

FEATURES

- 0.8 V – 1.6 V input voltage range
- 1.4 V – 1.8 V output voltage range
- 100 mA continuous load operation
- Integrated inductor
- 5 MHz switching frequency
- Soft-Start, OTP, SCP, cycle by cycle current limit
- Test points and sockets for VIN, VOUT and GND
- 7.9mm coin cell battery holder

APPLICATIONS

- Hearing aids and wearables
- IoT sensors
- Single- and double-cell PV applications

DESCRIPTION

The LMU20P1-EVB is a fully assembled and tested printed circuit board that demonstrates the LMU20P1 miniaturized step-up Power Supply in Package (PSiP). The LMU20P1 itself, offers small size, high efficiency and includes an integrated circuit and an inductor in a compact 2 mm x 2 mm x 0.75 mm package.

The LMU20P1 has a light-load efficiency enhancement function to achieve high efficiency across a wide load range and features a range of protection circuits that include soft start, over-temperature protection, short-circuit protection, and cycle-by-cycle current limit.

The evaluation board is equipped with test points and jumpers for testing most of the functionality of the device. There are also probing holes on critical nodes for precise measurements.

TYPICAL APPLICATION

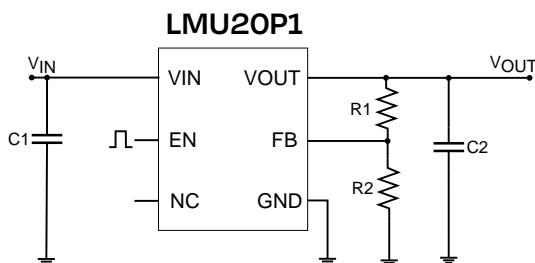


Figure 1: LMU20P1 application schematic

- C1 is the input capacitor
- C2 is the output capacitor
- R1 and R2 are the feedback resistors

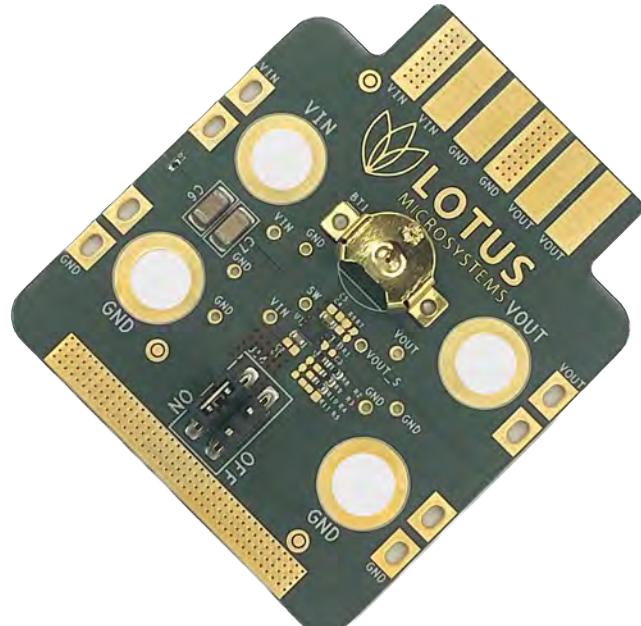


Figure 2: LMU20P1-EVB evaluation board

EVALUATION BOARD SPECIFICATIONS

All values are measured or simulated at $T_A = +25^\circ\text{C}$, $C_{IN} = C_{IN} = 10 \mu\text{F}$, $V_{IN} = V_{EN} = 1.5 \text{ V}$, $V_{OUT} = 1.6 \text{ V}$, unless otherwise noted.

Table 1: LMU20P1-EVB specifications

Specification	Symbol	Conditions & Notes	Min	Typ	Max	Unit
Input Quiescent Current	$I_{Q_IN_SD}$	EN=LOW		0.18		μA
	$I_{Q_IN_NSW}$	EN=HIGH, non-switching		0.7		μA
Input Voltage Range	V_{IN}		0.8	1.6		V
Input Start-up Voltage	V_{IN_STRT}			0.8		V
Output Voltage Accuracy		PWM			± 2	%
		PFM (Does not include feedback resistors tolerance)			± 3	%
Switching Frequency	f_{sw}			5.0		MHz
Output Voltage Range	V_{OUT}		1.4	1.8		V

BOARD DESCRIPTION

Figures 3 and 4, below, show the top view and the top layer assembly of the LMU20P1-EVB. The left side of the board contains the input and ground connectors, while the right side of the board contains the output connectors. The lower side contains the jumpers that enables the LMU20P1. The upper side socket connector is used for internal purposes only.

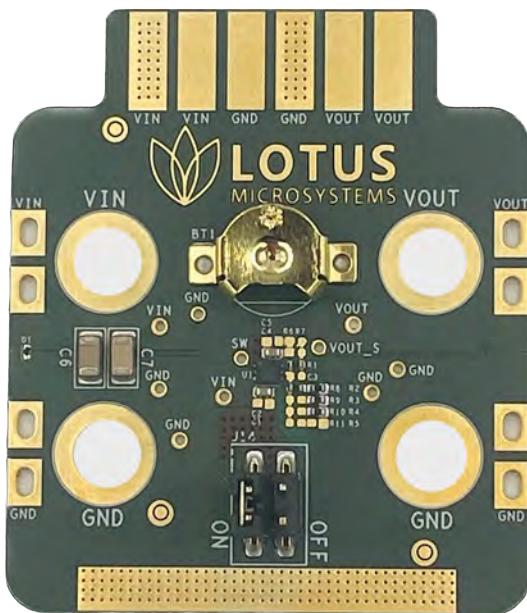


Figure 3: LMU20P1-EVB top layer assembly

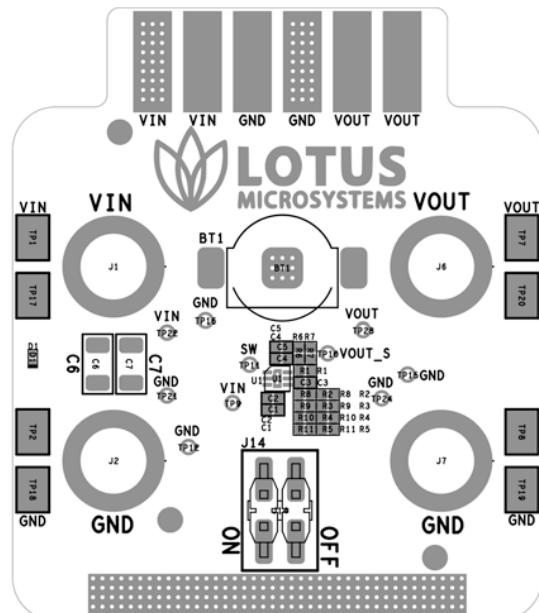


Figure 4: LMU20P1-EVB top layer layout

DETAILED HARDWARE DESCRIPTION

INPUT AND OUTPUT TERMINALS

The input voltage source of the LMU20P1-EVB can be connected to TP17 and TP1 or to J1 (not mounted), which enables installation of an optional banana jack terminal. In the same way, TP20, TP7 and J6 (not mounted) provide for a terminal to the output voltage. LMU20P1-EVB also provides for an optional coin cell battery holder (BT1) for portable application testing. BT1 must not be connected at the same time as the other input terminals to different voltage sources.

DEVICE ENABLING AND DISABLING

The LMU20P1 is enabled or disabled by J14, connected to the EN pin of the device. Only one of the sides of J14 should be connected. See table 2 for more information.

SETTING THE OUTPUT VOLTAGE

The evaluation board output voltage is set to 1.8 V by default. Use resistors R2 to R5 and R8 to R11 in order to set the desired voltage. Useful resistor footprints are set to mount the desired values. The tolerance of the feedback resistors is 1%.

SW PIN SWITCHING NODE

The LMU20P1 includes an SW pin which can be utilized for debugging and monitoring purposes through TP11. Under normal operation it should be left floating.

INPUT CAPACITORS AND PROTECTION

The LMU20P1-EVB includes C2 and C10 (not mounted) for the required input capacitance for the LMU20P1. They are located as close as possible to the device. C6 and C7 provide extra decoupling and filtering for cases where long wires or other noise or instability sources can affect the input voltage. The size of C6 and C7 depend on the application. The board also includes an ESD diode, D1, to provide protection at the board level.

OUTPUT CAPACITORS

The LMU20P1-EVB includes C4 and C5(not mounted) as the required output capacitance for the LMU20P1. They are located as close as possible to the device. Increasing the capacitance reduces the output voltage ripple and improves the transient response.

CONNECTORS AND JUMPERS

Table 2: LMU20P1-EVB connectors and jumpers

Pin	Name	Description
J1, TP1, TP17	VIN	Terminal. Connect input voltage source here
J6, TP7, TP20	VOUT	Terminal. Connect output load here
J2, J7, TP2, TP8, TP19	GND	Terminal. Connect ground here
J14	ON/OFF	Short pins 1 and 2 (ON) / Short pins 3 and 4 (OFF)
BT1	BT1	Optional coin cell battery connector for the input source

QUICK START PROCEDURE

- Before connecting any equipment to the board set J14 to the OFF position.
- Set the feedback resistors according to the schematic of figure 5 to set the desired output voltage.
- Connect any testing equipment and load.
- Set J14 to the ON position.
- Turn on the equipment, such as input source, current meters and load.

SCHEMATIC

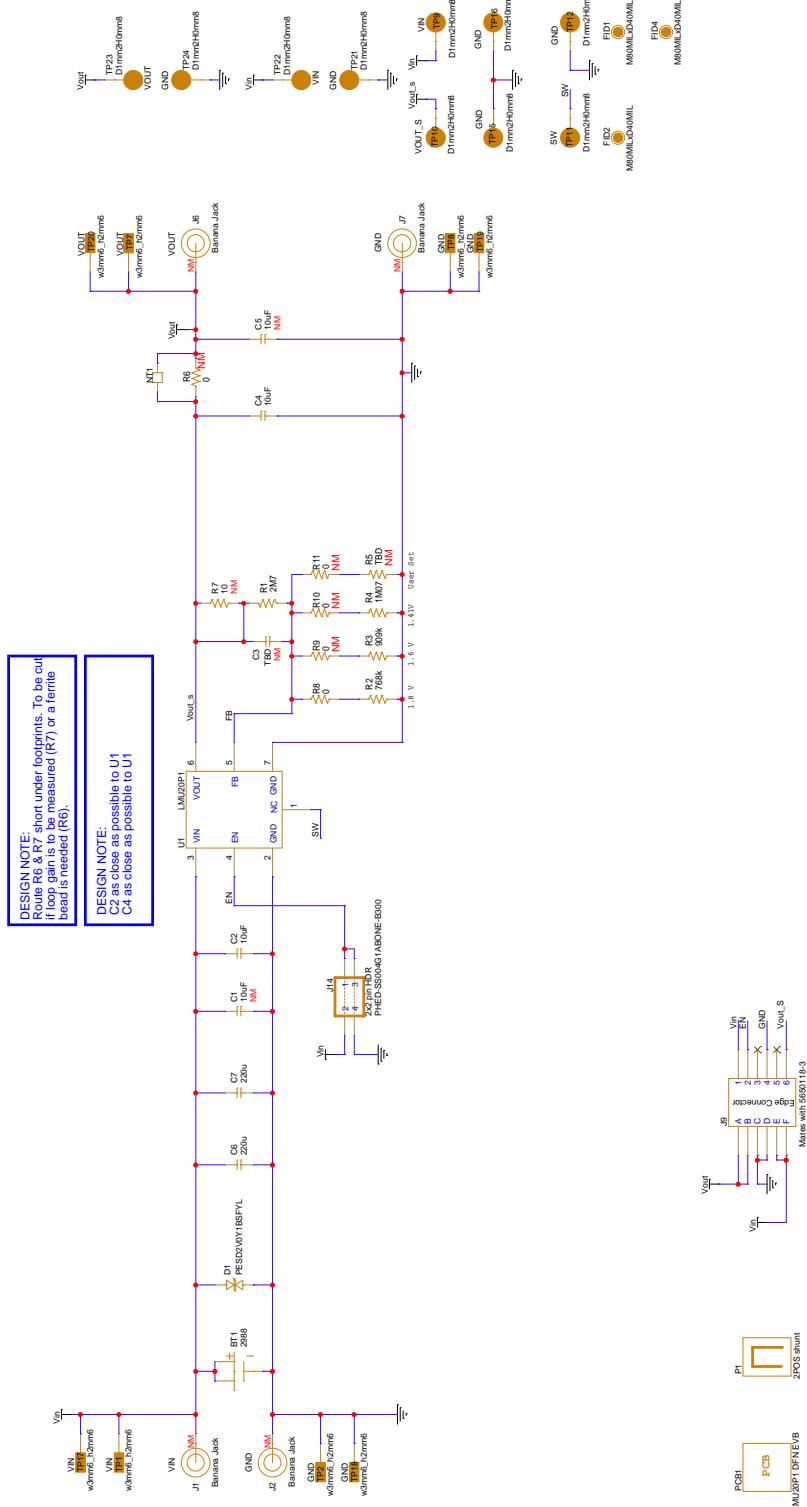


Figure 5: LMU20P1-EVB schematic

BILL OF MATERIALS

Table 3: LMU20P1-EVB bill of materials

Designator	Placing	Quantity	Description	Manufacturer	Part number
BT1	Mounted	1	BAT_2988TR	Keystone Electronics	2988TR
C1,C5	Not Mounted	2	CAP CER 10UF 6V3 X5R 0402	Murata	GRM155R60J106ME05J
C2,C4	Mounted	2	CAP CER 10UF 6V3 X5R 0402	Murata	GRM155R60J106ME05J
C3	Mounted	1	TBD		
C6,C7	Mounted	2	CAP CER 220UF 2.5V X6S 1206	Murata	GRM31CC80E227ME11
D1	Mounted	1	TVS DIODE 2VWM 3VC DSN0603-2	Nexperia	PESD2V0Y1BSFYL
J1,J2,J6,J7	Not Mounted	4	BANANA VERTICAL CONNECTOR	Keystone Electronics	575-8
J14	Mounted	1	CONN HEADER SMD 4POS 2.54MM	Superior Tech	PHED-SS004G1ABONE-B300
P1	Mounted	1	JUMPER W/TEST PNT 1X2PINS 2.54MM	Sullins Connector Solutions	QPC02SXGN-RC
R1	Mounted	1	RES 2.7M OHM 1% 1/16W 0402	Yageo	RC0402FR-072M7L
R2	Mounted	1	RES 768k OHM 1% 1/16W 0402	Yageo	RC0402FR-07768KL
R3	Mounted	1	RES 909k OHM 1% 1/16W 0402	Yageo	RC0402FR-07909KL
R4	Mounted	1	RES 1M07 OHM 1% 1/16W 0402	Yageo	RC0402FR-071M07L
R5	Not Mounted	1	RES TBD 0402		
R6,R9,R10,R11	Not Mounted	4	RES 0 OHM JUMPER 1/16W 1A 0402	Yageo	RC0402FR-070RL
R7	Not Mounted	1	RES 10 OHM 1% 1/16W 0402	Yageo	RC0402FR-0710RL
R8	Mounted	1	RES 0 OHM JUMPER 1/16W 1A 0402	Yageo	RC0402FR-070RL
U1	Mounted	1	100mA Synchronous Boost Converter	Lotus Microsystems	LMU20P1

PCB LAYOUT

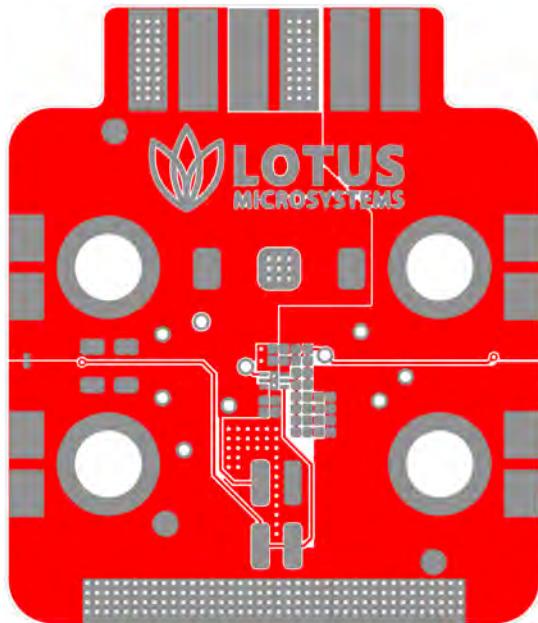


Figure 6: LMU20P1-EVB top layer layout

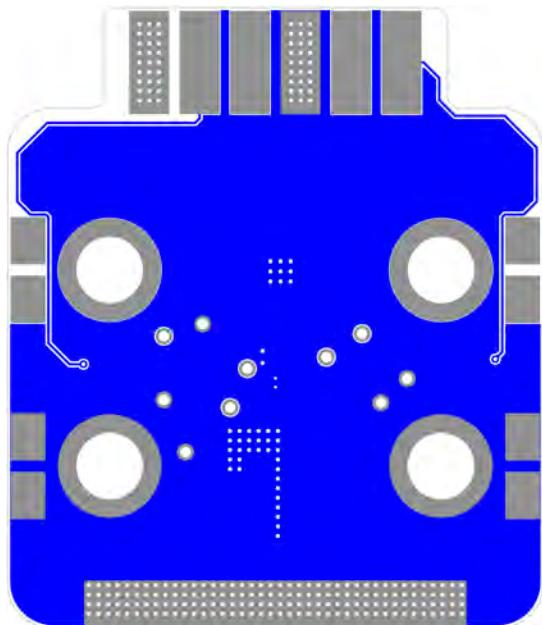


Figure 7: LMU20P1-EVB bottom layer layout (not mirrored)

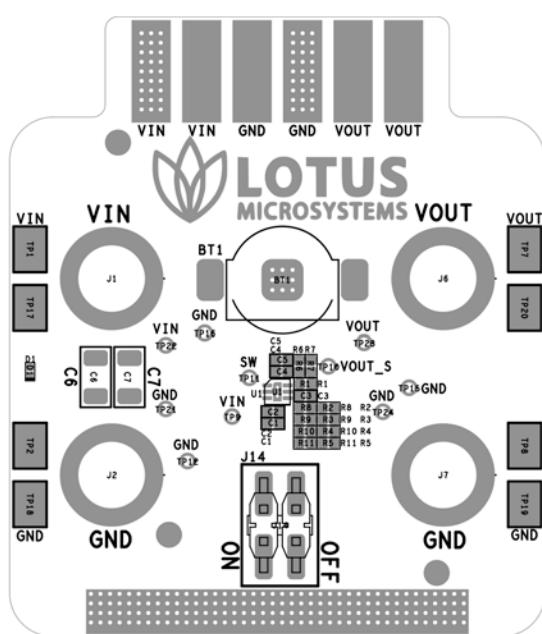


Figure 8: LMU20P1-EVB top layer assembly

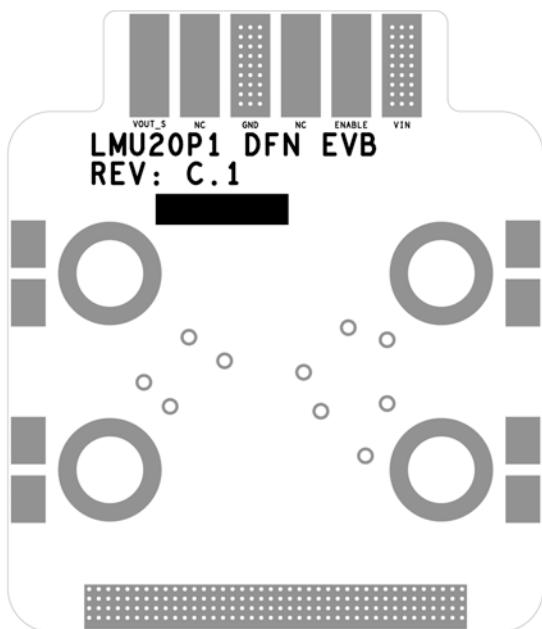


Figure 9: LMU20P1-EVB bottom layer assembly (mirrored)

REVISION HISTORY

Revision Number	Revision Date	Description	Pages Changed
0.9	28/02/2024	Preliminary release	-
0.91	07/03/2024	Update EVB picture	1,2
1.0	09/04/2025	Clean up for public release	-

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