

CY7C10212CV33

1-Mbit (64 K × 16) Static RAM

Features

- Temperature ranges □ Automotive-E: -40 °C to 125 °C
- Pin and function compatible with CY7C10212CV33
- High speed
 - □ t_{AA} = 12 ns (Automotive-E)
- CMOS for optimum speed and power
- Low active power: 325 mW (max)
- Automatic power down when deselected
- Independent control of upper and lower bits
- Available in Pb-free 48-ball FBGA package

Functional Description

The CY7C10212CV33 is a high performance CMOS static RAM organized as 65,536 words by 16 bits. This device has an automatic power down feature that significantly reduces power consumption when deselected.

Writing to the device is accomplished by taking Chip Enable $\overline{(CE)}$ and Write Enable (WE) inputs LOW. If Byte Low Enable (BLE) is LOW, then data from I/O pins (I/O₀ through I/O₇), is written into the location specified on the address pins (A₀ through A₁₅). If Byte High Enable (BHE) is LOW, then data from I/O pins (I/O₈ through I/O₁₅) is written into the location specified on the address pins (A₀ through A₁₅).

<u>Reading</u> from the device is <u>accomplished</u> by taking Chip Enable (CE) and Output Enable (OE) LOW while forcing the Write Enable (WE) HIGH. If Byte Low Enable (BLE) is LOW, then data from the memory location specified by the address pins appear on I/O₀ to I/O₇. If Byte High Enable (BHE) is LOW, then data from memory appears on I/O₈ to I/O₁₅. For more information, see the Truth Table on page 9 for a complete description of Read and Write modes.

The input and output pins (I/O₀ through I/O₁₅) are placed in a high impedance state when <u>the</u> device is des<u>elected</u> (CE HIGH), the outputs are disabled (OE HIGH), the BHE and <u>BLE</u> are disabled (BHE, BLE HIGH), or during a write operation (CE LOW and WE LOW).

For a complete list of related documentation, click here.

Logic Block Diagram





CY7C10212CV33

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Selection Guide

Description	-12	Unit
Maximum Access Time	12	ns
Maximum Operating Current	90	mA
Maximum CMOS Standby Current	10	mA

Pin Configuration

Figure 1. 48-ball FBGA pinout ^[1]





Maximum Ratings

Exceeding maximum ratings may impair the useful life of the device. These user guidelines are 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 ^[2]	–0.3 V to +4.6 V
DC Voltage Applied to Outputs in High Z State ^[2]	0.3 V to V _{CC} + 0.3 V

DC Input Voltage [2]	–0.3 V to V _{CC} + 0.3 V
Current into Outputs (LOW)	20 mA
Static Discharge Voltage (MIL-STD-883, Method 3015)	> 2001 V
Latch Up Current	> 200 mA

Operating Range

Range	Ambient Temperature (T _A)	V _{cc}
Automotive-E	–40 °C to +125 °C	$3.3~V\pm10\%$

Electrical Characteristics

Over the Operating Range

Boromotor	Description	Test Conditions	-	Unit	
Parameter	Description		Min	Max	Unit
V _{OH}	Output HIGH Voltage	V _{CC} = Min, I _{OH} = -4.0 mA	2.4	-	V
V _{OL}	Output LOW Voltage	V _{CC} = Min, I _{OL} = 8.0 mA	-	0.4	V
V _{IH}	Input HIGH Voltage		2.0	V _{CC} + 0.3	V
V _{IL}	Input LOW Voltage [2]		-0.3	0.8	V
I _{IX}	Input Leakage Current	$GND \leq V_I \leq V_{CC}$	-12	+12	μΑ
I/O _Z	Output Leakage Current	$GND \leq V_I \leq V_{CC}$, Output disabled	-12	+12	μΑ
I _{CC}	V _{CC} Operating Supply Current	V_{CC} = Max, I_{OUT} = 0 mA, f = f _{MAX} = 1/t _{RC}	-	90	mA
I _{SB1}	Automatic CE Power Down Current — TTL Inputs	$ \begin{array}{l} \text{Max } V_{CC}, \ \overline{CE} \geq V_{IH} \\ V_{IN} \geq V_{IH} \ \text{or} \ V_{IN} \leq V_{IL}, \ f = f_{MAX} \end{array} $	-	20	mA
I _{SB2}	Automatic CE Power Down Current — CMOS Inputs	$\begin{array}{l} \text{Max V}_{\text{CC}}, \ \overline{\text{CE}} \geq \text{V}_{\text{CC}} - 0.3 \text{ V}, \\ \text{V}_{\text{IN}} \geq \text{V}_{\text{CC}} - 0.3 \text{ V}, \text{ or } \text{V}_{\text{IN}} \leq 0.3 \text{ V}, \text{ f} = 0 \end{array}$	-	10	mA



Capacitance

Parameter ^[3]	Description	Test Conditions	Max	Unit
C _{IN}	Input Capacitance	T _A = 25 °C, f = 1 MHz, V _{CC} = 3.3 V	8	pF
C _{OUT}	Output Capacitance		8	pF

Thermal Resistance

Parameter ^[3]	Description	Test Conditions	48-ball FBGA	Unit
Θ_{JA}	Thermal resistance (junction to ambient)	Test conditions follow standard test methods and procedures for measuring thermal impedance, per	95.32	°C/W
Θ^{JC}	Thermal resistance (junction to case)	EIA/JESD51	10.68	°C/W

AC Test Loads and Waveforms





Notes

- Tested initially and after any design or process changes that may affect these parameters.
 Speed is tested using the Thevenin load shown in Figure 2 (a). High Z characteristics are tested using the test load shown in Figure 2 (b).



Switching Characteristics

Over the Operating Range

Baramotor ^[5]	Description	-1	Unit	
Farameter	Description	Min	Max	
Read Cycle				
t _{power} ^[6]	V _{CC} (Typical) to the First Access	100	_	μS
t _{RC}	Read Cycle Time	12	-	ns
t _{AA}	Address to Data Valid	-	12	ns
t _{OHA}	Data Hold from Address Change	3	_	ns
t _{ACE}	CE LOW to Data Valid	-	12	ns
t _{DOE}	OE LOW to Data Valid	-	6	ns
t _{LZOE}	OE LOW to Low Z ^[7]	0	-	ns
t _{HZOE}	OE HIGH to High Z ^[7, 8]	-	6	ns
t _{LZCE}	CE LOW to Low Z ^[7]	3	-	ns
t _{HZCE}	CE HIGH to High Z ^[7, 8]	-	6	ns
t _{PU} ^[9]	CE LOW to Power Up	0	-	ns
t _{PD} ^[9]	CE HIGH to Power Down	-	12	ns
t _{DBE}	Byte Enable to Data Valid	-	6	ns
t _{LZBE}	Byte Enable to Low Z	0	-	ns
t _{HZBE}	Byte Disable to High Z	-	6	ns
Write Cycle ^{[10,}	11]			
t _{WC}	Write Cycle Time	12	-	ns
t _{SCE}	CE LOW to Write End	9	-	ns
t _{AW}	Address Setup to Write End	9	-	ns
t _{HA}	Address Hold from Write End	0	-	ns
t _{SA}	Address Setup to Write Start	0	-	ns
t _{PWE}	WE Pulse Width	8	-	ns
t _{SD}	Data Setup to Write End	6	-	ns
t _{HD}	Data Hold from Write End	0	-	ns
t _{LZWE}	WE HIGH to Low Z ^[7]	3	-	ns
t _{HZWE}	WE LOW to High Z ^[7, 8]	-	6	ns
t _{BW}	Byte Enable to End of Write	8	_	ns

Notes

- 5. 6. 7.

- Test conditions assume signal transition time of 3 ns or less, timing reference levels of 1.5 V, and input pulse levels of 0 to 3.0 V. t_{POWER} gives the minimum amount of time that the power supply is at typical V_{CC} values until the first memory access is performed. At any temperature and voltage condition, t_{HZCE} is less than t_{LZCE} , t_{HZOE} is less than t_{LZOE} , and t_{HZWE} is less than t_{LZWE} for any given device. t_{HZOE} , t_{HZBE} , t_{HZCE} , and t_{HZWE} are specified with a load capacitance of 5 pF as in part (b) of Figure 2 on page 5. Transition is measured ±500 mV from steady state voltage. 8.

9. This parameter is guaranteed by design and is not tested.
 10. The internal write time of the memory is defined by the overlap of CE LOW, WE LOW, and BHE/BLE LOW. CE, WE, and BHE/BLE is LOW to initiate a write. The transition of these signals terminate the write. The input data setup and hold timing is referenced to the leading edge of the signal that terminates the write.
 11. The minimum write cycle pulse width for write cycle 3 (WE controlled, OE LOW) should be equal to the sum of tsD and tHZWE.



Switching Waveforms

Figure 3. Read Cycle No. 1 (Address Transition Controlled) ^[12, 13]







Notes

- 12. Device is continuously selected. \overline{OE} , \overline{CE} , \overline{BHE} , and/or \overline{BLE} = V_{IL}.
- 13. WE is HIGH for read cycle.
- 14. Address valid prior to or coincident with \overline{CE} transition LOW.



Switching Waveforms (continued)



Figure 5. Write Cycle No. 1 (CE Controlled) ^[15, 16]

Figure 6. Write Cycle No. 2 (BLE or BHE Controlled)



Notes

15. Data I/O is high impedance if OE, BHE, and/or BLE = V_{IH}.
 16. If OE goes HIGH simultaneously with WE going HIGH, the output remains in a high impedance state.



Switching Waveforms (continued)



Figure 7. Write Cycle No. 3 (WE Controlled, OE LOW)

Truth Table

CE	OE	WE	BLE	BHE	I/O ₀ – I/O ₇	I/O ₈ – I/O ₁₅	Mode	Power
Н	Х	Х	Х	Х	High Z	High Z	Power Down	Standby (I _{SB})
L	L	Н	L	L	Data Out	Data Out	Read – All Bits	Active (I _{CC})
			L	н	Data Out	High Z	Read – Lower Bits Only	Active (I _{CC})
			Н	L	High Z	Data Out	Read – Upper Bits Only	Active (I _{CC})
L	Х	L	L	L	Data In	Data In	Write – All Bits	Active (I _{CC})
			L	н	Data In	High Z	Write – Lower Bits Only	Active (I _{CC})
			Н	L	High Z	Data In	Write – Upper Bits Only	Active (I _{CC})
L	Н	Н	Х	Х	High Z	High Z	Selected, Outputs Disabled	Active (I _{CC})
L	Х	Х	Н	Н	High Z	High Z	Selected, Outputs Disabled	Active (I _{CC})



Ordering Information

Speed (ns)	Ordering Code	Package Diagram	Package Type	Operating Range
12	CY7C10212CV33-12BAXE	51-85106	48-ball FBGA (Pb-free)	Automotive-E

Ordering Code Definitions





Package Diagrams

Figure 8. 48-ball FBGA (7 × 8.5 × 1.2 mm) BA48A Package Outline, 51-85106





51-85106 *G





Acronyms

Acronym	Description		
BGA	Ball Grid Array		
CE	Chip Enable		
CMOS	Complementary Metal Oxide Semiconductor		
FBGA	Fine-Pitch Ball Grid Array		
I/O	Input/Output		
OE	Output Enable		
SRAM	Static Random Access Memory		
TQFP	Thin Quad Flat Pack		
TTL	Transistor-Transistor Logic		
WE	Write Enable		

Document Conventions

Units of Measure

Symbol	Unit of Measure		
°C	degree Celsius		
μA	microampere		
μs	microsecond		
mA	milliampere		
mm	millimeter		
mW	milliwatt		
MHz	megahertz		
ns	nanosecond		
%	percent		
pF	picofarad		
V	volt		
W	watt		



Document History Page

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