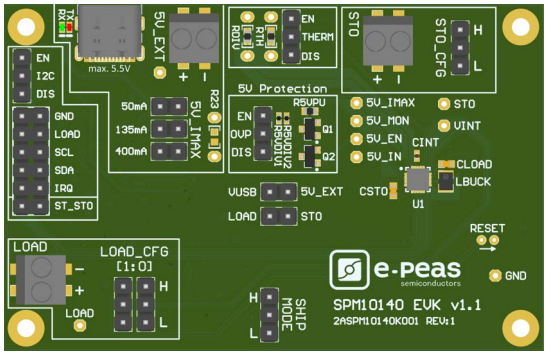
SPM10140 QFN-20 Evaluation Board



Features

Connectors

- 1 screw connector for the storage element (STO)
- 1 screw connector for the load output (LOAD)
- 1 screw connector for the 5 V power supply (5V_EXT)

Configurations

- 1 header STO_CFG to configure the storage element protection thresholds
- 2 headers LOAD_CFG[1:0] to configure the buck converter output (LOAD) voltage
- 1 header I2C to enable/disable the I²C functionalities
- 1 header (2x6-pins) to connect the I²C communication pins and ST_STO pin
- 1 header to connect LOAD to STO to use the I²C functionalities when LOAD is disabled
- 3 headers to configure the 5 V charger maximum current
- 1 header OVP to enable/disable the 5 V input protection circuit
- 1 header to connect VUSB with 5V_EXT
- 1 header THERM to enable/disable the thermal monitoring
- 1 header SHIP_MODE to enable/disable the shipping mode

Reset

- 2 reset pads (short each pad to GND following the direction of the arrow to reset the SPM10140)

Size

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

BOM

Designator	Description	Qty	Manufact.	Part Number
U1	SPM10140, QFN 20-pin, 3 x 3 mm	1	e-peas	10SPM10140K0000
CINT	Ceramic capacitor 10 µF, 6.3 V, 20%, X5R, 0402	1	Murata	GRM155R60J106ME
CSTO	Ceramic capacitor 47 µF 6.3 V 20% X5R, 0603	1	Murata	GRM188R60J476ME
LBUCK	Power inductor 10 µH	1	TDK	VLS252012CX-100M-1
CLOAD	Ceramic capacitor 22 µF, 10 V, 20%, X5R, 0603	1	Murata	GRM188R61A226ME
C5VIN	Ceramic capacitor 47 µF 6.3 V 20% X5R, 0603	1	Murata	GRM188R60J476ME
R5VIN	Resistor 1 Ω	1	Vishay	CRCW08051R00FK
Q1	Power MOSFET, P channel	1	Diodes Inc.	DMG2305UX
Q2	Power MOSFET, N channel	1	Diodes Inc.	BSS138-7-F
R5VDIV1	Resistor 44.2 kΩ	1	Yageo	RC0402FR-0744K2L
R5VDIV2	Resistor 10 kΩ	1	Yageo	RC0402FR-0710KL
R5VPU	Resistor 1 kΩ	1	Multicomp	MCWR06X1001FTL
RSCL	Resistor 1 kΩ	1	Multicomp	MCWR06X1001FTL
RSDA	Resistor 1 kΩ	1	Multicomp	MCWR06X1001FTL
RDIV	Resistor 22 kΩ	1	Yageo	RC0402FR-0722KL
RTH	10 kΩ NTC thermistor	1	Murata	NCP15XH103J03RC

Table 1: Evaluation board BOM

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1. Power-On Procedure

- STEP 1: Configure the SPM10140 (as described in Section 2)
- STEP 2: Connect the storage element on STO (V_{STO} ≥ 1.50 V)
- STEP 3: Connect the application circuit on LOAD
- STEP 4: Connect the 5 V charger

2. SPM10140 Configuration

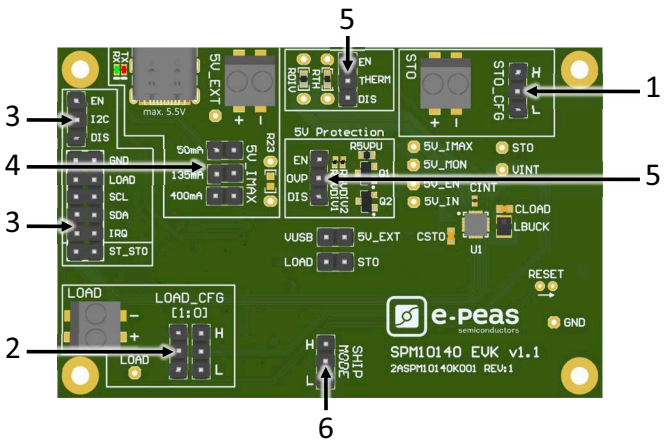


Figure 1: Configuration diagram

2.1. Storage Element Protection Thresholds

Configuration pin	Overdischarge voltage [V]	Charge-ready voltage [V]	Overcharge voltage [V]	Storage element type
STO_CFG	V_{OVDIS}	V_{CHRDY}	V_{OVCH}	
L	2.50	2.60	3.80	Lithium-ion Super Capacitor (LiC)
H	3.00	3.20	4.15	Lithium-ion Battery

Table 2: Storage element thresholds configuration with STO_CFG pin

Configuration pin	Buck charge-ready voltage [V]			Storage element type
STO_CFG	$V_{CHRDY,BUCK}$ for V_{LOAD} = 2.20 V	$V_{CHRDY,BUCK}$ for V_{LOAD} = 2.80 V	$V_{CHRDY,BUCK}$ for V_{LOAD} = 3.30 V	
L	2.60	2.90	3.40	Lithium-ion Super Capacitor (LiC)
H	3.20	3.20	3.50	Lithium-ion Battery

Table 3: Buck charge-ready threshold configuration with STO_CFG pin

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Configuration pin	Minimum charging temperature [°C]	Maximum charging temperature [°C]	Minimum discharging temperature [°C]	Maximum discharging temperature [°C]
STO_CFG	TEMPCOLDCH	TEMPHOTCH	TEMPCOLDDIS	TEMPHOTDIS
L	-15	60	-15	60
H	0	45	0	45

Table 4: Temperature thresholds configuration with STO_CFG pin with the recommended R_{DIV} and R_{TH}

NOTE: The STO_CFG pin is read HIGH by the SPM10140 if left floating.

2.2. LOAD Output Voltage

Configuration pins		LOAD voltage [V]
LOAD_CFG[1:0]		V_{LOAD}
L	L	LOAD disabled
L	H	2.20
H	L	2.80
H	H	3.30

Table 5: LOAD voltage configuration with LOAD_CFG[1:0] pins

NOTE: The LOAD_CFG[1:0] pins are read HIGH by the SPM10140 if left floating.

CAUTION: The voltage on the LOAD pin (V_{LOAD}) is used by the SPM10140 as the I²C bus supply. If disabling the buck converter output (LOAD) by setting LOAD_CFG[1:0] to LL, the user must apply an external voltage to the LOAD pin for the I²C communication to be used. See Section 2.3 for additional details.

2.3. I²C Communication

The I²C communication lets the application MCU control every setting and access SPM10140 data.

The I²C bus supply is the buck converter output voltage (V_{LOAD}). If the buck converter is disabled (LOAD_CFG[1:0] = LL), V_{LOAD} must be supplied externally, either with an external voltage less than or equal to V_{STO}, or directly by shorting the LOAD pin to the STO pin. The SPM10140 EVK provides a facility header "LOAD - STO" that allows to do so directly by installing a jumper, thus, setting the I²C high level to the storage element voltage (V_{STO}). See the SPM10140 datasheet for more details.

To enable the I²C interface, place a jumper on the I2C header in EN position.

The SPM10140 I²C pins can be accessed directly on the 2x6-pin header (on the EVK edge side), or through the USB-C connector. In this case, install jumpers on LOAD, SCL, SDA, and IRQ to connect the SPM10140 I²C pins to the I²C-to-USB converter mounted on this evaluation board.

Please note that while ST_STO shares the same header as the I²C pins, its power domain is V_{STO} instead of V_{LOAD}.

2.4. 5 V Charger

The 5 V charger current is configured between 50 and 400 mA thanks to R_{5V_IMAX} connected between 5V_IMAX and GND, with the following formula:

$$I_{5V,CC} = \frac{60}{R_{5V_IMAX}}$$

This current can be configured either by installing a jumper on one of the three dedicated headers, or by mounting R23 resistor with the desired value.

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The 5 V charger can be connected to the SPM10140 directly or through the overvoltage protection circuit (OVP) mounted on this evaluation board. This overvoltage protection circuit allows protecting the SPM10140 if the power supply connected to 5V_EXT exceeds 5.50 V.

Connect a jumper between OVP and DIS to disable the protection circuit, thus connecting 5V_EXT directly to the SPM10140 5V_IN pin, or connect a jumper between OVP and EN to enable the protection circuit.

A second jumper allows for connecting the USB-C supply (VUSB) to 5V_EXT. Simply connect a jumper between VUSB and 5V_EXT to supply the SPM10140 5 V charger with the USB-C or leave this header floating to disconnect them.

2.5. Thermal Monitoring

Connect a jumper between THERM and EN to enable the SPM10140 thermal monitoring feature.

If enabled, the temperature protection thresholds are configured as described in Table 4 if the GPIO configuration is used or configured according to the corresponding registers if the SPM10140 configuration is done through I²C (see the SPM10140 datasheet).

If the thermal monitoring is not required, it can be disabled by connecting a jumper between THERM and DIS.

NOTE: The THERM header must not be left floating.

2.6. Shipping Mode

The shipping mode feature can be enabled by connecting SHIP_MODE to H or disabled by connecting SHIP_MODE to L.

NOTE: The SHIP_MODE header must not be left floating.

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3. Revision History

EVK Version	User Guide Revision	Date	Description
1.1	1.0	October, 2026	Update to EVK v1.1.
1.0	1.0	September, 2026	Creation of the document.

Table 6: Revision history

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