

T-46-23-10



CYPRESS SEMICONDUCTOR

PRELIMINARY

CY7C106

262,144 x 4 Static R/W RAM

Features

- High speed
— $t_{AA} = 25$ ns
- CMOS for optimum speed/power
- Low active power
— 825 mW
- Low standby power
— 165 mW
- Automatic power-down when deselected
- TTL-compatible inputs and outputs

Functional Description

The CY7C106 is a high-performance CMOS static RAM organized as 262,144 words by 4 bits. Easy memory expansion is provided by an active LOW chip enable (\overline{CE}), an active LOW output enable (\overline{OE}), and three-state drivers. The device has an automatic power-down feature that reduces power consumption by more than 70% when deselected.

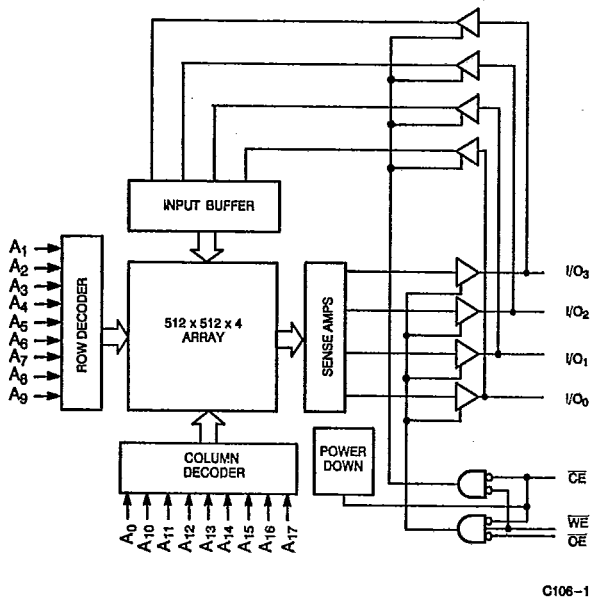
Writing to the device is accomplished by taking chip enable (\overline{CE}) and write enable (\overline{WE}) inputs LOW. Data on the four I/O pins (I/O_0 through I/O_3) is then written into the location specified on the address pins (A_0 through A_{17}).

Reading from the device is accomplished by taking chip enable (\overline{CE}) and output enable (\overline{OE}) LOW while forcing write enable (\overline{WE}) HIGH. Under these conditions, the contents of the memory location specified by the address pins will appear on the four I/O pins.

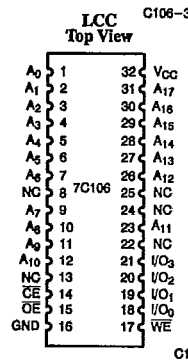
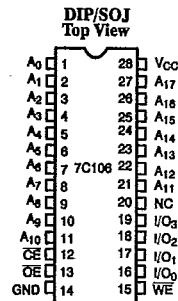
The four input/output pins (I/O_0 through I/O_3) are placed in a high-impedance state when the device is deselected (\overline{CE} HIGH), the outputs are disabled (\overline{OE} HIGH), or during a write operation (\overline{CE} and \overline{WE} LOW).

The CY7C106 is available in 32-pin leadless chip carriers and standard 28-pin, 400-mil-wide DIPs and SOJs.

Logic Block Diagram



Pin Configurations



Selection Guide

		7C106-25	7C106-35	7C106-45
Maximum Access Time (ns)		25	35	45
Maximum Operating Current (mA)	Commercial	150	125	115
	Military	150	125	115
Maximum Standby Current (mA)	Commercial	30	25	25
	Military	35	30	30



PRELIMINARY CY7C106

T-46-23-10

Maximum Ratings

(Above which the useful life may be impaired. For user guidelines, not tested.)

Storage Temperature	- 65°C to +150°C
Ambient Temperature with Power Applied	- 55°C to +125°C
Supply Voltage on V _{CC} Relative to GND ^[1]	- 0.5V to +7.0V
DC Voltage Applied to Outputs in High Z State ^[1]	- 0.5V to +7.0V
DC Input Voltage ^[1]	- 0.5V to +7.0V
Current into Outputs (LOW)	20 mA

Static Discharge Voltage (per MIL-STD-883, Method 3015)	>2001V
Latch-Up Current	>200 mA

Operating Range

Range	Ambient Temperature ^[2]	V _{CC}
Commercial	0°C to +70°C	5V ± 10%
Military	- 55°C to +125°C	5V ± 10%



SRAMS

Electrical Characteristics Over the Operating Range^[3]

Parameters	Description	Test Conditions	7C106-25		7C106-35		7C106-45		Units
			Min.	Max.	Min.	Max.	Min.	Max.	
V _{OH}	Output HIGH Voltage	V _{CC} = Min., I _{OH} = - 4.0 mA	2.4		2.4		2.4		V
V _{OL}	Output LOW Voltage	V _{CC} = Min., I _{OL} = 8.0 mA		0.4		0.4		0.4	V
V _{IH}	Input HIGH Voltage		2.2	V _{CC} + 0.3	2.2	V _{CC} + 0.3	2.2	V _{CC} + 0.3	V
V _{IL}	Input LOW Voltage ^[1]		- 0.3	0.8	- 0.3	0.8	- 0.3	0.8	V
I _{Ix}	Input Load Current	GND ≤ V _I ≤ V _{CC}	- 10	+10	- 10	+10	- 10	+10	µA
I _{OZ}	Output Leakage Current	GND ≤ V _I ≤ V _{CC} , Output Disabled	- 10	+10	- 10	+10	- 10	+10	µA
I _{OS}	Output Short Circuit Current ^[4]	V _{CC} = Max., V _{OUT} = GND		- 300		- 300		- 300	mA
I _{CC}	V _{CC} Operating Supply Current	V _{CC} = Max., I _{OUT} = 0 mA, f = f _{MAX} = 1/trc	Com'1	150		125		115	mA
			Mil	150		125		115	
I _{SB1}	Automatic CE Power-Down Current — TTL Inputs	Max. V _{CC} , CE ≥ V _{IH} , V _{IN} ≥ V _{IH} or V _{IN} ≤ V _{IL} , f = f _{MAX}	Com'1	30		25		25	mA
			Mil	35		30		30	
I _{SB2}	Automatic CE Power-Down Current — CMOS Inputs	Max. V _{CC} , CE ≥ V _{CC} - 0.3V, V _{IN} ≥ V _{CC} - 0.3V or V _{IN} ≤ 0.3V, f = 0	Com'1	10		10		10	mA
			Mil	10		10		10	

Capacitance^[5]

Parameters	Description	Test Conditions	Max.	Units
C _{IN}	Input Capacitance	T _A = 25°C, f = 1 MHz, V _{CC} = 5.0V	10	pF
C _{OUT}	Output Capacitance		12	pF

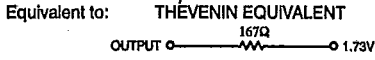
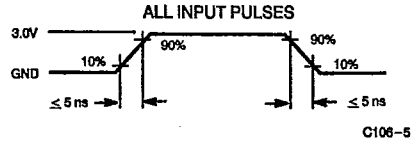
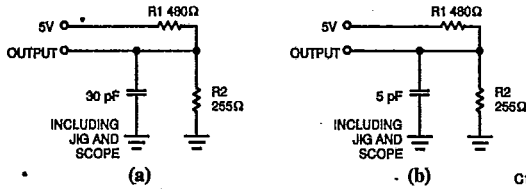
- Notes:
- V_{IL} (min.) = - 2.0V for pulse durations of less than 20 ns.
 - T_A is the "instant on" case temperature.
 - See the last page of this specification for Group A subgroup testing information.
 - Not more than 1 output should be shorted at one time. Duration of the short circuit should not exceed 30 seconds.
 - Tested initially and after any design or process changes that may affect these parameters.



PRELIMINARY CY7C106

T-46-23-10

AC Test Loads and Waveforms



Switching Characteristics Over the Operating Range^[2,6]

Parameters	Description	7C106-25		7C106-35		7C106-45		Units
		Min.	Max.	Min.	Max.	Min.	Max.	
READ CYCLE								
t _{RC}	Read Cycle Time	25		35		45		ns
t _{AA}	Address to Data Valid		25		35		45	ns
t _{OHA}	Data Hold from Address Change	5		5		5		ns
t _{ACE}	\overline{CE} LOW to Data Valid		25		35		45	ns
t _{DOE}	\overline{OE} LOW to Data Valid		10		15		20	ns
t _{LZOE}	\overline{OE} LOW to Low Z	0		0		0		ns
t _{HZOE}	\overline{OE} HIGH to High Z ^[7]		10		15		20	ns
t _{LZCE}	\overline{CE} LOW to Low Z ^[8]	5		5		5		ns
t _{HZCE}	\overline{CE} HIGH to High Z ^[7,8]		10		15		20	ns
t _{PU}	\overline{CE} LOW to Power-Up	0		0		0		ns
t _{PD}	\overline{CE} HIGH to Power-Down		25		35		45	ns
WRITE CYCLE^[9,10]								
t _{WC}	Write Cycle Time	25		35		45		ns
t _{SCE}	\overline{CE} LOW to Write End	20		25		30		ns
t _{AW}	Address Set-Up to Write End	20		25		30		ns
t _{HA}	Address Hold from Write End	0		0		0		ns
t _{SA}	Address Set-Up to Write Start	0		0		0		ns
t _{PWE}	\overline{WE} Pulse Width	20		25		30		ns
t _{SD}	Data Set-Up to Write End	15		20		25		ns
t _{HD}	Data Hold from Write End	0		0		0		ns
t _{LZWE}	\overline{WE} HIGH to Low Z ^[7]	5		5		5		ns
t _{HZWE}	\overline{WE} LOW to High Z ^[7,8]		15		20		25	ns

Notes:

- Test conditions assume signal transition time of 5 ns or less, timing reference levels of 1.5V, input pulse levels of 0 to 3.0V, and output loading of the specified I_{OL}/I_{OH} and 30-pF load capacitance.
- t_{HZOE}, t_{HZCE}, and t_{HZWE} are specified with a load capacitance of 5 pF as in part (b) of AC Test Loads. Transition is measured ±500 mV from steady state voltage.
- At any given temperature and voltage condition, t_{HZCE} is less than t_{LZCE} and t_{HZWE} is less than t_{LZWE} for any given device.
- The internal write time of the memory is defined by the overlap of \overline{CE} and \overline{WE} LOW. \overline{CE} and \overline{WE} must be LOW to initiate a write, and the transition of either of these signals can terminate the write. The input data set-up and hold timing should be referenced to the leading edge of the signal that terminates the write.
- The minimum write cycle time for Write Cycle No. 3 (\overline{WE} controlled, \overline{OE} LOW) is the sum of t_{HZWE} and t_{SD}.

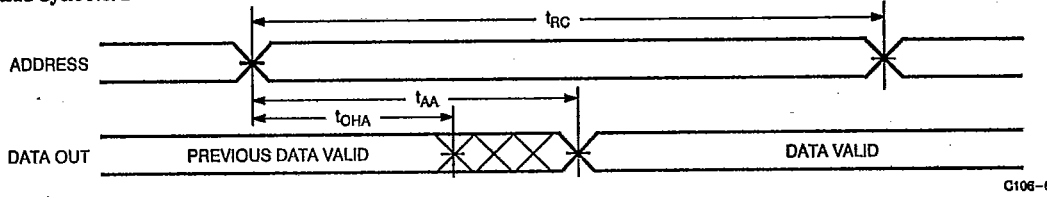


PRELIMINARY CY7C106

T-46-23-10

Switching Waveforms

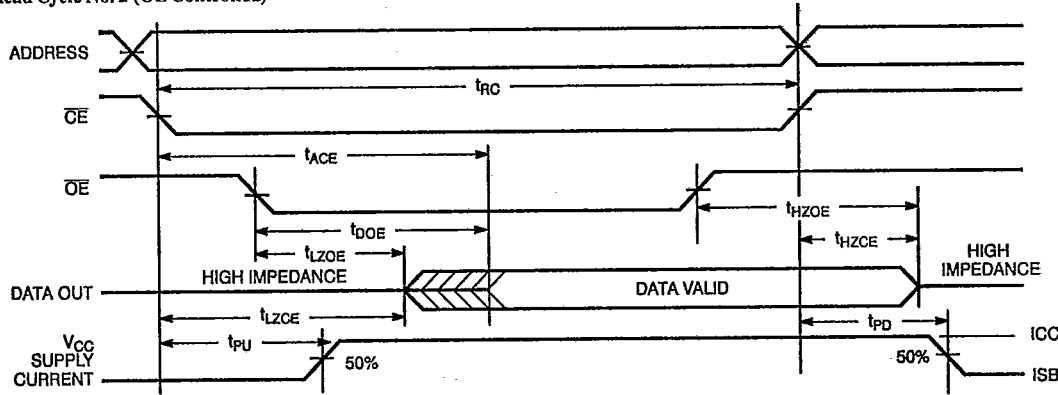
Read Cycle No. 1 [11, 12]



C106-6

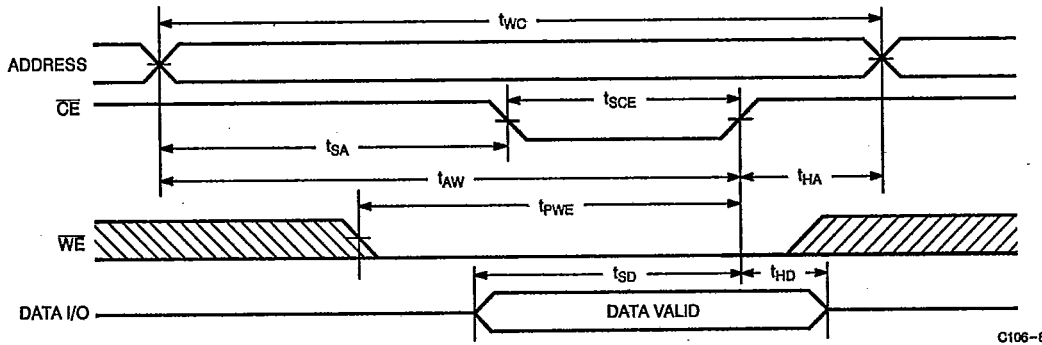


Read Cycle No. 2 (\overline{OE} Controlled) [11, 13]



C106-7

Write Cycle No. 1 (\overline{CE} Controlled) [14, 15]



C106-8

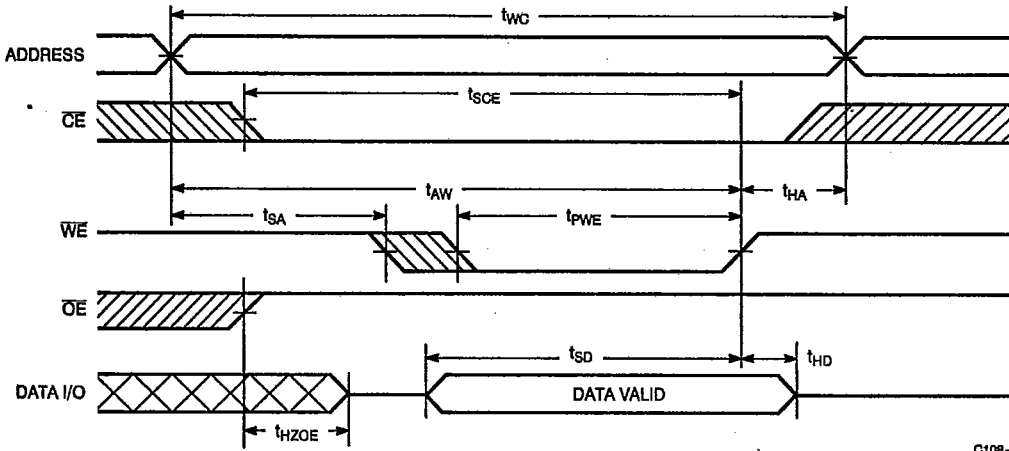
- Notes:
- 11. Device is continuously selected. \overline{OE} and $\overline{CE} = V_{IL}$.
 - 12. \overline{WE} is HIGH for read cycle.
 - 13. Address valid prior to or coincident with \overline{CE} transition LOW.
 - 14. If \overline{CE} goes HIGH simultaneously with \overline{WE} going HIGH, the output remains in a high-impedance state.
 - 15. Data I/O is high impedance if $\overline{OE} = V_{IH}$.



Switching Waveforms

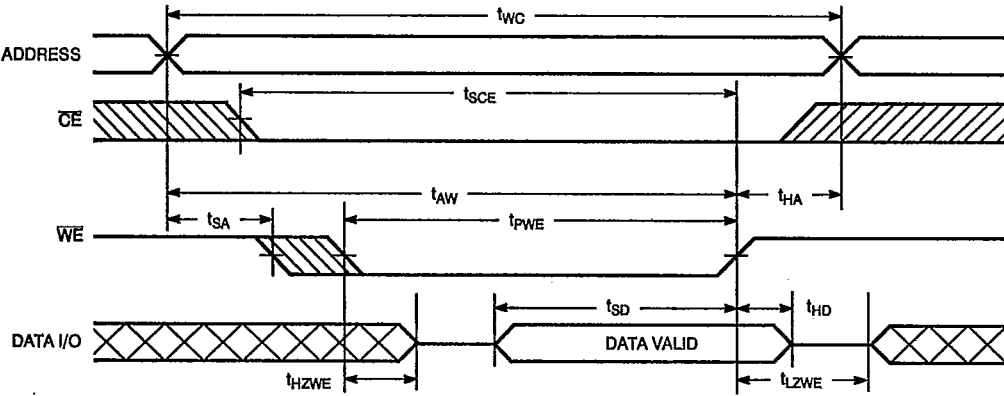
T-46-23-10

Write Cycle No. 2 (\overline{WE} Controlled, \overline{OE} HIGH During Write)^[14,15]



C108-9

Write Cycle No. 3 (\overline{WE} Controlled, \overline{OE} LOW)^[10,15]



C108-10

Truth Table

CE	OE	WE	I/O ₀ - I/O ₃	Mode	Power
H	X	X	High Z	Power-Down	Standby (I _{SD})
L	L	H	Data Out	Read	Active (I _{CC})
L	X	L	Data In	Write	Active (I _{CC})
L	H	H	High Z	Selected, Outputs Disabled	Active (I _{CC})



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T-46-23-10

Ordering Information

Speed (ns)	Ordering Code	Package Type	Operating Range	
25	CY7C106-25DC	D41	Commercial	
	CY7C106-25LC	L75		
	CY7C106-25PC	P41		
	CY7C106-25VC	V28		
	CY7C106-25DMB	D41		Military
	CY7C106-25LMB	L75		
35	CY7C106-35DC	D41	Commercial	
	CY7C106-35LC	L75		
	CY7C106-35PC	P41		
	CY7C106-35VC	V28		
	CY7C106-35DMB	D41		Military
	CY7C106-35LMB	L75		
45	CY7C106-45DC	D41	Commercial	
	CY7C106-45LC	L75		
	CY7C106-45PC	P41		
	CY7C106-45VC	V28		
	CY7C106-45DMB	D41		Military
	CY7C106-45LMB	L75		

MILITARY SPECIFICATIONS
Group A Subgroup Testing

DC Characteristics

Parameters	Subgroups
V _{OH}	1, 2, 3
V _{OL}	1, 2, 3
V _{IH}	1, 2, 3
V _{IL Max.}	1, 2, 3
I _{Ix}	1, 2, 3
I _{Oz}	1, 2, 3
I _{CC}	1, 2, 3
I _{SB1}	1, 2, 3
I _{SB2}	1, 2, 3



SRAMS

Switching Characteristics

Parameters	Subgroups
READ CYCLE	
t _{RC}	7, 8, 9, 10, 11
t _{AA}	7, 8, 9, 10, 11
t _{OHA}	7, 8, 9, 10, 11
t _{ACE}	7, 8, 9, 10, 11
t _{DOE}	7, 8, 9, 10, 11
WRITE CYCLE	
t _{WC}	7, 8, 9, 10, 11
t _{SCE}	7, 8, 9, 10, 11
t _{AW}	7, 8, 9, 10, 11
t _{HA}	7, 8, 9, 10, 11
t _{SA}	7, 8, 9, 10, 11
t _{PWE}	7, 8, 9, 10, 11
t _{SD}	7, 8, 9, 10, 11
t _{HD}	7, 8, 9, 10, 11

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