EVM3690-20A-BF-00A

16V, Dual 13A, High-Efficiency, Synchronous Step-Down Module Evaluation Board

DESCRIPTION

The EVM3690-20A-BF-00A evaluation board is designed to demonstrate the capabilities of the MPM3690-20A, a fully integrated, high-efficiency, synchronous, dual 13A output current (I_{OUT}), step-down power module.

The MPM3690-20A adopts internally compensated constant-on-time (COT) control to provide fast transient response and easy loop stabilization. The operating frequency can be set between 400kHz and 1MHz by connecting a resistor between f_{SET} and AGND. Refer to the MPM3690-20A datasheet for more detailed information.

It is recommended to read the MPM3690-20A datasheet prior to making any changes to the EVM3690-20A-BF-00A.

PERFORMANCE SUMMARY (1)

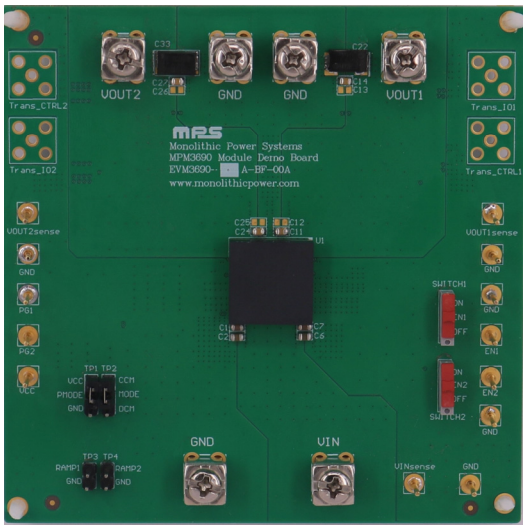
Specifications are at T_A = 25°C, unless otherwise noted.

Parameters	Conditions	Value
Input voltage (V_{IN}) range		3.2V to 16V (2)
Output voltage (V_{OUT})	V_{IN} = 3.2V to 16V, I_{OUT} = 0A to 13A	1.2V
Maximum output current (I_{OUT})	V_{IN} = 3.2V to 16V, V_{OUT} = 1.2V	13A
Full load efficiency (3)	V_{IN} = 12V, V_{OUT} = 1.2V, I_{OUT} = 13A, f_{SW} = 500kHz	92.45%
Peak efficiency (3)	V_{IN} =12V, V_{OUT} = 1.2V, I_{OUT} = 10A, f_{SW} = 500kHz	92.96%
Default switching frequency (f_{SW})		500kHz

Notes:

1) For different V_{IN} and V_{OUT} specifications with different output capacitors, the application circuit parameters may require changes.
2) When V_{IN} < 4V, an external 3.3V V_{CC} is required.
3) Only one channel is working; the other channel is off.

EVALUATION BOARD



LxWxH (10cmx10cmx1.5cm)

Board Number	MPS IC Number
EVM3690-20A-BF-00A	MPM3690GBF-20A

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QUICK START GUIDE

The EVM3690-20A-BF-00A evaluation board is easy to set up and use to evaluate the performance of the MPM3690-20A. For proper measurement equipment set-up, refer to Figure 1 and follow the steps below:

1. Preset the power supply (V_{IN}) between 4V and 16V, then turn off the power supply. (4)
2. Connect the power supply terminals to:
   a. Positive (+): VIN
   b. Negative (-): GND
3. Connect the load terminals to: (5)
   a. Positive (+): VOUT
   b. Negative (-): GND
4. After making the connections, turn on the power supply. The board should automatically start up.
5. Check for the proper output voltage (V_{OUT}) between the VOSENSE and VOGNDSEN terminals.
6. Once the proper V_{OUT} is established, adjust the load within the operating range and measure the efficiency, output ripple voltage, and other parameters. (5)
7. After completing all tests, adjust the load to 0A, then turn off the input power supply.

Notes:

4) Ensure that V_{IN} does not exceed 16V.
5) There is no initial load by default.
6) When measuring the output voltage ripple or input voltage ripple, do not use the oscilloscope probe's long ground lead.

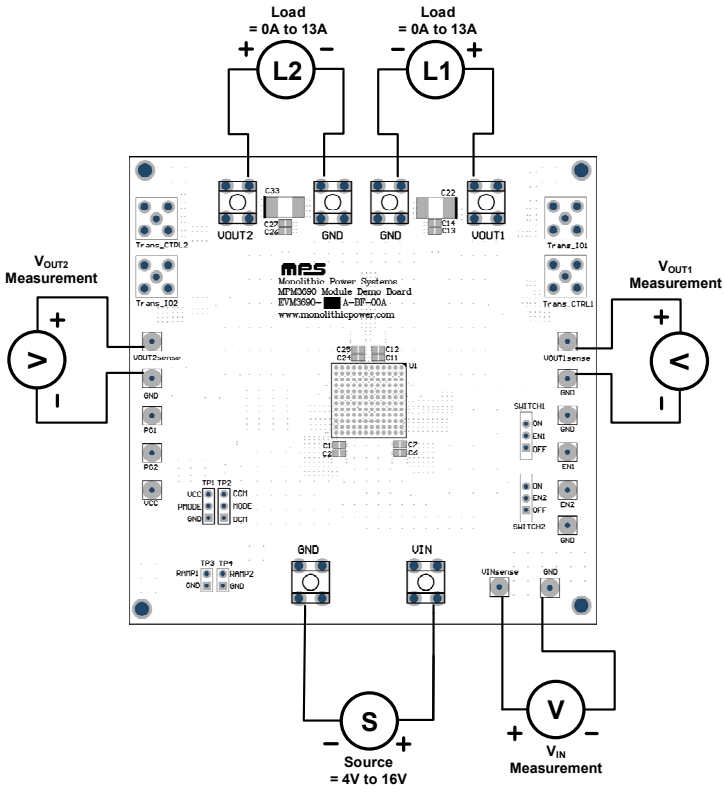

Figure 1: Proper Measurement Equipment Set-Up

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EVALUATION BOARD SCHEMATIC

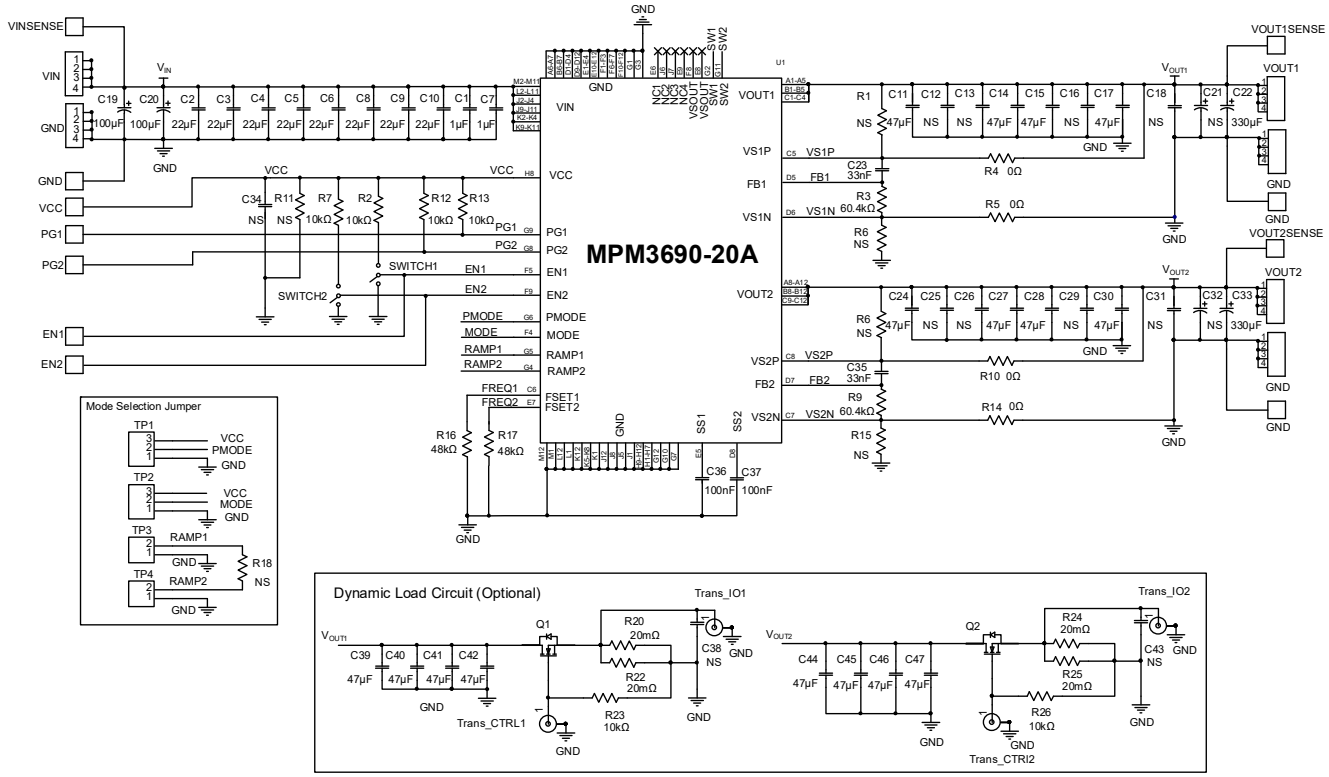

Figure 2: Evaluation Board Schematic

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EVM3690-20A-BF-00A BILL OF MATERIALS

Qty	Ref	Value	Description	Package	Manufacturer	Manufacturer PN
2	C19, C20	100µF	Surface-mount aluminum polymer capacitor, 25V	OSCON E7	Panasonic	25SVPF100M
8	C11, C14, C15, C17, C24, C27, C28, C30	47µF	Ceramic capacitor, 6.3V	0805	Murata	GRM21BR60J476ME15L
8	C2, C3, C4, C5, C6, C8, C9, C10	22µF	Ceramic capacitor, 25V	0805	Murata	GRM21BR61E226ME44L
2	C1, C7	1µF	Ceramic capacitor, 25V	0805	Murata	GRM219R71E105KA88D
2	C36, C37	100nF	Ceramic capacitor, 50V	0603	Murata	GRM188R71E104KA01D
2	C35, C23	33nF	Ceramic capacitor, 50V	0603	Wurth	885012206092
4	R4, R5, R10, R14,	0Ω	Resistor, 1%	0603	Yageo	RC0603FR-070RL
2	R16, R17	48kΩ	Resistor, 1%	0603	Yageo	RC0603FR-0748KL
4	R2, R7, R12, R13	10kΩ	Resistor, 1%	0603	Yageo	RC0603FR-0710KL
2	R3, R9	60.4kΩ	Resistor, 1%	0603	Yageo	RC0603FR-0760K4L
2	SWITCH1, SWITCH2	500mA	SPDT slide switch	10mmx 2.5mm	Wurth	450301014042
2	C22, C33	220µF	Tantalum capacitor, 6.3V, 15mΩ	SMD	Panasonic	EEFCX0J221R
1	U1	MPM3690-20A	16V, dual 13A, step-down module	BGA (16mmx 16mmx 5.18mm)	MPS	MPM3690-20AGLE

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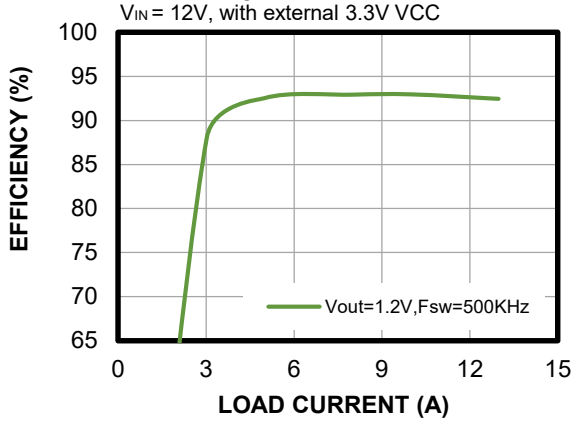
EVB TEST RESULTS

Performance curves and waveforms are tested on the evaluation board. V_{IN} = 12V, V_{OUT1} = V_{OUT2} = 1.2V, f_{SW1} = f_{SW2} = 500kHz, T_A = 25°C, unless otherwise noted.

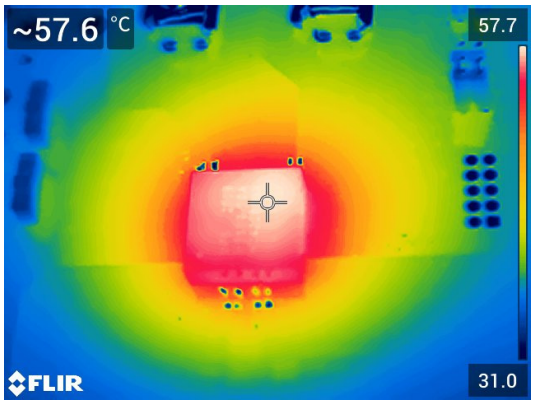
Efficiency vs. Load Current

V_{IN} = 12V, with external 3.3V VCC



Thermal Performance

I_{OUT1} = I_{OUT2} = 13A, no forced airflow, T_A = 28°C, T_{CASE} = 57.6°C



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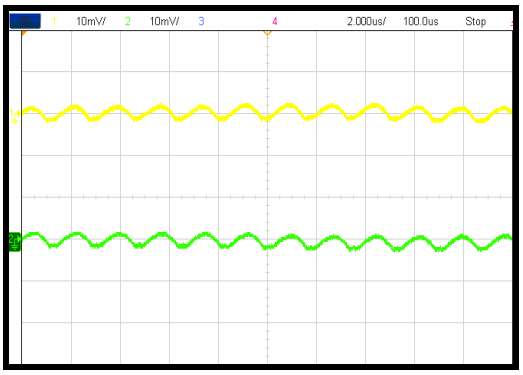
EVB TEST RESULTS *(continued)*

Performance curves and waveforms are tested on the evaluation board. V_{IN} = 12V, V_{OUT1} = V_{OUT2} = 1.2V, f_{SW1} = f_{SW2} = 500kHz, T_A = 25°C, unless otherwise noted.

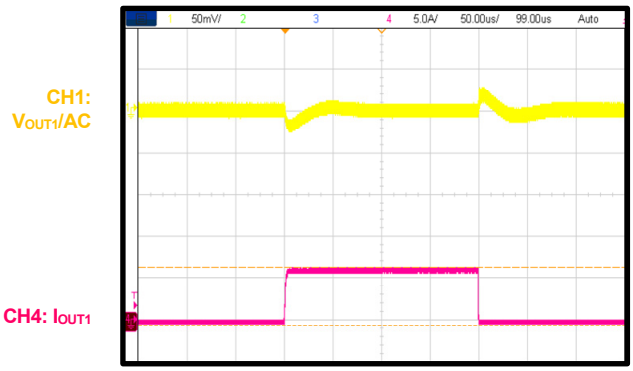
Steady State

I_{OUT1} = I_{OUT2} = 13A



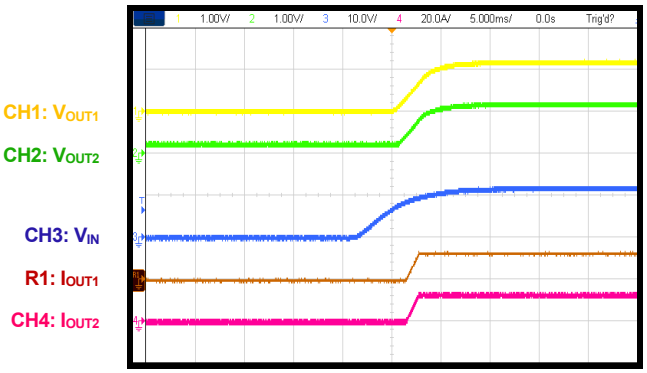
Load Transient Ripple

I_{OUT1} = 0A to 6.5A, slew rate = 10A/μs



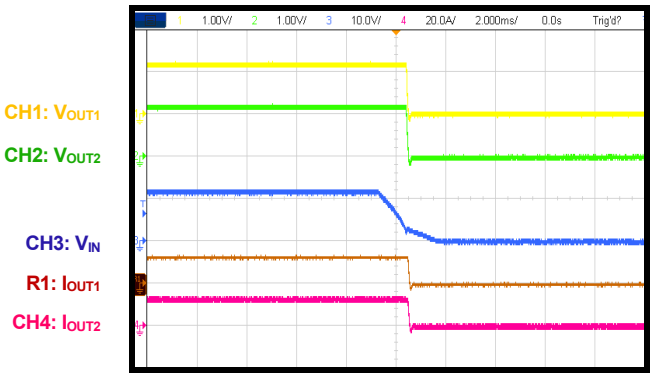
Start-Up through VIN

I_{OUT1} = I_{OUT2} = 13A



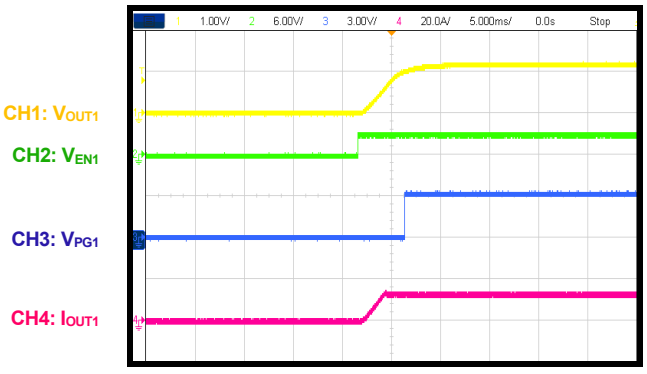
Shutdown through VIN

I_{OUT1} = I_{OUT2} = 13A



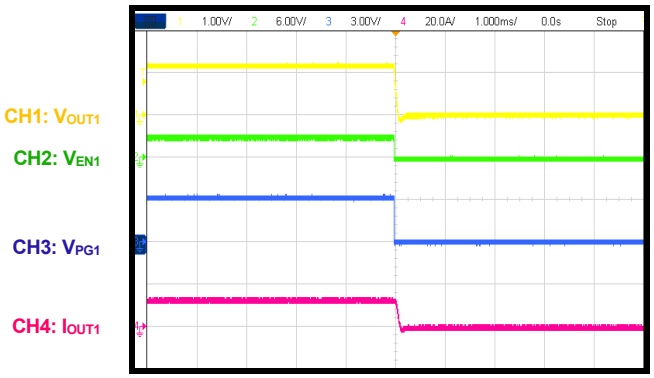
Startup through EN

I_{OUT1} = 13A



Shutdown through EN

I_{OUT1} = 13A



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PCB LAYOUT

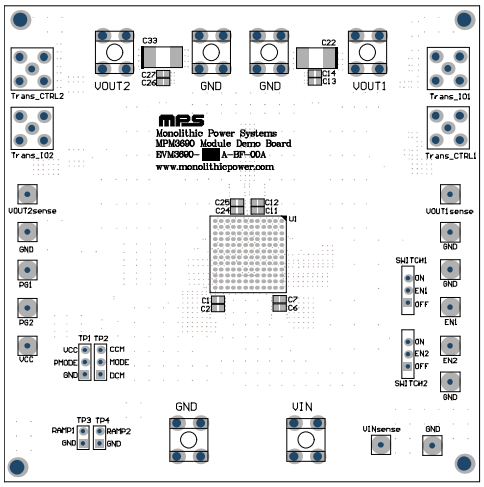

Figure 3: Top Silk

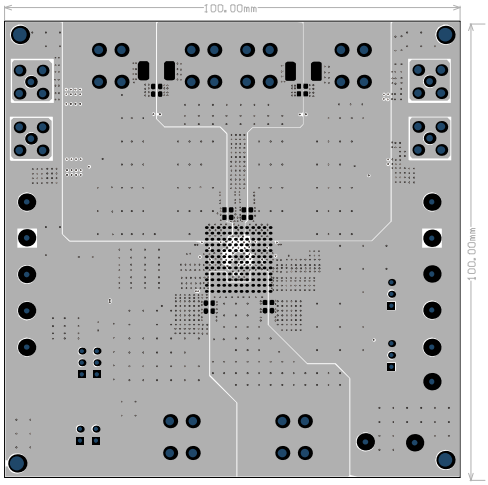

Figure 4: Top Layer

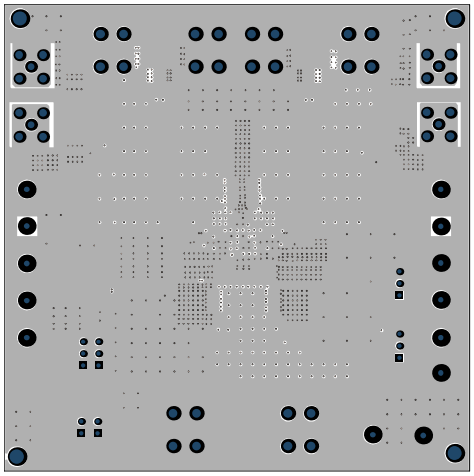

Figure 5: Mid-Layer 1

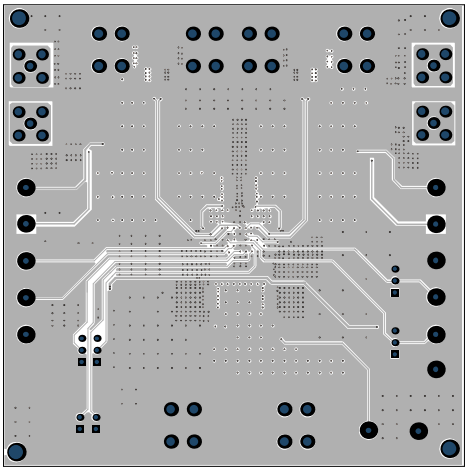

Figure 6: Mid-Layer 2

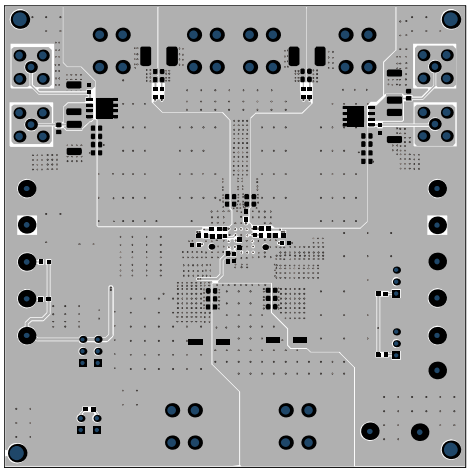

Figure 7: Bottom Layer

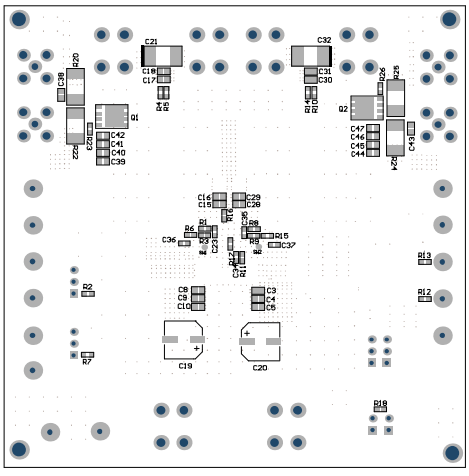

Figure 8: Bottom Silk

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REVISION HISTORY

Revision #	Revision Date	Description	Pages Updated
1.0	10/15/2021	Initial Release	-

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