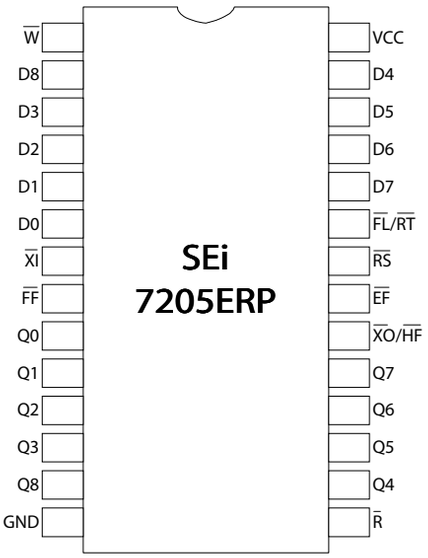
PRELIMINARY

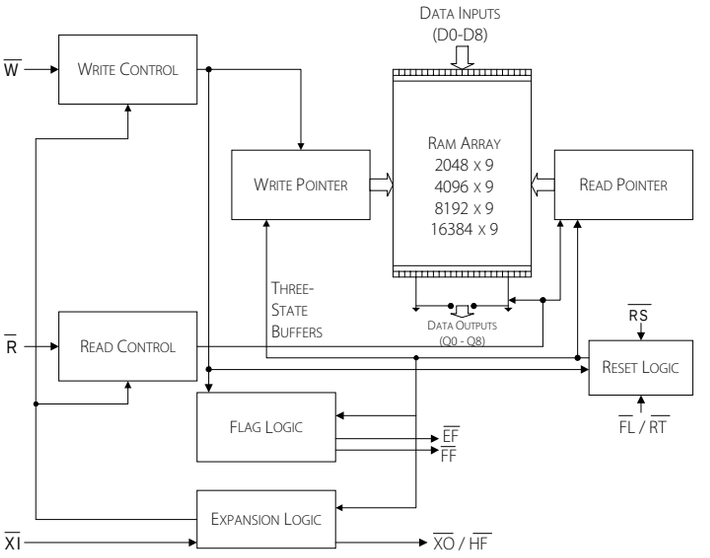
HIGH-SPEED EPI-CMOS 8192 x 9-BIT PARALLEL FIFO

7205ERP

SPACE ELECTRONICS INC.

SPACE PRODUCTS GROUP





FEATURES:

- 8192 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 > 100 MeV/mg cm^2
- 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 epitTechnology
- Retransmit capability
- Propagation Time (max access time):
  -25ns:7205ERPx-25
  -30ns:7205ERPx-30
  -40ns:7205ERPx-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
- QCI per TM5005
- Screening per TM5004

DESCRIPTION:

Space Electronics' 7205ERP (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 7205ERP 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 7205ERP 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 provides a 100krad (Si) or better total dose survivability, based on a GEO type orbit (actual TID tolerance is dependent of orbit and mission duration). Capable of surviving in space environments, the 7205ERP is ideal for satellite, spacecraft, and space probe missions. This product is available with packaging and screening up to Class S.

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7205ERP 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

7205ERP ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN	MAX	UNITS
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

7205ERP RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	MIN	MAX	UNITS
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

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7205ERP DC ELECTRICAL CHARACTERISTICS [1]

PARAMETER	SYMBOL	MIN	MAX	UNITS
Operating Supply Current	I_{CC1}	--	165	mA
Standby Supply Current ($\overline{R} = \overline{W} = \overline{FL/RT} = V_{IH}$)	I_{CC2}	--	25	mA
Power Down Current All input = V_{CC} - 0.2V	I_{CC3}	--	12	mA
Input Leakage Current 0.4V < V_{IN} < V_{CC}	I_{LI}	-1	+1	uA
Output Leakage Current R = V_{IH}, 0.4V < V_{OUT} < V_{CC}	I_{LO}	-10	+10	uA
Input Low Voltage	V_{IL}	--	0.8	V
Input High Voltage	V_{IH}	2.2	--	V
Output Low Voltage V_{CC} = min, I_{OL} = 8mA	V_{OL}	--	0.4	V
Output High Voltage V_{CC} = min, I_{OH} = -2mA	V_{OH}	2.4	--	V
Input Capacitance 2/	C_{IN}	--	10	pF
Output Capacitance 2/	C_{OUT}	--	10	pF

NOTE:
1/ $V_{CC} = 5 \pm 5\%$ volts; T_A = -55 to +125 °C.
2/ F = 1MHz.
3/ V_{IH} max = V_{CC} + 0.3V. V_{IL} min = -0.3V or -1V pulse width 50ns.

7205ERP TIMING CHARACTERISTICS [1]

PARAMETER	SYMBOL	MIN	MAX	UNITS
READ CYCLE				
Shift Frequency				
7205ERPx-25	f_S	--	28.5	MHz
7205ERPx-30		--	25	
7205ERPx-40		--	20	
Read Cycle Time				
7205ERPx-25	t_{RC}	35	--	ns
7205ERPx-30		40	--	
7205ERPx-40		50	--	
Access Time				
7205ERPx-25	t_A	--	25	ns
7205ERPx-30		--	30	
7205ERPx-40		--	40	
Read Recovery Time				
7205ERPx-25	t_{RR}	10	--	ns
7205ERPx-30		10	--	
7205ERPx-40		10	--	

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7205ERP TIMING CHARACTERISTICS [1] (cont)

PARAMETER	SYMBOL	MIN	MAX	UNITS
Read Pulse Width 2/				
7205ERPx-25	t_{RPW}	25	--	ns
7205ERPx-30		30	--	
7205ERPx-40		40	--	
Read Low to Data Low 3/				
7205ERPx-25	t_{RLZ}	5	--	ns
7205ERPx-30		5	--	
7205ERPx-40		5	--	
Write HIGH to Data Low-Z 3/ 4/				
7205ERPx-25	t_{WLZ}	5	--	ns
7205ERPx-30		10	--	
7205ERPx-40		10	--	
Data Valid from Read High				
7205ERPx-25	t_{DV}	5	--	ns
7205ERPx-30		5	--	
7205ERPx-40		5	--	
Read High to Data Bus High-Z 3/				
7205ERPx-25	t_{RHZ}	--	18	ns
7205ERPx-30		--	20	
7205ERPx-40		--	25	
WRITE CYCLE				
Write Cycle Time				
7205ERPx-25	t_{WC}	35	--	ns
7205ERPx-30		40	--	
7205ERPx-40		50	--	
Write Pulse Width 2/				
7205ERPx-25	t_{WPW}	25	--	ns
7205ERPx-30		30	----	
7205ERPx-40		40		
Write Recovery Time				
7205ERPx-25	t_{WR}	10	--	ns
7205ERPx-30		10	--	
7205ERPx-40		10	--	
Data Set-up Time				
7205ERPx-25	t_{DS}	15	--	ns
7205ERPx-30		18	--	
7205ERPx-40		20	--	
Data Hold Time				
7205ERPx-25	t_{DH}	0	--	ns
7205ERPx-30		0	--	
7205ERPx-40		0	--	

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7205ERP TIMING CHARACTERISTICS [1] (cont)

PARAMETER	SYMBOL	MIN	MAX	UNITS
RESET CYCLE				
Reset Cycle Time				
7205ERPx-25	t_{RSC}	35	--	ns
7205ERPx-30		40	--	
7205ERPx-40		50	--	
Reset Pulse Width 2/				
7205ERPx-25	t_{RS}	25	--	ns
7205ERPx-30		30	--	
7205ERPx-40		40	--	
Reset Set-up Time 3/				
7205ERPx-25	t_{RSS}	25	--	ns
7205ERPx-30		30	--	
7205ERPx-40		40	--	
Reset Recovery Time				
7205ERPx-25	t_{RSR}	10	--	ns
7205ERPx-30		10	--	
7205ERPx-40		15	--	
RETRANSMIT CYCLE				
Retransmit Cycle Time				
7205ERPx-25	t_{RTC}	35	--	ns
7205ERPx-30		40	--	
7205ERPx-40		50	--	
Retransmit Pulse Width 2/				
7205ERPx-25	t_{RT}	25	--	ns
7205ERPx-30		30	--	
7205ERPx-40		40	--	
Retransmit Set-up Time 3/				
7205ERPx-25	t_{RTS}	25	--	ns
7205ERPx-30		30	--	
7205ERPx-40		40	--	
Retransmit Recovery Time				
7205ERPx-25	t_{RSR}	10	--	ns
7205ERPx-30		10	--	
7205ERPx-40		15	--	
FLAGS				
Reset to $\overline{EF}$ Low				
7205ERPx-25	t_{EFL}	--	35	ns
7205ERPx-30		--	40	
7205ERPx-40		--	50	

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7205ERP TIMING CHARACTERISTICS [1] (cont)

PARAMETER	SYMBOL	MIN	MAX	UNITS
Reset to $\overline{HF}$ FF High				
7205ERPx-25	t_{HFH},t_{FFH}	--	35	ns
7205ERPx-30		--	40	
7205ERPx-40		--	50	
Retransmit LOW to Flags Valid				
7205ERPx-25	t_{RTF}	--	35	ns
7205ERPx-30		--	40	
7205ERPx-40		--	50	
Read Low to $\overline{EF}$ Low				
7205ERPx-25	t_{REF}	--	25	ns
7205ERPx-30		--	30	
7205ERPx-40		--	30	
Read High to $\overline{FF}$ High				
7205ERPx-25	t_{RFF}	--	25	ns
7205ERPx-30		--	30	
7205ERPx-40		--	35	
Read Pulse Width after $\overline{EF}$ High				
7205ERPx-25	t_{RPE}	24	--	ns
7205ERPx-30		30	--	
7205ERPx-40		40	--	
Write High to $\overline{EF}$ High				
7205ERPx-25	t_{WEF}	--	25	ns
7205ERPx-30		--	30	
7205ERPx-40		--	35	
Write Low to $\overline{FF}$ Low				
7205ERPx-25	t_{WFF}	--	25	ns
7205ERPx-30		--	30	
7205ERPx-40		--	35	
Write Low to $\overline{HF}$ Flag Low				
7205ERPx-25	t_{WHF}	--	35	ns
7205ERPx-30		--	40	
7205ERPx-40		--	50	
Read High to $\overline{HF}$ Flag High				
7205ERPx-25	t_{RHF}	--	35	ns
7205ERPx-30		--	40	
7205ERPx-40		--	50	
Read Pulse Width after $\overline{FF}$ High				
7205ERPx-25	t_{WPF}	25	--	ns
7205ERPx-30		30	--	
7205ERPx-40		40	--	

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7205ERP TIMING CHARACTERISTICS [1] (cont)

PARAMETER	SYMBOL	MIN	MAX	UNITS
Read/Write LOW to $\overline{XO}$ LOW				
7205ERPx-25	t_{XOL}	--	25	ns
7205ERPx-30		--	30	
7205ERPx-40		--	40	
Read/Write HIGH to $\overline{XO}$ HIGH				
7205ERPx-25	t_{XOH}	--	25	ns
7205ERPx-30		--	30	
7205ERPx-40		--	40	
$\overline{XI}$ Pulse Width 2/				
7205ERPx-25	t_{XI}	25	--	ns
7205ERPx-30		30	--	
7205ERPx-40		40	--	
$\overline{XI}$ Recovery Time				
7205ERPx-25	t_{XIR}	10	--	ns
7205ERPx-30		10	--	
7205ERPx-40		10	--	
$\overline{XI}$ Set-up Time				
7205ERPx-25	t_{XIS}	10	--	ns
7205ERPx-30		10	--	
7205ERPx-40		15	--	

NOTE:

1/ $V_{CC} = +5V$:$T_A = +25\ ^oC$; use switching test circuit. AC tests are performed with input rise and fall times of 5ns or less, timing reference levels of 1.5V, input pulse levels of 0 to 3.0V 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.

7205ERP FITs AND EARLY FAILURE RATES

FITs	EARLY FAILURE RATES
38	378

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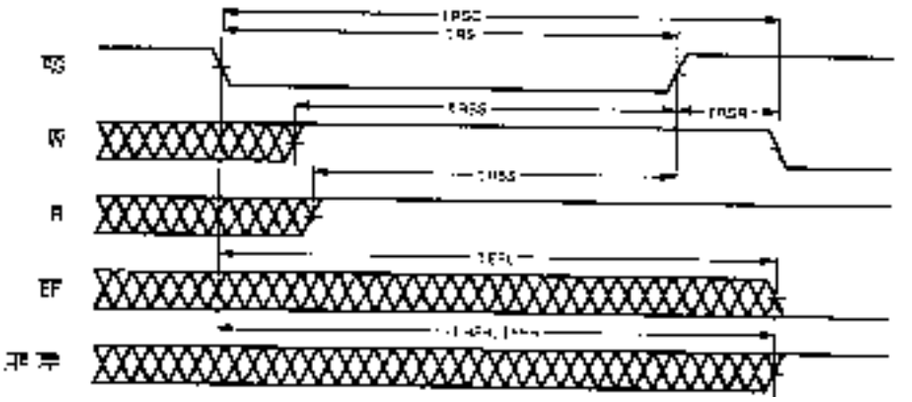
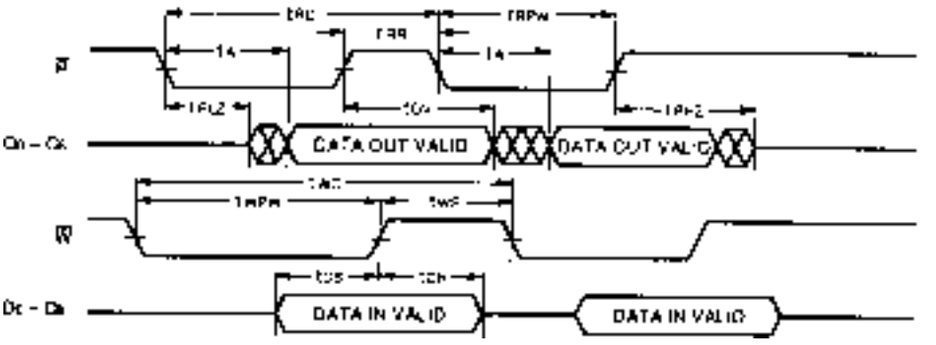
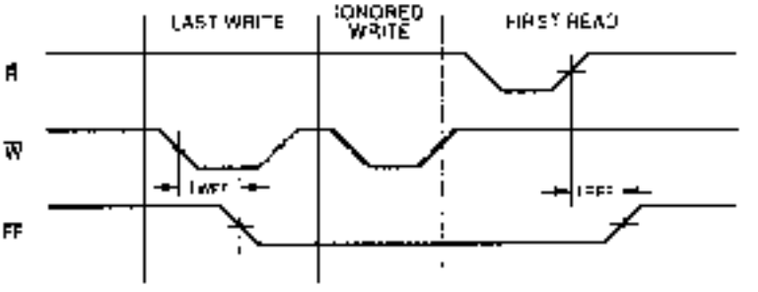
Reset



Asynchronous Write and Read Operation



Full Flag Timing from Last Write to First Read



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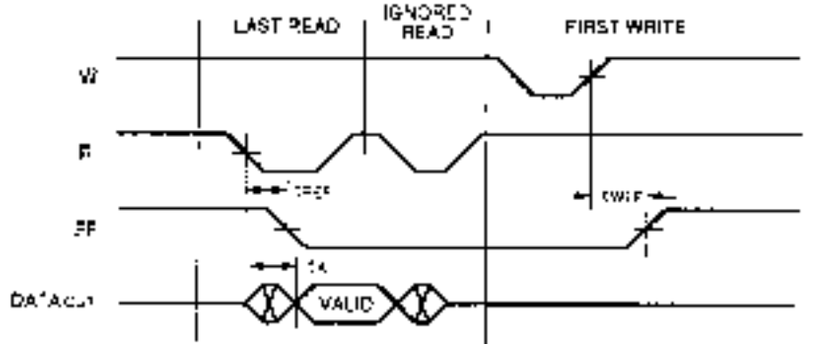
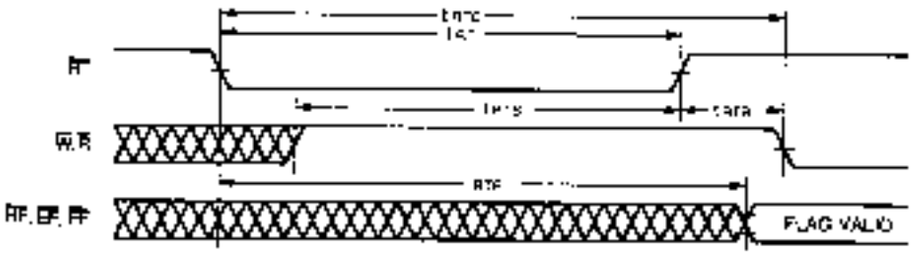
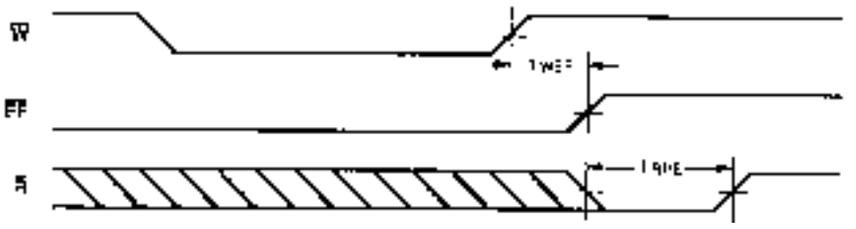
Empty Flag Timing from Last Read to First Write



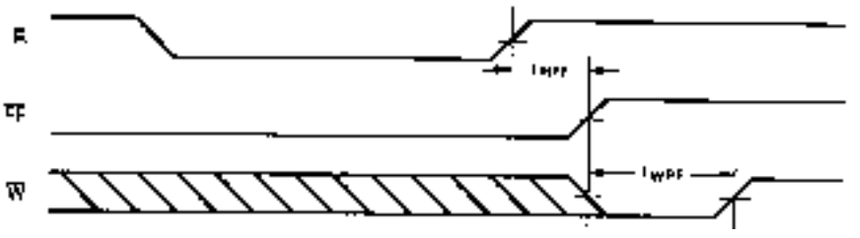
Retransmit



Minimum Timing for an Empty Flag Coincident Read Pulse



Minimum Timing for an Full Flag Coincident Write Pulse



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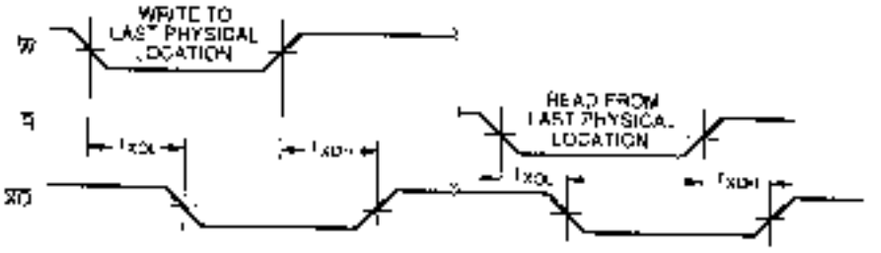
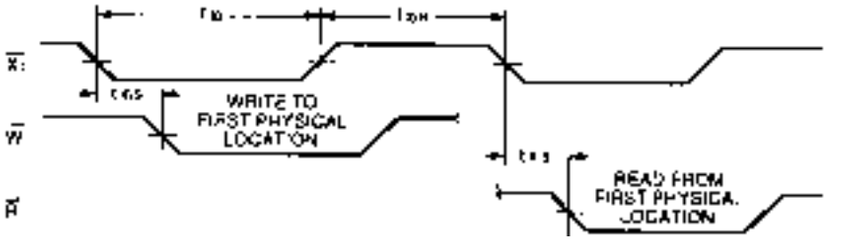
Half-Full Flag Timing

Expansion In



Expansion Out



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