P2110CSR-EVB

P2110 Powerharvester® Chipset Reference Design
Evaluation Board

DESCRIPTION

The P2110CSR-EVB contains an evaluation board and antennas to test and develop with the Powerharvester® Chipset Reference Design. The P2110CSR converts radio frequency (RF) energy into DC power and stores it in a capacitor to provide an intermittent, regulated voltage output.

ORDERING INFORMATION

The P2110CSR can be evaluated on the P2110CSR-EVB evaluation board. Contact Powercast for information about obtaining a design license of the P2110CSR for integration onto your PCB. Additional CSR designs are available to support different frequencies and power ranges.

ITEMS INCLUDED

1 – Evaluation Board for Powerharvester Chipset Reference Design
1 – 915 MHz PCB dipole antenna
1 – 915 MHz PCB patch antenna

Note – this kit needs to receive power from an RF source such as a Powercaster® Transmitter (TX91501-3W-ID) or other test equipment.

INSTRUCTIONS

1. Download the P2110CSR product datasheet from **www.powercastco.com/resources** to learn about the specific I/O, functions, and electrical ratings. Exceeding the ratings may cause permanent damage.

2. Connect one of the antennas to the SMA connector (J1) on the evaluation board, or connect J1 directly to RF test equipment. See datasheet for maximum input power.

3. Adjust switches S2, S3, and S4 to desired settings. See descriptions on next page.

4. Place evaluation board on flat surface and connect test meters as desired.

5. Turn on the source of RF energy (e.g. Powercaster transmitter, test equipment, other transmitter)

ITEM DESCRIPTIONS

915 MHz PCB Dipole Antenna

This antenna is flat and has the RF connector located at the bottom of the antenna.

Type: Omni-directional, Vertically polarized
Energy pattern: 360°
Antenna gain: Linear gain = 1.25 (1.0 dBi)

915 MHz PCB Patch Antenna

This antenna has two layers and the RF connector located on the back of the antenna. The front side should be pointed toward the transmitter with the same polarization.

Type: Directional, Vertically polarized
Energy pattern: 122° (azimuth/horizontal), 68° (elevation/vertical)
Antenna gain: Linear gain = 4.1 (6.1 dBi)

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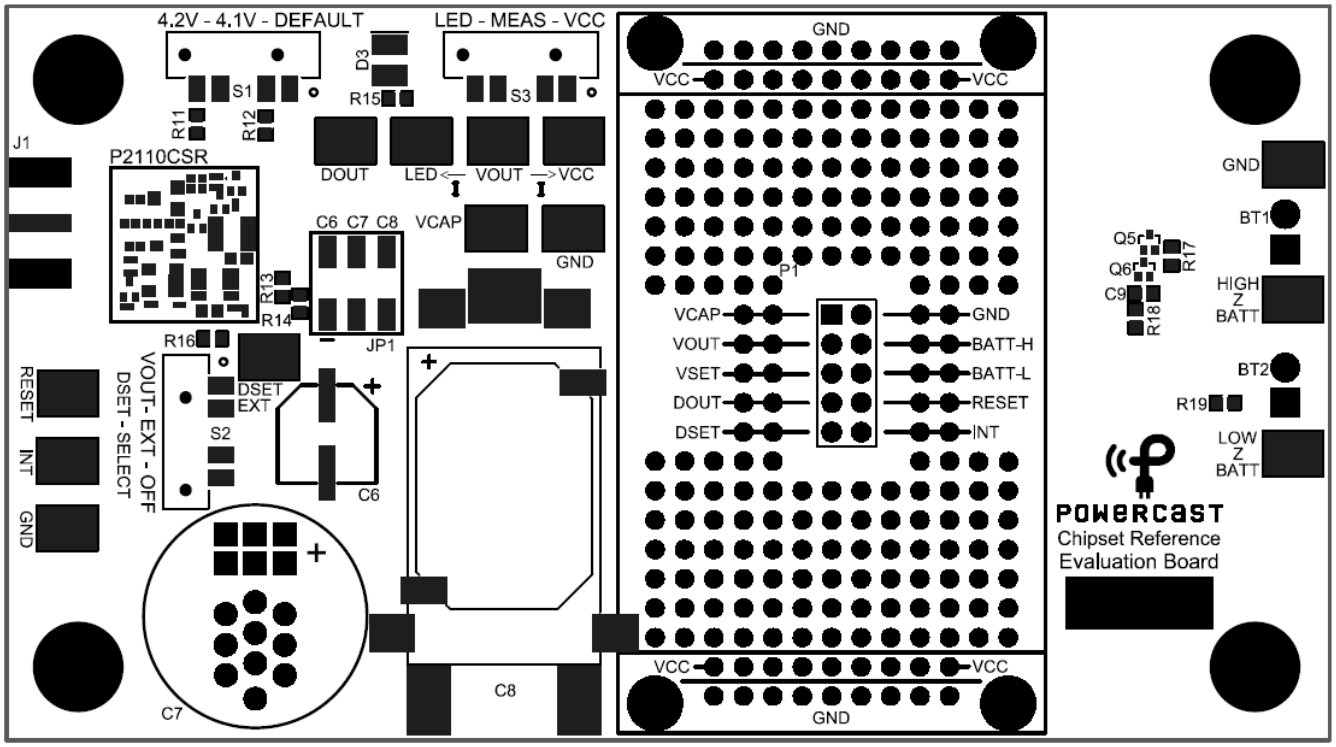
P2110CSR EVALUATION BOARD



Component	Description
BT1, BT2	External battery connection (described in detail below)
C6	Storage capacitor – 1000µF (small)
C7	Storage capacitor – not populated (user determined)
C8	Storage capacitor – 50mF (large)
C9, Q5, Q6, R17, R18	Output switch (described in detail below)
D3	LED for visual indication of power output
J1	SMA connector for antenna or RF input (add DC block for DC short antenna)
JP1	Jumper for selecting storage capacitor C6, C7, or C8
P1	Connector for add-on boards Connector on board: Sullins – P/N: SBH11-PBPC-D05-ST-BK Mating connector: Sullins – P/N: SFH11-PBPC-D05-ST-BK
R11, R12	Resistors for adjusting V_{OUT}, selectable using S1
R13, R14	Resistors for setting V_{OUT} default value
R15	LED bias resistor
R16	Resistor for pulling D_{SET} high using V_{OUT}, selectable using S2
R19	Resistor for limiting current to low impedance batteries
S1	Switch for selecting output voltage (described in detail below)
S2	Switch for D_{SET} selection (described in detail below)
S3	Switch for selecting V_{OUT} load (described in detail below)

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DETAILED COMPONENT DESCRIPTIONS AND OPERATING INSTRUCTIONS

Selecting Storage Capacitor

JP1 is used to select the storage capacitor used in the system. C6 is a 1000uF electrolytic capacitor. C7 is left unpopulated, but is a universal footprint so that a user can add a different capacitor to the system. C8 is a 50mF super capacitor with low ESR.

Selecting/Setting Output Voltage

S1 is used to select between three output voltage options for V_{OUT}. Selecting DEFAULT sets V_{OUT} to 3.3V. Selecting 4.1V or 4.2V changes V_{OUT} to the labeled voltage. The DEFAULT setting can also be adjusted to any voltage between 2.0V and 5.5V simply by changing the resistors R13 and R14. Refer to the P2110CSR datasheet for information about adjusting V_{OUT}. Note: Modifying R13 or R14 will also change the set point voltage of S1.

Selecting DSET

S2 is used to select how D_{SET} and D_{OUT} function on the board. Selecting OFF will allow the P2110CSR to operate normally. If it is desired to monitor D_{OUT}, selecting V_{OUT} will tie D_{SET} to V_{OUT} through a resistor, R16. In this mode, when V_{OUT} is on, D_{SET} will be pulled high and D_{OUT} can be used to measure RSSI or to retrieve data from the RF field. Selecting D_{SET} EXT will allow D_{SET} to be controlled externally using the DSET EXT test point.

LED, Prototyping, and Measuring Current

S3 is used to control flow of current from VOUT. Selecting LED will tie V_{OUT} to the on-board LED, D3, to be a visual indicator that the system working. Selecting VCC will tie V_{OUT} to the prototype area and output switch. NOTE: V_{OUT} is routed to the header P1 in parallel with S3, so V_{OUT} is present on the header pins regardless of S3 position. If using the P1 header, S3 should be in the MEAS position, as the other positions could use more power, resulting in longer charging periods on the storage cap.

Selecting MEAS allows for current to be measure by connected a current probe between test points V_{OUT} and LED or V_{OUT} and VCC. Current should be measured using an oscilloscope, as the time period V_{OUT} is on is generally too short to be seen on a multi-meter.

Output Switch and Batteries

With S3 in the VCC position, the output switch is activated. The output switch includes C9, Q5, Q6, R17 and R18, and is necessary when using the P2110CSR to charge a battery. The switch limits the current draw on the battery from the P2110CSR to 10-20nA. This ensures the P2110CSR does not discharge the battery during periods of non-harvesting.

BT1 is a connection point used for charging a high impedance battery (cell resistance >25 ohms) such as thin-film batteries from Infinite Power Solutions or Cymbet. The cell impedance of these types of batteries will limit the current drawn from the P2110CSR.

BT2 is a connection point used for charging a low impedance battery such as Li-ion or Alkaline rechargeable. Resistor R19 is in series with this connection to limit current flow between the output switch and the battery.

Schematic: