



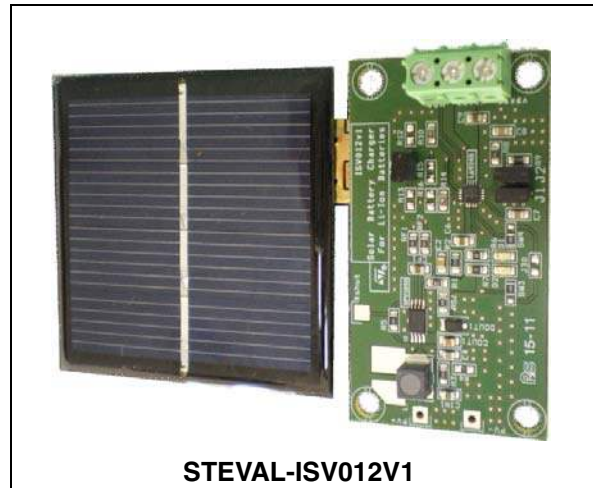
## STEVAL-ISV012V1

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



# 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.

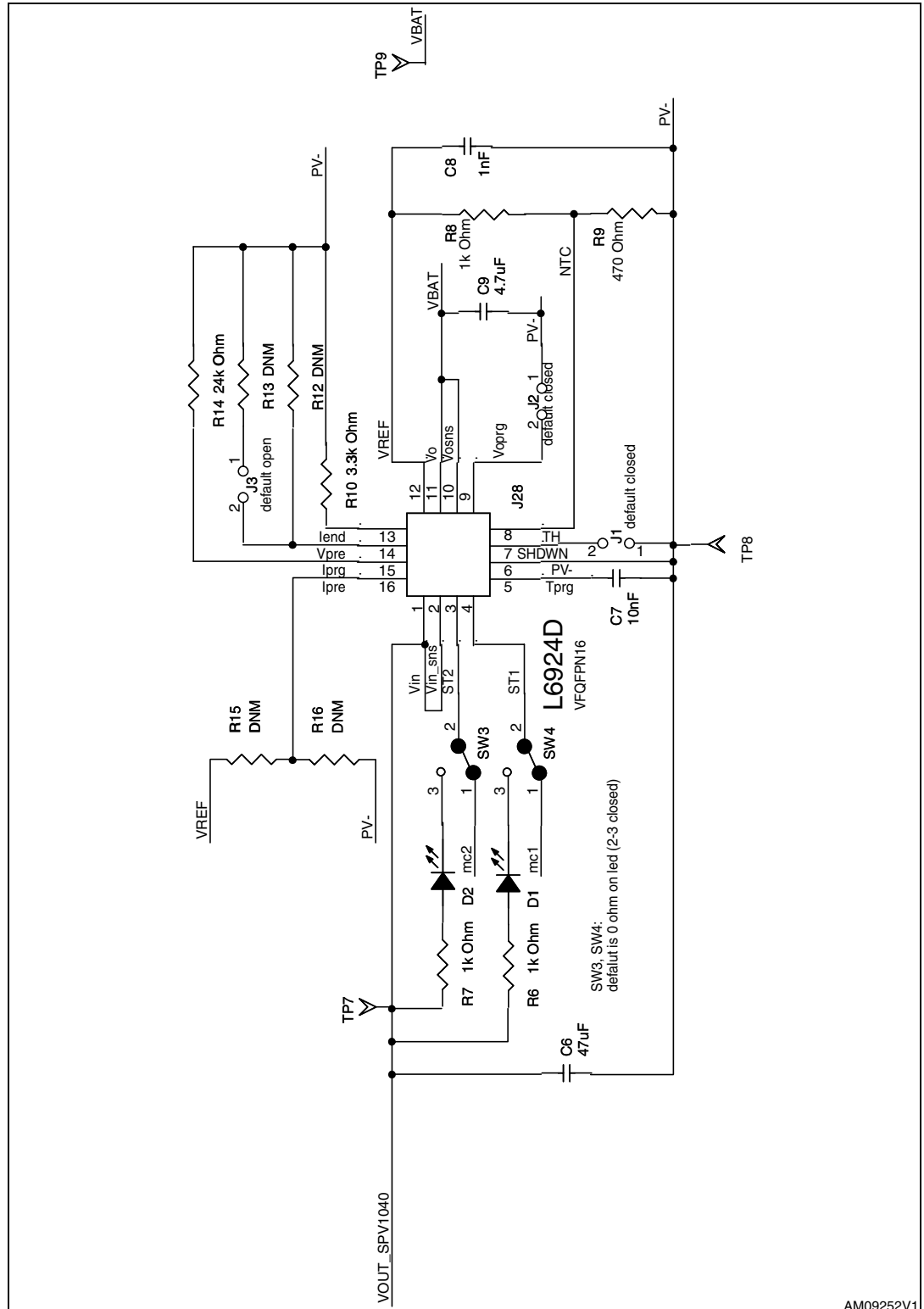
The main advantage of the quasi-pulse charging mode is that it shares the simplicity of the linear approach, where the power dissipated is dramatically reduced, thereby maximizing the charge rate from the solar panel.

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.

## 2 Schematic diagrams

Figure 1. L6924D circuit schematic



AM09252V1

Figure 2. SPV1040, MPPT boost circuit schematic

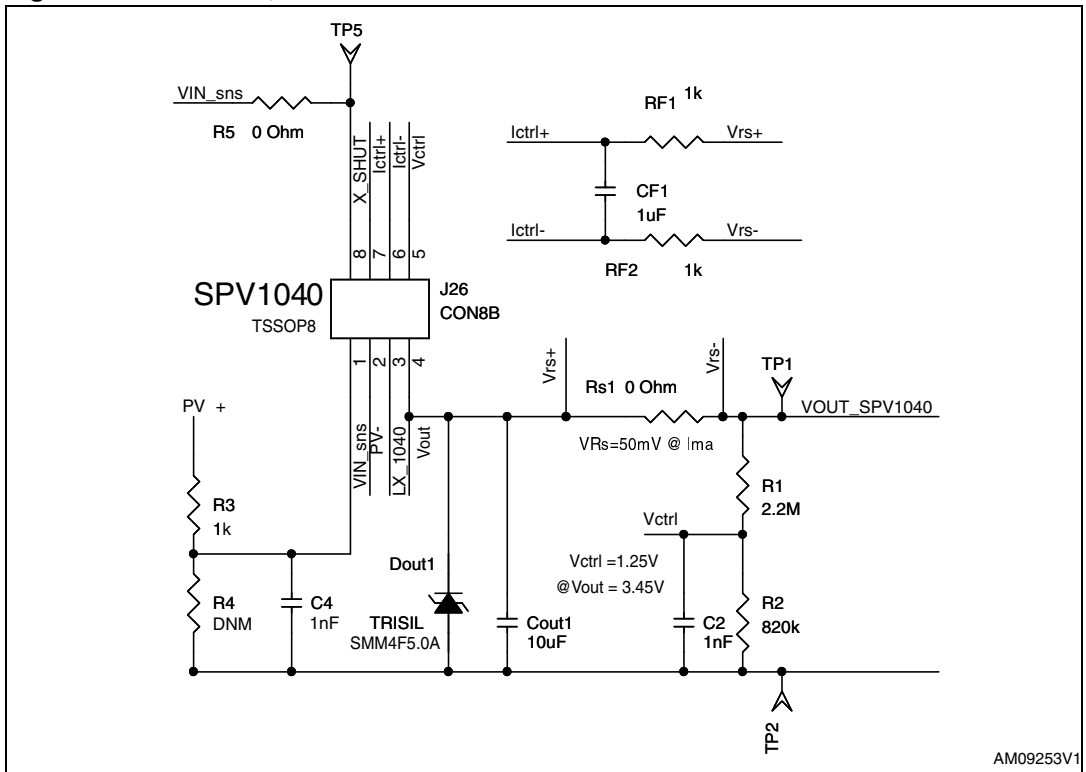


Figure 3. Supply section schematic

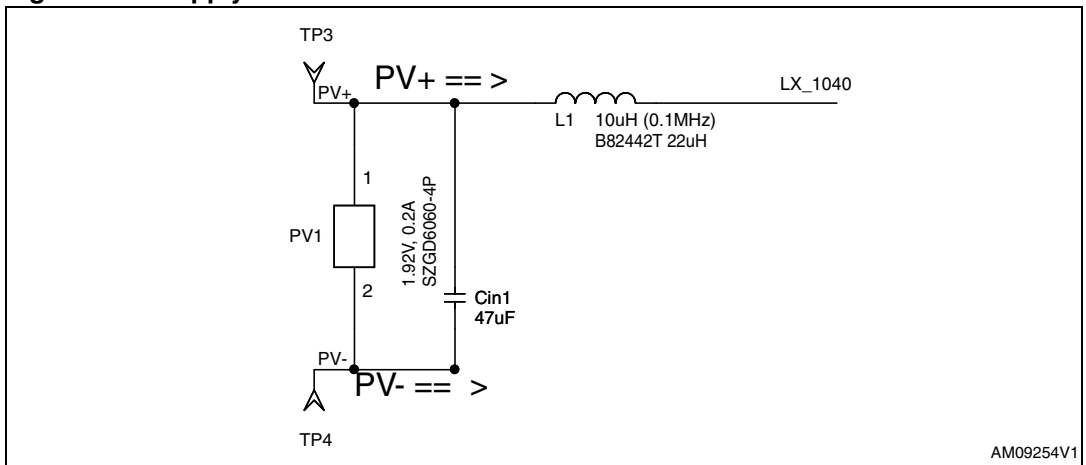


Figure 4.  $\mu$ C and battery section

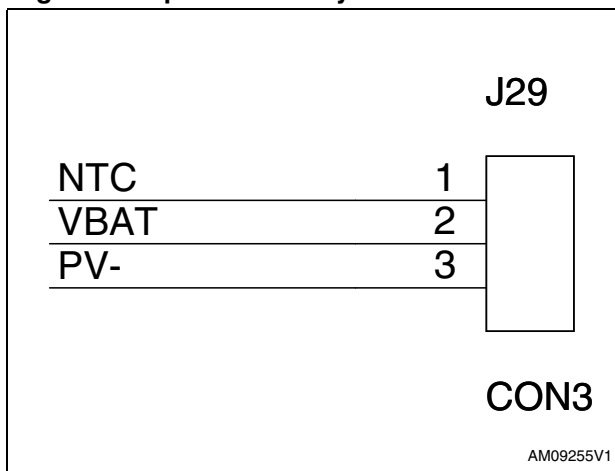
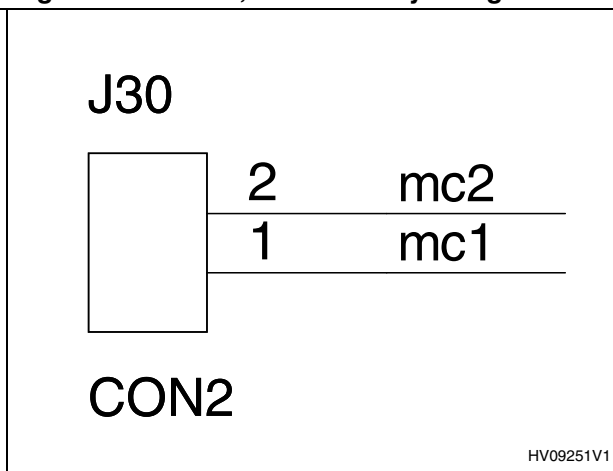


Figure 5. L6924, Li-ion battery charger



### 3 Revision history

Table 1. Document revision history

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

**Please Read Carefully:**

Information in this document is provided solely in connection with ST products. STMicroelectronics NV and its subsidiaries ("ST") reserve the right to make changes, corrections, modifications or improvements, to this document, and the products and services described herein at any time, without notice.

All ST products are sold pursuant to ST's terms and conditions of sale.

Purchasers are solely responsible for the choice, selection and use of the ST products and services described herein, and ST assumes no liability whatsoever relating to the choice, selection or use of the ST products and services described herein.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted under this document. If any part of this document refers to any third party products or services it shall not be deemed a license grant by ST for the use of such third party products or services, or any intellectual property contained therein or considered as a warranty covering the use in any manner whatsoever of such third party products or services or any intellectual property contained therein.

**UNLESS OTHERWISE SET FORTH IN ST'S TERMS AND CONDITIONS OF SALE ST DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY WITH RESPECT TO THE USE AND/OR SALE OF ST PRODUCTS INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION), OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT.**

**UNLESS EXPRESSLY APPROVED IN WRITING BY TWO AUTHORIZED ST REPRESENTATIVES, ST PRODUCTS ARE NOT RECOMMENDED, AUTHORIZED OR WARRANTED FOR USE IN MILITARY, AIR CRAFT, SPACE, LIFE SAVING, OR LIFE SUSTAINING APPLICATIONS, NOR IN PRODUCTS OR SYSTEMS WHERE FAILURE OR MALFUNCTION MAY RESULT IN PERSONAL INJURY, DEATH, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE. ST PRODUCTS WHICH ARE NOT SPECIFIED AS "AUTOMOTIVE GRADE" MAY ONLY BE USED IN AUTOMOTIVE APPLICATIONS AT USER'S OWN RISK.**

Resale of ST products with provisions different from the statements and/or technical features set forth in this document shall immediately void any warranty granted by ST for the ST product or service described herein and shall not create or extend in any manner whatsoever, any liability of ST.

ST and the ST logo are trademarks or registered trademarks of ST in various countries.

Information in this document supersedes and replaces all information previously supplied.

The ST logo is a registered trademark of STMicroelectronics. All other names are the property of their respective owners.

© 2011 STMicroelectronics - All rights reserved

STMicroelectronics group of companies

Australia - Belgium - Brazil - Canada - China - Czech Republic - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan - Malaysia - Malta - Morocco - Philippines - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States of America

[www.st.com](http://www.st.com)