EVM3695-10-MQ-10A

16V,10A,
Scalable DC/DC Power Module with PMBus

DESCRIPTION

The EVM3695-10-MQ-10A is the evaluation board for the MPM3695-10, a high-efficiency, high-power density, 10A, synchronous step-down power converter with an input range from 4 V to 16V. The lower limit of the input voltage can be extended to 3.3V by providing an external 3.3V supply to the VCC pin. The output voltage is adjustable from 0.5V to 5V. The EVM3695-10-MQ-10A delivers up to 10A continuous current.

The EVM3695-10-MQ-10A has one MPM3695-10 installed on the board and powers up to a default setting of 1.2V output voltage. The demo board embeds a load transient circuit and an SMA connector to allow for easy evaluation of the load transient performance and measurement of the output voltage ripple. The EVM3695-10-MQ-10A features an integrated PMBus interface, which provides operating parameter adjustment, including output voltage, switching frequency, fault management, and timing controls. Additionally, the PMBus interface allows users to view the telemetry of the voltage, current, temperature, and fault status. To explore the advanced features of the MPM3695-10 fully, use the EVKT-3695-10-A evaluation kit and install the Virtual Bench Pro software on your PC. The contents of the EVKT-3695-10-A is summarized in Table 1.

Table 1: Contents of EVKT-3695-10-A (1)

Item #	Part Number	Description	Qty
1	EVM3695-10-MQ-10A	MPM3695-10 single phase demo board	1
2	MPM3695GMQ-10-0022	MPM3695-10 Module	1
3	EVKT-USBI2C-02*	Includes one USB to PMBus Dongle, one USB Cable, and one Ribbon Cable	1

NOTE:
1) Items can be ordered separately. Please order from monolithicpower.com directly or from our distributors.

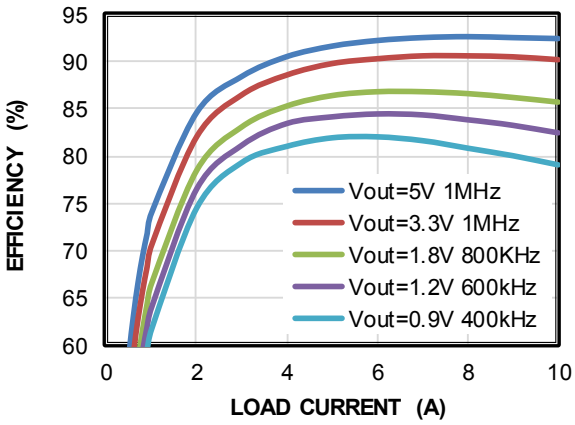
EVM3695-10-MQ-10A EVALUATION BOARD

(L x W) 64mm x 64mm

Board Number	MPS IC Number
EVM3695-10-MQ-10A	MPM3695GMQ-10-0022

Efficiency vs. Load Current

V_{IN}=12V



MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2019 MPS. All Rights Reserved.

PERFORMANCE SUMMARY

T_A = 25°C, unless otherwise noted.

Parameter	Conditions	Value
Input voltage range	Without external VCC	4V to 16V
	With external 3.3V VCC	3.3V to 16V
Output voltage range	V_{IN} = 4V to 16V	0.5V to 5V. Default: 1.2V
Maximum output current	V_{IN} = 4V to 16V, V_{OUT} = 0.5V to 5V	10A continuous
Efficiency	V_{IN} = 12V, V_{OUT} = 1.2V, I_{OUT} = 10A	81.6%
Default SW frequency		800kHz

QUICK-START GUIDE

1. Connect the positive and negative terminals of the load to VOUT and GND.
2. Pre-set the power supply output between 4V and 16V, and then turn off the power supply.
3. Connect the positive and negative terminals of the power supply to VIN and GND.
4. Turn the power supply on. The board will power up automatically.

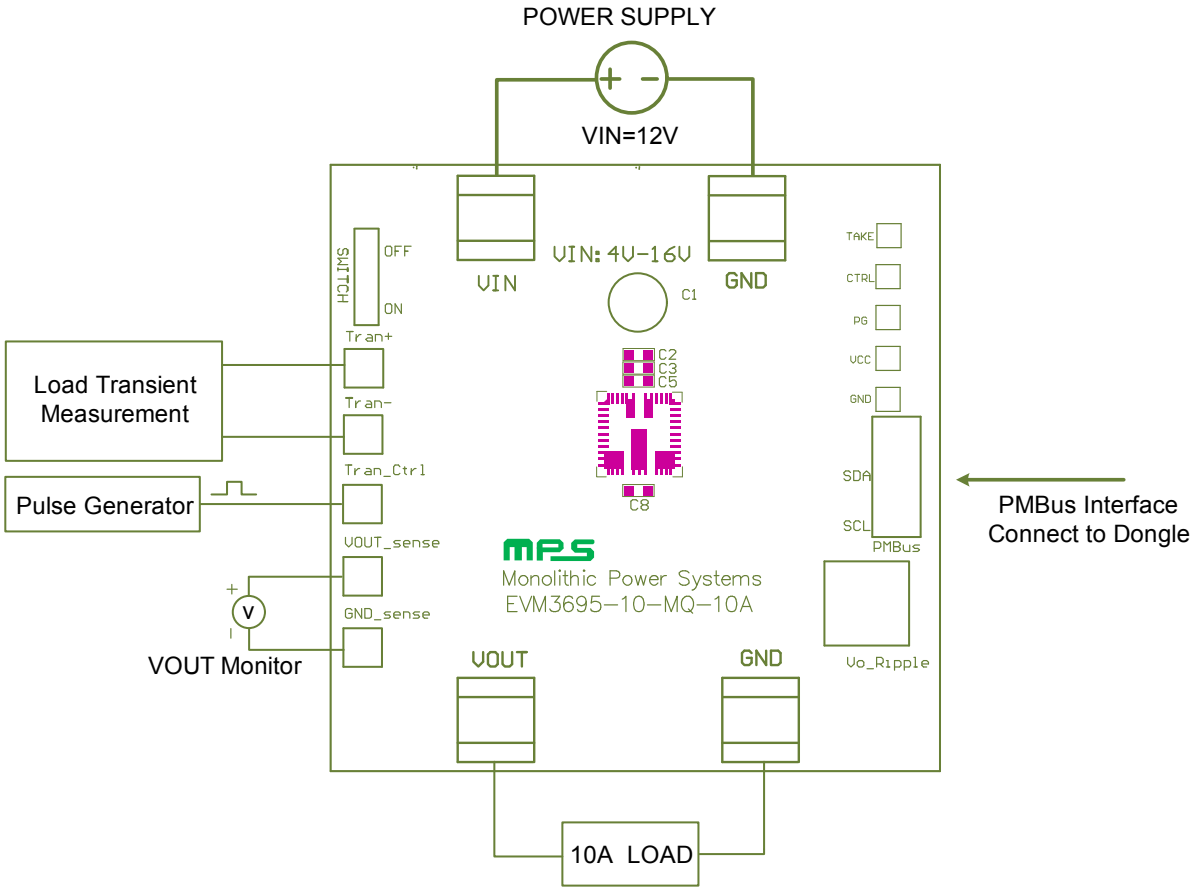


Figure 1: Illustration of testing configuration

MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2019 MPS. All Rights Reserved.

USER GUIDE FOR VIRTUAL BENCH PRO 3.0

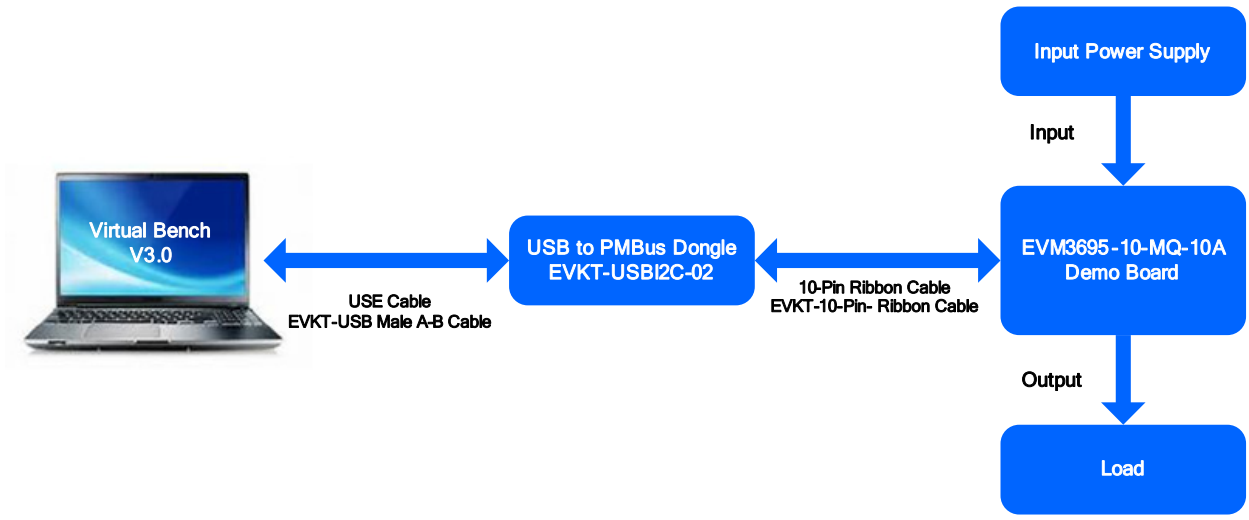


Figure 2: Block diagram of the PMBUS connection

1. Connect the PMBUS cable to the demo board and the dongle.
2. Connect the dongle to your PC using the USB cable.
3. Open Virtual Bench Pro. The software will scan the connected power modules.
4. The part number of the connected power module will be displayed in the left panel.
5. The registers can now be modified allowing customized settings. Please refer to the MPM3695-10 datasheet for detailed register descriptions.
6. The operating conditions, including the output voltage, input voltage, output current, and temperature, can be monitored on the right-side panel.

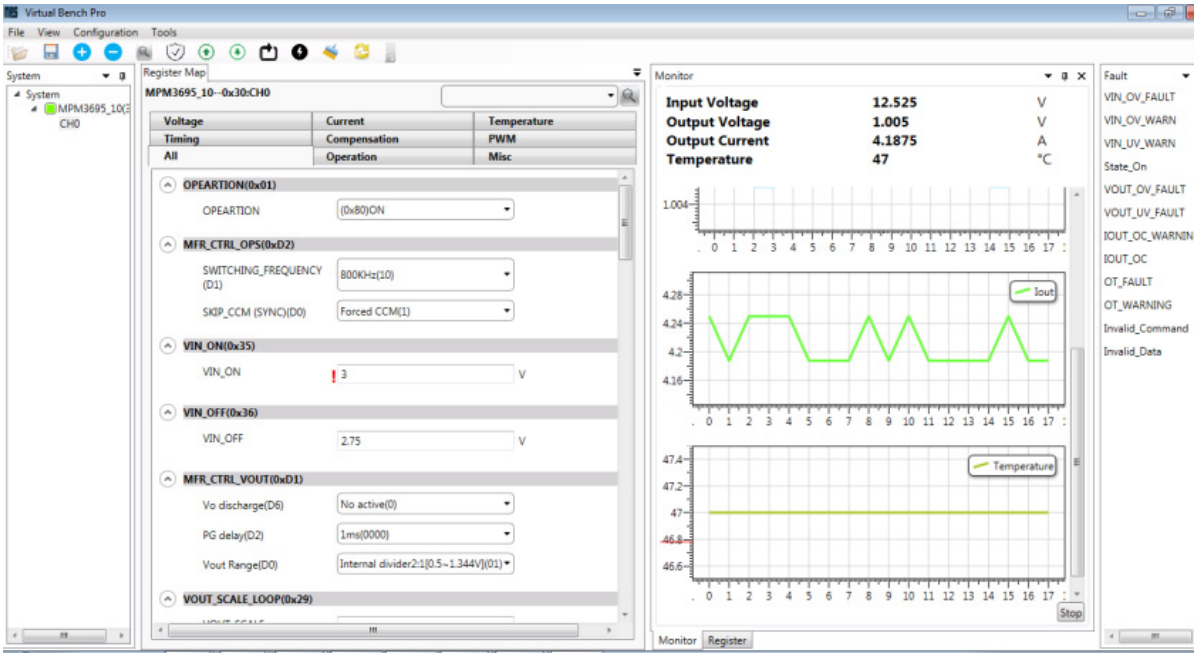
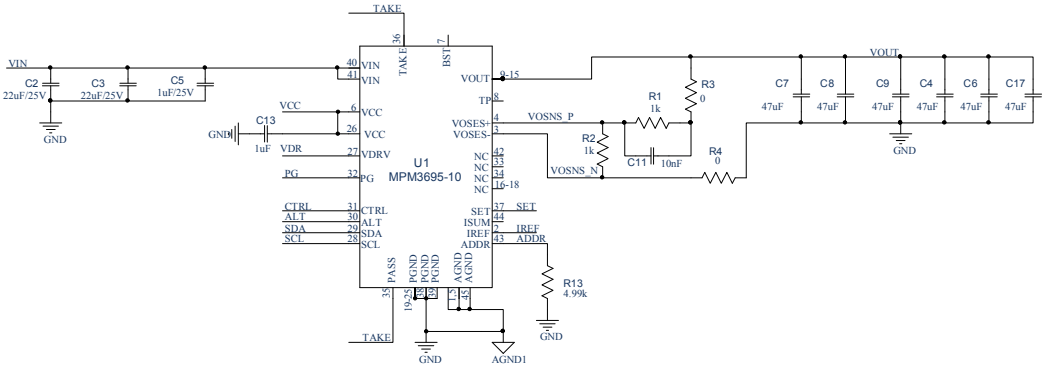
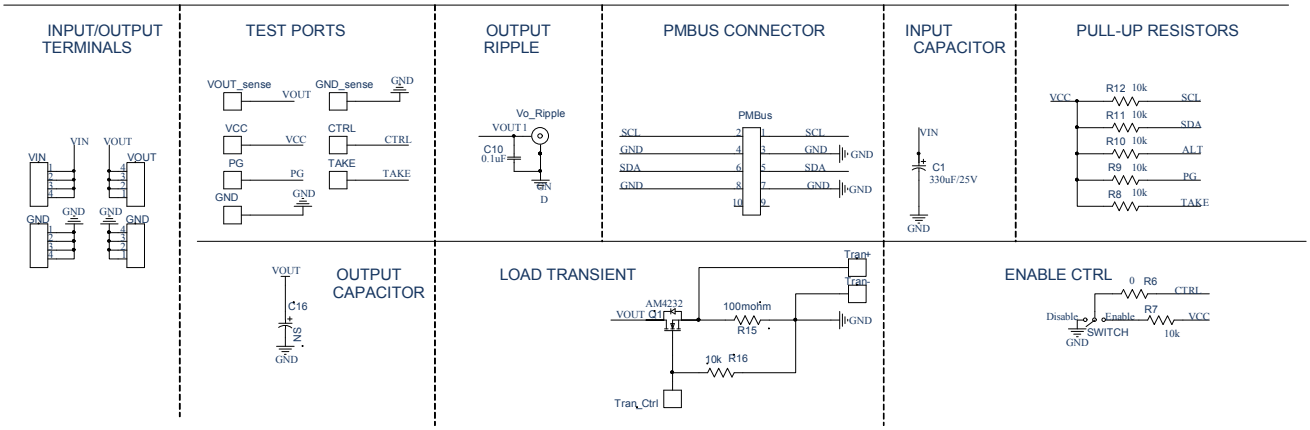


Figure 3: User interface of Virtual Bench Pro

MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2019 MPS. All Rights Reserved.

EVALUATION BOARD SCHEMATIC





MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2019 MPS. All Rights Reserved.

EVM3695-10-MQ-10A BILL OF MATERIALS

Qty	RefDes	Value	Description	Package	Manufacturer	Manufactuer_P/N
2	C2,C3	22μF	CAP CER 22μF 25V X5R 0805	0805	Murata	GRM21BR61E226ME44L
6	C4, C6, C7, C8, C9, C17	47μF	CAP CER 47μF 6.3V X5R 0805	0805	Murata	GRM21BR60J476ME15L
1	C13	1μF	CAP CER 25μF 25V X5R 0402	0402	Murata	GRM155R61E105KA12D
1	C5	1μF	CAP CER 25μF 25V X5R 0805	0805	Murata	GRM216R61E105KA12D
1	C1	330μF	Al Cap, 25V,330μF	OD8.0P3.5	PANASONIC	EEHZA1E331P
1	C16	220μF	Tantalum cap.,6.3V	SMD	PANASONIC	EEFCX0J221R
1	C11	10NF	CAP CER 10NF 16V X7R 0603	0603	WE	885012206040
2	R1,R2	1K	Film Res,1%,0603,1K	603	YAGEO	RC0603FR-071KL
3	R3, R4, R6	0R	Film Res,1%,0603,0R	0603	YAGEO	RC0603FR-070RL
7	R7,'R8, R9, R10, R11, R12,R16	10K	Film Res,1%,0603,10K	603	YAGEO	RC0603FR-0710KL
1	R13	4K99	Film Res,1%, 0603,4K99	603	YAGEO	RC0603FR-074K99L
1	U1	10A Module	MPS 10A power module	QFN41-10mmx 10mm	MPS	MPM3695-10

EVM3695-10-MQ-10A OPTIONAL AND TERMINALS

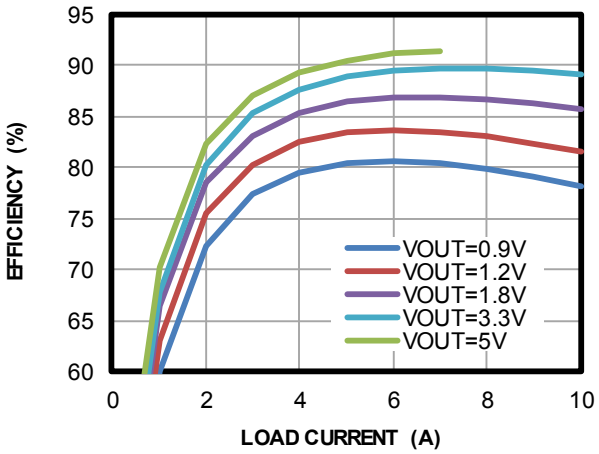
Qty	RefDes	Value	Description	Package	Manufacturer	Manufactuer_P/N
1	C10	0.1UF	CAP CER 100NF 25V X7R 0603	0603	WE	'885012206071
4	GND, VIN, VOUT	'KEYSTON E7697-75	'KEYSTONE7697-75	'KEYSTON E7697-75		
9	CTRL, GND, PG, VCC, Tran+, Tran-, Tran_Ctrl, VOUT_SNS+, VOUT_SNS-	φ1	φ1 copper pin	DIP		
1	PMBus	10PINS	10Pins	DIP	WE	61301021121
1	Q1	AM4432N	Mosfet,VDS=30V,ID S=16.8A,	SO-8	AnalogPower	AM4432N-T1-PF
1	Switch	SWITCH_S PDT_WE	JUMPER/3PIN-WE450301014042			
1	R15	0.1R	Film Res,1%,2512,0.1R	2512		
1	VOUT	SMA	SMA-PCB Mount Jack Straight THT	DIP	WE	60312002114503

MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2019 MPS. All Rights Reserved.

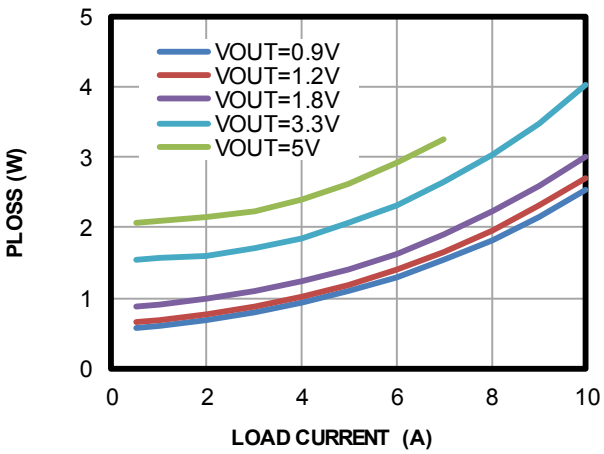
EVB TEST RESULTS

V_{IN} = 12V, V_{OUT} = 1.2V, f_{sw}=800kHz , T_A = 25°C, unless otherwise noted.

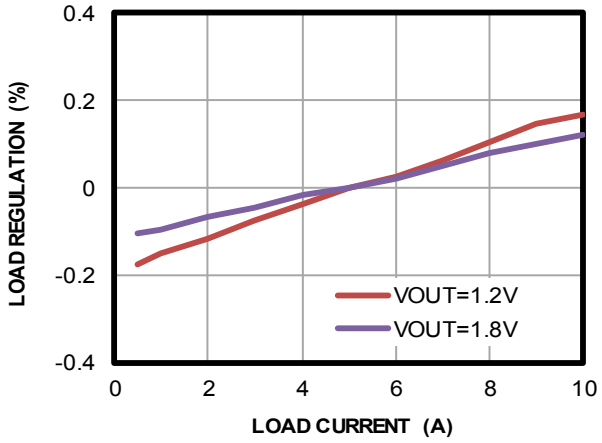
12V Input Efficiency



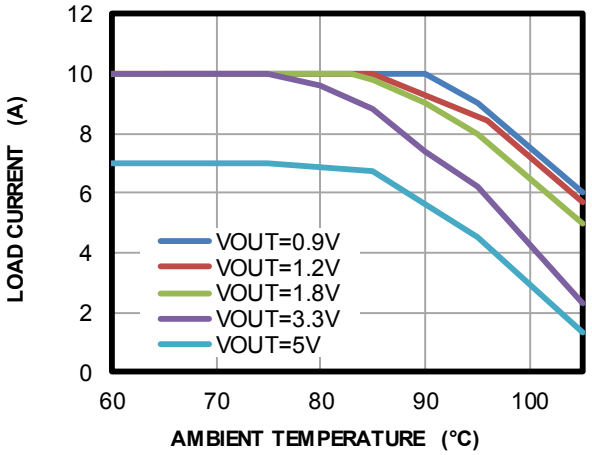
V_{IN} = 12V Ploss vs. Load Current



Load Regulation



Thermal De-rating at 200 LFM Air Flow

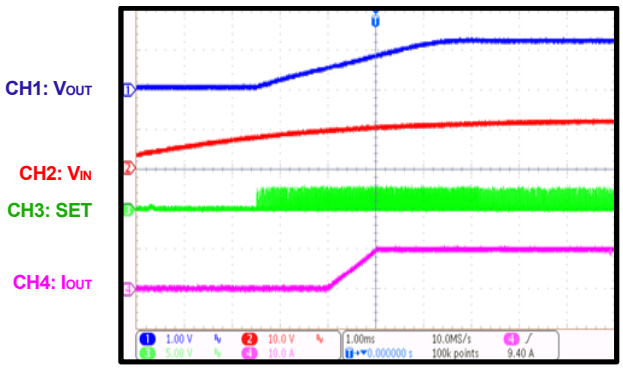


MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2019 MPS. All Rights Reserved.

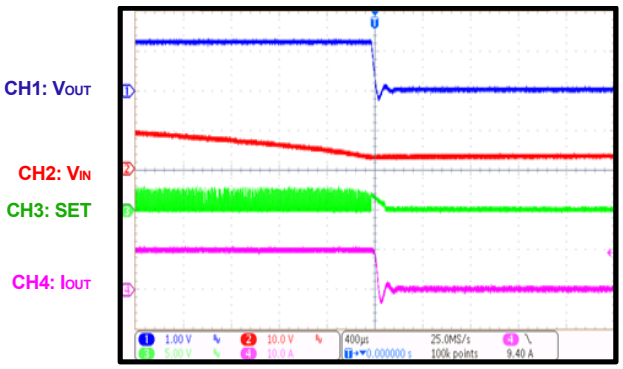
EVB TEST RESULTS *(continued)*

V_{IN} = 12V, V_{OUT} = 1.2V, f_{sw}=800kHz, T_A = 25°C, unless otherwise noted.

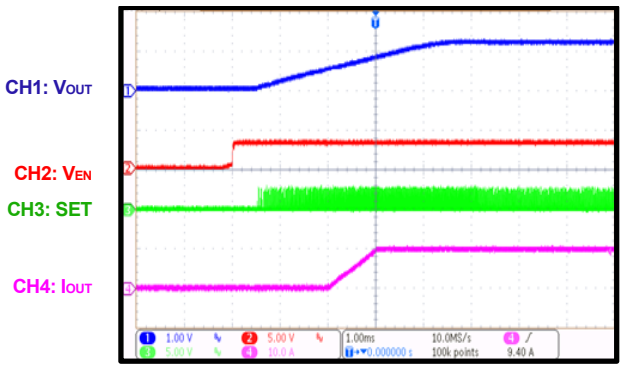
V_{IN} Start-Up at Full load



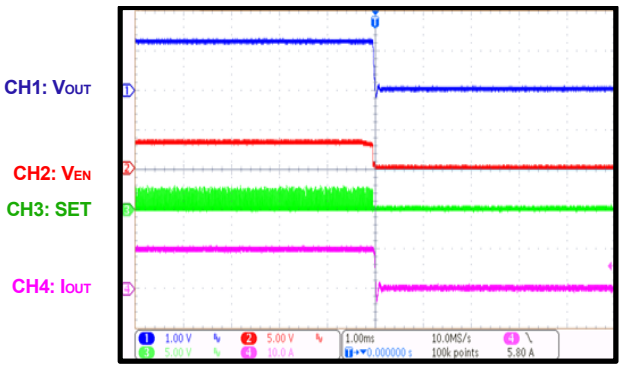
V_{IN} Shutdown at Full load



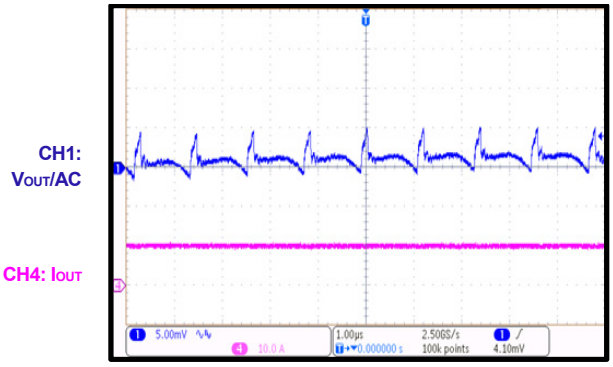
EN Start-Up at Full load



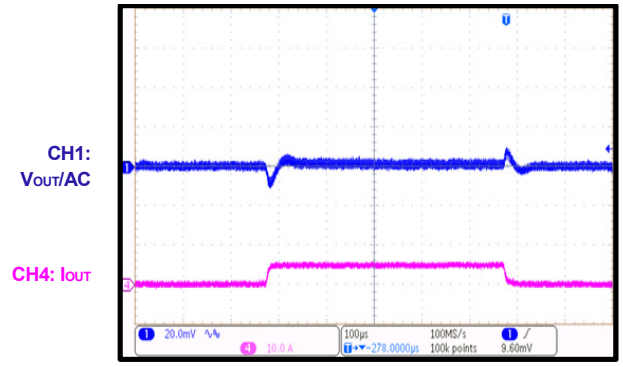
EN Shutdown at Full load



Output Voltage Ripple at Full load



Load Transient @ 0 - 5A Load, 20A/µs



MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2019 MPS. All Rights Reserved.

PRINTED CIRCUIT BOARD LAYOUT

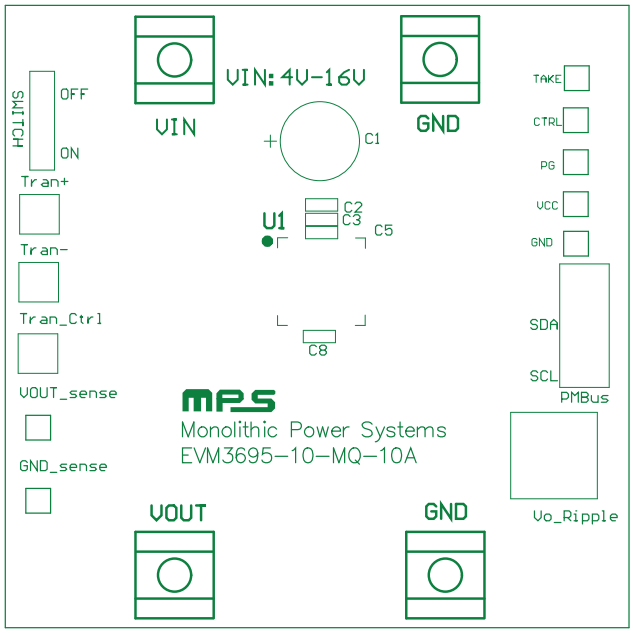


Figure 4: Top Silk Layer

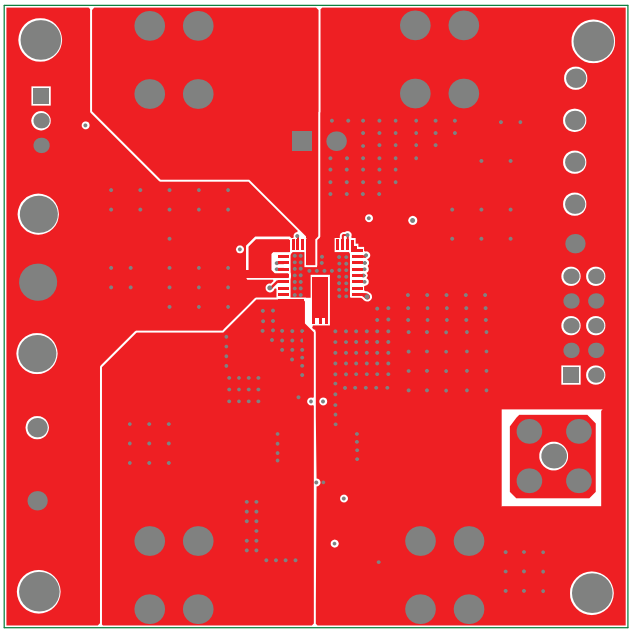


Figure 5: Top Layer

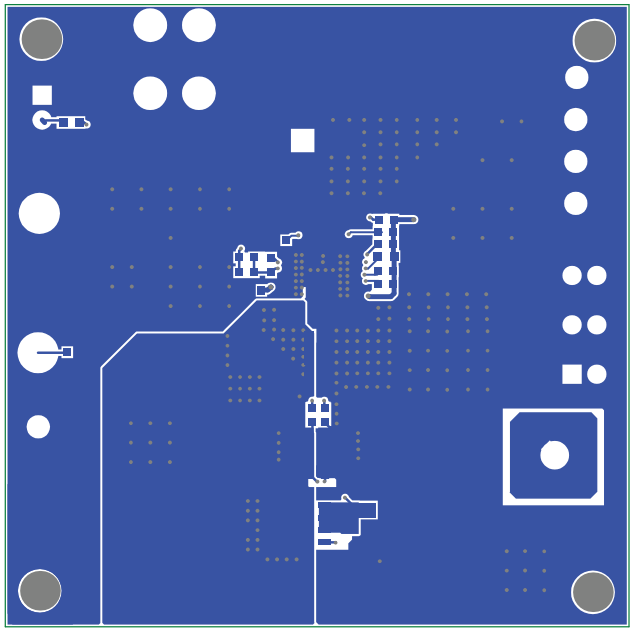


Figure 6: Bottom Layer

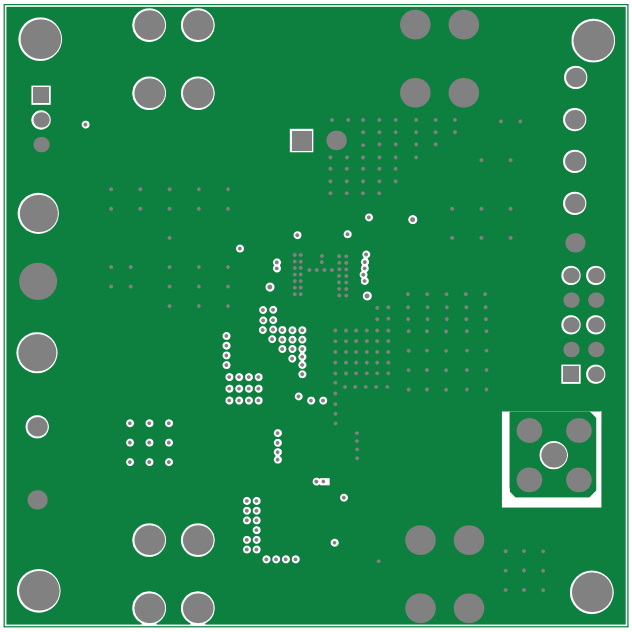


Figure 7: Inner Layer 1

MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2019 MPS. All Rights Reserved.

PRINTED CIRCUIT BOARD LAYOUT *(continued)*

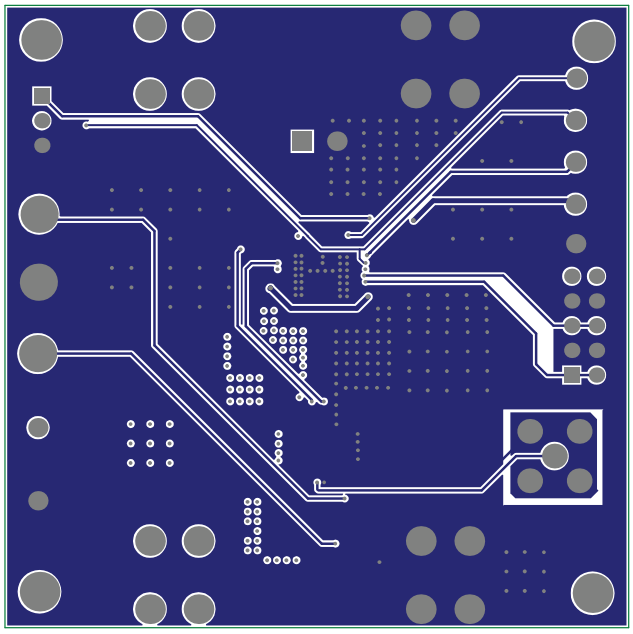


Figure 8: Inner Layer 2

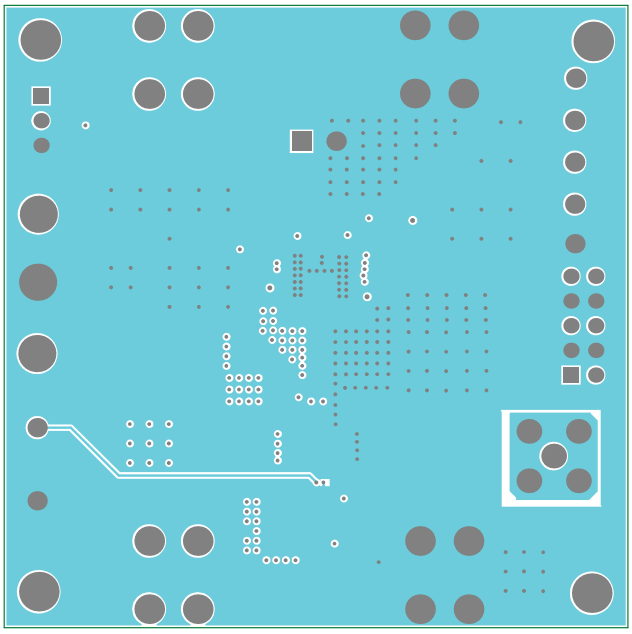


Figure 9: Inner Layer 3

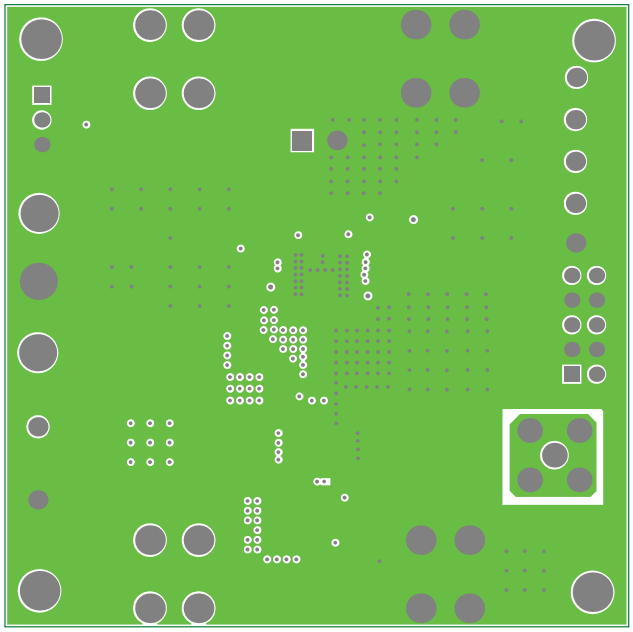


Figure 10: Inner Layer 4

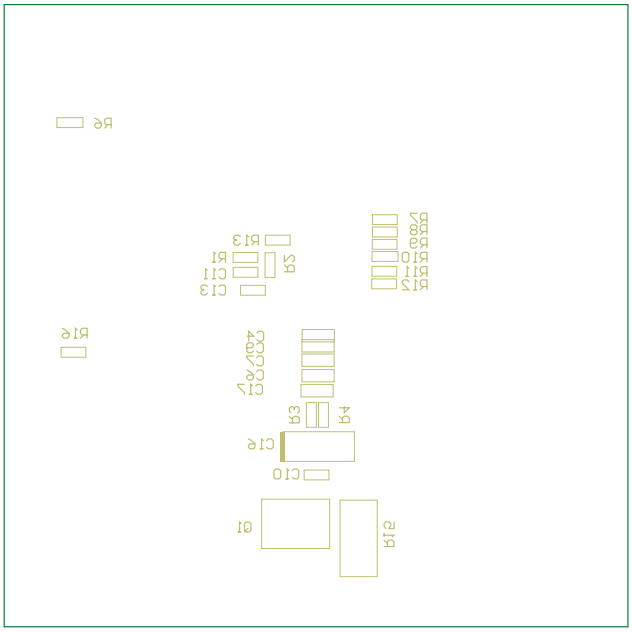


Figure 11: Bottom Silk Layer

NOTICE: The information in this document is subject to change without notice. Please contact MPS for current specifications. Users should warrant and guarantee that third party Intellectual Property rights are not infringed upon when integrating MPS products into any application. MPS will not assume any legal responsibility for any said applications.

MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2019 MPS. All Rights Reserved.