P4C422
ULTRA HIGH SPEED 256 x 4
STATIC CMOS RAM

FEATURES

- **High Speed (Equal Access and Cycle Times)**
  - **10/12/15/20/25/35 ns (Commercial)**
  - **15/20/25 /35 ns (Military)**

- **CMOS for Low Power**
  - **495 mW Max. – 10/12/15/20/25 (Commercial)**
  - **495 mW Max. – 15/20/25/35 (Military)**

- **Single 5V±10% Power Supply**

- **Separate I/O**

- **Fully TTL Compatible Inputs and Outputs**

- **Resistant to single event upset and latchup resulting from advanced process and design improvements**

- **Standard 22-pin 400 mil DIP, 24-pin 300 mil SOIC, 24-pin LCC package and 24-pin CERPACK package**

DESCRIPTION

The P4C422 is a 1,024-bit high-speed (10ns) Static RAM with a 256 x 4 organization. The memory requires no clocks or refreshing and has equal access and cycle times. Inputs and outputs are fully TTL compatible. Operation is from a single 5 Volt supply. Easy memory expansion is provided by an active LOW chip select one ($\overline{CS}_1$) and active HIGH chip select two (CS_2) as well as 3-state outputs.

In addition to very high performance and very high density, the device features latch-up protection, single event and upset protection. The P4C422 is offered in several packages: 22-pin 400 mil DIP (plastic and ceramic), 24-pin 300 mil SOIC, 24-pin LCC and 24-pin CERPACK. Devices are offered in both commercial and military temperature ranges.

FUNCTIONAL BLOCK DIAGRAM   PIN CONFIGURATIONS

SOIC (S4)
CERPACK (F3) SIMILAR
TOP VIEW

DIP (P3-1, D3-1)
TOP VIEW

LCC (L4)
TOP VIEW
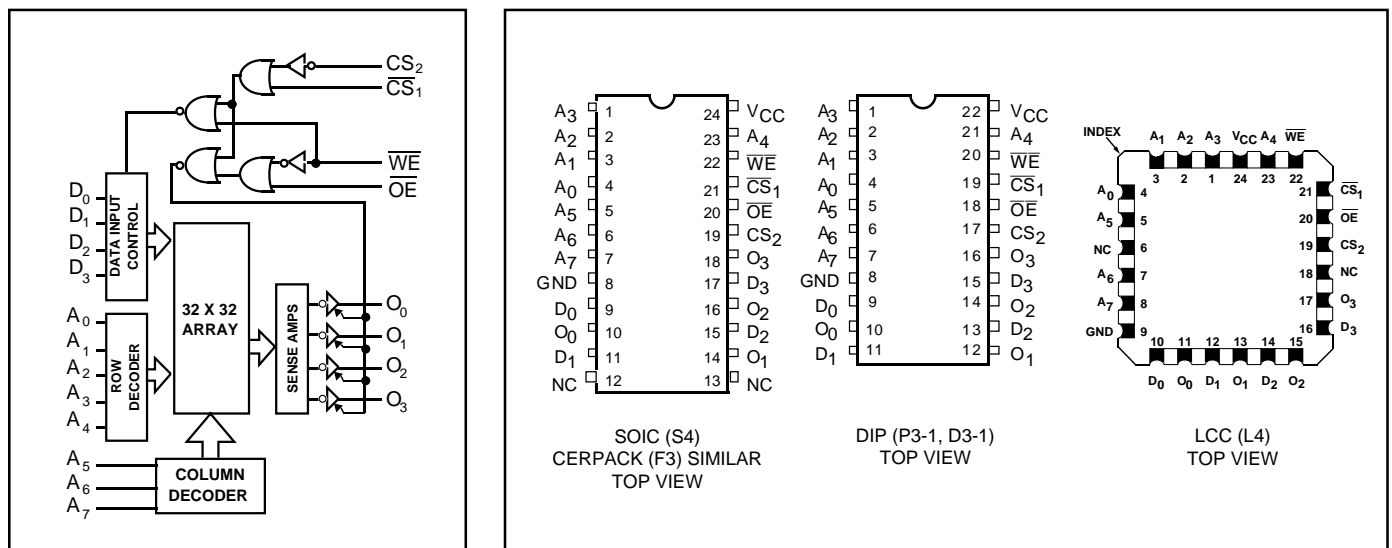
MAXIMUM RATINGS[1]

Symbol	Parameter	Value	Unit
V_{CC}	Power Supply Pin with Respect to GND	−0.5 to +7	V
V_{TERM}	Terminal Voltage with Respect to GND (up to 7.0V)	−0.5 to V_{CC} +0.5	V
T_A	Operating Temperature	−55 to +125	°C

Symbol	Parameter	Value	Unit
T_{BIAS}	Temperature Under Bias	−55 to +125	°C
T_{STG}	Storage Temperature	−65 to +150	°C
I_{OUT}	DC Output Current	20	mA

RECOMMENDED OPERATING CONDITIONS

Grade[2]	Ambient Temp	Gnd	Vcc
Commercial	0°C to 70°C	0V	5.0V ±10%
Military	−55°C to 125°C	0V	5.0V ±10%

CAPACITANCES[4]
(V_{CC} = 5.0V, T_A = 25°C, f = 1.0MHz)

Symbol	Parameter	Conditions	Typ.	Unit
C_{IN}	Input Capacitance	V_{IN} = 0V	5	pF
C_{OUT}	Output Capacitance	V_{OUT} = 0V	7	pF

DC ELECTRICAL CHARACTERISTICS

Over recommended operating temperature and supply voltage[2]

Symbol	Parameter	Test Conditions	Min	Max	Unit
V_{OH}	Output High Voltage	I_{OH} = −5.2 mA, V_{CC} = Min.	2.4		V
V_{OL}	Output Low Voltage	I_{OL} = +8 mA, V_{CC} = Min.		0.4	V
V_{IH}	Input High Voltage		2.1		V
V_{IL}	Input Low Voltage			0.8	V
V_{CL}	Input Clamp Diode Voltage	I_{IN} = −10 mA	−1.5		V
I_{IX}	Input Load Current	GND ≤ V_{IN} ≤ V_{CC}	−10	10	μA
I_{OZ}	Output Current (High Z)	V_{OL} ≤ V_{OUT} ≤ V_{OH}, Output Disabled	−10	10	μA
I_{OS}	Output Short Circuit Current[3]	V_{CC} = Max., V_{OUT} = GND		90	mA

POWER DISSIPATION CHARACTERISTICS VS. SPEED

Symbol	Parameter	Temperature Range	-10	-12	-15	-20	-25	-35	Unit
I_{CC}	Dynamic Operating Current	Commercial	90	90	90	90	65	65	mA
		Military	N/A	N/A	90	90	90	90	mA

Notes:
1. Stresses greater than those listed under MAXIMUM RATINGS may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to MAXIMUM rating conditions for extended periods may affect reliability.
2. Extended temperature operation guaranteed with 400 linear feet per minute of air flow.
3. For test purposes, not more than one output at a time should be shorted. Short circuit test duration should not exceed 30 seconds.
4. This parameter is sampled and not 100% tested.

5. Transition time is ≤ 3ns for 10, 12, and 15 ns products and ≤ 5ns for 20, 25, and 35 ns products, see Fig 1d. Timing is referenced at input and output levels of 1.5V. The output loading is equivalent to the specified I_{OL}/I_{OH} with a load capacitance of 15 pF (10, 12) or 30 pF (15, 20, 25, 35) as in Fig. 1a and 1b respectively.
6. Transition time is ≤ 3ns for 10, 12, and 15 ns products and ≤ 5ns for 20, 25, and 35 ns products, see Fig 1d. Transition is measured at steady state HIGH level -500mV or steady state LOW level +500mV on the output from a level on the input with load shown in Fig. 1c.
7. t_W is measured at t_{WSA} = min.: t_{WSA} is measured at t_W = min.

FUNCTIONAL DESCRIPTION

An active LOW write enable ($\overline{WE}$) controls the writing/reading operation of the memory. When the chip select one ($\overline{CS}_1$) and the write enable ($\overline{WE}$) are LOW and the chip select two (CS_2) is HIGH, the information on data inputs (D_0 through D_3) is written into the addressed memory word and preconditions the output circuitry so that true data is present at the outputs when the write cycle is complete. This preconditioning operation insures minimum write recovery times by eliminating the "write recovery glitch." Reading is performed with chip selct one ($\overline{CS}_1$) LOW, chip select two (CS_2) HIGH, write enable ($\overline{WE}$) HIGH and output enable ($\overline{OE}$) LOW. The information stored in the addressed word is read out on the noninverting outputs (O_0 through O_3). The outputs of the memory go to an inactive high impedance state whenever chip select one ($\overline{CS}_1$) is HIGH, or during the write operation when write enable ($\overline{WE}$) is LOW.

TRUTH TABLE

Mode	CS_2	$\overline{CS}_1$	$\overline{WE}$	$\overline{OE}$	Output
Standby	L	X	X	X	High Z
Standby	X	H	X	X	High Z
D_{OUT} Disabled	H	L	X	H	High Z
Read	H	L	H	L	D_{OUT}
Write	H	L	L	X	High Z

Notes: H = HIGH
L = Low
X = Don't Care
HIGH Z = Implies outputs are disabled or off. This condition is defined as high impedance state for the P4C422.
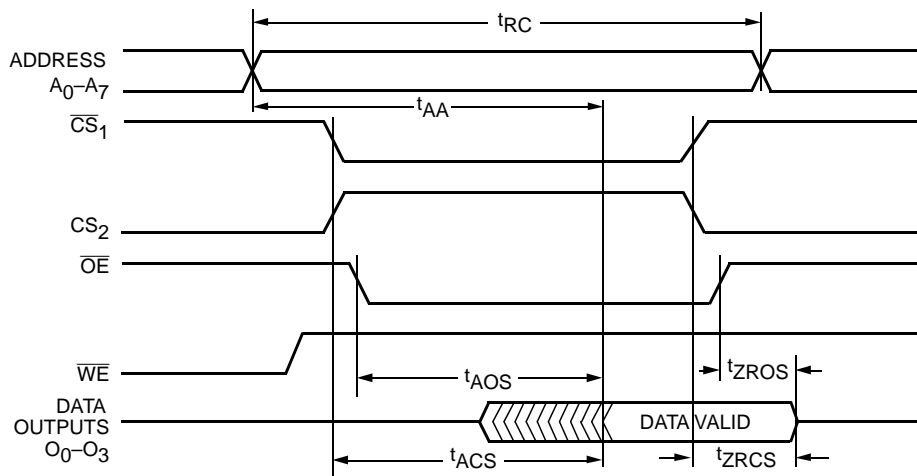
AC ELECTRICAL CHARACTERISTICS—READ CYCLE

(V_{CC} = 5V $\pm$ 10% except as noted, All Temperature Ranges)[2]

| Sym.	Parameter	-10*		-12		-15		-20		-25		-35		Unit
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	
t_{RC}	Read Cycle Time [5]	12		12		15		20		25		35		ns
t_{ACS}	Chip Select Time [5]		7.5		8		8		12		15		25	ns
t_{ZRCS}	Chip Select to High-Z [6]		8		10		12		15		20		30	ns
t_{AOS}	Output Enable Time		7.5		8		8		12		15		25	ns
t_{ZROS}	Output Enable to High-Z [6]		8		10		12		15		20		30	ns
t_{AA}	Address Access Time [5]		10		12		15		20		25		35	ns

*V_{CC} = 5V $\pm$ 5%

TIMING WAVEFORM OF READ CYCLE

AC CHARACTERISTICS—WRITE CYCLE

(V_{CC} = 5V ± 10% except as noted, All Temperature Ranges)[2]

Sym.	Parameter	-10*		-12		-15		-20		-25		-35		Unit
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	
t_{WC}	Write Cycle Time [5]	10		12		15		20		25		35		ns
t_{ZWS}	Write Enable to High-Z [6]		8		10		12		15		20		30	ns
t_{WR}	Write Recovery Time		8		10		12		15		20		25	ns
t_W	Write Pulse Width [5,7]	8		9		11		13		15		20		ns
t_{WSD}	Data Setup Time Prior to Write [5]	0		0		0		2		5		5		ns
t_{WHD}	Data Hold Time [5]	2		2		2		5		5		5		ns
t_{WSA}	Address Setup Time [5,7]	0		0		0		2		5		5		ns
t_{WHA}	Address Hold Time [5]	2		2		4		5		5		5		ns
t_{WSCS}	Chip Select Setup Time [5]	0		0		0		2		5		5		ns
t_{WHCS}	Chip Select Hold Time [5]	2		2		2		5		5		5		ns

*V_{CC} = 5V ± 5%

TIMING WAVEFORM OF WRITE CYCLE
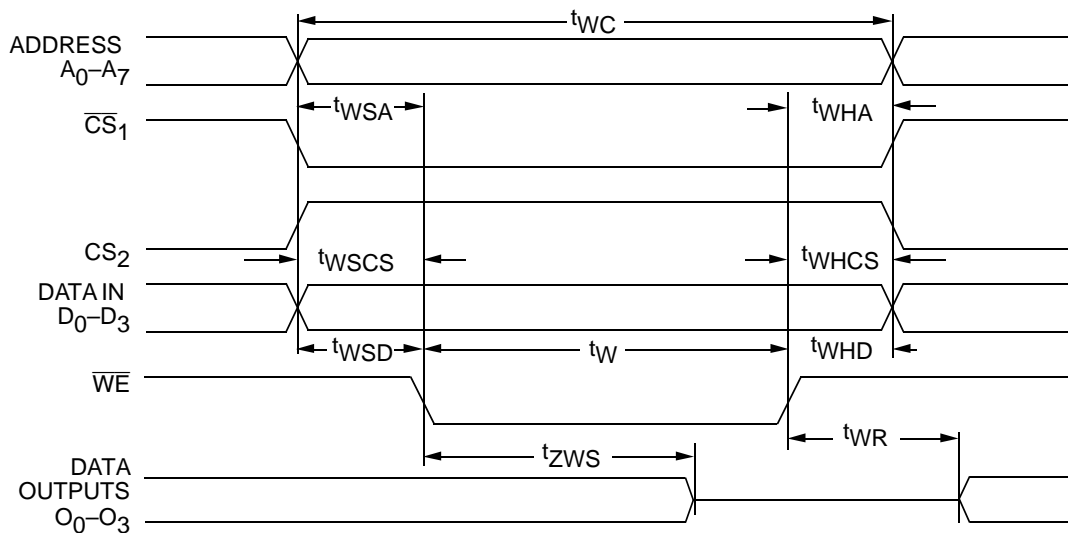
AC TEST LOADS & WAVEFORMS
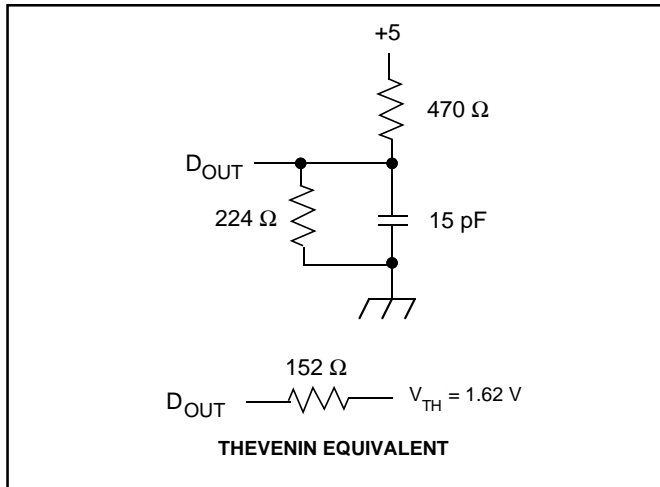
Figure 1a
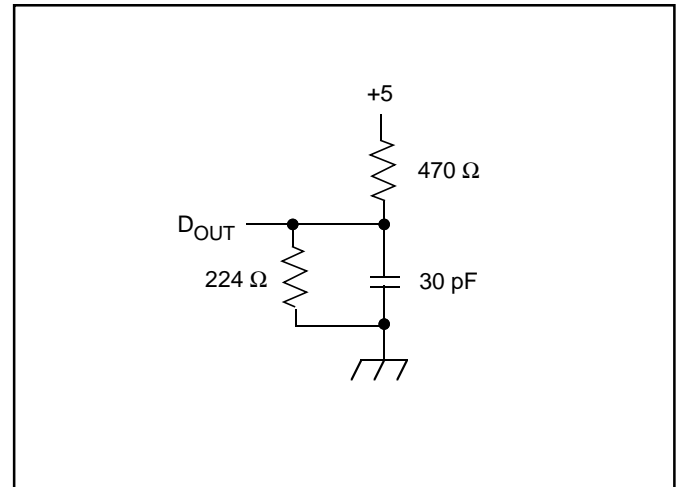
Figure 1b
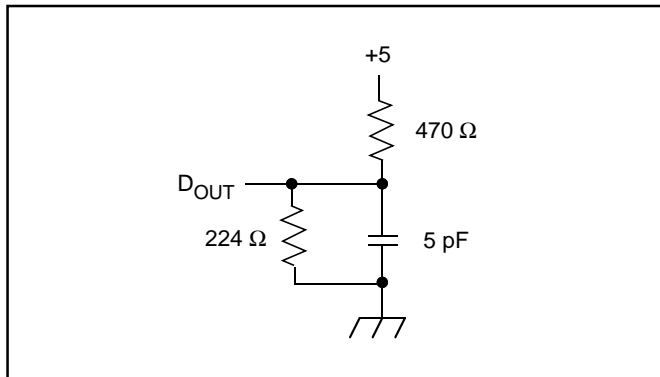
Figure 1c

Figure 1d

ORDERING INFORMATION

```
P4C422  —  xx      x        x
Device Type  Speed  Package  Processing
```

C   0°C to +70°C
M   -55°C to +125°C
MB   MIL-STD-883, Class B

F   CERPACK
D   CERDIP (400 mil)
L   Ceramic LCC (400 mil Square)
P   Plastic DIP (400 mil)
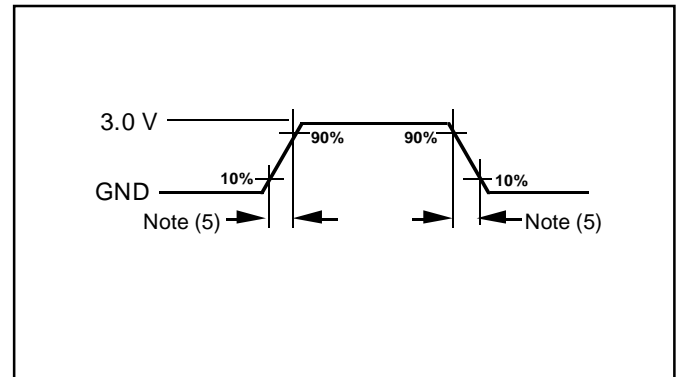S   Plastic SOIC (300 mil)

10,12,15, 25, 35 ns Commercial
15,20,25, 35 ns Military

256 x 4 SRAM
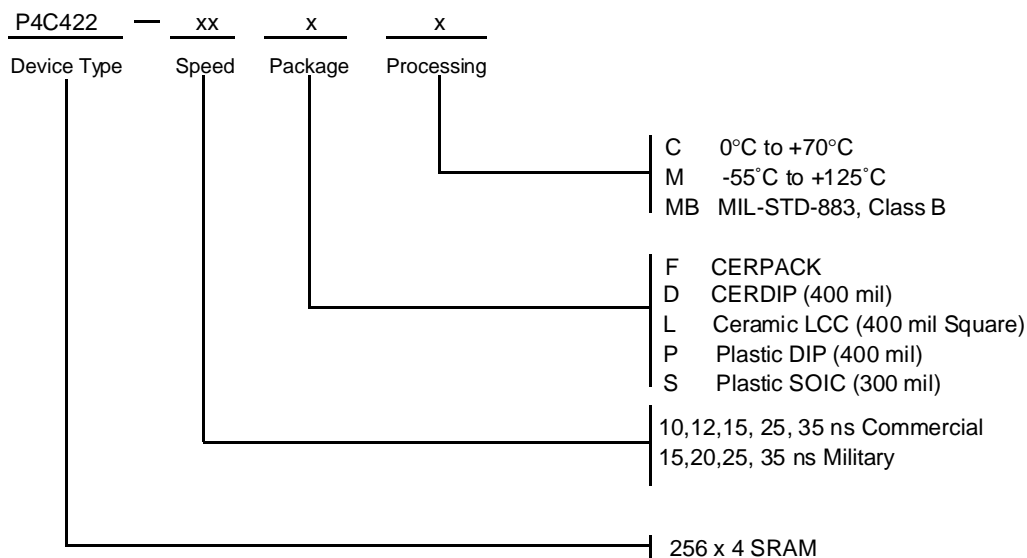
The P4C422 is also available as SMD Number: 5962-88594

SELECTION GUIDE

The P4C422 is available in the following temperature range, speed, and package options.

Temperature Range	Package	Speed (ns)					
		10	12	15	20	25	35
Commercial Temperature	Plastic DIP	-10PC	-12PC	-15PC	-20PC	-25PC	-35PC
	SOIC	-10SC	-12SC	-15SC	-20SC	-25SC	-35SC
Military Temperature	CERDIP	N/A	N/A	-15DM	-20DM	-25DM	-35DM
	LCC	N/A	N/A	-15LM	-20LM	-25LM	-35LM
	CERPACK	N/A	N/A	-15FM	-20FM	-25FM	-35FM
Military Processed*	CERDIP	N/A	N/A	-15DMB	-20DMB	-25DMB	-35DMB
	LCC	N/A	N/A	-15LMB	-20LMB	-25LMB	-35LMB
	CERPACK	N/A	N/A	-15FMB	-20FMB	-25FMB	-35FMB

*Military temperature range with MIL-STD-883, Class B compliance.
N/A = Not Available