



Reprogrammable Registered PROM

Features

- High speed
 - $t_{SA} = 18$ ns
 - $t_{CO} = 12$ ns
- BiFAMOS[®] for optimum speed/power
- Low Power
 - 1210 mW max.
- Output register for synchronous operation
- User-programmable output enable (OE)
- User-programmable INIT word for state machine applications
- User-programmable initialization control line (INIT)
- EPROM technology for 100% reprogrammability
- Capable of withstanding >2001V static discharge

Package options

- 40-pin, 600-mil plastic or hermetic DIP
- 44-pin plastic or hermetic LCC

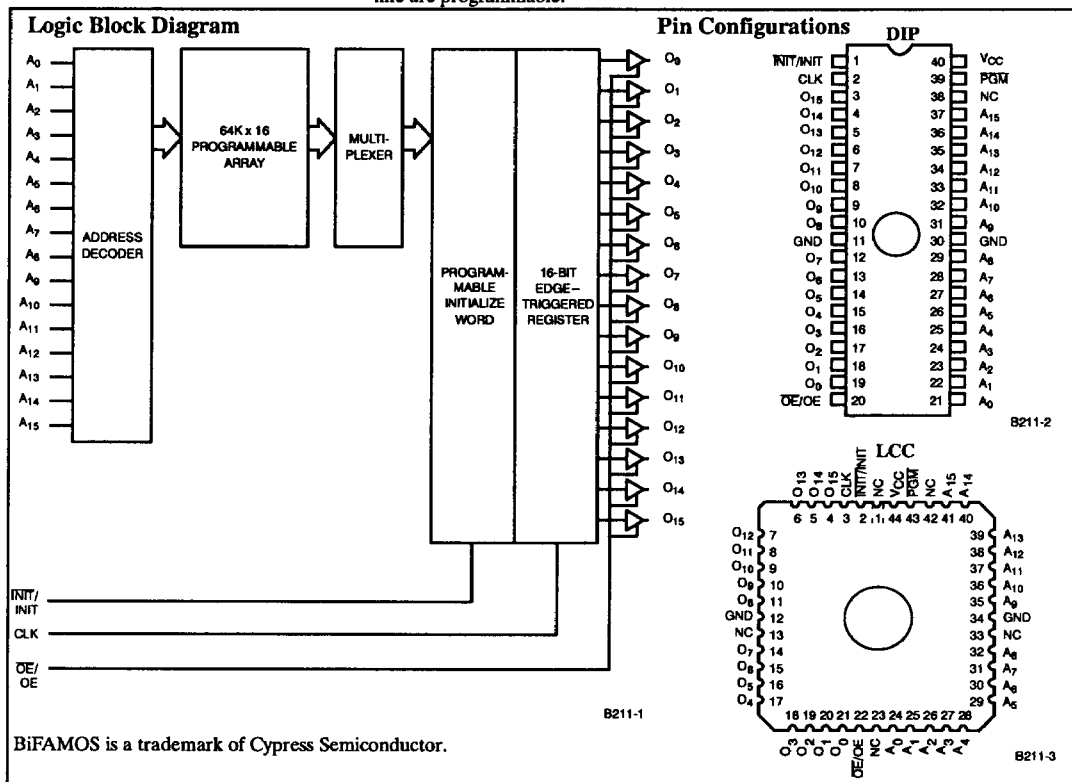
Functional Description

The CY7B211 is a high-performance 1-megabit BiFAMOS Registered PROM organized in 64K words. It is available in 40-pin, 600-mil DIP and 44-pin LCC packages. These devices offer high-density storage combined with 50-MHz performance. The CY7B211 is available in windowed and opaque packages. Windowed packages allow the device to be erased with UV light for 100% reprogrammability.

The CY7B211 is equipped with an output register for synchronous applications. A 16-bit, user programmable initialization word is available for state machine applications or to set or reset the outputs. The polarities of both the INIT/INIT input and the Output Enable (OE/OE) control line are programmable.

The memory cells utilize proven EPROM floating-gate technology and word-wide intelligent programming algorithms. The EPROM cell requires only 12.5V for the supvoltage and low programming current allows for gang programming. The EPROM allows for each memory location to be tested 100%, as each location is written to, erased, and repeatedly exercised prior to encapsulation. Each PROM is also tested for AC performance to guarantee that the product will meet DC and AC specification limits after customer programming.

The CY7B211 is read by selecting the OE/OE input. On the rising edge of CLK, the contents of the memory location selected by the address on inputs $A_{15} - A_0$ will appear at the outputs $O_{15} - O_0$. When the INIT/INIT input is selected, the user programmed INIT/INIT word will appear on the outputs until the rising edge of the CLK pulse after INIT/INIT is deselected.



Selection Guide

		CY7B211-18	CY7B211-25
Maximum Set-Up Time (ns)		18	25
Maximum Clock to Output (ns)		12	15
Maximum Operating Current (mA)	Commercial	220	220
	Military		220

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 to Ground Potential	– 0.5V to +7.0V
DC Voltage Applied to Outputs in High Z State	– 0.5V to +5.5V
DC Input Voltage	– 0.5V to +7.0V
Transient Input Voltage	– 3.0V for <20 ns
DC Program Voltage	13.00V

UV Erasure	7258 Wsec/cm ²
Static Discharge Voltage (per MIL-STD-883, Method 3015)	>2001V
Latch-Up Current	>200 mA

Operating Range

Range	Ambient Temperature	V _{CC}
Commercial	0°C to +70°C	5V ±10%
Military ^[1]	– 55°C to +125°C	5V ±10%
Industrial ^[2]	– 40°C to +85°C	5V ±10%

Electrical Characteristics^[3, 4]

Parameters	Description	Test Conditions	CY7B211-18 CY7B211-25		Units
			Min.	Max.	
V _{OH}	Output HIGH Voltage	V _{CC} = Min., I _{OH} = – 4.0 mA (3.0 mil)	2.4		V
V _{OL}	Output LOW Voltage	V _{CC} = Min., I _{OL} = 8.0 mA (6.0 mil)		0.4	V
V _{IH}	Input HIGH Level	Guaranteed Input Logical HIGH Voltage for All Inputs	2.0		V
V _{IL}	Input LOW Level	Guaranteed Input Logical LOW Voltage for All Inputs		0.8	V
I _{IX}	Input Leakage Current	GND ≤ V _{IN} ≤ V _{CC}	– 10	+ 10	μA
I _{OZ}	Output Leakage Current	V _{OL} ≤ V _{OUT} ≤ V _{OH} , Output Disabled	– 40	+ 40	μA
I _{OS}	Output Short Circuit Current	V _{CC} = Max., V _{OUT} = 0.0V ^[5]	– 20	– 180	mA
I _{CC}	Power Supply Current	V _{CC} = Max., I _{OUT} = 0.0 mA		220	mA

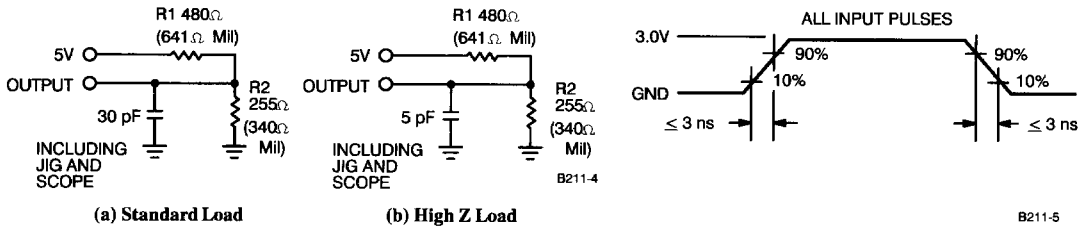
Capacitance^[4]

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:

1. T_A is the "instant on" case temperature.
2. Contact a Cypress representative for industrial temperature range specifications.
3. See the last page of this specification for group A subgroup testing information.
4. See Introduction to CMOS PROMs in this Data Book for general information on testing.
5. For test purposes, not more than one output at a time should be shorted. Short circuit test duration should not exceed 30 seconds.

AC Test Loads and Waveforms^[4]



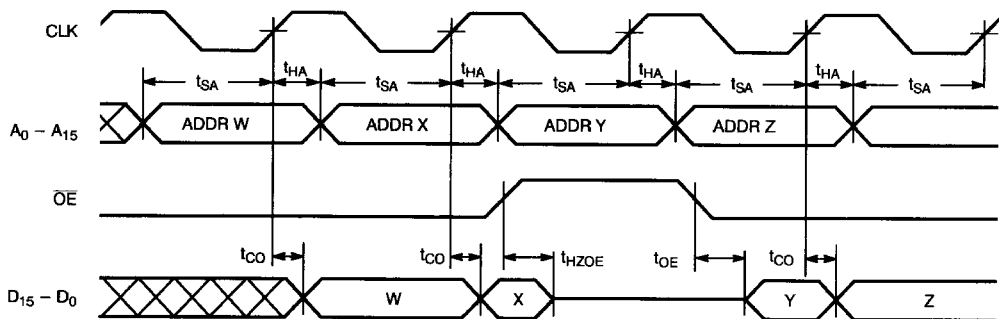
Equivalent to: THEVENIN EQUIVALENT
 166Ω (222Ω Mil)
 OUTPUT $\rightarrow$ 1.73V
 B211-6

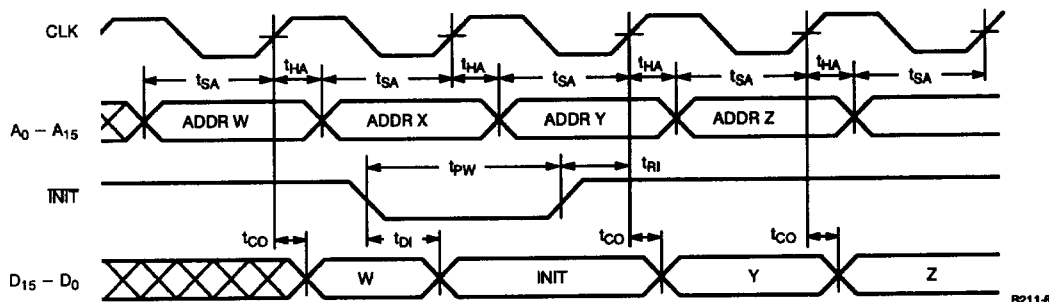
Switching Characteristics Over the Operating Range^[3, 4]

Parameters	Description	CY7B211-18		CY7B211-25		Units
		Min.	Max.	Min.	Max.	
t_{SA}	Address Set-Up to Rising Edge of CLK	18		25		ns
t_{HA}	Address Hold from Rising Edge of CLK	0		0		ns
t_{CO}	CLK to Output Valid		12		15	ns
t_{DI}	INIT/INIT to Output Valid		22		25	ns
t_{RI}	INIT/INIT Recovery to CLK	12		15		ns
t_{PW}	INIT/INIT Pulse Width	12		15		ns
t_{OE}	$\overline{OE}/OE$ deselected to Output Valid		15		20	ns
t_{HZOE}	$\overline{OE}/OE$ selected to High Z		15		18	ns

Switching Waveforms^[4]

Read Operation



Switching Waveforms^[4] (continued)
Initialization Operation

Erasure Characteristics

Wavelengths of light less than 4000 Angstroms begin to erase the 7B211 in the windowed package. For this reason, an opaque label should be placed over the window if the EPROM is exposed to sunlight or fluorescent lighting for extended periods of time.

The recommended dose of ultraviolet light for erasure is a wavelength of 2537 Angstroms for a minimum dose (UV intensity multiplied by exposure time) or 25 Wsec/cm². For an ultraviolet lamp with a 12 mW/cm² power rating the exposure time would be approximately 35 minutes. The 7B211 needs to be within 1 inch of the lamp during erasure. Permanent damage may result if the

EPROM is exposed to high-intensity UV light for an extended period of time. 7258 Wsec/cm² is the recommended maximum dosage.

Programming Modes

Programming support is available from Cypress as well as from a number of third-party software vendors. For detailed programming information, including a listing of software packages, please see the PROM Programming Information located at the end of this section. Programming algorithms can be obtained from any Cypress representative.

Table 1. Programming Electrical Characteristics

Parameter	Description	Min.	Max.	Units
V _{PP}	Programming Power Supply	12.5	13.0	V
I _{PP}	Programming Supply Current		100	ma
V _{IHP}	Programming Input Voltage HIGH	3.0	V _{CC}	V
V _{ILP}	Programming Input Voltage LOW		0.4	V

Table 2. Mode Selection

Mode	Pin Function ^[6]											
	Read	CLK	OE	NA	INIT	A ₉	A ₈	A ₃	A ₁₄	A ₁₅	A ₇	O ₁₅ - O ₀
Read ^[7]	Other	CLK	OE	PGM	V _{PP}	A ₉	A ₈	A ₃	A ₁₄	A ₁₅	A ₇	D ₁₅ - D ₀
Output Disable ^[7]		X	V _{IH}	X	V _{IH}	A ₉	A ₈	A ₃	A ₁₄	A ₁₅	A ₇	O ₁₅ - O ₀
Initialize		X	V _{IL}	X	V _{IL}	X	X	X	X	X	X	INIT Word
Program Array		X	V _{IHP}	V _{ILP}	V _{PP}	A ₉	A ₈	A ₃	A ₁₄	A ₁₅	A ₇	D ₁₅ - D ₀
Program Verify		X	V _{ILP}	V _{IHP}	V _{PP}	A ₉	A ₈	A ₃	A ₁₄	A ₁₅	A ₇	O ₁₅ - O ₀
Program Inhibit		X	V _{IHP}	V _{IHP}	V _{PP}	X	X	X	X	X	X	High Z
Program OE Active HIGH		X	V _{IHP}	V _{ILP}	V _{PP}	X	X	V _{PP}	V _{IHP}	V _{IHP}	X	High Z
Verify OE Active HIGH		X	V _{ILP}	X	V _{IHP}	X	X	X	X	X	V _{PP}	O ₀ = V _{OH}
Program INIT Active HIGH		X	V _{IHP}	V _{ILP}	V _{PP}	X	X	V _{PP}	V _{IHP}	V _{ILP}	X	High Z
Verify INIT Active HIGH		X	V _{ILP}	X	V _{IHP}	X	X	X	X	X	V _{PP}	O ₁ = V _{OH}
Program INIT Word		X	V _{IHP}	V _{ILP}	V _{PP}	X	X	V _{PP}	V _{ILP}	V _{IHP}	X	D ₁₅ - D ₀
Verify INIT Word		X	V _{ILP}	X	V _{IL}	X	X	X	X	X	X	O ₁₅ - O ₀
Signature Read (MFG)		X	V _{IL}	X	V _{IH}	V _{PP}	V _{ILP}	X	X	X	X	0034H
Signature Read (DEV)		X	V _{IL}	X	V _{IH}	V _{PP}	V _{IHP}	X	X	X	X	0012H

Notes:

6. X = can be V_{IL} (V_{ILP}) or V_{IH} (V_{IHP}).

7. OE and INIT are assumed to be active LOW (default).

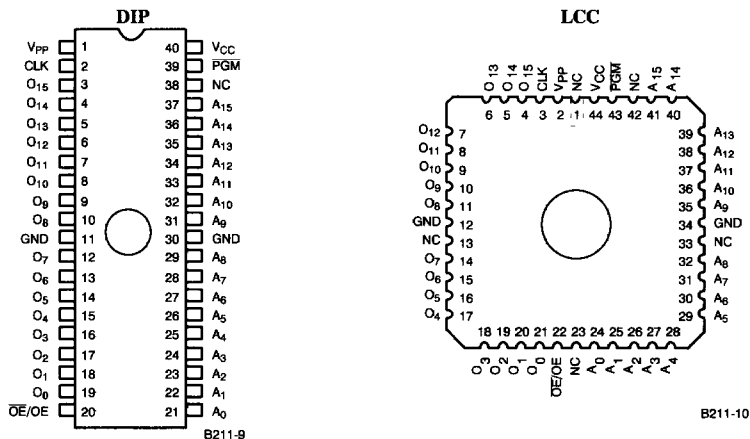


Figure 1. Programming Pinouts

Ordering Information^[8]

Speed (ns)	Ordering Code	Package Type	Operating Range
18	CY7B211-18DC	D18	Commercial
	CY7B211-18JC	J67	
	CY7B211-18PC	P18	
	CY7B211-18WC	W18	
25	CY7B211-25DC	D18	Commercial
	CY7B211-25JC	J67	
	CY7B211-25PC	P18	
	CY7B211-25WC	W18	
	CY7B211-25DMB	D18	Military
	CY7B211-25LMB	L67	
	CY7B211-25QMB	Q67	
	CY7B211-25WMB	W18	

Notes:

8. Most of the above products are available in industrial temperature range. Contact a Cypress representative for specifications and product availability.

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}	1, 2, 3
I_{IX}	1, 2, 3
I_{OZ}	1, 2, 3
I_{CC}	1, 2, 3

Switching Characteristics

Parameters	Subgroups
t_{SA}	7, 8, 9, 10, 11
t_{HA}	7, 8, 9, 10, 11
t_{CO}	7, 8, 9, 10, 11
t_{DI}	7, 8, 9, 10, 11
t_{RI}	7, 8, 9, 10, 11
t_{PW}	7, 8, 9, 10, 11
t_{OE}	7, 8, 9, 10, 11

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