

## AEM00920 Evaluation Kit User Guide

### Description

The AEM00920 evaluation kit (EVK) is a printed circuit board (PCB) featuring all the required components to operate the AEM00920 integrated circuit (IC) in QFN 24-pin package.

AEM00920 evaluation kit allows users to test e-peas IC and analyze its performances in a laboratory-like setting or in product mock-ups.

It allows easy connections to an energy harvester, an optional 5 V power source, a storage element and an application circuit. Thanks to headers and resistors, it also provides all configuration options to set the device in any of the modes described in the datasheet. A status signal is available on a standard pin header.

AEM00920 EVK is an easy-to-use, intuitive and efficient tool to optimize AEM00920 configuration, allowing users to design a highly efficient subsystem for the desired target application. Component replacement and operating mode switching is convenient and easy.

Detailed information about AEM00920 features can be found in the datasheet.

### Applications

Remote Controls      Wireless Keyboards

### Features and Benefits

#### Very high conversion efficiency

- Average 93% from source to storage element.
- Average 92% from storage element to application.

#### Two-way screw terminals

- DC source of energy (SRC).
- Energy storage element (STO).
- Application circuit (LOAD).
- 5 V DC power input (5V\_IN).

#### 3-pin headers

- Source voltage regulation mode configuration.
- Storage element voltage thresholds configuration.
- Load voltage regulation configuration.
- Shipping mode enable/disable.
- Boost configuration.

#### 2-pin headers

- 5 V power input max current presets.

#### USB connector

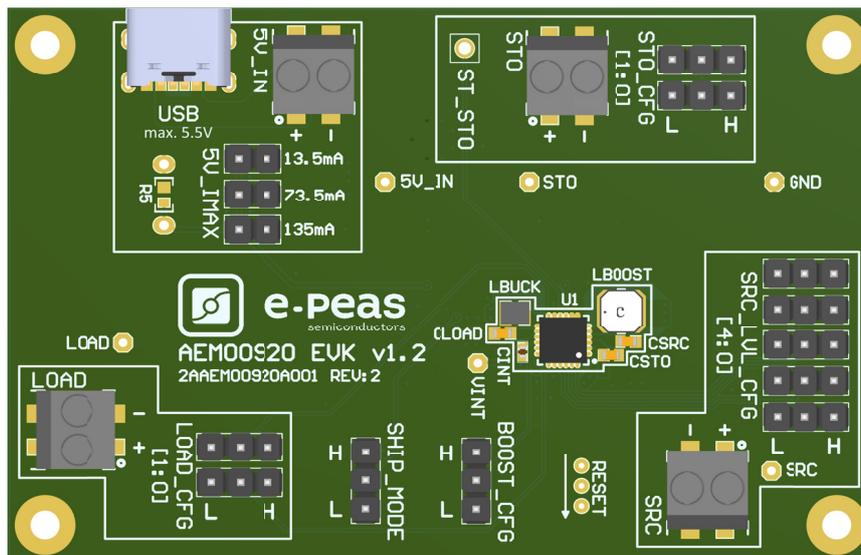
- 5 V DC power input (max. 5.5 V peak).

### Evaluation Kit Information

Part number	Dimensions
2AAEM00920A001 REV:1	76 mm x 49 mm

### Device Information

Part Number	Package	Body size
10AEM00920A0000	QFN 24-pin	4x4mm





## 2. Pin Configuration and Functions

NAME	FUNCTION	CONNECTION	
		If used	If not used
<b>Power Pins</b>			
SRC	Connection to the energy source harvested by the boost converter.	Connect the source element.	Can be left floating or connected to GND.
STO	Connection to the energy storage element (rechargeable battery or LiC).	Connect the storage element.	Leave floating. If left floating, storage element is on-board capacitor $C_{STO}$ , which may be too small for most applications.
LOAD	Output voltage of the buck converter to supply an application circuit.	Connect the application circuit.	Disable buck converter through <b>LOAD_CFG[1:0]</b> pins and leave the <b>LOAD</b> pin floating.
5V_IN	Input of the 5 V DC power supply.	Connect a 5 V DC power source.	Leave floating.
<b>Control Pin</b>			
SHIP_MODE	Logic input. When HIGH: <ul style="list-style-type: none"> <li>- Minimum consumption from the storage element.</li> <li>- Storage element charge is disabled (boost converter is disabled).</li> <li>- Buck (<b>LOAD</b>) is disabled.</li> <li>- Only <b>VINT</b> is charged if energy is available on <b>SRC</b>.</li> </ul>	Connect jumper to H.	Read as LOW if left floating.
<b>Configuration Pins</b>			
SRC_LVL_CFG[4:0]	Used for the configuration of <b>SRC</b> constant voltage regulation.	Connect jumpers.	Read as HIGH if left floating.
STO_CFG[1:0]	Used to configure the storage element voltage thresholds.	Connect jumpers.	Read as HIGH if left floating.
LOAD_CFG[1:0]	Used to configure the <b>LOAD</b> output regulation voltage.	Connect jumpers.	Read as HIGH if left floating.
BOOST_CFG	Used to configure the boost converter timings.	<ul style="list-style-type: none"> <li>- Connect jumper to L for timings x1.</li> <li>- Connect jumper to H for timings x3.</li> </ul>	Read as HIGH if left floating.
5V_IMAX	Connection to an external resistor to set the charging current from the <b>5V_IN</b> supply to <b>STO</b> .	Connect jumper on one of the three 2-pin headers or connect a resistor on R5.	Leave floating if <b>5V_IN</b> is not used.
<b>Status Pin</b>			
ST_STO	Logic output. <ul style="list-style-type: none"> <li>- HIGH when in <b>SUPPLY STATE</b> or in <b>SLEEP STATE</b>.</li> <li>- LOW otherwise.</li> </ul>	Connect to application circuit. HIGH level is <b>STO</b> .	Leave floating.

Table 1: Signals description

## 3. General Considerations

### 3.1. Safety Information

Always connect the elements in the following order:

1. Reset the board by temporarily connecting the “RESET” pads to GND, from top to bottom (as shown on PCB) silkscreen.
2. Completely configure the PCB (jumpers/resistors):
  - Sources voltage regulation mode (SRC\_LVL\_CFG[4:0]).
  - Storage element voltage thresholds (STO\_CFG[1:0]).
  - Load output regulation voltage (LOAD\_CFG[1:0]).
  - Boost converter timings configuration (BOOST\_CFG).
  - 5 V charger maximum current.
4. Connect a storage element on the STO screw connector.
5. Connect the application circuit on the LOAD screw connector.
6. Connect the harvester to the source.

### 3.2. AEM00920 Reset

The following procedure must be followed to properly reset the AEM00920:

- Connect a wire to GND.
- Use this wire to short the “Reset” pads to GND from top to bottom, as indicated on the EVK silkscreen.

### 3.3. Configurations

#### 3.3.1. Source Constant Voltage Configuration

Configuration pins					Voltage [V]
SRC_LVL_CFG[4:0]					V <sub>SRC,REG</sub>
L	L	L	L	L	0.25
L	L	L	L	H	0.30
L	L	L	H	L	0.35
L	L	L	H	H	0.40
L	L	H	L	L	0.45
L	L	H	L	H	0.50
L	L	H	H	L	0.55
L	L	H	H	H	0.60
L	H	L	L	L	0.65
L	H	L	L	H	0.70
L	H	L	H	L	0.75
L	H	L	H	H	0.80
L	H	H	L	L	0.85
L	H	H	L	H	0.90
L	H	H	H	L	0.95
L	H	H	H	H	1.00

Configuration pins					Voltage [V]
SRC_LVL_CFG[4:0]					V <sub>SRC,REG</sub>
H	L	L	L	L	1.10
H	L	L	L	H	1.20
H	L	L	H	L	1.30
H	L	L	H	H	1.40
H	L	H	L	L	1.50
H	L	H	L	H	1.60
H	L	H	H	L	1.70
H	L	H	H	H	1.80
H	H	L	L	L	1.90
H	H	L	L	H	2.00
H	H	L	H	L	2.20
H	H	L	H	H	2.40
H	H	H	L	L	2.60
H	H	H	L	H	2.80
H	H	H	H	L	3.00
H	H	H	H	H	3.20

Table 2: Configuration of the source constant regulation voltage with SRC\_LVL\_CFG[4:0]

#### 3.3.2. Storage Element Configuration

Configuration pins		Overdischarge voltage [V]	Charge ready voltage [V]	Overcharge voltage [V]	Storage element type
STO_CFG[1:0]		V <sub>OVDIS</sub>	V <sub>CHRDY</sub>	V <sub>OVCH</sub>	
L	L	2.50	2.55	3.80	Lithium-ion Super Capacitor (LiC)
L	H	3.00	3.20	4.12	Lithium-ion
H	L	3.00	3.20	4.35	Lithium Polymer (LiPo)
H	H	3.50	3.55	3.90	Lithium-ion (ultra-long life)

Table 3: Storage element configuration with STO\_CFG[1:0]

### 3.3.3. Load Configuration

Configuration pins		LOAD voltage [V]
<b>LOAD_CFG[1:0]</b>		<b>V<sub>LOAD</sub></b>
L	L	Buck disabled
L	H	2.2
H	L	2.5 <sup>1</sup>
H	H	2.8 <sup>2</sup>

Table 4: Configuration of LOAD voltage with LOAD\_CFG[1:0]

1. This configuration is only available if  $V_{OVDIS} > 2.5$  V.
2. This configuration is only available if  $V_{OVDIS} > 2.8$  V.

### 3.3.4. 5 V Charger Configuration

Resistor [ $\Omega$ ]	Maximum Charging Current [mA]
<b>R<sub>5V_IMAX</sub></b>	<b>I<sub>5V,CC</sub></b>
370	135.0
680	73.5
1500 <sup>1</sup>	33.3
3700	13.5

Table 5: Typical resistor values for setting 5 V charger max. current

1. Can be obtained by installing a 1.5 k $\Omega$  resistor on R5 and leaving all 3 headers without jumpers.

Three 2-pin headers corresponding to three current presets are available on the EVK. Install a jumper on the corresponding header to enable a preset.

Furthermore, R5 allows users for an easy installation of a custom resistor, either in through-hole or in SMD 0603 package. In that case, do not install any jumper on the three preset headers and install a resistor on R5 footprint.

### 3.3.5. Shipping Mode

The shipping mode feature allows for forcing the AEM00920 in **RESET STATE** (see datasheet), thus disabling all AEM00920 functionalities including the boost converter, the buck converter and the 5 V charger. Only **VINT** is charged from **SRC** if energy is available from it. The battery is no longer charged or discharged.

Shipping mode is enabled by installing a jumper to HIGH on the EVK dedicated header. To disable it, connect a jumper to LOW or leave it floating.

## 4. Functional Tests

This section presents a few simple tests that allow users to understand the functional behavior of the AEM00920. To avoid damaging the board, follow the procedure found in Section 3.1. If a test has to be restarted, make sure to properly reset the system to obtain reproducible results.

Users can adapt the setup to match the use case system as long as the source limitations are respected, as well as the minimum storage voltage and cold-start constraints (see “Typical Electrical Characteristics at 25 °C” Section of AEM00920 datasheet).

In the following sections, when a “power supply” is required, it can be either a standard one quadrant positive voltage / positive current laboratory power supply with regulated voltage, or an SMU set as voltage source with current compliance.

### 4.1. Start up

#### 4.1.1. Description

The following example allows users to observe the start-up behavior of the AEM00920.

#### 4.1.2. Setup

- Oscilloscope:
  - Channel 1: **STO**.
  - Channel 2: **VINT** (may be probed on H pin on **STO\_CFG[1]** header for example).
- **SRC** (2 alternatives, initially disconnected):
  - 1 V / 10 mA power supply with a 100 Ω resistor in series ( $I_{SRC} = 2.5 \text{ mA}$  with  $V_{SRC,REG} = 0.75 \text{ V}$ ).
  - SMU set as 2.5 mA current source with 1 V compliance.
- **SRC\_LVL\_CFG[4:0] = LHLHL**.
  - $V_{SRC,REG} = 0.75 \text{ V}$ .
  - $I_{SRC} = \frac{1\text{V} - 0.75\text{V}}{100\Omega} = 2.5\text{mA}$  (PSU).
  - $I_{SRC} = 2.5\text{mA}$  (SMU).
- 1000 μF capacitor connected to **STO** as storage element.
- 3 V power supply or SMU connected to **STO** beforehand.
- **STO\_CFG[1:0] = LH**.
  - $V_{OVDIS} = 3.00 \text{ V}$ .
  - $V_{CHRDY} = 3.20 \text{ V}$ .
  - $V_{OVCH} = 4.12 \text{ V}$ .
- **LOAD** is floating.
- **LOAD\_CFG[1:0] = LL**.
  - **LOAD** disabled.

### 4.1.3. Measurements

- Reset the AEM00920 as described in Section 3.2.
- Start with:
  - 3 V power supply connected to **STO** so that  $C_{STO}$  is charged to 3.0 V beforehand.
  - No source connected to **SRC**.
- Disconnect the power supply from **STO**.
- Connect the 1 V / 100  $\Omega$  PSU or the 2.5 mA current source SMU to **SRC**.
- Observe  $V_{INT}$  rise up to 2.2 V and be regulated at that voltage.
- Energy is transferred from **SRC** to **STO**:  $V_{STO}$  rises from its initial 3.0 V voltage to  $V_{OVCH}$  (4.12 V).
- $V_{STO}$  is regulated to  $V_{OVCH}$  (4.12 V) as the AEM00920 prevents the storage element to be charged any further.
- **5V\_IN** left floating.

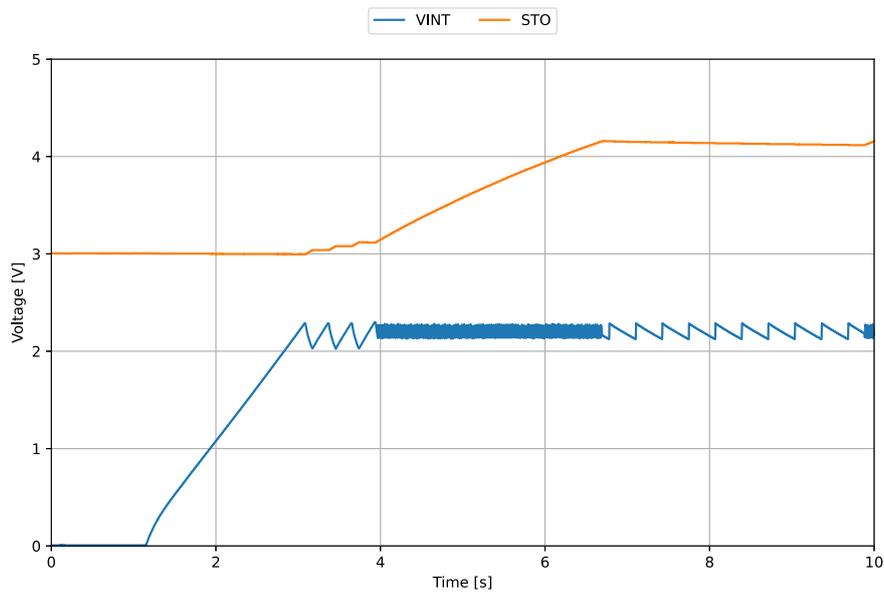


Figure 2: AEM00920 start-up behavior

## 4.2. Cold-Start

### 4.2.1. Description

The following example allows users to observe the cold-start behavior of the AEM00920.

### 4.2.2. Setup

- Oscilloscope:
  - Channel 1: SRC.
  - Channel 2: VINT (may be probed on H pin on STO\_CFG[1] header for example).
- SRC (2 alternatives, initially disconnected):
  - 1 V / 10 mA power supply with a 68 kΩ resistor in series. Please note that using a standard power supply allows for validating the minimum cold-start voltage but does not allow for validating the minimum cold-start power.
  - SMU set as 10 μA current source with 1 V compliance. Using an SMU allows for validating the minimum cold-start power as well as the minimum cold-start voltage.
- SRC\_LVL\_CFG[4:0] = LHLHL.
  - $V_{SRC,REG} = 0.75 \text{ V}$ .
  - $I_{SRC} = \frac{1\text{V} - 0.3\text{V}}{68\text{k}\Omega} = 10\mu\text{A}$  (PSU).
  - $I_{SRC} = 10\mu\text{A}$  (SMU).
- 1000 μF capacitor connected to STO as storage element.
- 3 V power supply connected to STO beforehand.
- STO\_CFG[1:0] = LH.
  - $V_{OVDIS} = 3.00 \text{ V}$ .
  - $V_{CHRDY} = 3.20 \text{ V}$ .
  - $V_{OVCH} = 4.12 \text{ V}$ .
- LOAD is floating.
- LOAD\_CFG[1:0] = LL.
  - LOAD disabled.

### 4.2.3. Measurements

- Reset the AEM00920 as described in Section 3.2.
- Start with:
  - 3 V power supply connected to **STO** so that  $C_{STO}$  is charged to 3.0 V beforehand.
  - No source connected to **SRC**.
- Disconnect the power supply from **STO**.
- Connect the power supply or SMU to **SRC**.
- Cold-start phase:
  - Observe  $V_{SRC}$  clamped to 0.3 V.
  - Observe  $V_{INT}$  rise up to 2.2 V and be regulated at that voltage.
- Once  $V_{INT}$  has reached its 2.2 V regulation voltage, the AEM00920 regulates the source at  $V_{SRC,REG}$ .

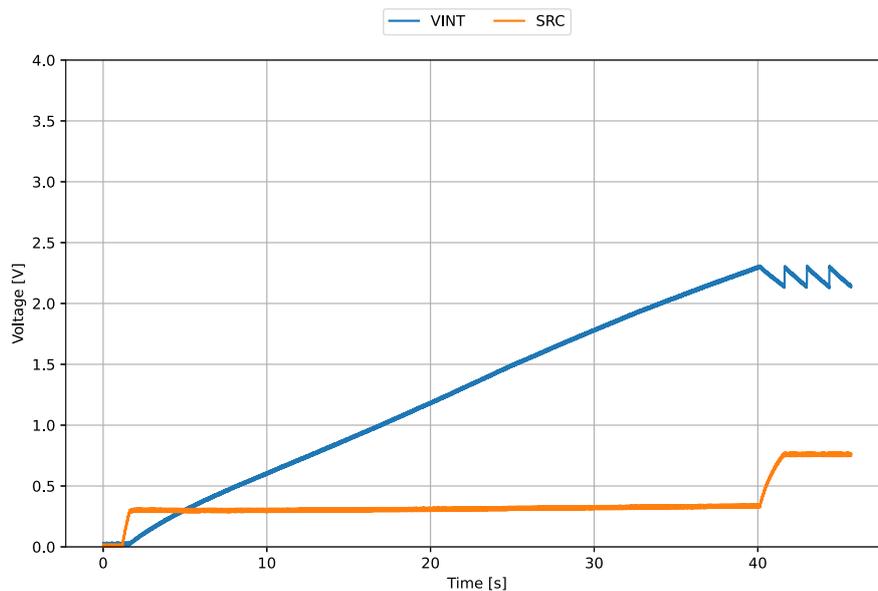


Figure 3: AEM00920 cold-start behavior

## 4.3. Load

### 4.3.1. Description

The following example allows users to observe how the AEM00920 switches ON and OFF the buck converter supplying the **LOAD** pin.

### 4.3.2. Setup

- Oscilloscope:
  - Channel 1: **STO**.
  - Channel 2: **LOAD**.
- **SRC** (2 alternatives, initially disconnected):
  - 1 V / 10 mA power supply with a 100  $\Omega$  resistor in series ( $I_{SRC} = 2.5$  mA with  $V_{SRC,REG} = 0.75$  V).
  - SMU set as 2.5 mA current source with 1.0 V compliance.
- **SRC\_LVL\_CFG[4:0]** = LHLHL.
  - $V_{SRC,REG} = 0.75$  V.
  - $I_{SRC} = \frac{1V - 0.75V}{100\Omega} = 2.5$  mA (PSU).
  - $I_{SRC} = 2.5$  mA (SMU).
- 1000  $\mu$ F capacitor connected to **STO** as storage element.
- 2.8 V power supply connected to **STO** beforehand.
- **STO\_CFG[1:0]** = LH.
  - $V_{OVDIS} = 3.00$  V.
  - $V_{CHRDY} = 3.20$  V.
  - $V_{OVCH} = 4.12$  V.
- **LOAD\_CFG[1:0]** = LH.
  - **LOAD** is regulated at 2.2 V.
  - **LOAD**: a 5 k $\Omega$  resistor is connected between **LOAD** and GND.
  - $I_{LOAD} = 440$   $\mu$ A.

### 4.3.3. Measurements

- Reset the AEM00920 as described in Section 3.2.
- Start with:
  - 2.8 V power supply connected to **STO** so that  $C_{STO}$  is charged to 2.8 V beforehand.
  - No source connected to **SRC**.
- Disconnect the power supply from **STO**.
- Connect the power supply or SMU to **SRC**.
- After cold start, observe the storage element charging.
- When  $V_{STO} > V_{CHRDY}$ , **LOAD** starts being regulated to 2.2 V, thus providing current to the 5 k $\Omega$  resistor. There is more energy harvested than consumed (positive power budget), so the storage element keeps being charged.
- Disconnect the power supply from **SRC** (done at about 4.75 s on Figure 4).
- The current drawn by the 5 k $\Omega$  is now discharging the storage element, as no more energy is harvested to compensate for the load.
- When  $V_{STO} < V_{OVDIS}$ , the AEM00920 waits for  $T_{CRIT}$  (2.5 s) and then switches OFF the buck converter. **LOAD** is no longer regulated and drops down to 0 V.

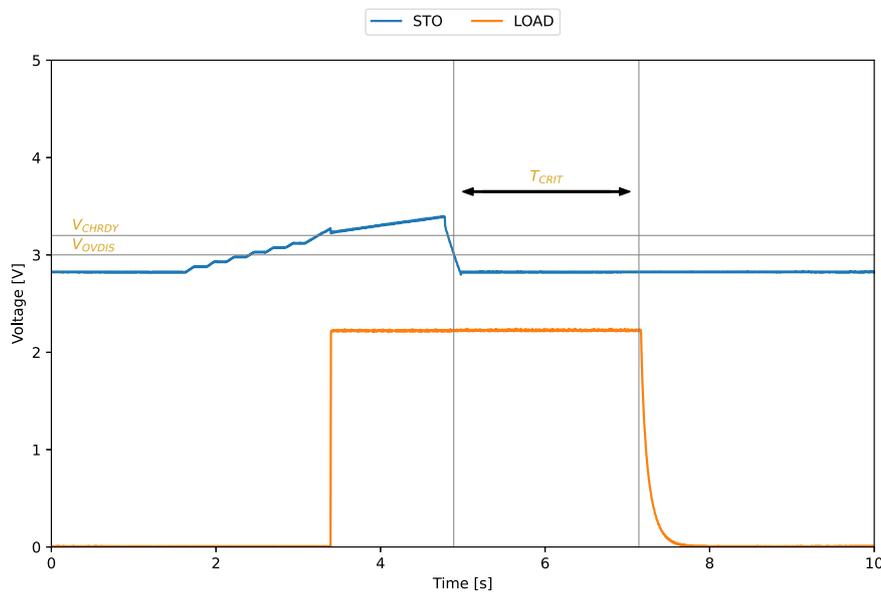


Figure 4: AEM00920 LOAD output behavior

**NOTE:** in a real application, the storage element would be a battery or a supercapacitor, with much higher stored energy, so that  $V_{STO}$  would not drop as low as on Figure 4 during  $T_{CRIT}$ .

## 4.4. 5 V Charger

### 4.4.1. Description

The following example allows users to observe how the AEM00920 coldstarts and charges the storage element from the 5 V charger.

### 4.4.2. Setup

- Oscilloscope:
  - Channel 1: **STO**.
  - Channel 2: **5V\_IN**.
- **SRC** left floating.
- **5V\_IN**: 5.0 V / 200 mA power supply or SMU (initially disconnected).
- **5V\_IN** constant current set to 13.5 mA by installing a jumper on the corresponding header.
- 10 mF capacitor connected to **STO** as storage element (1000  $\mu$ F will also work but **STO** charging slope will be even steeper).
- 2.8 V power supply connected to **STO** beforehand.
- **STO\_CFG[1:0]** = LH.
  - $V_{OVDIS}$  = 3.00 V.
  - $V_{CHRDY}$  = 3.20 V.
  - $V_{OVCH}$  = 4.12 V.
- **LOAD\_CFG[1:0]** = LL.
  - **LOAD** is disabled.
- **LOAD** left floating.

### 4.4.3. Measurements

- Reset the AEM00920 as described in Section 3.2.
- Start with:
  - 2.8 V power supply connected to **STO** so that  $C_{STO}$  is charged to 2.8 V beforehand.
  - No source connected to **5V\_IN**.
- Disconnect the power supply from **STO**.
- Connect the power supply or SMU to **5V\_IN**.
- After cold start, observe the storage element charging up to  $V_{OVCH}$  (4.12 V).

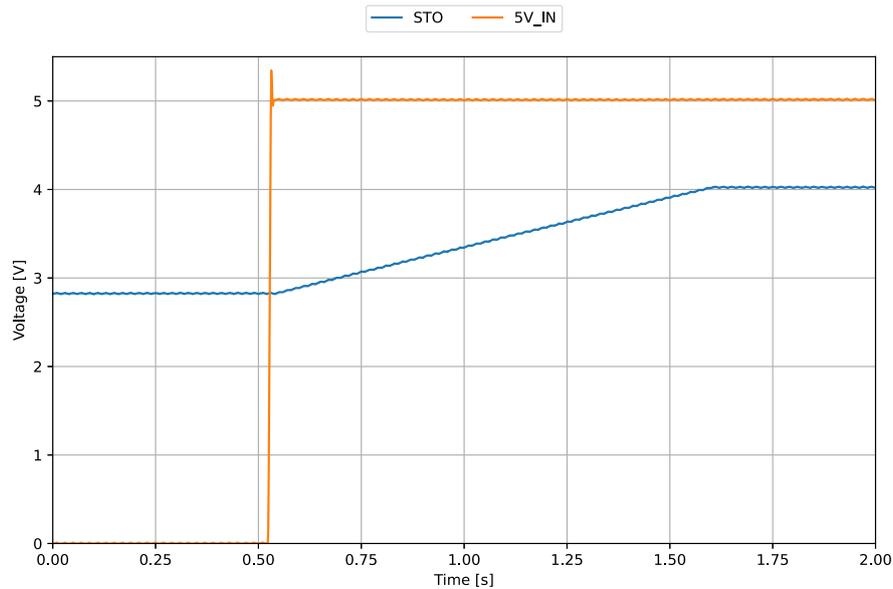


Figure 5: AEM00920 cold start and storage element charge from 5V\_IN

## 5. Performance Tests

This section presents the tests to reproduce the performance graphs found in the AEM00920 datasheet. To be able to reproduce those tests, you will need the following:

- 2 source measure units (SMU, typically Keithley 2450). Those must be set with longest integration time.
- 1 voltage source (only for coldstarting the AEM00920 when performing buck efficiency measurement).

To avoid damaging the board, follow the procedure found in Section 3.1 “Safety information”. If a test has to be restarted, make sure to properly reset the system to obtain reproducible results, as shown in Section 3.2.

### 5.1. Boost Converter Efficiency

#### 5.1.1. Description

The boost converter efficiency is determined for a fixed set point of the AEM00920:

- Fixed **SRC** voltage  $V_{SRC}$ .
- Fixed **SRC** current  $I_{SRC}$ .
- Fixed **STO** voltage  $V_{STO}$ .
- Fixed inductor value  $L_{BOOST}$ . Please note that the inductor model has a subsequent influence on the efficiency.

Boost efficiency measurement is about measuring the current provided to **STO** with all other parameters fixed.

Please note that to avoid any leakage that would affect the measurement, no probe or voltmeter must be connected to the AEM00920 pins while measuring the boost efficiency.

#### 5.1.2. Setup

- **SRC\_LVL\_CFG[4:0]** set accordingly to the desired  $V_{SRC}$  set point (see Table 2).
- **SRC**: SMU set as current source.
  - Current set to the desired  $I_{SRC}$ .
  - Voltage compliance set to 0.5 V above the desired  $V_{SRC}$  set point.
- **STO**: SMU set as voltage source:
  - Voltage set to the desired  $V_{STO}$  set point.
  - Current compliance set so that the power on **STO** ( $V_{STO} \times I_{STO}$ ) is at least higher than the power of the SMU connected to **SRC** ( $V_{SRC} \times I_{SRC}$ ). Do not lower the current compliance lower than 100  $\mu$ A.

### 5.1.3. Measurements

#### Cold start and initialization

This part must only be done for the first efficiency data point measurement. To avoid having to do it between two subsequent set points, users must make sure that  $V_{STO}$  does not drop below  $V_{OVDIS}$  between measurements.

- Start with both SMU switched OFF.
- Reset the AEM00920.
- **STO** SMU: set the voltage to 5.0 V and switch ON, to make sure that  $V_{STO}$  is above  $V_{OVCH}$ .
- **SRC** SMU: set the voltage source to 1.0 V with 1 mA current compliance to trigger the AEM00920 cold start.
- Wait for  $V_{INT}$  to rise to its regulation voltage of 2.2 V.
- The AEM00920 is now ready to perform an efficiency measurement. Do not lower  $V_{STO}$  below  $V_{OVDIS}$  from that point to avoid the AEM00920 going to **OVDIS STATE**. Keep **STO** SMU current compliance at least 100  $\mu$ A.

#### Efficiency measurement

The following needs to be done for all desired set points:

- Set **SRC** SMU to the desired voltage and current set point.
- Set **STO** SMU to the desired voltage and current set point.
- Clear both SMU buffers.
- Wait for the number of measures of both SMU to be sufficient (the lower the current the higher the necessary number of measures).
- Determine the average currents and voltages from both SMU buffers.
- Determine the boost efficiency with the following formula:

$$\eta[\%] = \frac{V_{STO} \cdot I_{STO}}{V_{SRC} \cdot I_{SRC}} \cdot 100$$

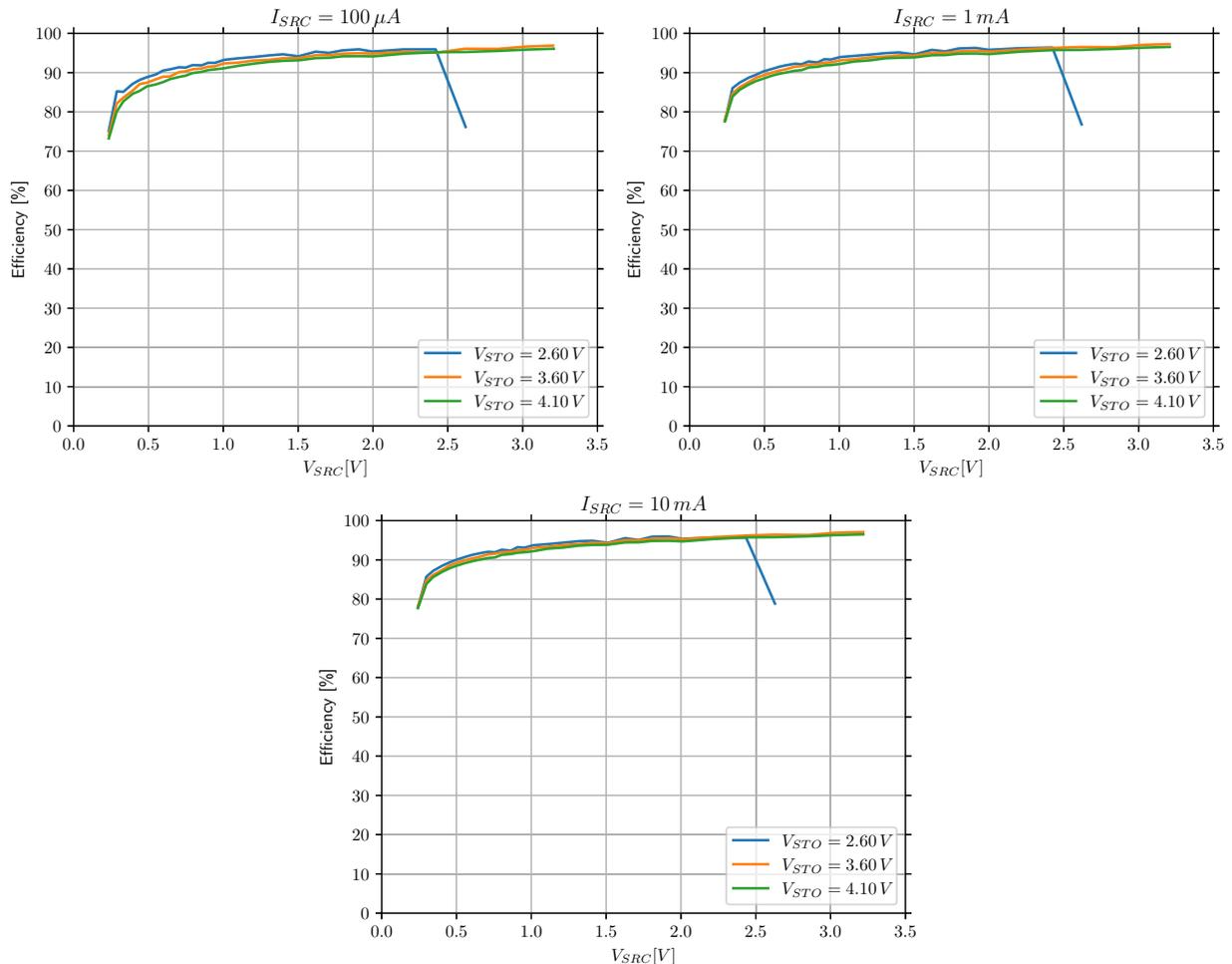


Figure 6: Boost converter efficiency with  $L_{BOOST} = 33 \mu H$  (Coilcraft LPS4018-333MRB) and timings x3

## 5.2. Buck Converter Efficiency

### 5.2.1. Description

The buck converter efficiency is determined on a fixed set point of the AEM00920:

- Fixed **STO** voltage  $V_{STO}$ .
- Fixed **LOAD** voltage  $V_{LOAD}$ .
- Fixed **LOAD** current  $I_{LOAD}$ .
- Fixed inductor value  $L_{BUCK}$ . Please note that the inductor model has a subsequent influence on the efficiency.

Buck efficiency measurement is about measuring the current that needs to be pulled from **STO** at a given  $V_{STO}$ , to provide a given current/voltage on **LOAD**, with all other parameters fixed.

Please note that, to avoid any leakage that would affect the measurement, no probe or voltmeter must be connected to the AEM00920 pins while measuring the buck efficiency.

### 5.2.2. Setup

- **STO**: SMU set as voltage source:
  - Voltage set to the desired  $V_{STO}$  set point.
  - Current compliance set so that the power on **STO** ( $V_{STO} \times I_{STO}$ ) is at least higher than the power of the SMU connected to **LOAD** ( $V_{LOAD} \times I_{LOAD}$ ).
- **LOAD**: SMU set as voltage source.
  - Voltage set to 0.5 V below the desired  $V_{LOAD}$  set point, forcing the SMU to pull the compliance current when the buck converter is regulating its output voltage.
  - Current compliance set to the desired  $I_{LOAD}$ .

### 5.2.3. Measurements

#### Cold start and initialization

This part must only be done for the first efficiency data point measurement. To avoid having to do it between two subsequent set points, users must make sure that **STO** voltage doesn't drop below  $V_{OVDIS}$  between measurements, with at least 100  $\mu\text{A}$  current compliance.

- Start with both SMU switched OFF.
- Reset the AEM00920.
- **STO** SMU: set the voltage to 5.0 V and switch ON, to make sure that the  $V_{STO}$  is above  $V_{OVCH}$ .
- Switch ON **SRC** power supply.
- Wait for  $V_{INT}$  to be regulated at 2.2 V.
- Switch OFF **SRC** power supply.
- The AEM00920 is now ready to perform an efficiency measurement. Do not lower  $V_{STO}$  below  $V_{OVDIS}$  from that point to avoid the AEM00920 going to **OVDIS STATE**. Keep the **STO** SMU current compliance at least 100  $\mu\text{A}$ .

#### Efficiency measurement

The following needs to be done for all desired set points:

- Set **STO** SMU to the desired voltage and current set point.
- Set **LOAD** SMU to the desired voltage and current set point.
- Clear both SMU buffers.
- Wait for the number of measures of both SMU to be sufficient (the lower the current the higher the necessary number of measures).
- Determine the average currents and voltages from both SMU buffers.
- Determine the buck efficiency with the following formula:

$$\eta[\%] = \frac{V_{LOAD} \cdot I_{LOAD}}{V_{STO} \cdot I_{STO}} \cdot 100$$

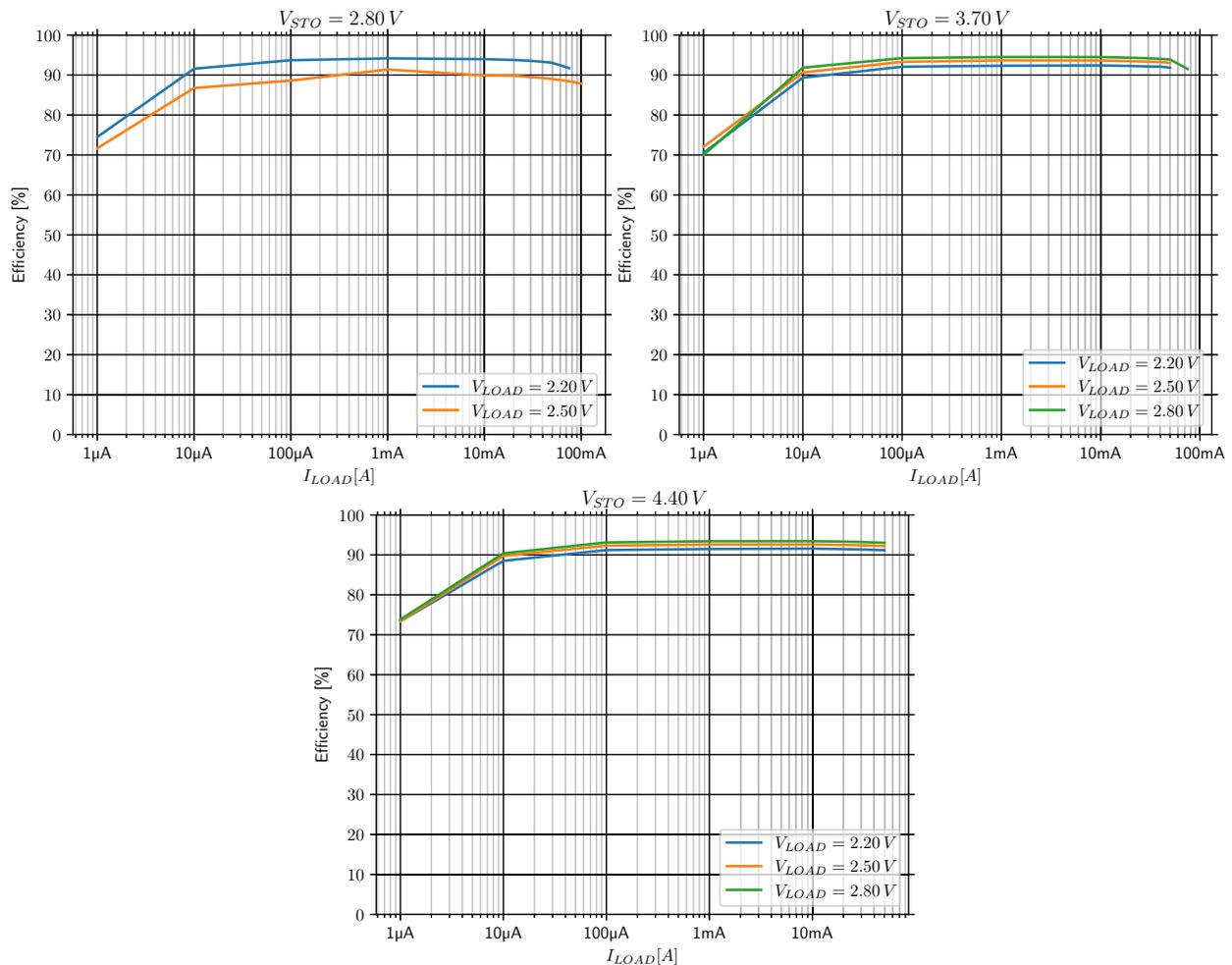


Figure 7: Buck (LOAD) converter efficiency with  $L_{BUCK} = 10 \mu\text{H}$  (Coilcraft LPS4018-103MRB)

## 6. EVK Schematic

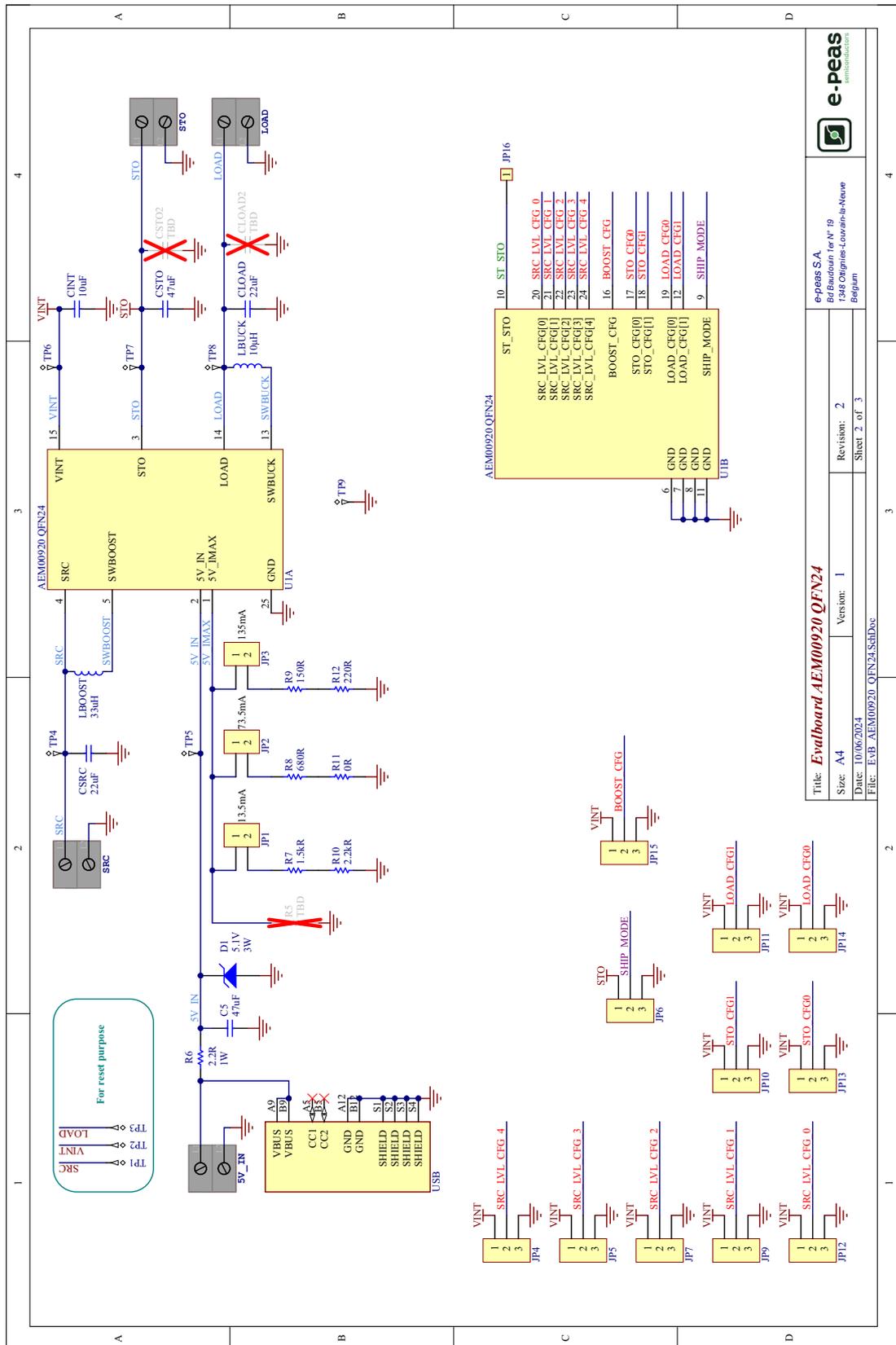


Figure 8: EVK schematic

## 7. Revision History

EVK Version	User Guide Revision	Date	Description
1.1	1.0	December, 2023	Creation of the document
1.1	1.1	March, 2024	Minor changes in Functional Tests
1.2	1.0	June, 2024	Added average efficiency values on first page.

Table 6: Revision history

## X-ON Electronics

Largest Supplier of Electrical and Electronic Components

*Click to view similar products for [Power Management IC Development Tools](#) category:*

*Click to view products by [e-peas](#) manufacturer:*

Other Similar products are found below :

[EVB-EP5348UI](#) [ISLUSBI2CKIT1Z](#) [ISL8002AEVAL1Z](#) [ISL91108IIA-EVZ](#) [AP62250WU-EVM](#) [SAMPLEBOXILD8150TOBO1](#)  
[AP61100Z6-EVM](#) [AP62300Z6-EVM](#) [BTS7030-2EPA](#) [LTC3308AIV#WTRPBF](#) [BTS71033-6ESA](#) [EV13N91A](#) [EV55W64A](#) [Si8285\\_86v2-](#)  
[KIT](#) [AP33772S-EVB](#) [TDINV3000W50B-KIT](#) [NCP1681CCM1KWGEVB](#) [APEK89303KET-01-T](#) [NCP1681MM500WGEVB](#) [SI83401BAA-](#)  
[KIT](#) [SI83402BAA-KIT](#) [SI83411BAA-KIT](#) [SI83412BAA-KIT](#) [MIKROE-5294](#) [MIKROE-5451](#) [MIKROE-5374](#) [APEK49406GES-01-T](#)  
[MIKROE-5019](#) [BTG70902EPLDAUGHBRDTOBO1](#) [5650](#) [TAB-48017](#) [APEK89307KET-01-T](#) [MIKROE-5510](#) [64010](#)  
[EVAL6EDL04I065PRTBOBO1](#) [LT8648SJV#WPBF](#) [LT8648SEV#WPBF](#) [EVB81340-100W](#) [RTKA489EPRDK0010BU](#) [DC3107A](#) [EVL4248-](#)  
[QV-00A](#) [EVQ4371-V-1000-00A](#) [EVL28167-B-Q-00A](#) [NEVB-NID1100UL](#) [EV6631B-L-00A](#) [EVL1608C-TL-00A](#) [EVAL-LTPA-KIT](#)  
[EVALKITTLE9189QUWTOBO1](#) [EVALKITTLE9189QVWTOBO1](#) [EVINVHPD2SICFS0108TOBO2](#)