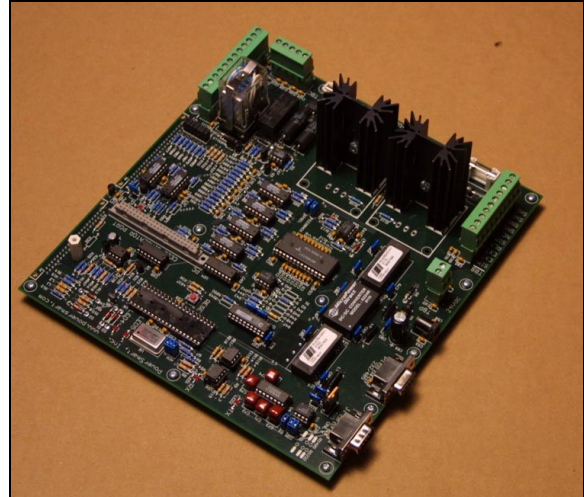


PowerCal™ Calibration Platform

Features

- Hardware platform for configuration, verification, precision calibration and production test of Microchip PowerSmart® smart battery systems
- Operates under control of Windows® based PowerTool software through COM port Interface to PC
- Directly connects to assembled smart battery pack or to stand-alone PowerSmart battery electronics
- Supports loading and verification of battery configuration parameters and 3D cell models in PS40X EEPROM and OTP memory
- Precision analog hardware calibrates PowerSmart battery pack for maximum possible accuracy in current, voltage and temperature measurements
- Programmable load capable of drawing up to 36W continuous discharge power from battery pack during calibration using natural-convection cooling
- Supports higher power ratings at reduced duty cycles, and/or with forced-air cooling
- Powered by 24V DC external supply (included)
- Extensive safety features including production proven EMI/ESD protection, fuses for device under test and optical isolation of serial port
- Dimensions: 8.66"W x 9.13"L x 2.06"H

Board Photo



Ordering Information

Part No.	Description
PS042	PowerCal calibration board

Development/Test Software

Part No.	Description
PS040	PowerTool™

1.0 PRODUCT OVERVIEW

PowerCal is a comprehensive hardware platform that supports configuration, verification, calibration and production test of Microchip PowerSmart smart battery systems. It operates under the control of Microchip's PowerTool Development/Test software interfaced to a Windows PC.

The PowerCal board facilitates serial communication between the PC and the SMBus interface on smart batteries, providing a direct connection to both. Under control of PowerTool, PowerCal performs loading and verification of battery configuration parameters and 3D cell models in PS40X EEPROM and OTP memory.

In addition, the PowerCal platform provides a complete precision system for calibrating current, voltage and temperature measurements in a smart battery, eliminating the need for expensive meters or power supplies.

During calibration, the PowerCal board accurately measures current, voltage and temperature and compares these measured values to those reported by the smart battery. Calibration values are then loaded into the programmable storage and used by the chip to compensate raw measurements made during normal operation. Reported values from the PowerSmart IC are therefore corrected to eliminate known, measured errors.

The PowerCal platform accomplishes calibration with programmable load and precision measurement hardware so that a known, constant discharge current is drawn from the battery pack. The programmable load circuit is capable of drawing up 36W continuous discharge power from the battery pack during calibration using natural-convection cooling. Higher discharge currents are supported at reduced duty cycles, and/or with forced-air cooling. In addition, there are provisions for the user to add their own external charger or load, at up to 10A.

The PowerCal board is designed to support both development and test environments. Both RS-232 and RS-485 interfaces are present so that the board can operate with a stand-alone connection (RS-232) or with a multidrop connection (RS-485) to the host PC. The hardware supports up to 7 PowerCal boards interfaced on a multidrop link from a PC COM port. As a result, up to 28 boards can be interfaced on a single PC with 4 COM ports. PowerCal boards can fit in a DIN 6U rack (2.25" board spacing); they can also be panel-mounted.

Extensive safety features include production proven EMI/ESD protection, optical isolation of the serial ports and protective fuses. Fuses protect the device under test, the PowerCal hardware and any connected external charger or load. The board is implemented using 4 layers with a dedicated ground plane. All I/O's are connected to bypass capacitors to earth ground.

2.0 GENERAL SETUP

The Microchip PowerCal platform is a very powerful, versatile calibration, test and evaluation system. It can be used in a variety of ways, as a single board in a development environment and as a multi-board system in a high volume production environment. The instructions that follow will guide you through setup for each of the features on the board. References to modules refer to PCB products not yet assembled into packs or connected to cells.

Power is provided to the board to the JP connector with a 24V DC, 500 mA power supply wall adapter.

2.1 Connections

- JP – 24V DC power supply.
- TBP – pluggable terminal block alternate 24V DC power supply (parallel connections with JP).
- TBS – pluggable terminal block for board-level test I/Os (to be developed later).
- TBC – Support for future capability.
- TBB – pluggable terminal block for device under test, module or pack (includes connections for cell voltage measurement and programming voltage).
- PC – cell simulator port

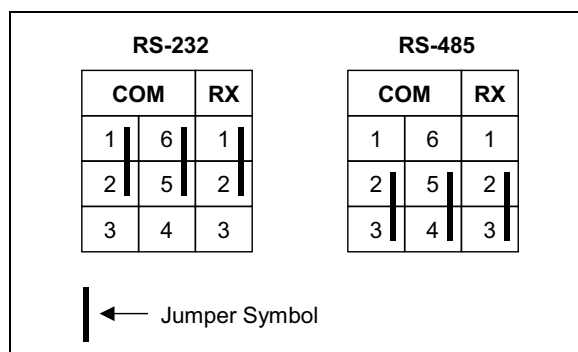
2.2 Jumpers

- ADR – jumper for board address identification

Address	Jumper Position		
	3-4	2-5	1-6
0	X	X	X
1	X	X	O
2	X	O	X
3	X	O	O
4	O	X	X
5	O	X	O
6	O	O	X
7	O	O	O

O – open, X – connect

- COM and RX – jumpers to select RS-232 or RS-485



3.0 FUNCTIONAL DESCRIPTION

With the current firmware, the PowerCal board can perform programming and test of packs and modules and the calibration of pack and cell voltages on packs. Apply power (24V DC) to the board at either the JP connector using an A/C wall adapter or at TBP connector. To use a single PowerCal board connected to the serial port of a PC, configure the COM and RX jumpers for RS-232 and connect the P1 connector to the PC serial port. To use multiple boards per COM port, configure the COM and RX jumpers for RS-485 and connect the P1 connector to the RS-485 connector on the PC card. Additional PowerCal boards may be added by connecting J1 on the first board to P1 on the next using a standard (straight-through) PC serial cable. Up to seven boards may be added in this manner. Use the ADR jumper to give each board a unique address. Install and run Microchip's PowerTool software on the PC. The calibration platform is ready to use.

3.1 Pack Programming, Calibration and Test

Attach the external pack contacts of the Microchip SmartBattery pack (V+, C, D, T, V-) to the same terminals on the TBB connector. Using PowerTool software, the EEPROM can be programmed and the pack voltage can be calibrated. To program OTP memory, the VPP contact in the pack must be connected to VPP on the TBB connector. The additional connection is only necessary for OTP programming. Additional PowerTool features, such as final test, can also be performed on the pack.

3.2 VCELL Calibration

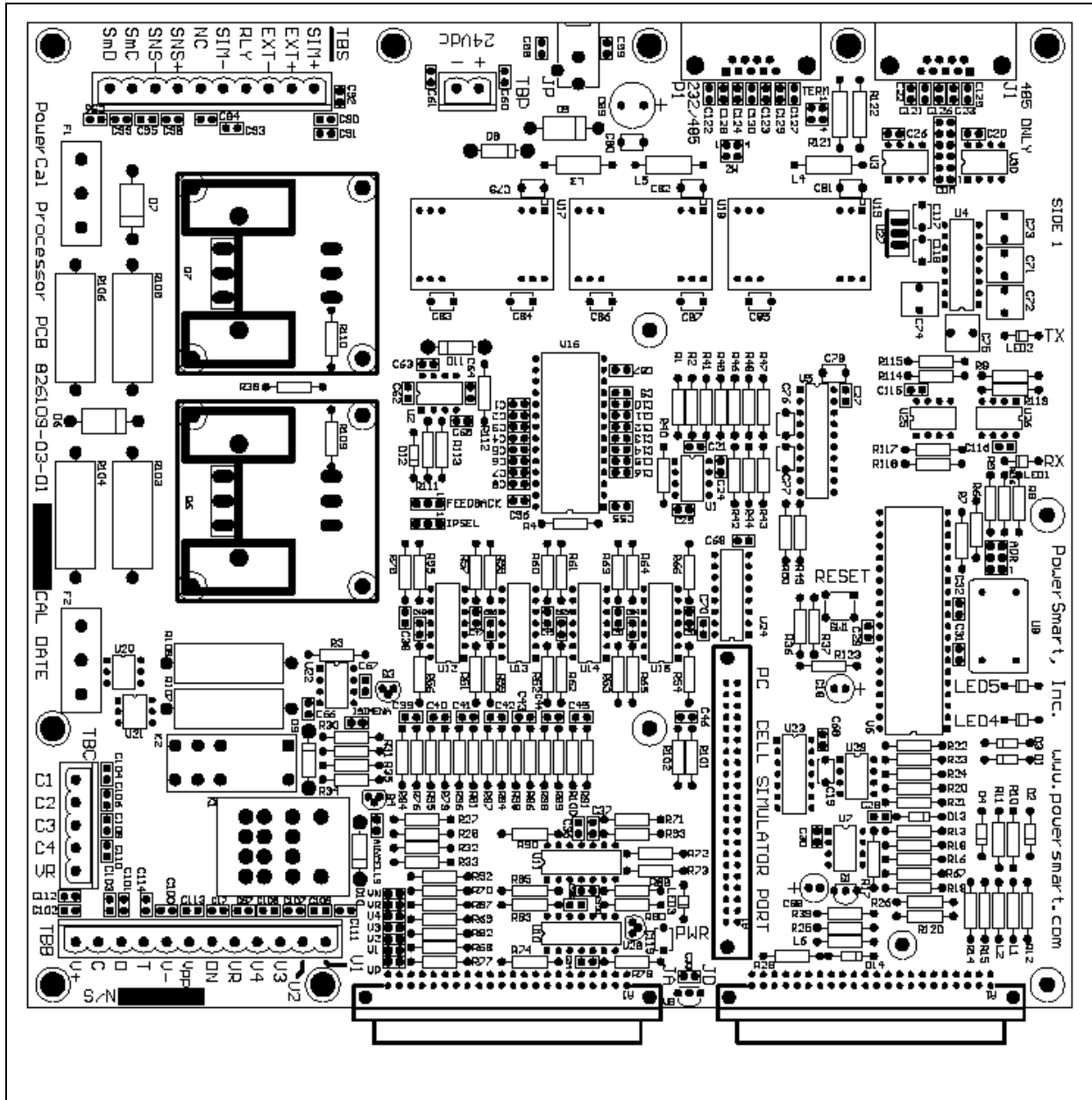
Additional connections to the TBB connector are necessary for the calibration of individual cell voltages. The bottom of the cell stack is connected to VR, the top of the cell stack is connected to V1, and the intermediate cell connections are made from the top-down. In other words, V2 is connected to the next cell below V1, V3 below V2, and V4 below V3. For 3-cell packs, do not connect V4. For 2-cell packs – do not connect V3 and V4. PowerTool software is used to calibrate the cell voltages.

PS042

4.0 MECHANICAL DIMENSIONS (units are inches)

8.66"W x 9.13"L x 2.06"H (height does not include stand-offs)

FIGURE 4-1: PowerCal™ BOARD TOP LAYER AND CONNECTIONS



5.0 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 5-1 summarizes the development tool offering from Microchip to support the P3 and P4 families. Please refer to the Microchip web site for ordering information and design documentation (including schematics) at www.microchip.com.

TABLE 5-1: MICROCHIP DEVELOPMENT TOOL SUMMARY

Development Tool	Use
PowerInfo™ hardware with PowerTool™ software (PS041)	Read and write Smart Battery data values, EEPROM programming
PowerCal™ hardware with PowerTool software (PS042)	Read and write Smart Battery data values, EEPROM programming, pack and individual calibration, pack test

Reference Documents

This data sheets provides an overview of the PowerCal Calibration Board. For further information on the PS401 and development tool operations, please refer to the following documents available for download at www.microchip.com.

Document Number	Documents Available
DS40239A	PS401 Smart Battery IC User's Guide
DS40238A	PS401 Single Chip Battery Manager Data Sheet (IC Products)
DS40234A	PS041 PowerInfo Configuration Interface Product Brief

PS042

NOTES:

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MICROCHIP

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>

Rocky Mountain

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

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: 972-818-7423 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, 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: 408-436-7950 Fax: 408-436-7955

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

China - Beijing

Microchip Technology Consulting (Shanghai)
Co., Ltd., Beijing Liaison Office
Unit 915
Bei Hai Wan 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: 86-28-86766200 Fax: 86-28-86766599

China - Fuzhou

Microchip Technology Consulting (Shanghai)
Co., Ltd., Fuzhou Liaison Office
Unit 28F, World Trade Plaza
No. 71 Wusi Road
Fuzhou 350001, China
Tel: 86-591-7503506 Fax: 86-591-7503521

China - Shanghai

Microchip Technology Consulting (Shanghai)
Co., Ltd.
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

Microchip Technology Consulting (Shanghai)
Co., Ltd., Shenzhen Liaison Office
Rm. 1315, 13/F, Shenzhen Kerry Centre,
Renminnan Lu
Shenzhen 518001, China
Tel: 86-755-82350361 Fax: 86-755-82366086

China - Hong Kong SAR

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

India

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

Japan

Microchip Technology Japan K.K.
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

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 (Barbados) Inc.,
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

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

Denmark

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

France

Microchip Technology SARL
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

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

Italy

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

United Kingdom

Microchip Ltd.
505 Eskdale Road
Winkersley Triangle
Wokingham
Berkshire, England RG41 5TU
Tel: 44 118 921 5869 Fax: 44-118 921-5820

08/01/02

