

Piezoelectric Horn Driver Circuit

Features:

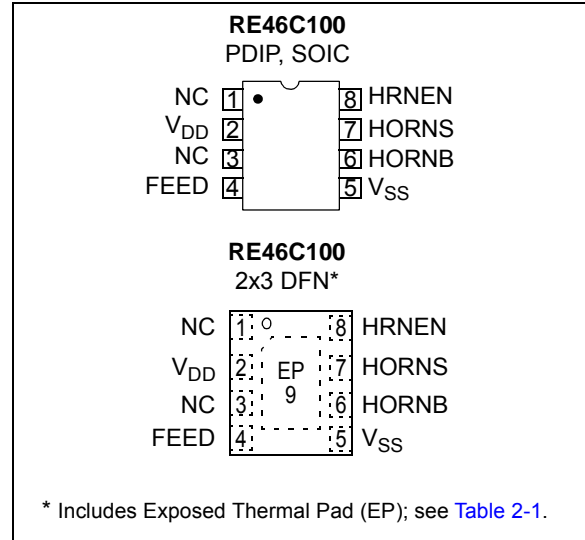
- Low Quiescent Current (< 100 nA)
- Low Driver R_{ON} – 20 Ω typical at 9V
- Wide Operating Voltage Range
- Available in 8-pin DFN, PDIP and SOIC packages

General Description:

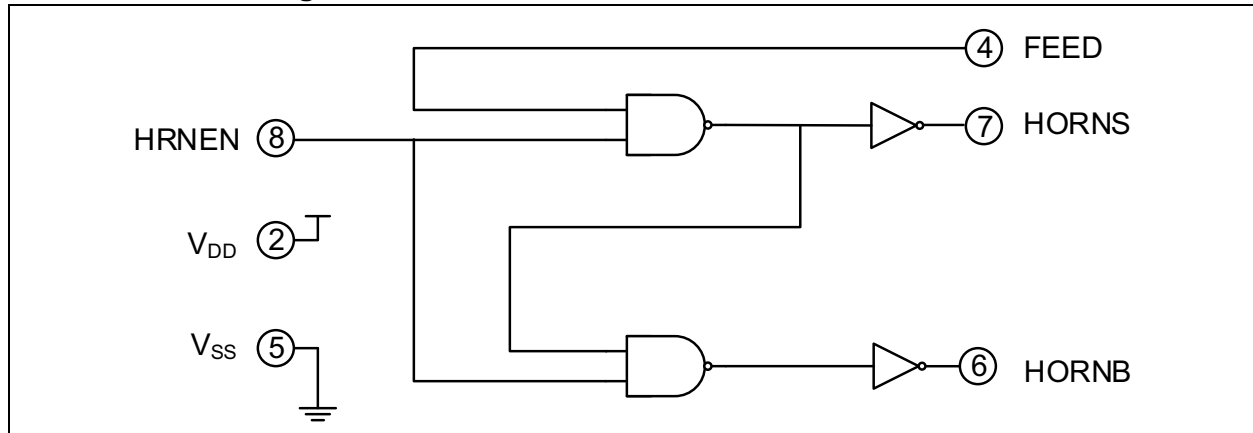
The RE46C100 devices are intended for applications using a self oscillating piezoelectric horn, although it can be used in direct drive applications. Feedback control and a driver circuit are provided, as well as a horn enable function.

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

Package Types

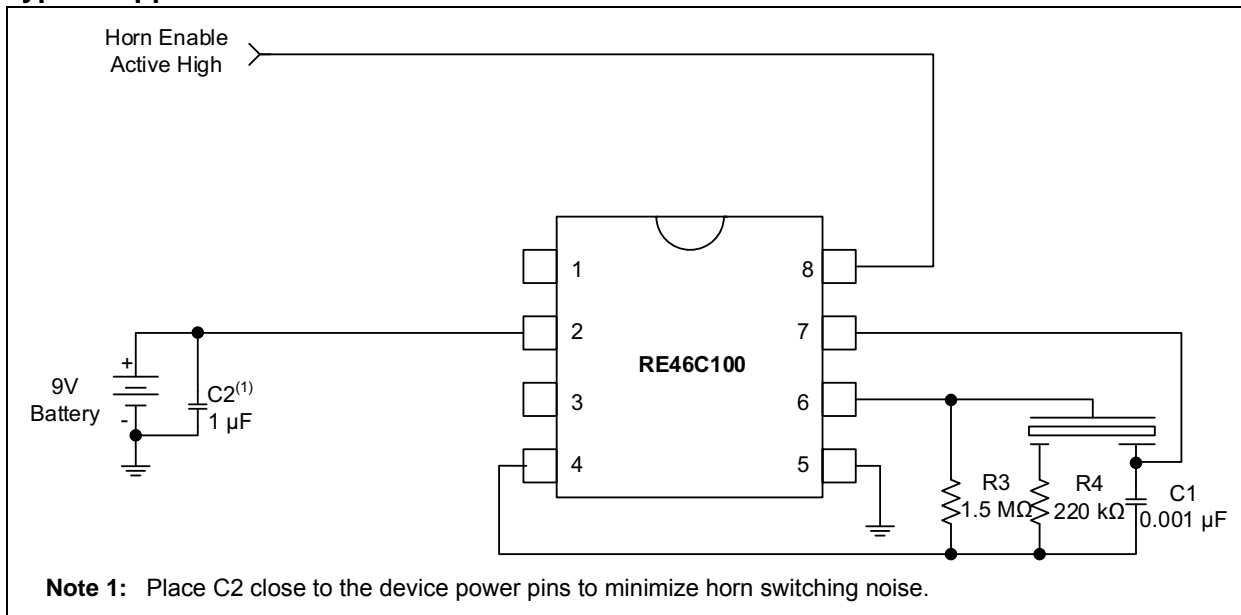


Functional Block Diagram



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	μA	FEED = -10V
Input Leakage High	I_{IH1}	8	—	—	100	nA	$V_{IN} = V_{DD}$
	I_{HFD}	4	—	—	50	μA	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
Temperature Ranges						
Operating Temperature Range	T_A	-40	—	+85	$^\circ\text{C}$	
Storage Temperature Range	T_{STG}	-55	—	+125	$^\circ\text{C}$	
Thermal Package Resistances						
Thermal Resistance, 8L 2x3 DFN	θ_{JA}	—	75	—	$^\circ\text{C/W}$	
Thermal Resistance, 8L-PDIP	θ_{JA}	—	89.3	—	$^\circ\text{C/W}$	
Thermal Resistance, 8L-SOIC	θ_{JA}	—	149.5	—	$^\circ\text{C/W}$	

RE46C100

2.0 PIN DESCRIPTIONS

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

TABLE 2-1: PIN FUNCTION TABLE

RE46C100 PDIP, SOIC	RE46C100 DFN	Symbol	Description
1	1	NC	No connection
2	2	V _{DD}	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 _{DD} or V _{SS} .
5	5	V _{SS}	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 _{SS} .

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

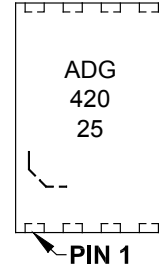
4.0 PACKAGING INFORMATION

4.1 Package Marking Information

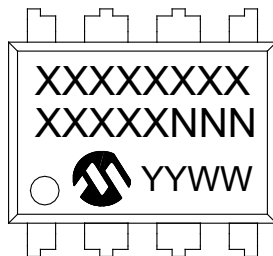
8-Lead DFN (2x3x0.9 mm)



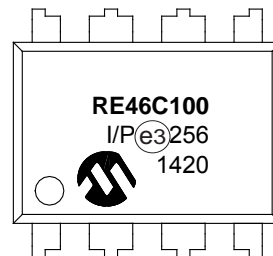
Example



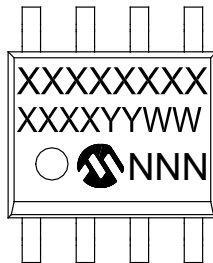
8-Lead PDIP (300 mil)



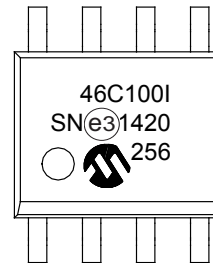
Example



8-Lead SOIC (3.90 mm)



Example

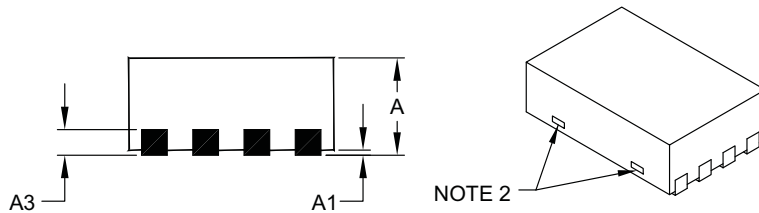
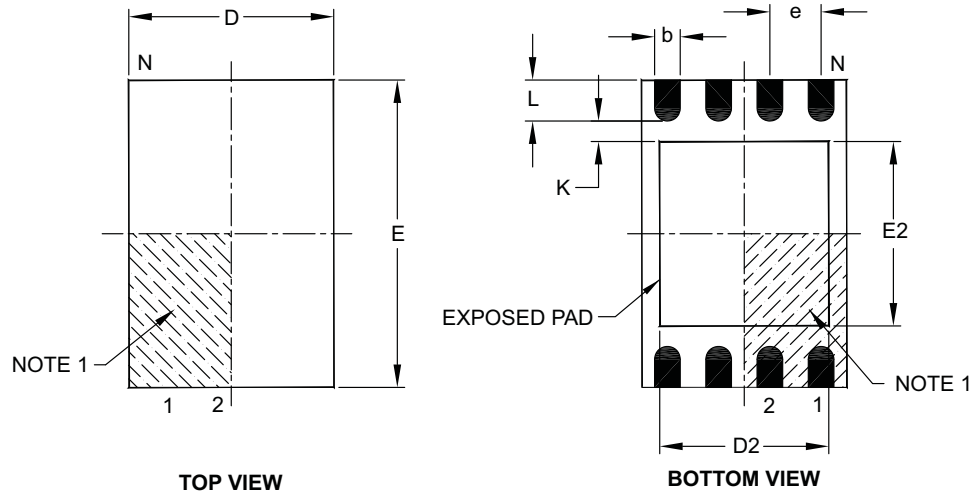


Legend:	XX...X	Customer-specific information
	Y	Year code (last digit of calendar year)
	YY	Year code (last 2 digits of calendar year)
	WW	Week code (week of January 1 is week '01')
	NNN	Alphanumeric traceability code
	(e3)	Pb-free JEDEC designator for Matte Tin (Sn)
	*	This package is Pb-free. The Pb-free 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.

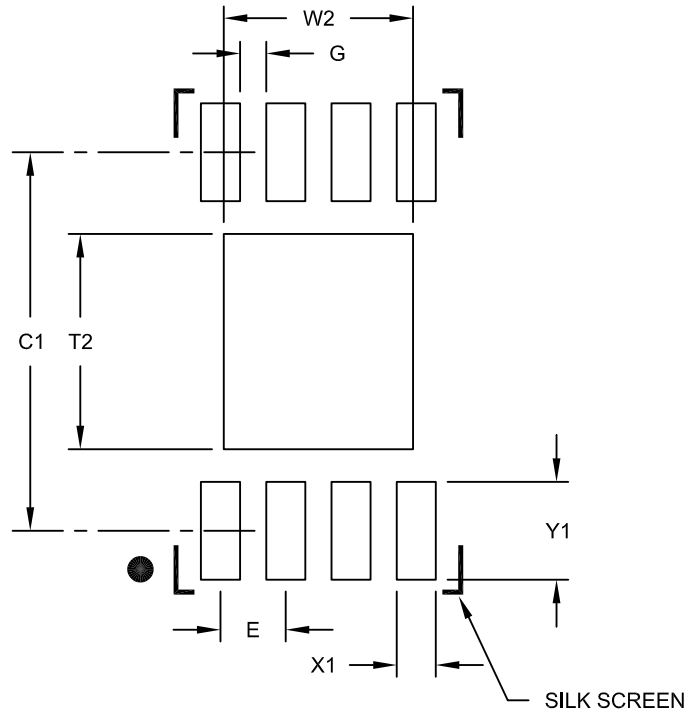
REF: Reference Dimension, usually without tolerance, for information purposes only.

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:

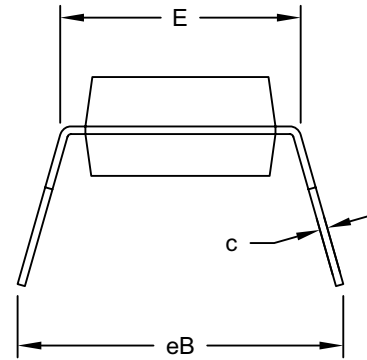
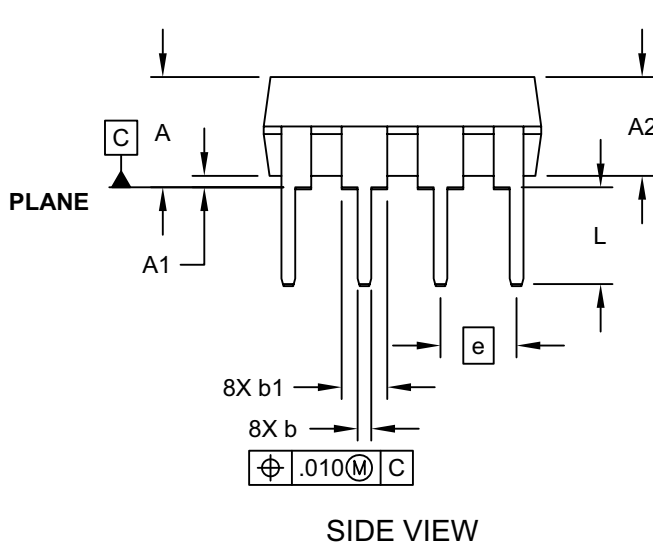
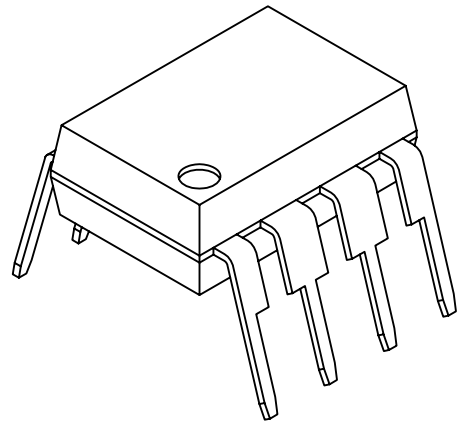
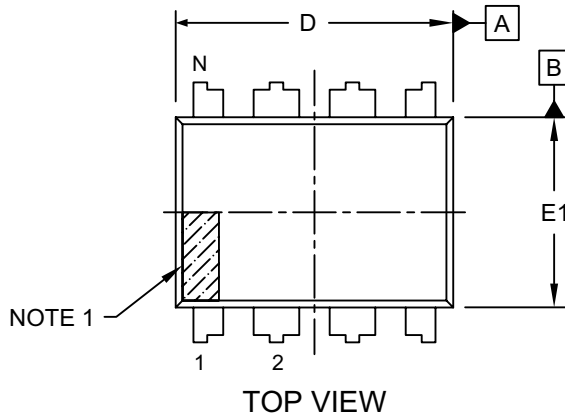
1. Dimensioning and tolerancing per ASME Y14.5M

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>



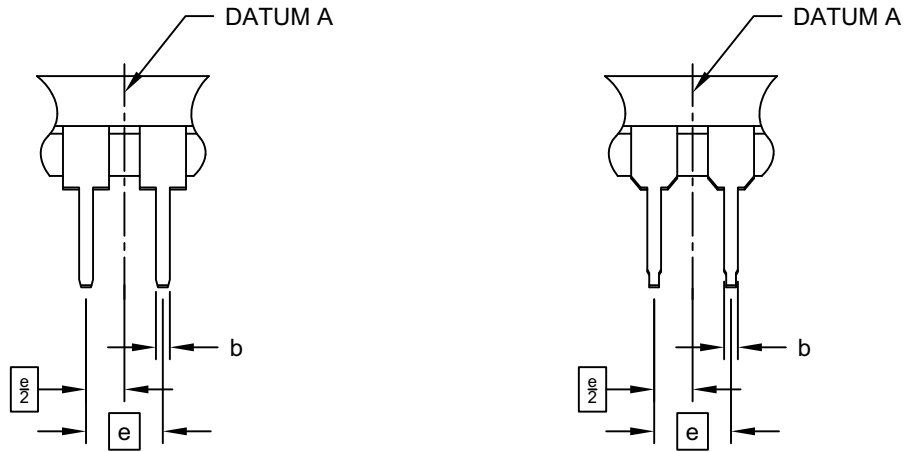
Microchip Technology Drawing No. C04-018D Sheet 1 of 2

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:

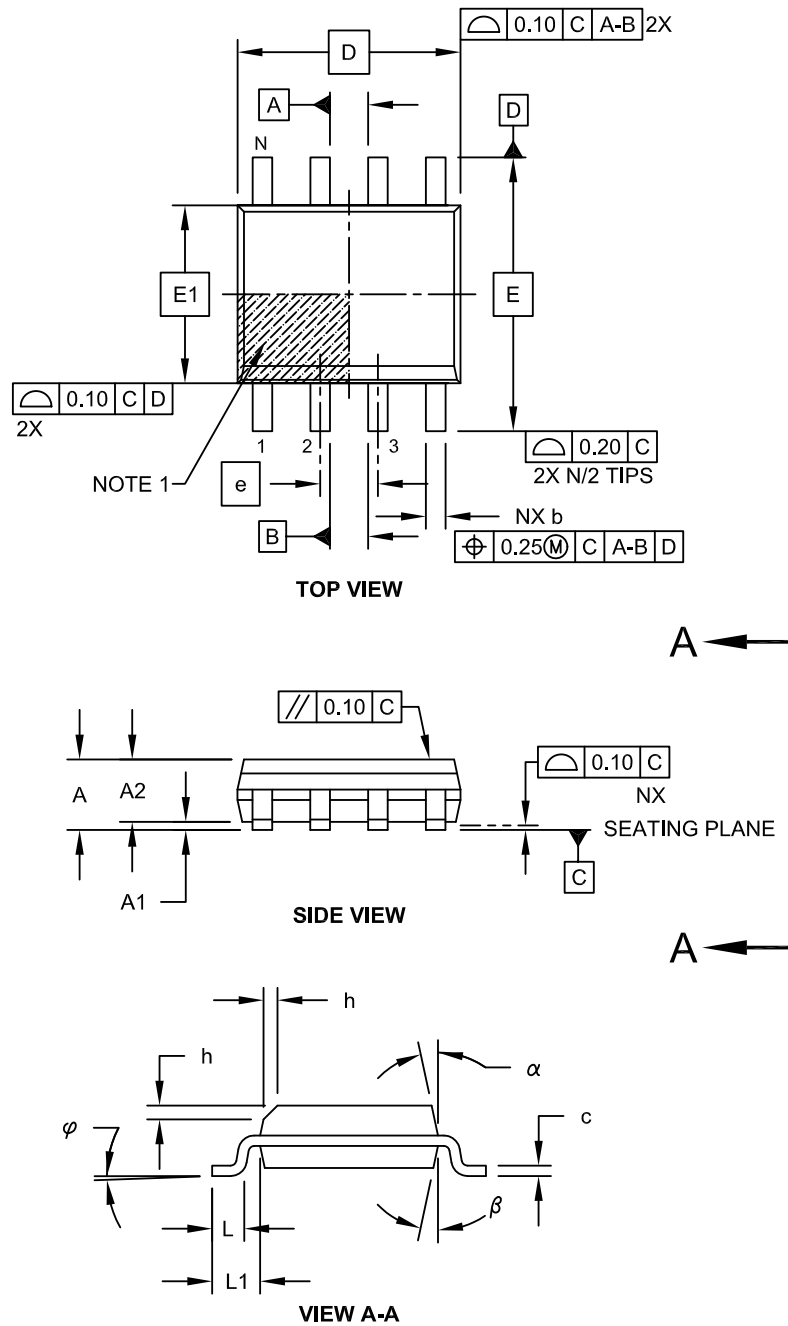
1. Pin 1 visual index feature may vary, but must be located within the hatched area.
2. § Significant Characteristic
3. Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" per side.
4. Dimensioning and tolerancing per ASME Y14.5M

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>

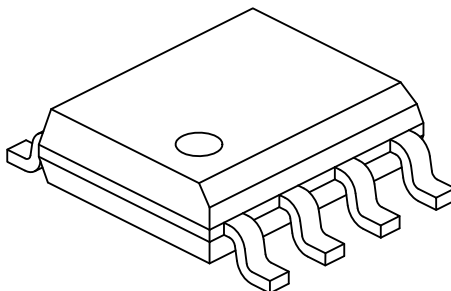


Microchip Technology Drawing No. C04-057C Sheet 1 of 2

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	φ		0°	-	8°
Lead Thickness	c		0.17	-	0.25
Lead Width	b		0.31	-	0.51
Mold Draft Angle Top	α		5°	-	15°
Mold Draft Angle Bottom	β		5°	-	15°

Notes:

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

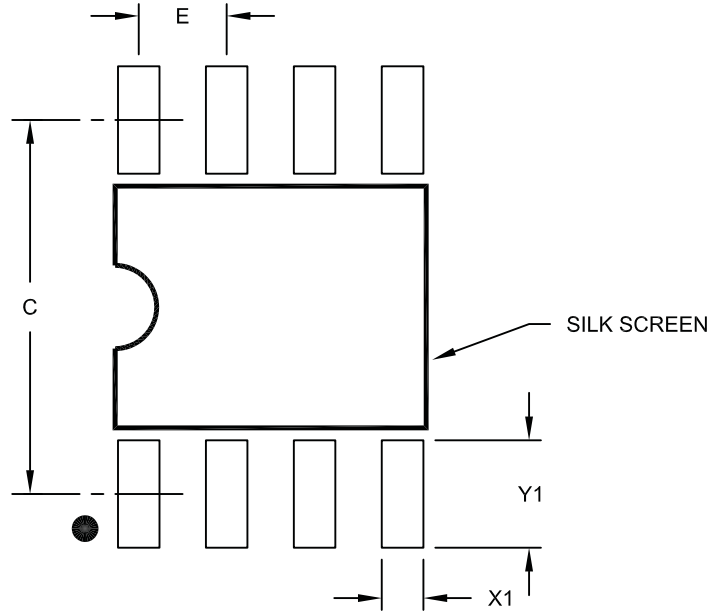
BSC: Basic Dimension. Theoretically exact value shown without tolerances.

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

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>Device:</p> <p>RE46C100: CMOS Photoelectric Smoke Detector ASIC RE46C100T: CMOS Photoelectric Smoke Detector ASIC (Tape and Reel)</p> <p>Package:</p> <p>D = 8-Lead DFN E = Plastic Dual In-Line (300 mil Body), 8-lead (PDIP) S = Plastic Small Outline - Narrow, 3.90 mm Body, 8-Lead (SOIC)</p>					
<p>Examples:</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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ISBN: 978-1-63276-287-0

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