ V}, V_{IN} = V_{IL}/V_{IH}, I_{OL} = 8 \text{ mA}$	V_{OL}		0.4	V
Output High Voltage $V_{CC} = 4.5 \text{ V}, V_{IN} = V_{IL}/V_{IH}, I_{OH} = -2 \text{ mA}$	V_{OH}	2.4		V
Input Low Current: $V_{IN} = 0 \text{ V}, V_{CC} = \text{Max}$	I_{IL}	-10	10	μA
Input High Current: $V_{IN} = 5.5 \text{ V}, V_{CC} = \text{Max}$	I_{IH}	-10	10	μA
Output Leakage Current: $V_{IN} = 5.5 \text{ V}/0 \text{ V}, V_{CC} = \text{Max}$	I_{OZ}	-10	10	μA
Active Power Supply Current ²	I_{CC1}		147	mA
Standby Supply Current ² : ($R = W \setminus RS \setminus FL \setminus RT \setminus V_{IH}$)	I_{CC2}		12	mA
Power Down Current ² : All Input = $V_{CC} - 0.2 \text{ V}$	I_{CC3}		2	mA
Input Capacitance ³	C_{IN}		11	pF
Output Capacitance ³	C_{OUT}		15	pF

Notes:

- $V_{CC} = 5 \pm 5\%$ volts; $T_A = -55$ to $+125$ °C.
- All measurements are made with outputs open (only capacitive loading).
- Guaranteed by design, $f = 1 \text{ MHz}$.



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7202ERP TIMING CHARACTERISTICS¹

PARAMETER	SYMBOL	MIN	MAX	UNIT
Shift Frequency 7202ERPx-30 7202ERPx-25 7202ERPx-20	f_s		25 28.5 33.3	ns
Read Cycle Time 7202ERPx-30 7202ERPx-25 7202ERPx-20	t_{RC}	40 35 30		ns
Data Access Time 7202ERPx-30 7202ERPx-25 7202ERPx-20	t_A		30 25 20	ns
Read Recovery Time 7202ERPx-30 7202ERPx-25 7202ERPx-20	t_{RR}	10 10 10		ns
Read Pulse Width ² 7202ERPx-30 7202ERPx-25 7202ERPx-20	t_{RPW}	30 25 20		ns
Read LOW to Data Bus LOW ³ 7202ERPx-30 7202ERPx-25 7202ERPx-20	t_{RLZ}	5 5 5		ns
Write HIGH to Data Bus Low-Z ^{3,4} 7202ERPx-30 7202ERPx-25 7202ERPx-20	t_{WLZ}	5 5 5		ns
Data Valid from Read HIGH 7202ERPx-30 7202ERPx-25 7202ERPx-20	t_{DV}	5 5 5		ns
Read HIGH to Data Bus High-Z ³ 7202ERPx-30 7202ERPx-25 7202ERPx-20	t_{RHZ}		20 18 15	ns



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7202ERP TIMING CHARACTERISTICS¹ - (Continued)

PARAMETER	SYMBOL	MIN	MAX	UNIT
Write Cycle Time 7202ERP _x -30 7202ERP _x -25 7202ERP _x -20	t_{wc}	40 35 30		ns
Write Pulse Width ² 7202ERP _x -30 7202ERP _x -25 7202ERP _x -20	t_{wpw}	30 25 20		ns
Write Recovery Time 7202ERP _x -30 7202ERP _x -25 7202ERP _x -20	t_{wr}	10 10 10		ns
Data Set-up Time 7202ERP _x -30 7202ERP _x -25 7202ERP _x -20	t_{ds}	18 15 12		ns
Data Hold Time 7202ERP _x -30 7202ERP _x -25 7202ERP _x -20	t_{dh}	0 0 0		ns
Reset Cycle Time 7202ERP _x -30 7202ERP _x -25 7202ERP _x -20	t_{rsc}	40 35 30		ns
Reset Pulse Width ² 7202ERP _x -30 7202ERP _x -25 7202ERP _x -20	t_{rs}	30 25 20		ns
Reset Set-up Time ³ 7202ERP _x -30 7202ERP _x -25 7202ERP _x -20	t_{rss}	30 25 20		ns
Reset Recovery Time 7202ERP _x -30 7202ERP _x -25 7202ERP _x -20	t_{rsr}	10 10 10		ns



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7202ERP TIMING CHARACTERISTICS¹ - (Continued)

PARAMETER	SYMBOL	MIN	MAX	UNIT
Retransmit Cycle Time 7202ERP _x -30 7202ERP _x -25 7202ERP _x -20	t_{RTC}	40 35 30		ns
Retransmit Pulse Width ² 7202ERP _x -30 7202ERP _x -25 7202ERP _x -20	t_{RT}	30 25 20		ns
Retransmit Set-up Time ³ 7202ERP _x -30 7202ERP _x -25 7202ERP _x -20	t_{RTS}	30 25 20		ns
Retransmit Recovery Time 7202ERP _x -30 7202ERP _x -25 7202ERP _x -20	t_{RSR}	10 10 10		ns
Reset to EF\ LOW 7202ERP _x -30 7202ERP _x -25 7202ERP _x -20	t_{EFL}		40 35 30	ns
Reset to HF\ and FF\ HIGH 7202ERP _x -30 7202ERP _x -25 7202ERP _x -20	t_{HFH}, t_{FFH}		40 35 20	ns
Retransmit LOW to Flags Valid 7202ERP _x -30 7202ERP _x -25 7202ERP _x -20	t_{RTF}		40 35 20	ns
Read LOW to EF\ LOW 7202ERP _x -30 7202ERP _x -25 7202ERP _x -20	t_{REF}		30 25 20	ns
Read HIGH to FF\ HIGH 7202ERP _x -30 7202ERP _x -25 7202ERP _x -20	t_{RFF}		30 25 20	ns



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7202ERP TIMING CHARACTERISTICS¹ - (Continued)

PARAMETER	SYMBOL	MIN	MAX	UNIT
Read Pulse Width after EF\ HIGH 7202ERP _x -30 7202ERP _x -25 7202ERP _x -20	t _{RPE}	30 25 20		ns
Write HIGH to EF\ HIGH 7202ERP _x -30 7202ERP _x -25 7202ERP _x -20	t _{WEF}		30 25 20	ns
Write LOW to FF\ LOW 7202ERP _x -30 7202ERP _x -25 7202ERP _x -20	t _{WFF}		30 25 20	ns
Write LOW to HF\ Flag LOW 7202ERP _x -30 7202ERP _x -25 7202ERP _x -20	t _{WHF}		40 35 30	ns
Read HIGH to HF\ Flag HIGH 7202ERP _x -30 7202ERP _x -25 7202ERP _x -20	t _{RHF}		40 35 30	ns
Write Pulse Width after FF HIGH 7202ERP _x -30 7202ERP _x -25 7202ERP _x -20	t _{WPF}	30 25 20		ns
Read/Write LOW to XO\ LOW 7202ERP _x -30 7202ERP _x -25 7202ERP _x -20	t _{XOL}		30 25 20	ns
Read/Write HIGH to XO\ HIGH 7202ERP _x -30 7202ERP _x -25 7202ERP _x -20	t _{XOH}		30 25 20	ns
XI\ Pulse Width ² 7202ERP _x -30 7202ERP _x -25 7202ERP _x -20	t _{XI}	30 25 20		ns



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7202ERP TIMING CHARACTERISTICS¹ - (Continued)

PARAMETER	SYMBOL	MIN	MAX	UNIT
XI Recovery Time 7202ERP _x -30 7202ERP _x -25 7202ERP _x -20	t_{XIR}	10 10 10		ns
XI Set-up Time 7202ERP _x -30 7202ERP _x -25 7202ERP _x -20	t_{XIS}	10 10 10		ns

Notes:

1. $V_{CC} = +5$ Volts; $T_A = +25$ °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 are not allowed.
3. Guaranteed by design, not tested.
4. Only applies to read data flow-through mode.

7202ERP Package Ordering Guide

Package Style	Case Outline	1/	Description
D	D-28		28 Pin Dual In Line Package
F	F-28		28 Pin Flat Package

Note:

1/ For outline information, see Appendix A (Package Information - Outline Dimension)

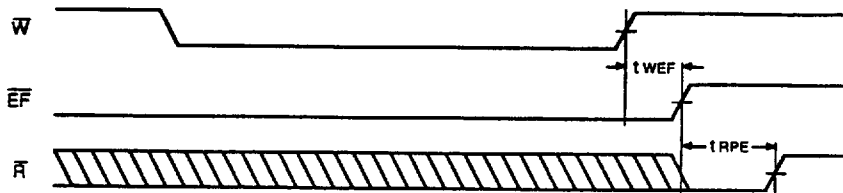


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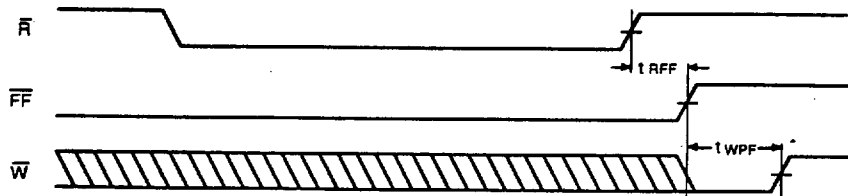
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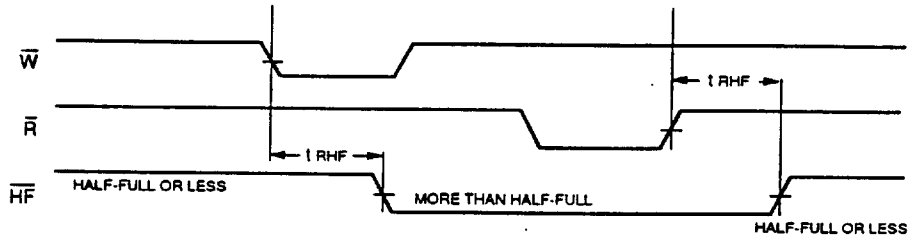
Minimum Timing for an Empty Flag Coincident Read Pulse



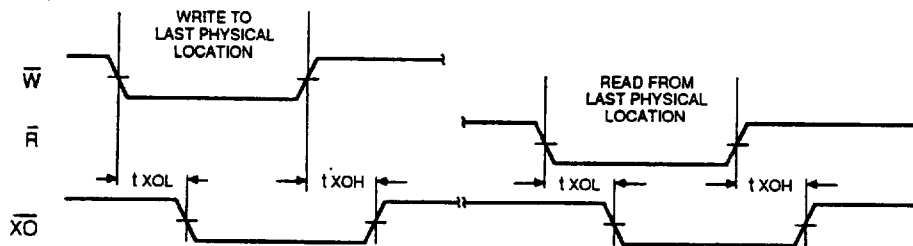
Minimum Timing for a Full Flag Coincident Write Pulse



Half-Full Flag Timing



Expansion Out



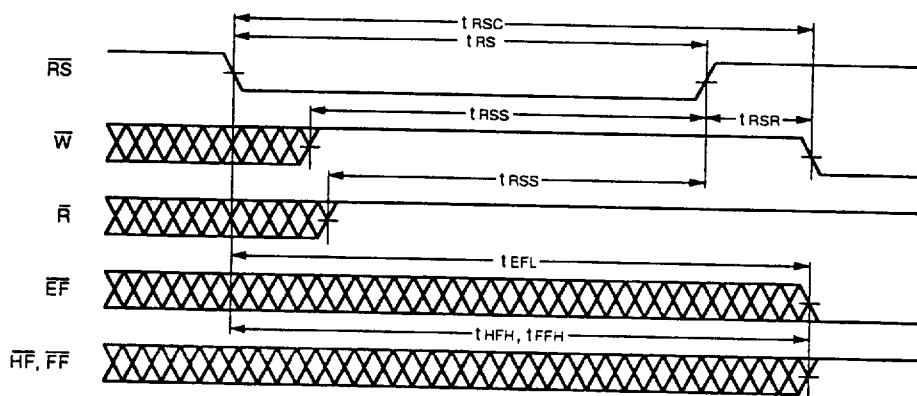
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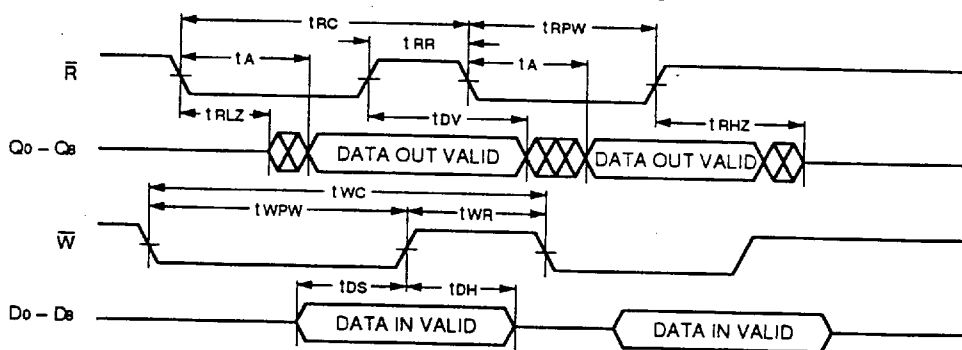
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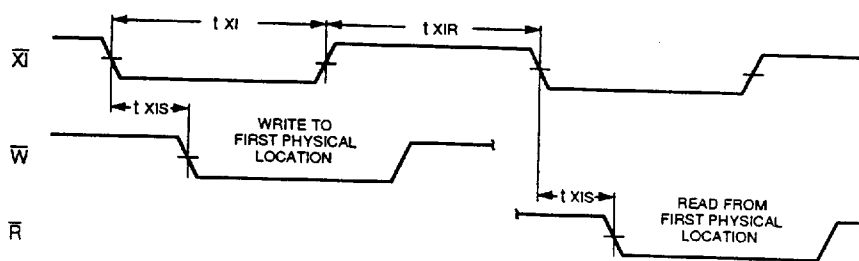
Reset



Asynchronous Write and Read Operation



Expansion In

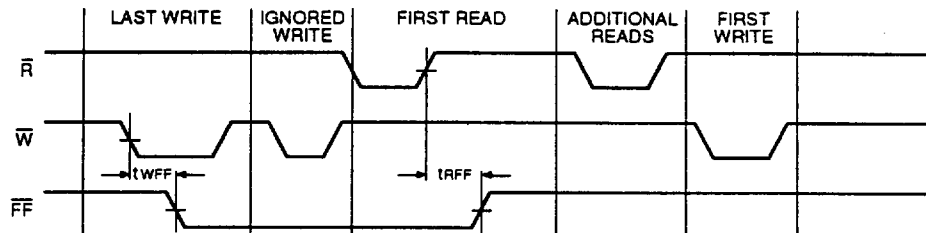


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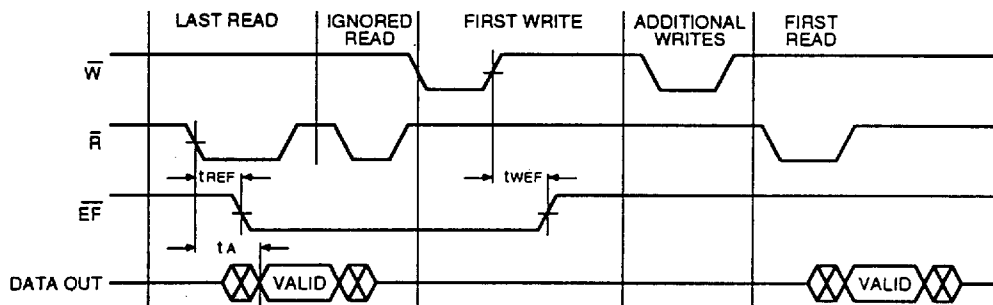
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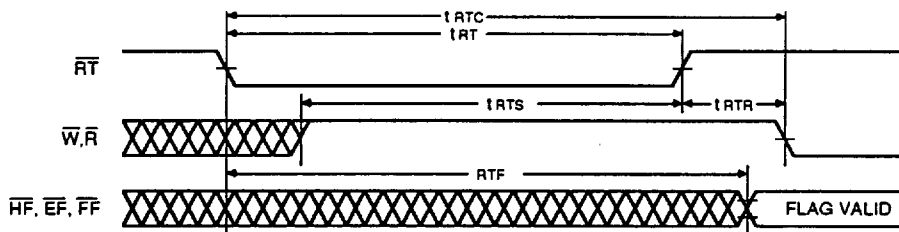
Full Flag From Last Write to First Read



Empty Flag From Last Read to First Write



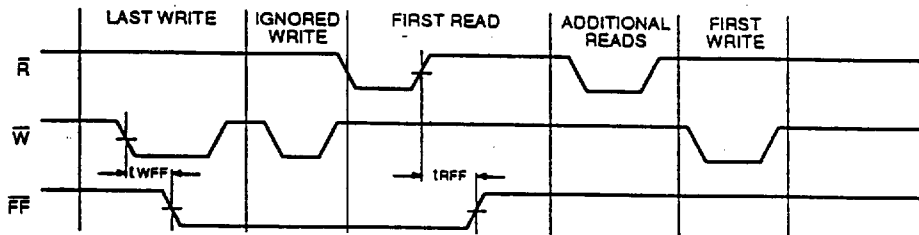
Retransmit



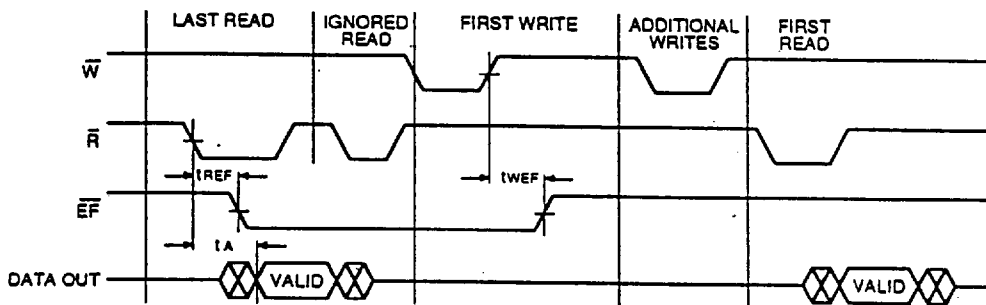
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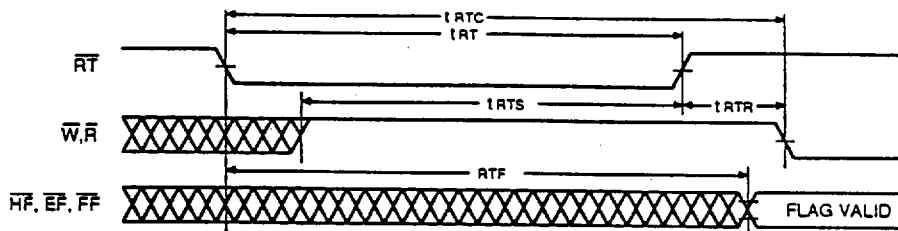
Full Flag From Last Write to First Read



Empty Flag From Last Read to First Write



Retransmit



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7202ERP PINOUT DESCRIPTION

PIN	SIGNAL	DESCRIPTION
1	W\	Write Enable
2	D8	Data Input
3	D3	Data Input
4	D2	Data Input
5	D1	Data Input
6	D0	Data Input
7	XI\	Expansion In
8	FF\	Full Flag
9	Q0	Data Output
10	Q1	Data Output
11	Q2	Data Output
12	Q3	Data Output
13	Q8	Data Output
14	GND	Ground
15	R\	Read Enable
16	Q4	Data Output
17	Q5	Data Output
18	Q6	Data Output
19	Q7	Data Output
20	XO\HF\	Expansion Out/ Half-Full Flag
21	EF\	Empty Flag
22	RS\	Reset
23	FLVRT\	First Load/ Retransmit
24	D7	Data Input
25	D6	Data Input
26	D5	Data Input
27	D4	Data Input
28	Vcc	Power Supply



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