## Features

- **Low-voltage and Standard-voltage Operation**
  - **2.7 ($V_{CC}$ = 2.7V to 5.5V)**
  - **1.8 ($V_{CC}$ = 1.8V to 5.5V)**
- **User-selectable Internal Organization**
  - **1K: 128 x 8 or 64 x 16**
- **Three-wire Serial Interface**
- **2 MHz Clock Rate (5V)**
- **Self-timed Write Cycle (10 ms max)**
- **High Reliability**
  - **Endurance: 1 Million Write Cycles**
  - **Data Retention: 100 Years**
- **Automotive Grade Devices Available**
- **8-lead JEDEC PDIP, 8-lead JEDEC SOIC, 8-lead EIAJ SOIC, 8-lead Ultra Thin mini-MAP (MLP 2x3), 8-lead TSSOP and 8-ball dBGA2 Packages**

## Description

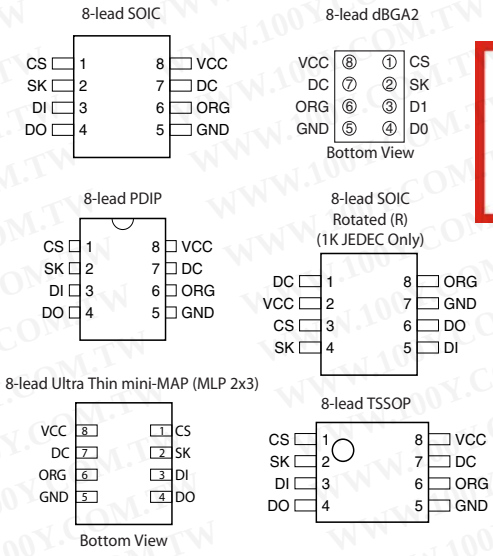
The AT93C46 provides 1024 bits of serial electrically erasable programmable read-only memory (EEPROM), organized as 64 words of 16 bits each (when the ORG pin is connected to VCC), and 128 words of 8 bits each (when the ORG pin is tied to ground). The device is optimized for use in many industrial and commercial applications where low-power and low-voltage operations are essential. The AT93C46 is available in space-saving 8-lead PDIP, 8-lead JEDEC SOIC, 8-lead EIAJ SOIC, 8-lead Ultra Thin mini-MAP (MLP 2x3), 8-lead TSSOP, and 8-lead dBGA2 packages.

The AT93C46 is enabled through the Chip Select pin (CS) and accessed via a three-wire serial interface consisting of Data Input (DI), Data Output (DO), and Shift Clock (SK). Upon receiving a Read instruction at DI, the address is decoded and the data is clocked out serially on the DO pin. The Write cycle is completely self-timed, and no separate Erase cycle is required before Write. The Write cycle is only enabled when the part is in the Erase/Write Enable state. When CS is brought high following the initiation of a Write cycle, the DO pin outputs the Ready/Busy status of the part.

The AT93C46 is available in 2.7V to 5.5V and 1.8V to 5.5V versions.

**Table 1.** Pin Configurations

| Pin Name | Function |
|---|---|
| CS | Chip Select |
| SK | Serial Data Clock |
| DI | Serial Data Input |
| DO | Serial Data Output |
| GND | Ground |
| VCC | Power Supply |
| ORG | Internal Organization |
| DC | Don't Connect |






# Three-wire Serial EEPROM

**1K (128 x 8 or 64 x 16)**

# AT93C46

Note: Not recommended for new design; please refer to AT93C46D datasheet.

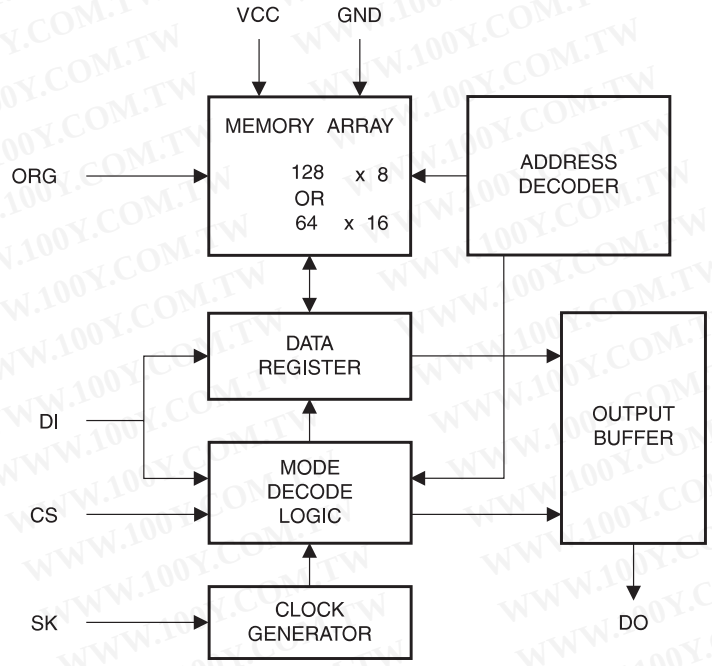
5140B–SEEPR–2/07

## Absolute Maximum Ratings*

| | |
|---|---|
| Operating Temperature | –55°C to +125°C |
| Storage Temperature | –65°C to +150°C |
| Voltage on Any Pin with Respect to Ground | –1.0V to +7.0V |
| Maximum Operating Voltage | 6.25V |
| DC Output Current | 5.0 mA |

*NOTICE: Stresses beyond 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 beyond those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability

**Figure 1.** Block Diagram




Note: When the ORG pin is connected to VCC, the "x 16" organization is selected. When it is connected to ground, the "x 8" organization is selected. If the ORG pin is left unconnected and the application does not load the input beyond the capability of the internal 1 Meg ohm pullup, then the "x 16" organization is selected. The feature is not available on the 1.8V devices.

For the AT93C46, if "x 16" organization is the mode of choice and Pin 6 (ORG) is left unconnected, Atmel recommends using the AT93C46A device. For more details, see the AT93C46A datasheet.

**Table 2.** Pin Capacitance[1]

Applicable over recommended operating range from $T_A$ = 25°C, f = 1.0 MHz, $V_{CC}$ = +5.0V (unless otherwise noted)

| Symbol | Test Conditions | Max | Units | Conditions |
|---|---|---|---|---|
| $C_{OUT}$ | Output Capacitance (DO) | 5 | pF | $V_{OUT}$ = 0V |
| $C_{IN}$ | Input Capacitance (CS, SK, DI) | 5 | pF | $V_{IN}$ = 0V |

Note: 1. This parameter is characterized and is not 100% tested.

**Table 3.** DC Characteristics

Applicable over recommended operating range from: $T_{AI}$ = –40°C to +85°C, $V_{CC}$ = +1.8V to +5.5V, $T_{AE}$ = -40°C to +125°C, $V_{CC}$ = +1.8V to +5.5V (unless otherwise noted)

| Symbol | Parameter | Test Condition | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $V_{CC1}$ | Supply Voltage | | | 1.8 | | 5.5 | V |
| $V_{CC2}$ | Supply Voltage | | | 2.7 | | 5.5 | V |
| $V_{CC3}$ | Supply Voltage | | | 4.5 | | 5.5 | V |
| $I_{CC}$ | Supply Current | $V_{CC}$ = 5.0V | READ at 1.0 MHz | | 0.5 | 2.0 | mA |
| | | | WRITE at 1.0 MHz | | 0.5 | 2.0 | mA |
| $I_{SB1}$ | Standby Current | $V_{CC}$ = 1.8V | CS = 0V | | 0 | 0.1 | µA |
| $I_{SB2}$ | Standby Current | $V_{CC}$ = 2.7V | CS = 0V | | 6.0 | 10.0 | µA |
| $I_{SB3}$ | Standby Current | $V_{CC}$ = 5.0V | CS = 0V | | 17 | 30 | µA |
| $I_{IL}$ | Input Leakage | $V_{IN}$ = 0V to $V_{CC}$ | | | 0.1 | 1.0 | µA |
| $I_{OL}$ | Output Leakage | $V_{IN}$ = 0V to $V_{CC}$ | | | 0.1 | 1.0 | µA |
| $V_{IL1}$[1] | Input Low Voltage | 2.7V ≤ $V_{CC}$ ≤ 5.5V | | –0.6 | | 0.8 | V |
| $V_{IH1}$[1] | Input High Voltage | | | 2.0 | | $V_{CC}$ + 1 | |
| $V_{IL2}$[1] | Input Low Voltage | 1.8V ≤ $V_{CC}$ ≤ 2.7V | | –0.6 | | $V_{CC}$ x 0.3 | V |
| $V_{IH2}$[1] | Input High Voltage | | | $V_{CC}$ x 0.7 | | $V_{CC}$ + 1 | |
| $V_{OL1}$ | Output Low Voltage | 2.7V ≤ $V_{CC}$ ≤ 5.5V | $I_{OL}$ = 2.1 mA | | | 0.4 | V |
| $V_{OH1}$ | Output High Voltage | | $I_{OH}$ = –0.4 mA | 2.4 | | | V |
| $V_{OL2}$ | Output Low Voltage | 1.8V ≤ $V_{CC}$ ≤ 2.7V | $I_{OL}$ = 0.15 mA | | | 0.2 | V |
| $V_{OH2}$ | Output High Voltage | | $I_{OH}$ = –100 µA | $V_{CC}$ – 0.2 | | | V |

Note: 1. $V_{IL}$ min and $V_{IH}$ max are reference only and are not tested.

**Table 4.** AC Characteristics

Applicable over recommended operating range from $T_{AI}$ = −40°C to + 85°C, $V_{CC}$ = As Specified, CL = 1 TTL Gate and 100 pF (unless otherwise noted)

| Symbol | Parameter | Test Condition | | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|---|
| $f_{SK}$ | SK Clock Frequency | $4.5V \le V_{CC} \le 5.5V$<br>$2.7V \le V_{CC} \le 5.5V$<br>$1.8V \le V_{CC} \le 5.5V$ | | 0<br>0<br>0 | | 2<br>1<br>0.25 | MHz |
| $t_{SKH}$ | SK High Time | $4.5V \le V_{CC} \le 5.5V$<br>$2.7V \le V_{CC} \le 5.5V$<br>$1.8V \le V_{CC} \le 5.5V$ | | 250<br>250<br>1000 | | | ns |
| $t_{SKL}$ | SK Low Time | $4.5V \le V_{CC} \le 5.5V$<br>$2.7V \le V_{CC} \le 5.5V$<br>$1.8V \le V_{CC} \le 5.5V$ | | 250<br>250<br>1000 | | | ns |
| $t_{CS}$ | Minimum CS Low Time | $4.5V \le V_{CC} \le 5.5V$<br>$2.7V \le V_{CC} \le 5.5V$<br>$1.8V \le V_{CC} \le 5.5V$ | | 250<br>250<br>1000 | | | ns |
| $t_{CSS}$ | CS Setup Time | Relative to SK | $4.5V \le V_{CC} \le 5.5V$<br>$2.7V \le V_{CC} \le 5.5V$<br>$1.8V \le V_{CC} \le 5.5V$ | 50<br>50<br>200 | | | ns |
| $t_{DIS}$ | DI Setup Time | Relative to SK | $4.5V \le V_{CC} \le 5.5V$<br>$2.7V \le V_{CC} \le 5.5V$<br>$1.8V \le V_{CC} \le 5.5V$ | 100<br>100<br>400 | | | ns |
| $t_{CSH}$ | CS Hold Time | Relative to SK | | 0 | | | ns |
| $t_{DIH}$ | DI Hold Time | Relative to SK | $4.5V \le V_{CC} \le 5.5V$<br>$2.7V \le V_{CC} \le 5.5V$<br>$1.8V \le V_{CC} \le 5.5V$ | 100<br>100<br>400 | | | ns |
| $t_{PD1}$ | Output Delay to “1” | AC Test | $4.5V \le V_{CC} \le 5.5V$<br>$2.7V \le V_{CC} \le 5.5V$<br>$1.8V \le V_{CC} \le 5.5V$ | | | 250<br>250<br>1000 | ns |
| $t_{PD0}$ | Output Delay to “0” | AC Test | $4.5V \le V_{CC} \le 5.5V$<br>$2.7V \le V_{CC} \le 5.5V$<br>$1.8V \le V_{CC} \le 5.5V$ | | | 250<br>250<br>1000 | ns |
| $t_{SV}$ | CS to Status Valid | AC Test | $4.5V \le V_{CC} \le 5.5V$<br>$2.7V \le V_{CC} \le 5.5V$<br>$1.8V \le V_{CC} \le 5.5V$ | | | 250<br>250<br>1000 | ns |
| $t_{DF}$ | CS to DO in High Impedance | AC Test<br>CS = $V_{IL}$ | $4.5V \le V_{CC} \le 5.5V$<br>$2.7V \le V_{CC} \le 5.5V$<br>$1.8V \le V_{CC} \le 5.5V$ | | | 100<br>100<br>400 | ns |
| $t_{WP}$ | Write Cycle Time | | | | | 10 | ms |
| | | | $4.5V \le V_{CC} \le 5.5V$ | 0.1 | 3 | | ms |
| Endurance(1) | 5.0V, 25°C | | | 1M | | | Write Cycles |

Note: 1. This parameter is characterized and is not 100% tested.

**Table 5.** Instruction Set for the AT93C46

| Instruction | SB | Op Code | Address | | Data | | Comments |
|---|---|---|---|---|---|---|---|
| | | | x 8 | x 16 | x 8 | x 16 | |
| READ | 1 | 10 | $A_6 – A_0$ | $A_5 – A_0$ | | | Reads data stored in memory, at specified address |
| EWEN | 1 | 00 | 11XXXXX | 11XXXX | | | Write enable must precede all programming modes |
| ERASE | 1 | 11 | $A_6 – A_0$ | $A_5 – A_0$ | | | Erases memory location $A_n – A_0$ |
| WRITE | 1 | 01 | $A_6 – A_0$ | $A_5 – A_0$ | $D_7 – D_0$ | $D_{15} – D_0$ | Writes memory location $A_n – A_0$ |
| ERAL | 1 | 00 | 10XXXXX | 10XXXX | | | Erases all memory locations. Valid only at $V_{CC}$ = 4.5V to 5.5V |
| WRAL | 1 | 00 | 01XXXXX | 01XXXX | $D_7 – D_0$ | $D_{15} – D_0$ | Writes all memory locations. Valid only at $V_{CC}$ = 4.5V to 5.5V |
| EWDS | 1 | 00 | 00XXXXX | 00XXXX | | | Disables all programming instructions |

Note: The Xs in the address field represent *DON'T CARE* values and must be clocked.

## Functional Description

The AT93C46 is accessed via a simple and versatile three-wire serial communication interface. Device operation is controlled by seven instructions issued by the host processor. *A valid instruction starts with a rising edge of CS* and consists of a start bit (logic "1") followed by the appropriate op code and the desired memory address location.

**READ (READ):** The Read (READ) instruction contains the address code for the memory location to be read. After the instruction and address are decoded, data from the selected memory location is available at the serial output pin DO. Output data changes are synchronized with the rising edges of serial clock SK. It should be noted that a dummy bit (logic "0") precedes the 8- or 16-bit data output string.

**ERASE/WRITE ENABLE (EWEN):** To assure data integrity, the part automatically goes into the Erase/Write Disable (EWDS) state when power is first applied. An Erase/Write Enable (EWEN) instruction must be executed first before any programming instructions can be carried out. Please note that once in the EWEN state, programming remains enabled until an EWDS instruction is executed or $V_{CC}$ power is removed from the part.

**ERASE (ERASE):** The Erase (ERASE) instruction programs all bits in the specified memory location to the logical "1" state. The self-timed erase cycle starts once the Erase instruction and address are decoded. The DO pin outputs the Ready/Busy status of the part if CS is brought high after being kept low for a minimum of 250 ns ($t_{CS}$). A logic "1" at pin DO indicates that the selected memory location has been erased and the part is ready for another instruction.

**WRITE (WRITE):** The Write (WRITE) instruction contains the 8 or 16 bits of data to be written into the specified memory location. The self-timed programming cycle $t_{WP}$ starts after the last bit of data is received at serial data input pin DI. The DO pin outputs the Read/Busy status of the part if CS is brought high after being kept low for a minimum of 250 ns ($t_{CS}$). A logic "0" at DO indicates that programming is still in progress. A logic "1" indicates that the memory location at the specified address has been written with the data pattern contained in the instruction and the part is ready for further instructions. *A Ready/Busy status cannot be obtained if the CS is brought high after the end of the self-timed programming cycle tWP.*

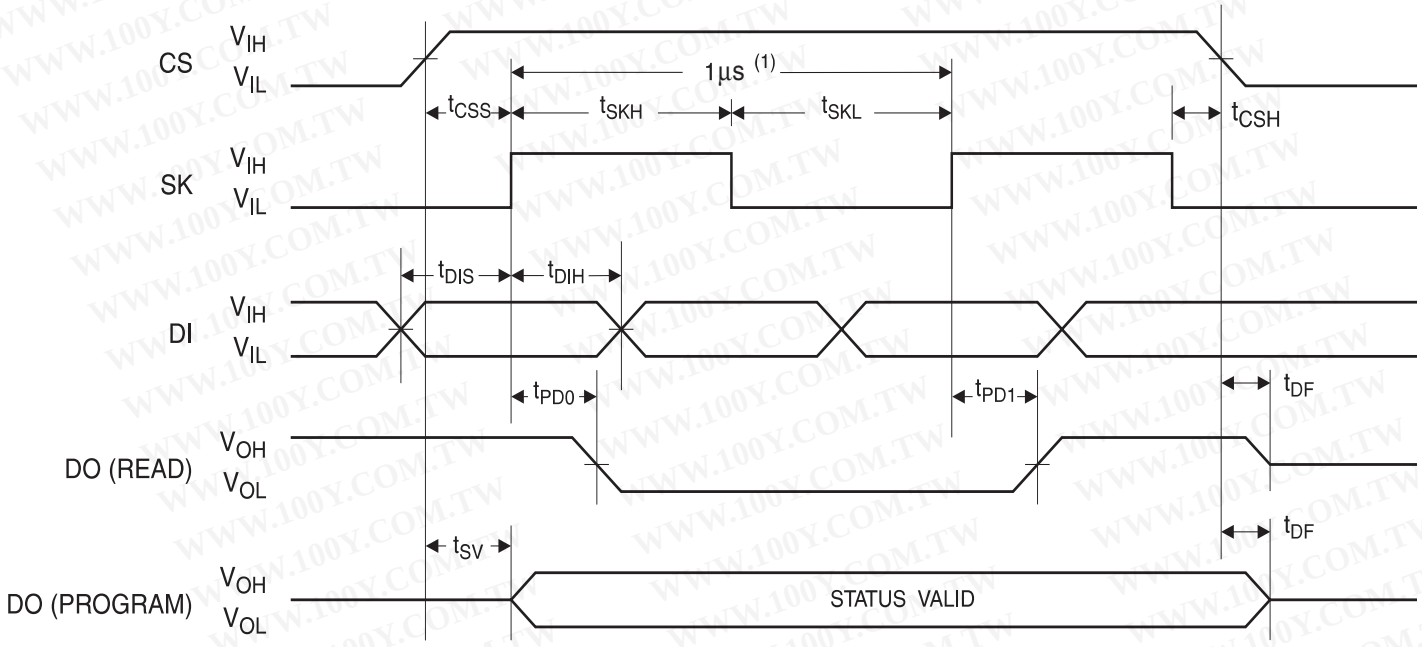
**ERASE ALL (ERAL):** The Erase All (ERAL) instruction programs every bit in the memory array to the logic "1" state and is primarily used for testing purposes. The DO pin outputs the Ready/Busy status of the part if CS is brought high after being kept low for a minimum of 250 ns ($t_{CS}$). The ERAL instruction is valid only at $V_{CC}$ = 5.0V ± 10%.

**WRITE ALL (WRAL)**: The Write All (WRAL) instruction programs all memory locations with the data patterns specified in the instruction. The DO pin outputs the Ready/Busy status of the part if CS is brought high after being kept low for a minimum of 250 ns ($t_{CS}$). The WRAL instruction is valid only at $V_{CC}$ = 5.0V ± 10%.

**ERASE/WRITE DISABLE (EWDS):** To protect against accidental data disturb, the Erase/Write Disable (EWDS) instruction disables all programming modes and should be executed after all programming operations. The operation of the Read instruction is independent of both the EWEN and EWDS instructions and can be executed at any time.

## Timing Diagrams

**Figure 2.** Synchronous Data Timing




Note: 1. This is the minimum SK period.

**Table 6.** Organization Key for Timing Diagrams

| | AT93C46 (1K) | |
|---|---|---|
| **I/O** | **x 8** | **x 16** |
| $A_N$ | $A_6$ | $A_5$ |
| $D_N$ | $D_7$ | $D_{15}$ |

**Figure 3.** READ Timing

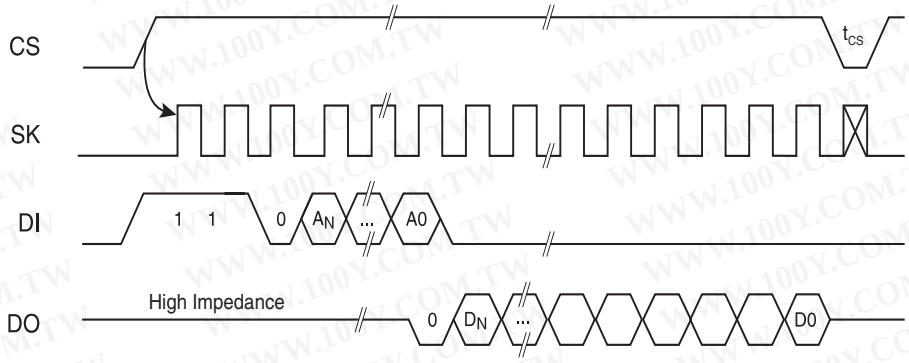



**Figure 4.** EWEN Timing

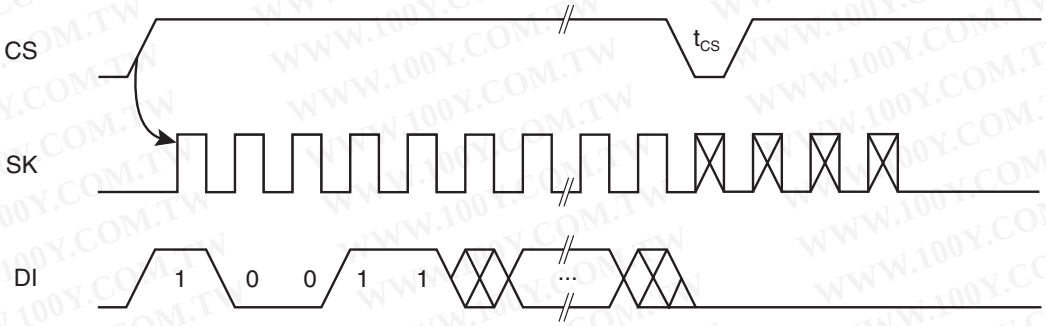



**Figure 5.** EWDS Timing

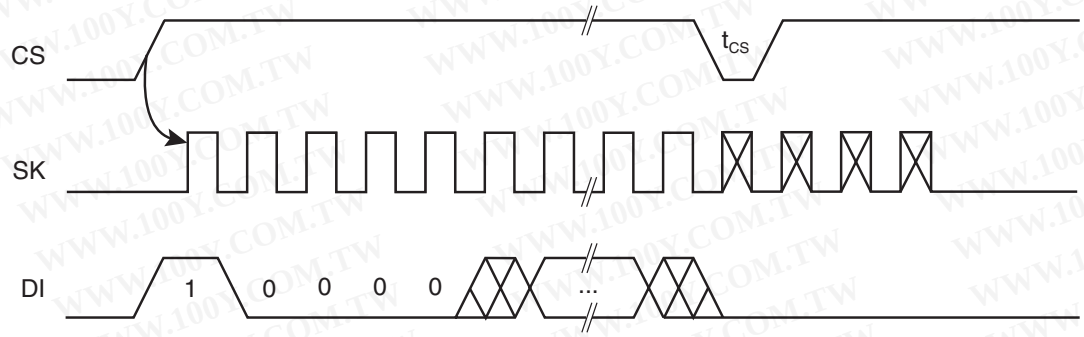


**Figure 6.** WRITE Timing

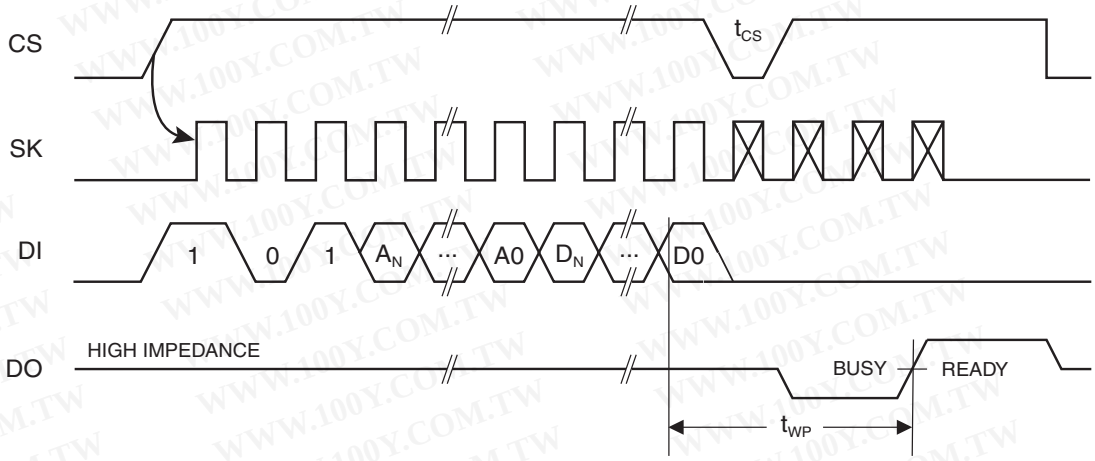
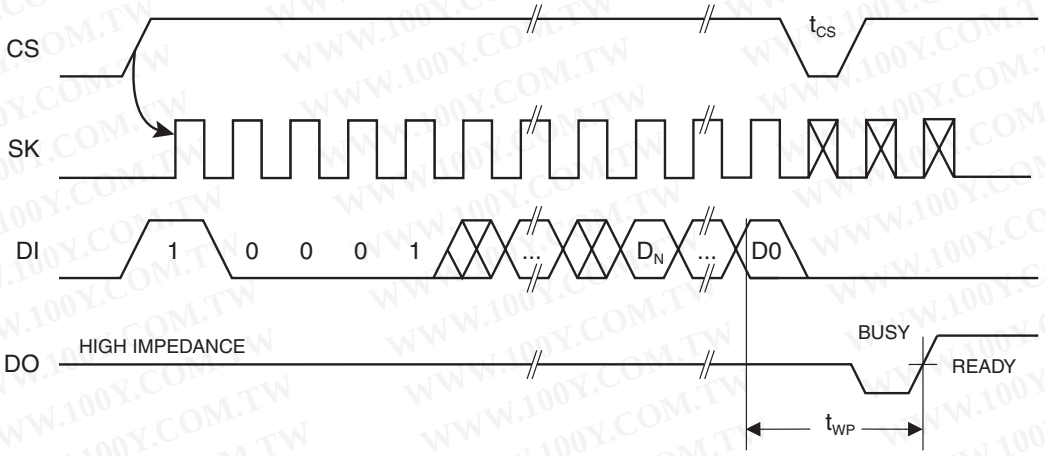



**Figure 7.** WRAL Timing[1]




Note: 1. Valid only at $V_{CC}$ = 4.5V to 5.5V.

**Figure 8.** ERASE Timing

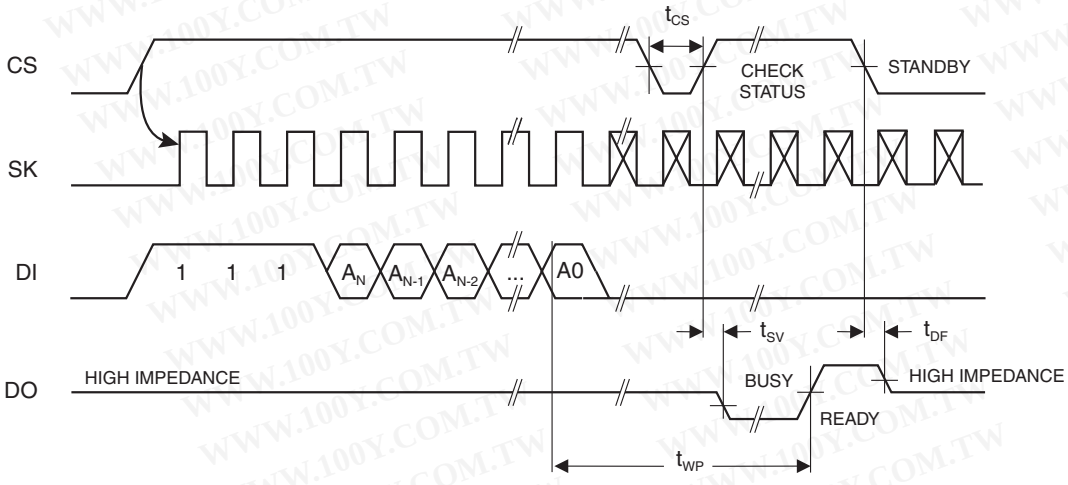
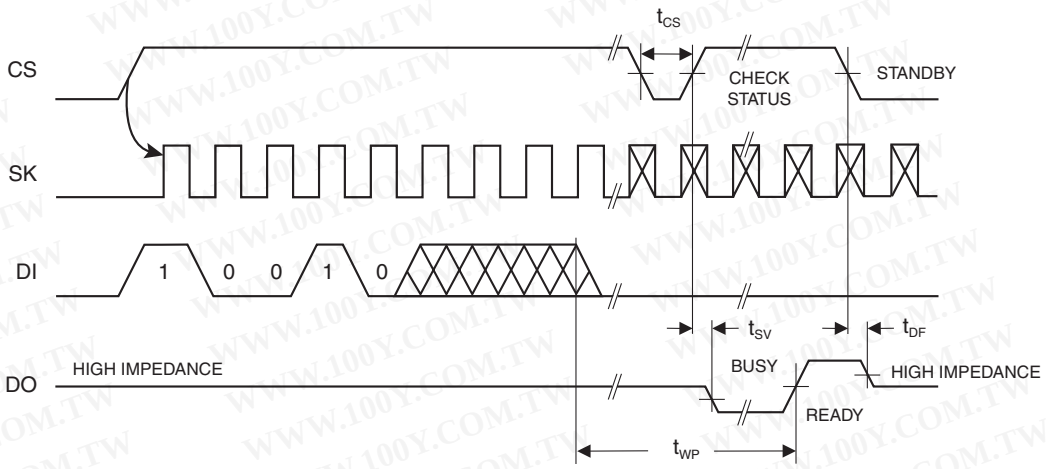


**Figure 9.** ERAL Timing[1]




Note: 1. Valid only at $V_{CC}$ = 4.5V to 5.5V.

## AT93C46 Ordering Information[1]

| Ordering Code | Package | Operation Range |
|---|---|---|
| AT93C46-10PU-2.7[2]<br>AT93C46-10PU-1.8[2]<br>AT93C46-10SU-2.7[2]<br>AT93C46-10SU-1.8[2]<br>AT93C46W-10SU-2.7[2]<br>AT93C46W-10SU-1.8[2]<br>AT93C46-10TU-2.7[2]<br>AT93C46-10TU-1.8[2]<br>AT93C46Y1-10YU-1.8[2] (Not recommended for new designs)<br>AT93C46Y6-10YH-1.8[3]<br>AT93C46U3-10UU-1.8[2] | 8P3<br>8P3<br>8S1<br>8S1<br>8S2<br>8S2<br>8A2<br>8A2<br>8Y1<br>8Y6<br>8U3-1 | Lead-free/Halogen-free/<br>Industrial Temperature<br>(–40°C to 85°C) |
| AT93C46-W1.8-11[4] | Die Sale | Industrial<br>(–40°C to 85°C) |

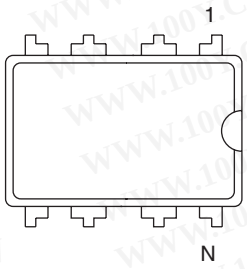
Notes:
1. For 2.7V devices used in the 4.5V to 5.5V range, please refer to performance values in the Table 3 on page 3 and Table 4 on page 4. Not recommended for new design. Please refer to AT93C46D datasheet.
2. "U" designates Green Package and RoHS compliant.
3. "H" designates Green Package and RoHS compliant, with NiPdAu Lead finish
4. Available in waffle pack and wafer form, order as SL788 for inkless wafer form. Bumped die available upon request.



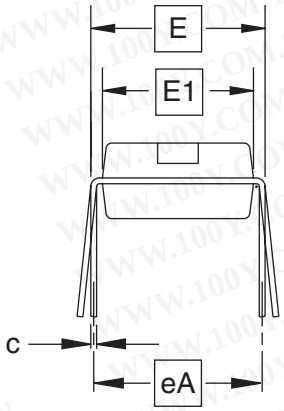
| Package Type | |
|---|---|
| **8P3** | 8-lead, 0.300" Wide, Plastic Dual Inline Package (PDIP) |
| **8S1** | 8-lead, 0.150" Wide, Plastic Gull Wing Small Outline (JEDEC SOIC) |
| **8S2** | 8-lead, 0.200" Wide, Plastic Gull Wing Small Outline (EIAJ SOIC) |
| **8A2** | 8-lead, 0.170" Wide, Thin Shrink Small Outline Package (TSSOP) |
| **8U3-1** | 8-ball, Die Ball Grid Array Package (dBGA2) |
| **8Y1** | 8-lead, 4.90 mm x 3.00 mm Body, Dual Footprint, Non-leaded, Miniature Array Package (MAP) |
| **8Y6** | 8-lead, 2.00 mm x 3.00 mm Body, 0.50mm Pitch, Ultra-Thin Mini-MAO, Dual No Lead Package. (DFN), (MLP 2x3mm) |
| **Options** | |
| **–2.7** | Low Voltage (2.7V to 5.5V) |
| **–1.8** | Low Voltage (1.8V to 5.5V) |
| **R** | Rotated Pinout |

## Packaging Information

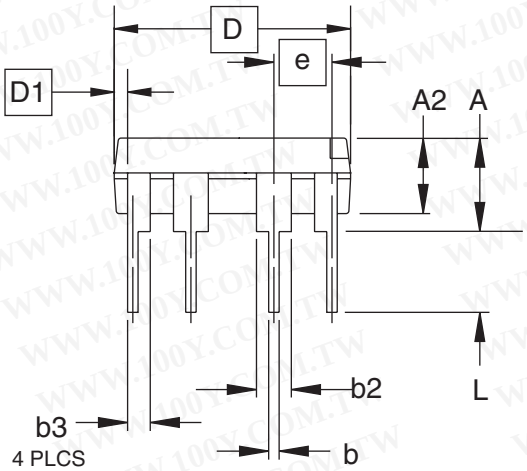
### 8P3 – PDIP




Top View




End View




Side View

**COMMON DIMENSIONS**
(Unit of Measure = inches)

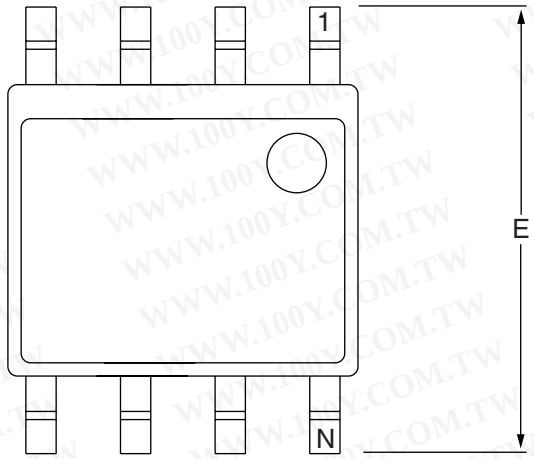
| SYMBOL | MIN | NOM | MAX | NOTE |
|---|---|---|---|---|
| A | | | 0.210 | 2 |
| A2 | 0.115 | 0.130 | 0.195 | |
| b | 0.014 | 0.018 | 0.022 | 5 |
| b2 | 0.045 | 0.060 | 0.070 | 6 |
| b3 | 0.030 | 0.039 | 0.045 | 6 |
| c | 0.008 | 0.010 | 0.014 | |
| D | 0.355 | 0.365 | 0.400 | 3 |
| D1 | 0.005 | | | 3 |
| E | 0.300 | 0.310 | 0.325 | 4 |
| E1 | 0.240 | 0.250 | 0.280 | 3 |
| e | 0.100 BSC | | | |
| eA | 0.300 BSC | | | 4 |
| L | 0.115 | 0.130 | 0.150 | 2 |

Notes:
1. This drawing is for general information only; refer to JEDEC Drawing MS-001, Variation BA for additional information.
2. Dimensions A and L are measured with the package seated in JEDEC seating plane Gauge GS-3.
3. D, D1 and E1 dimensions do not include mold Flash or protrusions. Mold Flash or protrusions shall not exceed 0.010 inch.
4. E and eA measured with the leads constrained to be perpendicular to datum.
5. Pointed or rounded lead tips are preferred to ease insertion.
6. b2 and b3 maximum dimensions do not include Dambar protrusions. Dambar protrusions shall not exceed 0.010 (0.25 mm).

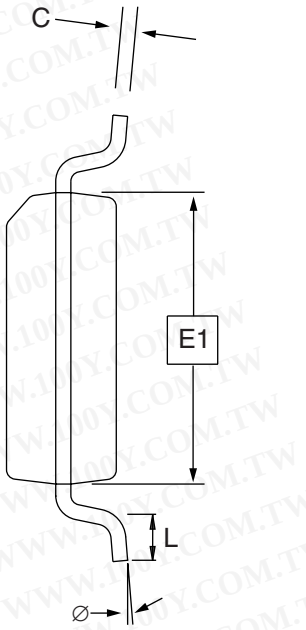
01/09/02

| | TITLE | DRAWING NO. | REV. |
|---|---|---|---|
| 2325 Orchard Parkway<br>San Jose, CA 95131 | **8P3**, 8-lead, 0.300" Wide Body, Plastic Dual In-line Package (PDIP) | 8P3 | B |

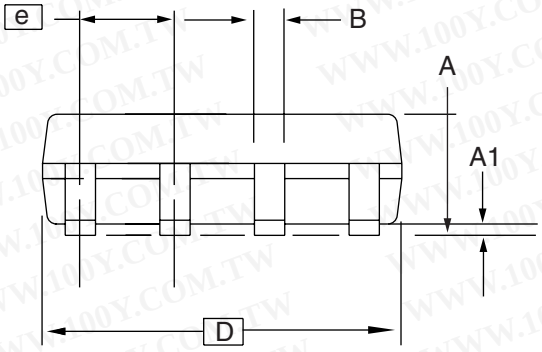
## 8S1 – JEDEC SOIC




Top View




End View




Side View

**COMMON DIMENSIONS**
(Unit of Measure = mm)

| SYMBOL | MIN | NOM | MAX | NOTE |
|---|---|---|---|---|
| A | 1.35 | – | 1.75 | |
| A1 | 0.10 | – | 0.25 | |
| b | 0.31 | – | 0.51 | |
| C | 0.17 | – | 0.25 | |
| D | 4.80 | – | 5.00 | |
| E1 | 3.81 | – | 3.99 | |
| E | 5.79 | – | 6.20 | |
| e | 1.27 BSC | | | |
| L | 0.40 | – | 1.27 | |
| ∅ | 0° | – | 8° | |

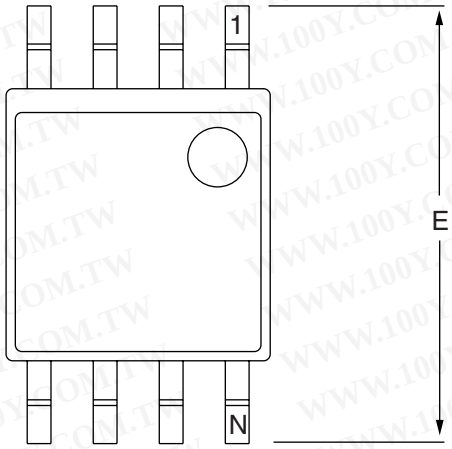
Note: These drawings are for general information only. Refer to JEDEC Drawing MS-012, Variation AA for proper dimensions, tolerances, datums, etc.

10/7/03

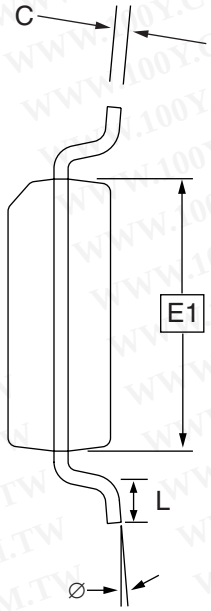
| | | | |
|---|---|---|---|
| 1150 E. Cheyenne Mtn. Blvd.<br>Colorado Springs, CO 80906 | **TITLE**<br>**8S1**, 8-lead (0.150" Wide Body), Plastic Gull Wing Small Outline (JEDEC SOIC) | **DRAWING NO.**<br>8S1 | **REV.**<br>B |

## 8S2 – EIAJ SOIC

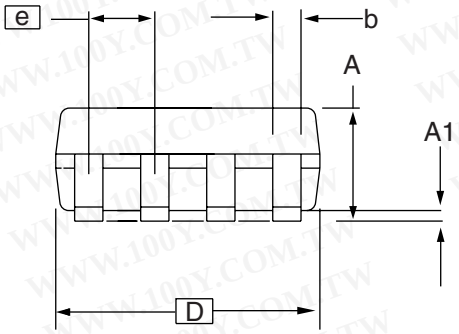





Top View




End View




Side View

**COMMON DIMENSIONS**
(Unit of Measure = mm)

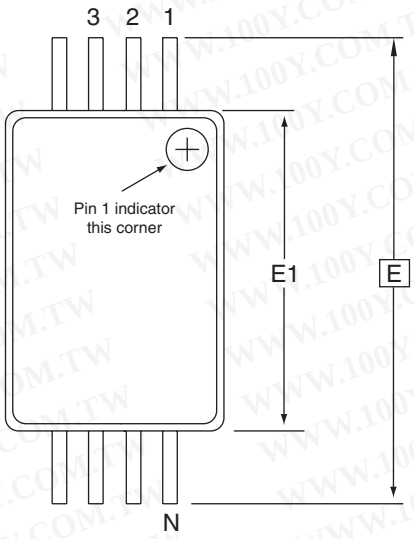
| SYMBOL | MIN | NOM | MAX | NOTE |
|---|---|---|---|---|
| A | 1.70 | | 2.16 | |
| A1 | 0.05 | | 0.25 | |
| b | 0.35 | | 0.48 | 5 |
| C | 0.15 | | 0.35 | 5 |
| D | 5.13 | | 5.35 | |
| E1 | 5.18 | | 5.40 | 2, 3 |
| E | 7.70 | | 8.26 | |
| L | 0.51 | | 0.85 | |
| ∅ | 0° | | 8° | |
| e | 1.27 BSC | | | 4 |

Notes: 1. This drawing is for general information only; refer to EIAJ Drawing EDR-7320 for additional information.
2. Mismatch of the upper and lower dies and resin burrs are not included.
3. It is recommended that upper and lower cavities be equal. If they are different, the larger dimension shall be regarded.
4. Determines the true geometric position.
5. Values b and C apply to pb/Sn solder plated terminal. The standard thickness of the solder layer shall be 0.010 +0.010/–0.005 mm.

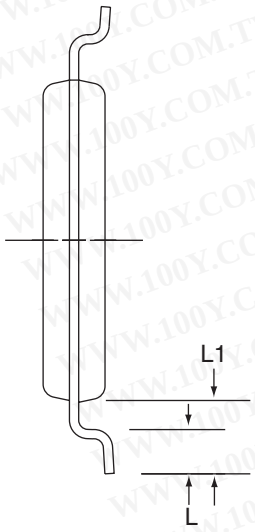
10/7/03

| | TITLE | DRAWING NO. | REV. |
|---|---|---|---|
| 2325 Orchard Parkway<br>San Jose, CA 95131 | **8S2**, 8-lead, 0.209" Body, Plastic Small Outline Package (EIAJ) | 8S2 | C |

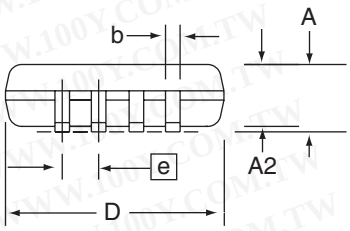
## 8A2 – TSSOP




Top View




End View




Side View

**COMMON DIMENSIONS**
(Unit of Measure = mm)

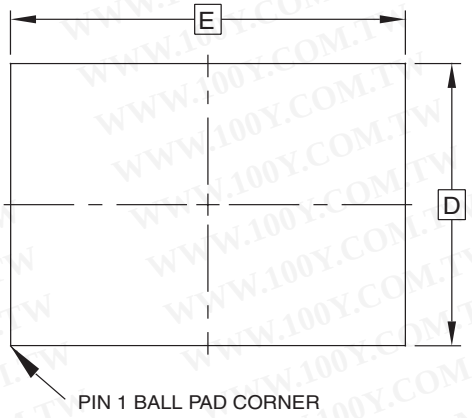
| SYMBOL | MIN | NOM | MAX | NOTE |
|---|---|---|---|---|
| D | 2.90 | 3.00 | 3.10 | 2, 5 |
| E | | 6.40 BSC | | |
| E1 | 4.30 | 4.40 | 4.50 | 3, 5 |
| A | – | – | 1.20 | |
| A2 | 0.80 | 1.00 | 1.05 | |
| b | 0.19 | – | 0.30 | 4 |
| e | | 0.65 BSC | | |
| L | 0.45 | 0.60 | 0.75 | |
| L1 | | 1.00 REF | | |

Notes:
1. This drawing is for general information only. Refer to JEDEC Drawing MO-153, Variation AA, for proper dimensions, tolerances, datums, etc.
2. Dimension D does not include mold Flash, protrusions or gate burrs. Mold Flash, protrusions and gate burrs shall not exceed 0.15 mm (0.006 in) per side.
3. Dimension E1 does not include inter-lead Flash or protrusions. Inter-lead Flash and protrusions shall not exceed 0.25 mm (0.010 in) per side.
4. Dimension b does not include Dambar protrusion. Allowable Dambar protrusion shall be 0.08 mm total in excess of the b dimension at maximum material condition. Dambar cannot be located on the lower radius of the foot. Minimum space between protrusion and adjacent lead is 0.07 mm.
5. Dimension D and E1 to be determined at Datum Plane H.

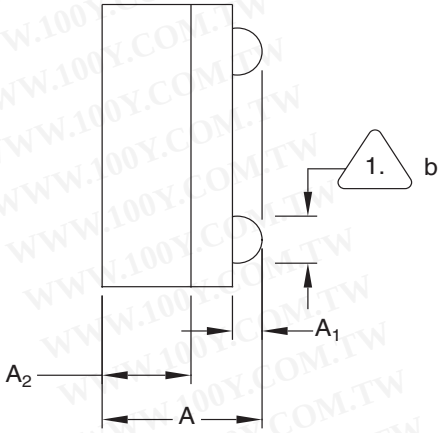
5/30/02

| | TITLE | DRAWING NO. | REV. |
|---|---|---|---|
| 2325 Orchard Parkway<br>San Jose, CA 95131 | **8A2**, 8-lead, 4.4 mm Body, Plastic<br>Thin Shrink Small Outline Package (TSSOP) | 8A2 | B |

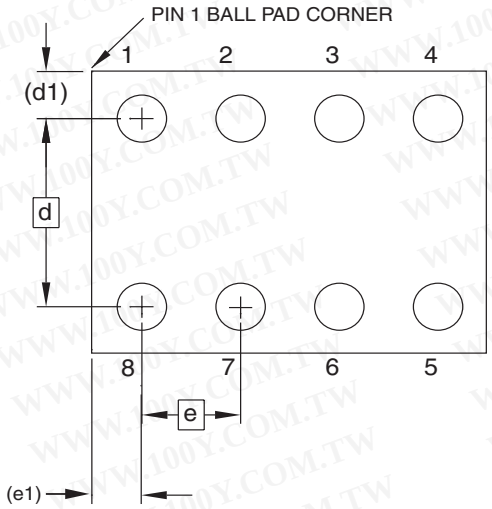
## 8U3-1 – dBGA2




Top View




Side View




Bottom View
8 SOLDER BALLS

1. Dimension “b” is measured at the maximum solder ball diameter.

This drawing is for general information only.

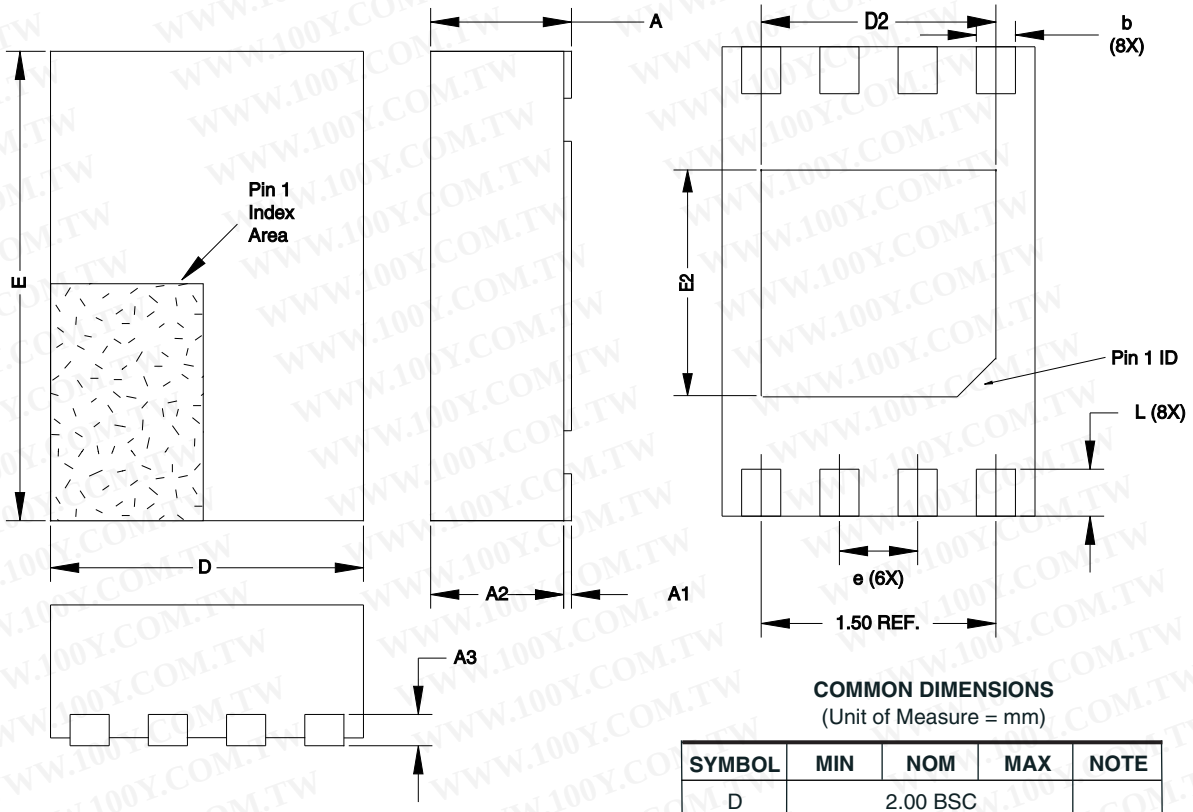
**COMMON DIMENSIONS**
(Unit of Measure = mm)

| SYMBOL | MIN | NOM | MAX | NOTE |
|---|---|---|---|---|
| A | 0.71 | 0.81 | 0.91 | |
| A1 | 0.10 | 0.15 | 0.20 | |
| A2 | 0.40 | 0.45 | 0.50 | |
| b | 0.20 | 0.25 | 0.30 | |
| D | 1.50 BSC | | | |
| E | 2.00 BSC | | | |
| e | 0.50 BSC | | | |
| e1 | 0.25 REF | | | |
| d | 1.00 BSC | | | |
| d1 | 0.25 REF | | | |

6/24/03

| | | | |
|---|---|---|---|
| 1150 E. Cheyenne Mtn. Blvd.<br>Colorado Springs, CO 80906 | **TITLE**<br>**8U3-1,** 8-ball, 1.50 x 2.00 mm Body, 0.50 mm pitch,<br>Small Die Ball Grid Array Package (dBGA2) | **DRAWING NO.**<br>PO8U3-1 | **REV.**<br>A |

## 8Y6 – Mini-MAP




**COMMON DIMENSIONS**
(Unit of Measure = mm)

| SYMBOL | MIN | NOM | MAX | NOTE |
|---|---|---|---|---|
| D | | 2.00 BSC | | |
| E | | 3.00 BSC | | |
| D2 | 1.40 | 1.50 | 1.60 | |
| E2 | - | - | 1.40 | |
| A | - | - | 0.60 | |
| A1 | 0.0 | 0.02 | 0.05 | |
| A2 | - | - | 0.55 | |
| A3 | | 0.20 REF | | |
| L | 0.20 | 0.30 | 0.40 | |
| e | | 0.50 BSC | | |
| b | 0.20 | 0.25 | 0.30 | 2 |

Notes:
1. This drawing is for general information only. Refer to JEDEC Drawing MO-229, for proper dimensions, tolerances, datums, etc.
2. Dimension b applies to metallized terminal and is measured between 0.15 mm and 0.30 mm from the terminal tip. If the terminal has the optional radius on the other end of the terminal, the dimension should not be measured in that radius area.

8/26/05

| | TITLE | DRAWING NO. | REV. |
|---|---|---|---|
| 2325 Orchard Parkway<br>San Jose, CA 95131 | **8Y6**, 8-lead 2.0 x 3.0 mm Body, 0.50 mm Pitch, Utlra Thin Mini-Map, Dual No Lead Package (DFN) ,(MLP 2x3) | 8Y6 | C |

## Revision History

| Doc. Rev. | Date | Comments |
|---|---|---|
| 5140B | 2/2007 | Implemented revision history.<br>Added note to page 1 and ordering information; ‘Not recommended for new design; please refer to AT93C46D datasheet’. |

## Atmel Corporation

2325 Orchard Parkway
San Jose, CA 95131, USA
Tel: 1(408) 441-0311
Fax: 1(408) 487-2600

## Regional Headquarters

***Europe***
Atmel Sarl
Route des Arsenaux 41
Case Postale 80
CH-1705 Fribourg
Switzerland
Tel: (41) 26-426-5555
Fax: (41) 26-426-5500

***Asia***
Room 1219
Chinachem Golden Plaza
77 Mody Road Tsimshatsui
East Kowloon
Hong Kong
Tel: (852) 2721-9778
Fax: (852) 2722-1369

***Japan***
9F, Tonetsu Shinkawa Bldg.
1-24-8 Shinkawa
Chuo-ku, Tokyo 104-0033
Japan
Tel: (81) 3-3523-3551
Fax: (81) 3-3523-7581

## Atmel Operations

***Memory***
2325 Orchard Parkway
San Jose, CA 95131, USA
Tel: 1(408) 441-0311
Fax: 1(408) 436-4314

***Microcontrollers***
2325 Orchard Parkway
San Jose, CA 95131, USA
Tel: 1(408) 441-0311
Fax: 1(408) 436-4314

La Chantrerie
BP 70602
44306 Nantes Cedex 3, France
Tel: (33) 2-40-18-18-18
Fax: (33) 2-40-18-19-60

***ASIC/ASSP/Smart Cards***
Zone Industrielle
13106 Rousset Cedex, France
Tel: (33) 4-42-53-60-00
Fax: (33) 4-42-53-60-01

1150 East Cheyenne Mtn. Blvd.
Colorado Springs, CO 80906, USA
Tel: 1(719) 576-3300
Fax: 1(719) 540-1759

Scottish Enterprise Technology Park
Maxwell Building
East Kilbride G75 0QR, Scotland
Tel: (44) 1355-803-000
Fax: (44) 1355-242-743

***RF/Automotive***
Theresienstrasse 2
Postfach 3535
74025 Heilbronn, Germany
Tel: (49) 71-31-67-0
Fax: (49) 71-31-67-2340

1150 East Cheyenne Mtn. Blvd.
Colorado Springs, CO 80906, USA
Tel: 1(719) 576-3300
Fax: 1(719) 540-1759

***Biometrics/Imaging/Hi-Rel MPU/***
***High Speed Converters/RF Datacom***
Avenue de Rochepleine
BP 123
38521 Saint-Egreve Cedex, France
Tel: (33) 4-76-58-30-00
Fax: (33) 4-76-58-34-80

***Literature Requests***
www.atmel.com/literature



5140B–SEEPR–2/07