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# STEVAL-ISV012V1

## Up to 5 W solar battery charger for single-cell Li-ion and Li-Pol batteries based on the SPV1040 and L6924D

**Data brief**

## Features

- SPV1040: solar boost converter with embedded maximum power point tracking (MPPT)
  - Proprietary “perturb & observe” MPPT algorithm
  - Up to 95% efficiency
  - Very low input voltage (down to 0.3 V)
  - Input reverse polarity protection
  - Thermal shut-down
  - Overcurrent protection
  - Enable pin
- L6924D: Fully integrated linear charger solution with power MOSFET, reverse blocking diode and battery thermal control
  - 1% battery voltage regulation accuracy
  - Up to 1 A charge current with 7% accuracy
  - Closed loop thermal regulation protection for output current control
  - Low battery leakage current
  - Embedded quasi-pulse charging mode maximizes charge rate from solar panel
  - Selectable 4.1 V and 4.2 V output voltage
  - JEITA compliant with external circuit
  - Programmable charge, fast charge (up to 1 A), pre-charge, termination current, pre-charge mode voltage threshold, charge timer
  - Multifunction pin for flexible charge process termination
  - Status outputs to drive LEDs or host processor interface
  - Battery absence detection
  - NTC or PTC thermistor interface for battery temperature monitoring and protection
  - RoHS compliant



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# 1 Description

The STEVAL-ISV012V1 demonstration board is based on the SPV1040 solar voltage boost converter and the L6924D single cell Li-ion battery charger.

The SPV1040 device is a high efficiency, low power, low voltage, monolithic step-up converter with an input voltage range from 0.3 V to 5.5 V, and is capable of maximizing the energy generated by even a single solar cell (or fuel cell), where low input voltage handling capability is extremely important.

Thanks to the embedded MPPT algorithm, even under varying environmental conditions (such as irradiation, dirt, temperature) the SPV1040 offers maximum efficiency in terms of power harvested from the cells and transferred to the output.

The SPV1040 protects itself and other application devices by stopping the PWM switching if either the maximum current threshold (up to 2 A) is reached or the maximum temperature limit (up to 155 °C) is exceeded.

The L6924D device is a fully monolithic battery charger dedicated to single cell Lithium-ion/Lithium-ion polymer battery packs. It is the ideal solution for space-limited applications such as PDAs, handheld equipment, cellular phones, and digital cameras.

The L6924D normally works as a linear charger when powered from an external voltage regulated adapter. The device can also work in “quasi-pulse” charger mode when powered from a current limited adapter like that of a solar panel. To work in this condition, the charging current of the device should be set to a level higher than the solar panel maximum peak current.

Thanks to the L6924D’s very low minimum input voltage (down to 2.5 V), during the fast-charge phase the output voltage of the solar panel drops down to the battery voltage plus the voltage drop across the power MOSFET of the charger.

The main advantage of the quasi-pulse charging mode is that it shares the simplicity of the linear approach, where the power dissipated is dramatically reduced, thereby maximizing the charge rate from the solar panel.

The Li-ion battery solar charger with embedded (MPPT) and quasi-pulse charging mode is “best-in-class” in terms of system efficiency, allowing battery charging while maximizing available solar panel power.

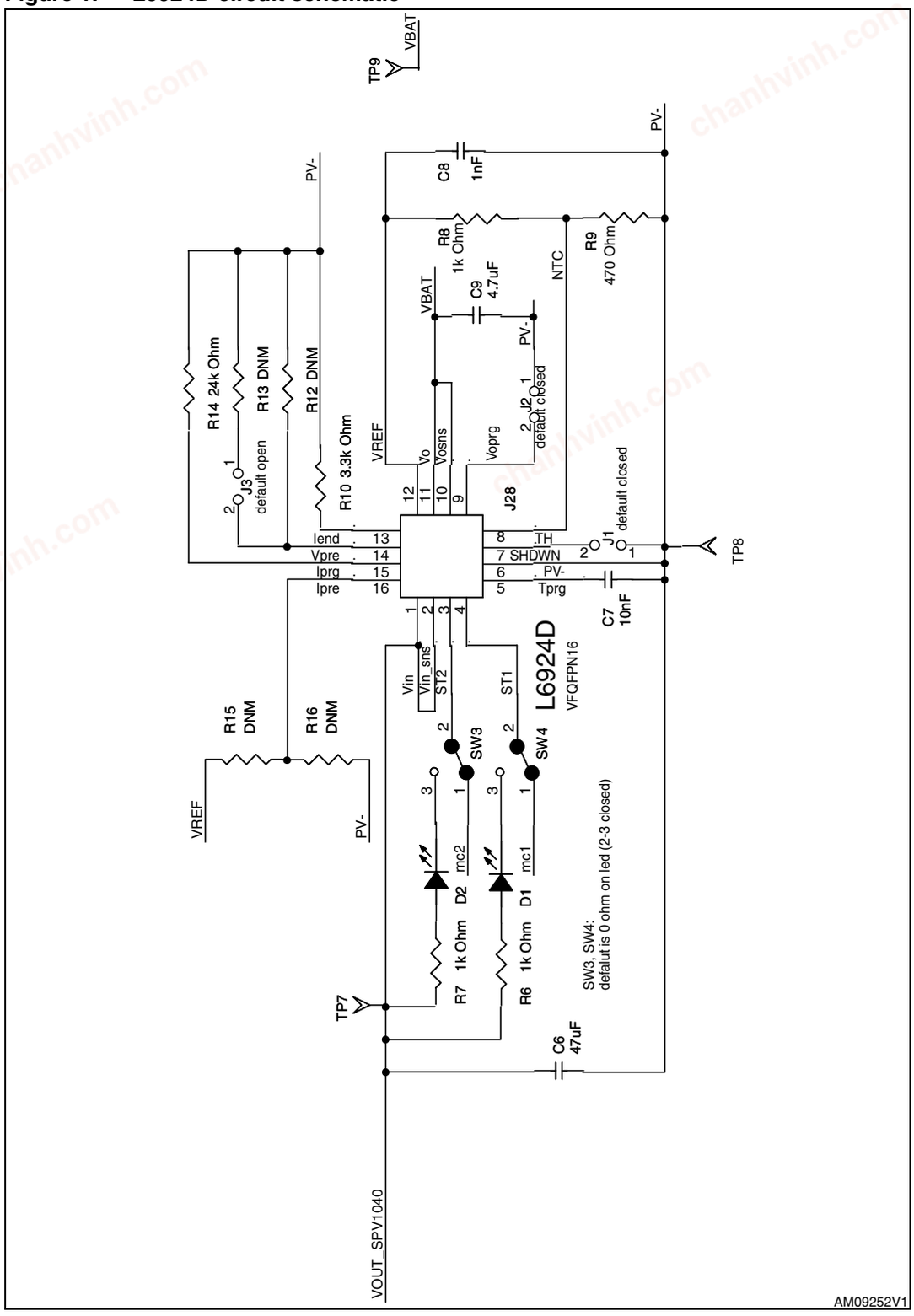
In the STEVAL-ISV012V1 demonstration board, the L6924D is supplied by the output stage of the SPV1040, which is supplied by a 400 mW PV panel.

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# 2 Schematic diagrams

**Figure 1. L6924D circuit schematic**



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**Figure 2. SPV1040, MPPT boost circuit schematic**

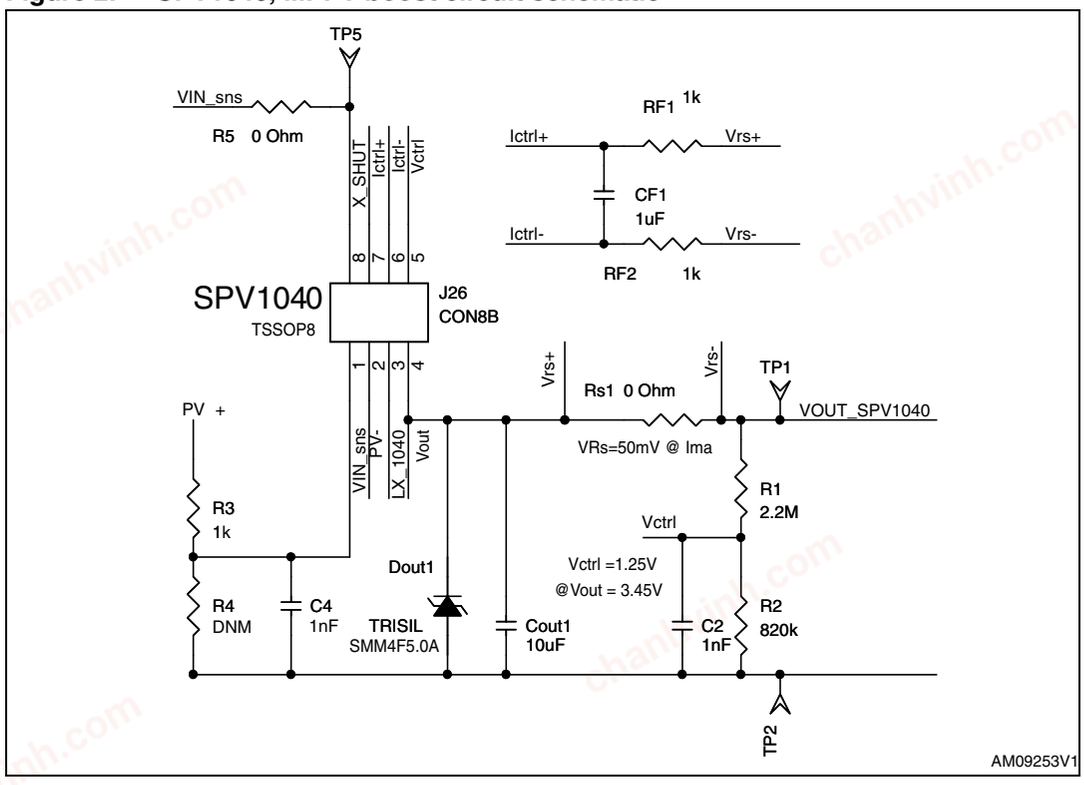
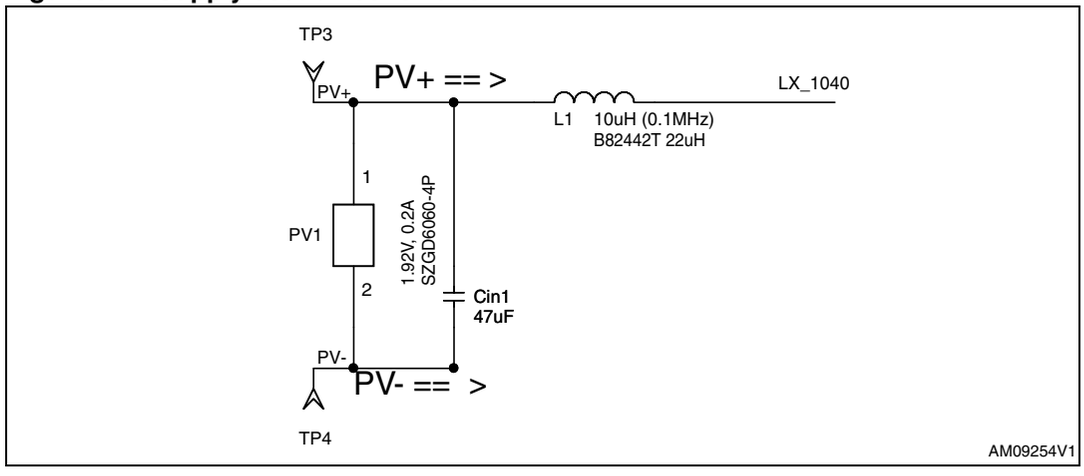



**Figure 3. Supply section schematic**



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Figure 4. µC and battery section

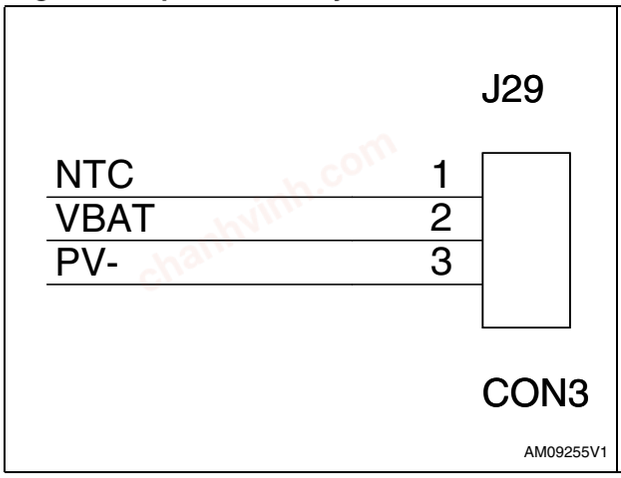
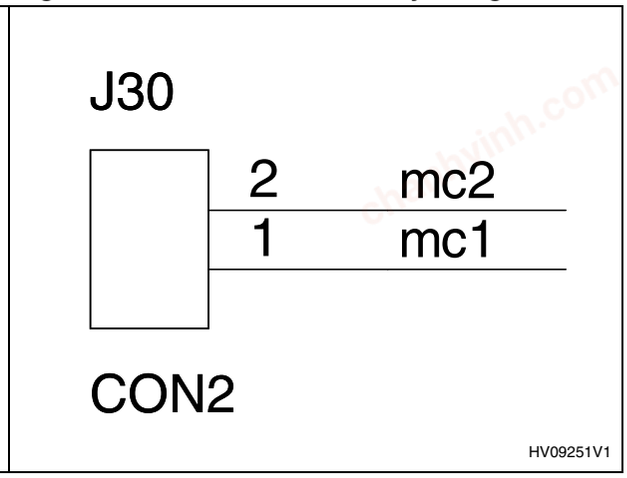



Figure 5. L6924, Li-ion battery charger



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# 3 Revision history

**Table 1. Document revision history**

| Date | Revision | Changes |
|---|---|---|
| 30-May-2011 | 1 | Initial release. |
| 21-Jul-2011 | 2 | Updated *Figure 1: L6924D circuit schematic* and *Figure 2: SPV1040, MPPT boost circuit schematic*. |

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