FEATURES

- High speed performance
  - 90 ns access time available
- CMOS Technology for low power consumption
  - 20 mA Active current
  - 100 μA 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.
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

<table>
<thead>
<tr>
<th>Name</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>A0-A14</td>
<td>Address Inputs</td>
</tr>
<tr>
<td>CE</td>
<td>Chip Enable</td>
</tr>
<tr>
<td>OE</td>
<td>Output Enable</td>
</tr>
<tr>
<td>VPP</td>
<td>Programming Voltage</td>
</tr>
<tr>
<td>O0 - O7</td>
<td>Data Output</td>
</tr>
<tr>
<td>VCC</td>
<td>-5V Power Supply</td>
</tr>
<tr>
<td>VSS</td>
<td>Ground</td>
</tr>
<tr>
<td>NC</td>
<td>No Connection; No Internal Connection</td>
</tr>
<tr>
<td>NU</td>
<td>Not Used; No External Connection Is Allowed</td>
</tr>
</tbody>
</table>

### TABLE 1-2: READ OPERATION DC CHARACTERISTICS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Part*</th>
<th>Status</th>
<th>Symbol</th>
<th>Min.</th>
<th>Max.</th>
<th>Units</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Voltages</td>
<td>all</td>
<td>Logic “1”</td>
<td>VIH</td>
<td>2.0</td>
<td>VCC+1</td>
<td>V</td>
<td>VIN = 0 to VCC</td>
</tr>
<tr>
<td></td>
<td>all</td>
<td>Logic “0”</td>
<td>VIL</td>
<td>-0.5</td>
<td>0.8</td>
<td>V</td>
<td>VCC</td>
</tr>
<tr>
<td>Input Leakage</td>
<td>all</td>
<td>—</td>
<td>ILI</td>
<td>-10</td>
<td>10</td>
<td>μA</td>
<td>VOUT = 0V to VCC</td>
</tr>
<tr>
<td>Output Voltages</td>
<td>all</td>
<td>Logic “1”</td>
<td>VOH</td>
<td>2.4</td>
<td>V</td>
<td>V</td>
<td>IOH = -400 μA</td>
</tr>
<tr>
<td></td>
<td>all</td>
<td>Logic “0”</td>
<td>VOL</td>
<td>0.45</td>
<td></td>
<td></td>
<td>IOL = 2.1 mA</td>
</tr>
<tr>
<td>Output Leakage</td>
<td>all</td>
<td>—</td>
<td>ILO</td>
<td>-10</td>
<td>10</td>
<td>μA</td>
<td>VIN = 0V; Tamb = 25°C; f = 1 MHz</td>
</tr>
<tr>
<td>Input Capacitance</td>
<td>all</td>
<td>—</td>
<td>CIN</td>
<td>6</td>
<td></td>
<td>pF</td>
<td>VOUT = 0V; Tamb = 25°C; f = 1 MHz</td>
</tr>
<tr>
<td>Output Capacitance</td>
<td>all</td>
<td>—</td>
<td>COUT</td>
<td>12</td>
<td></td>
<td>pF</td>
<td>VOUT = 0V; Tamb = 25°C; f = 1 MHz</td>
</tr>
<tr>
<td>Power Supply Current, Active</td>
<td>C, I, E</td>
<td>TTL input</td>
<td>ICC1</td>
<td>—</td>
<td>20</td>
<td>mA</td>
<td>VCC = 5.5V; VPP = VCC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TTL input</td>
<td>ICC2</td>
<td>—</td>
<td>25</td>
<td>mA</td>
<td>f = 1 MHz; OE = CE = VIH; IOUT = 0 mA;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CMOS input</td>
<td>—</td>
<td></td>
<td></td>
<td></td>
<td>VIH = -0.1 to 0.8V; VIL = -0.1 to 0.8V;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>—</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Note 1</td>
</tr>
<tr>
<td>Power Supply Current, Standby</td>
<td>C, I, E</td>
<td>TTL input</td>
<td>ICC(S)</td>
<td>—</td>
<td>2</td>
<td>mA</td>
<td>VCC = 5.5V; VPP = VCC</td>
</tr>
<tr>
<td></td>
<td>all</td>
<td>TTL input</td>
<td>—</td>
<td></td>
<td>3</td>
<td>mA</td>
<td>f = 1 MHz; OE = CE = VIH; IOUT = 0 mA;</td>
</tr>
<tr>
<td></td>
<td>all</td>
<td>CMOS input</td>
<td>—</td>
<td></td>
<td>100</td>
<td>μA</td>
<td>VIH = -0.1 to 0.8V; VIL = -0.1 to 0.8V;</td>
</tr>
<tr>
<td></td>
<td>all</td>
<td>—</td>
<td>—</td>
<td></td>
<td></td>
<td></td>
<td>Note 1</td>
</tr>
<tr>
<td>IPP Read Current</td>
<td>all</td>
<td>Read Mode</td>
<td>IPP</td>
<td>100</td>
<td></td>
<td>μA</td>
<td>VPP = 5.5V</td>
</tr>
<tr>
<td>VPP Read Voltage</td>
<td>all</td>
<td>Read Mode</td>
<td>VPP</td>
<td></td>
<td>V</td>
<td></td>
<td>VCC-0.7</td>
</tr>
</tbody>
</table>

* 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

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Sym</th>
<th>Units</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address to Output Delay</td>
<td>tACC</td>
<td>Min</td>
<td>Max</td>
</tr>
<tr>
<td>CE to Output Delay</td>
<td>tCE</td>
<td>Min</td>
<td>Max</td>
</tr>
<tr>
<td>OE to Output Delay</td>
<td>tOE</td>
<td>Min</td>
<td>Max</td>
</tr>
<tr>
<td>CE or OE to O/P High Impedance</td>
<td>tOFF</td>
<td>0</td>
<td>30</td>
</tr>
<tr>
<td>Output Hold from Address CE or OE, whichever goes first</td>
<td>toH</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

* -10, -90 AC Testing Waveform: Vih = 2.4V and VIL = .45V; VOH = 1.5V and VOL = 1.5V
Output Load: 1 TTL Load + 30pF

FIGURE 1-1: READ WAVEFORMS

<table>
<thead>
<tr>
<th>Address</th>
<th>Vih</th>
<th>VIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE</td>
<td>Vih</td>
<td>VIL</td>
</tr>
<tr>
<td>OE</td>
<td>Vih</td>
<td>VIL</td>
</tr>
<tr>
<td>Outputs</td>
<td>VOH</td>
<td>VOL</td>
</tr>
<tr>
<td>O0 - O7</td>
<td>High Z</td>
<td>Valid Output</td>
</tr>
</tbody>
</table>

Notes: (1) toff is specified for OE or CE, whichever occurs first
(2) OE may be delayed up to tce - toe after the falling edge of CE without impact on tce
(3) This parameter is sampled and is not 100% tested.
TABLE 1-4: PROGRAMMING DC CHARACTERISTICS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Status</th>
<th>Symbol</th>
<th>Min</th>
<th>Max.</th>
<th>Units</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Voltages</td>
<td>Logic“1”</td>
<td>VIH</td>
<td>2.0</td>
<td>VCC+1</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Logic“0”</td>
<td>VIL</td>
<td>-0.1</td>
<td>0.8</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>Input Leakage</td>
<td>—</td>
<td>ILI</td>
<td>-10</td>
<td>10</td>
<td>µA</td>
<td>VIN = 0V to VCC</td>
</tr>
<tr>
<td>Output Voltages</td>
<td>Logic“1”</td>
<td>VOH</td>
<td>2.4</td>
<td>0.45</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Logic“0”</td>
<td>VOL</td>
<td></td>
<td></td>
<td>V</td>
<td>IIOH = -400 µA, IOL = 2.1 mA</td>
</tr>
<tr>
<td>VCC Current, program &amp; verify</td>
<td>—</td>
<td>ICC2</td>
<td></td>
<td></td>
<td>20</td>
<td>mA Note 1</td>
</tr>
<tr>
<td>VPP Current, program</td>
<td>—</td>
<td>IPP2</td>
<td></td>
<td></td>
<td>25</td>
<td>mA Note 1</td>
</tr>
<tr>
<td>A9 Product Identification</td>
<td>—</td>
<td>VH</td>
<td>11.5</td>
<td>12.5</td>
<td>V</td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Min.</th>
<th>Max.</th>
<th>Units</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address Set-Up Time</td>
<td>tAS</td>
<td>2</td>
<td>—</td>
<td>µs</td>
<td></td>
</tr>
<tr>
<td>Data Set-Up Time</td>
<td>tDS</td>
<td>2</td>
<td>—</td>
<td>µs</td>
<td></td>
</tr>
<tr>
<td>Data Hold Time</td>
<td>tDH</td>
<td>2</td>
<td>—</td>
<td>µs</td>
<td></td>
</tr>
<tr>
<td>Address Hold Time</td>
<td>tAH</td>
<td>0</td>
<td>—</td>
<td>µs</td>
<td></td>
</tr>
<tr>
<td>Float Delay (2)</td>
<td>tDF</td>
<td>0</td>
<td>130</td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td>VCC Set-Up Time</td>
<td>tVCS</td>
<td>2</td>
<td>—</td>
<td>µs</td>
<td></td>
</tr>
<tr>
<td>Program Pulse Width (1)</td>
<td>tpW</td>
<td>95</td>
<td>105</td>
<td>µs</td>
<td>100 µs typical</td>
</tr>
<tr>
<td>CE Set-Up Time</td>
<td>tcES</td>
<td>2</td>
<td>—</td>
<td>µs</td>
<td></td>
</tr>
<tr>
<td>OE Set-Up Time</td>
<td>toES</td>
<td>2</td>
<td>—</td>
<td>µs</td>
<td></td>
</tr>
<tr>
<td>VPP Set-Up Time</td>
<td>tvPS</td>
<td>2</td>
<td>—</td>
<td>µs</td>
<td></td>
</tr>
<tr>
<td>Data Valid from OE</td>
<td>tOE</td>
<td>—</td>
<td>100</td>
<td>ns</td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Operation Mode</th>
<th>CE</th>
<th>OE</th>
<th>VPP</th>
<th>A9</th>
<th>O0 - O7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Read</td>
<td>VIL</td>
<td>VIL</td>
<td>VCC</td>
<td>X</td>
<td>DOUT</td>
</tr>
<tr>
<td>Program</td>
<td>VIL</td>
<td>VIL</td>
<td>VH</td>
<td>X</td>
<td>DIN</td>
</tr>
<tr>
<td>Program Verify</td>
<td>VIL</td>
<td>VIL</td>
<td>VH</td>
<td>X</td>
<td>DOUT</td>
</tr>
<tr>
<td>Program Inhibit</td>
<td>VIL</td>
<td>VIL</td>
<td>VH</td>
<td>X</td>
<td>High Z</td>
</tr>
<tr>
<td>Standby</td>
<td>VIL</td>
<td>X</td>
<td>VCC</td>
<td>X</td>
<td>High Z</td>
</tr>
<tr>
<td>Output Disable</td>
<td>VIL</td>
<td>VIL</td>
<td>VCC</td>
<td>X</td>
<td>High Z</td>
</tr>
<tr>
<td>Identity</td>
<td>VIL</td>
<td>VIL</td>
<td>VCC</td>
<td>VH</td>
<td>Identity Code</td>
</tr>
</tbody>
</table>

X = Don’t Care

1.2 Read Mode

(See Timing Diagrams and AC Characteristics) For Read operations, if the addresses are stable, the address access time (tACC) is equal to the delay from CE to output (tCE). Data is transferred to the output after a delay from the falling edge of OE (tOE).

Read Mode is accessed when:

a) the CE pin is low to power up (enable) the chip
b) the OE pin is low to gate the data to the output pins
1.3 **Standby Mode**

The standby mode is defined when the 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 µA.

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 CE 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 µW/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:

a) VCC is brought to the proper voltage,
b) VPP is brought to the proper VH level,
c) the OE pin is high, and
d) the 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 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:

a) VCC is at the proper level,
b) VPP is at the proper VH level,
c) the CE line is high, and
d) the OE line is low.

1.8 **Inhibit**

When programming multiple devices in parallel with different data, only CE need be under separate control to each device. By pulsing the CE line low on a particular device, that device will be programmed; all other devices with 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 CE and OE lines must be at VIH. A0 is used to access any of the two non-erasable bytes whose data appears on O0 through O7.

<table>
<thead>
<tr>
<th>Pin</th>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identity A0</td>
<td>0 0 0 0 0 0 0 1</td>
<td>O O O O O O O H</td>
</tr>
<tr>
<td>Manufacturer VIL</td>
<td>0 0 0 0 1 1 0</td>
<td></td>
</tr>
<tr>
<td>Device Type*</td>
<td>VIL</td>
<td>0</td>
</tr>
</tbody>
</table>

* Code subject to change
FIGURE 1-3: PROGRAMMING EXPRESS ALGORITHM

Conditions:
T<sub>amb</sub> = 25°C ±5°C
V<sub>CC</sub> = 6.5 ±0.25V
V<sub>PP</sub> = 13.0 ±0.25V

Start

ADDR = First Location
V<sub>CC</sub> = 6.5V
V<sub>PP</sub> = 13.0V

X = 0

Program one 100 µs pulse
Increment X

Verify Byte
Pass

Fail

Yes

Device Failed

X = 10 ?

No

Last Address?
Yes

Device Passed

All bytes = original data?
No

Device Failed

Increment Address

V<sub>CC</sub> = V<sub>PP</sub> = 4.5V, 5.5V
## 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.

<table>
<thead>
<tr>
<th>Device</th>
<th>27C256</th>
<th>256K (32K x 8) CMOS EPROM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Package:</td>
<td>L = Plastic Leaded Chip Carrier</td>
<td>P = Plastic DIP (Mil 600)</td>
</tr>
<tr>
<td>Temperature Range:</td>
<td>Blank = 0˚C to +70˚C</td>
<td>I = -40˚C to +85˚C</td>
</tr>
<tr>
<td>Access Time:</td>
<td>90 = 90 ns</td>
<td>10 = 100 ns</td>
</tr>
</tbody>
</table>
WORLDWIDE SALES AND SERVICE

AMERICAS
Corporate Office
Microchip Technology Inc.
2355 West Chandler Blvd.
Chandler, AZ 85224-6189
Tel: 480-786-7200 Fax: 480-786-7277
Technical Support: 480-786-7627
Web Address: http://www.microchip.com

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

Boston
Microchip Technology Inc.
5 Mount Royal Avenue
Marlborough, MA 01752
Tel: 508-480-9990 Fax: 508-480-8575

Chicago
Microchip Technology Inc.
333 Pierce Road, Suite 180
Itasca, IL 60143
Tel: 630-285-0071 Fax: 630-285-0075

Dallas
Microchip Technology Inc.
4570 Westgrove Drive, Suite 160
Addison, TX 75248
Tel: 972-818-7423 Fax: 972-818-2924

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

Los Angeles
Microchip Technology Inc.
18201 Von Karman, Suite 1090
Irvine, CA 92612
Tel: 949-263-1888 Fax: 949-263-1338

New York
Microchip Technology Inc.
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

AMERICAS (continued)

Toronto
Microchip Technology Inc.
5925 Airport Road, Suite 200
Mississauga, Ontario L4V 1W1, Canada
Tel: 905-405-6279 Fax: 905-405-6253

ASIA/PACIFIC

Hong Kong
Microchip Asia Pacific
Unit 2101, Tower 2
Metropolis
233 Hang Fong Road
Kwai Fong, N.T., Hong Kong
Tel: 852-2-401-1200 Fax: 852-2-401-3431

Beijing
Microchip Technology, Beijing
Unit 915, 6 Chaoyangmen Bei Dajie
Dong Erhuan Road, Dongcheng District
New China Hong Kong Manhattan Building
Beijing 100022 PRC
Tel: 86-10-85282100 Fax: 86-10-85282104

India
Microchip Technology Inc.
India Liaison Office
No. 6, Legacy, Covent Road
Bangalore 560 025, India
Tel: 91-80-229-0061 Fax: 91-80-2290062

Japan
Microchip Technology Int. Inc.
Benex S-1 6F
3-18-20, Shin Yokohama
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
Tel: 82-2-554-7200 Fax: 82-2-558-5934

Shanghai
Microchip Technology
RM 406 Shanghai Golden Bridge Bldg.
2077 Yan’an Road West, Hong Qiao District
Shanghai, PRC 200033
Tel: 86-21-6275-5700 Fax: 86-21-6275-5060

ASIA/PACIFIC (continued)

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

Taiwan, R.O.C
Microchip Technology Taiwan
10F-1C 207
Tung Hua North Road
Taipei, Taiwan, ROC
Tel: 886-2-2717-7175 Fax: 886-2-2545-0139

EUROPE

United Kingdom
Arizona Microchip Technology Ltd.
505 Eskdale Road
Winnesh Triangle
Wokingham
Berkshire, England RG41 STU
Tel: 44 118 921 5858 Fax: 44-118 921-5835

Denmark
Microchip Technology Denmark ApS
Regus Business Centre
Lautrup hj 1-3
Ballerpur DK-2750 Denmark
Tel: 45 4420 9856 Fax: 45 4420 9910

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

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

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

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