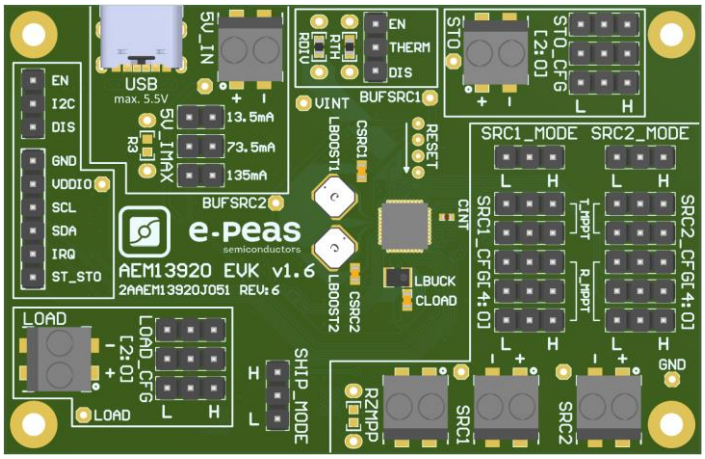
AEM13920
Quick Start Guide EVK



FEATURES

Connectors

- 2 screw connectors for the sources.
- 1 screw connector for the storage element.
- 1 screw connector for the application circuit.
- 1 screw connector for RZMPP.
- 1 screw connector for 5 V DC power input.

Configuration

- 1 header SRCx_MODE per source to define the source voltage regulation mode.
- 5 headers SRCx_CFG[4:0] per source to configure the source voltage regulation.
- 3 headers STO_CFG[2:0] to define the storage element protection levels.
- 3 headers LOAD_CFG[2:0] to configure the application circuit regulated voltage.
- 1 header THERM to enable/disable the thermal monitoring.
- 1 header to enable/disable the I²C functionalities.
- 1 header (6 pins) to connect the I²C communication related pins.
- 3 headers to configure the 5 V charge current.
- 1 header to enable/disable the shipping mode.

Size

- 76mm x 49mm.
- 4 x M2.5 mounting holes.

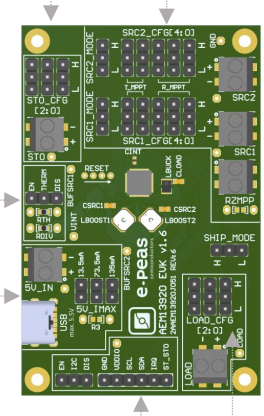
SUPPORT PCB

BOM around the AEM13920

	Designator	Description	Quantity	Manufacturer	Part Number
Mandatory	U1	AEM13920	1	e-peas	order at sales@e-peas.com
	Storage Element	Min. voltage 2.4 V Max. voltage 5.0 V	1	To be defined by user.	
	CINT	Ceramic capacitor 10 µF, 6.3 V, 20%, X5R, 0402	1	Murata	GRM155R60J106ME44D
	CSRC1	Ceramic capacitor 22 µF, 10 V, 20%, X5R, 0603	1	Murata	GRM188R61A226ME15D
	LBOOST1	Power Inductor 33 µH - 0.68 A	1	Coilcraft	LPS4018-333MRB
Optional	RZMPP	Resistor	1	To be defined by user.	
	CSRC2	Ceramic capacitor 22 µF, 10 V, 20%, X5R, 0603	1	Murata	GRM188R61A226ME15D
	LBOOST2	Power inductor 33 µH - 0.68 A	1	Coilcraft	LPS4018-333MRB
	R_5VIMAX	Resistor	1	To be defined by user.	
	CSTO	Ceramic capacitor 47 µF 6.3 V 20% X5R, 0603	1	Murata	GRM188R60J476ME15D
	CLOAD	Ceramic capacitor 22 µF, 10 V, 20%, X5R, 0603	1	Murata	GRM188R61A226ME15D
	LBUCK	Power inductor 10 µF	1	TDK	VLS252012CX-100M-1
	RSCL	Resistor 1 kΩ	1	Multicomp	MCWR06X1001FTL
	RSDA	Resistor 1 kΩ	1	Multicomp	MCWR06X1001FTL
	RDIV	Resistor 22 kΩ	1	Yageo	PNRC0402FR-0722KL
	RTH	10 kΩ NTC thermistor	1	Murata	NCP15XH103J03RC

Footprint & Symbol: Information available on the datasheet

STEP 1: Configure the AEM13920



- **Storage element voltages protection:** STO_CFG[2:0]

Configuration pins			Overdischarge voltage [V]	Charge ready voltage [V]	Overcharge voltage [V]	Battery Type
STO_CFG[2:0]			V_{OVDIS}	V_{CHRDY}	V_{OVCH}	
L	L	L	2.50	2.55	3.80	Lithium-ion Super Capacitor (LiC)
L	L	H	2.50	2.55	3.50	Lithium-ion Super Capacitor 85 °C (LiC)
L	H	L	3.00	3.30	4.12	Lithium-ion
L	H	H	3.00	3.30	3.90	Lithium-ion (long life)
H	L	L	3.50	3.55	3.90	Lithium-ion (super long life)
H	L	H	3.00	3.30	4.12	Lithium Polymer (LiPo)
H	H	L	2.80	3.10	3.63	Lithium Iron Phosphate (LiFePO4)
H	H	H	2.60	2.80	3.80	Tadiran HLC1020

- **SRC1 and SRC2 voltage regulation mode and associated configurations:** SRCx_MODE and SRCxCFG[4:0]

SRCx_MODE = L (constant voltage):

Configuration pins					Voltage [V]
SRCx_CFG[4:0]					$V_{SRCx,REG}$
L	L	L	L	L	0.14
L	L	L	L	H	0.30
L	L	L	H	L	0.36
L	L	L	H	H	0.42
L	L	H	L	L	0.48
L	L	H	L	H	0.51
L	L	H	H	L	0.525
L	L	H	H	H	0.54
L	H	L	L	L	0.555
L	H	L	L	H	0.57
L	H	L	H	L	0.60
L	H	L	H	H	0.66
L	H	H	L	L	0.72
L	H	H	L	H	0.735
L	H	H	H	L	0.75
L	H	H	H	H	0.765

Configuration pins					Voltage [V]
SRCx_CFG[4:0]					$V_{SRCx,REG}$
H	L	L	L	L	0.78
H	L	L	L	H	0.81
H	L	L	H	L	0.87
H	L	L	H	H	0.93
H	L	H	L	L	0.99
H	L	H	L	H	1.10
H	L	H	H	L	1.20
H	L	H	H	H	1.31
H	H	L	L	L	1.40
H	H	L	L	H	1.50
H	H	L	H	L	1.61
H	H	L	H	H	1.70
H	H	H	L	L	1.79
H	H	H	L	H	1.90
H	H	H	H	L	1.99
H	H	H	H	H	2.10

SRCx_MODE = H (MPPT):

Configuration pins			MPPT Ratio [%]
SRCx_CFG[2:0]			R_{MPPT}
L	L	L	35%
L	L	H	50%
L	H	L	65%
L	H	H	70%
H	L	L	75%
H	L	H	80%
H	H	L	85%
H	H	H	ZMPP (SRC1) / 100% (SRC2)

Configuration pins		Sampling Duration [ms]	Period [ms]
SRCx_CFG[4:3]		$T_{MPPT,SAMPLING}$	$T_{MPPT,PERIOD}$
L	L	2	128
L	H	8	512
H	L	32	2048
H	H	256	16384

- **Load configuration:** LOAD_CFG[2:0]

Configuration pins			LOAD voltage [V]
LOAD_CFG[2:0]			V_{LOAD}
L	L	L	Buck disabled
L	L	H	0.6
L	H	L	0.9
L	H	H	1.2
H	L	L	1.5
H	L	H	1.8
H	H	L	2.2
H	H	H	2.5[1]

1. This configuration is only available if $V_{OVDIS} \geq 2.5$ V.

- **5 V charger configuration**

Resistor [Ω]	Maximum Charging Current [mA]
R_{5V_IMAX}	$I_{5V,CC}$
370	135.0
680	73.5
1500	33.3
3700	13.5

- **Thermal monitoring:** connect the jumper THERM to EN/DIS to enable/disable the thermal monitoring feature.

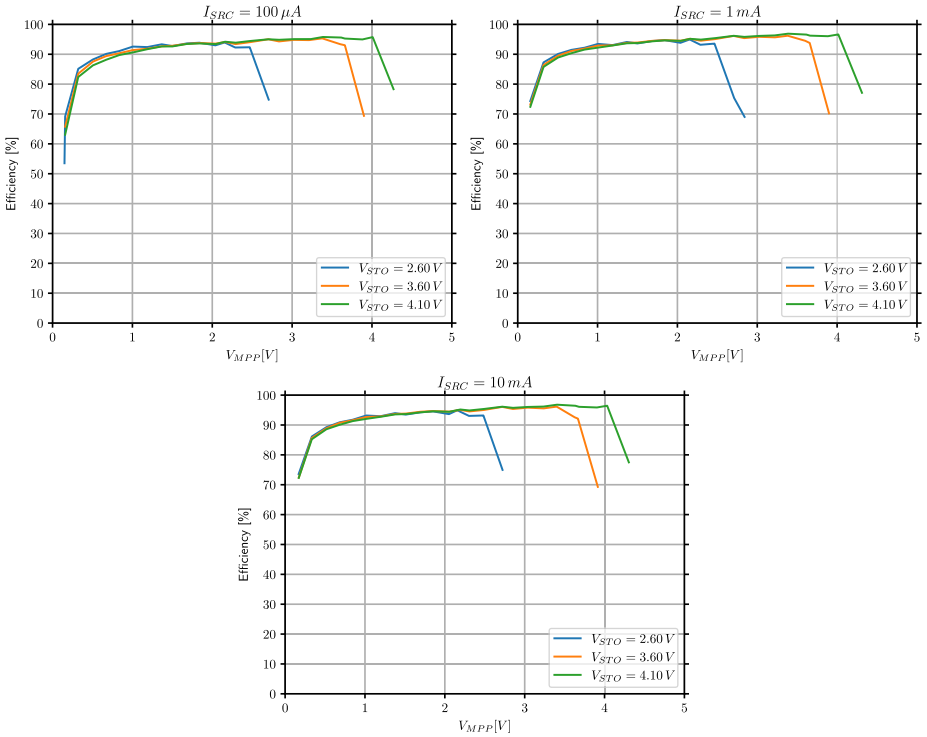
- **I²C communication:** all the configurations of the AEM, as well as various information, are available through I²C communication. See the datasheet for more details.

STEP 2: Connect the storage element with a voltage higher than 2.4 V.

STEP 3: Connect the source(s) or the 5 V power input.

STEP 4: Connect the application circuit.

- **Boost efficiency** (L_{BOOSTx} = 33 µH Coilcraft LPS4018-333MRB; boost timing x3):



- **Buck efficiency** (L_{BUCK} = 10 µH TDK VLS252012CX-100M-1; buck timing x2):