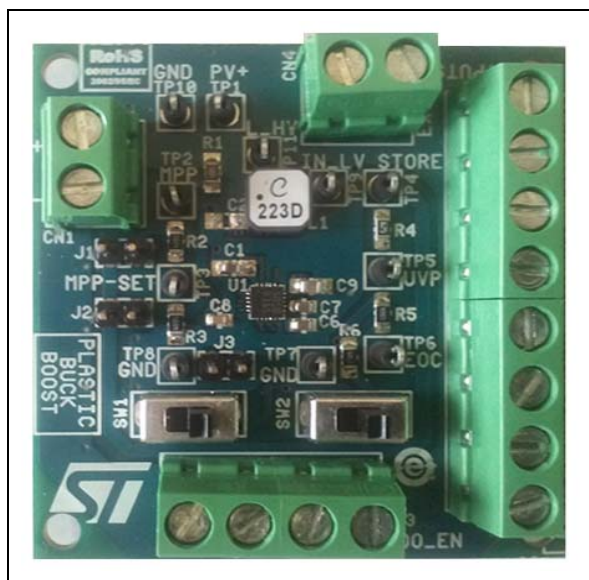


Evaluation board for SPV1050 ULP energy harvester and battery charger – buck-boost configuration

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 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 $2.6\text{ V} \leq V_{MP} \leq 9\text{ V}$ and $10\text{ }\mu\text{A} \leq I_{MP} \leq 20\text{ mA}$.

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.

More in detail, operating ranges can be extended as follows: V_{MP} from 150 mV up to 18 V, I_{MP} up to 100 mA, V_{UVP} down to 2.2 V and V_{EOC} up to 5.3 V.

Features

- First startup at $V_{in} = 2.6\text{ V}$
- Input voltage working range: $150\text{ mV} \leq V_{in} \leq 18\text{ V}$
- 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 Design resources tab of the STEVAL-ISV020V1 product folder on www.st.com.

Table 1. Bill of material

Sect.	Item	Quantity	Reference	Part / value	Tolerance %	Voltage current	Watt	Technol. info.	Package	Manufacturer	Man
DC-DC input section	1	1	U1	SPV1050					VFQFPN 3 x 3 x 1 20L (code A0BR)	ST	S
	2	1	CN1	2-way screw connector						TE Connectivity	2
	3	1	C1	4.7 μ F	15%	25 V			0805	Murata	GCM 47
	4	0	C2 (DNM)	4.7 μ F	15%	25 V			0805	Murata	GCM 47
	5	3	J1, J2, J3	Jumper				Pitch 2.54 mm	TH		
	8	1	R1	10 M Ω	1%				0805	YAGEO	RC 0
	9	1	R2	1 M Ω	1%				0805	TE Connectivity	CRG
	10	1	R3	5.6 M Ω	1%				0805	VISHAY	CRG 6
	11	1	L1	22 μ H	20%					Coilcraft	LF 2
	12	1	C8	10 nF	15%	16 V		X7R	0603	Murata	GRM 03



Table 1. Bill of material (continued)

Sect.	Item	Quantity	Reference	Part / value	Tolerance %	Voltage current	Watt	Technol. info.	Package	Manufacturer	Man
Battery section	13	1	CN4	2-way screw connector						TE Connectivity	28
	14	1	C9	47 μ F	20%	10 V			0805	TDK	C2076
	15	1	R4	6.2 M Ω	5%				0805	RS	RS-05%
	16	1	R5	499 k Ω	1%				0805	VISHAY	CRC
	17	1	R6	2.7 M Ω	1%				0805	VISHAY	CRC7
	18	1	CN2	8-way screw connector						TE Connectivity	28
LDOs section	19	2	C6, C7	100 nF	10%			X7R	0603	KEMET	C06
	21	2	SW1, SW2	5-pin male Stripline				Pitch 2.54 mm	TH		
	23	1	CN3	4-way screw connector						TE Connectivity	28

Table 1. Bill of material (continued)

Sect.	Item	Quantity	Reference	Part / value	Tolerance %	Voltage current	Watt	Technol. info.	Package	Manufacturer	Mar
List of test points	24	1	TP1					True hole			
	25	1	TP2					True hole			
	26	1	TP3					True hole			
	27	1	TP4					True hole			
	28	1	TP5					True hole			
	29	1	TP6					True hole			
	30	1	TP7					True hole			
	31	1	TP8					True hole			
	32	1	TP9					True hole			
	33	1	TP10					True hole			
	34	1	TP11					True hole			

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

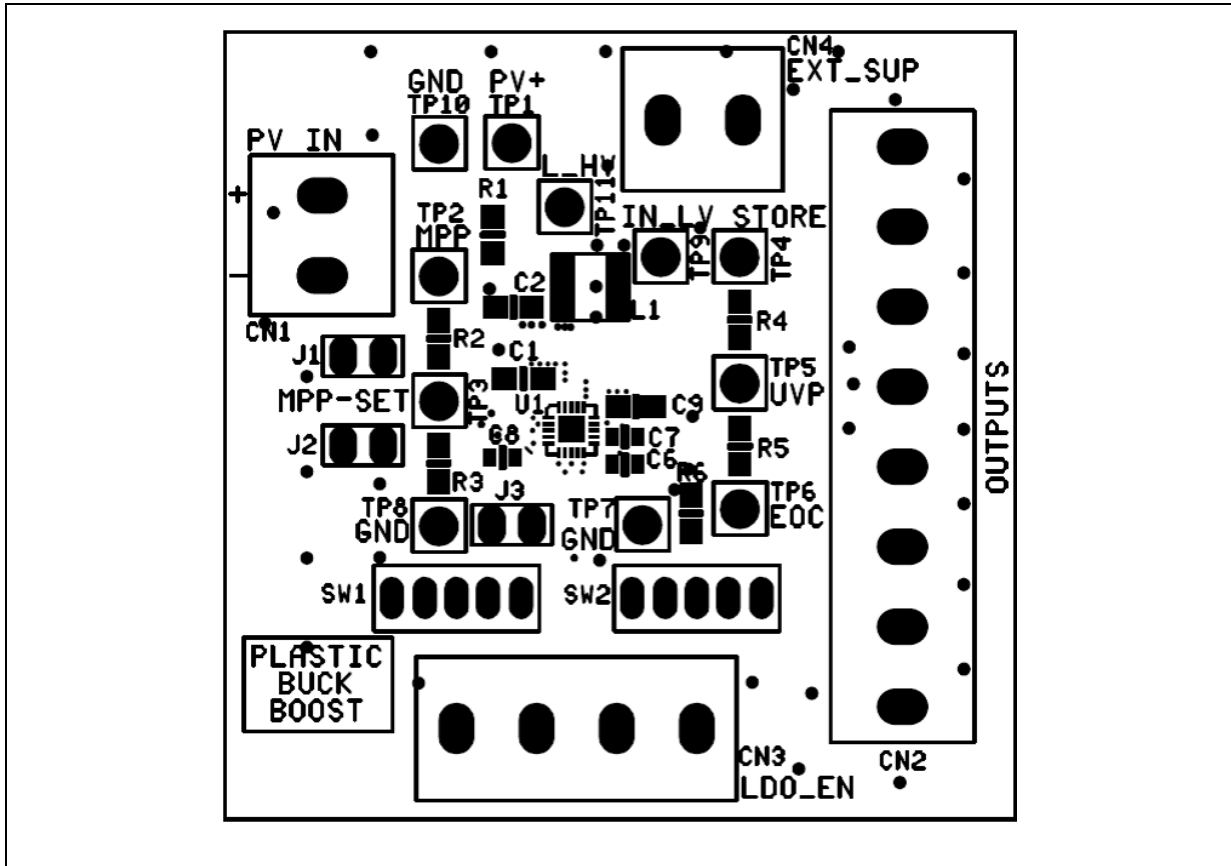


Figure 3. Layout - top view

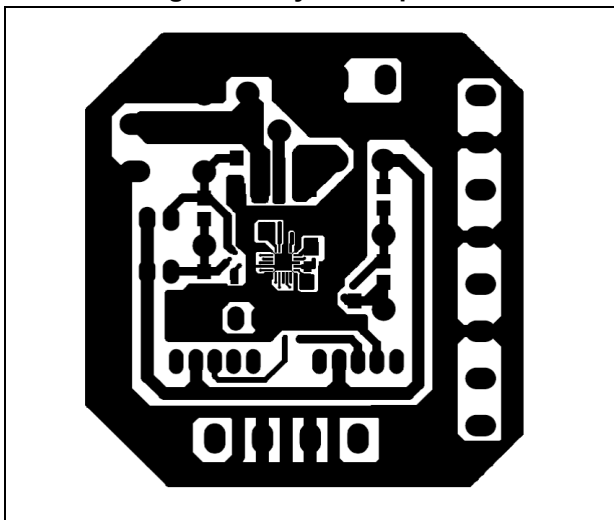
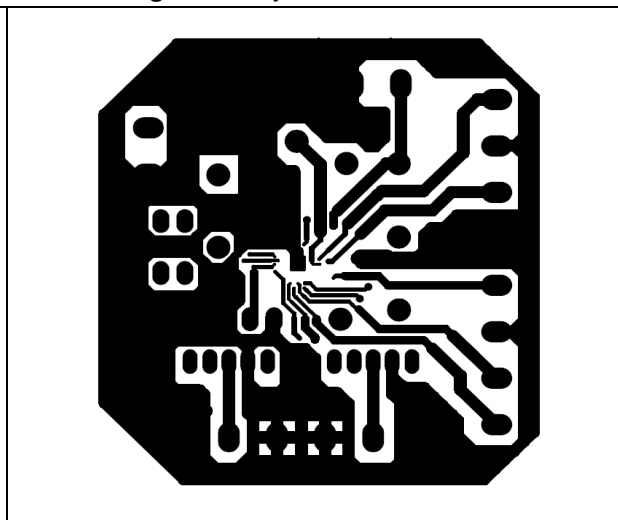


Figure 4. Layout - bottom view



3 Revision history

Table 2. Document revision history

Date	Revision	Changes
28-Nov-2013	1	Initial release.
05-May-2014	2	<p>Updated Section : Features on page 1 (updated values of “First startup at Vin” and “Input voltage working range”).</p> <p>Updated Section : Description on page 1 (updated values of “Harvest energy from PV panels supplying”, added extended operating ranges).</p> <p>Updated Section 1: Schematic and bill of material on page 2 (updated web link).</p> <p>Updated Figure 1: Schematic on page 3 (updated value of C9 capacitor, minor modifications).</p> <p>Updated Table 1: Bill of material on page 4 (removed “PV panel” item, updated numbering and quantity of several items, updated “Technol. info.” of J1, J2, J3 jumper, updated values and manufacturer information of C9 capacitor, updated “More information” for several items).</p> <p>Minor modifications throughout document.</p>

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