

## Piezoelectric Horn Driver Circuit

### Features:

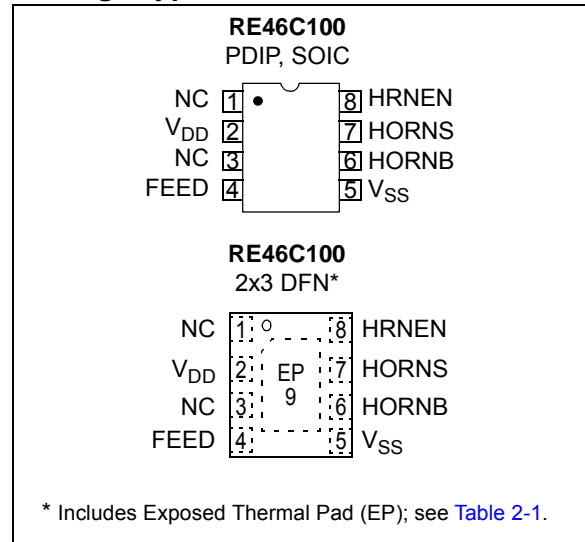
- Low Quiescent Current (< 100 nA)
- Low Driver  $R_{ON}$  – 20 $\Omega$  typical at 9V
- Wide Operating Voltage Range
- Available in 8-pin DFN, PDIP and SOIC packages

### General Description:

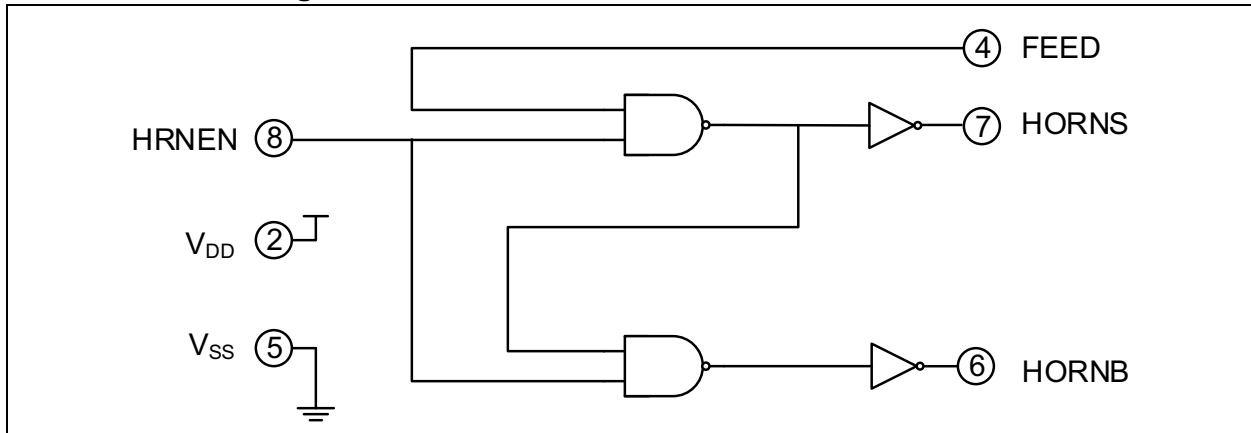
The RE46C100 devices are intended for applications using a self oscillating piezoelectric horn, although it can be used in direct drive applications. Feedback control and a driver circuit are provided, as well as a horn enable function.

The RE46C100 is intended for use in smoke detectors, CO detectors, personal security products and electronic toys.

### Package Types

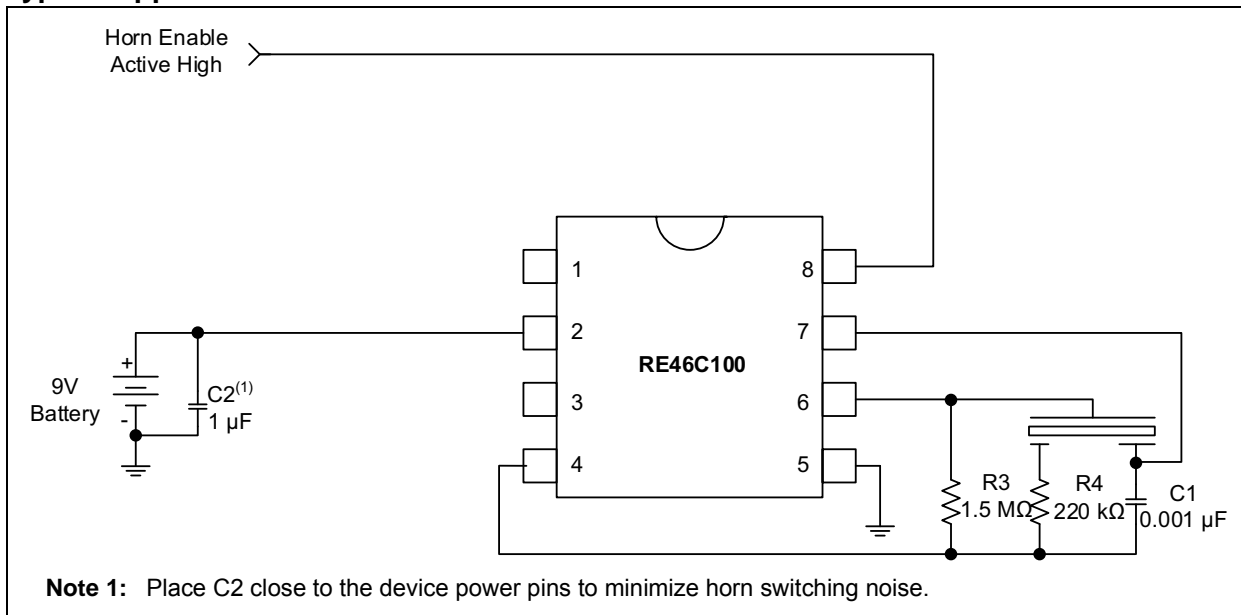


### Functional Block Diagram



# RE46C100

## Typical Application



## 1.0 ELECTRICAL CHARACTERISTICS

### Absolute Maximum Ratings†

|  |  |
|--|--|
| Supply Voltage.....                        | $V_{DD} = 18V$                                 |
| Input Voltage Range Except FEED, TEST..... | $V_{IN} = -0.3V \text{ to } V_{DD} + 0.3V$     |
| FEED Input Voltage Range .....             | $V_{INFD} = -10 \text{ to } +22V$              |
| Input Current except FEED .....            | $I_{IN} = 10 \text{ mA}$                       |
| Operating Temperature.....                 | $T_A = -40 \text{ to } +85^\circ\text{C}$      |
| Storage Temperature .....                  | $T_{STG} = -55 \text{ to } +125^\circ\text{C}$ |
| Maximum Junction Temperature .....         | $T_J = +150^\circ\text{C}$                     |

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

### DC ELECTRICAL CHARACTERISTICS

**DC Electrical Characteristics:** Unless otherwise indicated, all parameters apply at  $T_A = +25^\circ\text{C}$ ,  $V_{DD} = 9V$ , Typical Application.

| Parameter           | Symbol    | Test Pin | Min. | Typ. | Max. | Units         | Conditions                                  |
|---------------------|-----------|----------|------|------|------|---------------|---|
| Supply Voltage      | $V_{DD}$  | 2        | 6    | 9    | 16   | V             | Operating                                   |
| Supply Current      | $I_{DD1}$ | 2        | —    | —    | 100  | nA            | HRNEN = 0V, FEED = 0V                       |
| Input Voltage Low   | $V_{IL1}$ | 8        | —    | —    | 1    | V             |   |
| Input Voltage High  | $V_{IH1}$ | 8        | 2.3  | —    | —    | V             |   |
| Input Leakage Low   | $I_{IL1}$ | 8        | —    | —    | -100 | nA            | $V_{IN} = V_{SS}$                           |
|                     | $I_{LFD}$ | 4        | —    | —    | -50  | $\mu\text{A}$ | FEED = -10V                                 |
| Input Leakage High  | $I_{IH1}$ | 8        | —    | —    | 100  | nA            | $V_{IN} = V_{DD}$                           |
|                     | $I_{HFD}$ | 4        | —    | —    | 50   | $\mu\text{A}$ | FEED = 22V                                  |
| Output Voltage Low  | $V_{OL1}$ | 6, 7     | —    | 0.3  | 0.5  | V             | $I_{OL} = 16 \text{ mA}$                    |
|                     | $V_{OL2}$ | 6, 7     | —    | —    | 0.9  | V             | $I_{OL} = 16 \text{ mA}$ , $V_{DD} = 7.2V$  |
| Output Voltage High | $V_{OH1}$ | 6, 7     | 8.5  | 8.7  | —    | V             | $I_{OH} = -16 \text{ mA}$                   |
|                     | $V_{OH2}$ | 6, 7     | 6.3  | —    | —    | V             | $I_{OH} = -16 \text{ mA}$ , $V_{DD} = 7.2V$ |

### TEMPERATURE SPECIFICATIONS

**Electrical Specifications:** Unless otherwise indicated, all parameters apply at  $T_A = +25^\circ\text{C}$ ,  $V_{DD} = 9V$ , Typical Application.

| Parameters                         | Sym.          | Min. | Typ.  | Max. | Units              | Conditions |
|------------------------------------|---------------|------|-------|------|--------------------|------------|
| <b>Temperature Ranges</b>          |               |      |       |      |                    |            |
| Operating Temperature Range        | $T_A$         | -40  | —     | +85  | $^\circ\text{C}$   |            |
| Storage Temperature Range          | $T_{STG}$     | -55  | —     | +125 | $^\circ\text{C}$   |            |
| <b>Thermal Package Resistances</b> |               |      |       |      |                    |            |
| Thermal Resistance, 8L 2x3 DFN     | $\theta_{JA}$ | —    | 75    | —    | $^\circ\text{C/W}$ |            |
| Thermal Resistance, 8L-PDIP        | $\theta_{JA}$ | —    | 89.3  | —    | $^\circ\text{C/W}$ |            |
| Thermal Resistance, 8L-SOIC        | $\theta_{JA}$ | —    | 149.5 | —    | $^\circ\text{C/W}$ |            |

# RE46C100

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## 2.0 PIN DESCRIPTIONS

The descriptions of the pins are listed in [Table 2-1](#).

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

| RE46C100<br>PDIP, SOIC | RE46C100<br>DFN | Symbol          | Description  |
|------------------------|-----------------|-----------------|--|
| 1                      | 1               | NC              | No connection  |
| 2                      | 2               | V <sub>DD</sub> | Connect to the positive supply voltage   |
| 3                      | 3               | NC              | No connection  |
| 4                      | 4               | FEED            | Usually connected to the feedback electrode through a current-limiting resistor. If not used, this pin must be connected to V <sub>DD</sub> or V <sub>SS</sub> . |
| 5                      | 5               | V <sub>SS</sub> | Connect to the negative supply voltage   |
| 6                      | 6               | HORNB           | This pin is connected to the metal electrode of a piezoelectric transducer.  |
| 7                      | 7               | HORNS           | This pin is a complementary output to HORNB, connected to the ceramic electrode of the piezoelectric transducer.   |
| 8                      | 8               | HRNEN           | This pin enables the horn with a logic high.   |
| —                      | 9               | EP              | Exposed thermal pad. This pad should be connected to V <sub>SS</sub> .   |

## 3.0 DEVICE DESCRIPTION

The RE46C100 horn driver provides the circuitry necessary to drive a three-terminal self-oscillating piezoelectric horn. It can also drive a two-terminal piezoelectric horn with the FEED pin used as a signal input. The horn driver provides a push-pull circuit to drive the horn, as shown in the [Typical Application](#) circuit.

In a self-oscillating application, the FEED pin is connected to the feedback pin of the piezoelectric horn through a resistor. To drive a two-terminal piezoelectric horn with an external signal, the FEED pin should be used as the external signal input. The horn is enabled when HRNEN is driven to a logic high and is silenced when HRNEN is driven to a logic low. The horn output can be modulated using the HRNEN input.

# RE46C100

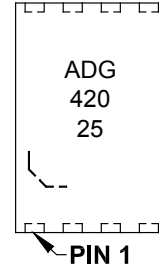
## 4.0 PACKAGING INFORMATION

### 4.1 Package Marking Information

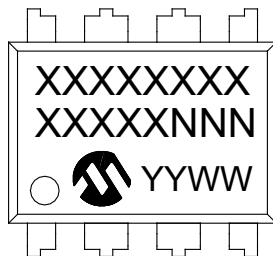
8-Lead DFN (2x3x0.9 mm)



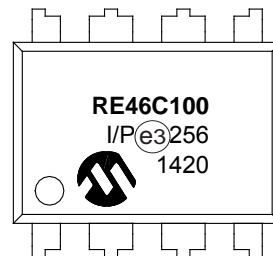
Example



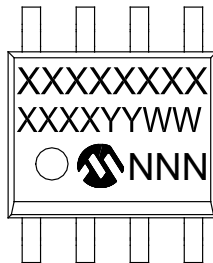
8-Lead PDIP (300 mil)



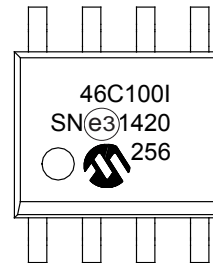
Example



8-Lead SOIC (3.90 mm)



Example

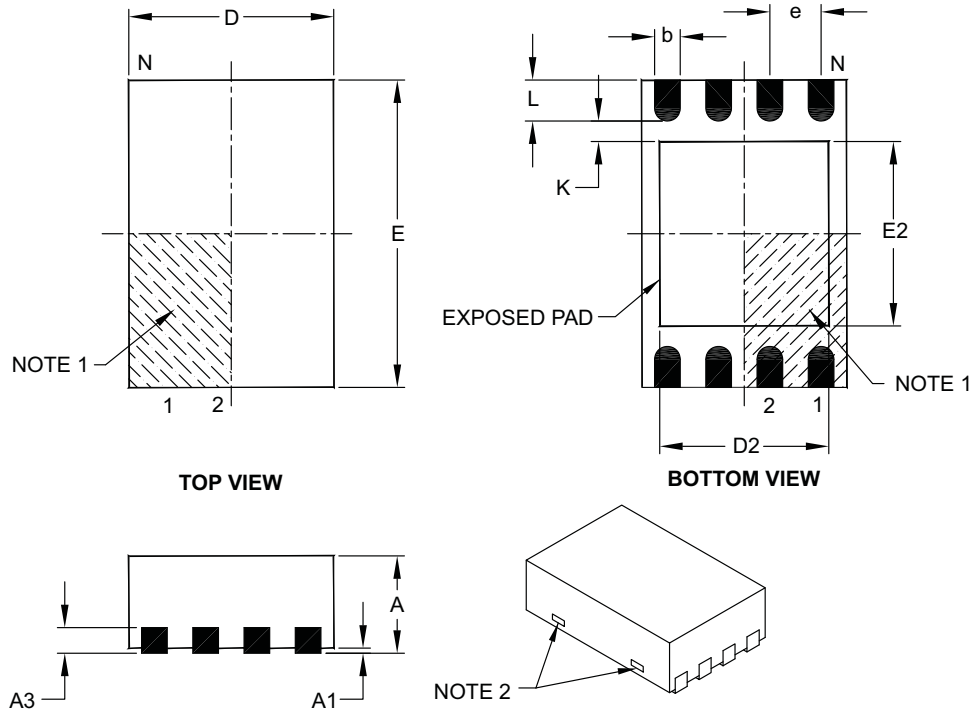


|                |        |  |
|----------------|--------|--|
| <b>Legend:</b> | XX...X | Customer-specific information  |
|                | Y      | Year code (last digit of calendar year)  |
|                | YY     | Year code (last 2 digits of calendar year)   |
|                | WW     | Week code (week of January 1 is week '01')   |
|                | NNN    | Alphanumeric traceability code   |
|                | (e3)   | Pb-free JEDEC designator for Matte Tin (Sn)  |
|                | *      | This package is Pb-free. The Pb-free JEDEC designator (e3) can be found on the outer packaging for this package. |

**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) – 2x3x0.9 mm Body [DFN]

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



| Dimension Limits       | Units | MILLIMETERS |      |      |
|------------------------|-------|-------------|------|------|
|                        |       | MIN         | NOM  | MAX  |
| Number of Pins         | N     | 8           |      |      |
| Pitch                  | e     | 0.50 BSC    |      |      |
| Overall Height         | A     | 0.80        | 0.90 | 1.00 |
| 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    | 1.30        | –    | 1.55 |
| Exposed Pad Width      | E2    | 1.50        | –    | 1.75 |
| Contact Width          | b     | 0.20        | 0.25 | 0.30 |
| Contact Length         | L     | 0.30        | 0.40 | 0.50 |
| Contact-to-Exposed Pad | K     | 0.20        | –    | –    |

**Notes:**

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

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

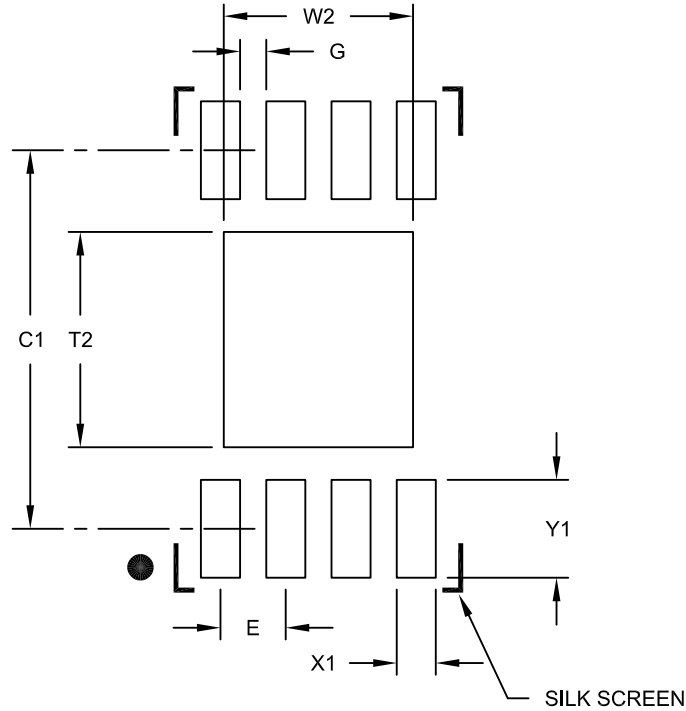
REF: Reference Dimension, usually without tolerance, for information purposes only.

Microchip Technology Drawing C04-123C

# RE46C100

## 8-Lead Plastic Dual Flat, No Lead Package (MC) - 2x3x0.9mm 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

| Dimension Limits           | Units | MILLIMETERS |      |      |
|----------------------------|-------|-------------|------|------|
|                            |       | MIN         | NOM  | MAX  |
| Contact Pitch              | E     | 0.50 BSC    |      |      |
| Optional Center Pad Width  | W2    |             |      | 1.45 |
| Optional Center Pad Length | T2    |             |      | 1.75 |
| Contact Pad Spacing        | C1    |             | 2.90 |      |
| Contact Pad Width (X8)     | X1    |             |      | 0.30 |
| Contact Pad Length (X8)    | Y1    |             |      | 0.75 |
| Distance Between Pads      | G     | 0.20        |      |      |

**Notes:**

1. Dimensioning and tolerancing per ASME Y14.5M

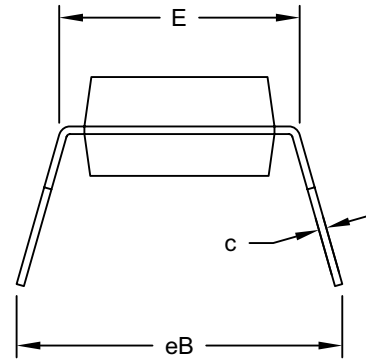
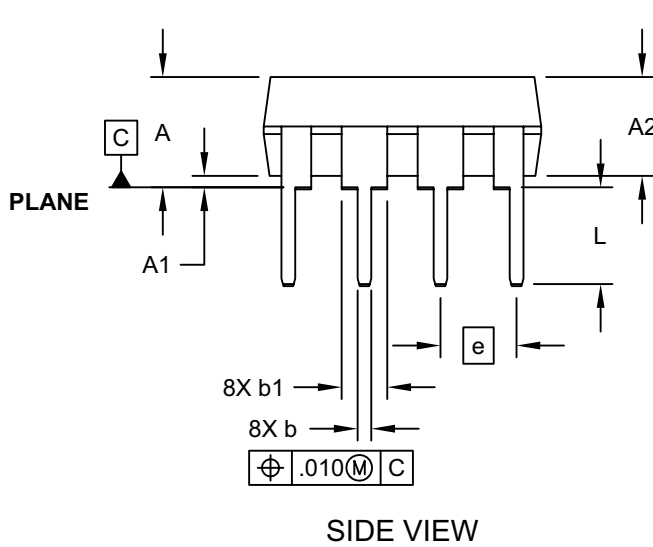
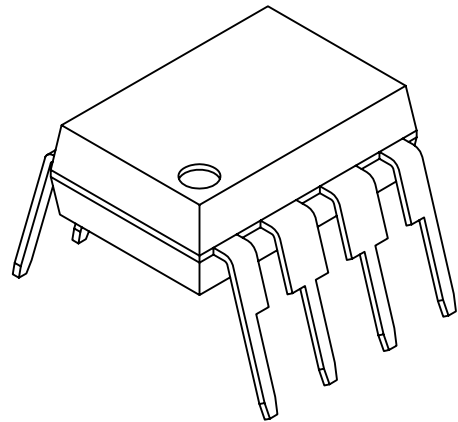
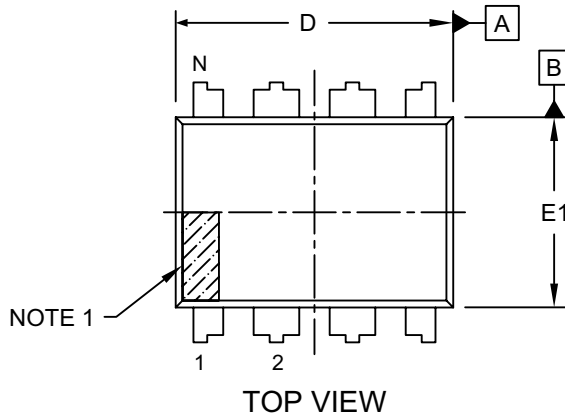
BSC: Basic Dimension. Theoretically exact value shown without tolerances.

Microchip Technology Drawing No. C04-2123B



## 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>



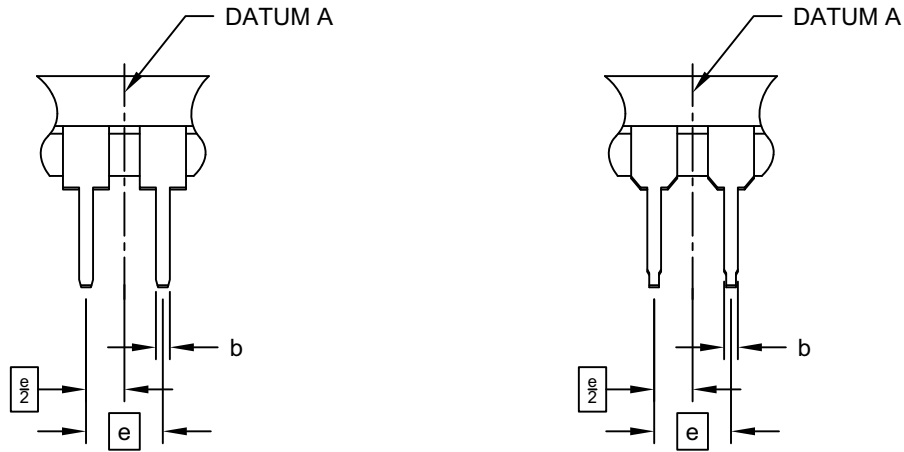
Microchip Technology Drawing No. C04-018D Sheet 1 of 2

# RE46C100

## 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>

### ALTERNATE LEAD DESIGN (VENDOR DEPENDENT)



| Dimension Limits           | Units | INCHES   |      |      |
|----------------------------|-------|----------|------|------|
|                            |       | 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:**

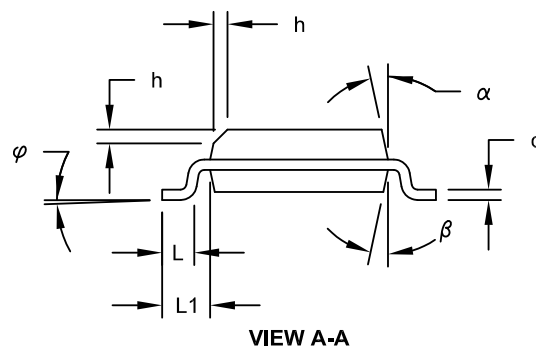
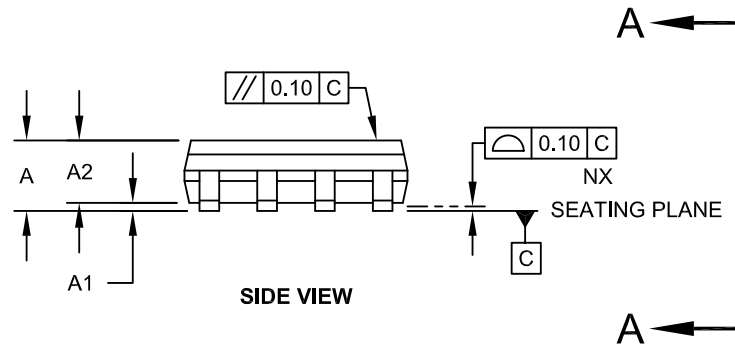
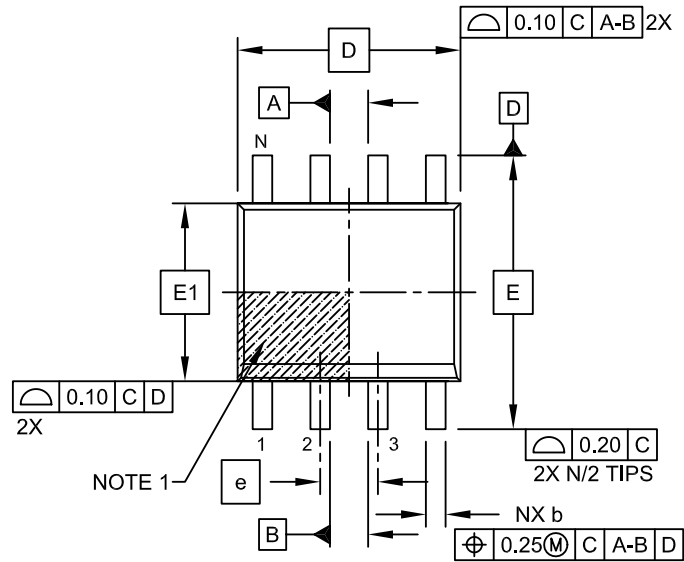
1. Pin 1 visual index feature may vary, but must be located within the hatched area.
2. § Significant Characteristic
3. Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" per side.
4. Dimensioning and tolerancing per ASME Y14.5M

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

Microchip Technology Drawing No. C04-018D Sheet 2 of 2

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

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

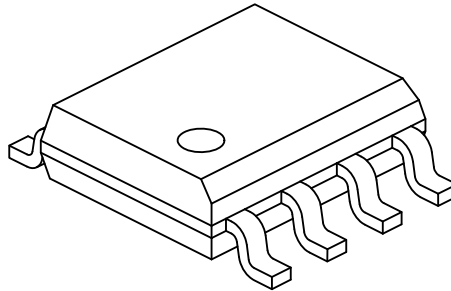


Microchip Technology Drawing No. C04-057C Sheet 1 of 2

# RE46C100

## 8-Lead Plastic Small Outline (SN) - Narrow, 3.90 mm 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    |     |      |
| Foot Angle               | $\varphi$ |       | 0°          | -   | 8°   |
| Lead Thickness           | c         |       | 0.17        | -   | 0.25 |
| Lead Width               | b         |       | 0.31        | -   | 0.51 |
| Mold Draft Angle Top     | $\alpha$  |       | 5°          | -   | 15°  |
| Mold Draft Angle Bottom  | $\beta$   |       | 5°          | -   | 15°  |

### 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

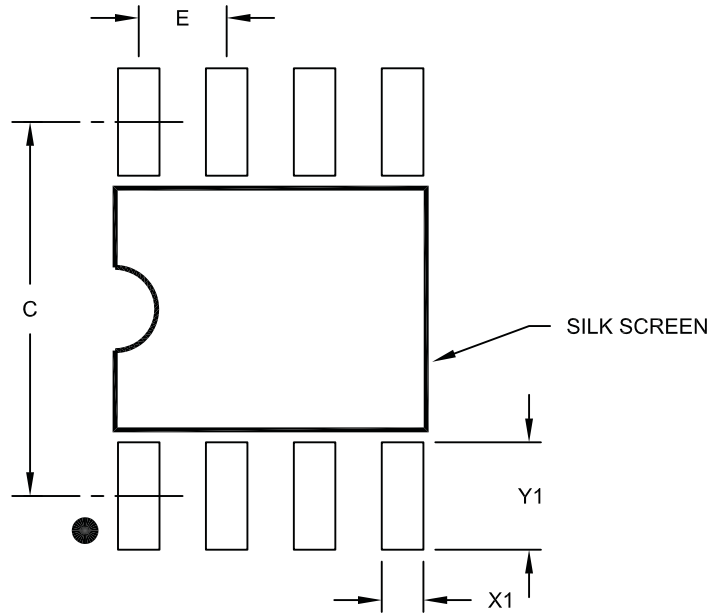
BSC: Basic Dimension. Theoretically exact value shown without tolerances.

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

Microchip Technology Drawing No. C04-057C Sheet 2 of 2

## 8-Lead Plastic Small Outline (SN) – Narrow, 3.90 mm 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

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

**Notes:**

1. Dimensioning and tolerancing per ASME Y14.5M

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

Microchip Technology Drawing No. C04-2057A

# RE46C100

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NOTES:

## APPENDIX A: REVISION HISTORY

### Revision B (June 2014)

The following is the list of modifications:

1. Added new package to the family (2x3 DFN) and related information throughout the document.
2. Added thermal package resistance information in [Temperature Specifications](#).
3. Added package markings and drawings for all packages.
4. Added [Product Identification System](#).

### Revision A (May 2009)

- Original Release of this Document.

## PRODUCT IDENTIFICATION SYSTEM

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

| <u>PART NO.</u>  | X       | XX             | I             | X         |  |
|--|---------|----------------|---------------|-----------|--|
| Device   | Package | Number of Pins | Tape and Reel | Lead Free |  |
| <p><b>Device:</b></p> <p>RE46C100: CMOS Photoelectric Smoke Detector ASIC<br/> RE46C100T: CMOS Photoelectric Smoke Detector ASIC (Tape and Reel)</p> <p><b>Package:</b></p> <p>D = 8-Lead DFN<br/> E = Plastic Dual In-Line (300 mil Body), 8-lead (PDIP)<br/> S = Plastic Small Outline - Narrow, 3.90 mm Body, 8-Lead (SOIC)</p> |         |                |               |           | <p><b>Examples:</b></p> <p>a) RE46C100D8F: 8LD DFN Package, Lead Free</p> <p>b) RE46C100D8TF: 8LD DFN Package, Tape and Reel, Lead Free</p> <p>c) RE46C100E8F: 8LD PDIP Package, Lead Free</p> <p>d) RE46C100S8F: 8LD SOIC Package, Lead Free</p> <p>e) RE46C100S8TF: 8LD SOIC Package, Tape and Reel, Lead Free</p> |



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*Microchip received ISO/TS-16949:2009 certification for its worldwide headquarters, design and wafer fabrication facilities in Chandler and Tempe, Arizona; Gresham, Oregon and design centers in California and India. The Company's quality system processes and procedures are for its PIC<sup>®</sup> MCUs and dsPIC<sup>®</sup> DSCs, KEELOQ<sup>®</sup> code hopping devices, Serial EEPROMs, microperipherals, nonvolatile memory and analog products. In addition, Microchip's quality system for the design and manufacture of development systems is ISO 9001:2000 certified.*



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Факс: 8 (812) 320-03-32

Электронная почта: [ocean@oceanchips.ru](mailto:ocean@oceanchips.ru)

Web: <http://oceanchips.ru/>

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А