# Product Change Notification: SYST-09EFRG993

## Date:

10-Apr-2025

## Product Category:

Memory

## Notification Subject:

Data Sheet - 24AA16/24LC16B/24FC16 - 16-Kbit I²C Serial EEPROM

## Affected CPNs:

**SYST-09EFRG993_Affected_CPN_04102025.pdf**
**SYST-09EFRG993_Affected_CPN_04102025.csv**

## Notification Text:

| SYST-09EFRG993 |
| --- |
| Microchip has released a new Datasheet for the 24AA16/24LC16B/24FC16 - 16-Kbit I²C Serial EEPROM of devices. If you are using one of these devices please read the document located at **24AA16/24LC16B/24FC16 - 16-Kbit I²C Serial EEPROM**.<br><br>**Notification Status:** Final<br><br>**Description of Change:**<br><br>Updated Q6B package outline drawing; Minor editorial updates throughout the document.<br><br>**Impacts to Data Sheet:** See above details.<br><br>**Change Implementation Status:** Complete<br><br>**Date Document Changes Effective:** 10 Apr 2025<br><br>**NOTE:** Please be advised that this is a change to the document only the product has not been changed. |

**Markings to Distinguish Revised from Unrevised Devices:**:N/A

## Attachments:

### 24AA16/24LC16B/24FC16 - 16-Kbit $I^2C$ Serial EEPROM

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Affected Catalog Part Numbers (CPN)

24LC16B/ST

24LC16B/SN

24LC16B/P

24AA16/P

24LC16B-E/ST

24FC16-E/ST

24LC16BH-E/ST

24AA16-E/ST

24LC16B-E/MS

24FC16-E/MS

24LC16BH-E/MS

24AA16-E/MS

24LC16B-E/MC

24LC16B-E/SN

24FC16-E/SN

24LC16BH-E/SN

24FC16H-E/SN

24AA16-E/SN

24FC16-E/SN36KVAO

24LC16B-E/P

24FC16-E/P

24LC16BH-E/P

24AA16-E/P

24LC16B-I/ST

24FC16-I/ST

24LC16BH-I/ST

24AA16-I/ST

24AA16H-I/ST

24LC16B-I/MS

24FC16-I/MS

24LC16BH-I/MS

24AA16-I/MS

24AA16H-I/MS

24LC16B-I/MC

24AA16-I/MC

24LC16B-I/SN

24FC16-I/SN

24LC16BH-I/SN

24FC16H-I/SN

24AA16-I/SN

24AA16H-I/SN

24LC16B-I/P

24FC16-I/P

24LC16BH-I/P

24AA16-I/P

24AA16H-I/P

24LC16BT/ST

24LC16BT/SN

24LC16BT-I/MNY

24LC16BHT-I/MNY

24AA16T-I/MNY

24AA16HT-I/MNY

24LC16BT-I/ST

24FC16T-I/ST

24LC16BHT-I/ST

24AA16T-I/ST

24AA16HT-I/ST

24LC16BT-I/MS

24FC16T-I/MS

24LC16BHT-I/MS

24AA16T-I/MS

24AA16HT-I/MS

24LC16BT-I/MC

24AA16T-I/MC

24LC16BT-I/SN

24FC16T-I/SN

24LC16BHT-I/SN

24FC16HT-I/SN

24AA16T-I/SN

24AA16HT-I/SN

24LC16BT-I/OT

24FC16T-I/OT

24LC16BHT-I/OT

24FC16HT-I/OT

24AA16T-I/OT

24AA16HT-I/OT

24FC16T-I/MUY

24FC16T-I/Q4B

24FC16T-E/Q6B36KVAO

24LC16BT-E/MNY

24LC16BHT-E/MNY

24AA16T-E/MNY

24LC16BT-E/ST

24FC16T-E/ST

24LC16BHT-E/ST

24AA16T-E/ST

24FC16T-E/ST36KVAO

24LC16BT-E/MS

24FC16T-E/MS

24LC16BHT-E/MS

24AA16T-E/MS

24LC16BT-E/MC

24LC16BT-E/SN

24FC16T-E/SN

24LC16BHT-E/SN

24FC16HT-E/SN

24AA16T-E/SN

24FC16T-E/SN36KVAO

24LC16BT-E/OT

24FC16T-E/OT

24LC16BHT-E/OT

24FC16HT-E/OT

24AA16T-E/OT

24FC16T-E/OT36KVAO

24FC16T-E/MUY

24FC16T-E/Q4B

24LC16B-E/SNA26

24AA16-I/SNB22

24LC16BT/SNA31

24LC16BT/SNRVE

24LC16BT-I/SNRVE

24LC16BT-I/SN15KV02

24LC16BT-I/SN15KV08

24LC16BT-I/SN15KV13

24LC16BT-I/SN15KV14

24AA16T-I/SN15KVAO

24LC16BT-I/OT15KV11

24LC16BT-I/OT15KV17

24LC16BT-E/SNA26

24LC16BT-E/SN15KV03

24LC16BT-E/SN15KV15

24LC16BT-E/SN15KV16

24LC16BT-E/SN15KVAO

24LC16BT-E/ST15KV10

24LC16BT-E/OTG15KV05

24LC16BT-E/OT15KV12

24LC16BT-E/OT15KV12-BW

24AA16SC/WNBI15K

24LC16B-E/SN16KVAO

24LC16B-M/SN

24AA16-I/S0816K

24AA16-I/MC16KVAO

24LC16B-I/PRVF

24LC16B-I/ST116

24LC16BT-H/SN16KVAO

24LC16BT-H/OT16KVAO

24LC16BT/SNA79

24LC16BT-I/MC16KVAO

24AA16T-I/MC16KVAO

24AA16T-I/SNB22

24LC16BT-I/SN16KVAO

24LC16BT-I/ST114

24LC16BT-I/ST116

24LC16BT-I/STA31

24AA16T-I/OT117

24AA16T-I/OT118

24LC16BT-I/OTGYR

24LC16BT-I/OT16KV06

24LC16BT-I/OT16KVAO

24AA16T-I/OT16KVAO

24LC16BT-M/SN

24LC16BT-M/OT

24LC16BT-E/MNYRVF

24LC16BT-E/MNY16KVAO

24AA16T-E/MNY16KVAO

24LC16BT-E/SN16KV03

24LC16BT-E/SN16KV04

24LC16BT-E/SN16KV07

24LC16BT-E/SN16KVAO

24LC16BT-E/OT16KV09

24LC16BT-E/OT16KVAO

24AA16T-E/OT16KVAO

24LC16BT-E/OT16KVAO-BW

24LC16BHT-E/OT16KV01

# 24AA16/24LC16B/24FC16

## 16-Kbit I²C Serial EEPROM

### Device Selection Table

| Part Number | Vcc Range | Max. Clock Frequency | Temp. Ranges | Available Packages |
|---|---|---|---|---|
| 24AA16 | 1.7V-5.5V | 400 kHz(1) | I, E | MC, MS, P, SN, OT, MNY, ST |
| 24LC16B | 2.5V-5.5V | 400 kHz | I, E | MC, MS, P, SN, OT, MNY, ST |
| 24FC16 | 1.7V-5.5V | 1 MHz | I, E | MS, P, SN, OT, ST, Q4B, Q6B |

**Note 1:** 100 kHz for Vcc < 2.5V.

### Features

- Single Supply with Operation down to 1.7V for 24AA16 and 24FC16 Devices, 2.5V for 24LC16B Devices
- Low-Power CMOS Technology:
  - Read current 1 mA, maximum
  - Standby current 1 µA, maximum (I-Temp.)
- Two-Wire Serial Interface, I²C Compatible
- Schmitt Trigger Inputs for Noise Suppression
- Output Slope Control to Eliminate Ground Bounce
- 100 kHz, 400 kHz and 1 MHz Compatibility
- Page Write Time: 5 ms, Maximum
- Self-Timed Erase/Write Cycle
- 16-Byte Page Write Buffer
- Hardware Write-Protect
- ESD Protection > 4,000V
- More than 1 Million Erase/Write Cycles
- Data Retention > 200 Years
- Factory Programming Available
- RoHS Compliant
- Temperature Ranges:
  - Industrial (I): -40°C to +85°C
  - Extended (E): -40°C to +125°C
- AEC-Q100 Automotive Qualified

### Packages

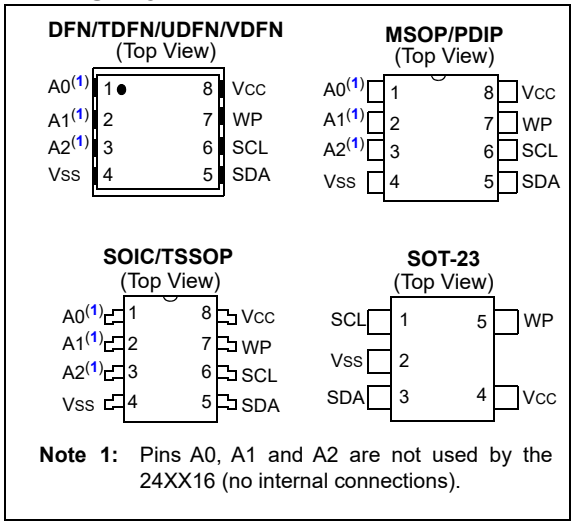
- 8-Lead DFN, 8-Lead MSOP, 8-Lead PDIP, 8-Lead SOIC, 5-Lead SOT-23, 8-Lead TDFN, 8-Lead TSSOP, 8-Lead UDFN and 8-Lead Wettable Flanks VDFN

### Description

The Microchip Technology Inc. 24XX16(1) is a 16-Kbit Electrically Erasable PROM (EEPROM). The device is organized as eight blocks of 256 x 8-bit memory with a two-wire serial interface. Its low-voltage design permits operation down to 1.7V with standby and active currents of only 1 µA and 1 mA, respectively. The 24XX16 also has a page write capability for up to 16 bytes of data.

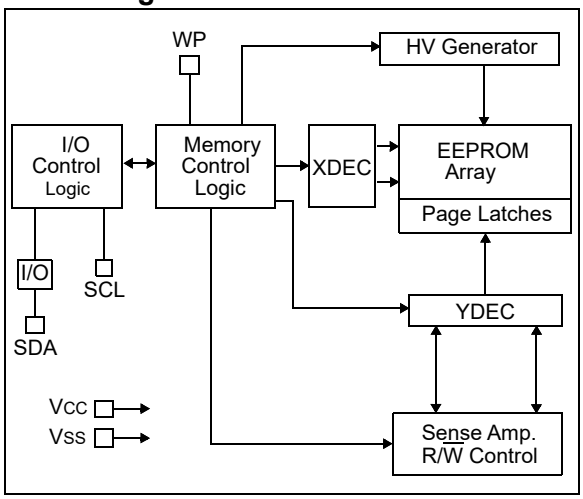
**Note 1:** 24XX16 is used in this document as a generic part number for the 24AA16/24LC16B/24FC16 devices.

### Package Types




**Note 1:** Pins A0, A1 and A2 are not used by the 24XX16 (no internal connections).

## Block Diagram



# 1.0 ELECTRICAL CHARACTERISTICS

## Absolute Maximum Ratings (†)

VCC.....6.5V

All inputs and outputs w.r.t. VSS .....-0.3V to VCC +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 those or any other conditions above those indicated in the operational listings of this specification is not implied. Exposure to maximum rating conditions for extended periods may affect device reliability.

**TABLE 1-1: DC CHARACTERISTICS**

| **DC CHARACTERISTICS** | | | **Industrial (I): TA = -40°C to +85°C, VCC = +1.7V to +5.5V<br>Extended (E): TA = -40°C to +125°C, VCC = +2.5V to +5.5V (24LC16B)<br>Extended (E): TA = -40°C to +125°C, VCC = +1.7V to +5.5V (24FC16)** | | | |
|---|---|---|---|---|---|---|
| **Param. No.** | **Symbol** | **Characteristic** | **Min.** | **Max.** | **Units** | **Conditions** |
| D1 | VIH | High-Level Input Voltage | 0.7 VCC | — | V | |
| D2 | VIL | Low-Level Input Voltage | — | 0.3 VCC | V | |
| D3 | VHYS | Hysteresis of Schmitt Trigger Inputs | 0.05 VCC | — | V | **Note 1** |
| D4 | VOL | Low-Level Output Voltage | — | 0.40 | V | IOL = 3.0 mA, VCC = 2.5V |
| D5 | ILI | Input Leakage Current | — | ±1 | µA | VIN = VSS or VCC |
| D6 | ILO | Output Leakage Current | — | ±1 | µA | VOUT = VSS or VCC |
| D7 | CIN, COUT | Pin Capacitance (all inputs/outputs) | — | 10 | pF | VCC = 5.0V (**Note 1**)<br>TA = 25°C, FCLK = 1 MHz |
| D8 | ICCWRITE | Operating Current | — | 3 | mA | VCC = 5.5V, SCL = 400 kHz |
| D9 | ICCREAD | | — | 1 | mA | VCC = 5.5V, SCL = 400 kHz |
| D10 | ICCS | Standby Current | — | 1 | µA | SDA = SCL = VCC<br>WP = VSS, I-Temp. |
| | | | — | 3 | µA | SDA = SCL = VCC<br>WP = VSS, E-Temp. (**24FC16**) |
| | | | — | 5 | µA | SDA = SCL = VCC<br>WP = VSS, E-Temp. (**24LC16B**) |

**Note 1:** This parameter is periodically sampled and not 100% tested.

**TABLE 1-2: AC CHARACTERISTICS**

| AC CHARACTERISTICS | | | Industrial (I): $T_A$ = -40°C to +85°C, $V_{CC}$ = +1.7V to +5.5V<br>Extended (E): $T_A$ = -40°C to +125°C, $V_{CC}$ = +2.5V to +5.5V (24LC16B)<br>Extended (E): $T_A$ = -40°C to +125°C, $V_{CC}$ = +1.7V to +5.5V (24FC16) | | | |
|---|---|---|---|---|---|---|
| **Param. No.** | **Symbol** | **Characteristic** | **Min.** | **Max.** | **Units** | **Conditions** |
| 1 | $F_{CLK}$ | Clock Frequency | — | 400 | kHz | 2.5V ≤ $V_{CC}$ ≤ 5.5V |
| | | | — | 100 | kHz | 1.7V ≤ $V_{CC}$ < 2.5V (**24AA16**) |
| | | | — | 1000 | kHz | 1.7V ≤ $V_{CC}$ ≤ 5.5V (**24FC16**) |
| 2 | $T_{HIGH}$ | Clock High Time | 600 | — | ns | 2.5V ≤ $V_{CC}$ ≤ 5.5V |
| | | | 4000 | — | ns | 1.7V ≤ $V_{CC}$ < 2.5V (**24AA16**) |
| | | | 260 | — | ns | 1.7V ≤ $V_{CC}$ ≤ 5.5V (**24FC16**) |
| 3 | $T_{LOW}$ | Clock Low Time | 1300 | — | ns | 2.5V ≤ $V_{CC}$ ≤ 5.5V |
| | | | 4700 | — | ns | 1.7V ≤ $V_{CC}$ < 2.5V (**24AA16**) |
| | | | 500 | — | ns | 1.7V ≤ $V_{CC}$ ≤ 5.5V (**24FC16**) |
| 4 | $T_R$ | SDA and SCL Rise Time | — | 300 | ns | 2.5V ≤ $V_{CC}$ ≤ 5.5V (**Note 1**) |
| | | | — | 1000 | ns | 1.7V ≤ $V_{CC}$ < 2.5V (**24AA16**) (**Note 1**) |
| | | | — | 1000 | ns | 1.7V ≤ $V_{CC}$ ≤ 5.5V (**24FC16**) (**Note 1**) |
| 5 | $T_F$ | SDA and SCL Fall Time | — | 300 | ns | **Note 1** |
| 6 | $T_{HD:STA}$ | Start Condition Hold Time | 600 | — | ns | 2.5V ≤ $V_{CC}$ ≤ 5.5V |
| | | | 4000 | — | ns | 1.7V ≤ $V_{CC}$ < 2.5V (**24AA16**) |
| | | | 250 | — | ns | 1.7V ≤ $V_{CC}$ ≤ 5.5V (**24FC16**) |
| 7 | $T_{SU:STA}$ | Start Condition Setup Time | 600 | — | ns | 2.5V ≤ $V_{CC}$ ≤ 5.5V |
| | | | 4700 | — | ns | 1.7V ≤ $V_{CC}$ < 2.5V (**24AA16**) |
| | | | 250 | — | ns | 1.7V ≤ $V_{CC}$ ≤ 5.5V (**24FC16**) |
| 8 | $T_{HD:DAT}$ | Data Input Hold Time | 0 | — | ns | **Note 2** |
| 9 | $T_{SU:DAT}$ | Data Input Setup Time | 100 | — | ns | 2.5V ≤ $V_{CC}$ ≤ 5.5V |
| | | | 250 | — | ns | 1.7V ≤ $V_{CC}$ < 2.5V (**24AA16**) |
| | | | 50 | — | ns | 1.7V ≤ $V_{CC}$ ≤ 5.5V (**24FC16**) |
| 10 | $T_{SU:STO}$ | Stop Condition Setup Time | 600 | — | ns | 2.5V ≤ $V_{CC}$ ≤ 5.5V |
| | | | 4000 | — | ns | 1.7V ≤ $V_{CC}$ < 2.5V (**24AA16**) |
| | | | 250 | — | ns | 1.7V ≤ $V_{CC}$ ≤ 5.5V (**24FC16**) |
| 11 | $T_{SU:WP}$ | WP Setup Time | 600 | — | ns | 1.7V ≤ $V_{CC}$ ≤ 5.5V (**24FC16**) |
| 12 | $T_{HD:WP}$ | WP Hold Time | 600 | — | ns | 1.7V ≤ $V_{CC}$ ≤ 5.5V (**24FC16**) |
| 13 | $T_{AA}$ | Output Valid from Clock | — | 900 | ns | 2.5V ≤ $V_{CC}$ ≤ 5.5V (**Note 2**) |
| | | | — | 3500 | ns | 1.7V ≤ $V_{CC}$ < 2.5V (**24AA16**) (**Note 2**) |
| | | | — | 450 | ns | 1.7V ≤ $V_{CC}$ ≤ 5.5V (**24FC16**) (**Note 2**) |
| 14 | $T_{BUF}$ | Bus Free Time: The time the bus must be free before a new transmission can start | 1300 | — | ns | 2.5V ≤ $V_{CC}$ ≤ 5.5V |
| | | | 4700 | — | ns | 1.7V ≤ $V_{CC}$ < 2.5V (**24AA16**) |
| | | | 500 | — | ns | 1.7V ≤ $V_{CC}$ ≤ 5.5V (**24FC16**) |

**Note 1:** Characterized but not 100% tested.

**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:** $C_B$ = total capacitance of one bus line in pF.

**4:** This parameter is not tested but ensured by characterization.

**TABLE 1-2: AC CHARACTERISTICS**

| AC CHARACTERISTICS (Continued) | | | Industrial (I): TA = -40°C to +85°C, VCC = +1.7V to +5.5V<br>Extended (E):TA = -40°C to +125°C, VCC = +2.5V to +5.5V (24LC16B)<br>Extended (E):TA = -40°C to +125°C, VCC = +1.7V to +5.5V (24FC16) | | | |
|---|---|---|---|---|---|---|
| **Param. No.** | **Symbol** | **Characteristic** | **Min.** | **Max.** | **Units** | **Conditions** |
| 15 | TOF | Output Fall Time from VIH Minimum to VIL Maximum | — | 250 | ns | 2.5V ≤ VCC ≤ 5.5V (Notes 1, Note 3 and Note 4) |
| | | | — | 250 | ns | 1.7V ≤ VCC < 2.5V (**24AA16**) (Notes 1, Note 3 and Note 4) |
| 16 | TSP | Input Filter Spike Suppression (SDA and SCL pins) | — | 50 | ns | **Note 1** |
| | | | — | 100 | ns | 1.7V ≤ VCC ≤ 5.5V (**24FC16**) (**Note 1**) |
| 17 | TWC | Write Cycle Time (byte or page) | — | 5 | ms | |
| 18 | | Endurance | 1,000,000 | — | cycles | +25°C, 5.5V, Page Mode (**Note 4**) |

**Note 1:** Characterized but not 100% tested.

**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:** CB = total capacitance of one bus line in pF.

**4:** This parameter is not tested but ensured by characterization.

**FIGURE 1-1: BUS TIMING DATA**

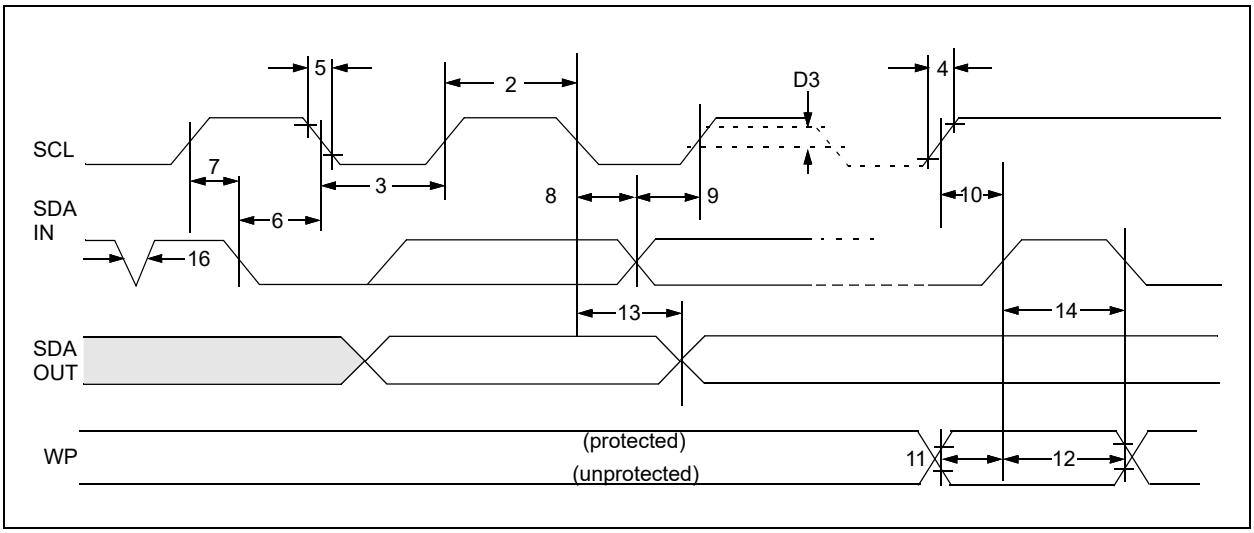
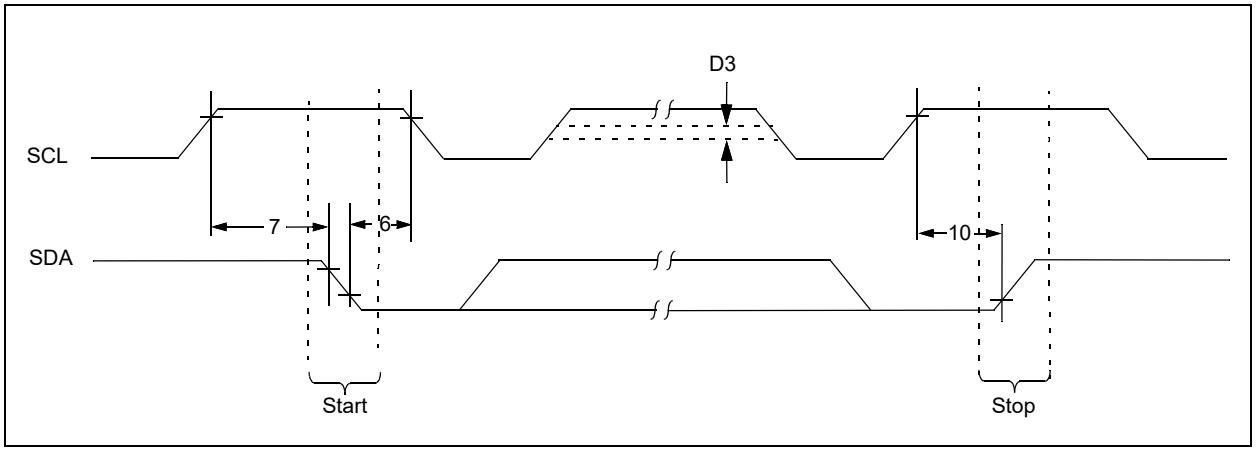


**FIGURE 1-2: BUS TIMING START/STOP**



## 2.0 PIN DESCRIPTIONS

The descriptions of the pins are listed in Table 2-1.

**TABLE 2-1: PIN FUNCTION TABLE**

| Name | DFN(1) | MSOP | PDIP | SOIC | SOT-23 | TDFN(1) | TSSOP | UDFN(1) | VDFN(1) | Description |
|---|---|---|---|---|---|---|---|---|---|---|
| A0 | 1 | 1 | 1 | 1 | — | 1 | 1 | 1 | 1 | Not Connected |
| A1 | 2 | 2 | 2 | 2 | — | 2 | 2 | 2 | 2 | Not Connected |
| A2 | 3 | 3 | 3 | 3 | — | 3 | 3 | 3 | 3 | Not Connected |
| VSS | 4 | 4 | 4 | 4 | 2 | 4 | 4 | 4 | 4 | Ground |
| SDA | 5 | 5 | 5 | 5 | 3 | 5 | 5 | 5 | 5 | Serial Address/Data I/O |
| SCL | 6 | 6 | 6 | 6 | 1 | 6 | 6 | 6 | 6 | Serial Clock |
| WP | 7 | 7 | 7 | 7 | 5 | 7 | 7 | 7 | 7 | Write-Protect Input |
| VCC | 8 | 8 | 8 | 8 | 4 | 8 | 8 | 8 | 8 | Power Supply |

**Note 1:** The exposed pad on the DFN/TDFN/UDFN/VDFN package can be connected to VSS or left floating.

### 2.1 A0, A1, A2

The A0, A1 and A2 pins are not used by the 24XX16. They may be left floating or tied to either VSS or VCC.

### 2.2 Serial Address/Data Input/Output (SDA)

The SDA input is a bidirectional pin used to transfer addresses and data into and out of the device. Since it is an open-drain terminal, the SDA bus requires a pull-up resistor to VCC (typical 10 kΩ for 100 kHz, 2 kΩ for 400 kHz and 1 MHz).

For normal data transfer, SDA is allowed to change only during SCL low. Changes during SCL high are reserved for indicating Start and Stop conditions.

### 2.3 Serial Clock (SCL)

The SCL input is used to synchronize the data transfer to and from the device.

### 2.4 Write-Protect (WP)

This pin must be connected to either VSS or VCC.

If tied to VSS, normal memory operation is enabled (read/write the entire memory 000-7FF).

If tied to VCC, write operations are inhibited. The entire memory will be write-protected. Read operations are not affected.

## 3.0 FUNCTIONAL DESCRIPTION

The 24XX16 supports a bidirectional, two-wire bus and data transmission protocol. A device that sends data onto the bus is defined as a transmitter, while a device receiving data is defined as a receiver. The bus must be controlled by a host device, which generates the Serial Clock (SCL), controls the bus access and generates the Start and Stop conditions, while the 24XX16 works as a client. Both host and client can operate as transmitter or receiver, but the host device determines which mode is activated.

### 3.1 Device Factory Default Condition

The 24XX16 is shipped to the customer with the EEPROM array set to FFh data pattern (logic '1' state).

## 4.0 BUS CHARACTERISTICS

The following **bus protocol** has been defined:

- Data transfer may be initiated only when the bus is not busy.
- During data transfer, the data line must remain stable whenever the clock line is high. Changes in the data line while the clock line is high will be interpreted as a Start or Stop condition.

Accordingly, the following bus conditions have been defined (Figure 4-1).

### 4.1 Bus Not Busy (A)

Both data and clock lines remain high.

### 4.2 Start Data Transfer (B)

A high-to-low transition of the SDA line while the clock (SCL) is high determines a Start condition. All commands must be preceded by a Start condition.

### 4.3 Stop Data Transfer (C)

A low-to-high transition of the SDA line while the clock (SCL) is high determines a Stop condition. All operations must be ended with a Stop condition.

### 4.4 Data Valid (D)

The state of the data line represents valid data when, after a Start condition, the data line is stable for the duration of the high period of the clock signal.

The data on the line must be changed during the low period of the clock signal. There is one clock pulse per bit of data.

Each data transfer is initiated with a Start condition and terminated with a Stop condition. The number of data bytes transferred between the Start and Stop conditions is determined by the host device and is, theoretically, unlimited (although only the last sixteen will be stored when doing a write operation). When an overwrite does occur, it will replace data based on the First-In First-Out (FIFO) principle.

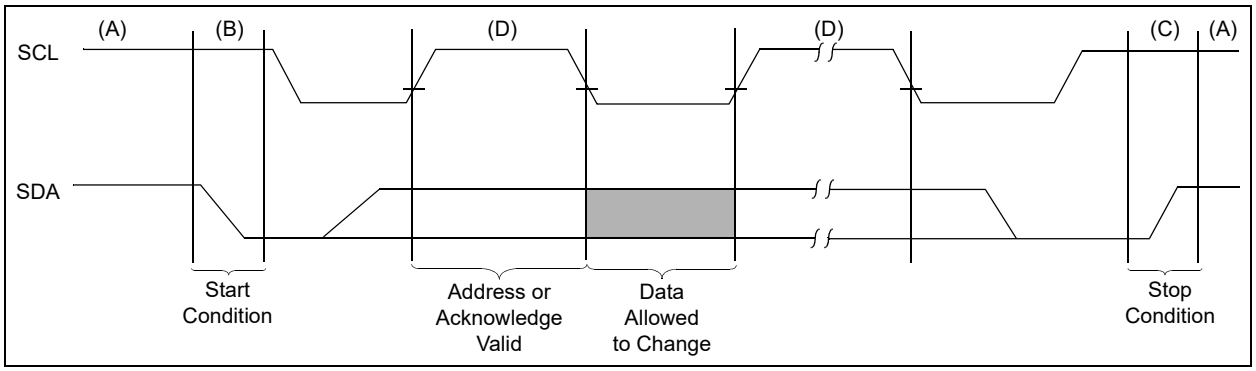
### 4.5 Acknowledge

Each receiving device, when addressed, is obliged to generate an Acknowledge after the reception of each byte. The host device must generate an extra clock pulse which is associated with this Acknowledge bit.

| **Note:** | The 24XX16 does not generate any Acknowledge bits if an internal programming cycle is in progress. |
|---|---|

The device that acknowledges has to pull down the SDA line during the Acknowledge clock pulse in such a way that the SDA line is stable-low during the high period of the Acknowledge-related clock pulse. Moreover, setup and hold times must be taken into account. During reads, a host must signal an end of data to the client by not generating an Acknowledge bit on the last byte that has been clocked out of the client. In this case, the client (24XX16) will leave the data line high to enable the host to generate the Stop condition.

**FIGURE 4-1: DATA TRANSFER SEQUENCE ON THE SERIAL BUS**



## 5.0 DEVICE ADDRESSING

A control byte is the first byte received following the Start condition from the host device. The control byte consists of a 4-bit control code. For the 24XX16, this is set as '1010' binary for read and write operations. The next three bits of the control byte are the block-select bits (B2, B1, B0). They are used by the host device to select which of the eight 256-word blocks of memory are to be accessed. These bits, in effect, are the three Most Significant bits of the word address. It should be noted that the protocol limits the size of the memory to eight blocks of 256 words; therefore, the protocol can support only one 24XX16 per system. The combination of the 4-bit control code and the next three bits are called the client address.

The last bit of the control byte is the Read/$\overline{\text{Write}}$ (R/$\overline{\text{W}}$) bit and it defines the operation to be performed. When set to '1', a read operation is selected. When set to '0', a write operation is selected. Following the Start condition, the 24XX16 monitors the SDA bus, checking the device type identifier being transmitted. Upon receiving a valid client address and the R/$\overline{\text{W}}$ bit, the client device outputs an Acknowledge signal on the SDA line. Depending on the state of the R/$\overline{\text{W}}$ bit, the 24XX16 will select a read or write operation.

The next byte received defines the address of the first data byte within the selected block (Figure 5-2). The word address byte uses all eight bits.

| Operation | Control Code | Block Select | R/$\overline{\text{W}}$ |
|---|---|---|---|
| Read | 1010 | Block Address | 1 |
| Write | 1010 | Block Address | 0 |

**FIGURE 5-1: CONTROL BYTE ALLOCATION**

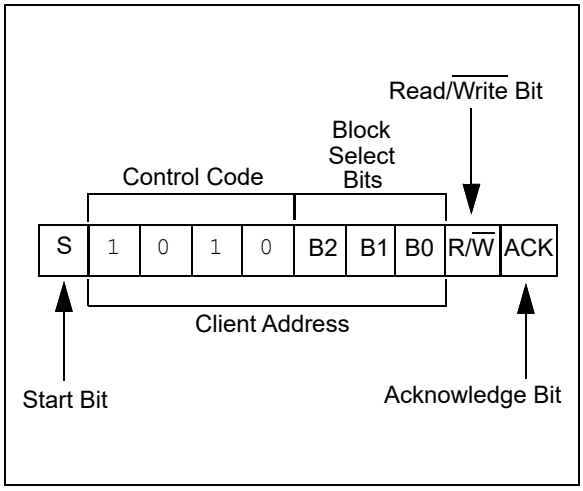
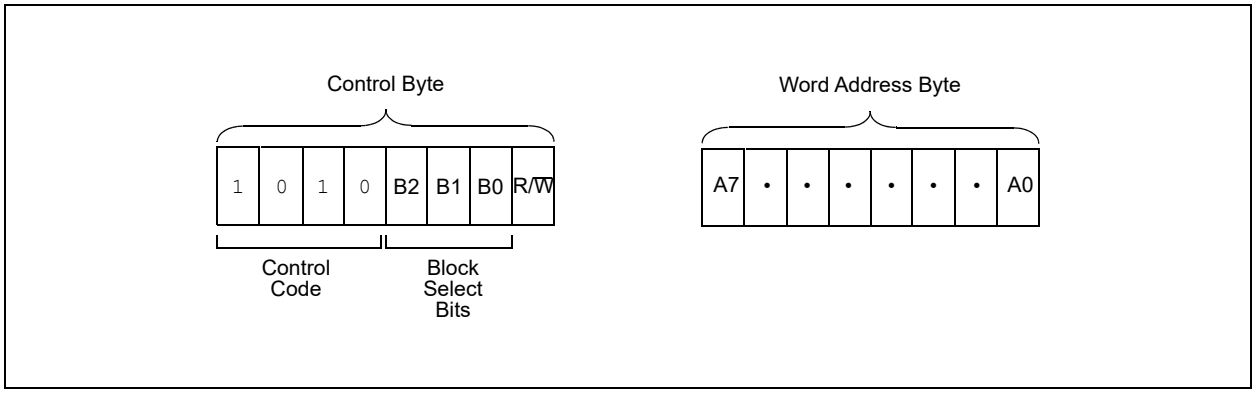



**FIGURE 5-2: ADDRESS SEQUENCE BIT ASSIGNMENTS**



## 6.0 WRITE OPERATION

### 6.1 Byte Write

Following the Start condition from the host, the device code (4 bits), the block address (3 bits) and the R/$\overline{W}$ bit, which is a logic-low, are placed onto the bus by the host transmitter. This indicates to the addressed client receiver that a byte with a word address will follow after it has generated an Acknowledge bit during the ninth clock cycle. Therefore, the next byte transmitted by the host is the word address and will be written into the Address Pointer of the 24XX16. After receiving another Acknowledge signal from the 24XX16, the host device will transmit the data word to be written into the addressed memory location. The 24XX16 acknowledges again and the host generates a Stop condition. This initiates the internal write cycle and, during this time, the 24XX16 will not generate Acknowledge signals (Figure 6-1).

### 6.2 Page Write

The write control byte, word address and first data byte are transmitted to the 24XX16 in the same way as in a byte write. However, instead of generating a Stop condition, the host transmits up to 16 data bytes to the 24XX16, which are temporarily stored in the on-chip page buffer and will be written into the memory once the host has transmitted a Stop condition. Upon receipt of each word, the four lower-order Address Pointer bits, which form the byte counter, are internally incremented by one. The higher-order four bits of the word address and bits B2, B1 and B0 remain constant. If the host should transmit more than 16 words prior to generating the Stop condition, the Address Pointer will roll over and the previously received data will be overwritten. As with the byte write operation, once the Stop condition is received, an internal write cycle will begin (Figure 6-2).

| | |
|---|---|
| **Note:** | Page write operations are limited to writing bytes within a single physical page **regardless** of the number of bytes actually being written. Physical page boundaries start at addresses that are integer multiples of the page buffer size (or 'page size') and end at addresses that are integer multiples of page size – 1. If a page write command attempts to write across a physical page boundary, the result is that the data wrap around to the beginning of the current page (overwriting data previously stored there), instead of being written to the next page, as might be expected. It is therefore necessary for the application software to prevent page write operations that would attempt to cross a page boundary. |

### 6.3 Write Protection

The WP pin allows the user to write-protect the entire array (000-7FF) when the pin is tied to VCC. If tied to VSS, the write protection is disabled.

**FIGURE 6-1: BYTE WRITE**

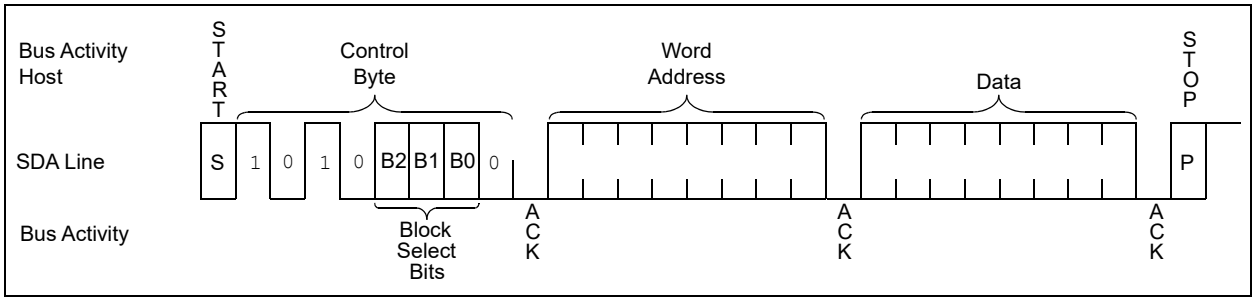
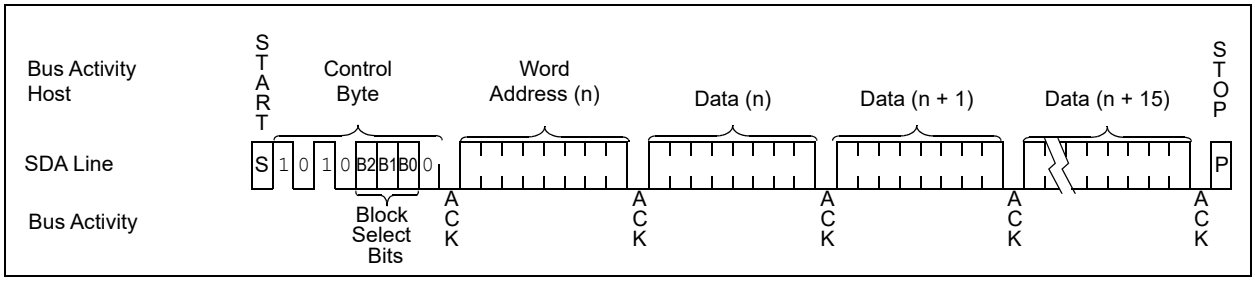


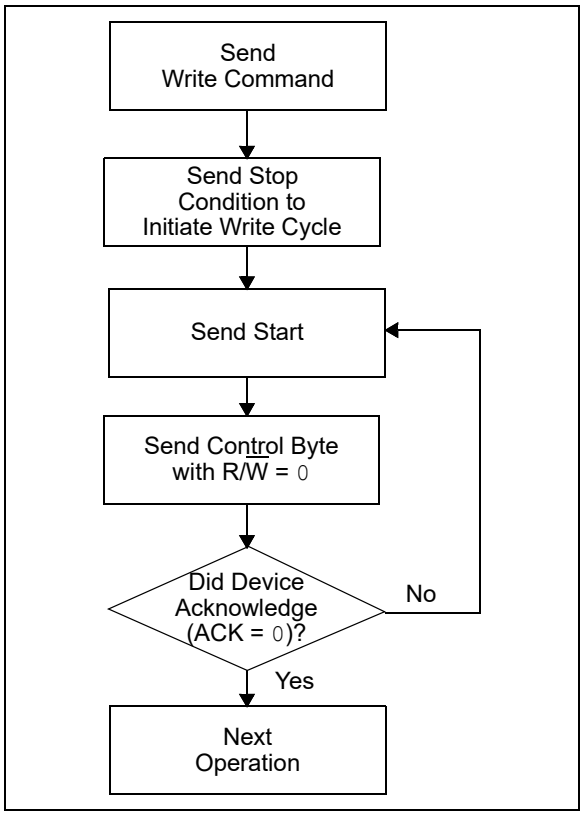
**FIGURE 6-2: PAGE WRITE**



## 7.0 ACKNOWLEDGE POLLING

Since the device will not acknowledge during a write cycle, acknowledge polling can be used to determine when the cycle is complete (this feature can be used to maximize bus throughput). Once the Stop condition for a write command has been issued from the host, the device initiates the internally-timed write cycle. ACK polling can then be initiated immediately. This involves the host sending a Start condition followed by the control byte for a write command (R/$\overline{W}$ = 0). If the device is still busy with the write cycle, no ACK will be returned. If the cycle is complete, the device will return the ACK and the host can then proceed with the next read or write operation. See Figure 7-1 for a flow diagram of this operation.

**FIGURE 7-1: ACKNOWLEDGE POLLING FLOW**



## 8.0 READ OPERATION

Read operations are initiated in the same way as write operations, with the exception that the R/$\overline{W}$ bit of the client address is set to '1'. There are three basic types of read operations: current address read, random read and sequential read.

### 8.1 Current Address Read

The 24XX16 contains an Address Pointer that maintains the address of the last word accessed, internally incremented by one. Therefore, if the previous access (either a read or write operation) was to address `n`, the next current address read operation would access data from address `n + 1`. Upon receipt of the client address with R/$\overline{W}$ bit set to '1', the 24XX16 issues an Acknowledge and transmits the 8-bit data word. The host will not acknowledge the transfer, but does generate a Stop condition and the 24XX16 discontinues transmission (Figure 8-1).

### 8.2 Random Read

Random read operations allow the host to access any memory location in a random manner. To perform this type of read operation, the word address must first be set. This is accomplished by sending the word address to the 24XX16 as part of a write operation. Once the word address is sent, the host generates a Start condition following the Acknowledge. This terminates the write operation, but not before the internal Address Pointer is set. The host then issues the control byte again, but with the R/$\overline{W}$ bit set to a '1'. The 24XX16 will then issue an Acknowledge and transmits the 8-bit data word. The host will not acknowledge the transfer, but does generate a Stop condition and the 24XX16 discontinues transmission (Figure 8-2).

### 8.3 Sequential Read

Sequential reads are initiated in the same way as a random read or current read, except that once the 24XX16 transmits the first data byte, the host issues an Acknowledge (as opposed to a Stop condition in a random read). This directs the 24XX16 to transmit the next sequentially addressed 8-bit word (Figure 8-3).

To provide sequential reads the 24XX16 contains an internal Address Pointer which is incremented by one at the completion of each operation. This Address Pointer allows the entire memory contents to be serially read during one operation.

### 8.4 Noise Protection

The SCL and SDA inputs have Schmitt Trigger and filter circuits which suppress noise spikes to assure proper device operation even on a noisy bus.

**FIGURE 8-1: CURRENT ADDRESS READ**

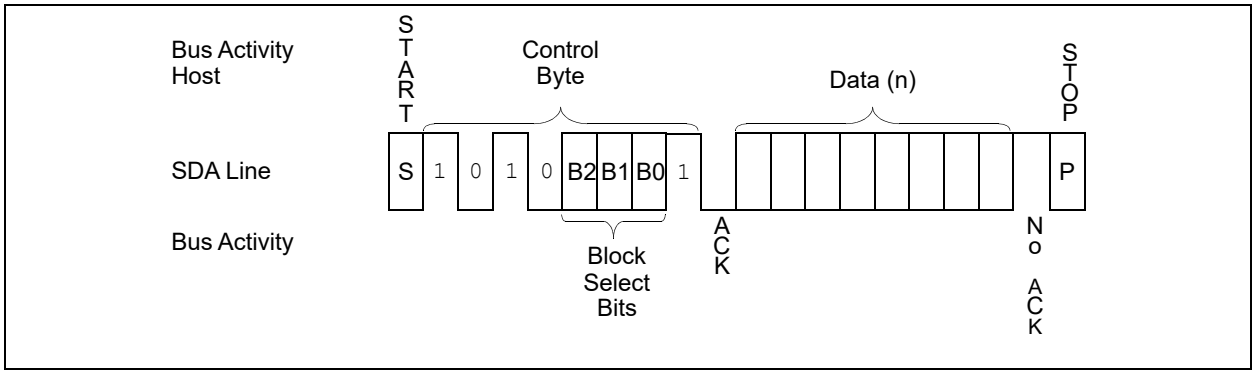


**FIGURE 8-2: RANDOM READ**

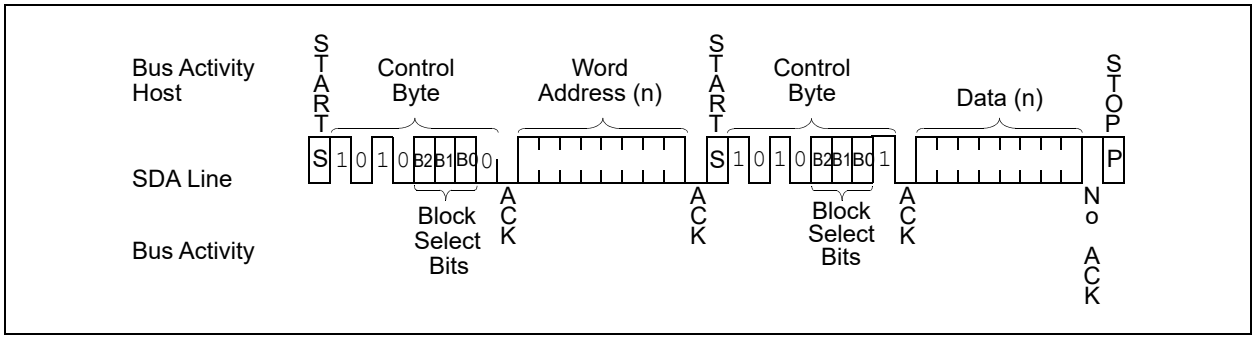
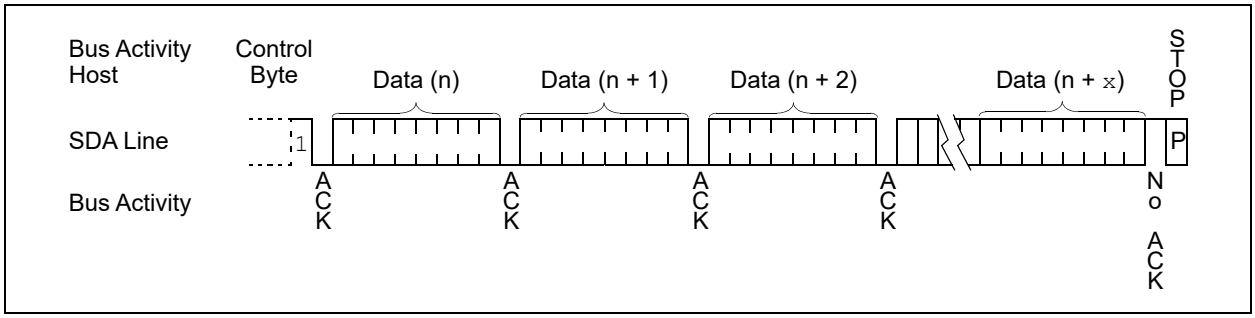


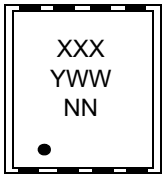

**FIGURE 8-3: SEQUENTIAL READ**



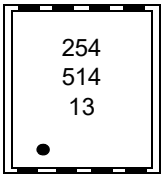
## 9.0 PACKAGING INFORMATION

### 9.1 Package Marking Information*

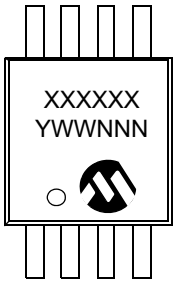
8-Lead 2x3 DFN



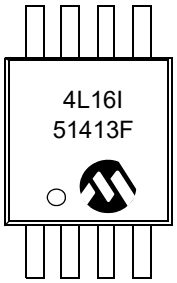

Example



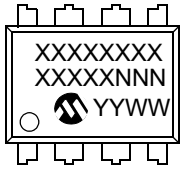

8-Lead MSOP



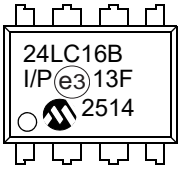

Example



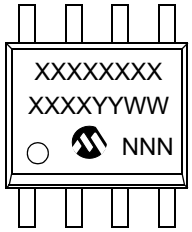

8-Lead PDIP (300 mil)



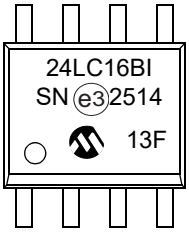

Example



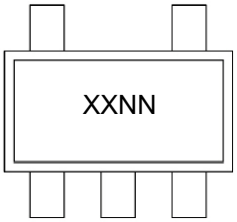

8-Lead SOIC (3.90 mm)



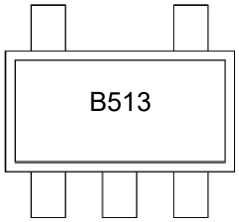

Example



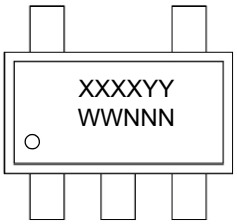

5-Lead SOT-23 (**1-Line Marking**)



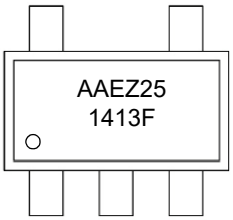

Example



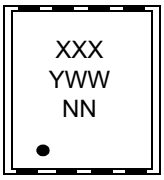
5-Lead SOT-23 (**2-Line Marking**)



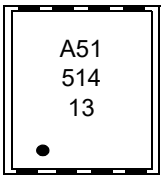

Example




8-Lead 2x3 TDFN

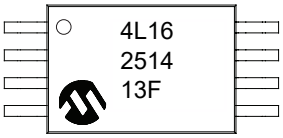



Example

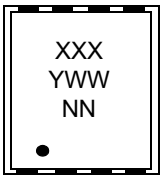



8-Lead TSSOP

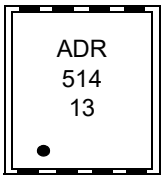

Example



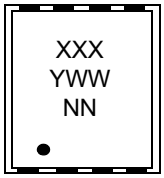

8-Lead 2x3 UDFN (Q4B)



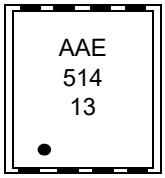

Example




8-Lead 2x3 VDFN (Q6B)




Example



| Part Number | 1st Line Marking Codes | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | DFN | | MSOP | SOIC | SOT-23 | | TDFN | | TSSOP | UDFN (Q4B) | VDFN (Q6B) |
| | I-Temp. | E-Temp. | | | I-Temp. | E-Temp. | I-Temp. | E-Temp. | | | |
| 24AA16 | 251 | — | 4A16T | 24AA16T | B5NN(1) | 7VNN(1) | A51 | EE9 | 4A16 | — | — |
| 24LC16B | 254 | 255 | 4L16T | 24LC16BT | M5NN(1) | N5NN(1) | A54 | A55 | 4L16 | — | — |
| 24FC16 | — | — | 24FC16 | 24FC16 | AAEZYY(2) | AAEZYY(2) | — | — | AADW | ADR | AAE |

**Note 1:** These parts use the 1-line SOT-23 marking format

**2:** These parts use the 2-line SOT-23 marking format

| | | |
|---|---|---|
| **Legend:** | XX...X | Part number or part number code |
| | T | Temperature (I, E) |
| | Y | Year code (last digit of calendar year) |
| | YY | Year code (last 2 digits of calendar year) |
| | WW | Week code (week of January 1 is week '01') |
| | NNN | Alphanumeric traceability code (2 characters for small packages) |
| | (e3) | JEDEC® designator for Matte Tin (Sn) |

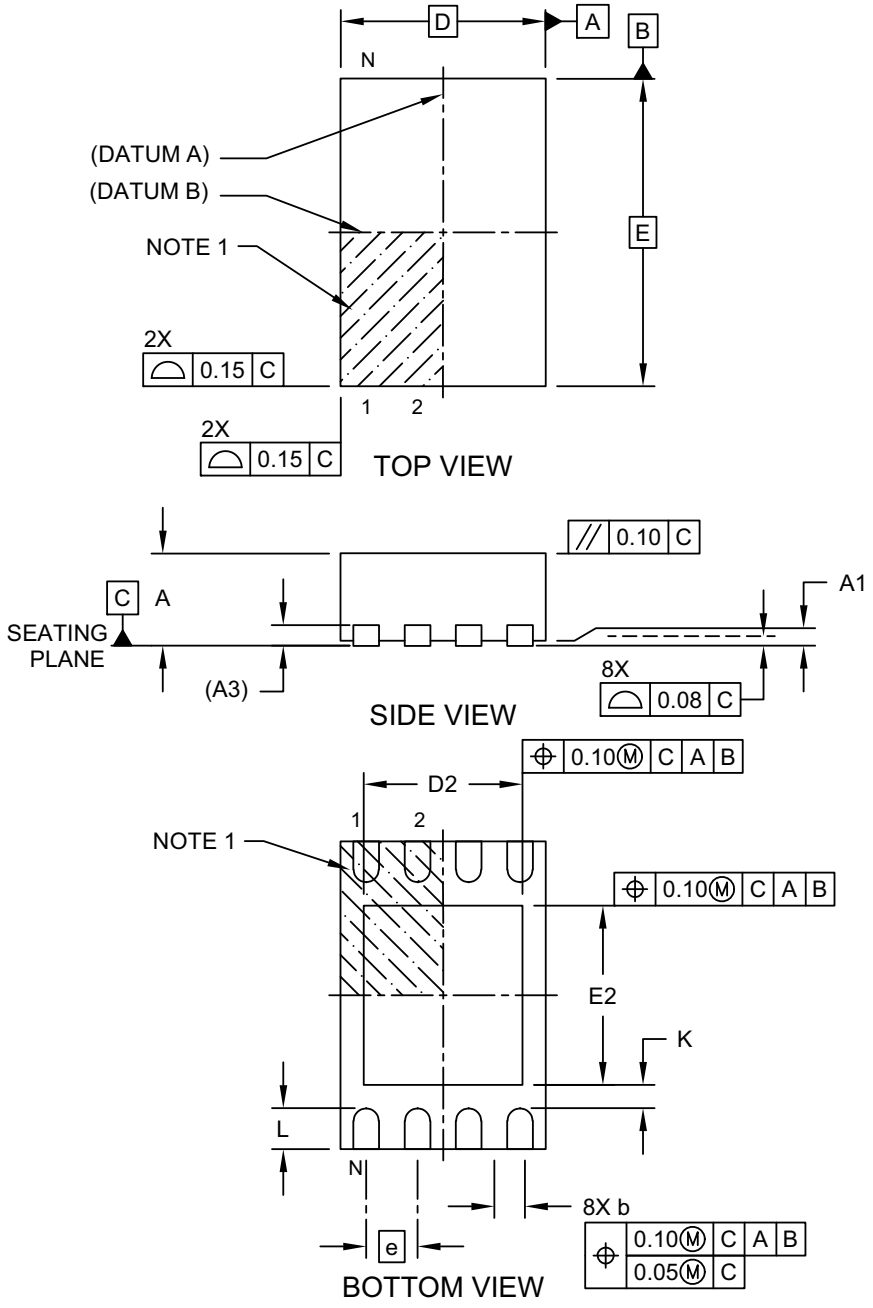
* Standard OTP marking consists of Microchip part number, year code, week code, and traceability code.

**Note:** For very small packages with no room for the JEDEC® designator (e3), the marking will only appear on the outer carton or reel label.

**Note:** In the event the full Microchip part number cannot be marked on one line, it will be carried over to the next line, thus limiting the number of available characters for customer-specific information.

### 8-Lead Plastic Dual Flat, No Lead Package (MC) - 2x3x1 mm Body [DFN]

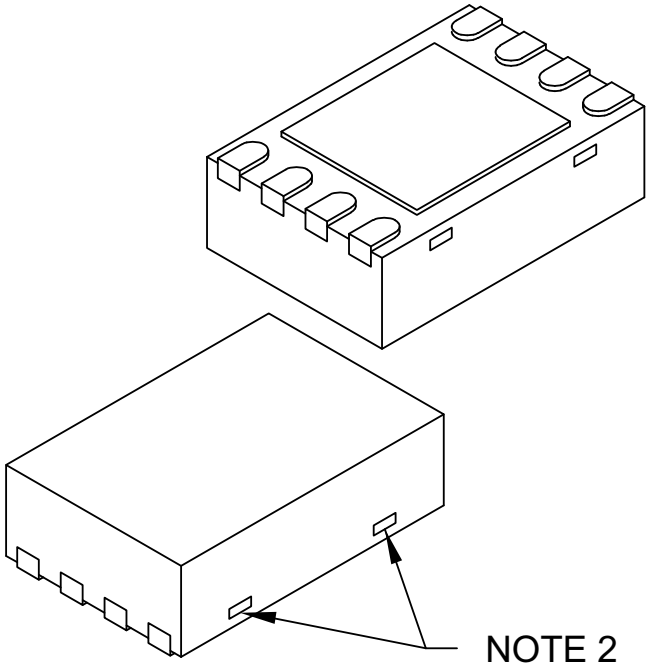
**Note:** For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging




Microchip Technology Drawing C04-123 Rev E Sheet 1 of 2

### 8-Lead Plastic Dual Flat, No Lead Package (MC) - 2x3x1 mm Body [DFN]

**Note:** For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging




| Units | | MILLIMETERS | | |
|---|---|---|---|---|
| Dimension Limits | | MIN | NOM | MAX |
| Number of Terminals | N | | 8 | |
| Pitch | e | | 0.50 BSC | |
| Overall Height | A | 0.80 | 0.90 | 1.00 |
| Standoff | A1 | 0.00 | 0.02 | 0.05 |
| Terminal Thickness | A3 | | 0.20 REF | |
| Overall Length | D | | 2.00 BSC | |
| Exposed Pad Length | D2 | 1.30 | - | 1.55 |
| Overall Width | E | | 3.00 BSC | |
| Exposed Pad Width | E2 | 1.50 | - | 1.75 |
| Terminal Width | b | 0.20 | 0.25 | 0.30 |
| Terminal Length | L | 0.30 | 0.40 | 0.50 |
| Terminal-to-Exposed-Pad | K | 0.20 | - | - |

Notes:

1. Pin 1 visual index feature may vary, but must be located within the hatched area.
2. Package may have one or more exposed tie bars at ends.
3. Package is saw singulated
4. Dimensioning and tolerancing per ASME Y14.5M

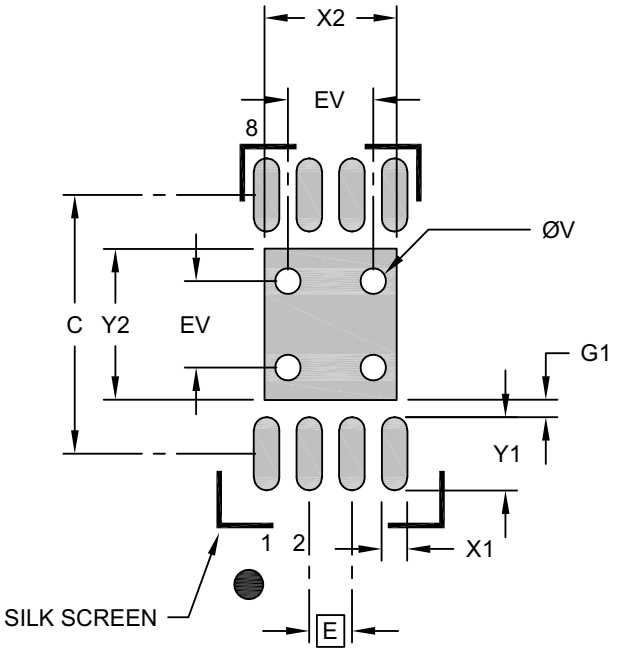
   BSC: Basic Dimension. Theoretically exact value shown without tolerances.

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

Microchip Technology Drawing C04-123 Rev E Sheet 2 of 2

### 8-Lead Plastic Dual Flat, No Lead Package (MC) - 2x3x1 mm Body [DFN]

**Note:** For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging




RECOMMENDED LAND PATTERN

| Units | | MILLIMETERS | | |
|---|---|---|---|---|
| Dimension Limits | | MIN | NOM | MAX |
| Contact Pitch | E | | 0.50 BSC | |
| Optional Center Pad Width | X2 | | | 1.55 |
| Optional Center Pad Length | Y2 | | | 1.75 |
| Contact Pad Spacing | C | | 3.00 | |
| Contact Pad Width (X8) | X1 | | | 0.30 |
| Contact Pad Length (X8) | Y1 | | | 0.85 |
| Contact Pad to Center Pad (X8) | G1 | 0.20 | | |
| Thermal Via Diameter | V | | 0.30 | |
| Thermal Via Pitch | EV | | 1.00 | |

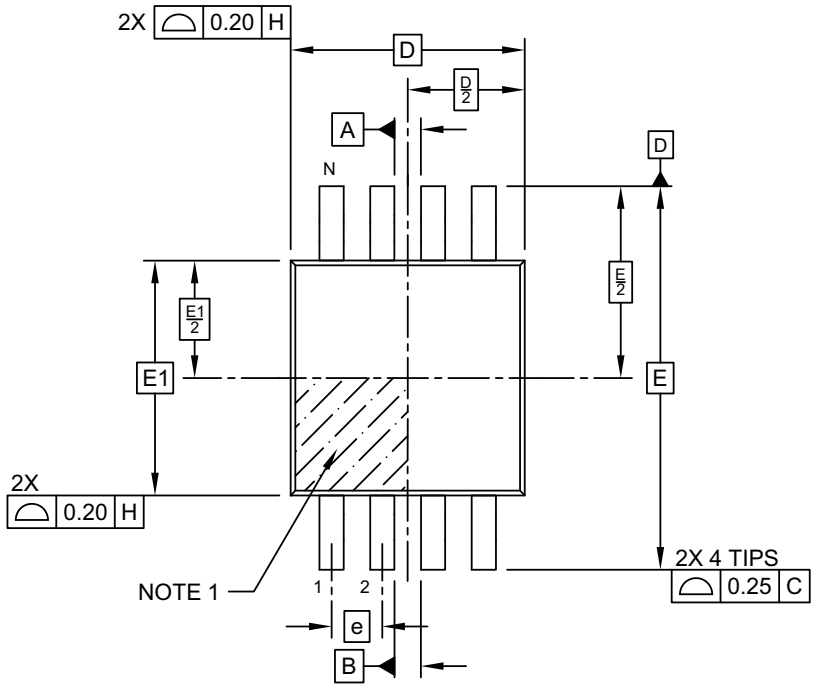
Notes:

1. Dimensioning and tolerancing per ASME Y14.5M
   BSC: Basic Dimension. Theoretically exact value shown without tolerances.
2. For best soldering results, thermal vias, if used, should be filled or tented to avoid solder loss during reflow process

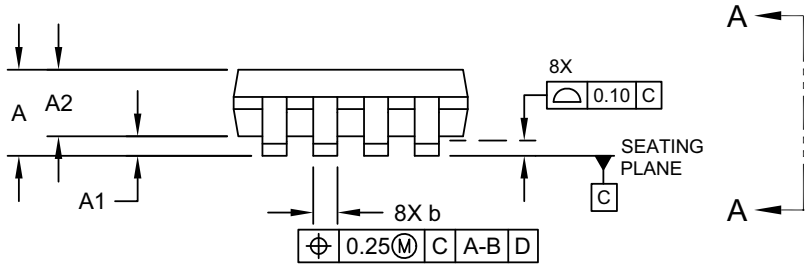
Microchip Technology Drawing C04-2123 Rev E

### 8-Lead Plastic Micro Small Outline Package (MS) - 3x3 mm Body [MSOP]

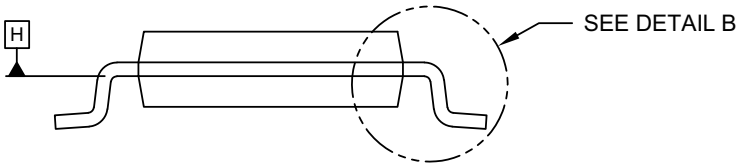
**Note:** For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging




TOP VIEW




SIDE VIEW

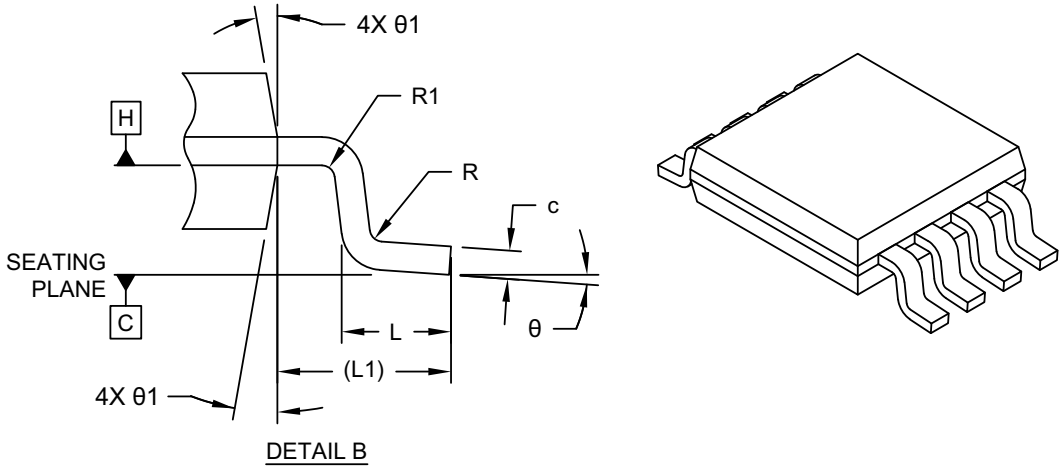



VIEW A–A

Microchip Technology Drawing C04-111-MS Rev F Sheet 1 of 2

### 8-Lead Plastic Micro Small Outline Package (MS) - 3x3 mm Body [MSOP]

**Note:** For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging




| Units | | MILLIMETERS | | |
|---|---|---|---|---|
| Dimension Limits | | MIN | NOM | MAX |
| Number of Terminals | N | | 8 | |
| Pitch | e | | 0.65 BSC | |
| Overall Height | A | – | – | 1.10 |
| Standoff | A1 | 0.00 | – | 0.15 |
| Molded Package Thickness | A2 | 0.75 | 0.85 | 0.95 |
| Overall Length | D | | 3.00 BSC | |
| Overall Width | E | | 4.90 BSC | |
| Molded Package Width | E1 | | 3.00 BSC | |
| Terminal Width | b | 0.22 | – | 0.40 |
| Terminal Thickness | c | 0.08 | – | 0.23 |
| Terminal Length | L | 0.40 | 0.60 | 0.80 |
| Footprint | L1 | | 0.95 REF | |
| Lead Bend Radius | R | 0.07 | – | – |
| Lead Bend Radius | R1 | 0.07 | – | – |
| Foot Angle | θ | 0° | – | 8° |
| Mold Draft Angle | θ1 | 5° | – | 15° |

Notes:

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

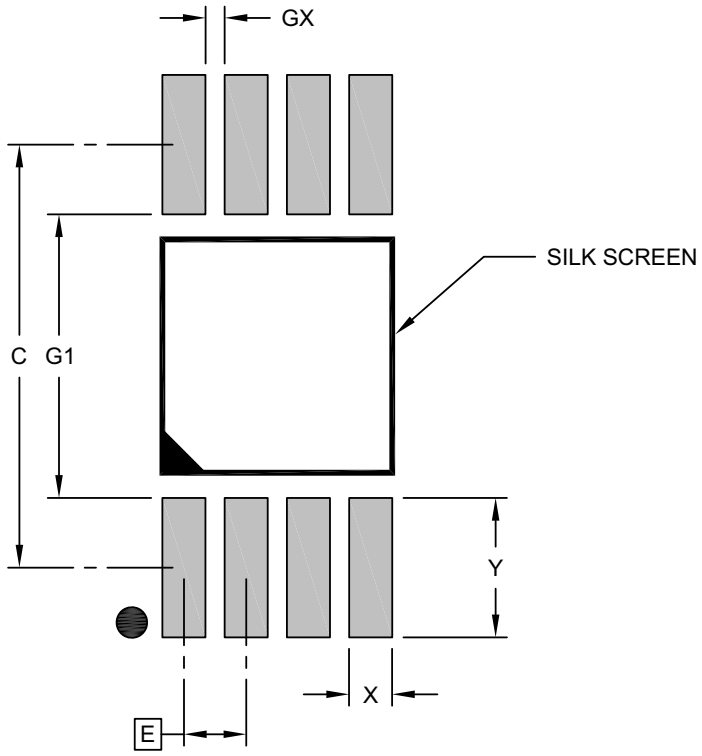
   BSC: Basic Dimension. Theoretically exact value shown without tolerances.

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

Microchip Technology Drawing C04-111-MS Rev F Sheet 2 of 2

### 8-Lead Plastic Micro Small Outline Package (MS) - 3x3 mm Body [MSOP]

**Note:** For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging




RECOMMENDED LAND PATTERN

| Units | | MILLIMETERS | | |
|---|---|---|---|---|
| Dimension Limits | | MIN | NOM | MAX |
| Contact Pitch | E | 0.65 BSC | | |
| Contact Pad Spacing | C | | 4.40 | |
| Contact Pad Width (X8) | X | | | 0.45 |
| Contact Pad Length (X8) | Y | | | 1.45 |
| Contact Pad to Contact Pad (X4) | G1 | 2.95 | | |
| Contact Pad to Contact Pad (X6) | GX | 0.20 | | |

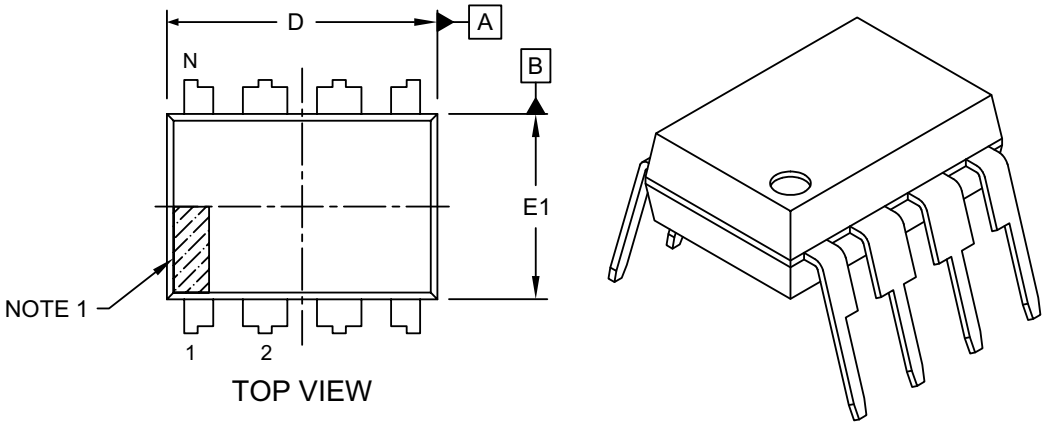
Notes:

1. Dimensioning and tolerancing per ASME Y14.5M
   BSC: Basic Dimension. Theoretically exact value shown without tolerances.

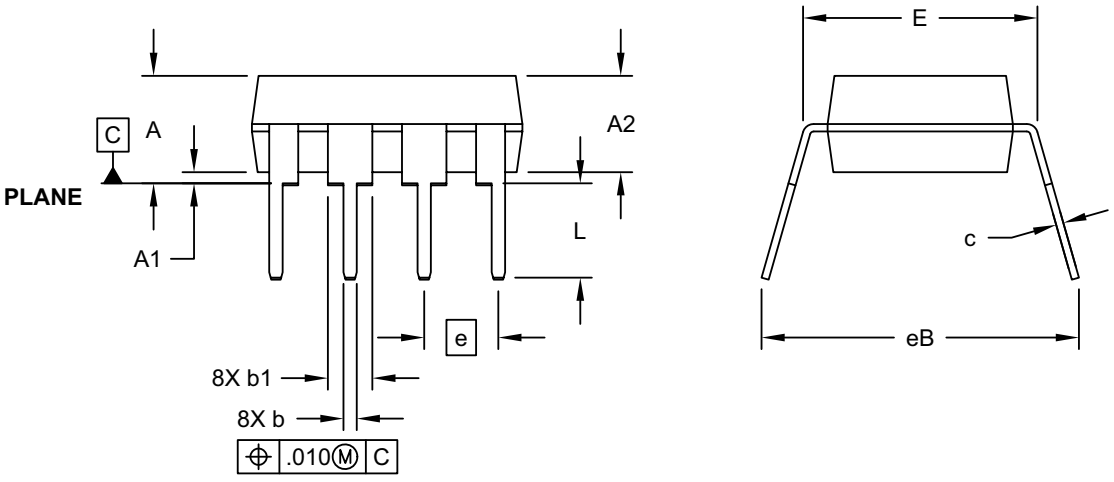
Microchip Technology Drawing C04-2111-MS Rev F

### 8-Lead Plastic Dual In-Line (P) - 300 mil Body [PDIP]

**Note:** For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging




TOP VIEW



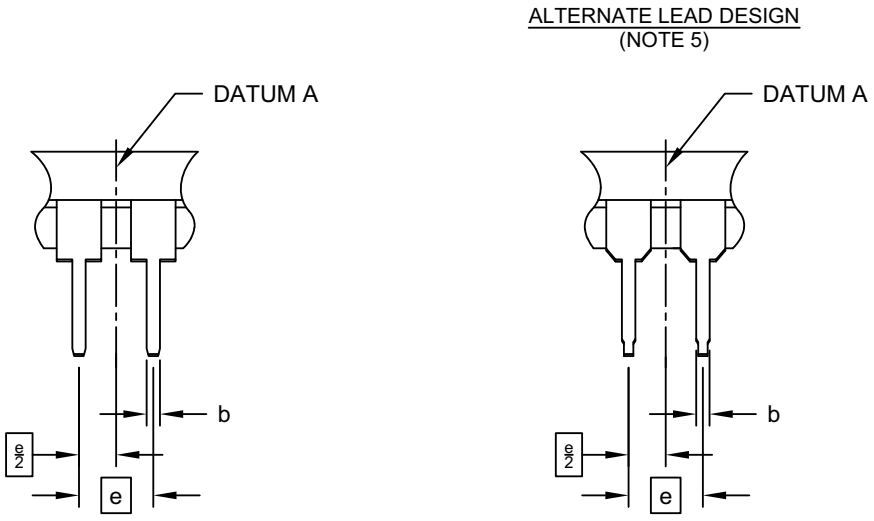

SIDE VIEW

END VIEW

Microchip Technology Drawing No. C04-018-P Rev G Sheet 1 of 2

### 8-Lead Plastic Dual In-Line (P) - 300 mil Body [PDIP]

**Note:** For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging




| Units | | INCHES | | |
|---|---|---|---|---|
| Dimension Limits | | MIN | NOM | MAX |
| Number of Pins | N | | 8 | |
| Pitch | e | | .100 BSC | |
| Top to Seating Plane | A | - | - | .210 |
| Molded Package Thickness | A2 | .115 | .130 | .195 |
| Base to Seating Plane | A1 | .015 | - | - |
| Shoulder to Shoulder Width | E | .290 | .310 | .325 |
| Molded Package Width | E1 | .240 | .250 | .280 |
| Overall Length | D | .348 | .365 | .400 |
| Tip to Seating Plane | L | .115 | .130 | .150 |
| Lead Thickness | c | .008 | .010 | .015 |
| Upper Lead Width | b1 | .040 | .060 | .070 |
| Lower Lead Width | b | .014 | .018 | .022 |
| Overall Row Spacing § | eB | - | - | .430 |

Notes:

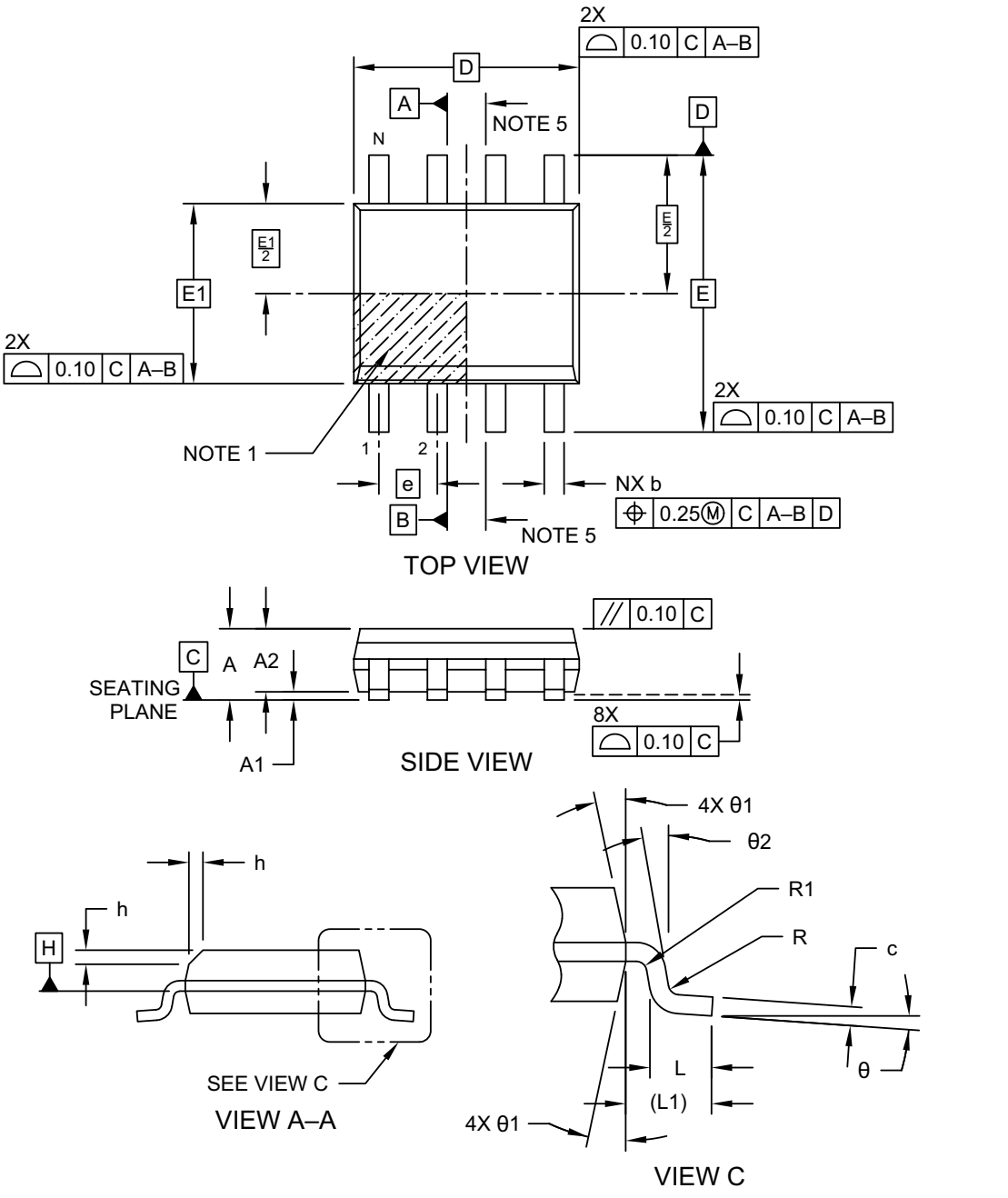
1. Pin 1 visual index feature may vary, but must be located within the hatched area.
2. § Significant Characteristic
3. Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" per side.
4. Dimensioning and tolerancing per ASME Y14.5M

   BSC: Basic Dimension. Theoretically exact value shown without tolerances.
5. Lead design above seating plane may vary, based on assembly vendor.

Microchip Technology Drawing No. C04-018-P Rev G Sheet 2 of 2

### 8-Lead Plastic Small Outline (SN) - Narrow, 3.90 mm (.150 In.) Body [SOIC]

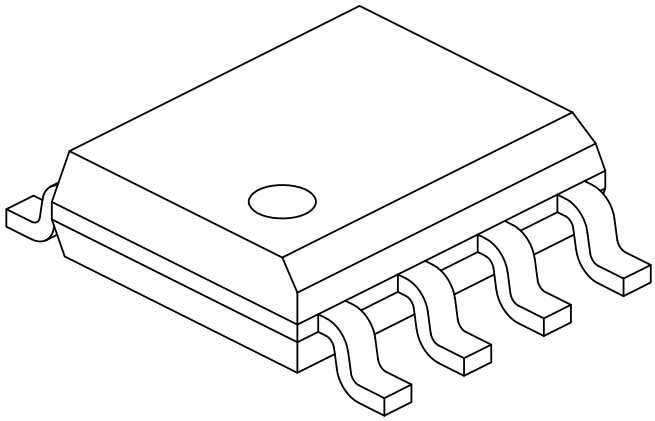
**Note:** For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging




Microchip Technology Drawing No. C04-057-SN Rev K Sheet 1 of 2

### 8-Lead Plastic Small Outline (SN) - Narrow, 3.90 mm (.150 In.) Body [SOIC]

**Note:** For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging



| Units | | MILLIMETERS | | |
|---|---|---|---|---|
| Dimension Limits | | 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 | |
| Lead Thickness | c | 0.17 | – | 0.25 |
| Lead Width | b | 0.31 | – | 0.51 |
| Lead Bend Radius | R | 0.07 | – | – |
| Lead Bend Radius | R1 | 0.07 | – | – |
| Foot Angle | θ | 0° | – | 8° |
| Mold Draft Angle | θ1 | 5° | – | 15° |
| Lead Angle | θ2 | 0° | – | – |

Notes:

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

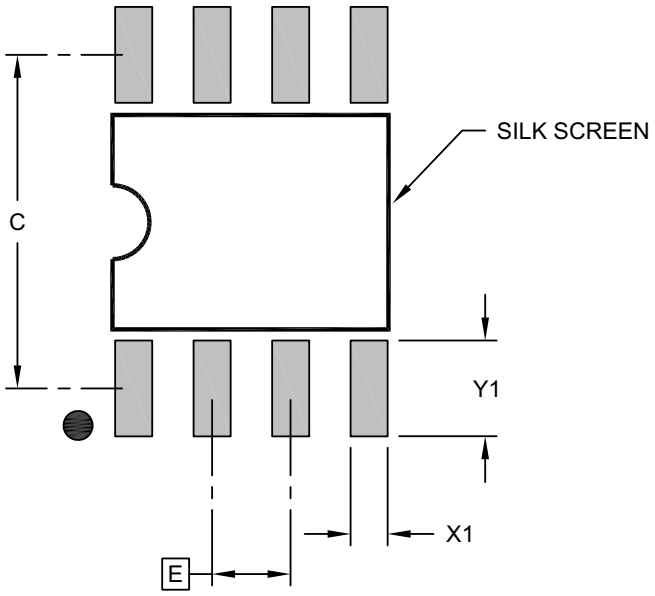
   BSC: Basic Dimension. Theoretically exact value shown without tolerances.

   REF: Reference Dimension, usually without tolerance, for information purposes only.
5. Datums A & B to be determined at Datum H.

Microchip Technology Drawing No. C04-057-SN Rev K Sheet 2 of 2

### 8-Lead Plastic Small Outline (SN) - Narrow, 3.90 mm (.150 In.) Body [SOIC]

**Note:** For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging




RECOMMENDED LAND PATTERN

| Units | | MILLIMETERS | | |
|---|---|---|---|---|
| Dimension Limits | | 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:

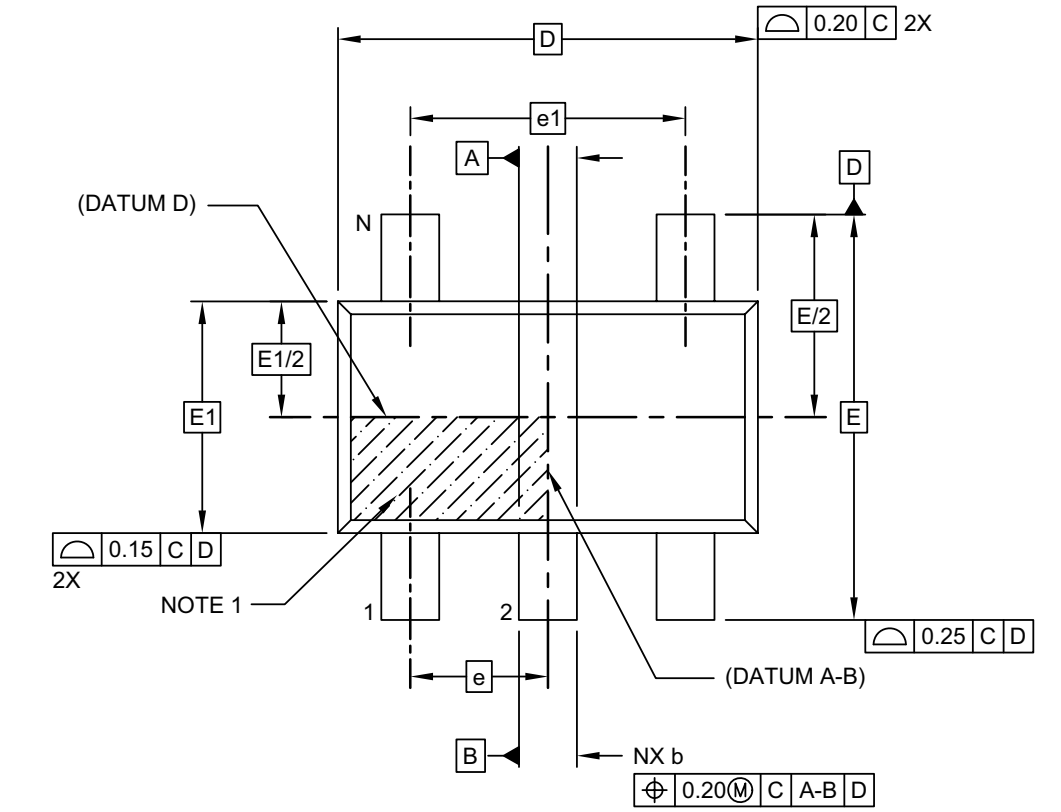
1. Dimensioning and tolerancing per ASME Y14.5M

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

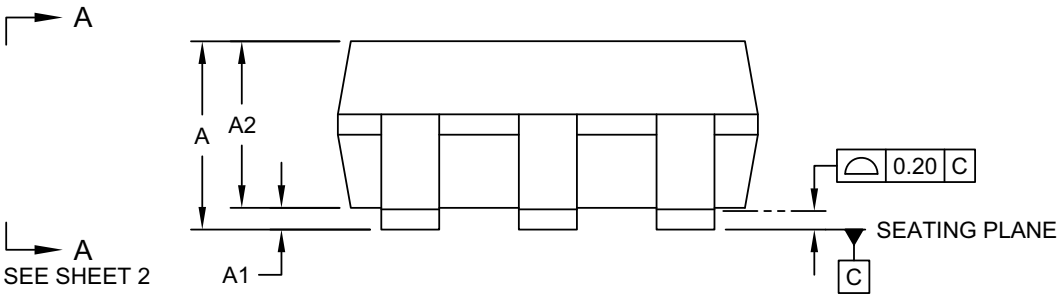
Microchip Technology Drawing C04-2057-SN Rev K

### 5-Lead Plastic Small Outline Transistor (OT) [SOT-23]

**Note:** For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging




TOP VIEW

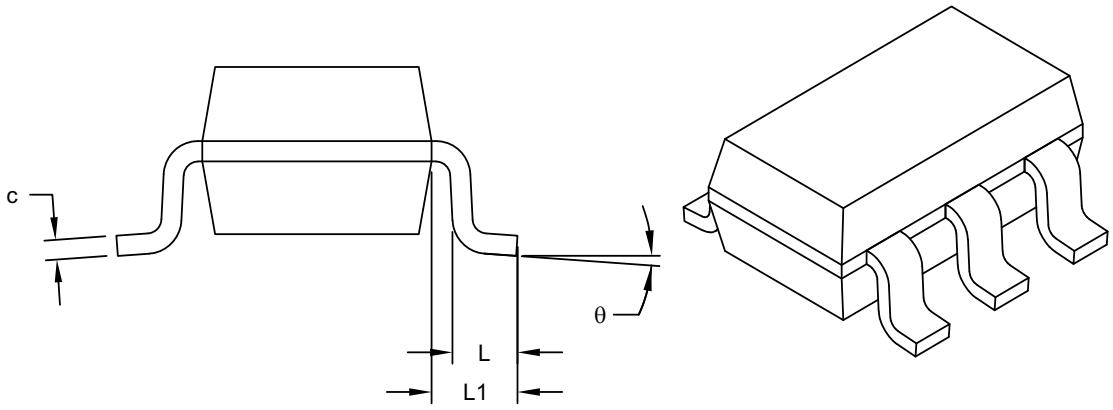



SIDE VIEW

Microchip Technology Drawing C04-091-OT Rev H Sheet 1 of 2

### 5-Lead Plastic Small Outline Transistor (OT) [SOT-23]

**Note:** For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging




VIEW A-A
SHEET 1

| Units | | MILLIMETERS | | |
|---|---|---|---|---|
| Dimension Limits | | MIN | NOM | MAX |
| Number of Pins | N | | 5 | |
| Pitch | e | | 0.95 BSC | |
| Outside lead pitch | e1 | | 1.90 BSC | |
| Overall Height | A | 0.90 | - | 1.45 |
| Molded Package Thickness | A2 | 0.89 | - | 1.30 |
| Standoff | A1 | - | - | 0.15 |
| Overall Width | E | | 2.80 BSC | |
| Molded Package Width | E1 | | 1.60 BSC | |
| Overall Length | D | | 2.90 BSC | |
| Foot Length | L | 0.30 | - | 0.60 |
| Footprint | L1 | | 0.60 REF | |
| Foot Angle | θ | 0° | - | 10° |
| Lead Thickness | c | 0.08 | - | 0.26 |
| Lead Width | b | 0.20 | - | 0.51 |

Notes:

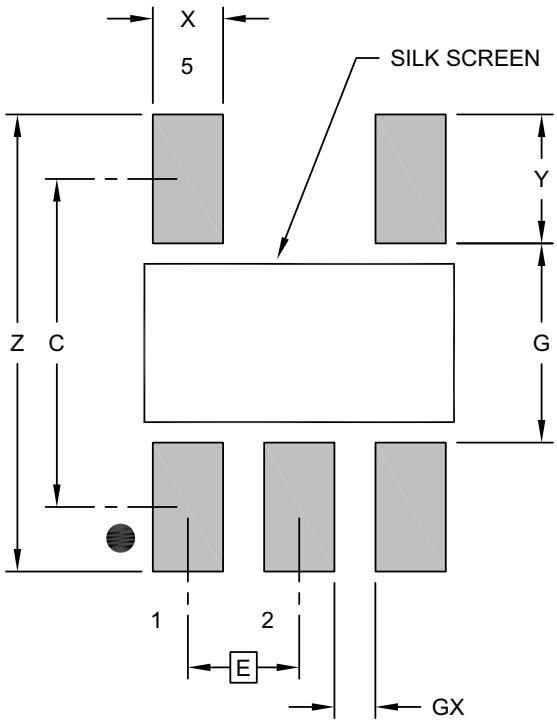
1. Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.25mm per side.
2. Dimensioning and tolerancing per ASME Y14.5M

   BSC: Basic Dimension. Theoretically exact value shown without tolerances.
   REF: Reference Dimension, usually without tolerance, for information purposes only.

Microchip Technology Drawing C04-091-OT Rev H Sheet 2 of 2

### 5-Lead Plastic Small Outline Transistor (OT) [SOT-23]

**Note:** For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging




RECOMMENDED LAND PATTERN

| Units | | MILLIMETERS | | |
|---|---|---|---|---|
| Dimension Limits | | MIN | NOM | MAX |
| Contact Pitch | E | | 0.95 BSC | |
| Contact Pad Spacing | C | | 2.80 | |
| Contact Pad Width (X5) | X | | | 0.60 |
| Contact Pad Length (X5) | Y | | | 1.10 |
| Distance Between Pads | G | 1.70 | | |
| Distance Between Pads | GX | 0.35 | | |
| Overall Width | Z | | | 3.90 |

Notes:

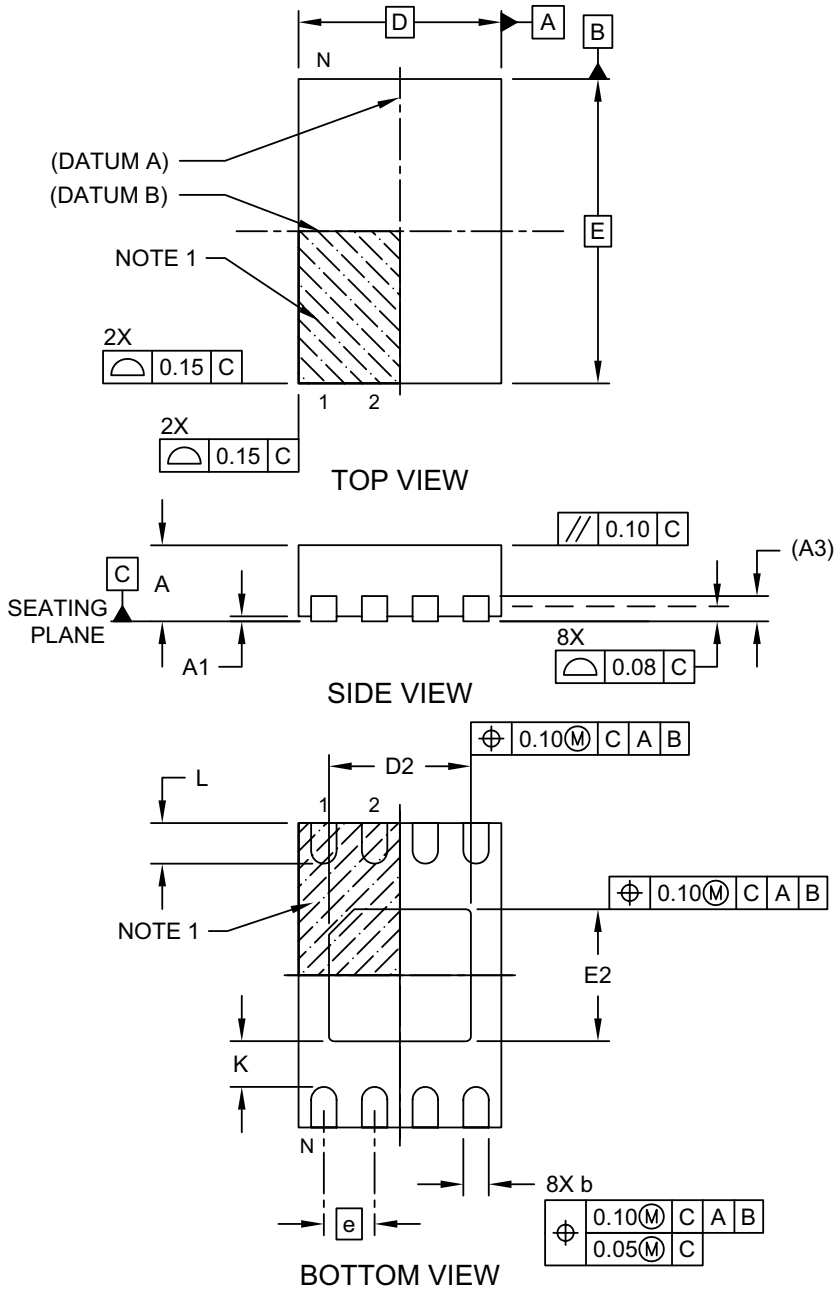
1. Dimensioning and tolerancing per ASME Y14.5M

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

Microchip Technology Drawing No. C04-2091-OT Rev H

**8-Lead Plastic Dual Flat, No Lead Package (MNY) – 2x3x0.8 mm Body [TDFN]**
**With 1.4x1.3 mm Exposed Pad (JEDEC Package type WDFN)**

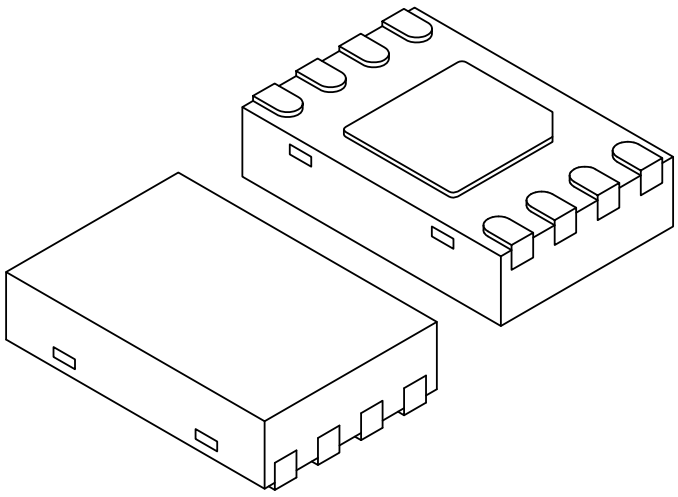
| **Note:** | For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging |
|---|---|




Microchip Technology Drawing No. C04-129-MNY Rev E Sheet 1 of 2

**8-Lead Plastic Dual Flat, No Lead Package (MNY) – 2x3x0.8 mm Body [TDFN]**
**With 1.4x1.3 mm Exposed Pad (JEDEC Package type WDFN)**

**Note:** For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging



| Units | | MILLIMETERS | | |
|---|---|---|---|---|
| Dimension Limits | | MIN | NOM | MAX |
| Number of Pins | N | | 8 | |
| Pitch | e | | 0.50 BSC | |
| Overall Height | A | 0.70 | 0.75 | 0.80 |
| Standoff | A1 | 0.00 | 0.02 | 0.05 |
| Contact Thickness | A3 | | 0.20 REF | |
| Overall Length | D | | 2.00 BSC | |
| Overall Width | E | | 3.00 BSC | |
| Exposed Pad Length | D2 | 1.35 | 1.40 | 1.45 |
| Exposed Pad Width | E2 | 1.25 | 1.30 | 1.35 |
| Contact Width | b | 0.20 | 0.25 | 0.30 |
| Contact Length | L | 0.25 | 0.30 | 0.45 |
| Contact-to-Exposed Pad | K | 0.20 | - | - |

**Notes:**

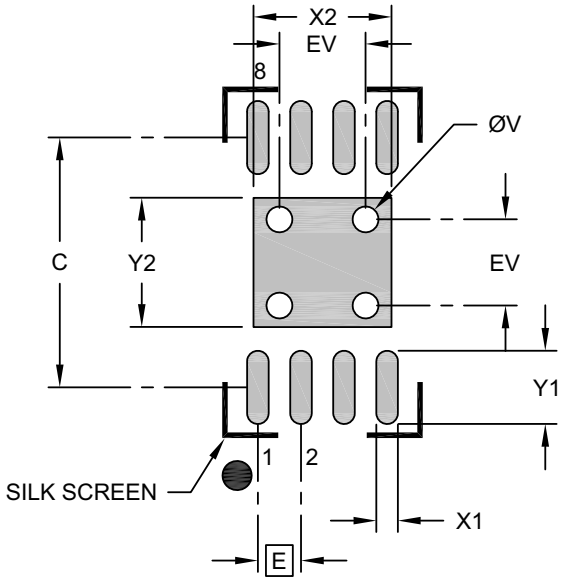
1. Pin 1 visual index feature may vary, but must be located within the hatched area.
2. Package may have one or more exposed tie bars at ends.
3. Package is saw singulated
4. Dimensioning and tolerancing per ASME Y14.5M

BSC: Basic Dimension. Theoretically exact value shown without tolerances.
REF: Reference Dimension, usually without tolerance, for information purposes only.

Microchip Technology Drawing No. C04-129-MNY Rev E Sheet 2 of 2

### 8-Lead Plastic Dual Flat, No Lead Package (MNY) – 2x3x0.8 mm Body [TDFN] With 1.4x1.3 mm Exposed Pad (JEDEC Package type WDFN)

**Note:** For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging




RECOMMENDED LAND PATTERN

| Units | | MILLIMETERS | | |
|---|---|---|---|---|
| Dimension Limits | | MIN | NOM | MAX |
| Contact Pitch | E | | 0.50 BSC | |
| Optional Center Pad Width | X2 | | | 1.60 |
| Optional Center Pad Length | Y2 | | | 1.50 |
| Contact Pad Spacing | C | | 2.90 | |
| Contact Pad Width (X8) | X1 | | | 0.25 |
| Contact Pad Length (X8) | Y1 | | | 0.85 |
| Thermal Via Diameter | V | | 0.30 | |
| Thermal Via Pitch | EV | | 1.00 | |

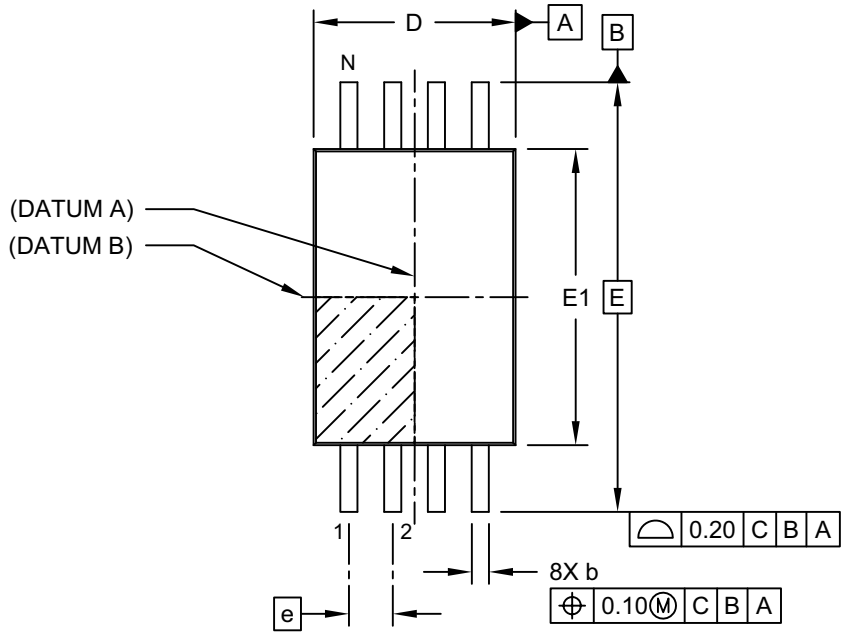
Notes:

1. Dimensioning and tolerancing per ASME Y14.5M
   BSC: Basic Dimension. Theoretically exact value shown without tolerances.
2. For best soldering results, thermal vias, if used, should be filled or tented to avoid solder loss during reflow process

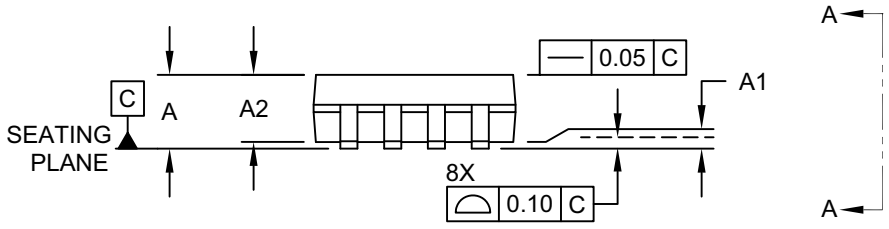
Microchip Technology Drawing No. C04-129-MNY Rev. B

## 8-Lead Plastic Thin Shrink Small Outline (ST) - 4.4 mm Body [TSSOP]

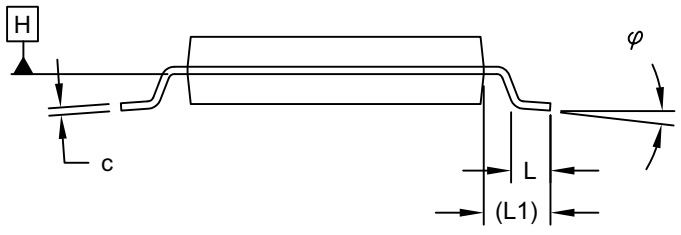
**Note:** For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging




TOP VIEW




SIDE VIEW

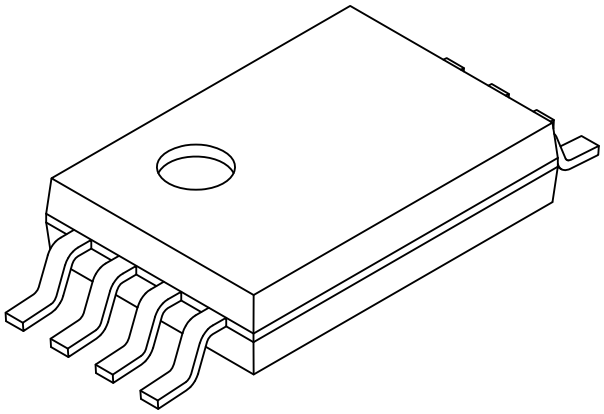



VIEW A-A

Microchip Technology Drawing C04-086 Rev C Sheet 1 of 2

### 8-Lead Plastic Thin Shrink Small Outline (ST) - 4.4 mm Body [TSSOP]

**Note:** For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging



| Units | | MILLIMETERS | | |
|---|---|---|---|---|
| Dimension Limits | | MIN | NOM | MAX |
| Number of Pins | N | | 8 | |
| Pitch | e | | 0.65 BSC | |
| Overall Height | A | - | - | 1.20 |
| Molded Package Thickness | A2 | 0.80 | 1.00 | 1.05 |
| Standoff | A1 | 0.05 | - | - |
| Overall Width | E | | 6.40 BSC | |
| Molded Package Width | E1 | 4.30 | 4.40 | 4.50 |
| Overall Length | D | 2.90 | 3.00 | 3.10 |
| Foot Length | L | 0.45 | 0.60 | 0.75 |
| Footprint | L1 | | 1.00 REF | |
| Lead Thickness | c | 0.09 | - | 0.25 |
| Foot Angle | φ | 0° | 4° | 8° |
| Lead Width | b | 0.19 | - | 0.30 |

Notes:

1. Pin 1 visual index feature may vary, but must be located within the hatched area.
2. Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.20mm per side.
3. Dimensioning and tolerancing per ASME Y14.5M

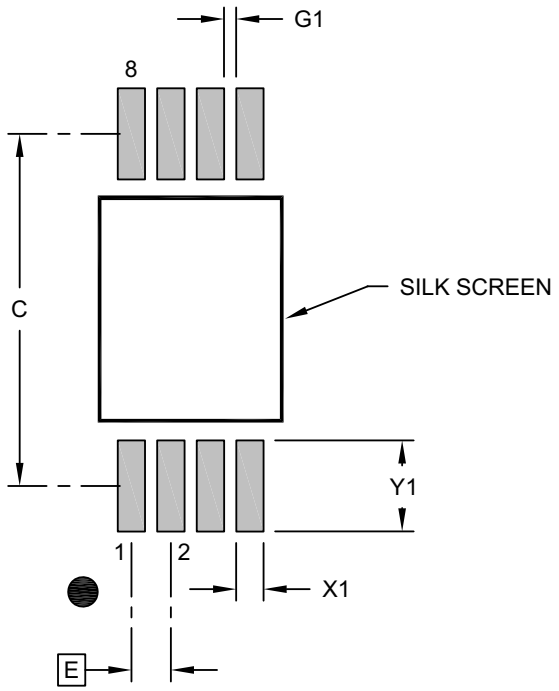
BSC: Basic Dimension. Theoretically exact value shown without tolerances.

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

Microchip Technology Drawing C04-086 Rev C Sheet 2 of 2

### 8-Lead Plastic Thin Shrink Small Outline (ST) - 4.4 mm Body [TSSOP]

**Note:** For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging




RECOMMENDED LAND PATTERN

| Units | | MILLIMETERS | | |
|---|---|---|---|---|
| Dimension Limits | | MIN | NOM | MAX |
| Contact Pitch | E | 0.65 BSC | | |
| Contact Pad Spacing | C | | 5.80 | |
| Contact Pad Width (X8) | X1 | | | 0.45 |
| Contact Pad Length (X8) | Y1 | | | 1.50 |
| Contact Pad to Center Pad (X6) | G1 | 0.20 | | |

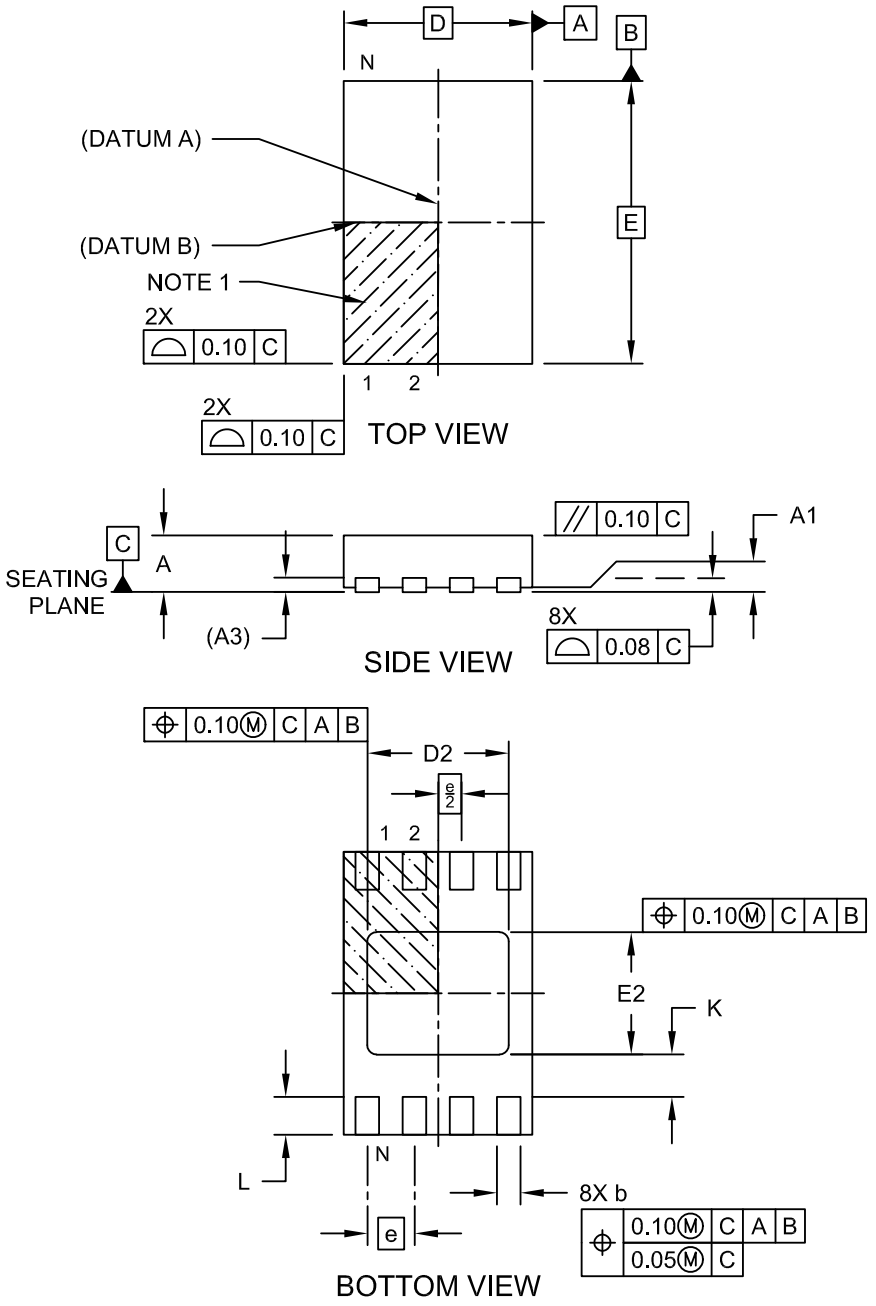
Notes:

1. Dimensioning and tolerancing per ASME Y14.5M
   BSC: Basic Dimension. Theoretically exact value shown without tolerances.
2. For best soldering results, thermal vias, if used, should be filled or tented to avoid solder loss during reflow process

Microchip Technology Drawing C04-2086 Rev B

**8-Lead Ultra Thin Plastic Dual Flat, No Lead Package (Q4B) - 2x3 mm Body [UDFN]**
**Atmel Legacy Global Package Code YNZ**

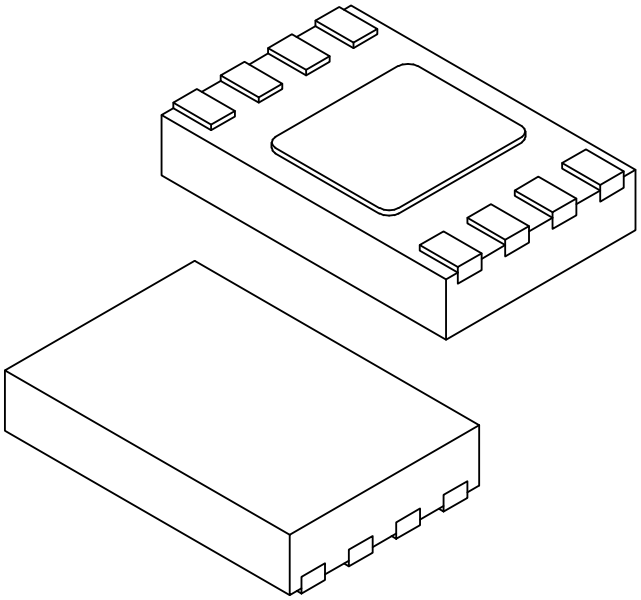
| **Note:** | For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging |
|---|---|




Microchip Technology Drawing C04-21355-Q4B Rev C Sheet 1 of 2

## 8-Lead Ultra Thin Plastic Dual Flat, No Lead Package (Q4B) - 2x3 mm Body [UDFN]
## Atmel Legacy Global Package Code YNZ

**Note:** For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging



| Units | | MILLIMETERS | | |
|---|---|---|---|---|
| Dimension Limits | | MIN | NOM | MAX |
| Number of Terminals | N | | 8 | |
| Pitch | e | | 0.50 BSC | |
| Overall Height | A | 0.50 | 0.55 | 0.60 |
| Standoff | A1 | 0.00 | 0.02 | 0.05 |
| Terminal Thickness | A3 | | 0.152 REF | |
| Overall Length | D | | 2.00 BSC | |
| Exposed Pad Length | D2 | 1.40 | 1.50 | 1.60 |
| Overall Width | E | | 3.00 BSC | |
| Exposed Pad Width | E2 | 1.20 | 1.30 | 1.40 |
| Terminal Width | b | 0.18 | 0.25 | 0.30 |
| Terminal Length | L | 0.25 | 0.35 | 0.45 |
| Terminal-to-Exposed-Pad | K | 0.20 | - | - |

Notes:

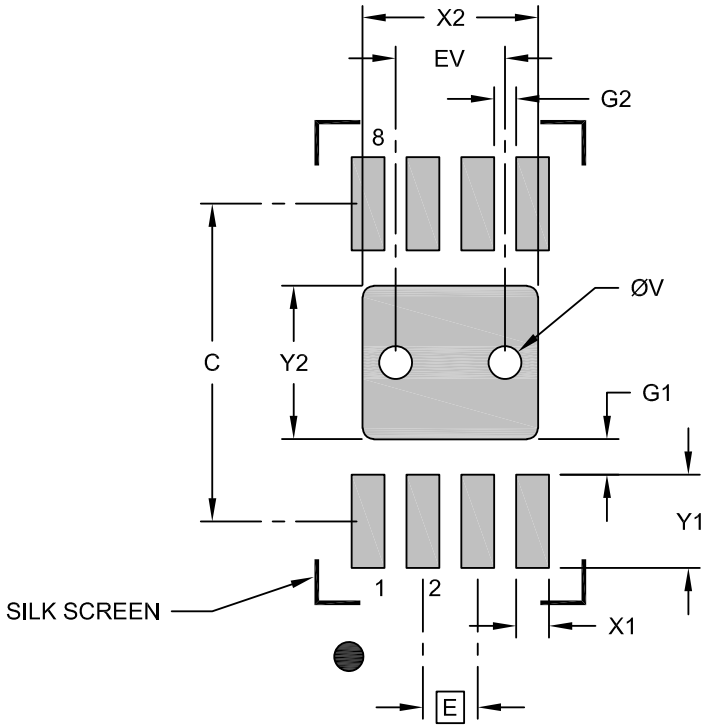
1. Pin 1 visual index feature may vary, but must be located within the hatched area.
2. Package is saw singulated
3. Dimensioning and tolerancing per ASME Y14.5M

BSC: Basic Dimension. Theoretically exact value shown without tolerances.
REF: Reference Dimension, usually without tolerance, for information purposes only.

Microchip Technology Drawing C04-21355-Q4B Rev C Sheet 2 of 2

### 8-Lead Ultra Thin Plastic Dual Flat, No Lead Package (Q4B) - 2x3 mm Body [UDFN]
### Atmel Legacy Global Package Code YNZ

**Note:** For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging




RECOMMENDED LAND PATTERN

| Units | | MILLIMETERS | | |
|---|---|---|---|---|
| Dimension Limits | | MIN | NOM | MAX |
| Contact Pitch | E | 0.50 BSC | | |
| Optional Center Pad Width | X2 | | | 1.60 |
| Optional Center Pad Length | Y2 | | | 1.40 |
| Contact Pad Spacing | C | | 2.90 | |
| Contact Pad Width (X8) | X1 | | | 0.30 |
| Contact Pad Length (X8) | Y1 | | | 0.85 |
| Contact Pad to Center Pad (X8) | G1 | 0.33 | | |
| Contact Pad to Contact Pad (X6) | G2 | 0.20 | | |
| Thermal Via Diameter | V | | 0.30 | |
| Thermal Via Pitch | EV | | 1.00 | |

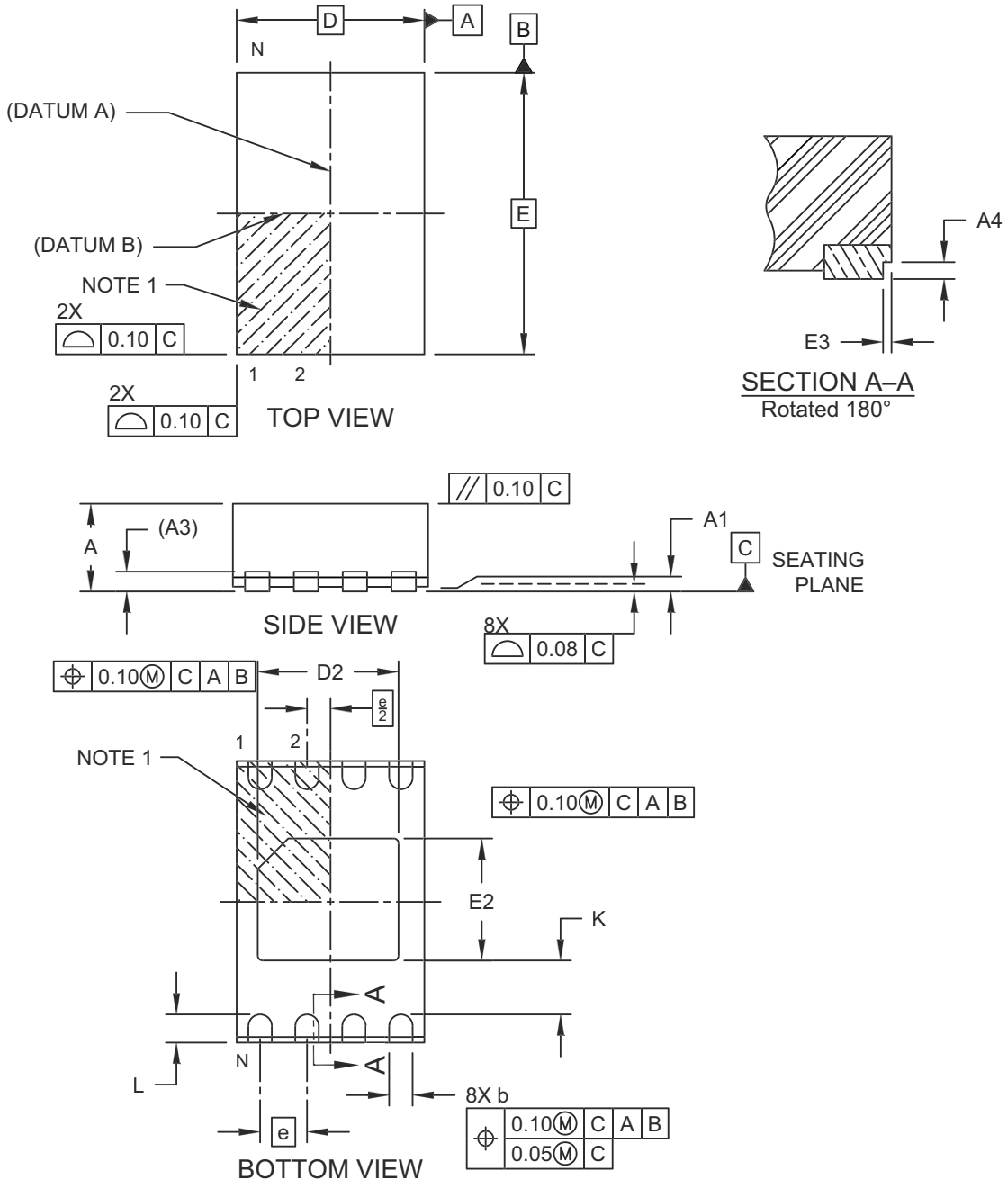
Notes:

1. Dimensioning and tolerancing per ASME Y14.5M
   BSC: Basic Dimension. Theoretically exact value shown without tolerances.
2. For best soldering results, thermal vias, if used, should be filled or tented to avoid solder loss during reflow process

Microchip Technology Drawing C04-23355-Q4B Rev C

**8-Lead Very Thin Plastic Dual Flat, No Lead Package (Q6B) - 2x3x1.0 mm Body [VDFN] 1.5x1.3 mm Exposed Pad Wettable Step Cut Flanks**

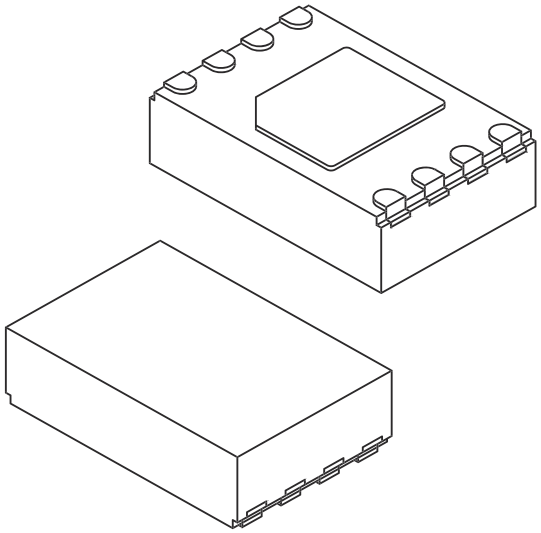
| **Note:** | For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging |
|---|---|




Microchip Technology Drawing C04-00598 Rev E Sheet 1 of 2

### 8-Lead Very Thin Plastic Dual Flat, No Lead Package (Q6B) - 2x3x1.0 mm Body [VDFN] 1.5x1.3 mm Exposed Pad Wettable Step Cut Flanks

**Note:** For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging



| Units | | MILLIMETERS | | |
|---|---|---|---|---|
| Dimension Limits | | MIN | NOM | MAX |
| Number of Terminals | N | | 008 | |
| Pitch | e | | 0.50 BSC | |
| Overall Height | A | 0.80 | 0.90 | 1.00 |
| Standoff | A1 | 0.00 | 0.02 | 0.05 |
| Terminal Thickness | A3 | | 0.203 REF | |
| Overall Length | D | | 2.00 BSC | |
| Exposed Pad Length | D2 | 1.40 | 1.50 | 1.60 |
| Overall Width | E | | 3.00 BSC | |
| Exposed Pad Width | E2 | 1.20 | 1.30 | 1.40 |
| Terminal Width | b | 0.20 | 0.25 | 0.30 |
| Terminal Length | L | 0.25 | 0.35 | 0.45 |
| Terminal-to-Exposed-Pad | K | 0.20 | – | – |
| Wettable Flank Step Cut Width | E3 | 0.035 | 0.06 | 0.085 |
| Wettable Flank Step Cut Depth | A4 | 0.100 | – | 0.190 |

Notes:

1. Pin 1 visual index feature may vary, but must be located within the hatched area.
2. Package is saw singulated
3. Dimensioning and tolerancing per ASME Y14.5M

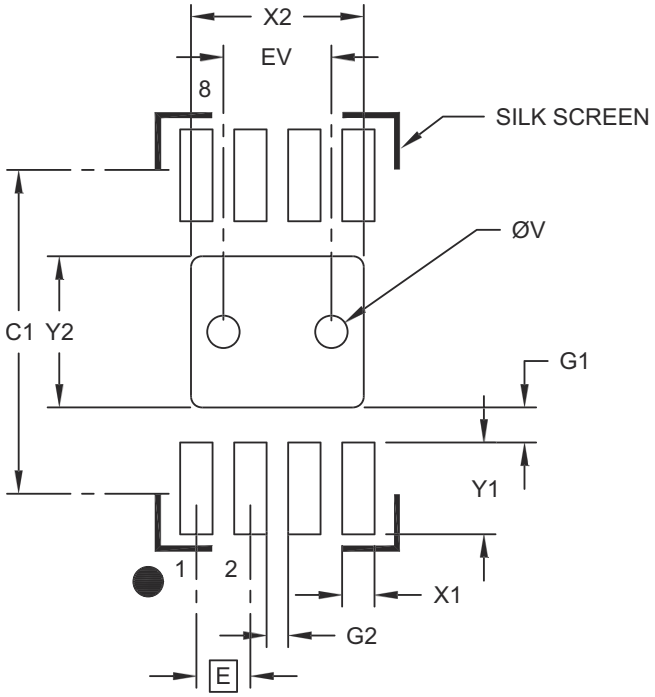
   BSC: Basic Dimension. Theoretically exact value shown without tolerances.

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

Microchip Technology Drawing C04-00598 Rev E Sheet 2 of 2

### 8-Lead Very Thin Plastic Dual Flat, No Lead Package (Q6B) - 2x3x1.0 mm Body [VDFN] 1.5x1.3 mm Exposed Pad Wettable Step Cut Flanks

**Note:** For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging




RECOMMENDED LAND PATTERN

| Units | | MILLIMETERS | | |
|---|---|---|---|---|
| Dimension Limits | | MIN | NOM | MAX |
| Contact Pitch | E | | 0.50 BSC | |
| Center Pad Width | X2 | | | 1.60 |
| Center Pad Length | Y2 | | | 1.40 |
| Contact Pad Spacing | C1 | | 2.90 | |
| Contact Pad Width (X8) | X1 | | | 0.30 |
| Contact Pad Length (X8) | Y1 | | | 0.85 |
| Contact Pad to Center Pad (X8) | G1 | 0.33 | | |
| Contact Pad to Contact Pad (X6) | G2 | 0.20 | | |
| Thermal Via Diameter | V | | 0.30 | |
| Thermal Via Pitch | EV | | 1.00 | |

Notes:

1. Dimensioning and tolerancing per ASME Y14.5M

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

2. For best soldering results, thermal vias, if used, should be filled or tented to avoid solder loss during reflow process

Microchip Technology Drawing C04-02598 Rev E

## APPENDIX A: REVISION HISTORY

### Revision Q (04/2025)

Updated Q6B package outline drawing; Minor editorial updates throughout the document.

### Revision P (08/2021)

Added 24FC16 and Q6B package Automotive product offerings; Removed CSP product offering; Removed H-temp. offering from Automotive Product Identification System; Updated DFN and SOT-23 package drawings.

### Revision N (03/2021)

Replaced terminology “Master” and “Slave” with “Host” and “Client” respectively. Changed “MUY” with “Q4B” part number for UDFN package. Updated PDIP, SOIC, TSSOP and UDFN package drawings. Added Automotive Product Identification System.

### Revision M (12/2019)

Added the 24FC16 device; Updated Package Drawings; Updated formating throughout for clarification.

### Revision L (12/2012)

Revised Automotive E-temp.; Product ID System.

### Revision K (01/2012)

Added Chip Scale Package; Revised Product ID System.

### Revision J (10/2009)

Added 5-Lead Chip Scale Package.

### Revision H (01/2009)

Added TDFN Package; Updated Package Drawings.

### Revision G (02/2007)

Changed 1.8V to 1.7V; Revised Features Section; Replaced Package Drawings; Revised Product ID Section.

### Revision F (09/2005)

Revised Figure 3-2 Control Byte Allocation; Figure 4-1 Byte Write; Figure 4-2 Page Write; Section 6.0 Write Protection; Figure 7-1 Current Address Read; Figure 7-2 Random Read; Figure 7-3 Sequential Read; Section 8.3 Write-Protect (WP).

### Revision E (03/2005)

Added DFN package.

### Revision D (12/2003)

Corrections to Section 1.0 Electrical Characteristics.

## PRODUCT IDENTIFICATION SYSTEM (NON-AUTOMOTIVE)

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

| PART NO. | [X](1) | -X | /XX |
|---|---|---|---|
| Device | Tape and Reel Option | Temperature Range | Package |

**Device:** 24AA16: = 1.7V, 16-Kbit $I^2C$ Serial EEPROM
24LC16B: = 2.5V, 16-Kbit $I^2C$ Serial EEPROM
24FC16: = 1.7V, High-Speed, 16-Kbit $I^2C$ Serial EEPROM

**Tape and Reel Option:** Blank = Standard packaging (tube or tray)
T = Tape and Reel(1)

**Temperature Range:** I = -40°C to +85°C (Industrial)
E = -40°C to +125°C (Extended)

**Package:**
- MC = Plastic Dual Flat, No Lead Package – 2x3x1.0 mm Body, 8-Lead (DFN)
- MS = Plastic Micro Small Outline Package, 8-Lead (MSOP)
- P = Plastic Dual In-Line – 300 mil Body, 8-Lead (PDIP)
- SN = Plastic Small Outline - Narrow, 3.90 mm Body, 8-Lead (SOIC)
- OT = Plastic Small Outline Transistor, 5-Lead (SOT-23) (Tape and Reel only)
- MNY = Plastic Dual Flat, No Lead Package - 2x3x0.8 mm Body, 8-Lead (TDFN)
- ST = Plastic Thin Shrink Small Outline – 4.4 mm, 8-Lead (TSSOP)
- Q4B = Ultra Thin Plastic Dual Flat, No Lead Package - 2x3x0.6 mm Body, 8-Lead (UDFN)

**Examples:**

a) 24AA16-I/P: Industrial Temperature, 1.7V, PDIP package.

b) 24AA16-I/SN: Industrial Temperature, 1.7V, SOIC package.

c) 24AA16T-I/OT: Tape and Reel, Industrial Temperature, 1.7V, SOT-23 package.

d) 24LC16B-I/P: Industrial Temperature, 2.5V, PDIP package.

e) 24LC16B-E/SN: Extended Temperature, 2.5V, SOIC package.

f) 24LC16BT-I/OT: Tape and Reel, Industrial Temperature, 2.5V, SOT-23 package.

g) 24AA16T-E/SN: Tape and Reel, Extended Temperature, 1.7V, SOIC package.

h) 24AA16T-I/MNY: Tape and Reel, Industrial Temperature, 1.7V, TDFN package.

i) 24FC16-I/SN: Industrial Temperature, 1.7V, SOIC package.

j) 24FC16T-E/ST: Tape and Reel, Extended Temperature, 1.7V, TSSOP package.

k) 24FC16T-I/Q4B: Tape and Reel, Industrial Temperature, 1.7V, UDFN package.

**Note 1:** Tape and Reel identifier only appears in the catalog part number description. This identifier is used for ordering purposes and is not printed on the device package. Check with your Microchip Sales Office for package availability with the Tape and Reel option.

## PRODUCT IDENTIFICATION SYSTEM (AUTOMOTIVE)

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

| PART NO. | [X](1) | X | /XX | XXX(2, 3) |
|---|---|---|---|---|
| Device | Tape and Reel Option | Temperature Range | Package | Variant |

**Device:**
- 24AA16: = 1.7V, 16-Kbit $I^2C$ Serial EEPROM
- 24LC16B: = 2.5V, 16-Kbit $I^2C$ Serial EEPROM
- 24FC16: = 1.7V, High-Speed, 16-Kbit $I^2C$ Serial EEPROM

**Tape and Reel Option:**
- Blank = Standard packaging (tube or tray)
- T = Tape and Reel(1)

**Temperature Range:**
- I = -40°C to +85°C(AEC-Q100 Grade 3)
- E = -40°C to +125°C(AEC-Q100 Grade 1)

**Package:**
- MS = Plastic Micro Small Outline Package, 8-Lead (MSOP)
- SN = Plastic Small Outline – Narrow, 3.90 mm Body, 8-Lead (SOIC)
- OT = Plastic Small Outline Transistor, 5-Lead (SOT-23) (Tape and Reel Only)
- MNY = Plastic Dual Flat, No Lead Package – 2x3x0.8mm Body, 8-Lead (TDFN)
- ST = Plastic Thin Shrink Small Outline – 4.4mm, 8-Lead (TSSOP)
- Q6B = Very Thin Plastic Dual Flat, No Lead Wettable Flanks Package - 2x3x1.0 mm Body, 8-Lead (VDFN)

**Variant(2,3):**
- 15KVAO = Standard Automotive, 15K Process(4)
- 15KVXX = Customer-Specific Automotive, 15K Process(4)
- 16KVAO = Standard Automotive, 16K Process(4)
- 16KVXX = Customer-Specific Automotive, 16K Process(4)
- 36KVAO = Standard Automotive, 36K Process
- 36KVXX = Customer-Specific Automotive, 36K Process

**Examples:**

a) 24AA16T-I/OT16KVAO: Tape and Reel, Automotive Grade 3, 1.7V, SOT-23 Package.

b) 24AA16T-E/MNY16KVAO: Tape and Reel, Automotive Grade 1, 1.7V, TDFN Package.

c) 24LC16BT-I/SN16KVAO: Tape and Reel, Automotive Grade 3, 2.5V, SOIC Package.

d) 24LC16BT-E/MNY16KVAO:Tape and Reel, Automotive Grade 1, 2.5V TDFN Package.

e) 24FC16T-E/SN36KVAO: Tape and Reel, Automotive Grade 1, 1.7V SOIC Package.

f) 24FC16T-E/ST36KVAO: Tape and Reel, Automotive Grade 1, 1.7V TSSOP Package.

g) 24FC16T-E/OT36KVAO: Tape and Reel, Automotive Grade 1, 1.7V SOT-23 Package.

h) 24FC16T-E/Q6B36KVAO: Tape and Reel, Automotive Grade 1, 1.7V VDFN Package.

**Note 1:** Tape and Reel identifier only appears in the catalog part number description. This identifier is used for ordering purposes and is not printed on the device package. Check with your Microchip Sales Office for package availability with the Tape and Reel option.

**2:** The VAO/VXX automotive variants have been designed, manufactured, tested and qualified in accordance with AEC-Q100 requirements for automotive applications.

**3:** For customers requesting a PPAP, a customer-specific part number will be generated and provided. A PPAP is not provided for VAO part numbers.

**4:** Not recommended for new designs.

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