EVM4730-PQ-00A

2.8V to 22V V_{IN}, Max 1A, 4-Switch Integrated Buck-Boost Module Evaluation Board

DESCRIPTION

The EVM4730-PQ-00A is an evaluation board designed to demonstrate the capabilities of the MPM4730, a 2.8V to 22V input voltage (V_{IN}) range, synchronous, four-switch integrated buck-boost module, with regulated output voltage (V_{OUT}) and high efficiency.

The MPM4730 provides automatic pulse-frequency modulation (PFM)/pulse-width modulation (PWM) mode or forced PWM mode. The device also provides selectable switching frequency (f_{SW}) and configurable soft start (SS). Full protection features include over-current protection (OCP), over-voltage protection (OVP), under-voltage protection (UVP), and thermal shutdown.

It is recommended to read the MPM4730 datasheet prior to making any changes to the EVM4730-PQ-00A.

PERFORMANCE SUMMARY (1)

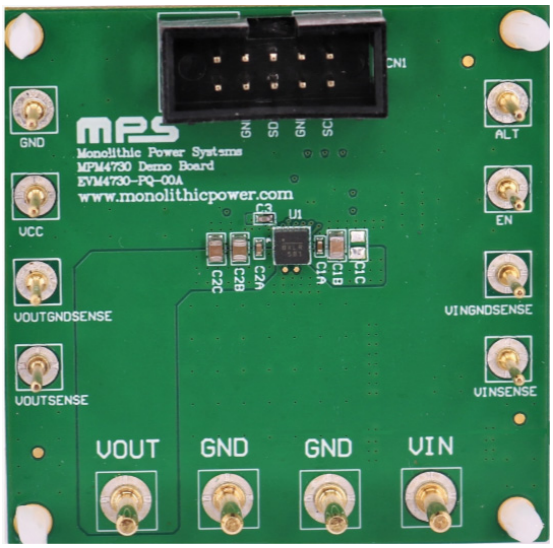
Specifications are at T_A = 25°C, unless otherwise noted.

Parameters	Conditions	Value
Input voltage (V_{IN}) range	Default configuration	2.8V to 22V
Output voltage (V_{OUT})	Default configuration	15V
Maximum output current (I_{OUT})	V_{IN} = 2.8V to 22V	1A
Typical efficiency	V_{IN} = 12V, V_{OUT} = 15V, I_{OUT} = 1A, f_{SW} = 500kHz	95.7%
Peak efficiency	V_{IN} = 12V, V_{OUT} = 15V, I_{OUT} = 0.4A, f_{SW} = 500kHz	96.4%
Switching frequency (f_{SW})	Default configuration	500kHz

Note:

1) For different V_{IN} and V_{OUT} specifications with different output capacitors, a change in the application circuit's parameters may be required.

EVALUATION BOARD



LxWxH (5.1cmx5.1cmx1.6mm)

Board Number	MPS IC Number
EVM4730-PQ-00A	MPM4730GPQ

QUICK START GUIDE

The EVM4730-PQ-00A evaluation board is designed to evaluate the performance of the MPM4730. Refer to Figure 1 and follow the steps below to quickly set up the board:

1. Preset the power source (V_{IN}) between 2.8V and 22V. (2)
2. Turn off the power source off.
3. Connect the power source terminals to:
   a. Positive (+): VIN
   b. Negative (-): GND
4. Connect the load terminals to: (3)
   a. Positive (+): VOUT
   b. Negative (-): GND
5. After making the connections, turn on the power supply. The board should start up automatically.
6. Check for the proper output voltage (V_{OUT}) from the VOUTSENSE and VOUTGNDSENSE turrets.
7. Once the proper V_{OUT} is established, adjust the load within the operating range, and measure the efficiency, V_{OUT} ripple, and other parameters. Do not use the long ground lead on the oscilloscope probe when measuring the V_{OUT} ripple and V_{IN} ripple.

Notes:

2) Ensure that the V_{IN} does not exceed 22V.
3) The initial load should be set to 0A.

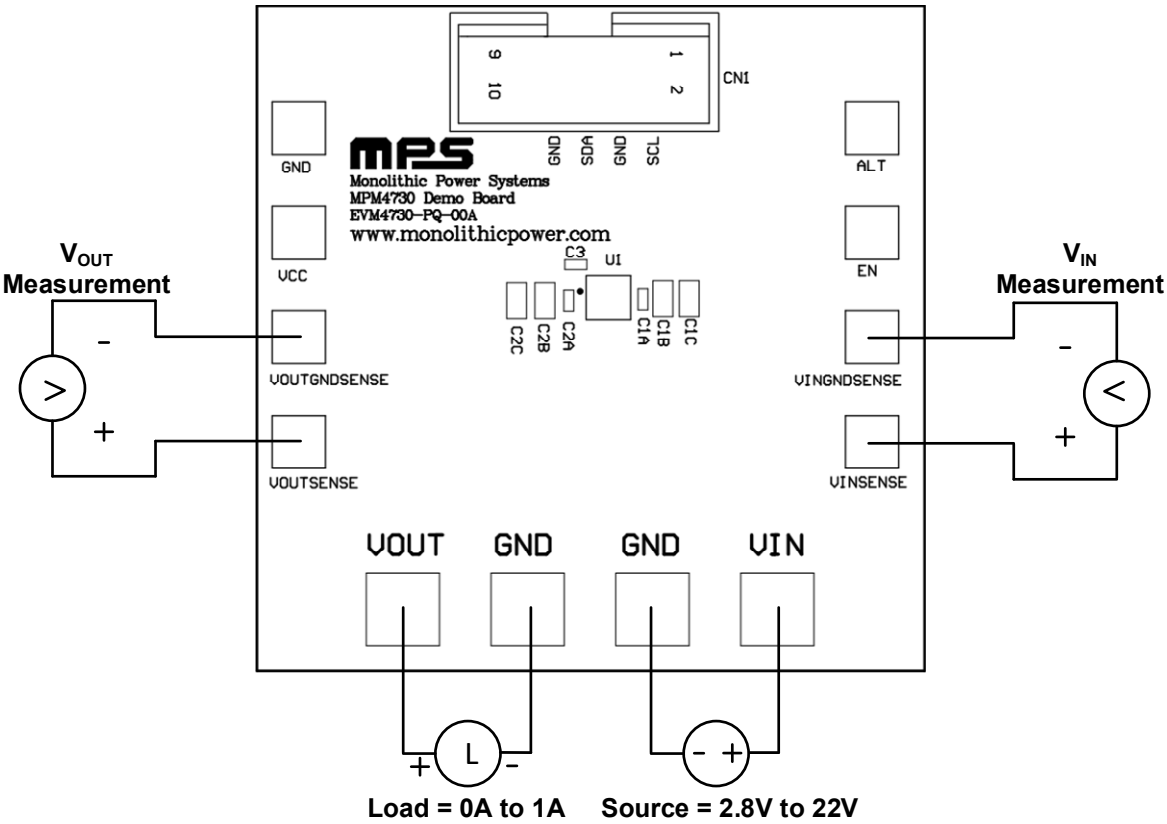


Figure 1: Measurement Equipment Set-Up

EVALUATION BOARD SCHEMATIC

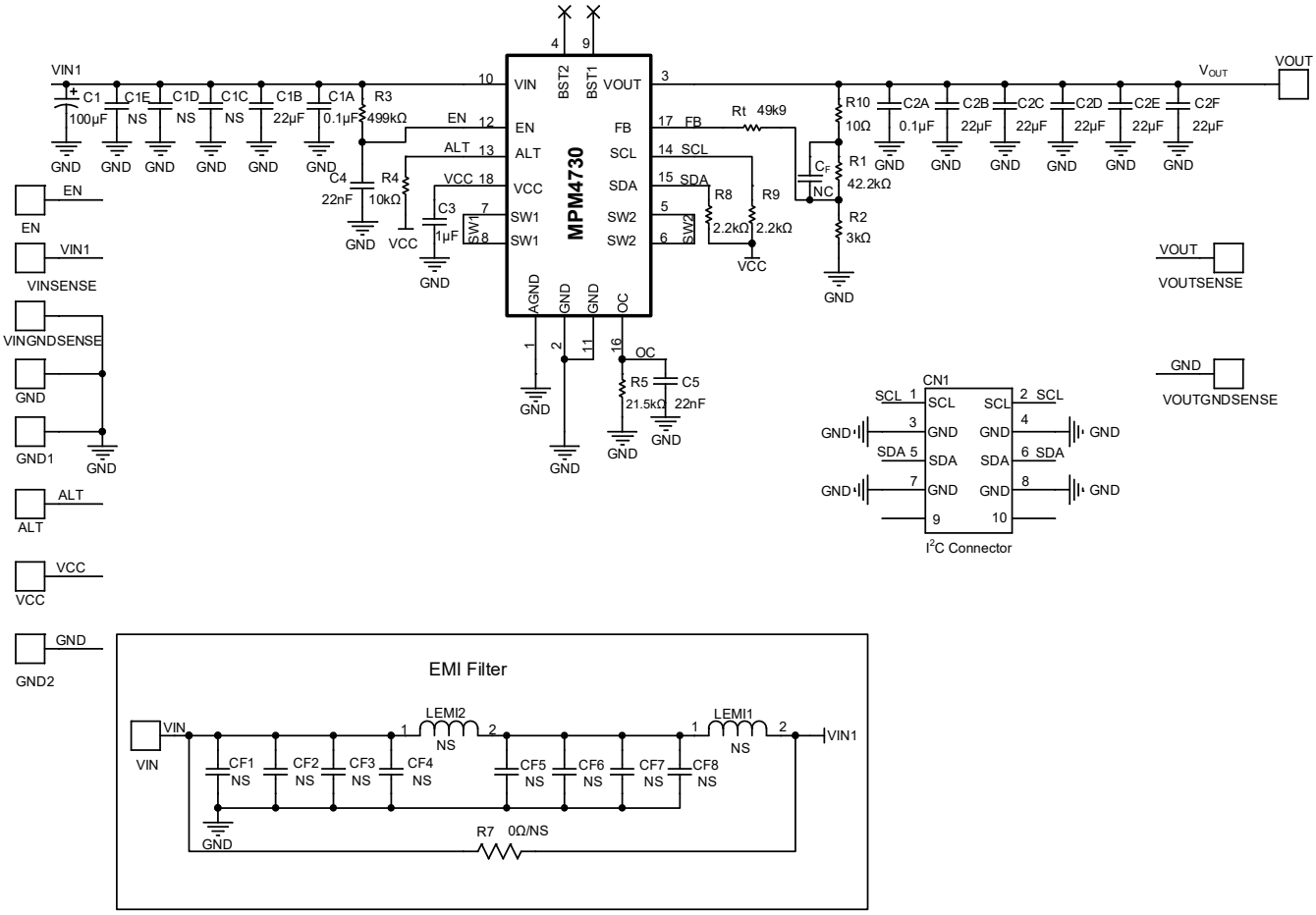


Figure 2: Evaluation Board Schematic

EVM4730-PQ-00A BILL OF MATERIALS

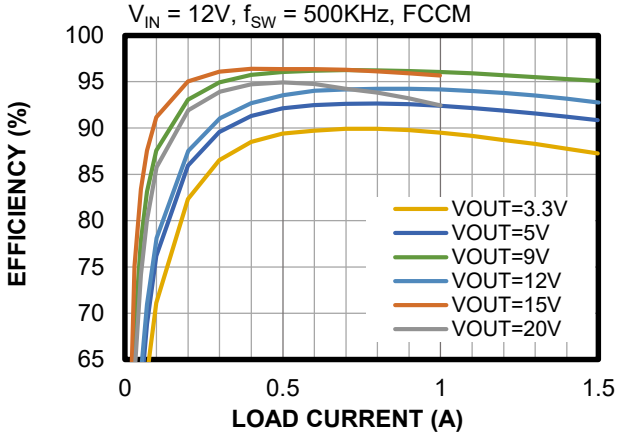
Qty	Ref	Value	Description	Package	Manufacturer	Manufacturer PN
6	C1B, C2B, C2C, C2D, C2E, C2F	22µF	Ceramic capacitor, 25V, X5R	0805	Murata	GRM21BR61E226ME44L
2	C1A, C2A	0.1µF	Ceramic capacitor, 25V, X7R	0402	Murata	GRM188R71E104KA01D
1	C3	1µF	Ceramic capacitor, 10V, X7R	0603	Wurth	885012206026
1	C1	100µF	Electrolytic cap，35V	SMD	Chemicon	EMZJ350ADA101MF80G
2	C4, C5	22nF	Ceramic capacitor, 50V, X5R	0603	Murata	GRM188R71H223KA01D
1	R3	499kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-07499KL
1	R5	21.5kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-0721K5L
2	R8, R9	2.2kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-072K2L
1	R10	10Ω	Film resistor, 1%	0603	Yageo	RC0603FR-0710RL
1	R1	42.2kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-0742.2KL
1	R2	3kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-073KL
1	R4	10kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-0710KL
1	Rt	49.9kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-0749K9L
1	R7	0Ω	Film resistor, 1%	2512	Yageo	RC2512FK-070RL
1	CN1	2.54mm	2-row, 5-pin I^2C connector	DIP	Wurth	612010235121
8	GND, VINSENSE, VINGNDSENSE, EN, ALT, VOUTGNDSENSE, VOUTSENSE, VCC	Φ1	Φ1.0 copper pin	DIP	Any	
4	VIN, VOUT, GND	Φ2	Φ2.0 copper pin	DIP	Any	
1	U1	MPM4730	2.8V to 22V buck-boost module	ECLGA-18 (3mmx 3mm)	MPS	MPM4730GPQ

EVB TEST RESULTS

Performance curves and waveforms are tested on the evaluation board. V_{IN} = 12V, V_{OUT} = 15V, C_{OUT} = 5 x 22µF ceramic capacitor, FCCM, f_{SW} = 500kHz, T_A = 25°C, unless otherwise noted.

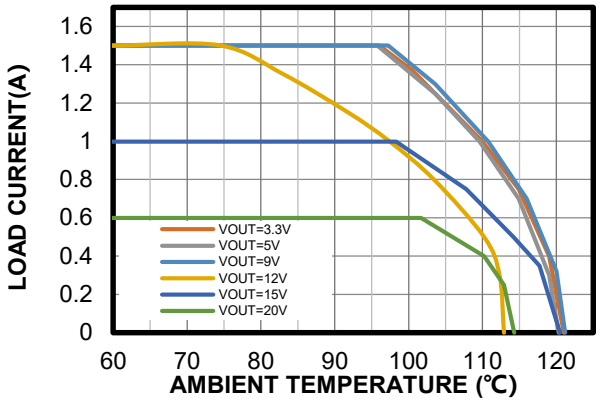
Efficiency vs. Load Current

V_{IN} = 12V, f_{SW} = 500KHz, FCCM



Thermal Derating

V_{IN} = 12V, f_{SW} = 500kHz, No Airflow

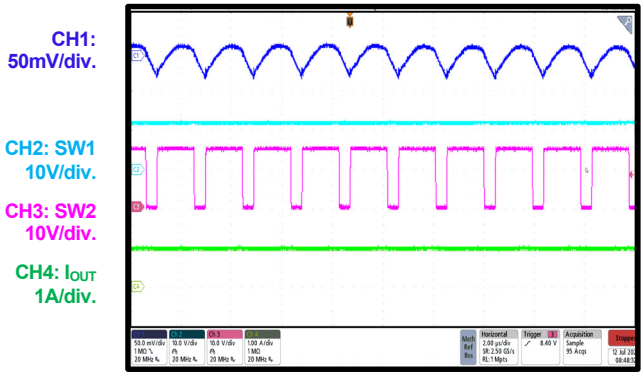


EVB TEST RESULTS *(continued)*

Performance curves and waveforms are tested on the evaluation board. V_{IN} = 12V, V_{OUT} = 15V, C_{OUT} = 5 x 22µF ceramic capacitor, FCCM, f_{SW} = 500kHz, T_A = 25°C, unless otherwise noted.

Steady State and Output Ripple

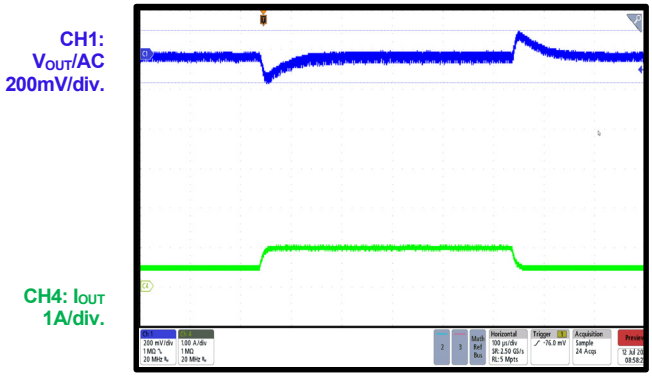
I_{OUT} = 1A



2µs/div.

Load Transient Output Ripple

I_{OUT} = 0.5A to 1A, slew rate = 150mA/µs e-load



100µs/div.

PCB LAYOUT

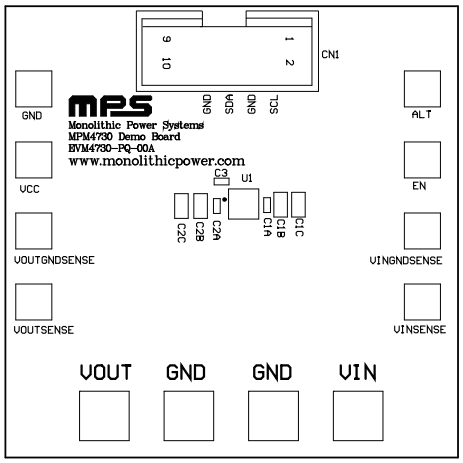


Figure 3: Top Silk

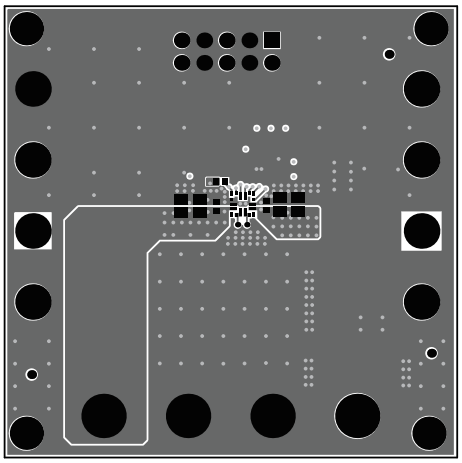


Figure 4: Top Layer

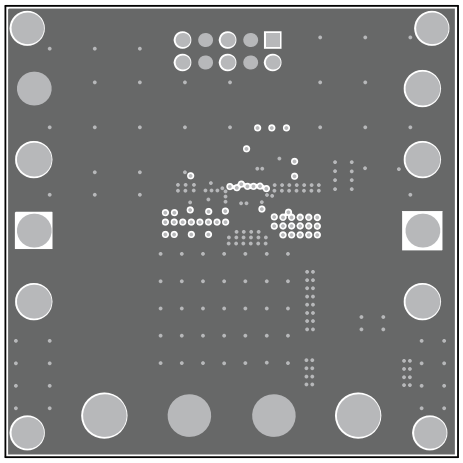


Figure 5: Mid-Layer 1

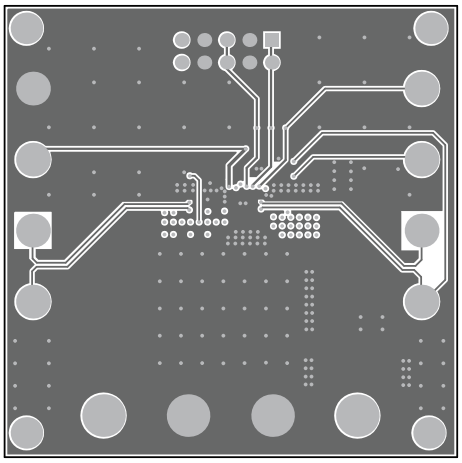


Figure 6: Mid-Layer 2

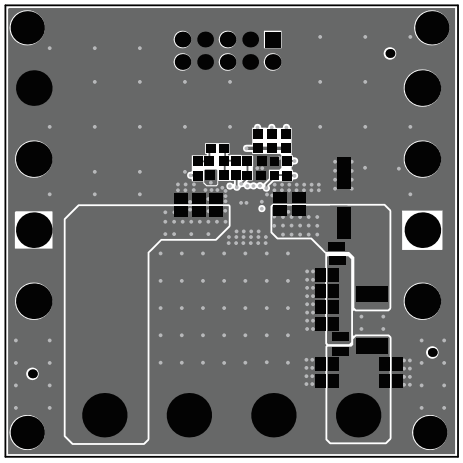


Figure 7: Bottom Layer

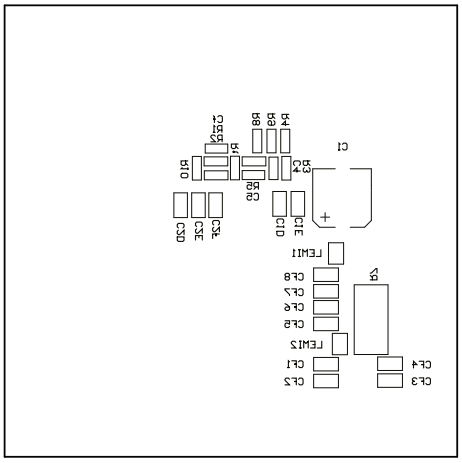


Figure 8: Bottom Silk

REVISION HISTORY

Revision #	Revision Date	Description	Pages Updated
1.0	9/29/2023	Initial Release	-