



Obsolete Device

27C256

256K (32K x 8) CMOS EPROM

FEATURES

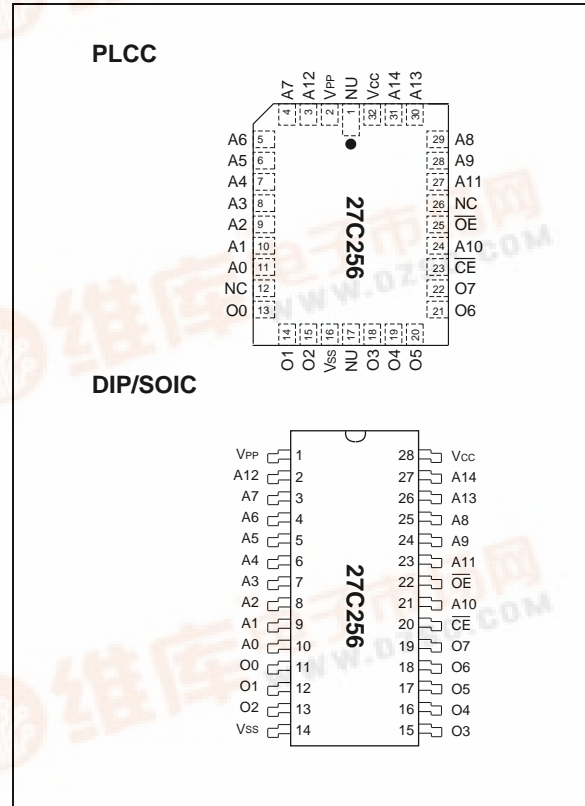
- High speed performance
 - 90 ns access time available
- CMOS Technology for low power consumption
 - 20 mA Active current
 - 100 μ A Standby current
- Factory programming available
- Auto-insertion-compatible plastic packages
- Auto ID aids automated programming
- Separate chip enable and output enable 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 microprocessors 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



27C256

1.0 ELECTRICAL CHARACTERISTICS

1.1 Maximum Ratings*

VCC and input voltages w.r.t. VSS -0.6V to +7.25V

VPP voltage w.r.t. VSS during programming -0.6V to +14.0V

Voltage on A9 w.r.t. VSS -0.6V to +13.5V

Output voltage w.r.t. VSS -0.6V to VCC +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{CE}	Chip Enable
\overline{OE}	Output Enable
VPP	Programming Voltage
O0 - O7	Data Output
VCC	+5V Power Supply
VSS	Ground
NC	No Connection; No Internal Connection
NU	Not Used; No External Connection Is Allowed

TABLE 1-2: READ OPERATION DC CHARACTERISTICS

VCC = +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"	V _{IH}	2.0	V _{CC} +1	V	
		Logic "0"	V _{IL}	-0.5	0.8	V	
Input Leakage	all	—	I _{LI}	-10	10	µA	V _{IN} = 0 to V _{CC}
Output Voltages	all	Logic "1"	V _{OH}	2.4		V	I _{OH} = -400 µA I _{OL} = 2.1 mA
		Logic "0"	V _{OL}		0.45	V	
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	I _{CC1}	—	20	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
		TTL input	I _{CC2}	—	25	mA	
Power Supply Current, Standby	C	TTL input	I _{CC(S)}	—	2	mA	$\overline{CE} = V_{CC} \pm 0.2V$
	I, E	TTL input			3	mA	
	all	CMOS input			100	µA	
IPP Read Current	all	Read Mode	I _{PP}		100	µA	V _{PP} = 5.5V
VPP Read Voltage	all	Read Mode	V _{PP}	V _{CC} -0.7	V _{CC}	V	

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

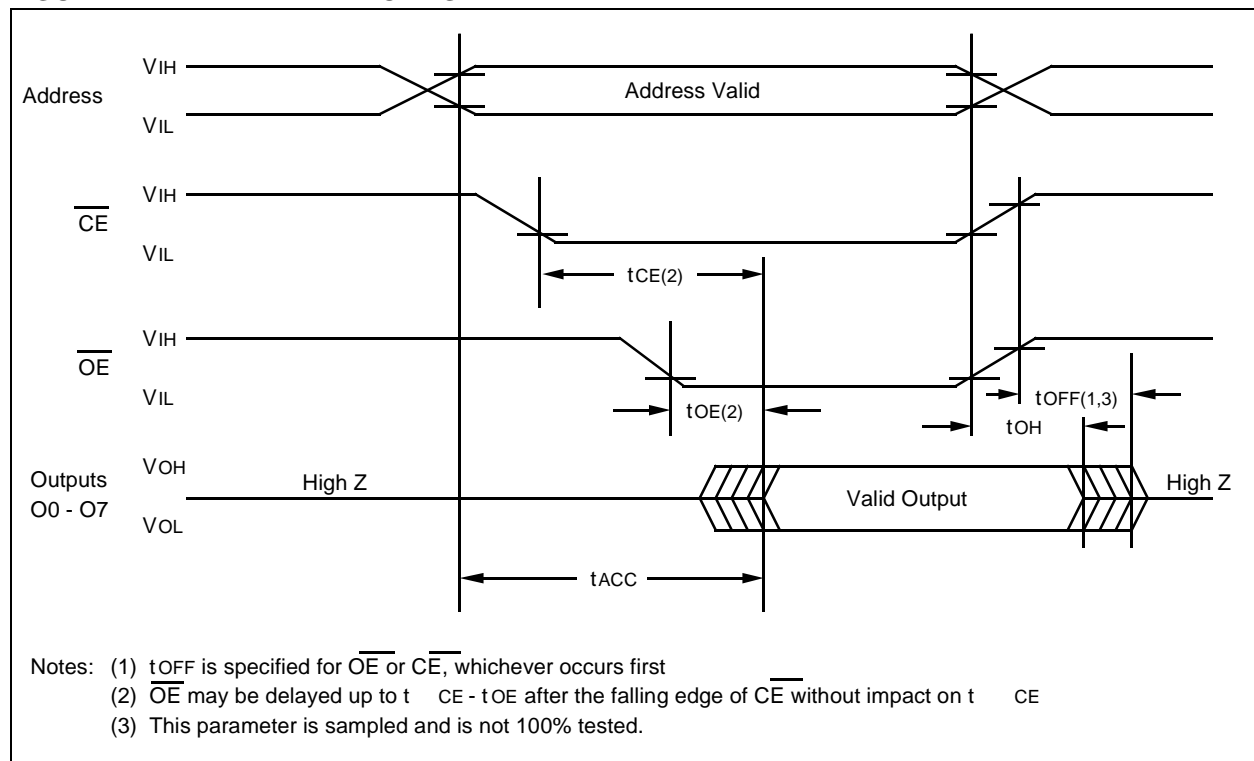
Note 1: Typical active current increases .75 mA per MHz up to operating frequency for all temperature ranges.

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



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TABLE 1-4: PROGRAMMING DC CHARACTERISTICS

Ambient Temperature: T _{amb} = 25°C ± 5°C V _{CC} = 6.5V ± 0.25V, V _{PP} = V _H = 13.0V ± 0.25V						
Parameter	Status	Symbol	Min	Max.	Units	Conditions
Input Voltages	Logic"1"	V _{IH}	2.0	V _{CC} +1	V	
	Logic"0"	V _{IL}	-0.1	0.8	V	
Input Leakage	—	I _{LI}	-10	10	μA	V _{IN} = 0V to V _{CC}
Output Voltages	Logic"1"	V _{OH}	2.4	0.45	V	I _{OH} = -400 μA I _{OL} = 2.1 mA
	Logic"0"	V _{OL}			V	
V _{CC} Current, program & verify	—	I _{CC2}	—	20	mA	Note 1
V _{PP} Current, program	—	I _{PP2}	—	25	mA	Note 1
A9 Product Identification	—	V _H	11.5	12.5	V	

Note 1: V_{CC} must be applied simultaneously or before V_{PP} and removed simultaneously or after V_{PP}

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°C ± 5°C V _{CC} = 6.5V ± 0.25V, V _{PP} = V _H = 13.0V ± 0.25V				
Parameter	Symbol	Min.	Max.	Units	Remarks	
Address Set-Up Time	t _{AS}	2	—	μs		
Data Set-Up Time	t _{DS}	2	—	μs		
Data Hold Time	t _{DH}	2	—	μs		
Address Hold Time	t _{AH}	0	—	μs		
Float Delay (2)	t _{DF}	0	130	ns		
V _{CC} Set-Up Time	t _{VCS}	2	—	μs		
Program Pulse Width (1)	t _{PW}	95	105	μs	100 μs typical	
$\overline{\text{CE}}$ Set-Up Time	t _{CES}	2	—	μs		
$\overline{\text{OE}}$ Set-Up Time	t _{OES}	2	—	μs		
V _{PP} Set-Up Time	t _{VPS}	2	—	μs		
Data Valid from $\overline{\text{OE}}$	t _{OE}	—	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

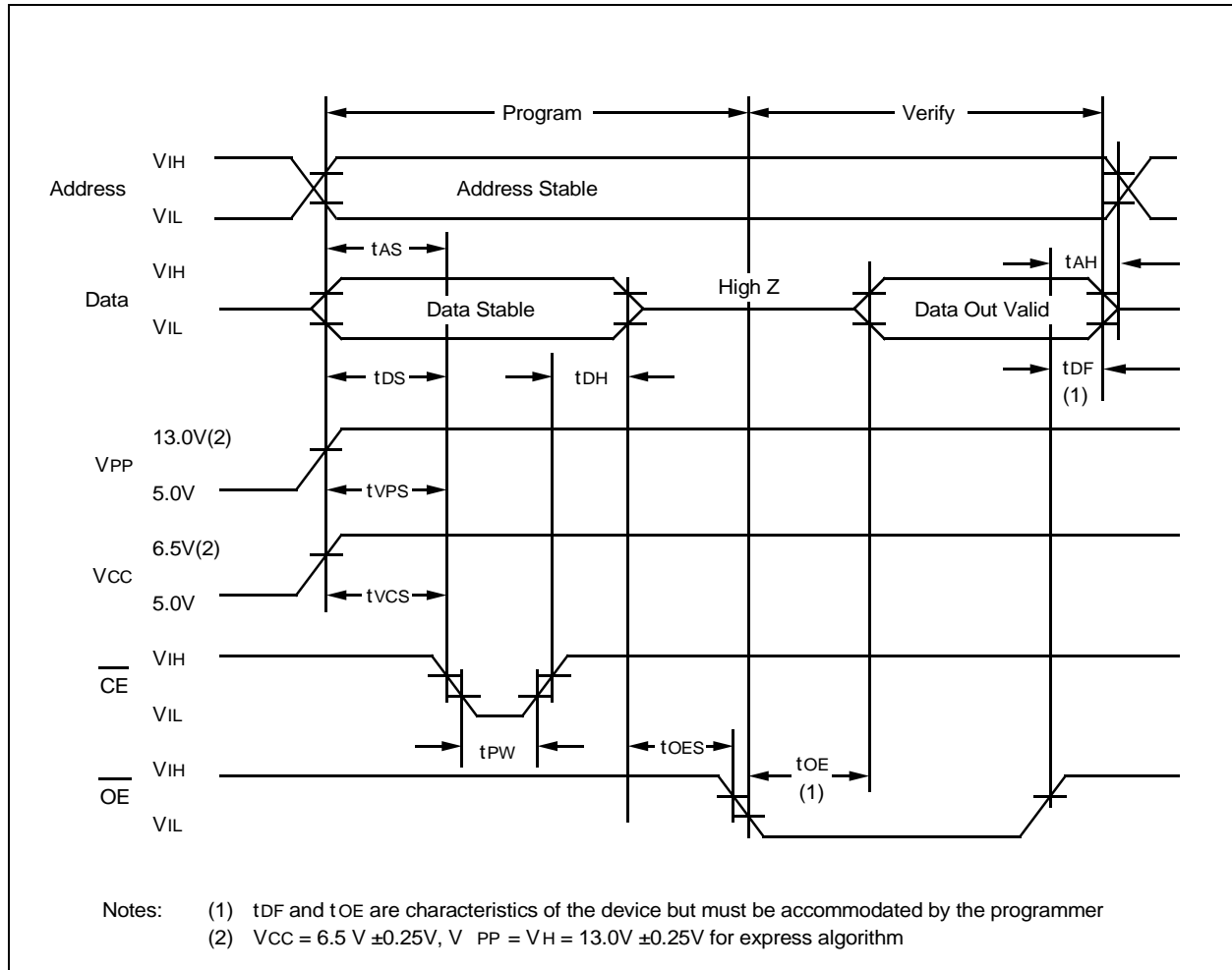


TABLE 1-6: MODES

Operation Mode	\overline{CE}	OE	VPP	A9	O0 - O7
Read	VIL	VIL	VCC	X	DOUT
Program	VIL	V _H	V _H	X	DIN
Program Verify	V _H	VIL	V _H	X	DOUT
Program Inhibit	V _H	V _H	V _H	X	High Z
Standby	V _H	X	VCC	X	High Z
Output Disable	VIL	V _H	VCC	X	High Z
Identity	VIL	VIL	VCC	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}).

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1.3 Standby Mode

The standby mode is defined when the \overline{CE} pin is high (VIH) 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:

- VCC is brought to the proper voltage,
- VPP is brought to the proper VH 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:

- VCC is at the proper level,
- VPP is at the proper VH 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.

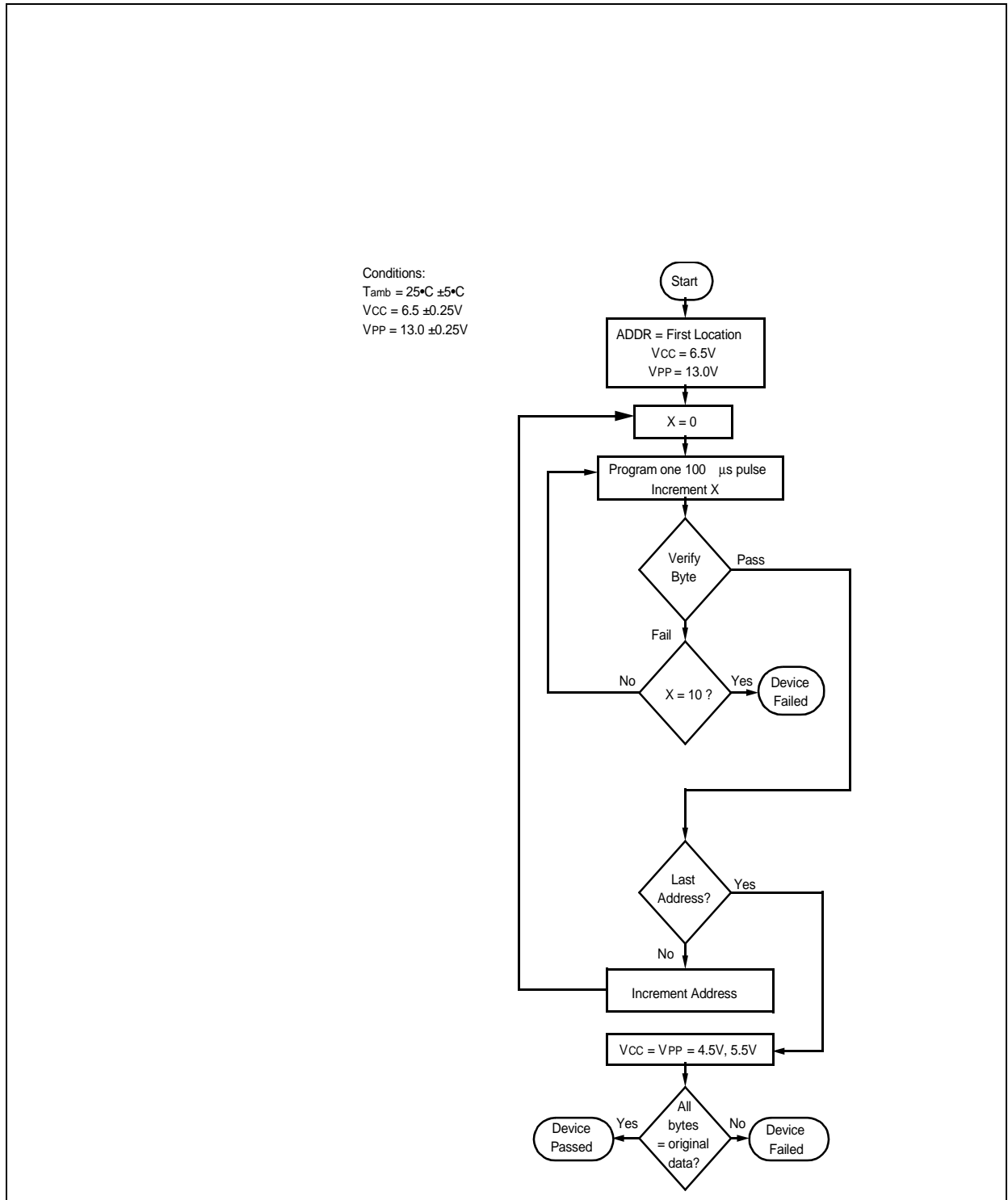
1.9 Identity Mode

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 VH (11.5V to 12.5V). The \overline{CE} and \overline{OE} lines must be at VIL. 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	07	06	05	04	03	02	01	00	Hex
Manufacturer	VIL	0	0	1	0	1	0	0	1	29
Device Type*	VIH	1	0	0	0	1	1	0	0	8C

* Code subject to change

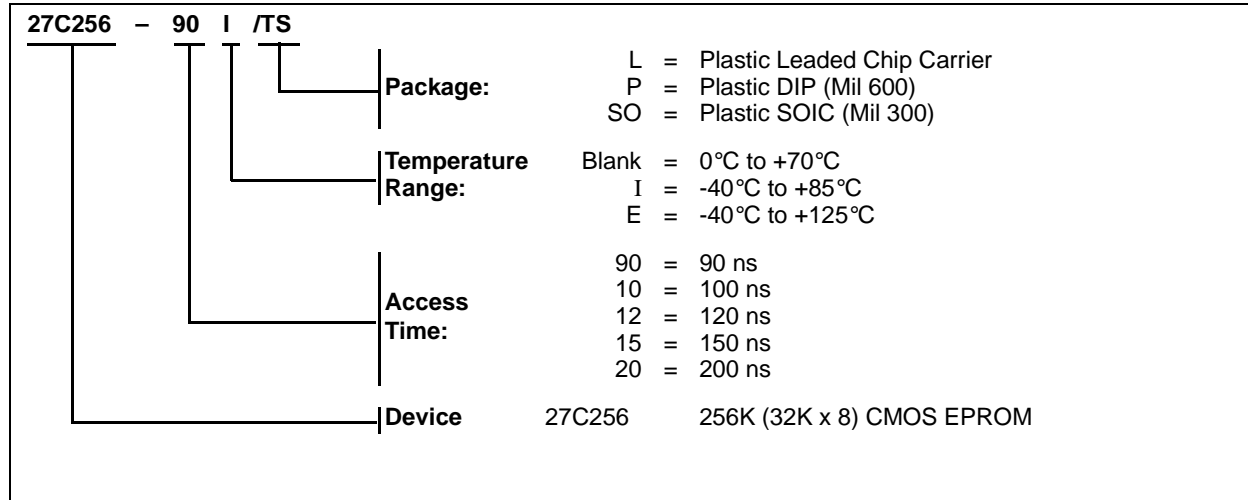
FIGURE 1-3: PROGRAMMING EXPRESS ALGORITHM



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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.



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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Technical Support: 480-792-7627
Web Address: www.microchip.com

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Fax: 248-538-2260

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

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Mission Viejo, CA 92691
Tel: 949-462-9523
Fax: 949-462-9608

San Jose

1300 Terra Bella Avenue
Mountain View, CA 94043
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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
Tel: 86-591-7503506
Fax: 86-591-7503521

China - Hong Kong SAR

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

China - Shanghai

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

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Fax: 86-755-8295-1393

China - Shunde

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Tel: 86-532-5027355 Fax: 86-532-5027205

India

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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
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Korea

168-1, Youngbo Bldg. 3 Floor
Samsung-Dong, Kangnam-Ku
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Kaohsiung Branch
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Min Chuan 2nd Road
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Fax: 886-7-536-4817

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Italy

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Milan, Italy
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Netherlands

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United Kingdom

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Berkshire, England RG41 5TU
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Fax: 44-118-921-5820