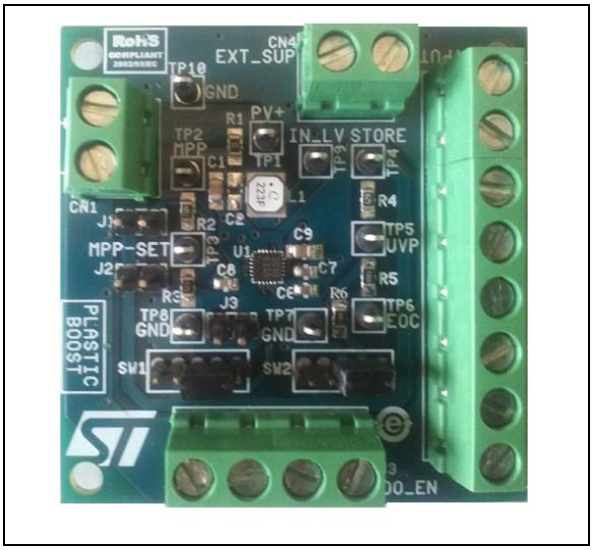
STEVAL-ISV019V1

Evaluation board for SPV1050 ULP energy harvester and battery charger – boost configuration

Data brief



Features

- First startup at Vin = 450 mV
- Input voltage working range: 180 mV ≤ Vin ≤ V_{EOC}
- End of charge battery voltage: V_{EOC} = 4.25 V
- Battery undervoltage protection: V_{UVP} = 3.7 V

Applications

- Charge any battery chemistry, including lithium based, NiMH, solid state thin film and supercapacitor.
- WSN, HVAC, building and home automation, industrial control, access control, smart lighting, asset and livestock positioning and tracking, surveillance.
- Body area network, sportswear, fitness.

Description

The STEVAL-ISV019V1 is an evaluation board based on the ultralow power energy harvester and battery charger SPV1050. For any detail related to the SPV1050 features and performances please refer to the preliminary datasheet.

The evaluation board implements the boost configuration of the DC-DC converter and has the purpose of enhancing the SPV1050 based applications development by testing the silicon performance thanks to many jumpers and test points, and by helping to find out the best system configuration to make the SPV1050 working at the most of efficiency.

The STEVAL-ISV019V1 is optimized to:

Harvest energy from PV panels supplying 1 V ≤ V_{MP} ≤ 2.5 V and 200 µA ≤ I_{MP} ≤ 10 mA.

Charge a battery with 3.7 V undervoltage protection threshold (V_{UVP}) and 4.2 V end of charge voltage threshold (V_{EOC}).

Nevertheless, few easy changes on the application components (input and output resistor partitioning, C_{IN} capacitor) allow to use a different PV panel and source (like TEG), and battery by setting the V_{MPP_SET}, the V_{UVP} and the V_{EOC} thresholds according to the new source and load.

1 Schematic and bill of material

The schematic, bill of material and gerber files can be downloaded from the web link: http://ims.st.com/referencedesign/photovoltaic.php.

Figure 1. Schematic

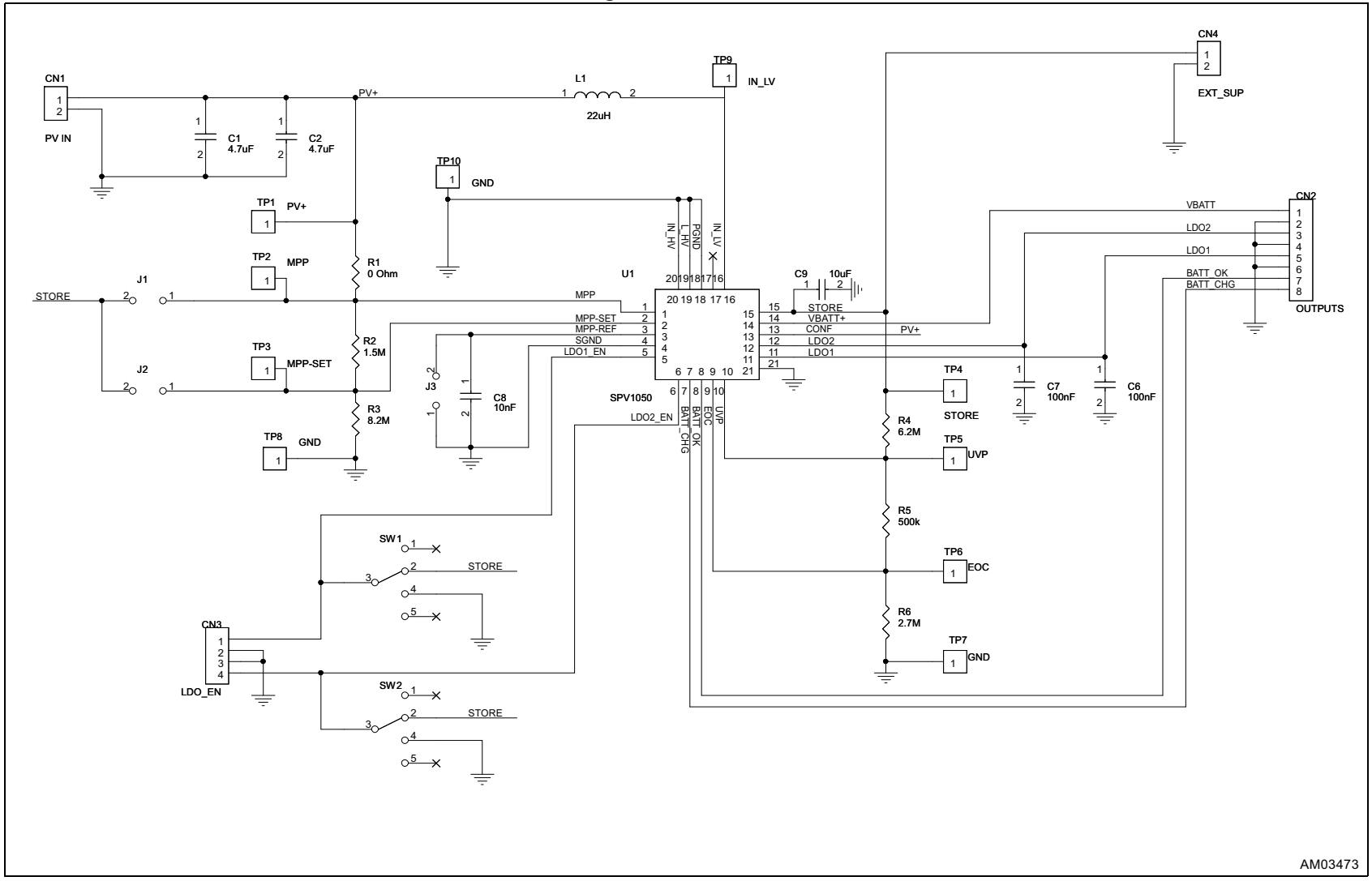


Table 1. Bill of material

Sect.	Item	Quan-tity	Reference	Part / value	Tolerance %	Voltage current	Watt	Technol. info.	Package	Manufacturer	Manufacturer code	More information
DC-DC input section	1	1	PV panel							ST		
	2	1	U1	SPV1050					VFQFPN 3 x 3 x 1 20L (code A0BR)	ST	SPV1050	Plastic socket
												Input connector for PV panel or TEG
	3	1	CN1	2-ways screw connector						TE Connectivity	282834-2	Input capacitance
	3	1	C1	4.7 µF	15%	16 V			0805	Murata	GCM21BR71C475KA73L	Input capacitance
	4	0	C2 (DNM)	4.7 µF	15%	16 V			0805	Murata	GCM21BR71C475KA73L	Jumper closed = MPPT disabled
	4	3	J1, J2, J3	jumper				Pitch 100 mils	TH			Jumper open = MPPT enabled
	7	1	R1	0 Ω	1%				0805	VISHAY	CRCW08052M70FKEA	Resistor partitioning for MPP track/setting
	8	1	R2	1.5 MΩ	1%				0805	VISHAY	CRCW08051M50FKEA	
	9	1	R3	8.2 MΩ	1%				0805	YAGEO	232273468205	
	10	1	L1	22 µH	20%					Coilcraft	LPS4018-223ML_	DC-DC inductor
	11	1	C8	10 nF	15%	16 V		X7R	0603	Murata	GRM188R71C103KA01D	Voltage sampling time constant capacitance

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Sect.	Item	Quan-tity	Reference	Part / value	Tolerance %	Voltage current	Watt	Technol. info.	Package	Manufacturer	Manufacturer code	More information
Battery section	12	1	CN4	2-way screw connector						TE Connectivity	282834-2	Connector for external supply of pin STORE
	13	1	C9	10 µF	15%	10 V			0805	Murata	GRM21BR71A106KE51L	
	14	1	R4	6.2 MΩ	5%				0805	RS	RS-0805-6m2-5%-0.125W	Resistor partitioning for UVP, EOC, protection setting
	15	1	R5	499 kΩ	1%				0805	VISHAY	CRCW0805499KFKEA	
	16	3	R6	2.7 MΩ	1%				0805	VISHAY	CRCW08052M70FKEA	
	19	1	CN2	8-way screw connector						TE Connectivity	282836-8	Connector for battery and battery status signals
LDOs section	20	2	C6, C7	100 nF	10%			X7R	0603	KEMET	C0603C104K4RAC	Tank capacitor for LDOs
	22	2	SW1, SW2	5-pin male Stripline				Pitch 2.54 mm	TH			Close 2 - 3: LDO disabled Close 1 - 2: LDO enabled Floating: external control trough CN3
	24	1	CN3	4-way screw connector						TE Connectivity	282836-4	Connector for LDOs load connection

Table 1. Bill of material

Sect.	Item	Quan-tity	Reference	Part / value	Tolerance %	Voltage current	Watt	Technol. info.	Package	Manufacturer	Manufacturer code	More information
List of test points												
	25	1	TP1					True hole				PV+ pin sensing and soldering
	26	1	TP2					True hole				MPP pin sensing and soldering
	27	1	TP3					True hole				MPP-SET pin sensing and soldering
	28	1	TP4					True hole				STORE pin sensing and soldering
	29	1	TP5					True hole				ULP pin sensing and soldering
	30	1	TP6					True hole				EOC pin sensing and soldering
	31	1	TP7					True hole				GND pin sensing and soldering
	32	1	TP8					True hole				GND pin sensing and soldering
	33	1	TP9					True hole				IN_LV pin sense (for probe scope)
	34	1	TP10					True hole				GND pin sensing (for probe scope)

2 Layout

Figure 2 to *Figure 4* show the component placement and the layout (top and bottom views) of the STEVAL-ISV019V1.

Figure 2. Layout - silkscreen view

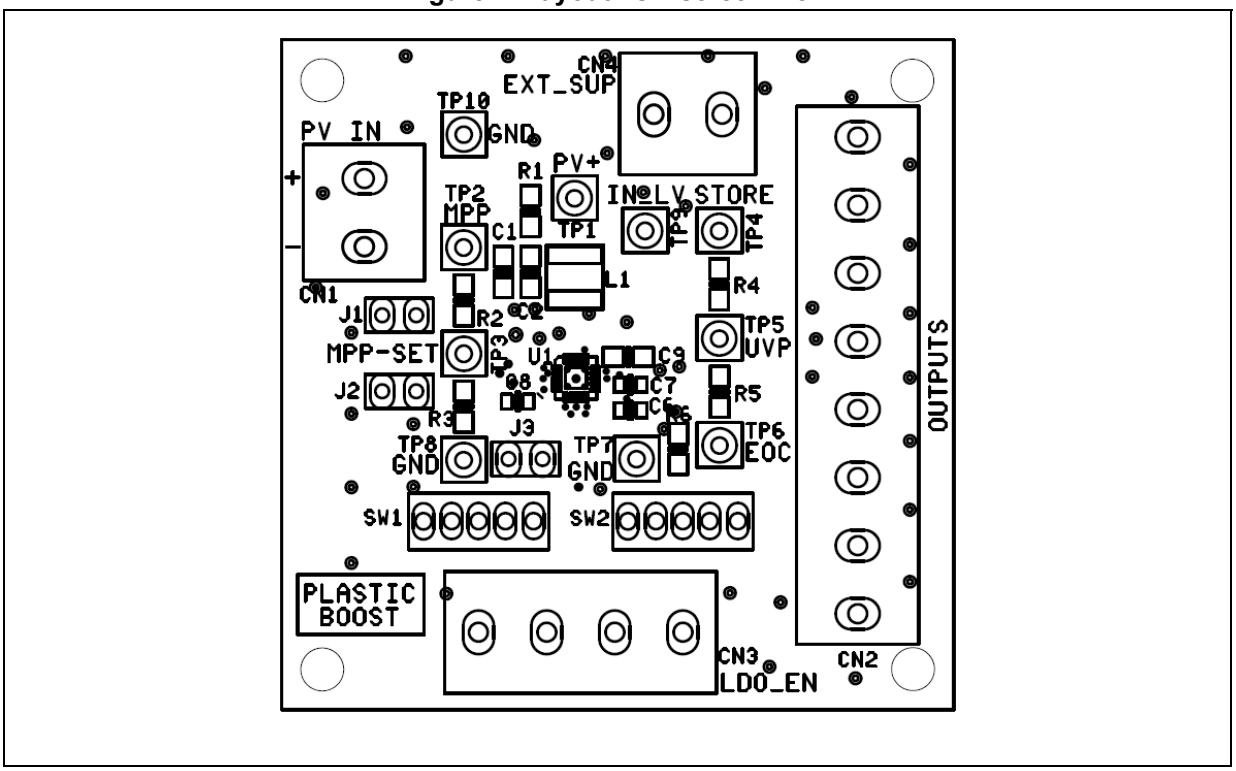


Figure 3. Layout - top view

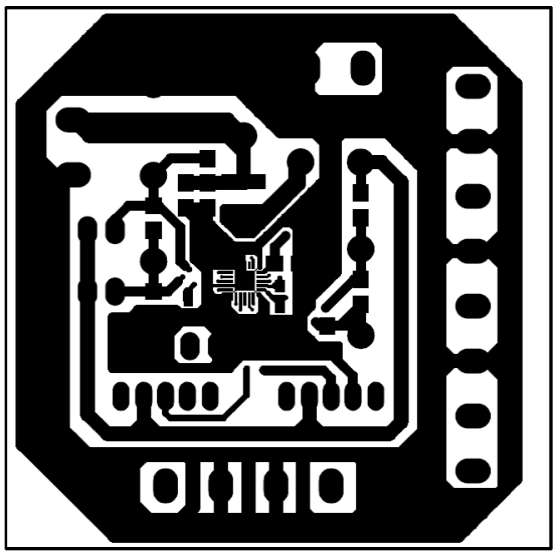
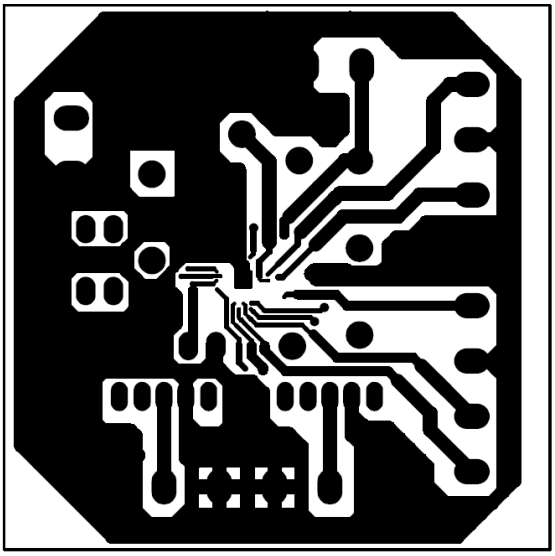


Figure 4. Layout - bottom view



3 Revision history

Table 2. Document revision history

Date	Revision	Changes
27-Nov-2013	1	Initial release.

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