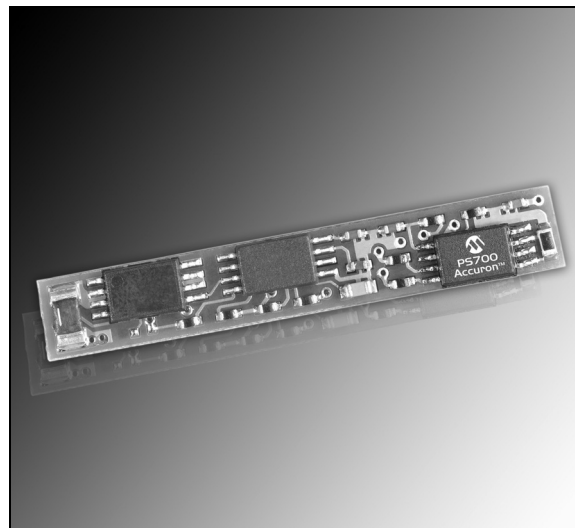


PS700 Battery Monitor and Safety Module

Features

- PS700 tested, fully populated modules for evaluation
- Designed to work with 1 and 2 series cell Lithium configurations
- Performs all major battery management functions including accurate capacity monitoring
- SMBus v1.1 with PEC/CRC-8 communication with system host
- High accuracy measurement of charge/discharge current, voltage and temperature with on-chip 15-bit integrating A/D
- Precise capacity reporting using Microchip patented algorithms and 3D battery cell models
- 3D models and “learned” parameters stored in integrated EEPROM
- Extremely low-power operation:
 - Sleep mode: < 20 μ A typical
 - Run mode: < 100 μ A typical
 - Sample mode: < 50 μ A typical
- Complete hardware and software development tools available
- Overall mechanical dimensions:
 - 0.248 W x 1.200 L (inches)
 - 6.30 W x 30.50 L (millimeters)

Board Photo



Ordering Information

Part Number	Description
PS7051	Li Ion - 1 series cell
PS7052	Li Ion - 2 series cells

PS7051/PS7052

1.0 GENERAL DESCRIPTION

The PS7051 and PS7052 modules are complete Smart Battery controller subsystems based on the Microchip PS700 battery monitor. The modules are designed to operate in a battery pack consisting of one (1) or two (2) series connected Lithium cells. The module consists of the Microchip PS700 fuel gauge IC and a Seiko battery protection IC.

1.1 Quick Start – Pack Assembly

Follow these directions to assemble a pack with the PS705X module.

- Use standard precautions when handling static sensitive devices.
- Modules should be connected to battery cells in the order indicated below to insure proper start-up and operation. Wires should be attached to the modules first and then connected to the battery cells as instructed.
- The connection sequence is critical to successful use of the PS700 family of CMOS ASICs. The pack positive should be securely connected to the module first, followed by pack negative.

Step 1: Connect wires to module. Use large diameter wire (18 AWG-20 AWG) or tabs for current carrying lines from VR, V2 (PS7052 only) and V1. All others are signal only lines (24 to 22 AWG).

Step 2: Connect V1 to the most positive point on the battery cell stack.

Step 3: Connect VR to the most negative point on the battery cell stack.

Step 4: For PS7052 only, connect V2 to the middle of the cell stack.

Step 5: Connect external connector to B-, C, D and B+.

Step 6: Program the assembled pack using Microchip's PowerMate™ software and PowerCal™ 2 board or PowerInfo™ 2 board hardware. The EEPROM parameters can be changed at will using the utilities on the EE page in the PowerMate software.

Step 7: Calibrate the pack using the PowerMate software and PowerCal 2 board hardware. The pack is now ready for use.

FIGURE 1-1: PS7051 BOARD ASSEMBLY (SIDE 1)

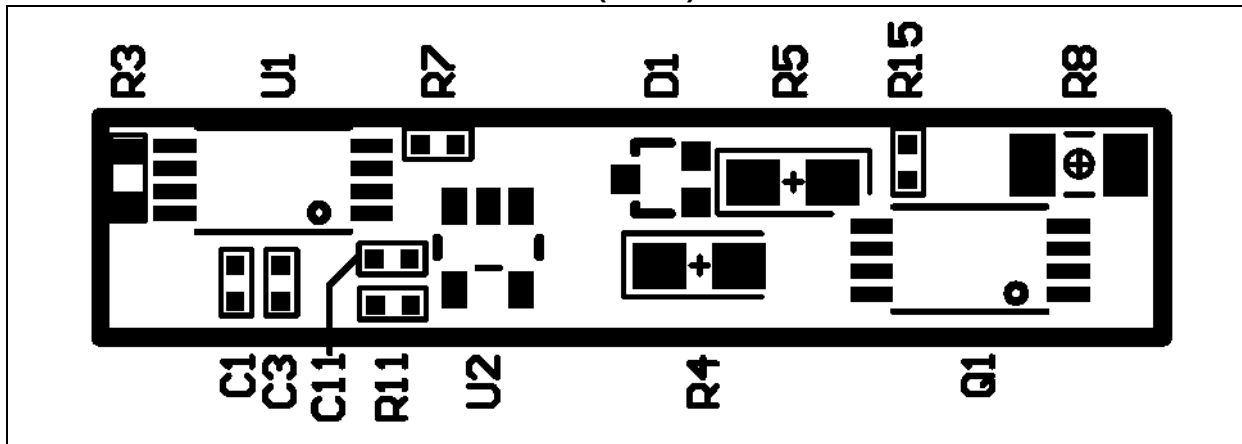


FIGURE 1-2: PS7051 BOARD ASSEMBLY (SIDE 2)

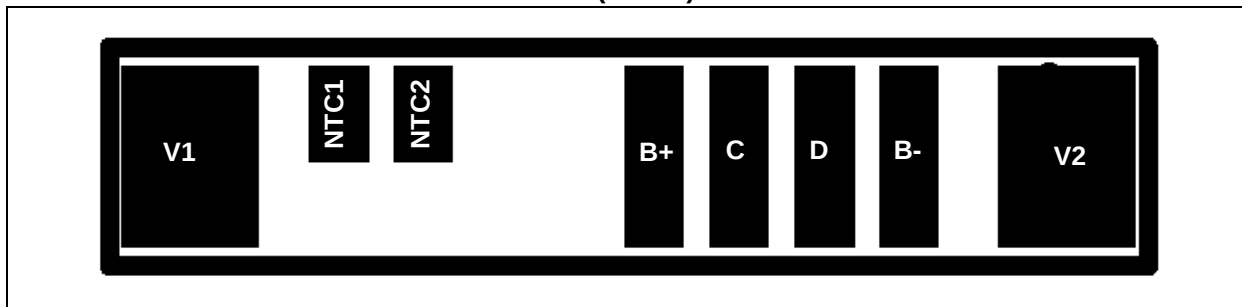


FIGURE 1-3: PS7052 BOARD ASSEMBLY (SIDE 1)

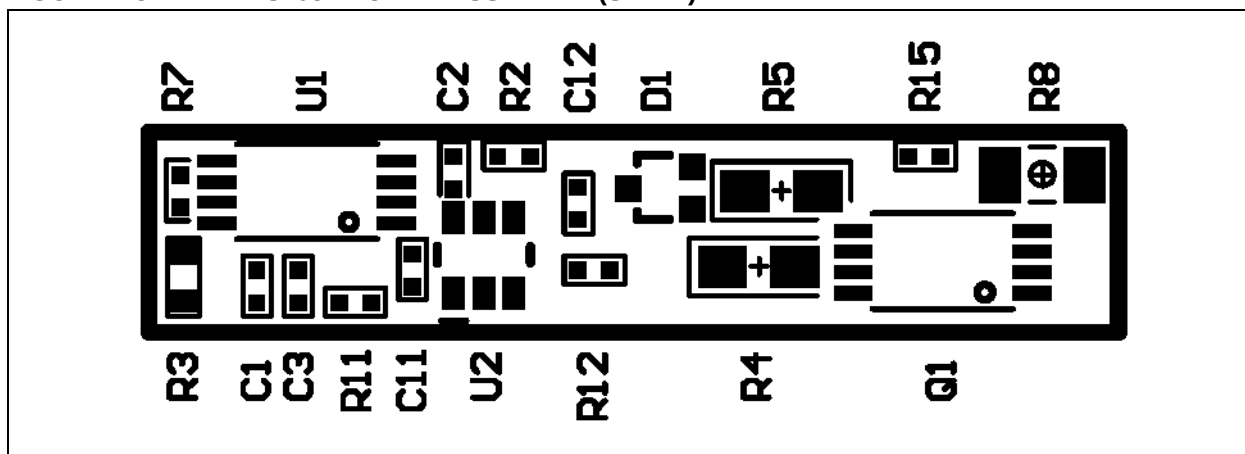
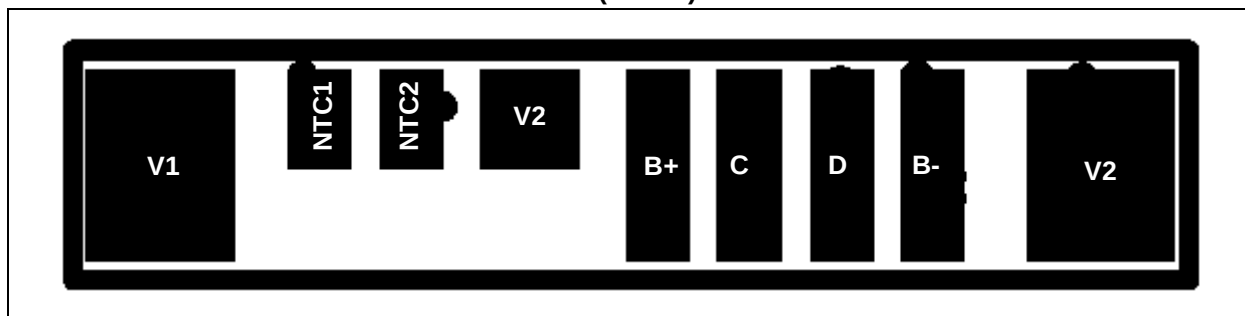


FIGURE 1-4: PS7052 BOARD ASSEMBLY (SIDE 2)



2.0 FUNCTIONAL DESCRIPTION

2.1 PS700 Fuel Gauge

The module fuel gauge provides State-Of-Charge (SOC) and battery status data in accordance with the SMBus standards version 1.1. The PS700 monitors the cell voltages, battery temperature and current to determine SOC and battery status. The State-Of-Charge calculations are compensated for cell self-discharge. The remaining time calculation is compensated for temperature and discharge rate. The parameters for determining battery status flags and alarm thresholds are all programmable, as is the battery design capacity and the battery performance model data. Please refer to the PS700 Data Sheet (DS21760) for details on configuring the PS700.

2.2 Primary Safety

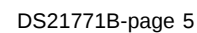
The primary safety circuit provides cell protection from conditions of overcharge, overdischarge and overcurrent. Analog ICs from Seiko measure individual cell voltages and voltage across the discharge FET. These values are compared against internal reference values and the gates of two N-channel power MOSFETs are controlled based on the comparison results.

3.0 BOARD DESCRIPTION

PCB schematics and bill of materials are included here for completeness. To download full size schematic and BOM, please visit the Microchip web site (www.microchip.com).

3.1 Mechanical Dimensions

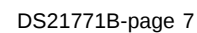
Overall Dimensions: 248 mils W x 1200 mils L



PS7051/PS7052

TABLE 3-1: PS7051 BILL OF MATERIALS

Symbols	Description	Manufacturer	Manufacturer PN	Qty.
	Raw PCB, PS7051	Microchip	04-826142 Rev 3.1	1
C3	Capacitor, Ceramic, 1.0 nF, 25V, +/-10%, X7R dielectric, 0402	Panasonic	ECJ-0EB1E102K	1
C1, C11	Capacitor, Ceramic, 100 nF, 16V, +80%/-20%, Y5V dielectric, 0402	BC Components	0402F104Z160BT	2
D1	Dual Zener Diode, 5.6V +/-10%, 200 mW, common anode, SOT-323	<u>Central Semi.</u> Diodes Inc.	<u>CMSZDA5V6</u> AZ23C5V6W-7	1
Q1	MOSFET, Dual N-channel Enhancement mode, -20V, -6A, 18 mOhm, 1.19W, TSSOP (8/4.4 mm body width) package	Vishay Siliconix	SI6880EDQ	1
R7	Resistor, film, 0402, 1%, 6.49 KOhms	Panasonic	ERJ-2RKF6491X	1
R15	Resistor, film, 0402, 5%, 1.0 KOhms	Panasonic	ERJ-2GEJ102X	1
R11	Resistor, film, 0402, 5%, 470 ohms	Panasonic	ERJ-2GEJ471X	1
R3	Resistor, film, 0603, 1%, 221 KOhms	Panasonic	ERJ-3EKF2213V	1
R4, R5	Resistor, film, 0805, 5%, 680 ohms	Panasonic	ERJ-6GEYJ681V	2
R8	Resistor, metal strip, 1206, 1%, 0.020 ohms	Vishay	WSL1206-0.020-1%-R86	1
U1	IC, Low-Voltage Fuel Gauge, -20°C to +70°C, TSSOP (8/4.4 mm body width) package	Microchip	PS700-I/ST	1
U2	IC, Battery Protection Circuit, Li Ion, 1-cell, -40°C to +85°C, SOT-23-5 package	Seiko Instruments	S-8241ABPMC-GBP-T2	1

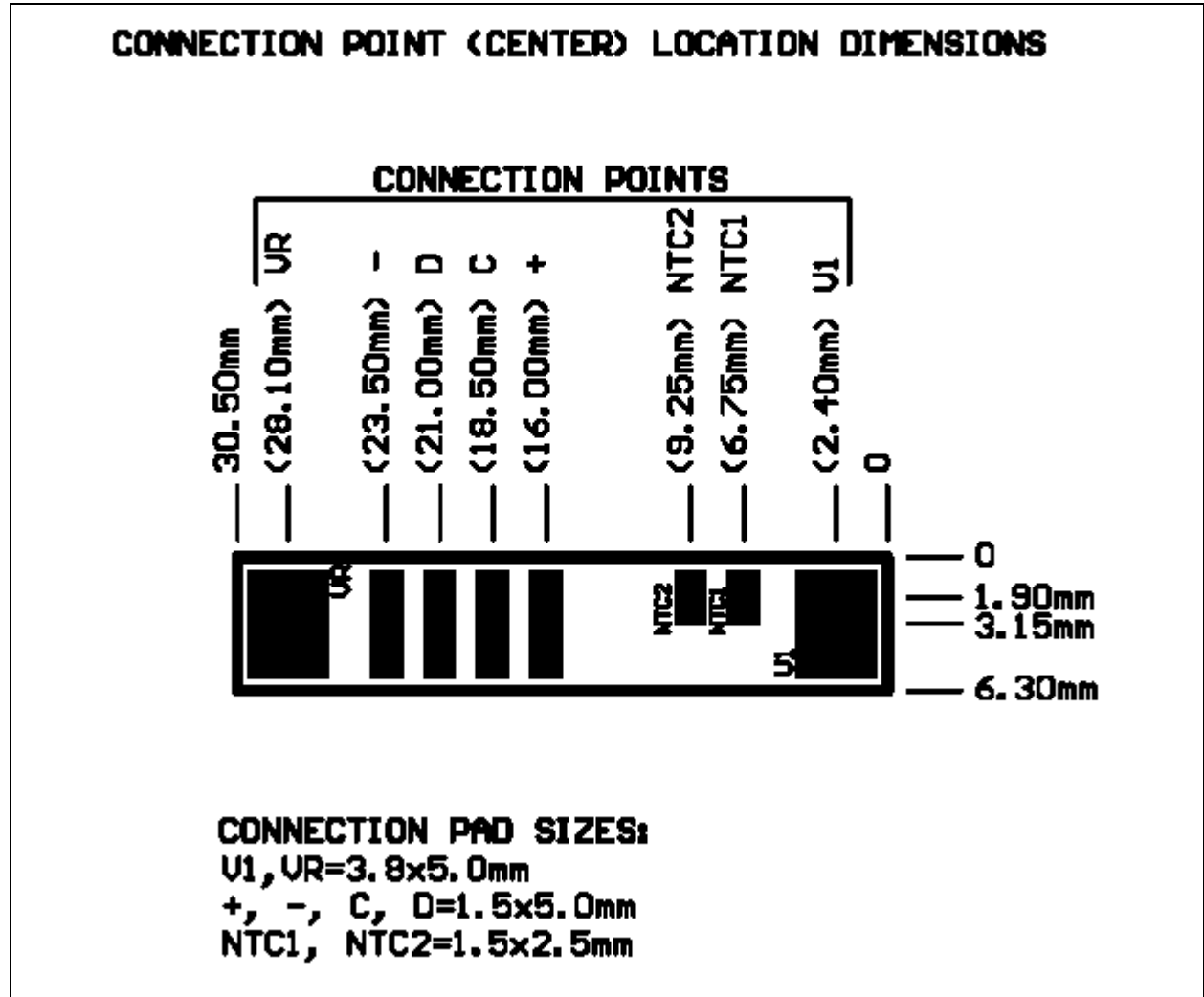


PS7051/PS7052

TABLE 3-2: PS7052 BILL OF MATERIALS

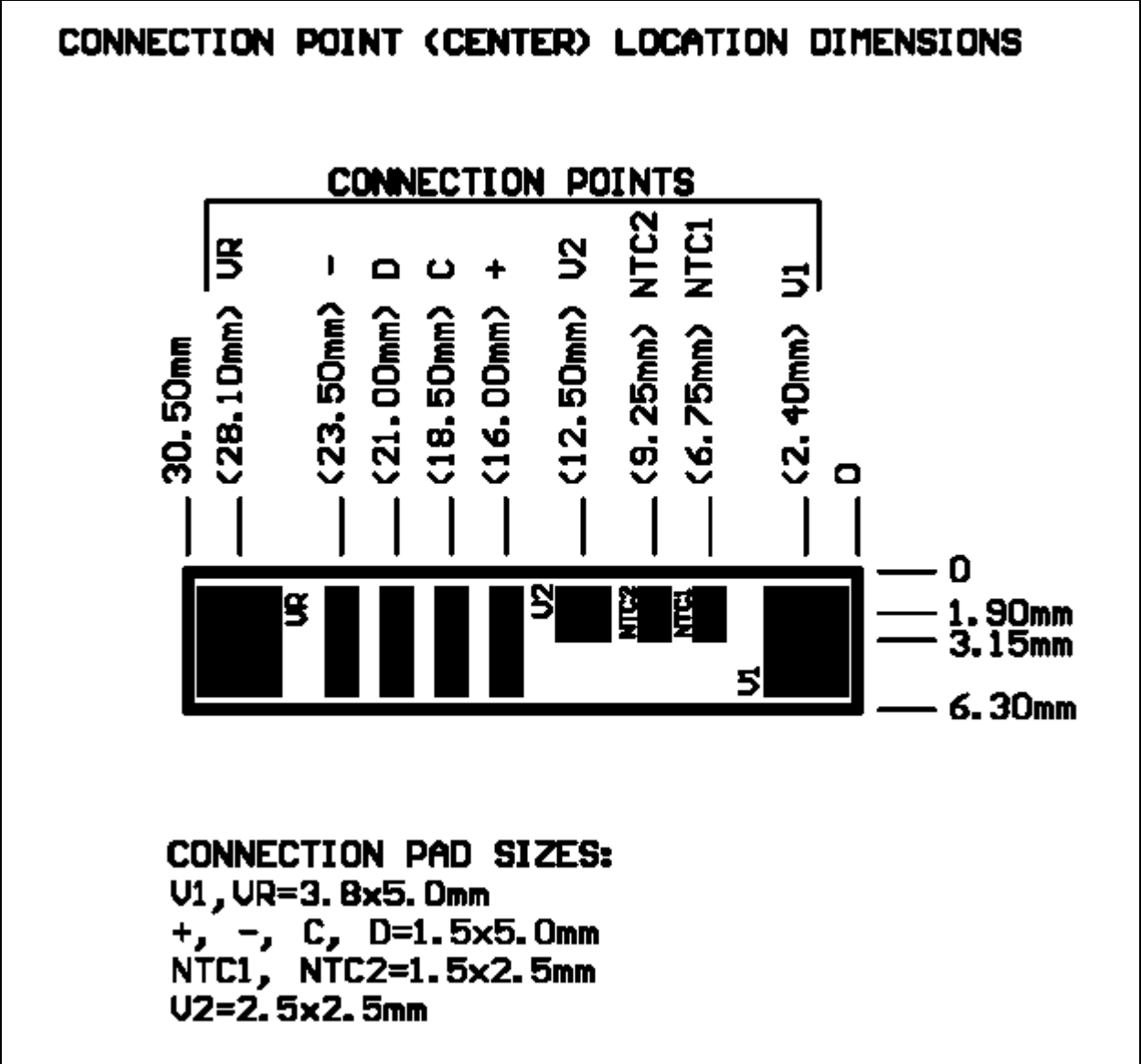
Symbols	Description	Manufacturer	Manufacturer PN	Qty.
	Raw PCB, PS7052	Microchip	04-826143 Rev 3.1	1
C3	Capacitor, Ceramic, 1.0 nF, 25V, +/-10%, X7R dielectric, 0402	Panasonic	ECJ-0EB1E102K	1
C1-C2, C11-C12	Capacitor, Ceramic, 100 nF, 16V, +80%/-20%, Y5V dielectric, 0402	BC Components	0402F104Z160BT	4
D1	Dual Zener Diode, 5.6V +/-10%, 200 mW, common anode, SOT-323	<u>Central Semi.</u> Diodes Inc.	<u>CMSZDA5V6</u> AZ23C5V6W-7	1
Q1	MOSFET, Dual N-channel Enhancement mode, -20V, -5A, TSSOP (8/4.4 mm body width) package	Toshiba	TPCS8209(TE12L)	1
R7	Resistor, film, 00402, 1%, 6.49 KOhms	Panasonic	ERJ-2RKF6491X	1
R2, R11-R12	Resistor, film, 0402, 5%, 470 ohms	Panasonic	ERJ-2GEJ471X	3
R15	Resistor, film, 0402, 5%, 2.0 KOhms	Panasonic	ERJ-2GEJ202X	1
R3	Resistor, film, 0603, 1%, 221 KOhms	Panasonic	ERJ-3EKF2213V	1
R4, R5	Resistor, film, 0805, 5%, 680 ohms	Panasonic	ERJ-6GEYJ681V	2
R8	Resistor, metal strip, 1206, 1%, 0.020 ohms	Vishay	WSL1206-0.020-1%-R86	1
U1	IC, Low-Voltage Fuel Gauge, -20°C to +70°C, TSSOP (8/4.4 mm body width) package	Microchip	PS700-I/ST	1
U2	IC, Battery Protection Circuit, Li Ion, 2-cell, -40°C to +85°C, SOT-23-6 package.	Seiko Instruments	S-8242AAG-M6T2G	1

FIGURE 3-3: PS7051 DIMENSION DETAILS



PS7051/PS7052

FIGURE 3-4: PS7052 DIMENSION DETAILS



4.0 DEVELOPMENT TOOL SUMMARY

Microchip provides all the necessary hardware and software to enable easy tailoring of battery control algorithm parameters and cell performance models to meet specific application requirements and attain the highest accuracy available anywhere. Table 4-1 summarizes the development tool offering from Microchip to support the PS705X. Please refer to the Microchip web site for ordering information and design documentation (including schematics) at www.microchip.com.

4.1 Reference Documents

This data sheet provides an overview of the PS705X Battery Monitor and Safety Module. For further information on the PS700 and development tool operations, please refer to the documents listed in Table 4-2 available for download at www.microchip.com.

TABLE 4-1: MICROCHIP DEVELOPMENT TOOL SUMMARY

Development Tool	Use
PowerInfo™ 2 hardware with PowerMate™ software (PS051)	Read and write PS700 registers and EEPROM
PowerCal™ 2 hardware with PowerMate software (PS052)	Read and write PS700 registers and EEPROM, calibration

TABLE 4-2: MICROCHIP REFERENCE DOCUMENTS

Document Number	Documents Available
DS21760	PS700 Battery Monitor

PS7051/PS7052

NOTES:

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, Accuron and PowerSmart are registered trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

SmartShunt is a registered trademark of Microchip Technology Incorporated in the U.S.A.

PowerCal, PowerInfo, PowerMate, PowerTool, SmartSensor and SmartTel are trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

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

© 2004, Microchip Technology Incorporated. Printed in the U.S.A., All Rights Reserved.

 Printed on recycled paper.



WORLDWIDE SALES AND SERVICE

AMERICAS

Corporate Office

2355 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>

Atlanta

3780 Mansell Road, Suite 130
Alpharetta, GA 30022
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: 972-818-7423
Fax: 972-818-2924

Detroit

Tri-Atria 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, IN 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

Phoenix

2355 West Chandler Blvd.
Chandler, AZ 85224-6199
Tel: 480-792-7966
Fax: 480-792-4338

San Jose

1300 Terra Bella Avenue
Mountain View, CA 94043
Tel: 650-215-1444

Toronto

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

ASIA/PACIFIC

Australia

Suite 22, 41 Rawson Street
Epping 2121, NSW
Australia
Tel: 61-2-9868-6733
Fax: 61-2-9868-6755

China - Beijing

Unit 706B
Wan Tai Bei Hai Bldg.
No. 6 Chaoyangmen Bei Str.
Beijing, 100027, China
Tel: 86-10-85282100
Fax: 86-10-85282104

China - Chengdu

Rm. 2401-2402, 24th Floor,
Ming Xing Financial Tower
No. 88 TIDU Street
Chengdu 610016, China
Tel: 86-28-86766200
Fax: 86-28-86766599

China - Fuzhou

Unit 28F, World Trade Plaza
No. 71 Wusi Road
Fuzhou 350001, China
Tel: 86-591-7503506
Fax: 86-591-7503521

China - Hong Kong SAR

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

China - Shanghai

Room 701, Bldg. B
Far East International Plaza
No. 317 Xian Xia Road
Shanghai, 200051
Tel: 86-21-6275-5700
Fax: 86-21-6275-5060

China - Shenzhen

Rm. 1812, 18/F, Building A, United Plaza
No. 5022 Binhe Road, Futian District
Shenzhen 518033, China
Tel: 86-755-82901380
Fax: 86-755-8295-1393

China - Shunde

Room 401, Hongjian Building
No. 2 Fengxiangnan Road, Ronggui Town
Shunde City, Guangdong 528303, China
Tel: 86-765-8395507 Fax: 86-765-8395571

China - Qingdao

Rm. B505A, Fullhope Plaza,
No. 12 Hong Kong Central Rd.
Qingdao 266071, China
Tel: 86-532-5027355 Fax: 86-532-5027205

India

Divyasree Chambers
1 Floor, Wing A (A3/A4)
No. 11, O'Shaugnessey Road
Bangalore, 560 025, India
Tel: 91-80-2290061 Fax: 91-80-2290062

Japan

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

Korea

168-1, Youngbo Bldg. 3 Floor
Samsung-Dong, Kangnam-Ku
Seoul, Korea 135-882
Tel: 82-2-554-7200 Fax: 82-2-558-5932 or
82-2-558-5934

Singapore

200 Middle Road
#07-02 Prime Centre
Singapore, 188980
Tel: 65-6334-8870 Fax: 65-6334-8850

Taiwan

Kaohsiung Branch
30F - 1 No. 8
Min Chuan 2nd Road
Kaohsiung 806, Taiwan
Tel: 886-7-536-4818
Fax: 886-7-536-4803

Taiwan

Taiwan Branch
11F-3, No. 207
Tung Hua North Road
Taipei, 105, Taiwan
Tel: 886-2-2717-7175 Fax: 886-2-2545-0139

EUROPE

Austria

Durisolstrasse 2
A-4600 Wels
Austria
Tel: 43-7242-2244-399
Fax: 43-7242-2244-393

Denmark

Regus Business Centre
Lautrup høj 1-3
Ballerup DK-2750 Denmark
Tel: 45-4420-9895 Fax: 45-4420-9910

France

Parc d'Activite du Moulin de Massy
43 Rue du Saule Trapu
Batiment A - 1er Etage
91300 Massy, France
Tel: 33-1-69-53-63-20
Fax: 33-1-69-30-90-79

Germany

Steinheilstrasse 10
D-85737 Ismaning, Germany
Tel: 49-89-627-144-0
Fax: 49-89-627-144-44

Italy

Via Quasimodo, 12
20025 Legnano (MI)
Milan, Italy
Tel: 39-0331-742611
Fax: 39-0331-466781

Netherlands

P. A. De Biesbosch 14
NL-5152 SC Drunen, Netherlands
Tel: 31-416-690399
Fax: 31-416-690340

United Kingdom

505 Eskdale Road
Wokingham
Berkshire, England RG41 5TU
Tel: 44-118-921-5869
Fax: 44-118-921-5820

11/24/03

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

[Microchip:](#)

[PS7051](#) [PS7052](#)