



ispPAC-POWR607 Evaluation Board

User's Guide

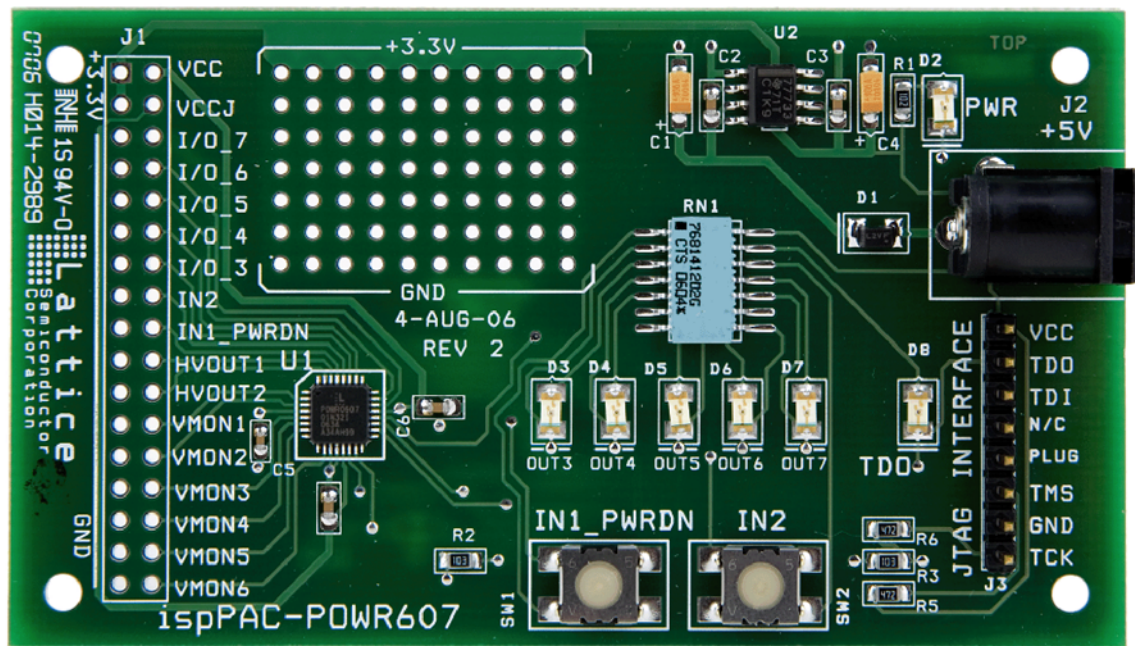
Introduction

Lattice Semiconductor's Power Manager II ispPAC®-POWR607 device simplifies power supply design by integrating the analog and digital functions of power supply management (sequencing, monitoring, reset generation into a single device). This device provides designers with a rich set of features: precision comparators with a built-in voltage reference, MOSFET drivers and a programmable logic device (PLD) for sequencing and supervisory logic functions or reset control. Configuration for all subsystems in the ispPAC-POWR607 device is stored in non-volatile E²CMOS® memory. Programming is performed via the industry-standard JTAG IEEE 1149.1 interface.

PAC-POWR607-EV Evaluation Board

The PAC-POWR607-EV evaluation board (Figure 1) allows the designer to quickly configure and evaluate the ispPAC-POWR607 device on a fully assembled printed-circuit board. The board supports a 32-pin QFN package, pads for user I/O, a JTAG programming cable connector, LEDs and switches. JTAG programming signals can be generated by using an ispDOWNLOAD® programming cable connected between the evaluation board and a PC's parallel (printer) port. Both analog and digital features of the ispPACPOWR607device can be easily configured using PAC-Designer® software.

Figure 1. PAC-POWR607-EV Evaluation Board



Programming Interface

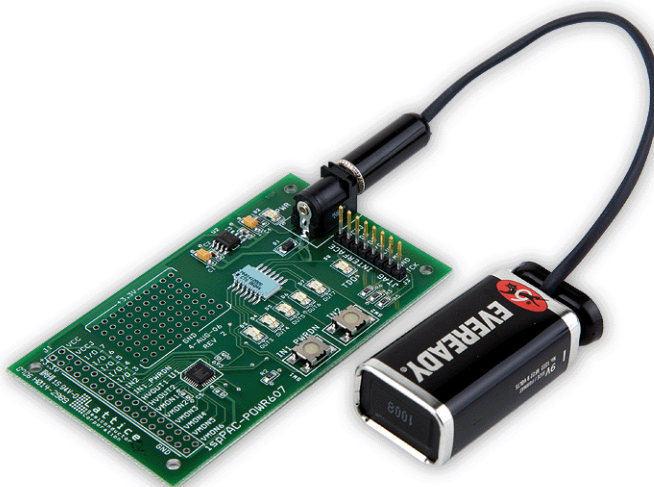
Lattice Semiconductor's ispDOWNLOAD cable can be used to program the ispPAC-POWR607 device on the evaluation board. This cable plugs into a PC-compatible's parallel port connector, and includes active buffer circuitry inside its DB-25 connector housing. The other end of the ispDOWNLOAD cable terminates in an 8-pin 0.100" pitch header connector, which plugs directly into a mating connector, (J3) provided on the PAC-POWR607-EV evaluation board.

Important Note: The board must be un-powered when connecting, disconnecting, or reconnecting the ispDOWNLOAD Cable. Always connect the ispDOWNLOAD Cable's GND pin (black wire), before connecting any other JTAG pins. Failure to follow these procedures can in result in damage to the ispPAC-POWR607 device and render the board inoperable.

Power Supply Considerations

The ispPAC-POWR607 device operates with analog and digital core power supplies of 3.3V. To simplify evaluation work, the evaluation board was designed to operate from a single 4.5V to 9V power supply, which may be brought in through a standard 5mm power plug (J2 - center tip positive). The evaluation board provides a linear regulator to provide the appropriate operating voltages for the ispPACPOWR607 device, as well as reverse polarity protection. The kit comes with a battery and cable that plugs into the connector at J2 and provides power with a 9V battery, see Figure 2. If it is desired to test the current in the power down mode of the ispPAC-POWR607, the link between pins 3 and 4 of J1 should be cut (please refer to Appendix A). Otherwise, approximately 2mA will be drawn when the device is in power down mode.

Figure 2. 9V Battery Power Interface



Input/Output Connections

Connectors are provided for key functions and test points on this evaluation board, as shown in Figure 1. The JTAG programming cable is connected to a header (J3) in the lower right corner of the board.

Access to the ispPAC-POWR607 device's I/O pins is available along the left edge of the assembly, where a 2x17 block of pads (J1) supports the attachment of test probes or a ribbon-cable connector. In addition, there is an array of 70 proto-type holes for interfacing.

Two momentary switches, S1 and S2, are provided on the evaluation board. They are connected to IN1_PWRDN and IN2 respectively. Several LEDs are also provided on the evaluation board to indicate proper function and as aids to debugging. LED D2 indicates that the on-board 3.3V supply is powered up. LED D3 is connected to the ispPACPOWR607 device's TDO line, and will briefly flash when downloading, indicating that download data has made it to the device. Five LEDs are also provided on digital outputs OUT3 through OUT7 so that a user may easily view the progress of Sequence, Monitor, Reset programs run on the evaluation board.

Demo Sequence and Reprogramming

This evaluation board is shipped from the factory pre-programmed with the "ispPAC_POWR607_LED_Blinker.PAC" sequence from PAC-Designer's library. The IN1_PWRDN button must be depressed in order to bring the ispPAC-POWR607 device out of its power down mode. The programmed sequence will cause the LEDs to flash for about six seconds, and then the device will revert to the power down mode.

In order to reprogram the ispPAC-POWR607, it must be brought out of power down mode. Thus, the IN1_PWRDN button must be depressed immediately before beginning a download to the device from PAC-Designer or ispVM.

Bill of Materials for the ispPAC-POWR607 Evaluation Board

Qty.	Ref Des	Description	Dig-Key # or Equivalent
2	C1, C4	10µF 10V Tant. SMD capacitor	478-1751-1-ND
5	C2, C3,C5,C6,C8	0.1µF SMD0603 ceramic capacitor	PCC1762CT-ND
1	D1	Diode Schottky 20V 1A SOD123FI	MBR120VLSFT10SCT-ND
1	R1	1k resistor SMD 0805	311-1.0KACT-ND
1	D2	GREEN LED SMD 1206	160-1404-1-ND
6	D3, 4, 5, 6, 7, 8	RED LED SMD 1206	160-1405-1-ND
1	J2	2.5mm power connector	CP-102B-ND
1	RN1	Res Net 2k 14-pin SOIC	768-141-R2K-ND
2	R2, R3	10k resistor SMD 0805	311-10KACT-ND
2	R5, R6	4.7k resistor SMD 0805	311-4.7KACT-ND
1	J3	Header 36 pos .100 vert Gold Break into 8-pin used for JTAG	WM6736-ND
2	SW1, SW2	Momentary push-button switches	P10885SCT-ND
1	U1	ispPAC-POWR607	Lattice Semiconductor
1	U2	IC 3.3V LDO REG SOIC	296-2787-5-ND
1	N/A	PCB 2" by 3.5"	ispPAC-POWR607 Rev-2

Ordering Information

- Part Number: PAC-POWR607-EV

References

- ispPAC-POWR607 Data Sheet

Technical Support Assistance

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Revision History

Date	Version	Change Summary
May 2007	01.0	Initial release.

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The following figures comprise the schematics for the ispPAC-POWR607 evaluation board. Figure 3 shows the device schematic and JTAG interface, while Figure 4 shows the on-board power-supply circuitry and the LED display.

VCC is jumpered to 3.3V at pins 1 and 2 of J1 on the backside of the board. To measure the device power down current, cut the jumper trace on the backside of the board and connect an ammeter between pins 1 and 2. In addition, cut the jumper on the backside between pins 3 and 4 of J1 to disconnect VCCD. Replace with jumper blocks for normal operation.

J1

3.3V VCC VCCD VCCJ

ispPAC-POWR0607

VCC VCCD VCCJ VMON1 VMON2 VMON3 VMON4 VMON5 VMON6 IN1 IN2 TDI TDO TMS TCK

Header 17X2

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34

J3

VCC R5 4.7k TDI TMS TCK R6 4.7k

JTAG Interface

1 2 3 4 5 6 7 8

ispPAC-POWR0607

IN1_PWRDN IN2 TDI TDO TMS TCK

IN1 OUT1 IN2 OUT2 IN3 OUT3 IN4 OUT4 IN5 OUT5 IN6 OUT6 IN7 OUT7

27 26 25 24 23 22 21 20

30 31

HVOUT1 HVOUT2

VCC VCCD VCCJ C5 100n C6 100n C8 100n

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File ispPAC-POWR0607

Size A

Document Number ispPAC-POWR0607 Evaluation Board

Rev 3

Date: 1 of 3

The schematic diagram illustrates the power supply and LED control circuitry for the ispPAC-POWR0607 Evaluation Board. It is divided into two main sections: the Regulator and the LEDs.

Regulator Section:

- Input:** A 3.3V PWR JACK (J2) provides the input voltage.
- Diode:** A Schottky diode (D1, MBR130p) is connected in series with the input.
- TPS7733 Regulator:** The U2 component is configured as a voltage regulator. Its input (IN) is connected to the output of D1. The output (OUT) is connected to the PWR pin of the LED array.
- Resistors:** A 1kΩ resistor (R1) is connected between the input and the regulator's input. A 10kΩ resistor (R2) is connected between the output and the INT_PWRDN pin.
- Capacitors:** Several capacitors are used for decoupling: C1 (10μF, 10V), C2 (100nF), C3 (100nF), C4 (10μF, 10V), and C5 (100nF).

LEDs Section:

- LED Array:** A 2k x 13 array of LEDs is connected to the PWR pin of the regulator.
- Control Pins:** The array has control pins labeled IN, OUT3, OUT4, OUT5, OUT6, OUT7, and TDO. These are connected to the output of the regulator.
- Diodes:** Seven LEDs (D9-D14) are connected to the control pins. D9-D11 are labeled (RED) and D12-D14 are labeled (RED).
- Resistors:** 10kΩ resistors (R2, R3) are connected to the INT_PWRDN and IN2 pins, respectively.
- Switches:** Two switches (SW3, SW4) are connected to the IN2 and INT_PWRDN pins, respectively.

The diagram also includes a title block with the following information:

Title		Power Supply and LEDs	
Size	A	Document Number	ispPAC-POWR0607 Evaluation Board
Rev	3	Sheet	3 of 3