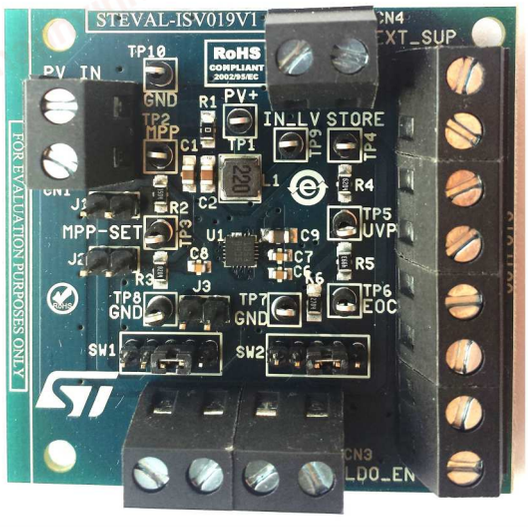
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# STEVAL-ISV019V1

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

**Data brief**




## Features

- First startup at Vin = 500 mV
- Input voltage working range: 150 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 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 device working at the most of efficiency.

The STEVAL-ISV019V1 is optimized to:

Harvest energy from PV panels supplying 0.5 V ≤ $V_{MP}$ ≤ 2.5 V and 30 µA ≤ $I_{MP}$ ≤ 20 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 a battery by setting the $V_{MPP_SET}$, the $V_{UVP}$ and the $V_{EOC}$ thresholds according to the new source and load. More in detail, operating ranges can be extended as follows: $V_{MP}$ from 150 mV up to 5 V, $I_{MP}$ up to 100 mA, $V_{UVP}$ down to 2.2 V and $V_{EOC}$ up to 5.3 V.



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# 1 Schematic and bill of material

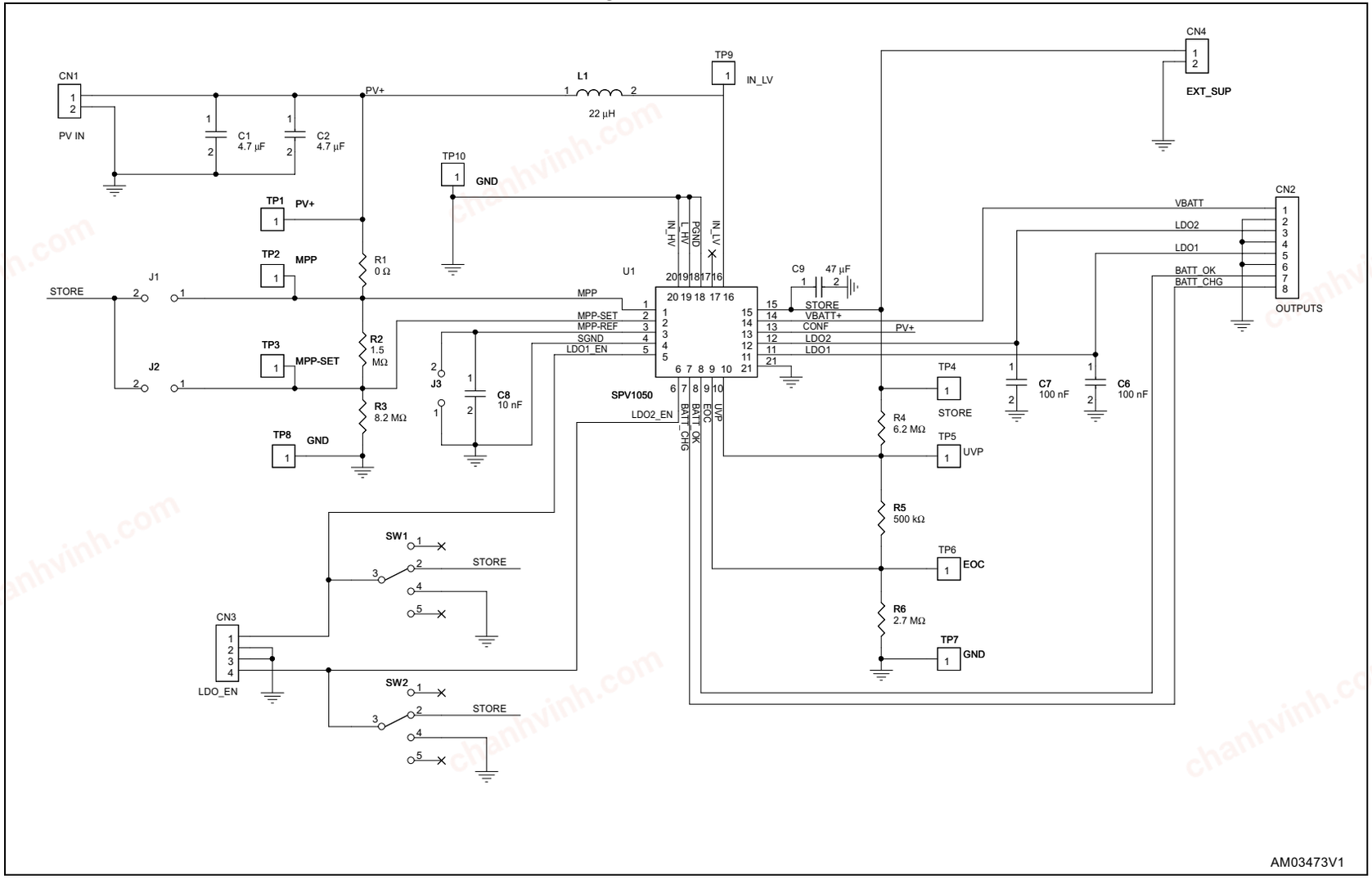
The schematic, bill of material and gerber files can be downloaded from the Design resources tab of the STEVAL-ISV019V1 product folder on *www.st.com*.

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## Figure 1. Schematic



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**Table 1. Bill of material**

| Sect. | Item | Q.ty | Reference | Part / value | Toler. % | Voltage current | Watt | Technol. info. | Package | Manufacturer | Manufacturer code | More information |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DC-DC input section | 1 | 1 | U1 | SPV1050 | | | | | VFQFPN 3 x 3 x 1 20L (code A0BR) | ST | SPV1050 | |
| | 2 | 1 | CN1 | 2-ways screw connector | | | | | | TE Connectivity | 282834-2 | Input connector for PV panel or TEG |
| | 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 | |
| | 5 | 3 | J1, J2, J3 | jumper | | | | Pitch 2.54 mm | TH | | | Enable/disable MPPT |
| | 8 | 1 | R1 | 0 Ω | 1% | | | | 0805 | VISHAY | CRCW08052M70FKEA | Resistor partitioning for MPP track/setting |
| | 9 | 1 | R2 | 1.5 MΩ | 1% | | | | 0805 | VISHAY | CRCW08051M50FKEA | |
| | 10 | 1 | R3 | 8.2 MΩ | 1% | | | | 0805 | YAGEO | 232273468205 | |
| | 11 | 1 | L1 | 22 µH | 20% | | | | | Coilcraft | LPS4018-223ML_ | DC-DC inductor |
| | 12 | 1 | C8 | 10 nF | 15% | 16 V | | X7R | 0603 | Murata | GRM188R71C103KA01D | Voltage sampling time constant capacitance |

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**Table 1. Bill of material (continued)**

| Sect. | Item | Q.ty | Reference | Part / value | Toler. % | 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 | 47 µF | 20% | 10 V | | | 0805 | TDK | C2012X5R1A476M125AC | |
| | 15 | 1 | R4 | 6.2 MΩ | 5% | | | | 0805 | RS | RS-0805-6m2-5%-0.125W | Resistor partitioning for UVP, EOC, protection setting |
| | 16 | 1 | R5 | 499 kΩ | 1% | | | | 0805 | VISHAY | CRCW0805499KFKEA | |
| | 17 | 1 | R6 | 2.7 MΩ | 1% | | | | 0805 | VISHAY | CRCW08052M70FKEA | |
| | 18 | 1 | CN2 | 8-way screw connector | | | | | | TE Connectivity | 282836-8 | Connector for battery and battery status signals |
| LDOs section | 19 | 2 | C6, C7 | 100 nF | 10% | | | X7R | 0603 | KEMET | C0603C104K4RAC | Tank capacitor for LDOs |
| | 21 | 2 | SW1, SW2 | 5-pin male Stripline | | | | Pitch 2.54 mm | TH | | | Close 2 - 3: LDO disabled<br>Close 1 - 2: LDO enabled<br>Floating: external control through CN3 |
| | 23 | 1 | CN3 | 4-way screw connector | | | | | | TE Connectivity | 282836-4 | Connector for LDOs enable connection |

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Table 1. Bill of material (continued)

| Sect. | Item | Q.ty | Reference | Part / value | Toler. % | 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) |

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# 2 Layout

From *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**

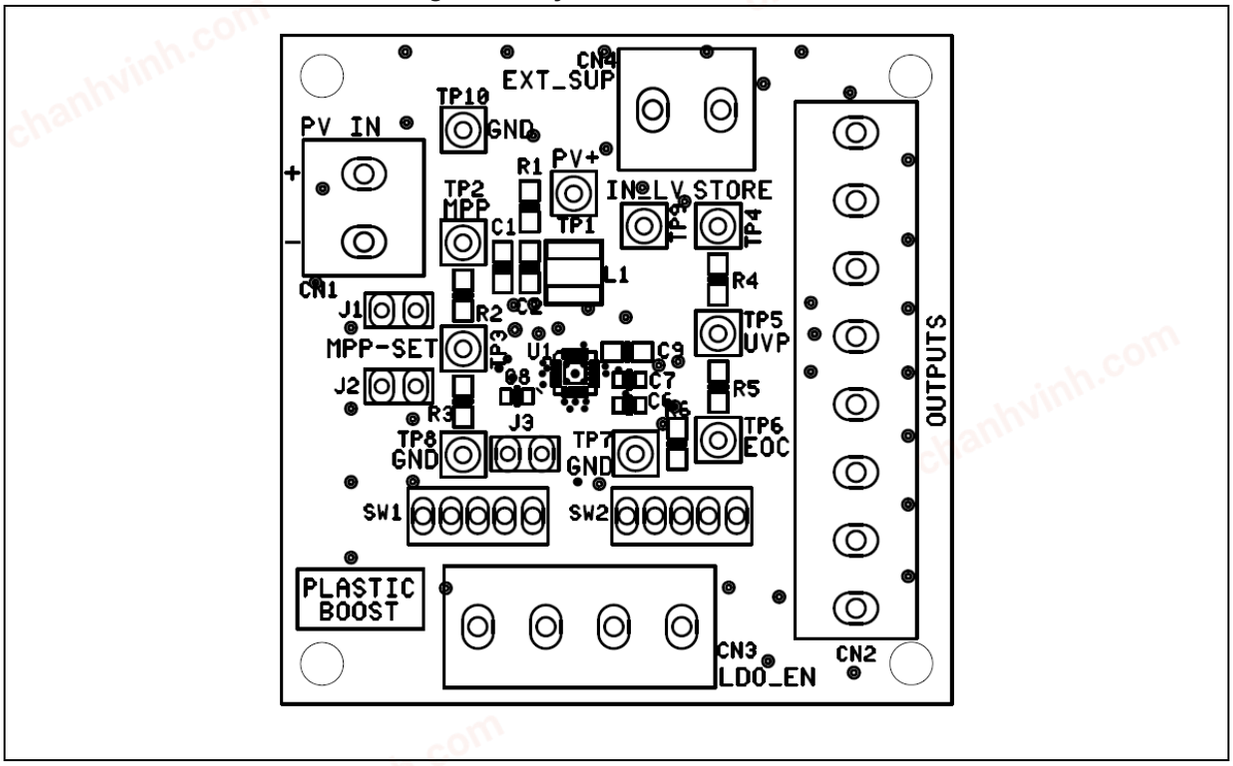



**Figure 3. Layout - top view**

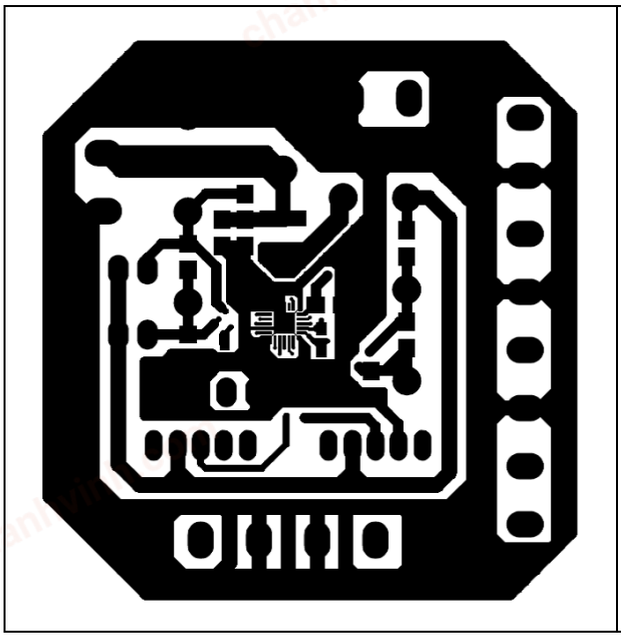
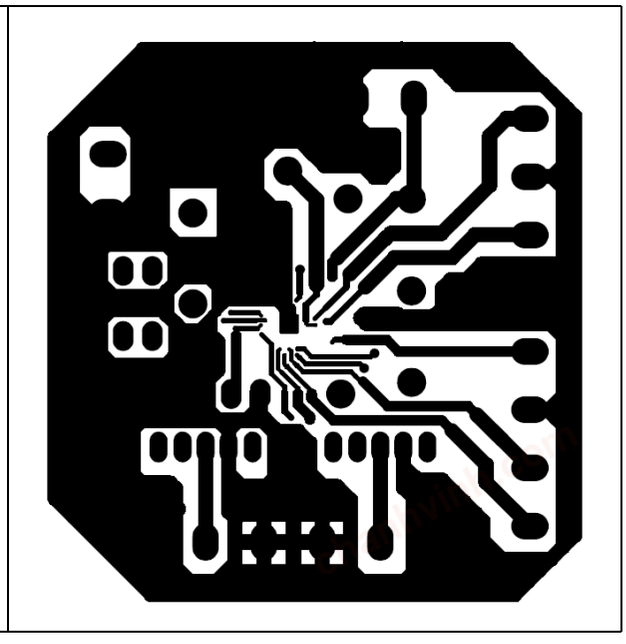


**Figure 4. Layout - bottom view**



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# 3 Revision history

**Table 2. Document revision history**

| Date | Revision | Changes |
|---|---|---|
| 27-Nov-2013 | 1 | Initial release. |
| 29-Apr-2014 | 2 | Updated *Section : Features on page 1* (updated values of “First startup at Vin” and “Input voltage working range”).<br>Updated *Section : Description on page 1* (updated values of “Harvest energy from PV panels supplying”, added extended operating ranges).<br>Updated *Section 1: Schematic and bill of material on page 2* (updated web link).<br>Updated *Figure 1: Schematic on page 3* (updated value of C9 capacitor, minor modifications).<br>Updated *Table 1: Bill of material on page 4* (removed “PV panel” item, updated values and manufacturer information of C9 capacitor, updated “Technol. info.” of J1, J2, J3 jumper, quantity of R6 item, item numbers and “More information” for several items).<br>Minor modifications throughout document. |
| 13-Nov-2014 | 3 | Updated figure in cover page. |

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