

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

Data brief



Description

The STEVAL-ISV020V1 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 buck-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 device working at the most of efficiency.

The STEVAL-ISV020V1 board is optimized to:

Harvest energy from PV panels supplying $4\text{ V} \leq V_{MP} \leq 8\text{ V}$ and $100\text{ }\mu\text{A} \leq I_{MP} \leq 1\text{ mA}$.

Charge a battery with the 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 source and load.

Features

- First startup at $V_{in} = 2.5\text{ V}$
- Input voltage working range: $180\text{ mV} \leq V_{in} \leq 8\text{ V}$
- End of charge battery voltage: $V_{EOC} = 4.25\text{ V}$
- Battery undervoltage protection: $V_{UVP} = 3.7\text{ V}$

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.

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>.



Table 1. Bill of material

Sect.	Item	Quantity	Reference	Part / value	Tolerance %	Voltage current	Watt	Technol. info.	Package	Manufacturer	Manufacturer code	More information
DC-DC input section	1	1	PV panel									
	2	1	U1	SPV1050					VFQFPN 3 x 3 x 1 20L (code A0BR)	ST	SPV1050	Plastic socket
	3	1	CN1	2-way screw connector						TE Connectivity	282834-2	Input connector for PV panel or TEG
	4	1	C1	4.7 μ F	15%	25 V			0805	Murata	GCM21BR71C 475KA73L	Input capacitance
	5	0	C2 (DNM)	4.7 μ F	15%	25 V			0805	Murata	GCM21BR71C 475KA73L	Input capacitance
	5	3	J1, J2, J3	Jumper				Pitch 100 mils	TH			Jumper open = MPPT enabled Jumper closed = MPPT disabled
	8	1	R1	10 M Ω	1%				0805	YAGEO	RC0805FR- 0710ML	Resistor partitioning for MPP track/setting
	9	1	R2	1 M Ω	1%				0805	TE Connectivity	CRG0805F1M0	
	10	1	R3	5.6 M Ω	1%				0805	VISHAY	CRCW08055M 60FKEA	
	11	1	L1	22 μ H	20%					Coilcraft	LPS4018- 223ML_	DC-DC inductor
	12	1	C8	10 nF	15%	16 V		X7R	0603	Murata	GRM188R71C1 03KA01D	Voltage sampling time constant capacitance

Table 1. Bill of material (continued)

Sect.	Item	Quantity	Reference	Part / value	Tolerance %	Voltage current	Watt	Technol. info.	Package	Manufacturer	Manufacturer code	More information
Battery section	13	1	CN4	2-way screw connector						TE Connectivity	282834-2	Connector for external supply of pin STORE
	14	1	C9	10 μ F	15%	10 V			0805	Murata	GRM21BR71A106KE51L	
	15	1	R4	6.2 M Ω	5%				0805	RS	RS-0805-6m2-5%-0.125W	Resistor Partitioning for UVP, EOC, protection setting
	16	1	R5	499 k Ω	1%				0805	VISHAY	CRCW0805499KFKEA	
	17	3	R6	2.7 M Ω	1%				0805	VISHAY	CRCW08052M70FKEA	
	20	1	CN2	8-way screw connector							TE Connectivity	282836-8
LDOs section	21	2	C6, C7	100 nF	10%			X7R	0603	KEMET	C0603C104K4RAC	Tank capacitor for LDOs
	23	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 through CN3
	25	1	CN3	4-way screw connector						TE Connectivity	282836-4	Connector for LDOs load connection



Table 1. Bill of material (continued)

Sect.	Item	Quantity	Reference	Part / value	Tolerance %	Voltage current	Watt	Technol. info.	Package	Manufacturer	Manufacturer code	More information
List of test points	26	1	TP1					True hole				PV+ pin sensing and soldering
	27	1	TP2					True hole				MPP pin sensing and soldering
	28	1	TP3					True hole				MPP-SET pin sensing and soldering
	29	1	TP4					True hole				STORE pin sensing and soldering
	30	1	TP5					True hole				ULP pin sensing and soldering
	31	1	TP6					True hole				EOC pin sensing and soldering
	32	1	TP7					True hole				GND pin sensing and soldering
	33	1	TP8					True hole				GND pin sensing and soldering
	34	1	TP9					True hole				IN_LV pin sense (for probe scope)
	35	1	TP10					True hole				GND pin sensing (for probe scope)
	36	1	TP11					True hole				L_HV pin sensing (for probe scope)

2 Layout

Figure 2 to Figure 4 show the components placement and the layout (top and bottom views) of the STEVAL-ISV020V1.

Figure 2. Layout - silkscreen view

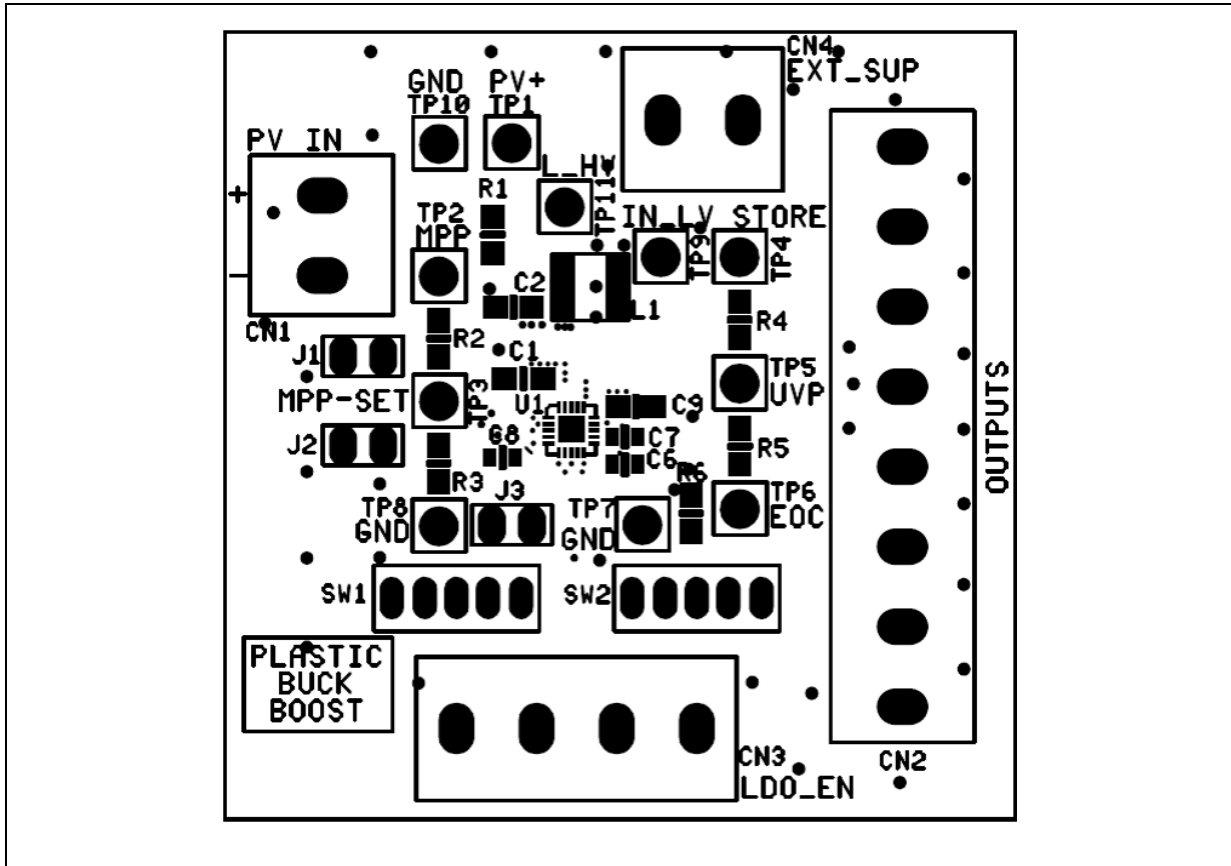


Figure 3. Layout - top view

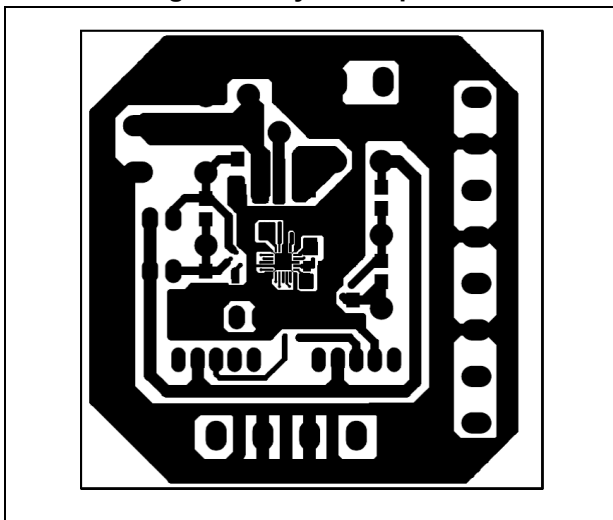
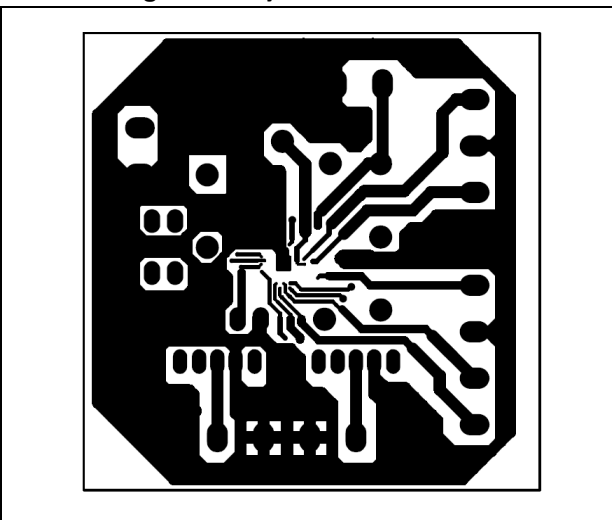


Figure 4. Layout - bottom view



3 Revision history

Table 2. Document revision history

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

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