

DESCRIPTION

The EVM3683-10-MN-01A is an evaluation board designed to demonstrate the capabilities of the MPM3683-10, a fully integrated, step-down DC/DC power module with 10A of continuous output current (I_{OUT}).

The MPM3683-10 features a configurable soft-start (SS) timer with one capacitor. An open-

drain power good (PG) signal indicates that the output voltage (V_{OUT}) is within its nominal voltage range.

It is recommended to read MPM3683-10 datasheet prior to making any changes to the EVM3683-10-MN-01A.

PERFORMANCE SUMMARY ⁽¹⁾

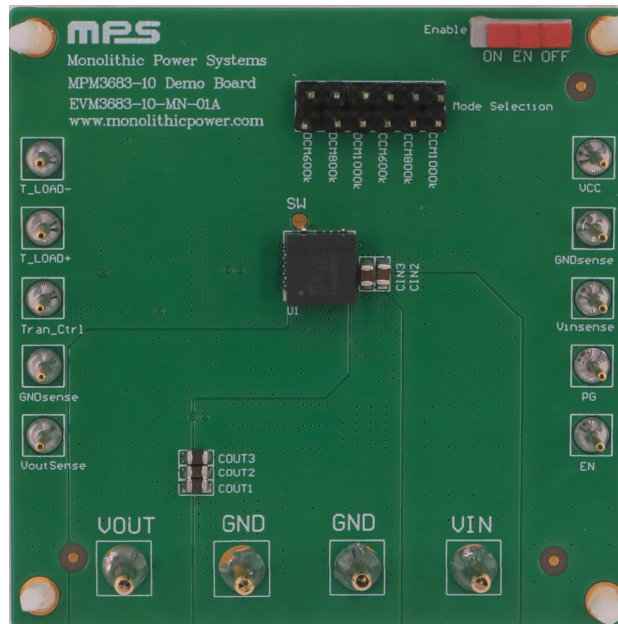
Specifications are at $T_A = 25^\circ\text{C}$, unless otherwise noted.

Parameters	Conditions	Value
Input voltage (V_{IN}) range		4V to 16V
Output voltage (V_{OUT})	Default configuration	1.2V
Maximum output current (I_{OUT})	$V_{IN} = 4V$ to 16V	10A
Typical efficiency	$V_{IN} = 12V$, $V_{OUT} = 3.3V$, $I_{OUT} = 10A$, $f_{SW} = 1\text{MHz}$	92.4%
Peak efficiency	$V_{IN} = 12V$, $V_{OUT} = 3.3V$, $I_{OUT} = 5A$, $f_{SW} = 1\text{MHz}$	93.5%
Switching frequency (f_{SW})	Default configuration	1MHz

Note:

1) For different V_{IN} and V_{OUT} specifications with different output capacitors, the application circuit parameters may require changes.

EVALUATION BOARD



LxWxH (6.4cmx6.4cmx1.6mm)

Board Number	MPS IC Number
EVM3683-10-MN-01A	MPM3683GMN-10

QUICK START GUIDE

The EVM3683-10-MN-01A evaluation board is easy to set up and use to evaluate the performance of the MPM3683-10. 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. ⁽²⁾
2. Connect the power supply terminals to:
 - a. Positive (+): V_{IN}
 - b. Negative (-): GND
3. Connect the load terminals to: ⁽³⁾
 - 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 $V_{OUTSENSE}$ to $GNDSENSE$ terminals.
6. Once the proper V_{OUT} is established, adjust the load within the operating range, then measure the efficiency, output ripple voltage, and other parameters.

Notes:

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

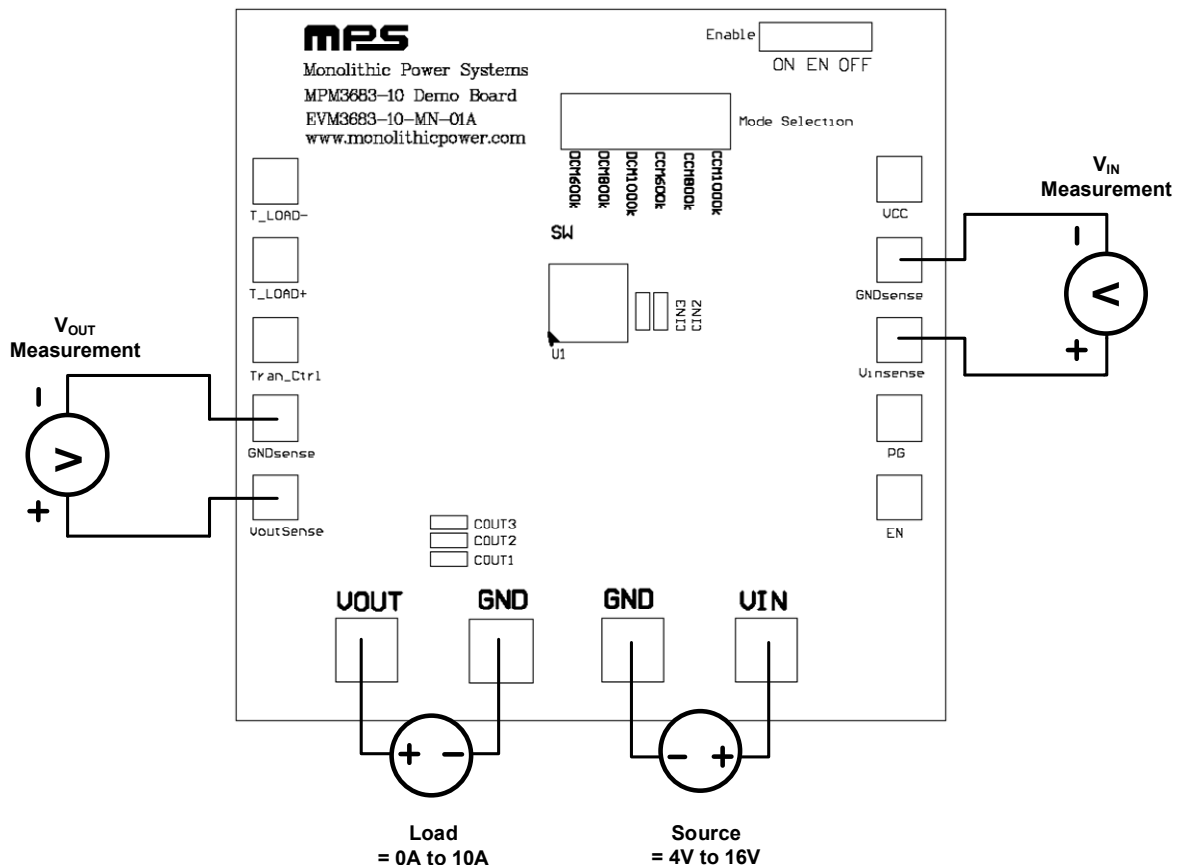


Figure 1: Proper Measurement Equipment Set-Up

EVALUATION BOARD SCHEMATIC

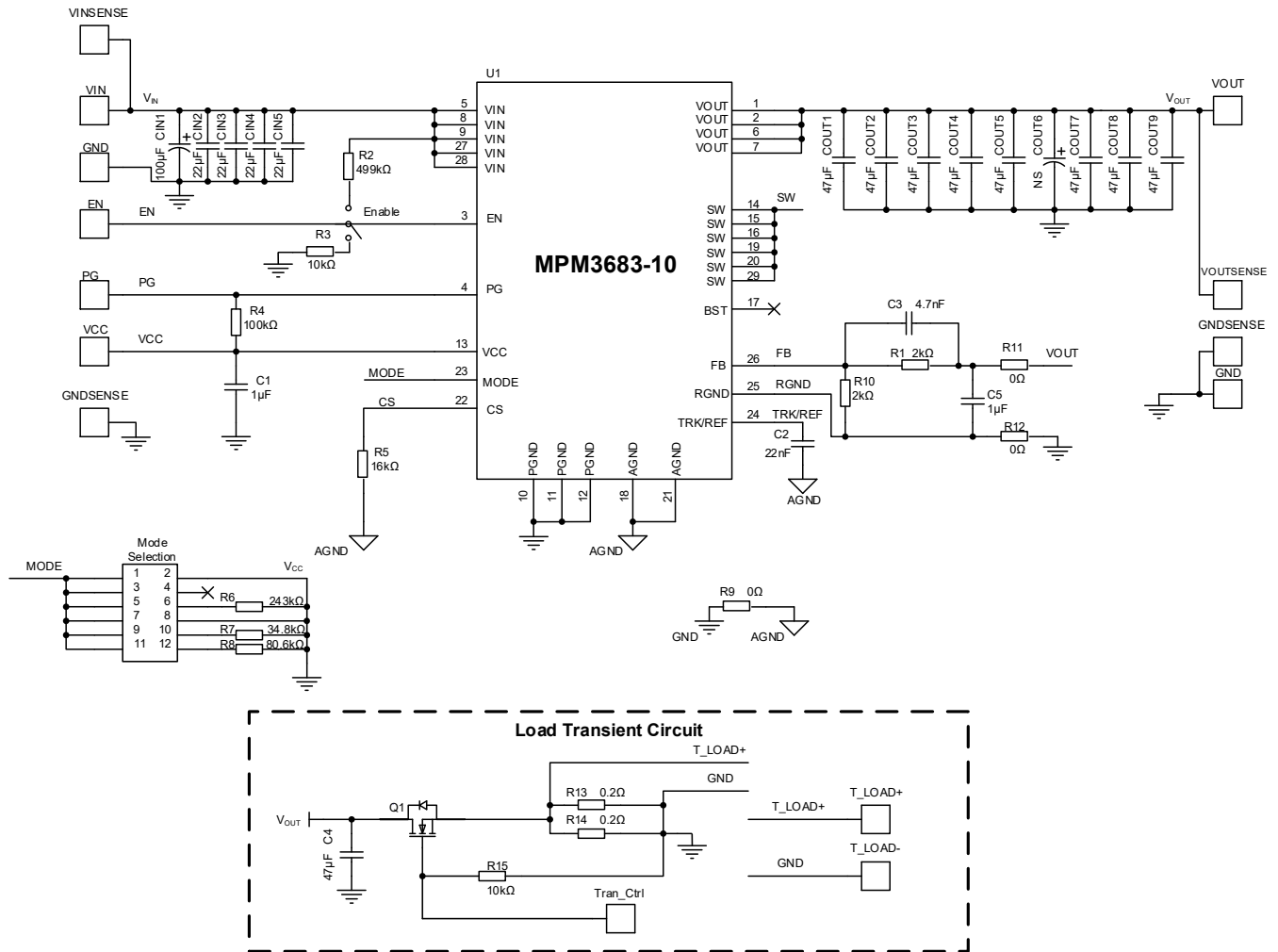


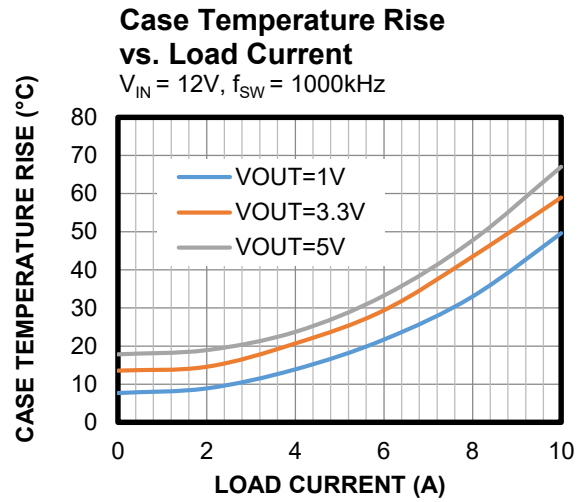
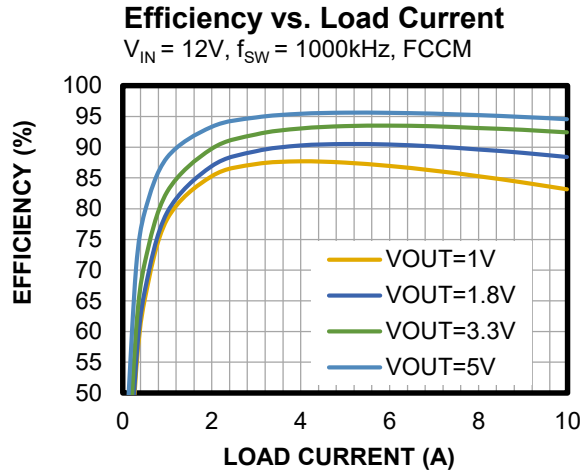
Figure 2: Evaluation Board Schematic

EVM3683-10-MN-01A BILL OF MATERIALS

Qty	Ref	Value	Description	Package	Manufacturer	Manufacturer PN
1	CIN1,	100 μ F	Electrolytic capacitor, 35V	SMD	Chemi-Con	EMZJ350ADA101M F80G
4	CIN2, CIN3, CIN4, CIN5	22 μ F	Ceramic capacitor, 25V, X5R	0805	Murata	GRM21BR61E226 ME44L
9	C4, COUT1, COUT2, COUT3, COUT4, COUT5, COUT7, COUT8, COUT9	47 μ F	Ceramic capacitor, 10V, X5R	0805	Murata	GRM21BR61A476 ME15L
0	COUT6	NS				
2	C1, C5	1 μ F	Ceramic capacitor, 16V, X5R	0603	Murata	GRM185R61C105 KE44D
1	C2	22nF	Ceramic capacitor, 16V, X7R	0603	Würth	885012206042
1	C3	4.7nF	Ceramic capacitor, 50V, X7R	0603	Würth	885012206087
1	R2	499k Ω	Film resistor, 1%	0603	Yageo	RC0603FR-07499KL
2	R3, R15	10k Ω	Film resistor, 1%	0603	Yageo	RC0603FR-0710KL
1	R4	100k Ω	Film resistor, 1%	0603	Yageo	RC0603FR-07100KL
1	R5	16k Ω	Film resistor, 1%	0603	Yageo	RC0603FR-0716KL
1	R6	243k Ω	Film resistor, 1%	0603	Yageo	RC0603FR-07243KL
1	R7	34.8k Ω	Film resistor, 1%	0603	Yageo	RC0603FR-0734K8L
1	R8	80.6k Ω	Film resistor, 1%	0603	Yageo	RC0603FR-0780K6L
3	R9, R11, R12	0 Ω	Film resistor, 1%	0603	Yageo	RC0603FR-070RL
2	R1, R10	2k Ω	Film resistor, 1%	0603	Yageo	RC0603FR-072KL
2	R13, R14	0.2 Ω	Film resistor, 1%	2512	Yageo	RL2512FK-070R2L
1	Q1	27A	N-channel MOSFET	SOIC-8PP	Analog Power	AM7432N-T1-PF
1	MODE	12 pins	12-pin, double-row straight header	DIP	Würth	61301221121
1	ENABLE	3 pins	Slide switch, SPDT, vertical, through hole	SIP	Würth	450301014042
4	VIN, GND, VOUT	ϕ 2.0	ϕ 2.0 copper pin	DIP	Custom	
10	T_LOAD-, T_LOAD+, Tran_Ctrl, GNDSENSE, VOUTSENSE, EN, PG, VINSENSE, VCC	ϕ 1.0	ϕ 1.0 copper pin	DIP	Custom	
1	U1	MPM3683-10	Step-down power module, 16V, 10A	FCMLGA	MPS	MPM3683GMN-10

EVB TEST RESULTS

Performance curves and waveforms are tested on the evaluation board. $V_{IN} = 12V$, $V_{OUT} = 3.3V$, $T_A = 25^\circ C$, unless otherwise noted.

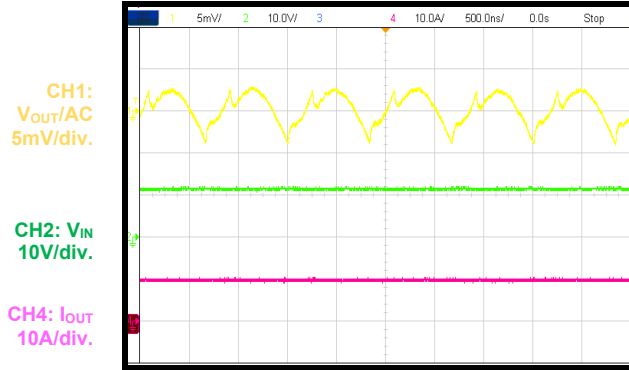


EVB TEST RESULTS *(continued)*

Performance curves and waveforms are tested on the evaluation board. $V_{IN} = 12V$, $V_{OUT} = 3.3V$, $T_A = 25^\circ C$, unless otherwise noted.

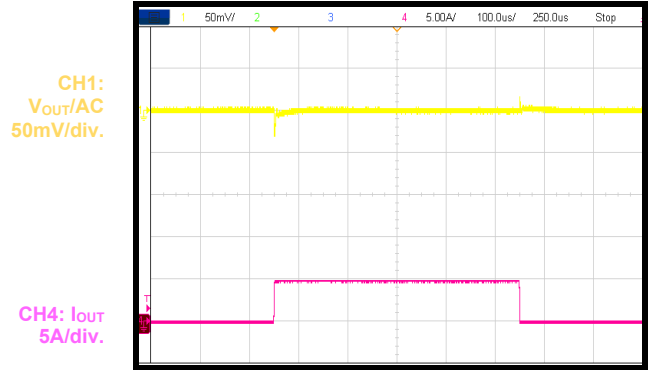
Steady State and Output Ripple

$I_{OUT} = 10A$



Load Transient Output Ripple

$I_{OUT} = 0A$ to $5A$, slew rate = $5A/\mu s$



PCB LAYOUT

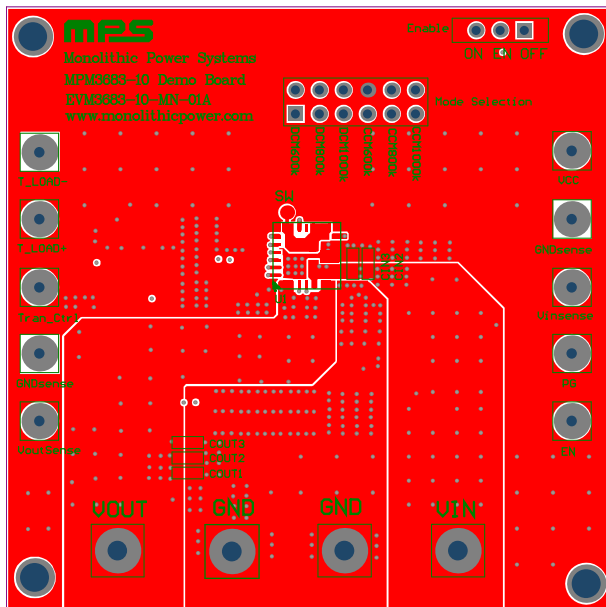


Figure 3: Top Layer

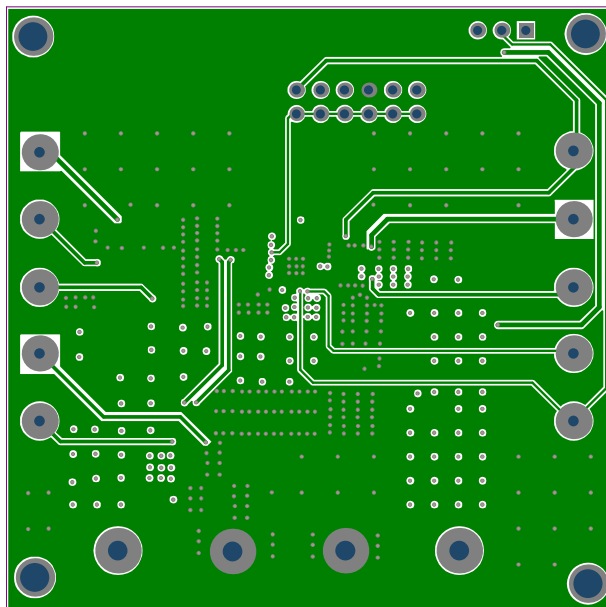


Figure 4: Mid-Layer 1

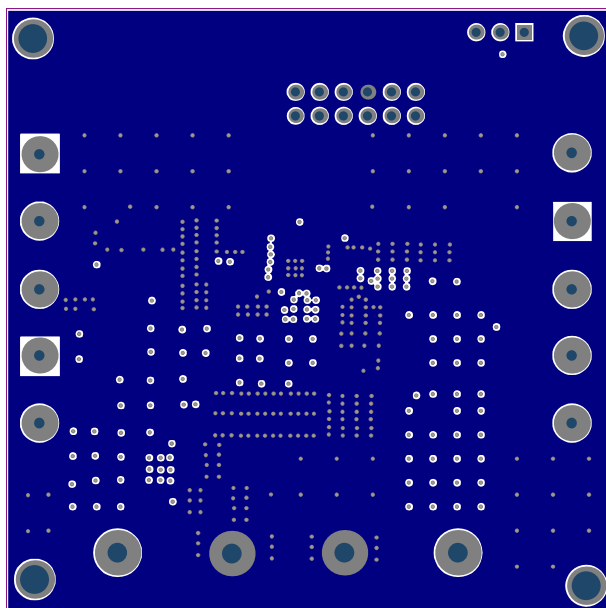


Figure 5: Mid-Layer 2

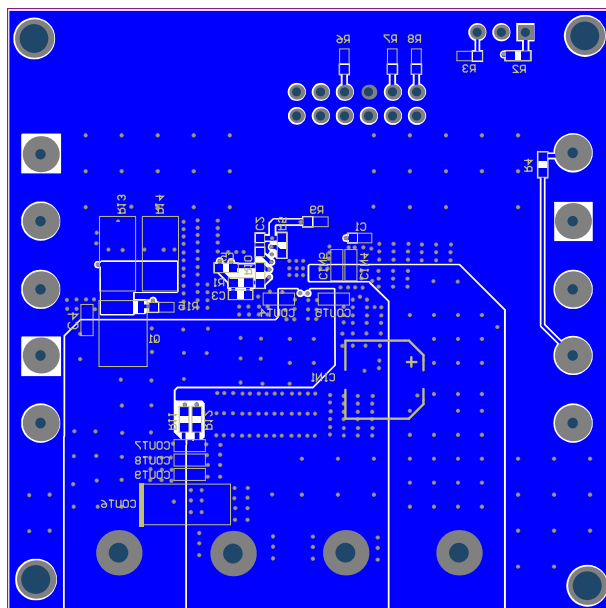


Figure 6: Bottom Layer

REVISION HISTORY

Revision #	Revision Date	Description	Pages Updated
1.0	09/09/2021	Initial Release	-

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