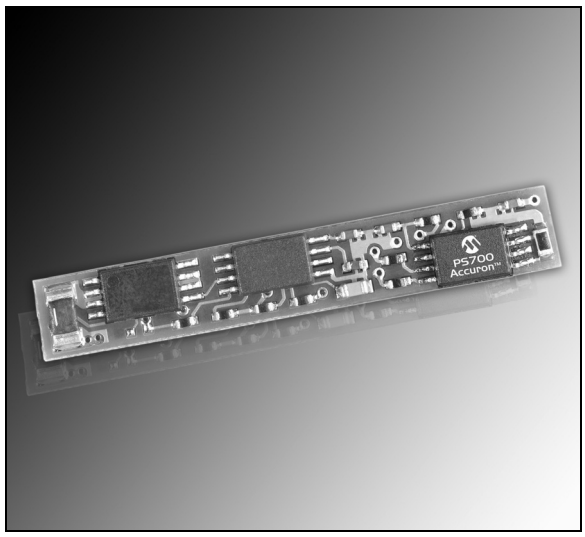
PS7051/PS7052

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 µA typical
  - Run mode: < 100 µA typical
  - Sample mode: < 50 µA 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

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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)

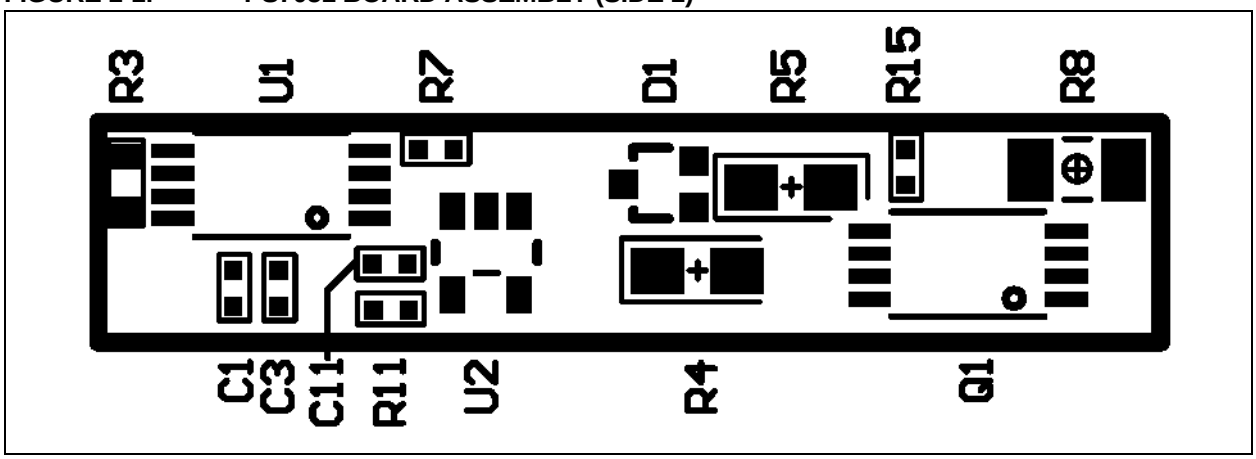

FIGURE 1-2: PS7051 BOARD ASSEMBLY (SIDE 2)

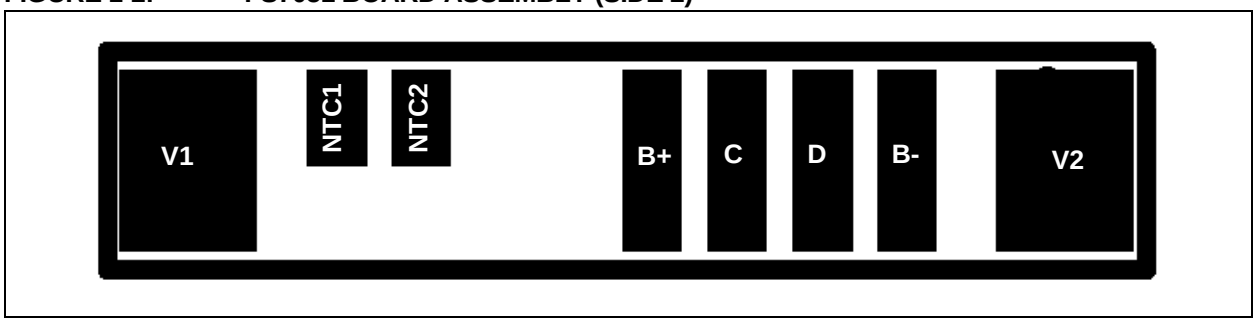

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FIGURE 1-3: PS7052 BOARD ASSEMBLY (SIDE 1)

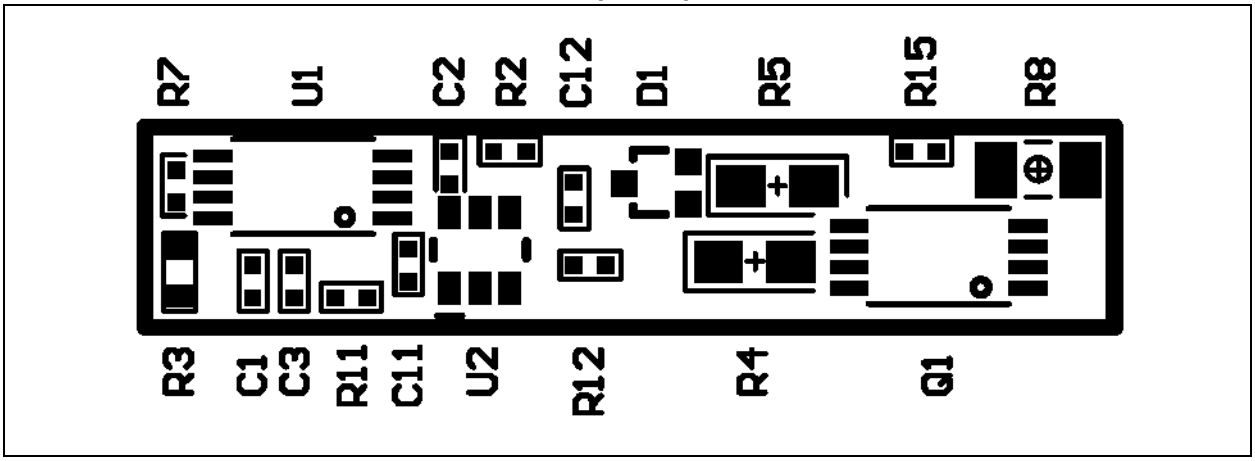
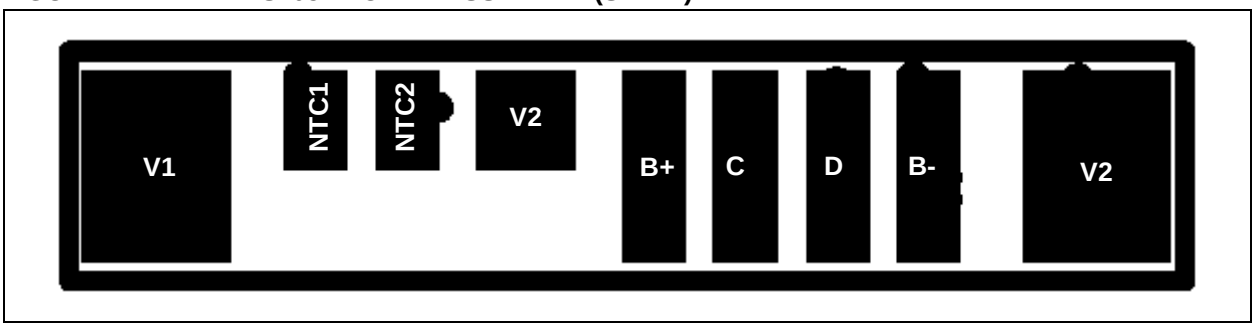


FIGURE 1-4: PS7052 BOARD ASSEMBLY (SIDE 2)



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 over-current. 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

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FIGURE 3-1: PS7051 BOARD SCHEMATIC

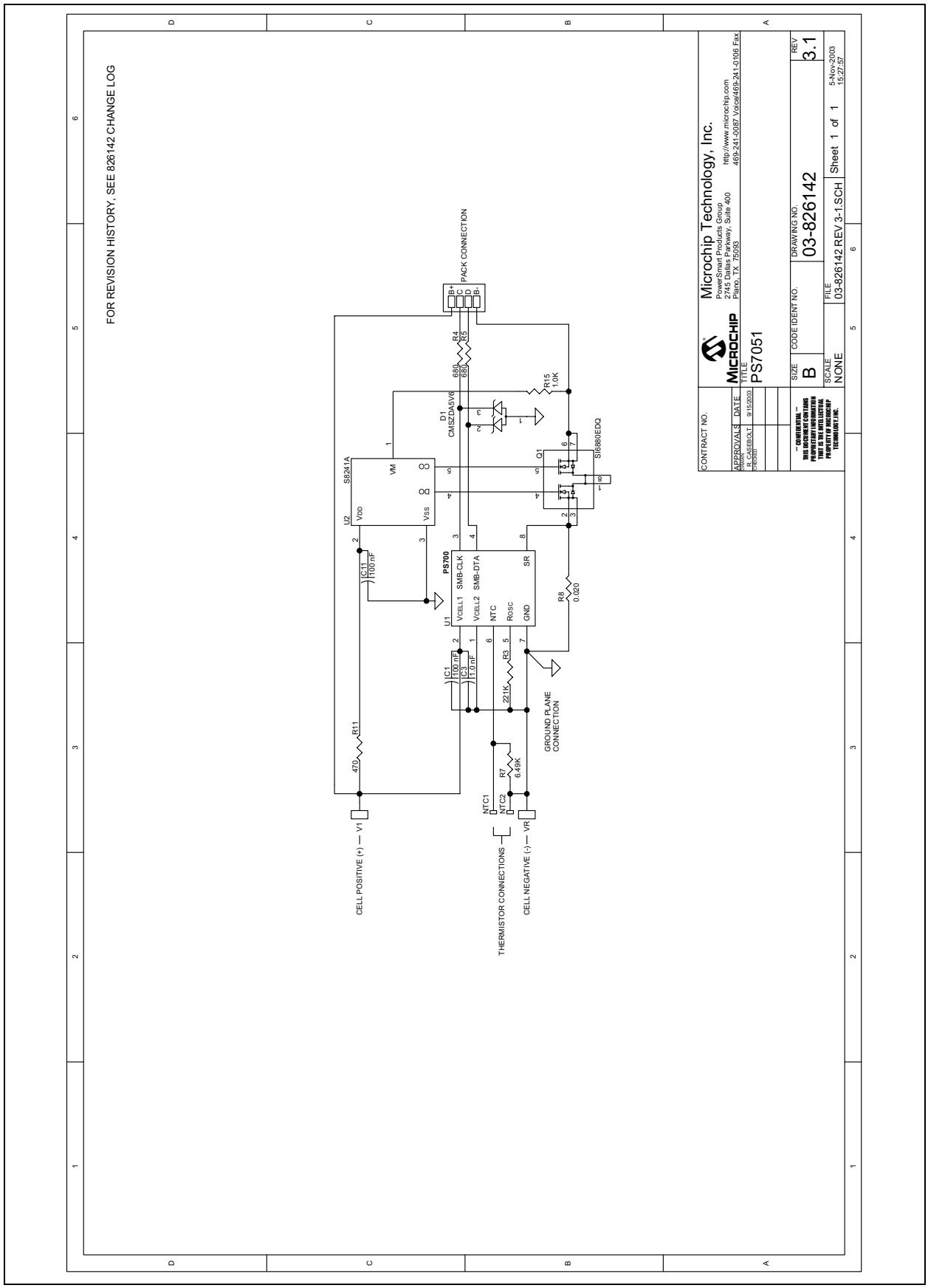

TABLE 3-1: PS7051 BILL OF MATERIALS

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	Central Semi. Diodes Inc.	CMSZDA5V6 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

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FIGURE 3-2: PS7052 BOARD SCHEMATIC

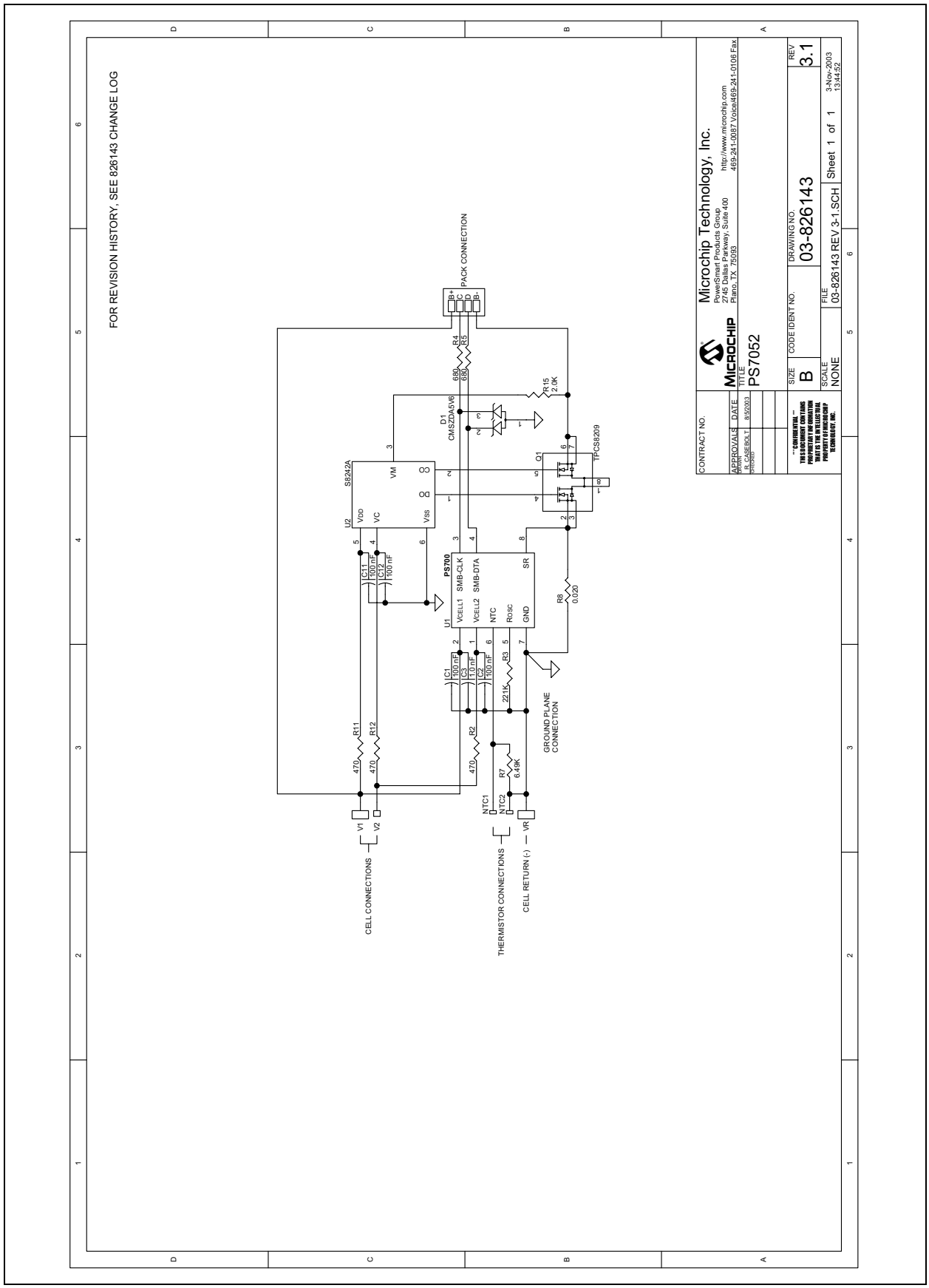

TABLE 3-2: PS7052 BILL OF MATERIALS

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	Central Semi. Diodes Inc.	CMSZDA5V6 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

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FIGURE 3-3: PS7051 DIMENSION DETAILS

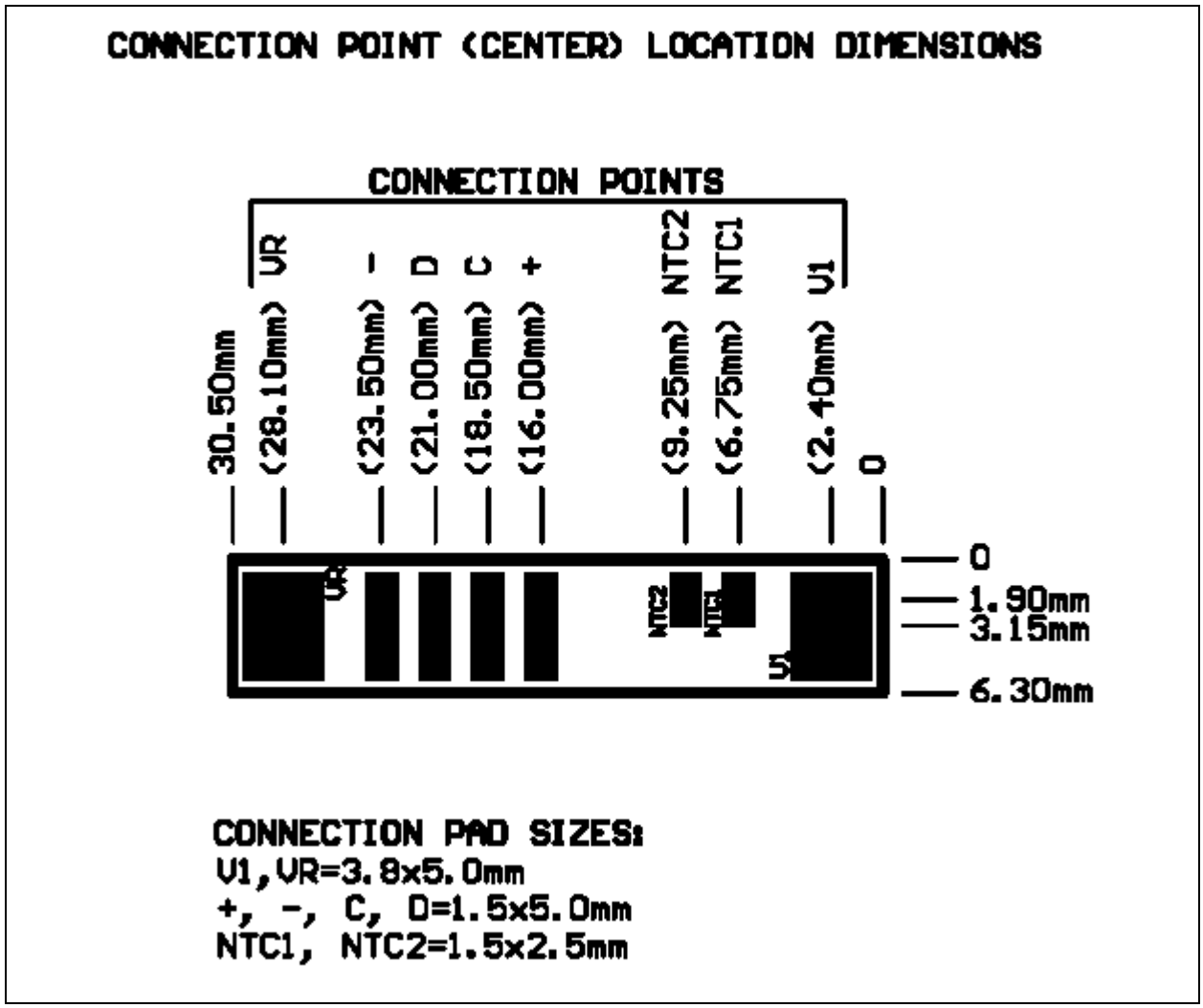
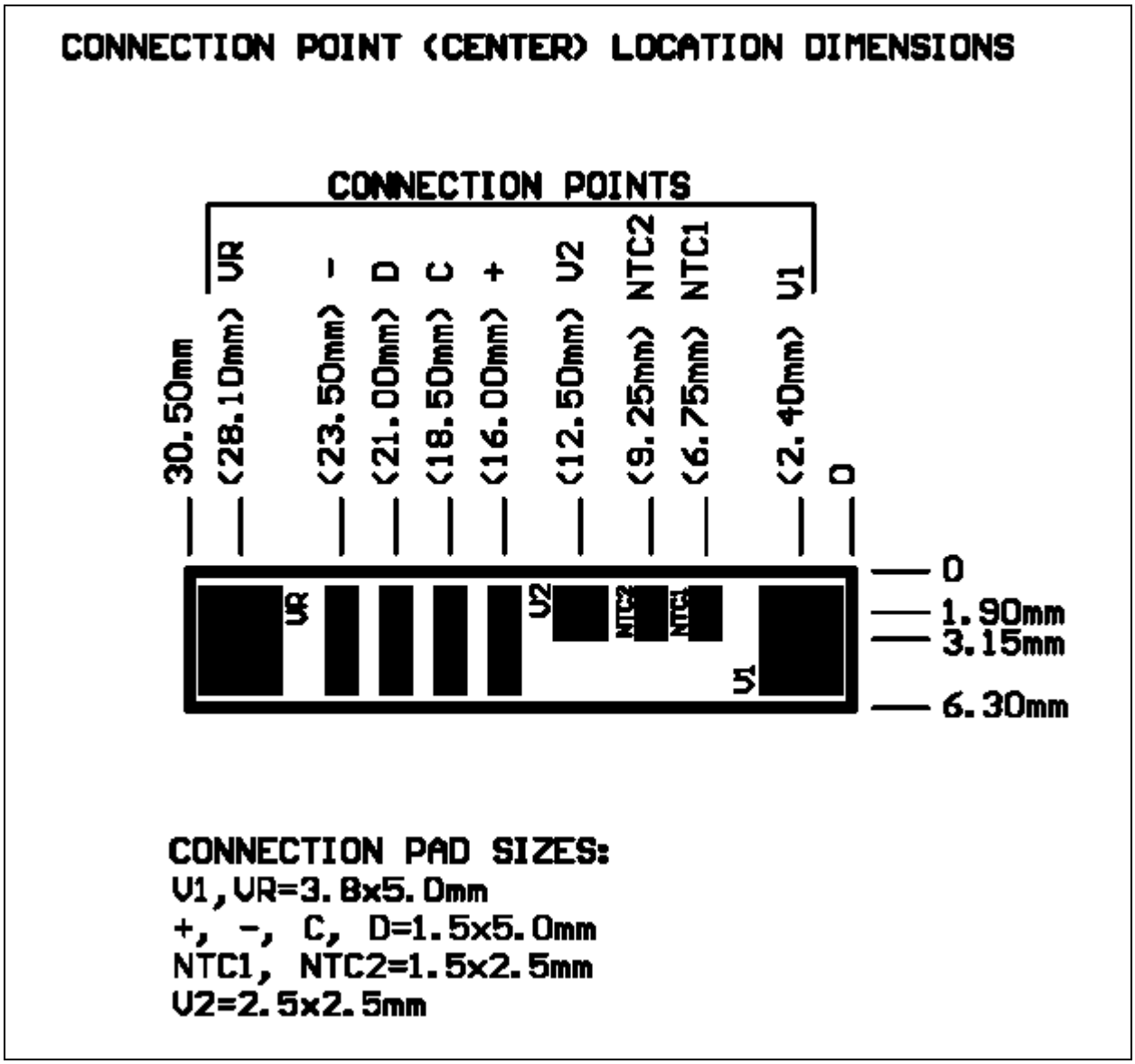


FIGURE 3-4: PS7052 DIMENSION DETAILS



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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 Batter 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

NOTES:

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