



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⁾

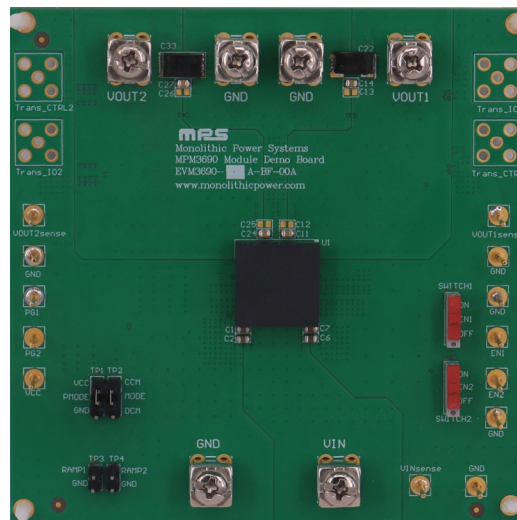
Specifications are at $T_A = 25^\circ\text{C}$, unless otherwise noted.

Parameters	Conditions	Value
Input voltage (V_{IN}) range		3.2V to 16V ⁽²⁾
Output voltage (V_{OUT})	$V_{IN} = 3.2\text{V to } 16\text{V}$, $I_{OUT} = 0\text{A to } 13\text{A}$	1.2V
Maximum output current (I_{OUT})	$V_{IN} = 3.2\text{V to } 16\text{V}$, $V_{OUT} = 1.2\text{V}$	13A
Full load efficiency ⁽³⁾	$V_{IN} = 12\text{V}$, $V_{OUT} = 1.2\text{V}$, $I_{OUT} = 13\text{A}$, $f_{SW} = 500\text{kHz}$	92.45%
Peak efficiency ⁽³⁾	$V_{IN} = 12\text{V}$, $V_{OUT} = 1.2\text{V}$, $I_{OUT} = 10\text{A}$, $f_{SW} = 500\text{kHz}$	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 $V_{IN} < 4\text{V}$, 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

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 (+): V_{IN}
 - b. Negative (-): GND
3. Connect the load terminals to: ⁽⁵⁾
 - a. Positive (+): V_{OUT}
 - 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 VOGNDSSEN 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.

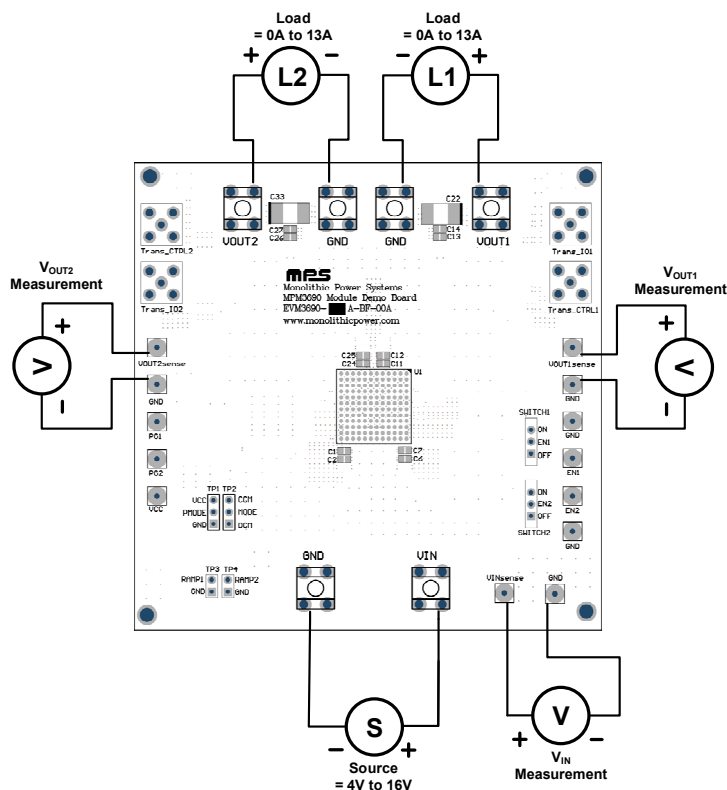


Figure 1: Proper Measurement Equipment Set-Up

EVALUATION BOARD SCHEMATIC

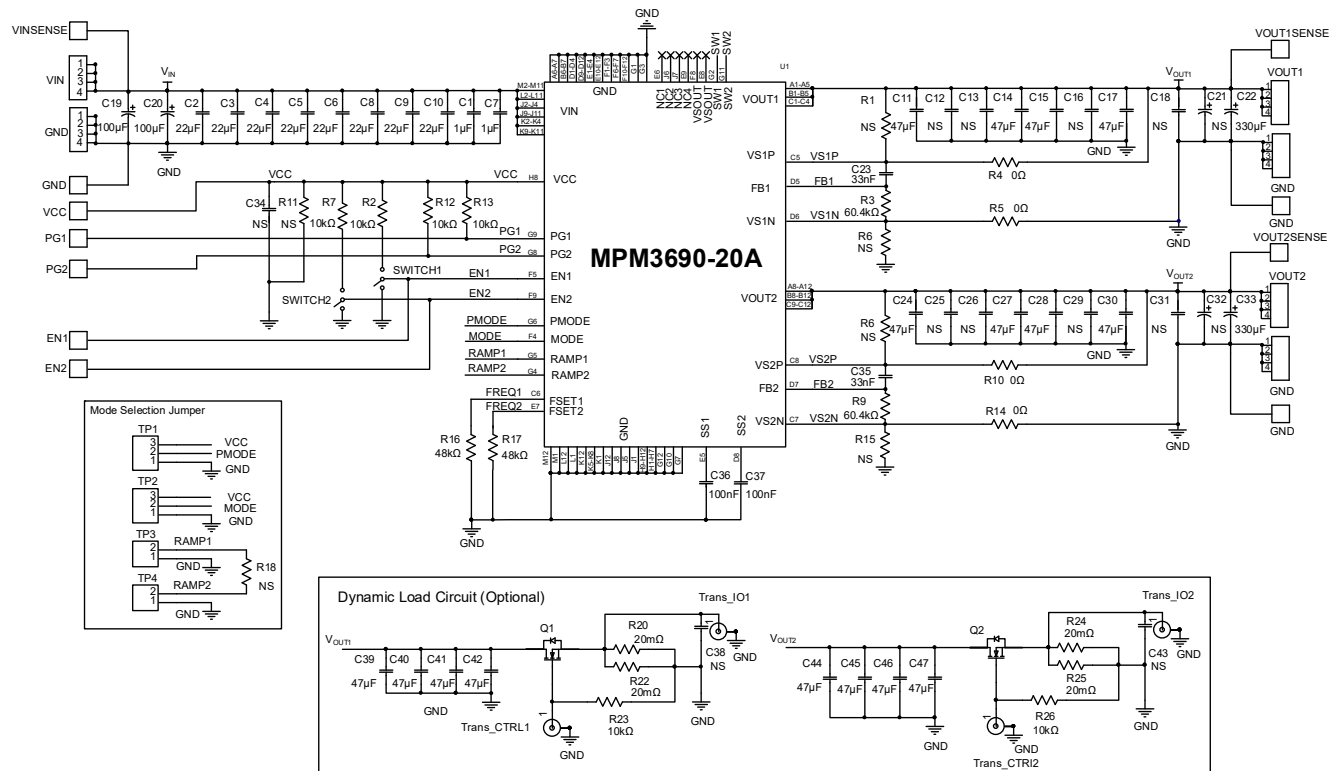


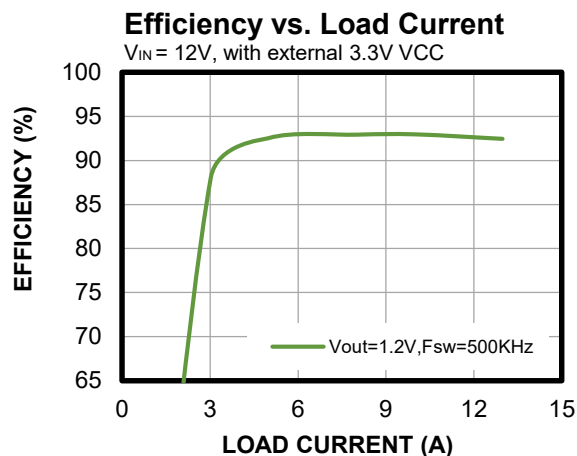
Figure 2: Evaluation Board Schematic

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	GRM21BR60J476M E15L
8	C2, C3, C4, C5, C6, C8, C9, C10	22μF	Ceramic capacitor, 25V	0805	Murata	GRM21BR61E226M E44L
2	C1, C7	1μF	Ceramic capacitor, 25V	0805	Murata	GRM219R71E105K A88D
2	C36, C37	100nF	Ceramic capacitor, 50V	0603	Murata	GRM188R71E104K A01D
2	C35, C23	33nF	Ceramic capacitor, 50V	0603	Würth	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	Würth	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

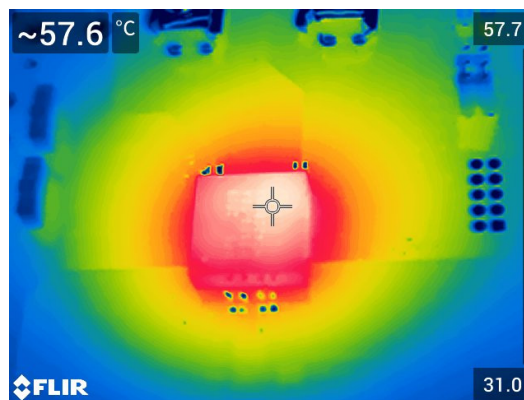
EVB TEST RESULTS

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



Thermal Performance

$I_{OUT1} = I_{OUT2} = 13A$, no forced airflow, $T_A = 28^{\circ}C$,
 $T_{CASE} = 57.6^{\circ}C$

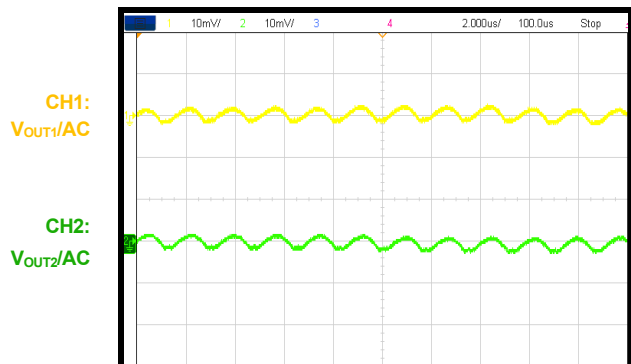


EVB TEST RESULTS *(continued)*

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

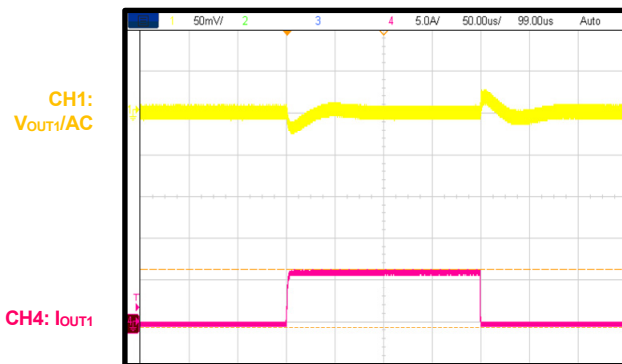
Steady State

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



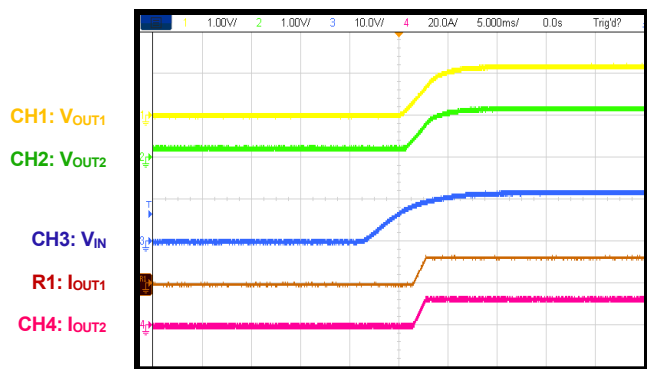
Load Transient Ripple

$I_{OUT1} = 0A$ to $6.5A$, slew rate = $10A/\mu s$



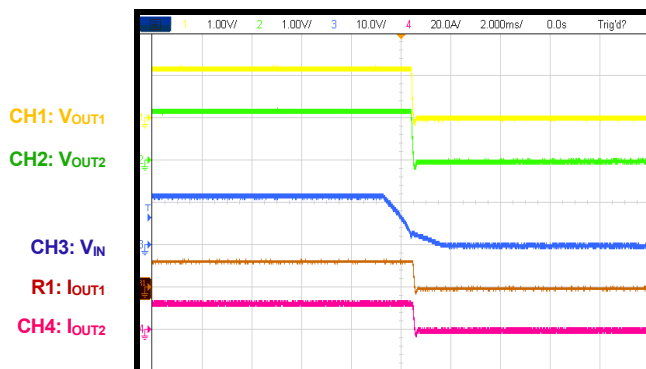
Start-Up through VIN

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



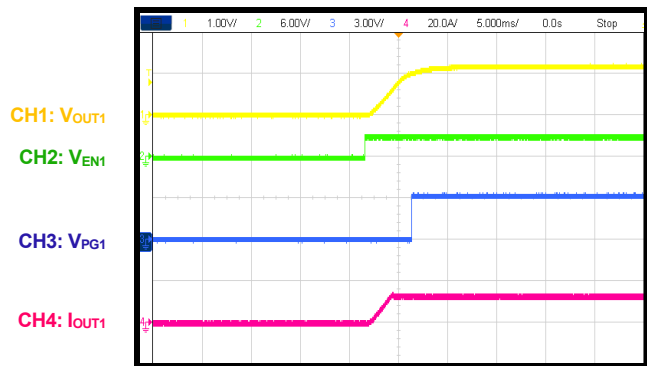
Shutdown through VIN

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



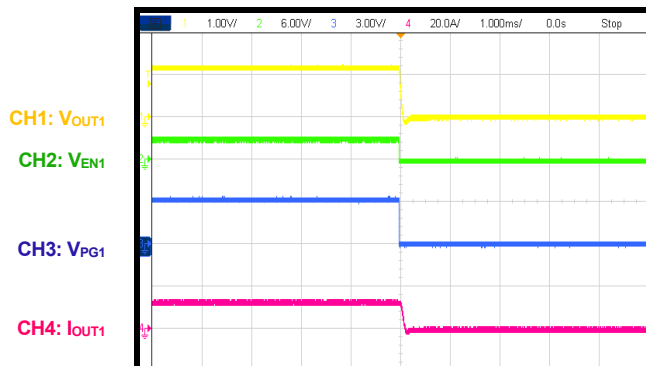
Startup through EN

$I_{OUT1} = 13A$



Shutdown through EN

$I_{OUT1} = 13A$



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REVISION HISTORY

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

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