

128K (16K x 8) CMOS EPROM

FEATURES

- High speed performance
 - 120 ns access time available
- CMOS Technology for low power consumption
 - 20 mA Active current
 - 100 μ A Standby current
- Factory programming available
- Auto-insertion-compatible plastic packages
- Auto ID aids automated programming
- Separate chip enable and output enable controls
- High speed "express" programming algorithm
- Organized 16K x 8: JEDEC standard pinouts
 - 28-pin Dual-in-line package
 - 32-pin PLCC Package
 - 28-pin SOIC package
 - Tape and reel
- Available for the following temperature ranges:
 - Commercial: 0°C to +70°C
 - Industrial: -40°C to +85°C
 - Automotive: -40°C to +125°C

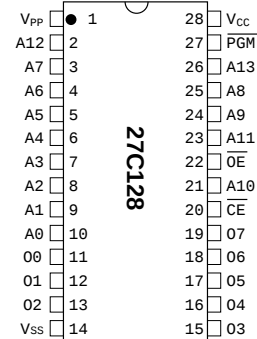
DESCRIPTION

The Microchip Technology Inc. 27C128 is a CMOS 128K bit (electrically) Programmable Read Only Memory. The device is organized as 16K words by 8 bits (16K bytes). Accessing individual bytes from an address transition or from power-up (chip enable pin going low) is accomplished in less than 120 ns. CMOS design and processing enables this part to be used in systems where reduced power consumption and high reliability are requirements. A complete family of packages is offered to provide the most flexibility in applications. For surface mount applications, PLCC, SOIC, or TSOP packaging is available. Tape and reel packaging is also available for PLCC or SOIC packages. UV erasable versions are also available.

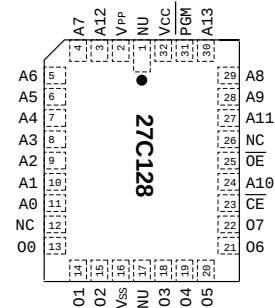
A complete family of packages is offered to provide the most flexibility in applications. For surface mount applications, PLCC or SOIC packaging is available. Tape and reel packaging is also available for PLCC or SOIC packages.

PACKAGE TYPES

DIP/SOIC



PLCC



1.0 ELECTRICAL CHARACTERISTICS

1.1 Maximum Ratings*

V_{CC} and input voltages w.r.t. V_{SS} -0.6V to +7.25V

V_{PP} voltage w.r.t. V_{SS} during programming -0.6V to +14V

Voltage on A9 w.r.t. V_{SS} -0.6V to +13.5V

Output voltage w.r.t. V_{SS} -0.6V to V_{CC} +1.0V

Storage temperature -65°C to +150°C

Ambient temp. with power applied -65°C to +125°C

*Notice: Stresses above 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 those or any other conditions above those indicated in the operation listings of this specification is not implied. Exposure to maximum rating conditions for extended periods may affect device reliability.

TABLE 1-1: PIN FUNCTION TABLE

Name	Function
A0-A13	Address Inputs
$\overline{CE}$	Chip Enable
$\overline{OE}$	Output Enable
$\overline{PGM}$	Program Enable
V _{PP}	Programming Voltage
O0 - O7	Data Output
V _{CC}	+5V Power Supply
V _{SS}	Ground
NC	No Connection; No Internal Connections
NU	Not Used; No External Connection Is Allowed

TABLE 1-2: READ OPERATION DC CHARACTERISTICS

V _{CC} = +5V (±10%) Commercial: Tamb = 0°C to +70°C Industrial: Tamb = -40°C to +85°C Extended (Automotive): Tamb = -40°C to +125°C							
Parameter	Part*	Status	Symbol	Min.	Max.	Units	Conditions
Input Voltages	all	Logic "1" Logic "0"	V _{IH} V _{IL}	2.0 -0.5	V _{CC} +1 0.8	V V	
Input Leakage	all	—	I _{LI}	-10	10	μA	V _{IN} = 0 to V _{CC}
Output Voltages	all	Logic "1" Logic "0"	V _{OH} V _{OL}	2.4	0.45	V V	I _{OH} = -400 μA I _{OL} = 2.1 mA
Output Leakage	all	—	I _{LO}	-10	10	μA	V _{OUT} = 0V to V _{CC}
Input Capacitance	all	—	C _{IN}	—	6	pF	V _{IN} = 0V; Tamb = 25°C; f = 1 MHz
Output Capacitance	all	—	C _{OUT}	—	12	pF	V _{OUT} = 0V; Tamb = 25°C; f = 1 MHz
Power Supply Current, Active	C I, E	TTL input TTL input	I _{CC1} I _{CC2}	— —	20 25	mA mA	V _{CC} = 5.5V; V _{PP} = V _{CC} f = 1 MHz; $\overline{OE} = \overline{CE} = V_{IL}$; I _{OUT} = 0 mA; V _{IL} = -0.1 to 0.8V; V _{IH} = 2.0 to V _{CC} ; Note 1
Power Supply Current, Standby	C I, E all	TTL input TTL input CMOS input	I _{CC} (s)	— — —	2 3 100	mA mA μA	$\overline{CE} = V_{CC} \pm 0.2V$
I _{PP} Read Current V _{PP} Read Voltage	all all	Read Mode Read Mode	I _{PP} V _{PP}	V _{CC} -0.7	100 V _{CC}	μA V	V _{PP} = 5.5V

* Parts: C=Commercial Temperature Range; I, E=Industrial and Extended Temperature Ranges

Note 1: Typical active current increases .75 mA per MHz up to operating frequency for all temperature ranges.

TABLE 1-3: READ OPERATION AC CHARACTERISTICS

		AC Testing Waveform:		$V_{IH} = 2.4V$ and $V_{IL} = 0.45V$; $V_{OH} = 2.0V$ $V_{OL} = 0.8V$									
		Output Load:		1 TTL Load + 100 pF									
		Input Rise and Fall Times:		10 ns									
		Ambient Temperature:		Commercial:				$T_{amb} = 0^{\circ}C$ to $+70^{\circ}C$					
				Industrial:				$T_{amb} = -40^{\circ}C$ to $+85^{\circ}C$					
				Extended (Automotive):				$T_{amb} = -40^{\circ}C$ to $+125^{\circ}C$					
Parameter	Sym	27C128-12		27C128-15		27C128-17		27C128-20		27C128-25		Units	Conditions
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max		
Address to Output Delay	t_{ACC}	—	120	—	150	—	170	—	200	—	250	ns	$\overline{CE} = \overline{OE} = V_{IL}$
$\overline{CE}$ to Output Delay	t_{CE}	—	120	—	150	—	170	—	200	—	250	ns	$\overline{OE} = V_{IL}$
$\overline{OE}$ to Output Delay	t_{OE}	—	65	—	70	—	70	—	75	—	100	ns	$\overline{CE} = V_{IL}$
$\overline{CE}$ or $\overline{OE}$ to O/P High Impedance	t_{OFF}	0	50	0	50	0	50	0	55	0	60	ns	
Output Hold from Address $\overline{CE}$ or $\overline{OE}$, whichever occurs first	t_{OH}	0	—	0	—	0	—	0	—	0	—	ns	

FIGURE 1-1: READ WAVEFORMS

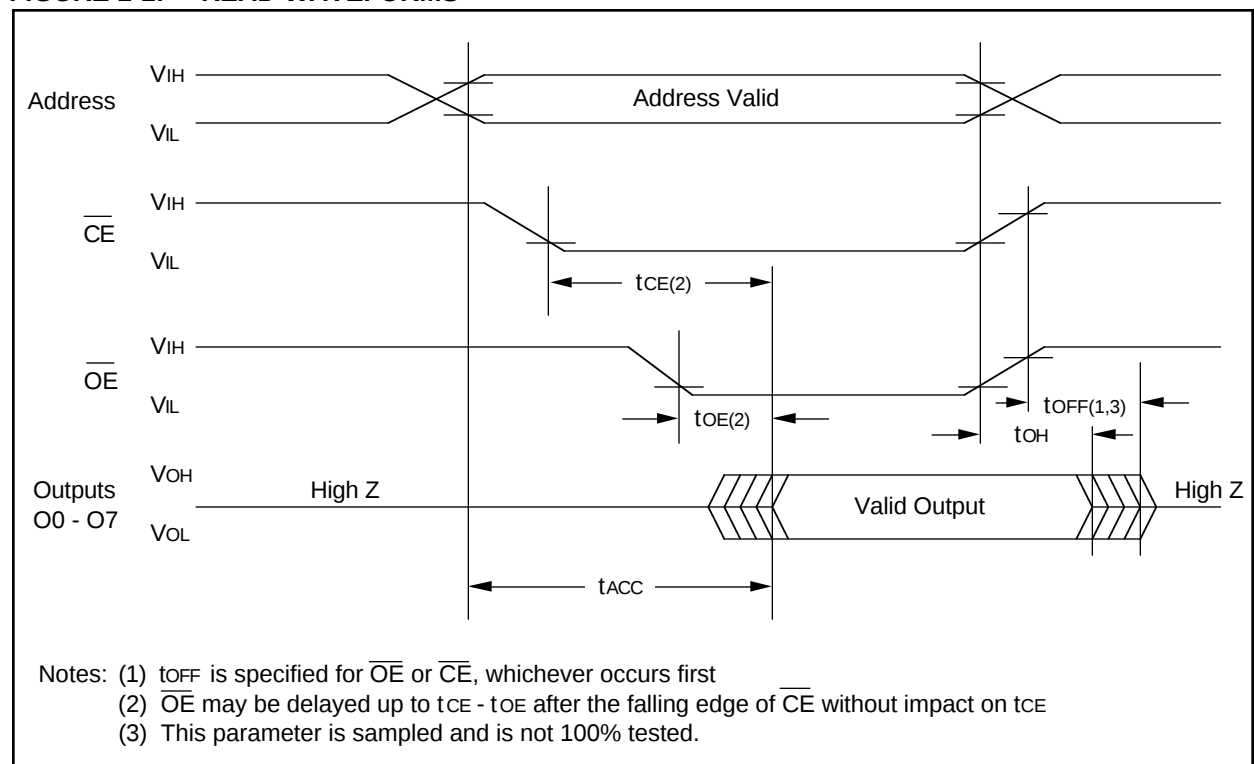


TABLE 1-4: PROGRAMMING DC CHARACTERISTICS

Ambient Temperature: Tamb = 25°C ± 5°C VCC = 6.5V ± 0.25V, VPP = 13.0V ± 0.25V						
Parameter	Status	Symbol	Min	Max.	Units	Conditions
Input Voltages	Logic"1" Logic"0"	VIH VIL	2.0 -0.1	VCC+1 0.8	V V	
Input Leakage	—	ILI	-10	10	μA	VIN = 0V to VCC
Output Voltages	Logic"1" Logic"0"	VOH VOL	2.4	0.45	V V	IOH = -400 μA IOL = 2.1 mA
VCC Current, program & verify	—	ICC2	—	20	mA	Note 1
VPP Current, program	—	I PP2	—	25	mA	Note 1
A9 Product Identification	—	VH	11.5	12.5	V	

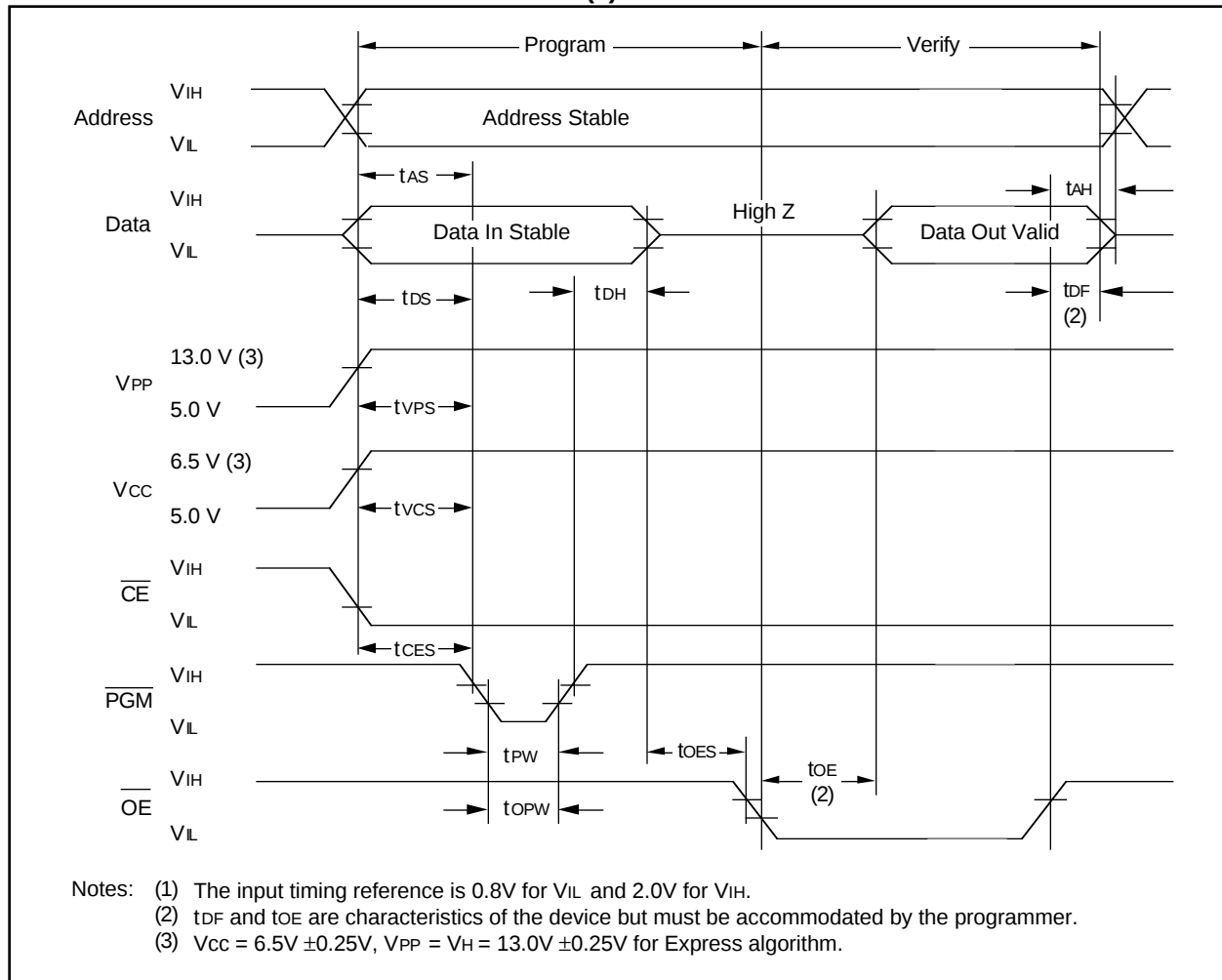
Note 1: VCC must be applied simultaneously or before VPP and removed simultaneously or after VPP

TABLE 1-5: PROGRAMMING AC CHARACTERISTICS

for Program, Program Verify and Program Inhibit Modes	AC Testing Waveform: $V_{IH}=2.4V$ and $V_{IL}=0.45V$; $V_{OH}=2.0V$; $V_{OL}=0.8V$ Ambient Temperature: $T_{amb}=25^{\circ}C \pm 5^{\circ}C$ $V_{CC}= 6.5V \pm 0.25V$, $V_{PP} = V_H = 13.0V \pm 0.25V$				
Parameter	Symbol	Min	Max	Units	Remarks
Address Set-Up Time	tAS	2	—	μs	
Data Set-Up Time	tDS	2	—	μs	
Data Hold Time	tDH	2	—	μs	
Address Hold Time	tAH	0	—	μs	
Float Delay (2)	tDF	0	130	ns	
VCC Set-Up Time	tVCS	2	—	μs	
Program Pulse Width (1)	tPW	95	105	μs	100 μs typical
$\overline{CE}$ Set-Up Time	tCES	2	—	μs	
$\overline{OE}$ Set-Up Time	tOES	2	—	μs	
VPP Set-Up Time	tVPS	2	—	μs	
Data Valid from $\overline{OE}$	tOE	—	100	ns	

Note 1: For express algorithm, initial programming width tolerance is 100 μs ±5%.

2: This parameter is only sampled and not 100% tested. Output float is defined as the point where data is no longer driven (see timing diagram).

FIGURE 1-2: PROGRAMMING WAVEFORMS (1)**TABLE 1-6: MODES**

Operation Mode	$\overline{CE}$	$\overline{OE}$	$\overline{PGM}$	V_{PP}	A9	O0 - O7
Read	V_{IL}	V_{IL}	V_{IH}	V_{CC}	X	DOUT
Program	V_{IL}	V_{IH}	V_{IL}	V_H	X	DIN
Program Verify	V_{IL}	V_{IL}	V_{IH}	V_H	X	DOUT
Program Inhibit	V_{IH}	X	X	V_H	X	High Z
Standby	V_{IH}	X	X	V_{CC}	X	High Z
Output Disable	V_{IL}	V_{IH}	V_{IH}	V_{CC}	X	High Z
Identity	V_{IL}	V_{IL}	V_{IH}	V_{CC}	V_H	Identity Code

X = Don't Care

1.2 Read Mode

(See Timing Diagrams and AC Characteristics)

Read Mode is accessed when

- the $\overline{CE}$ pin is low to power up (enable) the chip
- the $\overline{OE}$ pin is low to gate the data to the output pins

For Read operations, if the addresses are stable, the address access time (t_{ACC}) is equal to the delay from $\overline{CE}$ to output (t_{CE}). Data is transferred to the output after a delay from the falling edge of $\overline{OE}$ (t_{OE}).

1.3 Standby Mode

The standby mode is defined when the $\overline{CE}$ pin is high (V_{IH}) and a program mode is not defined.

When these conditions are met, the supply current will drop from 20 mA to 100 μ A.

1.4 Output Enable

This feature eliminates bus contention in microprocessor-based systems in which multiple devices may drive the bus. The outputs go into a high impedance state when the following condition is true:

- The $\overline{OE}$ and $\overline{PGM}$ pins are both high.

1.5 Erase Mode (U.V. Windowed Versions)

Windowed products offer the capability to erase the memory array. The memory matrix is erased to the all 1's state when exposed to ultraviolet light. To ensure complete erasure, a dose of 15 watt-second/cm² is required. This means that the device window must be placed within one inch and directly underneath an ultraviolet lamp with a wavelength of 2537 Angstroms, intensity of 12,000 μ W/cm² for approximately 20 minutes.

1.6 Programming Mode

The Express Algorithm has been developed to improve the programming throughput times in a production environment. Up to ten 100-microsecond pulses are applied until the byte is verified. No overprogramming is required. A flowchart of the express algorithm is shown in Figure 1-3.

Programming takes place when:

- V_{CC} is brought to the proper voltage,
- V_{PP} is brought to the proper V_H level,
- the $\overline{CE}$ pin is low,
- the $\overline{OE}$ pin is high, and
- the $\overline{PGM}$ pin is low.

Since the erased state is "1" in the array, programming of "0" is required. The address to be programmed is set via pins A0-A13 and the data to be programmed is presented to pins O0-O7. When data and address are stable, $\overline{OE}$ is high, $\overline{CE}$ is low and a low-going pulse on the $\overline{PGM}$ line programs that location.

1.7 Verify

After the array has been programmed it must be verified to ensure all the bits have been correctly programmed. This mode is entered when all the following conditions are met:

- V_{CC} is at the proper level,
- V_{PP} is at the proper V_H level,
- the $\overline{CE}$ line is low,
- the $\overline{PGM}$ line is high, and
- the $\overline{OE}$ line is low.

1.8 Inhibit

When programming multiple devices in parallel with different data, only $\overline{CE}$ or $\overline{PGM}$ need be under separate control to each device. By pulsing the $\overline{CE}$ or $\overline{PGM}$ line low on a particular device in conjunction with the $\overline{PGM}$ or $\overline{CE}$ line low, that device will be programmed; all other devices with $\overline{CE}$ or $\overline{PGM}$ held high will not be programmed with the data, although address and data will be available on their input pins (i.e., when a high level is present on $\overline{CE}$ or $\overline{PGM}$); and the device is inhibited from programming.

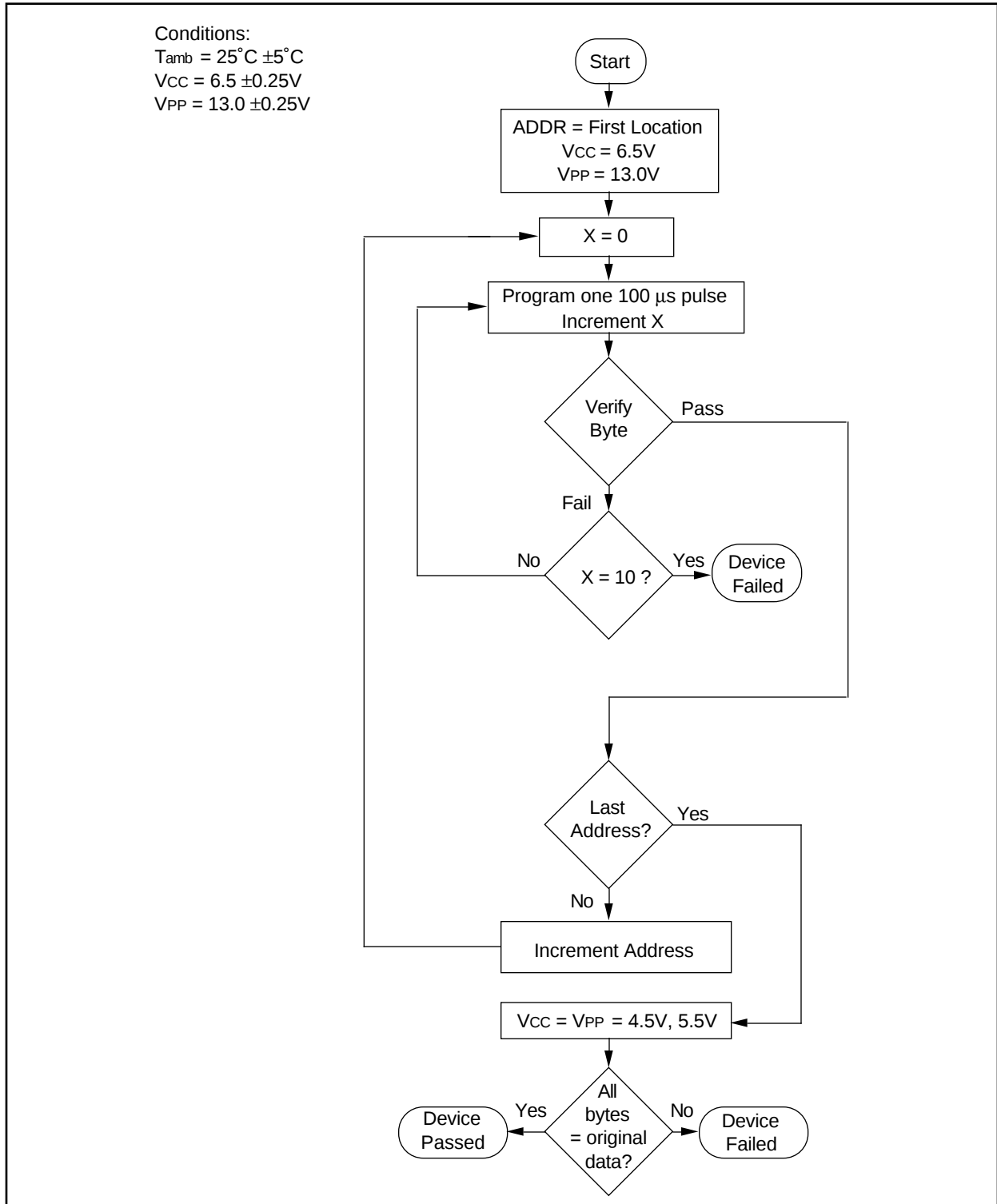
1.9 Identity Mode

In this mode specific data is output which identifies the manufacturer as Microchip Technology Inc. and device type. This mode is entered when Pin A9 is taken to V_H (11.5V to 12.5V). The $\overline{CE}$ and $\overline{OE}$ lines must be at V_{IL}. A0 is used to access any of the two non-erasable bytes whose data appears on O0 through O7.

Pin $\rightarrow$	Input	Output									
Identity $\downarrow$	A0	0	0	0	0	0	0	0	0	0	H e x
		7	6	5	4	3	2	1	0		
Manufacturer	V _{IL}	0	0	1	0	1	0	0	1	29	
Device Type*	V _{IH}	1	0	0	0	0	0	1	1	83	

* Code subject to change

FIGURE 1-3: PROGRAMMING EXPRESS ALGORITHM



NOTES:

NOTES:

NOTES:

27C128

27C128 Product Identification System

To order or to obtain information, e.g., on pricing or delivery, please use the listed part numbers, and refer to the factory or the listed sales offices.

27C128	-25	I	/P	
				Package:
				L = Plastic Leaded Chip Carrier (PLCC)
				P = Plastic DIP (600 Mil)
				SO = Plastic SOIC (300 Mil)
				Temperature Range:
				Blank = 0°C to +70°C
				I = -40°C to +85°C
				E = -40°C to +125°C
				Access Time:
				12 = 120 ns
				15 = 150 ns
				17 = 170 ns
				20 = 200 ns
				25 = 250 ns
				Device:
				27C128 128K (16K x 8) CMOS EPROM

Note the following details of the code protection feature on PICmicro® MCUs.

- The PICmicro family meets the specifications contained in the Microchip Data Sheet.
- Microchip believes that its family of PICmicro microcontrollers is one of the most secure products of its kind on the market today, when used in the intended manner and under normal conditions.
- There are dishonest and possibly illegal methods used to breach the code protection feature. All of these methods, to our knowledge, require using the PICmicro microcontroller in a manner outside the operating specifications contained in the data sheet. The person doing so may be engaged in theft of intellectual property.
- Microchip is willing to work with the customer who is concerned about the integrity of their code.
- Neither Microchip nor any other semiconductor manufacturer can guarantee the security of their code. Code protection does not mean that we are guaranteeing the product as “unbreakable”.
- Code protection is constantly evolving. We at Microchip are committed to continuously improving the code protection features of our product.

If you have any further questions about this matter, please contact the local sales office nearest to you.

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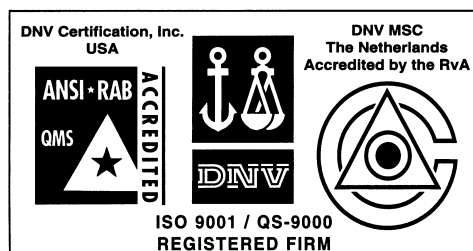
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WORLDWIDE SALES AND SERVICE

AMERICAS

Corporate Office

2355 West Chandler Blvd.
Chandler, AZ 85224-6199
Tel: 480-792-7200 Fax: 480-792-7277
Technical Support: 480-792-7627
Web Address: <http://www.microchip.com>

Rocky Mountain

2355 West Chandler Blvd.
Chandler, AZ 85224-6199
Tel: 480-792-7966 Fax: 480-792-7456

Atlanta

500 Sugar Mill Road, Suite 200B
Atlanta, GA 30350
Tel: 770-640-0034 Fax: 770-640-0307

Boston

2 Lan Drive, Suite 120
Westford, MA 01886
Tel: 978-692-3848 Fax: 978-692-3821

Chicago

333 Pierce Road, Suite 180
Itasca, IL 60143
Tel: 630-285-0071 Fax: 630-285-0075

Dallas

4570 Westgrove Drive, Suite 160
Addison, TX 75001
Tel: 972-818-7423 Fax: 972-818-2924

Detroit

Tri-Atria Office Building
32255 Northwestern Highway, Suite 190
Farmington Hills, MI 48334
Tel: 248-538-2250 Fax: 248-538-2260

Kokomo

2767 S. Albright Road
Kokomo, Indiana 46902
Tel: 765-864-8360 Fax: 765-864-8387

Los Angeles

18201 Von Karman, Suite 1090
Irvine, CA 92612
Tel: 949-263-1888 Fax: 949-263-1338

New York

150 Motor Parkway, Suite 202
Hauppauge, NY 11788
Tel: 631-273-5305 Fax: 631-273-5335

San Jose

Microchip Technology Inc.
2107 North First Street, Suite 590
San Jose, CA 95131
Tel: 408-436-7950 Fax: 408-436-7955

Toronto

6285 Northam Drive, Suite 108
Mississauga, Ontario L4V 1X5, Canada
Tel: 905-673-0699 Fax: 905-673-6509

ASIA/PACIFIC

Australia

Microchip Technology Australia Pty Ltd
Suite 22, 41 Rawson Street
Epping 2121, NSW
Australia
Tel: 61-2-9868-6733 Fax: 61-2-9868-6755

China - Beijing

Microchip Technology Consulting (Shanghai)
Co., Ltd., Beijing Liaison Office
Unit 915
Bei Hai Wan Tai Bldg.
No. 6 Chaoyangmen Beidajie
Beijing, 100027, No. China
Tel: 86-10-85282100 Fax: 86-10-85282104

China - Chengdu

Microchip Technology Consulting (Shanghai)
Co., Ltd., Chengdu Liaison Office
Rm. 2401, 24th Floor,
Ming Xing Financial Tower
No. 88 TIDU Street
Chengdu 610016, China
Tel: 86-28-6766200 Fax: 86-28-6766599

China - Fuzhou

Microchip Technology Consulting (Shanghai)
Co., Ltd., Fuzhou Liaison Office
Unit 28F, World Trade Plaza
No. 71 Wusi Road
Fuzhou 350001, China
Tel: 86-591-7503506 Fax: 86-591-7503521

China - Shanghai

Microchip Technology Consulting (Shanghai)
Co., Ltd.
Room 701, Bldg. B
Far East International Plaza
No. 317 Xian Xia Road
Shanghai, 200051
Tel: 86-21-6275-5700 Fax: 86-21-6275-5060

China - Shenzhen

Microchip Technology Consulting (Shanghai)
Co., Ltd., Shenzhen Liaison Office
Rm. 1315, 13/F, Shenzhen Kerry Centre,
Renminnan Lu
Shenzhen 518001, China
Tel: 86-755-2350361 Fax: 86-755-2366086

Hong Kong

Microchip Technology Hongkong Ltd.
Unit 901-6, Tower 2, Metroplaza
223 Hing Fong Road
Kwai Fong, N.T., Hong Kong
Tel: 852-2401-1200 Fax: 852-2401-3431

India

Microchip Technology Inc.
India Liaison Office
Divyasree Chambers
1 Floor, Wing A (A3/A4)
No. 11, O'Shaugnessey Road
Bangalore, 560 025, India
Tel: 91-80-2290061 Fax: 91-80-2290062

Japan

Microchip Technology Japan K.K.
Benex S-1 6F
3-18-20, Shinyokohama
Kohoku-Ku, Yokohama-shi
Kanagawa, 222-0033, Japan
Tel: 81-45-471- 6166 Fax: 81-45-471-6122

Korea

Microchip Technology Korea
168-1, Youngbo Bldg. 3 Floor
Samsung-Dong, Kangnam-Ku
Seoul, Korea 135-882
Tel: 82-2-554-7200 Fax: 82-2-558-5934

Singapore

Microchip Technology Singapore Pte Ltd.
200 Middle Road
#07-02 Prime Centre
Singapore, 188980
Tel: 65-334-8870 Fax: 65-334-8850

Taiwan

Microchip Technology Taiwan
11F-3, No. 207
Tung Hua North Road
Taipei, 105, Taiwan
Tel: 886-2-2717-7175 Fax: 886-2-2545-0139

EUROPE

Denmark

Microchip Technology Nordic ApS
Regus Business Centre
Lautrup høj 1-3
Ballerup DK-2750 Denmark
Tel: 45 4420 9895 Fax: 45 4420 9910

France

Microchip Technology SARL
Parc d'Activite du Moulin de Massy
43 Rue du Saule Trapu
Batiment A - 1er Etage
91300 Massy, France
Tel: 33-1-69-53-63-20 Fax: 33-1-69-30-90-79

Germany

Microchip Technology GmbH
Gustav-Heinemann Ring 125
D-81739 Munich, Germany
Tel: 49-89-627-144 0 Fax: 49-89-627-144-44

Italy

Microchip Technology SRL
Centro Direzionale Colleoni
Palazzo Taurus 1 V. Le Colleoni 1
20041 Agrate Brianza
Milan, Italy
Tel: 39-039-65791-1 Fax: 39-039-6899883

United Kingdom

Arizona Microchip Technology Ltd.
505 Eskdale Road
Winnersh Triangle
Wokingham
Berkshire, England RG41 5TU
Tel: 44 118 921 5869 Fax: 44-118 921-5820

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