

## 1K 5.0V I<sup>2</sup>C™ Serial EEPROM

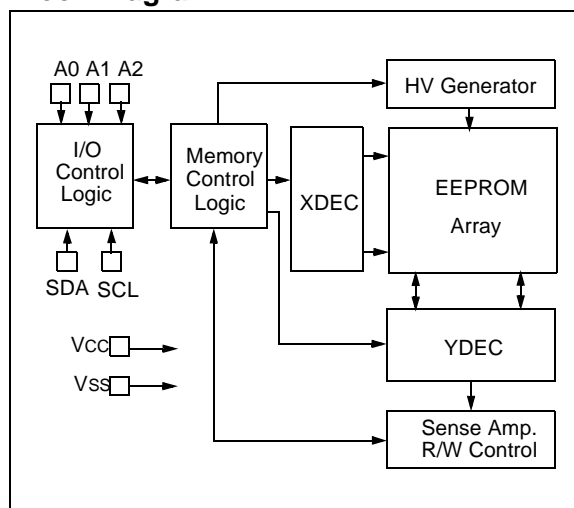
### Features:

- Single Supply with Operation from 4.5V to 5.5V
- Low-Power CMOS Technology:
  - Read current 1 mA, max.
  - Standby current 5  $\mu$ A, max.
- 2-Wire Serial Interface, I<sup>2</sup>C™ Compatible
- Cascadable up to Eight Devices
- Schmitt Trigger Inputs for Noise Suppression
- Output Slope Control to Eliminate Ground Bounce
- 100 kHz and 400 kHz Clock Compatibility
- Page Write Time 1 ms max.
- Self-Timed Erase/Write Cycle
- 16-Byte Page Write Buffer
- ESD Protection >4000V
- More than 1 Million Erase/Write Cycles
- Data Retention >200 Years
- Factory Programming Available
- Packages include 8-lead PDIP, SOIC, TSSOP, DFN, TDFN and MSOP
- Pb-Free and RoHS Compliant
- Temperature Ranges:
  - Industrial (I): -40°C to +85°C
  - Automotive (E): -40°C to +125°C

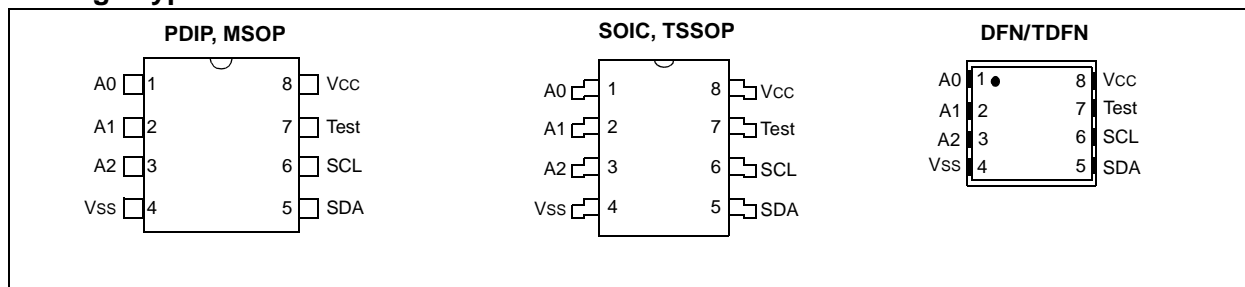
### Description:

The Microchip Technology Inc. 24C01C is a 1K bit Serial Electrically Erasable PROM with a voltage range of 4.5V to 5.5V. The device is organized as a single block of 128 x 8-bit memory with a 2-wire serial interface. Low-current design permits operation with max. standby and active currents of only 5  $\mu$ A and 1 mA, respectively. The device has a page write capability for up to 16 bytes of data and has fast write cycle times of only 1 ms for both byte and page writes. Functional address lines allow the connection of up to eight 24C01C devices on the same bus for up to 8K bits of contiguous EEPROM memory. The device is available in the standard 8-pin PDIP, 8-pin SOIC (3.90 mm), 8-pin 2x3 DFN and TDFN, 8-pin MSOP and TSSOP packages.

### Block Diagram



### Package Types



# 24C01C

## 1.0 ELECTRICAL CHARACTERISTICS

### Absolute Maximum Ratings<sup>(†)</sup>

|   |                                |
|---|--------------------------------|
| V <sub>CC</sub> .....                               | 7.0V                           |
| All inputs and outputs w.r.t. V <sub>SS</sub> ..... | -0.6V to V <sub>CC</sub> +1.0V |
| Storage temperature .....                           | -65°C to +150°C                |
| Ambient temperature with power applied.....         | -40°C to +125°C                |
| ESD protection on all pins .....                    | ≥ 4 kV                         |

† NOTICE: Stresses above those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational listings of this specification is not implied. Exposure to Absolute Maximum Rating conditions for extended periods may affect device reliability.

**TABLE 1-1: DC CHARACTERISTICS**

| DC CHARACTERISTICS |                                    |  | Electrical Characteristics:                     |                     |                                  |   |
|--------------------|------------------------------------|--|---|---------------------|----------------------------------|---|
|                    |                                    |  | Industrial (I): V <sub>CC</sub> = +4.5V to 5.5V |                     | T <sub>A</sub> = -40°C to +85°C  |   |
|                    |                                    |  | Automotive (E): V <sub>CC</sub> = +4.5V to 5.5V |                     | T <sub>A</sub> = -40°C to +125°C |   |
| Param. No.         | Sym.                               | Characteristic                                       | Min.  | Max.                | Units                            | Conditions  |
| D1                 | —                                  | A0, A1, A2, SCL, SDA and WP pins:                    | —   | —                   | —                                | —   |
| D2                 | V <sub>IH</sub>                    | High-level input voltage                             | 0.7 V <sub>CC</sub>                             | —                   | V                                | —   |
| D3                 | V <sub>IL</sub>                    | Low-level input voltage                              | —   | 0.3 V <sub>CC</sub> | V                                | —   |
| D4                 | V <sub>HYS</sub>                   | Hysteresis of Schmitt Trigger inputs (SDA, SCL pins) | 0.05 V <sub>CC</sub>                            | —                   | V                                | <b>(Note)</b>   |
| D5                 | V <sub>OL</sub>                    | Low-level output voltage                             | —   | 0.40                | V                                | I <sub>OL</sub> = 3.0 mA @ V <sub>CC</sub> = 4.5V                           |
| D6                 | I <sub>I</sub>                     | Input leakage current                                | —   | ±1                  | μA                               | V <sub>IN</sub> = V <sub>SS</sub> or V <sub>CC</sub> , WP = V <sub>SS</sub> |
| D7                 | I <sub>O</sub>                     | Output leakage current                               | —   | ±1                  | μA                               | V <sub>OUT</sub> = V <sub>SS</sub> or V <sub>CC</sub>                       |
| D8                 | C <sub>IN</sub> , C <sub>OUT</sub> | Pin capacitance (all inputs/outputs)                 | —   | 10                  | pF                               | V <sub>CC</sub> = 5.0V <b>(Note)</b><br>T <sub>A</sub> = 25°C, f = 1 MHz    |
| D9                 | I <sub>CC</sub> Read               | Operating current                                    | —   | 1                   | mA                               | V <sub>CC</sub> = 5.5V, SCL = 400 kHz                                       |
|                    | I <sub>CC</sub> Write              |  | —   | 3                   | mA                               | V <sub>CC</sub> = 5.5V  |
| D10                | I <sub>CCS</sub>                   | Standby current                                      | —   | 5                   | μA                               | V <sub>CC</sub> = 5.5V, SDA = SCL = V <sub>CC</sub><br>WP = V <sub>SS</sub> |

**Note:** This parameter is periodically sampled and not 100% tested.

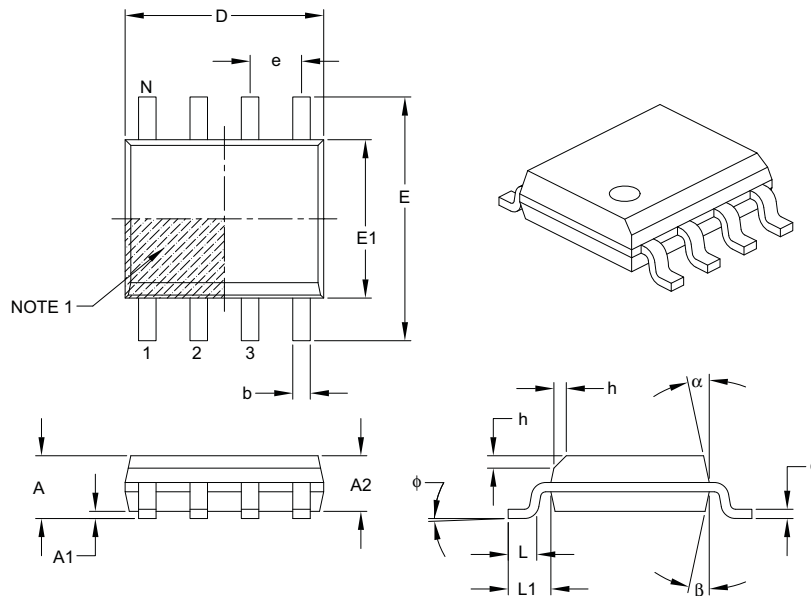
TABLE 1-2: AC CHARACTERISTICS

| AC CHARACTERISTICS |         |  | Electrical Characteristics:         |             |                      |               |
|--------------------|---------|--|-------------------------------------|-------------|----------------------|---------------|
|                    |         |  | Industrial (I): VCC = +4.5V to 5.5V |             | TA = -40°C to +85°C  |               |
|                    |         |  | Automotive (E): VCC = +4.5V to 5.5V |             | TA = -40°C to +125°C |               |
| Param. No.         | Sym.    | Characteristic   | Min.                                | Max.        | Units                | Conditions    |
| 1                  | FCLK    | Clock frequency  | —<br>—                              | 100<br>400  | kHz                  | —<br>(I-temp) |
| 2                  | THIGH   | Clock high time  | 4000<br>600                         | —<br>—      | ns                   | —<br>(I-temp) |
| 3                  | TLOW    | Clock low time   | 4700<br>1300                        | —<br>—      | ns                   | —<br>(I-temp) |
| 4                  | TR      | SDA and SCL rise time<br>(Note 1)  | —<br>—                              | 1000<br>300 | ns                   | —<br>(I-temp) |
| 5                  | TF      | SDA and SCL fall time<br>(Note 1)  | —                                   | 300         | ns                   | —             |
| 6                  | THD:STA | Start condition hold time  | 4000<br>600                         | —<br>—      | ns                   | —<br>(I-temp) |
| 7                  | TSU:STA | Start condition setup time   | 4700<br>600                         | —<br>—      | ns                   | —<br>(I-temp) |
| 8                  | THD:DAT | Data input hold time   | 0                                   | —           | ns                   | (Note 2)      |
| 9                  | TSU:DAT | Data input setup time  | 250<br>100                          | —<br>—      | ns                   | —<br>(I-temp) |
| 10                 | TSU:STO | Stop condition setup time  | 4000<br>600                         | —<br>—      | ns                   | —<br>(I-temp) |
| 11                 | TAA     | Output valid from clock<br>(Note 2)  | —<br>—                              | 3500<br>900 | ns                   | —<br>(I-temp) |
| 12                 | TBUF    | Bus free time: Time the bus must be free before a new transmission can start | 4700<br>1300                        | —<br>—      | ns                   | —<br>(I-temp) |
| 13                 | TOF     | Output fall time from VIH minimum to VIL maximum<br>CB ≤ 100 pF              | 10 + 0.1CB                          | 250         | ns                   | (Note 1)      |
| 14                 | TSP     | Input filter spike suppression (SDA and SCL pins)                            | —                                   | 50          | ns                   | (Note 3)      |
| 15                 | TWC     | Write cycle time (byte or page)  | —                                   | 1.5<br>1    | ms                   | —<br>(I-temp) |
| 16                 | —       | Endurance  | 1,000,000                           | —           | cycles               | 25°C (Note 4) |

**Note 1:** Not 100% tested. CB = total capacitance of one bus line in pF.

- 2:** As a transmitter, the device must provide an internal minimum delay time to bridge the undefined region (minimum 300 ns) of the falling edge of SCL to avoid unintended generation of Start or Stop conditions.
- 3:** The combined TSP and VHYS specifications are due to new Schmitt Trigger inputs, which provide improved noise spike suppression. This eliminates the need for a TI specification for standard operation.
- 4:** This parameter is not tested but ensured by characterization. For endurance estimates in a specific application, please consult the Total Endurance™ Model, which can be obtained from Microchip's web site

## 8-Lead Plastic Small Outline (SN) – Narrow, 3.90 mm Body [SOIC]



| Dimension Limits         | Units | MILLIMETERS |     |      |
|--------------------------|-------|-------------|-----|------|
|                          |       | MIN         | NOM | MAX  |
| Number of Pins           | N     | 8           |     |      |
| Pitch                    | e     | 1.27 BSC    |     |      |
| Overall Height           | A     | –           | –   | 1.75 |
| Molded Package Thickness | A2    | 1.25        | –   | –    |
| Standoff §               | A1    | 0.10        | –   | 0.25 |
| Overall Width            | E     | 6.00 BSC    |     |      |
| Molded Package Width     | E1    | 3.90 BSC    |     |      |
| Overall Length           | D     | 4.90 BSC    |     |      |
| Chamfer (optional)       | h     | 0.25        | –   | 0.50 |
| Foot Length              | L     | 0.40        | –   | 1.27 |
| Footprint                | L1    | 1.04 REF    |     |      |
| Foot Angle               | φ     | 0°          | –   | 8°   |
| Lead Thickness           | c     | 0.17        | –   | 0.25 |
| Lead Width               | b     | 0.31        | –   | 0.51 |
| Mold Draft Angle Top     | α     | 5°          | –   | 15°  |
| Mold Draft Angle Bottom  | β     | 5°          | –   | 15°  |

### Notes:

- Pin 1 visual index feature may vary, but must be located within the hatched area.
- § Significant Characteristic.
- Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.15 mm per side.
- Dimensioning and tolerancing per ASME Y14.5M.

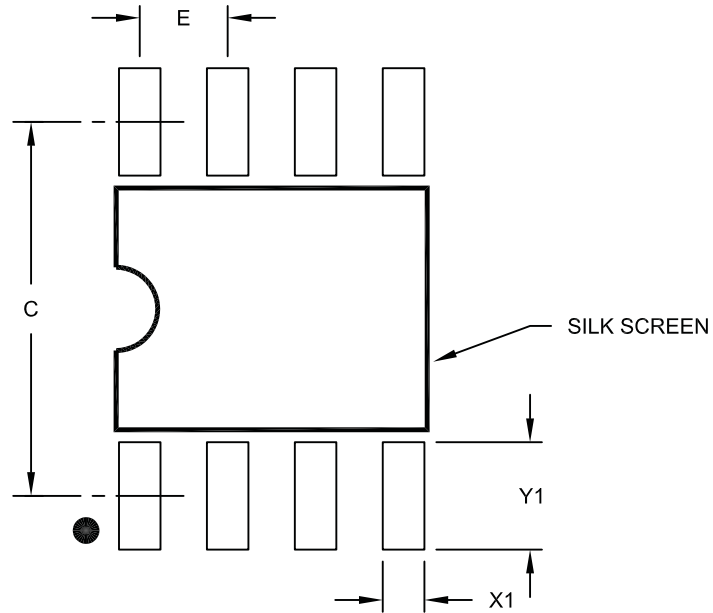
BSC: Basic Dimension. Theoretically exact value shown without tolerances.

REF: Reference Dimension, usually without tolerance, for information purposes only.

Microchip Technology Drawing C04-057B

# 24C01C

## 8-Lead Plastic Small Outline (SN) – Narrow, 3.90 mm Body [SOIC]



RECOMMENDED LAND PATTERN

| Dimension Limits        | Units | MILLIMETERS |          |      |
|-------------------------|-------|-------------|----------|------|
|                         |       | MIN         | NOM      | MAX  |
| Contact Pitch           | E     |             | 1.27 BSC |      |
| Contact Pad Spacing     | C     |             | 5.40     |      |
| Contact Pad Width (X8)  | X1    |             |          | 0.60 |
| Contact Pad Length (X8) | Y1    |             |          | 1.55 |

Notes:

1. Dimensioning and tolerancing per ASME Y14.5M

BSC: Basic Dimension. Theoretically exact value shown without tolerances.

Microchip Technology Drawing No. C04-2057A

## PRODUCT IDENTIFICATION SYSTEM

To order or obtain information, e.g., on pricing or delivery, refer to the factory or the listed sales office.

| <u>PART NO.</u>  | <u>X</u>          | <u>/XX</u>  |
|--|-------------------|---|
| Device   | Temperature Range | Package   |
| <p><b>Device:</b></p> <p>24C01C: 1K I<sup>2</sup>C Serial EEPROM<br/>           24C01CT: 1K I<sup>2</sup>C Serial EEPROM (Tape and Reel)</p> <p><b>Temperature Range:</b></p> <p>I = -40°C to +85°C<br/>           E = -40°C to +125°C</p> <p><b>Package:</b></p> <p>P = Plastic DIP (300 mil Body), 8-lead<br/>           SN = Plastic SOIC, (3.90 mm Body), 8-lead<br/>           ST = TSSOP (4.4 mm Body), 8-lead<br/>           MS = Plastic Micro Small Outline (MSOP), 8-lead<br/>           MC = Plastic Dual Flat (DFN), No lead, 2x3 mm body, 8-lead<br/>           MNY<sup>(1)</sup> = Plastic Dual Flat (TDFN), No lead package, 2x3 mm body, 8-lead</p> <p><b>Note 1:</b> "Y" indicates a Nickel, Palladium, Gold (NiPdAu) finish.</p> |                   | <p><b>Examples:</b></p> <p>a) 24C01C-I/P: Industrial Temperature, PDIP Package</p> <p>b) 24C01C-E/SN: Extended Temperature, SOIC Package</p> <p>c) 24C01C-I/MNY: Industrial Temperature, 2x3 TDFN Package</p> |