Solving Sensor Offset Problems with TC7106

INTRODUCTION

Design engineers sometimes have to interface the TC7106 and similar ADCs to "non-ideal" sensors. A very common problem is that the sensor often does not give a "zero" output where the design wants a zero reading.

One example of a "non-ideal" sensor is a diode used as a temperature sensor. The diode typically changes –2mV per degree Celsius, but the change is from the diode’s forward voltage of 600mV or so. In order for the display to read “000” at 0.0 degrees, an offset must be provided.

The differential inputs of the TC7106 yield an easy solution to the offset problem. Figure 1 shows a simple thermometer with a diode sensor. Because the diode voltage decreases as temperature increases, IN LO is connected to the diode temperature sensor. The IN HI input is connected to a trim pot which is used to cancel the diode’s forward voltage.

The offset problem gets a little more difficult, however, if a sensor requires a negative offset. The easiest way, shown in Figure 2, is to use a LM285-1.2 reference. This will provide an offset of up to –1.20V. The only “trick” to this circuit is that resistor R1 must source enough current for the LM285-1.2 plus a few extra microamps for the COMMON input.

Figure 2 also demonstrates the utility of the TC7106 families’ differential reference. The effective reference voltage is simply the difference between the REF HI and REF LO inputs. In this way, the same LM285-1.2 can be used to produce both input offset and reference voltages.

FIGURE 1: Positive offset.

FIGURE 2: Negative offset.
FIGURE 2: Negative offset.
Information contained in this publication regarding device applications and the like is intended through suggestion only and may be superseded by updates. It is your responsibility to ensure that your application meets with your specifications. No representation or warranty is given and no liability is assumed by Microchip Technology Incorporated with respect to the accuracy or use of such information, or infringement of patents or other intellectual property rights arising from such use or otherwise. Use of Microchip’s products as critical components in life support systems is not authorized except with express written approval by Microchip. No licenses are conveyed, implicitly or otherwise, under any intellectual property rights.

Trademarks

The Microchip name and logo, the Microchip logo, FilterLab, KEELoc®, microID, MPLAB®, PIC®, PICmicro®, PICMASTER®, PICSTART®, PRO MATE®, SEEVAL® and The Embedded Control Solutions Company are registered trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

dsPIC®, ECONOMONITOR®, FanSense®, FlexROM®, fuzzyLAB®, In-Circuit Serial Programming®, ICSP®, ICEPIC®, microPort®, Migratable Memory®, MPASM®, MPLIB®, MPLINK®, MPSIM®, MXDEV®, PIC®, PICDEM®, PICDEM.net®, rFIC®, Select Mode and Total Endurance are trademarks of Microchip Technology Incorporated in the U.S.A.

Serialized Quick Turn Programming® (SQTP®) is a service mark of Microchip Technology Incorporated in the U.S.A.

All other trademarks mentioned herein are property of their respective companies.

© 2002, Microchip Technology Incorporated, Printed in the U.S.A., All Rights Reserved.

Printed on recycled paper.
AMERICAS  
Corporate Office  
2335 West Chandler Blvd.  
Chandler, AZ  85224-6199  
Tel:  480-792-7200  Fax:  480-792-7277  
Technical Support:  480-792-7627  
Web Address:  http://www.microchip.com  

Rocky Mountain  
2335 West Chandler Blvd.  
Chandler, AZ  85224-6199  
Tel:  480-792-7966  Fax:  480-792-7456  

Atlanta  
500 Sugar Mill Road, Suite 200B  
Atlanta, GA  30350  
Tel:  770-640-0034  Fax:  770-640-0307  

Boston  
2 Lan Drive, Suite 120  
Westford, MA  01886  
Tel:  978-692-3848  Fax:  978-692-3821  

Chicago  
333 Pierce Road, Suite 180  
Itasca, IL  60143  
Tel:  630-285-0071  Fax:  630-285-0075  

Dallas  
4570 Westgrove Drive, Suite 160  
Addison, TX  75001  
Tel:  972-818-7943  Fax:  972-818-2924  

Detroit  
Tri-Attra Office Building  
32255 Northwestern Highway, Suite 190  
Farmington Hills, MI  48334  
Tel:  248-538-2250  Fax:  248-538-2260  

Kokomo  
2767 S. Albright Road  
Kokomo, Indiana  46902  
Tel:  765-864-8360  Fax:  765-864-8387  

Los Angeles  
18201 Von Karman, Suite 1090  
Irvine, CA  92612  
Tel:  949-263-1888  Fax:  949-263-1338  

New York  
150 Motor Parkway, Suite 202  
Hauppauge, NY  11788  
Tel:  631-273-5305  Fax:  631-273-5335  

San Jose  
Microchip Technology Inc.  
2107 North First Street, Suite 590  
San Jose, CA  95131  
Tel:  408-438-7950  Fax:  408-436-7965  

Toronto  
6285 Northam Drive, Suite 108  
Mississauga, Ontario L4V 1X5, Canada  
Tel:  905-673-0699  Fax:  905-673-6509  

ASIA/PACIFIC  
Australia  
Microchip Technology Australia Pty Ltd  
Suite 22, 41 Ravenswood Street  
Epping, NSW  2121, Australia  
Tel:  61-2-8686-6733  Fax:  61-2-8968-6755  

China - Beijing  
Microchip Technology Consulting (Shanghai) Co., Ltd., Beijing Liaison Office  
Unit 915, Bei Hai Yan Tai Bldg., No. 6 Chaoyangmen Beidajie  
Beijing, 100027, No. China  
Tel:  86-10-85282100 Fax:  86-10-85282104  

China - Chengdu  
Microchip Technology Consulting (Shanghai) Co., Ltd., Chengdu Liaison Office  
Rm. 2401, 24th Floor, Ming Xing Financial Tower  
No. 88 TIDU Street  
Chengdu 610016, China  
Tel:  86-28-6766200  Fax:  86-28-6766599  

China - Fuzhou  
Microchip Technology Consulting (Shanghai) Co., Ltd., Fuzhou Liaison Office  
Unit 3001, Zhongxue Building  
Fuzhou, 350001, China  
Tel:  86-591-7503506  Fax:  86-591-7503521  

China - Shanghai  
Microchip Technology Consulting (Shanghai) Co., Ltd., Shanghai Liaison Office  
Room 701, Bldg. B, Far East International Plaza  
No. 71 Wusong Road  
Shanghai, 200001  
Tel:  86-21-6275-5700 Fax:  86-21-6275-5060  

Hong Kong  
Microchip Technology Hongkong Ltd.  
Unit 901-6, Tower 2, Metroplaza  
223 Hing Fong Road  
Kwai Tong, N.T., Hong Kong  
Tel:  852-2401-1200 Fax:  852-2401-3431  

India  
Microchip Technology India.  
India Liaison Office  
Divyagar Chambers  
1 Floor, Wing A (A3/A4)  
No. 11, O’Shaunessy Road  
Bangalore, 560 025, India  
Tel:  91-80-2399061 Fax:  91-80-2399062  

Japan  
Microchip Technology Japan K.K.  
Benex S-1 6F  
3-18-20, Shinoyokohama  
Kohoku-Ku, Yokohama-shi  
Kanagawa, 222-0033, Japan  
Tel:  81-45-471-6166 Fax:  81-45-471-6122  

Korea  
Microchip Technology Korea  
168-1, Youngbo Bldg. 3 Floor  
Samsung-Dong, Kangnam-Ku  
Seoul, Korea 135-882  
Tel:  82-2-554-7200  Fax:  82-2-558-5934  

Singapore  
Microchip Technology Singapore Pte Ltd.  
200 Middle Road #07-02 Prime Centre  
Singapore, 188980  
Tel:  65-6334-8870 Fax:  65-6334-8850  

Taiwan  
Microchip Technology Taiwan  
1IF-3, No. 207  
Tung Hua North Road  
Taipei, 105, Taiwan  
Tel:  886-2-2717-7175 Fax:  886-2-2545-0139  

EUROPE  
Denmark  
Microchip Technology Nordic ApS  
Regus Business Centre  
Laurupshoj 1-3  
Ballrup DK-2750 Denmark  
Tel:  45 4420 9895 Fax:  45 4420 9910  

France  
Microchip Technology SARL  
Parc d’Activite du Moulin de Massy  
4 Rue du Saule Trapu  
Bâtiment A - 1er Etage  
91300 Massy, France  
Tel:  33-1-69-53-63-20 Fax:  33-1-69-30-90-79  

Germany  
Microchip Technology GmbH  
Renninunn La  
Stuttgart, 70180, Germany  
Tel:  49-71-6275-5700 Fax:  49-71-6275-5060  

Italy  
Microchip Technology SRL  
Palazzo Taurus 1 V. Le Colleoni 1  
20041 Agra Via Brianza  
Milan, Italy  
Tel:  39-039-65791-1 Fax:  39-039-6899883  

United Kingdom  
Arizona Microchip Technology Ltd.  
505 Eskdale Road  
Winsneshe Triangle  
Wokingham  
Berkshire, England RG41 5TU  
Tel:  44 118 921 5869 Fax:  44 118 921-5820  

03/01/02