

256K (32K x 8) CMOS EPROM

FEATURES

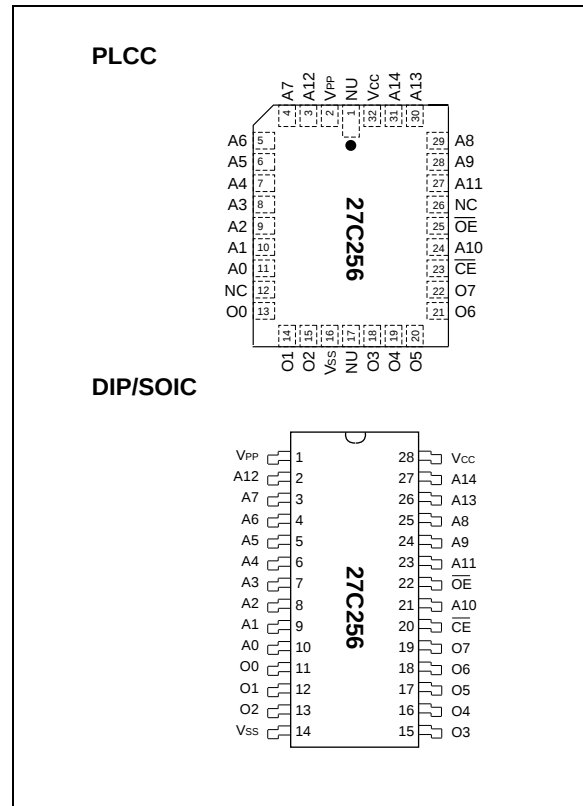
- High speed performance
 - 90 ns access time available
- CMOS Technology for low power consumption
 - 20 mA Active current
 - 100 μ A Standby current
- Factory programming available
- Auto-insertion-compatible plastic packages
- Auto ID aids automated programming
- Separate chip enable and output enable controls
- High speed "express" programming algorithm
- Organized 32K x 8: JEDEC standard pinouts
 - 28-pin Dual-in-line package
 - 32-pin PLCC Package
 - 28-pin SOIC package
 - Tape and reel
- Data Retention > 200 years
- 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. 27C256 is a CMOS 256K bit electrically Programmable Read Only Memory (EPROM). The device is organized as 32K words by 8 bits (32K bytes). Accessing individual bytes from an address transition or from power-up (chip enable pin going low) is accomplished in less than 90 ns. This very high speed device allows the most sophisticated micro-processors to run at full speed without the need for WAIT states. CMOS design and processing enables this part to be used in systems where reduced power consumption and reliability are requirements.

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



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 +14.0V

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-A14	Address Inputs
$\overline{\text{CE}}$	Chip Enable
$\overline{\text{OE}}$	Output Enable
V _{PP}	Programming Voltage
O0 - O7	Data Output
V _{CC}	+5V Power Supply
V _{SS}	Ground
NC	No Connection; No Internal Connection
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; $\overline{\text{OE}} = \overline{\text{CE}} = \text{V}_{\text{IL}}$; 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	$\overline{\text{CE}} = \text{V}_{\text{CC}} \pm 0.2\text{V}$
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 $+85^{\circ}C$ Automotive: $T_{amb} = -40^{\circ}C$ to $+125^{\circ}C$													
Parameter	Sym	27C256-90*		27C256-10*		27C256-12		27C256-15		27C256-20		Units	Conditions
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max		
Address to Output Delay	tACC	—	90	—	100	—	120	—	150	—	200	ns	$\overline{CE} = \overline{OE} = V_{IL}$
$\overline{CE}$ to Output Delay	tCE	—	90	—	100	—	120	—	150	—	200	ns	$\overline{OE} = V_{IL}$
$\overline{OE}$ to Output Delay	tOE	—	40	—	45	—	55	—	65	—	75	ns	$\overline{CE} = V_{IL}$
$\overline{CE}$ or $\overline{OE}$ to O/P High Impedance	tOFF	0	30	0	30	0	35	0	50	0	55	ns	
Output Hold from Address $\overline{CE}$ or $\overline{OE}$, whichever goes first	tOH	0	—	0	—	0	—	0	—	0	—	ns	

* -10, -90 AC Testing Waveform: $V_{IH} = 2.4V$ and $V_{IL} = .45V$; $V_{OH} = 1.5V$ and $V_{OL} = 1.5V$
 Output Load: 1 TTL Load + 30pF

FIGURE 1-1: READ WAVEFORMS

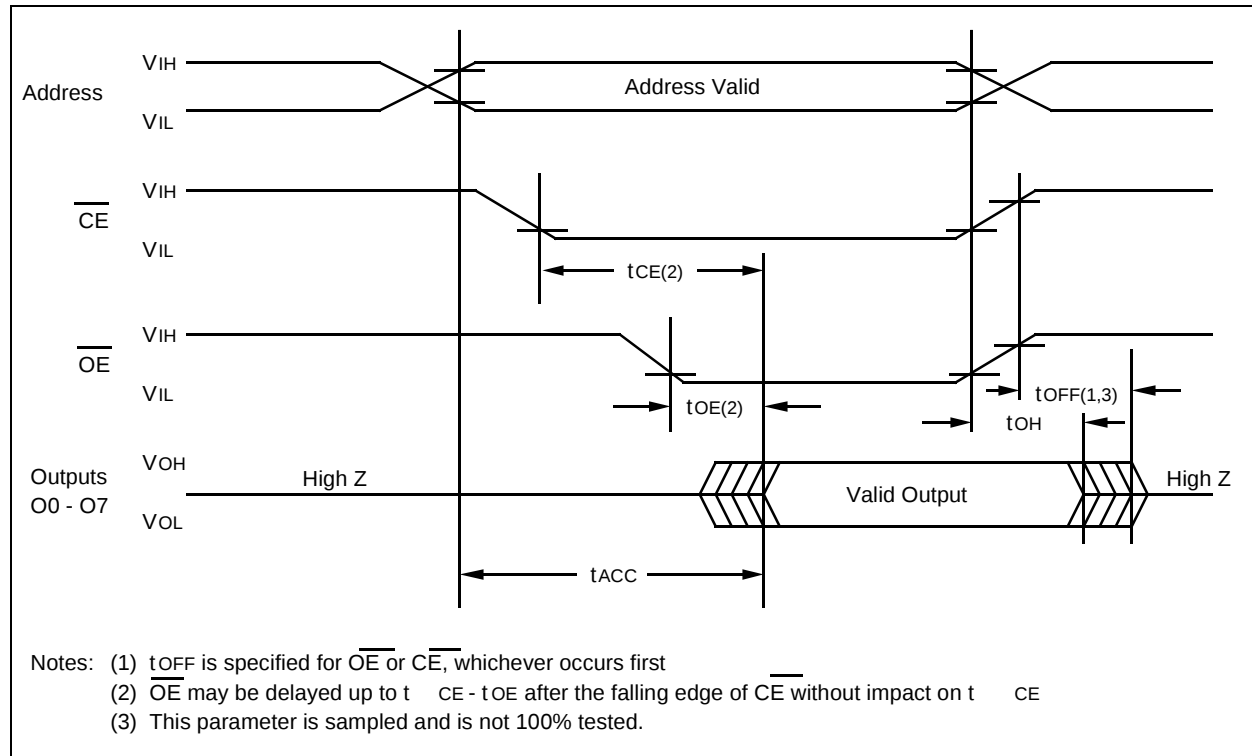


TABLE 1-4: PROGRAMMING DC CHARACTERISTICS

Ambient Temperature: $T_{amb} = 25^{\circ}\text{C} \pm 5^{\circ}\text{C}$ $V_{CC} = 6.5\text{V} \pm 0.25\text{V}$, $V_{PP} = V_H = 13.0\text{V} \pm 0.25\text{V}$						
Parameter	Status	Symbol	Min	Max.	Units	Conditions
Input Voltages	Logic"1" Logic"0"	V_{IH} V_{IL}	2.0 -0.1	$V_{CC}+1$ 0.8	V V	
Input Leakage	—	I_{LI}	-10	10	μA	$V_{IN} = 0\text{V to } V_{CC}$
Output Voltages	Logic"1" Logic"0"	V_{OH} V_{OL}	2.4	0.45	V V	$I_{OH} = -400\text{ }\mu\text{A}$ $I_{OL} = 2.1\text{ mA}$
VCC Current, program & verify	—	I_{CC2}	—	20	mA	Note 1
VPP Current, program	—	I_{PP2}	—	25	mA	Note 1
A9 Product Identification	—	V_H	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 $V_{IL}=0.45V$; $V_{OH}=2.0V$; $V_{OL}=0.8V$ Output Load: 1 TTL Load + 100pF 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 $\mu\text{s} \pm 5\%$.

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

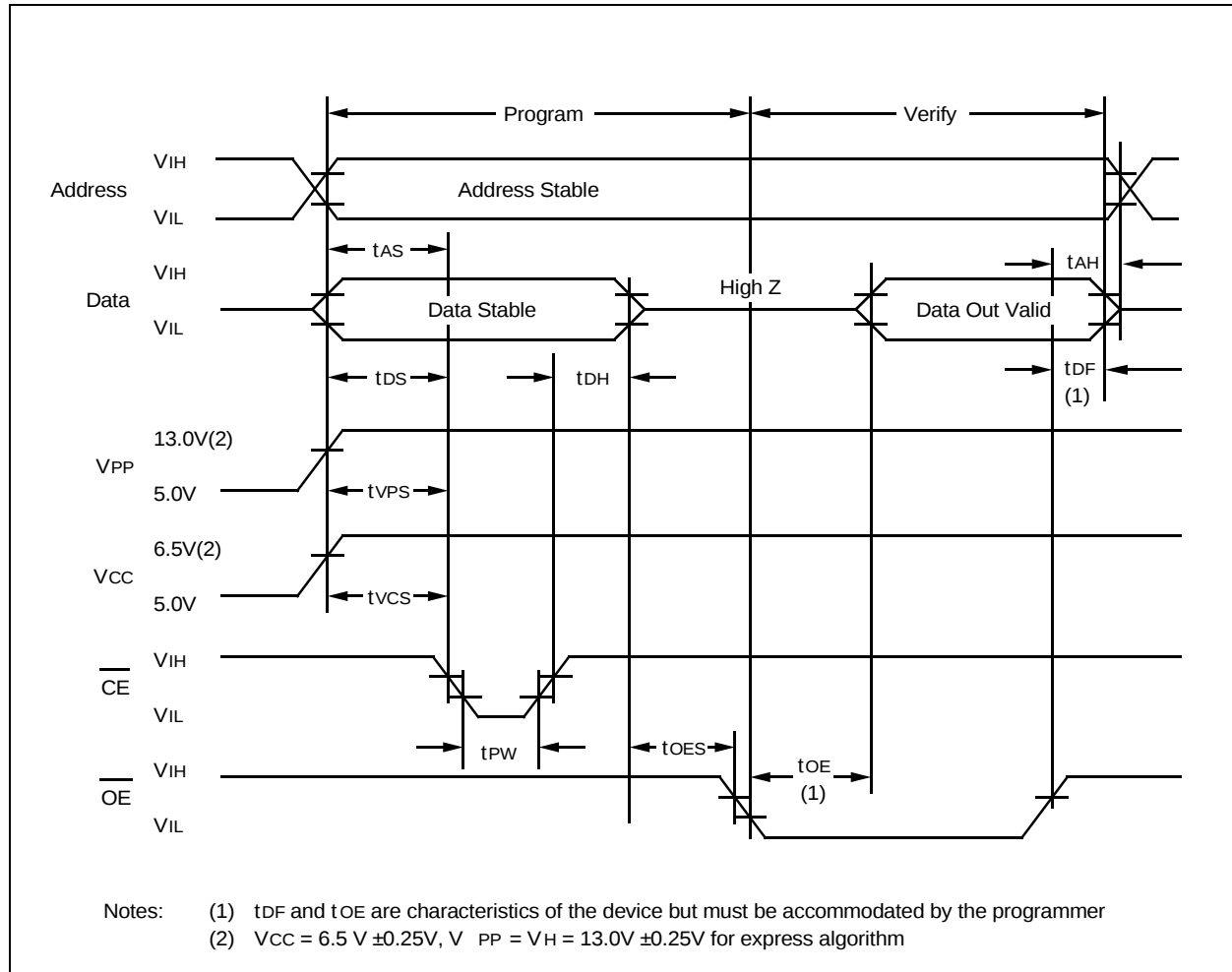


TABLE 1-6: MODES

Operation Mode	$\overline{CE}$	$\overline{OE}$	V_{PP}	A9	O0 - O7
Read	V_{IL}	V_{IL}	V_{CC}	X	DOUT
Program	V_{IL}	V_{IH}	V_{H}	X	DIN
Program Verify	V_{IH}	V_{IL}	V_{H}	X	DOUT
Program Inhibit	V_{IH}	V_{IH}	V_{H}	X	High Z
Standby	V_{IH}	X	V_{CC}	X	High Z
Output Disable	V_{IL}	V_{IH}	V_{CC}	X	High Z
Identity	V_{IL}	V_{IL}	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 multiple bus microprocessor systems and the outputs go to a high impedance when the following condition is true:

- The $\overline{OE}$ pin is high and the program mode is not defined.

1.5 Erase Mode (U.V. Windowed Versions)

Windowed products offer the ability 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 on 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 $\overline{OE}$ pin is high, and
- the $\overline{CE}$ 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-A14 and the data to be programmed is presented to pins O0-O7. When data and address are stable, a low going pulse on the $\overline{CE}$ 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 high, and
- the $\overline{OE}$ line is low.

1.8 Inhibit

When programming multiple devices in parallel with different data, only $\overline{CE}$ need be under separate control to each device. By pulsing the $\overline{CE}$ line low on a particular device, that device will be programmed; all other devices with $\overline{CE}$ held high will not be programmed with the data, although address and data will be available on their input pins.

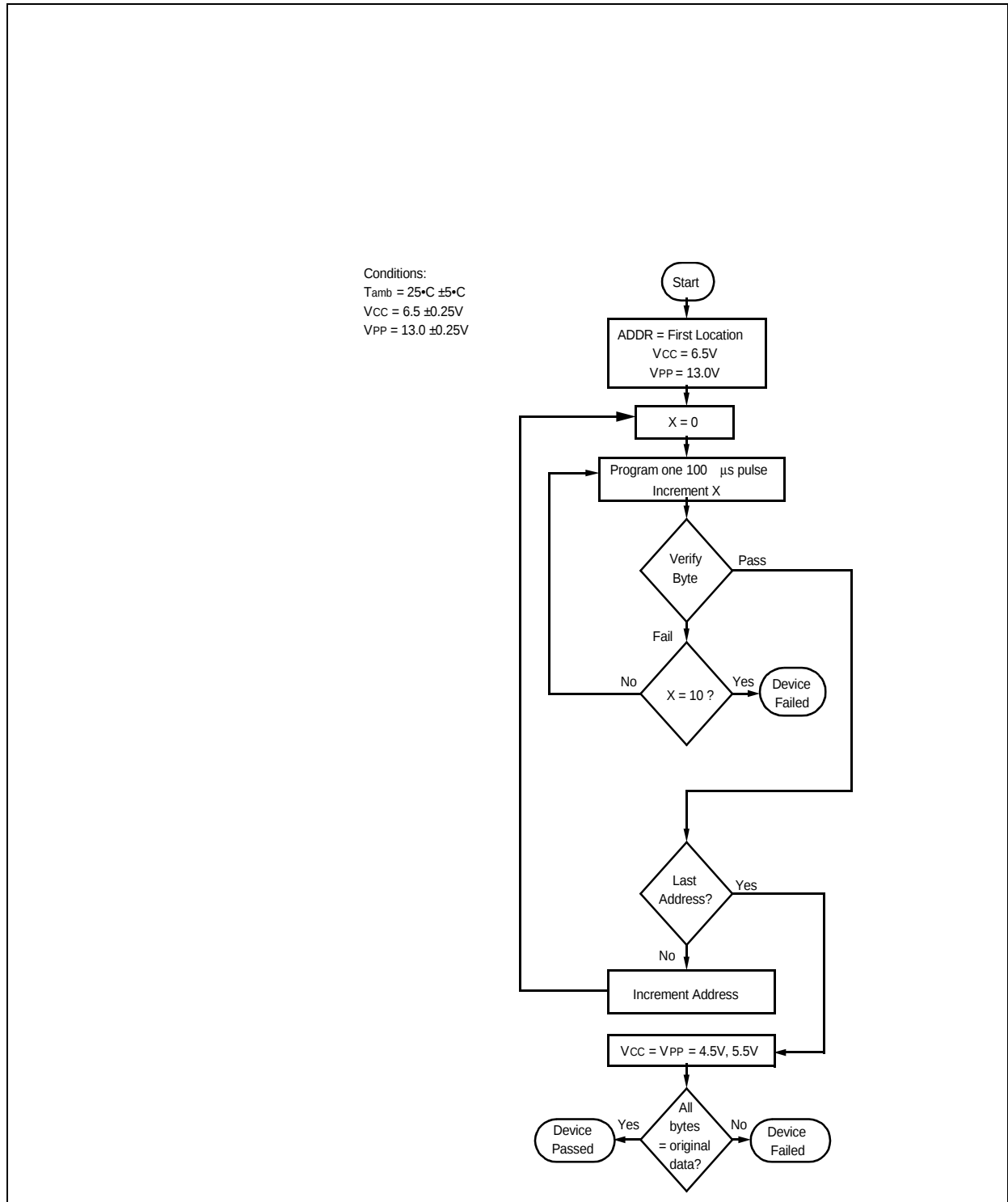
1.9 Identity Mode

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 7	0 6	0 5	0 4	0 3	0 2	0 1	0 0	H e x
Manufacturer	V _{IL}	0	0	1	0	1	0	0	1	29
Device Type*	V _{IH}	1	0	0	0	1	1	0	0	8C

* Code subject to change

FIGURE 1-3: PROGRAMMING EXPRESS ALGORITHM



27C256 Product Identification System

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

27C256		-	90	I	/TS	
						Package:
						L = Plastic Leaded Chip Carrier
						P = Plastic DIP (Mil 600)
						SO = Plastic SOIC (Mil 300)
						Temperature Range:
						Blank = 0°C to +70°C
						I = -40°C to +85°C
						E = -40°C to +125°C
						Access Time:
						90 = 90 ns
						10 = 100 ns
						12 = 120 ns
						15 = 150 ns
						20 = 200 ns
						Device
						27C256 256K (32K x 8) CMOS EPROM

Note the following details of the code protection feature on Microchip devices:

- Microchip products meet the specification contained in their particular Microchip Data Sheet.
- Microchip believes that its family of products is one of the most secure families 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 Microchip products in a manner outside the operating specifications contained in Microchip's Data Sheets. Most likely, the person doing so is 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."

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WORLDWIDE SALES AND SERVICE

AMERICAS

Corporate Office

2355 West Chandler Blvd.
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Tel: 480-792-7200
Fax: 480-792-7277
Technical Support: 480-792-7627
Web Address: www.microchip.com

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3780 Mansell Road, Suite 130
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Fax: 630-285-0075

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Fax: 248-538-2260

Kokomo

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

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Mission Viejo, CA 92691
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Fax: 949-462-9608

San Jose

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Mountain View, CA 94043
Tel: 650-215-1444
Fax: 650-961-0286

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
Unit 32 41 Rawson Street
Epping 2121, NSW
Sydney, Australia
Tel: 61-2-9868-6733
Fax: 61-2-9868-6755

China - Beijing

Unit 706B
Wan Tai Bei Hai Bldg.
No. 6 Chaoyangmen Bei Str.
Beijing, 100027, China
Tel: 86-10-85282100
Fax: 86-10-85282104

China - Chengdu

Rm. 2401-2402, 24th Floor,
Ming Xing Financial Tower
No. 88 TIDU Street
Chengdu 610016, China
Tel: 86-28-86766200
Fax: 86-28-86766599

China - Fuzhou

Unit 28F, World Trade Plaza
No. 71 Wusi Road
Fuzhou 350001, China
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Fax: 86-591-7503521

China - Hong Kong SAR

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China - Shanghai

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Fax: 86-21-6275-5060

China - Shenzhen

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No. 5022 Binhe Road, Futian District
Shenzhen 518033, China
Tel: 86-755-82901380
Fax: 86-755-8295-1393

China - Shunde

Room 401, Hongjian Building, No. 2
Fengxiangnan Road, Ronggui Town, Shunde
District, Foshan City, Guangdong 528303, China
Tel: 86-757-28395507 Fax: 86-757-28395571

China - Qingdao

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No. 12 Hong Kong Central Rd.
Qingdao 266071, China
Tel: 86-532-5027355 Fax: 86-532-5027205

India

Divyasree Chambers
1 Floor, Wing A (A3/A4)
No. 11, O'Shaughnessy Road
Bangalore, 560 025, India
Tel: 91-80-22290061 Fax: 91-80-22290062

Japan

Yusen Shin Yokohama Building 10F
3-17-2, Shin Yokohama, Kohoku-ku,
Yokohama, Kanagawa, 222-0033, Japan
Tel: 81-45-471- 6166 Fax: 81-45-471-6122

Korea

168-1, Youngbo Bldg. 3 Floor
Samsung-Dong, Kangnam-Ku
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Kaohsiung Branch
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Fax: 886-7-536-4817

Taiwan

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Taipei, 105, Taiwan
Tel: 886-2-2717-7175 Fax: 886-2-2545-0139

Taiwan

Taiwan Branch
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Fax: 49-89-627-144-44

Italy

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Milan, Italy
Tel: 39-0331-742611
Fax: 39-0331-466781

Netherlands

Waegenburghtplein 4
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Tel: 31-416-690399
Fax: 31-416-690340

United Kingdom

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