

EVM3695-25-RF-03B 16V, 40A, Scalable

DC/DC Power Module Demo

The Future of Analog IC Technology

NOT RECOMMENDED FOR NEW DESIGNS, REFER TO EVM3695-20-PJ-00A

DESCRIPTION

EVM3695-25-RF-03B is a high efficiency, high power density 40A synchronous step-down power converter, featuring MPM3696-25 in parallel. The input range is from 4.5V to 16V. Providing the external 3.3V supply to VCC pin can extend the operation range from 3V to 16V. The output voltage is adjustable from 0.5V to 5.5V, with default at 1.8V. The EVM3695-25-RF-03B can output up to 40A continuously/50A peak load current.

The EVM3695-25-RF-03B has two MPM3695-25 on the board. MPM3695-25 is a scalable, 16V, 20A step-down power modules with PMBus interface. It adopts MPS's proprietary multi-phase constant-on-time (MCOT) control structure which can provide ultra-fast transient responses, and simple loop compensation. The integrated PMBus interface provides flexible power management functions, including setting output voltage, switching frequency, fault management, timing control, and provide telemetry read back. For more details, please check MPM3695-25 datasheet. The EVM3695-25-RF-03B size is 85mm x 90mm. The total solution resides in a 15mm x 21mm area, top and bottom side. The board also provides on-board load transient circuit and SMA connector, to easily measure the voltage ripple and load transient performances.

To fully explore the digital functions of the board, the EVKT-USBI2C-02 and the Virtual Bench Pro 3.0 GUI is needed. Please contact MPS for more information.

Get EVKT-3695-25-RF-03B

#	Part Number	Item	Qty	Required
1	EVM3695-25-RF-03B*	MPM3695-25 Demo board	1	\checkmark
2	EVKT-USBI2C-02*	USB to PMBus Dongle	1	√**
3	MPM3695GRF-25- 2222	2pcs Power Module	2	\checkmark

*Datasheet is available. Please contact MPS

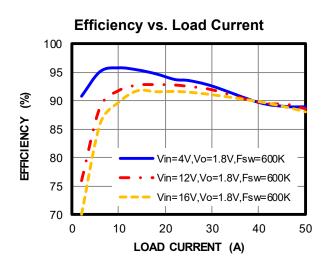
**Only required if the customer does not have these MPS USB Dongle.

EVM3695-25-RF-03B DEMO BOARD



(L × W) 85mn	א י 90mm
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Board Number	MPS IC Number		
EVM3695-25-RF-03B	MPM3695GRF-25-2222		



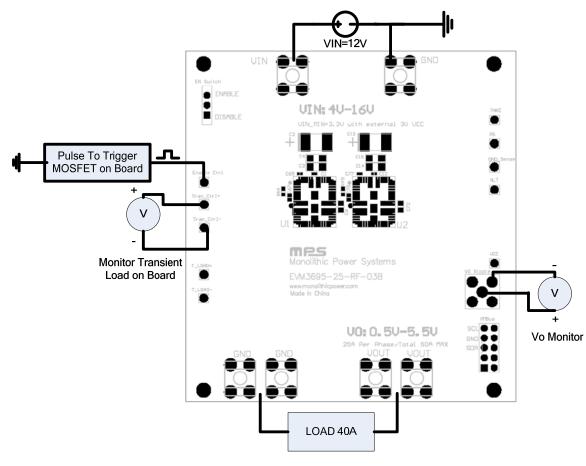


PERFORMANCE SUMMARY

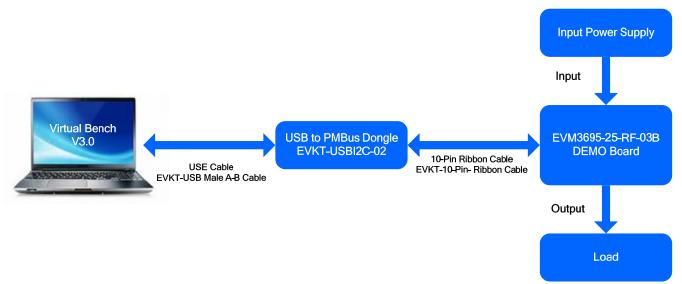
PARAMETER	CONDITIONS	VALUE
Innut Voltago Dongo	No external VCC	4V to 16V
Input Voltage Range	With external 3.3V VCC	3V to 16V
Output Voltage Range	VIN=4V to 16V	Default: 1.8V
Maximum Output Current	VIN=4V to 16V, VOUT=0.5V to 3.3V	50A Peak
Typical Efficiency	VIN=12V, VOUT=1.8V, IOUT=40A	89.70%
Peak Efficiency	VIN=12V, VOUT=1.8V, IOUT=20A	92.50%
Default SW Frequency	Pre-Rail	600kHz

QUICK START

- 1. Connect the positive and negative terminals of the load to the VOUT and GND pins.
- 2. Preset 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 the VIN and GND pins.
- 4. Turn the power supply on. The board will automatically start up.



USE VIRTUAL BENCH PRO 3.0 TO EVALUATE DEMO



- 1. Connect PMBus wires to EVB and click the 'Virtual Bench Pro.exe', GUI will auto scan deceive:
- 2. When the part is found, the PN will be shown. The GUI allow user modify the internal parameters; please refer to the register details in IC datasheet.

On the right side, user can read the VOUT, IOUT, Temperature and other parameters.

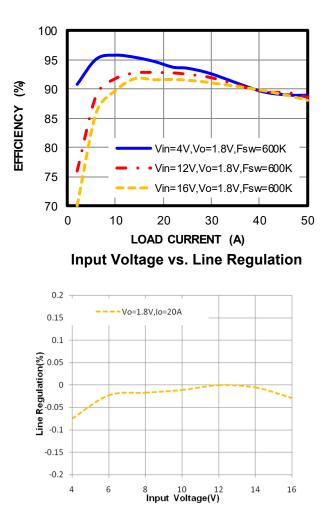
Virtual Bench Pro							
File View Configuration	Tools Help						
🎼 🔒 🕒 📄 I	🖳 🕑 💽 💽 🕑 🚱	≼ 😂 🚦					
System 💌 🗭 🗙	Register Map			Monitor		- ↓ ×	Fault ▼ ♯ X
▲ System	MPM3695_250x30:CH0		• 9	Input Voltage	12.3	V	VIN_OV_FAULT
MPM3695_25(3 CH0	Quick Setting	PWM	Current	Output Voltage	1.7525	V	VIN_OV_WARN
	Compensation		liming	Output Current	10.875	A	VIN_UV_WARN
	Temperature	7	Misc	Temperature	30	°C	State On
	All	Operation	Voltage	1710.4		2 2 2 22	VOUT_OV_FAULT
	 OPEARTION 		*	1.748		*	New yorks in the second s
	OPEARTION	ON[0x80]	•	1.744			VOUT_UV_FAULT
			E	24 28 32 36 40 44	48 52 56 60 64 68 72	76 80 84 88	IOUT_OC_WARNING
	MFR_CTRL_VOUT						IOUT_OC 🏾 🐣
	Vo discharge	No active[0b0]	•			Iout	OT_FAULT 🐣
	PG delay	1ms[0b0000]		11.2			OT_WARNING 🏾 🌑
	PG delay	Tuestopooool		11			Invalid_Command 🌰
	Vout Range	External divier(0.5~0.67	2V)[0b00]				Invalid_Data 🛛 🌏
	VOUT MARGIN HIGH			10.8 10.7			
				34.5			
	VOUT_MARGIN_HIGH	112	%VOUT_COMMAND	24 28 32 36 40 44	48 52 56 60 64 68 72	76 80 84 88	
				24 20 32 30 40 44	40 52 50 00 04 00 72		
	◇ VOUT_COMMAND			52	C		
	VOUT_COMMAND	1.8	V		E	Temperature	
				30	Λ.		
						••••	
	VOUT_SCALE	0.333		28			
	→ MFR_CTRL_OPS) > <u>1</u>	48 52 56 60 64 68 72		
	SWITCHING_FREQUEN	CY 600KHz[0b01]	•	24 28 32 36 40 44	48 52 56 60 64 68 72	76 80 84 88 * Stop	
	*		· · ·			stop	
< <u> </u>				Monitor Register			< ►

EVB TEST RESULTS

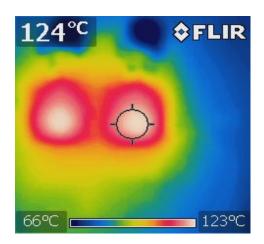
 V_{IN} = 12V, V_{OUT} = 1.8V, T_A = 25°C, unless otherwise noted.

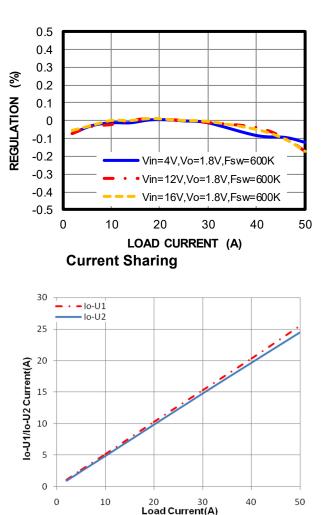
Efficiency vs. Load Current

Regulation vs. Load Current



VIN = 12V, VOUT = 1.8V, IO=40A, TA = 25°C



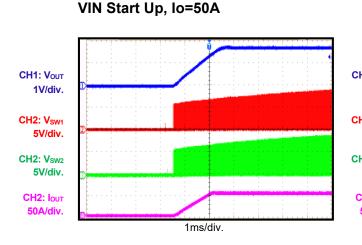


EVM3695-25-RF-03B 16V, 40A, SCALABLE DC/DC POWER MODULE WITH PMBUS

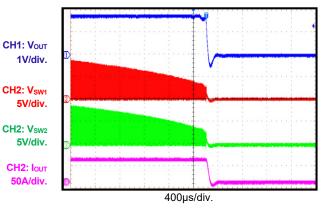
NOT RECOMMENDED FOR NEW DESIGNS, REFER TO EVM3695-20-PJ-00A

EVB TEST RESULTS (Continued)

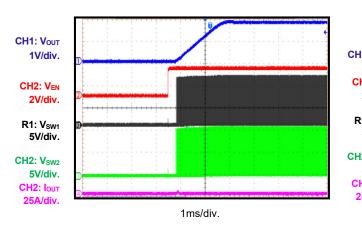
 V_{IN} = 12V, V_{OUT} = 1.8V, T_A = 25°C, unless otherwise noted.



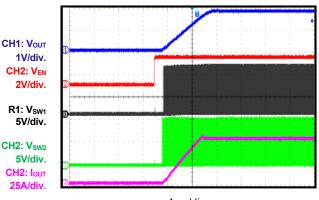
VIN Shutdown, Io=50A





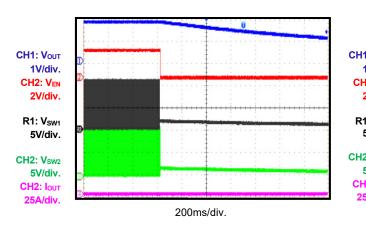


EN Start Up, Io=50A

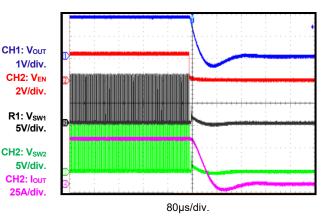


1ms/div.





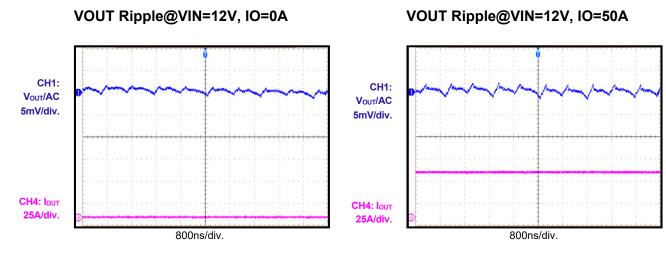
EN Shutdown, Io=50A



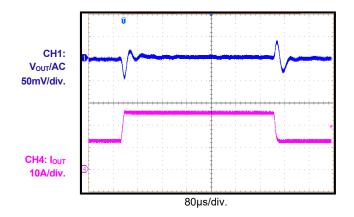


EVB TEST RESULTS (Continued)

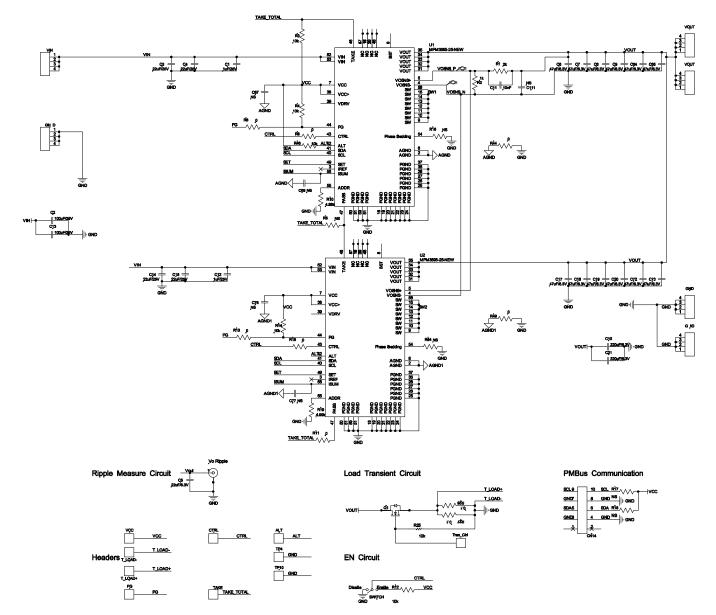
 V_{IN} = 12V, V_{OUT} = 1.8V, T_A = 25°C, unless otherwise noted.



Load Transient @ 25%-50%,2.5A/us



EVM3695-25-RF-03B SCHEMATIC



Qty	RefDes	Value	Description	Package	Manufacturer	Manufactuer_P/N
4	C3, C4, C14, C15	22µF	Ceramic Cap., 25V,X7R	1206	Murata	GRM31CR61E226KE15L
2	C1, C12	1µF	Ceramic Cap., 25V,X5R	0402	Murata	GRM155R61E105KA12D
1	C11	10nF	Ceramic Cap., 25V,X7R	0603	WE	885012206065
13	C5, C6, C7, C8, C9, C17, C18, C19, C20, C64, C65, C72, C73	47µF	Ceramic Cap., 10V,X5R	0805	Murata	GRM21BR61A476ME15L
2	C10, C21	220µF	Tantalum cap., 6.3V	D2	Panasonic	EEFCX0J221R
2	C2, C13	100µF	100µF/35V	SMD	NIPPON CHEMI-CON	EMZJ350ADA101MF80G
6	R3, R4, R12, R14, R25, R46	10K	Film Res, 1%,0603,10K	0603	YAGEO	RC0603FR-0710KL
2	R10, R19	4K99	Film Res, 1%,0603,4K99	0603	YAGEO	RC0603FR-074K99L
7	R6, R8, R11, R13, R15, R44, R49	0R	Film Res, 1%,0603,0R	0603	YAGEO	RC0603FR-070RL
1	R1	2k	Film Res, 1%,0603,2K	0603	YAGEO	RC0603FR-072KL
1	R2	1k	Film Res, 1%,0603,1K	0603	YAGEO	RC0603FR-071KL
2	U1, U2	MPM3695-25	20A power module	QFN	MPS	MPM3695GRF-25-2222

EVM3695-25-RF-03B POWER BOM

mps

EVM3695-25-RF-03B OPTIONAL AND TERMINALS

Qty	RefDes	Value	Description	Package	Manufacturer	Manufactuer_P/N
9	ALT	φ1.0	φ1.0 copper pin	DIP	N/A	φ1.0 copper pin
1	Vo Ripple	N/A	4pin	DIP	N/A	SMA connector
2	R27. R28	0R1	Film Res,1%,2512,OR 1	2512	YAGEO	RC2512FR-070R1L
1	Q1	N-MOS	Mosfet,VDS=30V, IDS=24A,Rds=4. 9mOhm	SOIC- 8PP	AnalogPower	AM7432N
1	PMBus	١	10pin connector	١	١	١
6	VIN,GND	١	١	١	Keystone	KEYSTONE7697-75
1	SWITCH	SWITCH	Tact Switch,push type,white actuator	SMD	WE	450301014042



PRINTED CIRCUIT BOARD LAYOUT

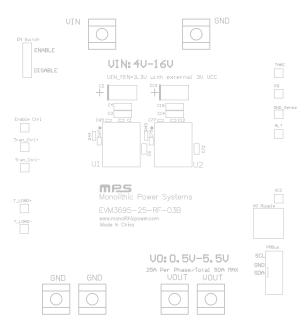


Figure 1: Top Silk Layer

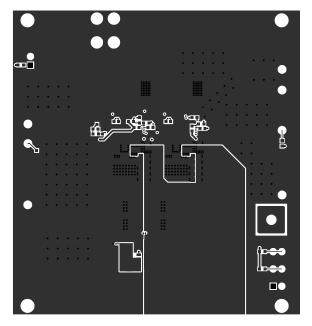


Figure 3: Bottom Layer

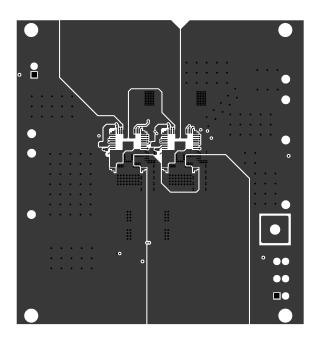


Figure 2: Top Layer

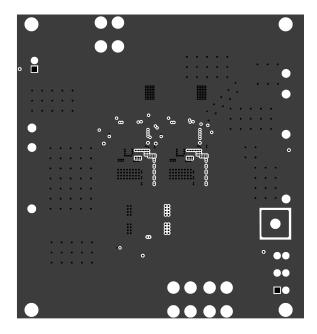


Figure 4: Inner 1 Layer



EVM3695-25-RF-03B 16V, 40A, SCALABLE DC/DC POWER MODULE WITH PMBUS

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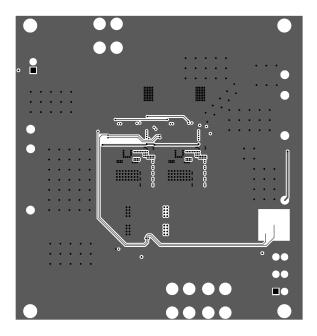


Figure 5: Inner 2 Layer

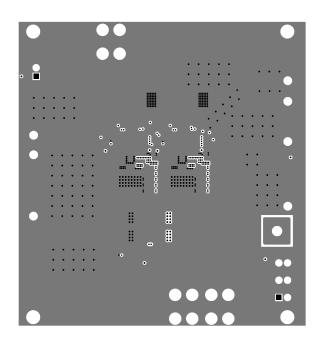


Figure 6: Inner 3 Layer

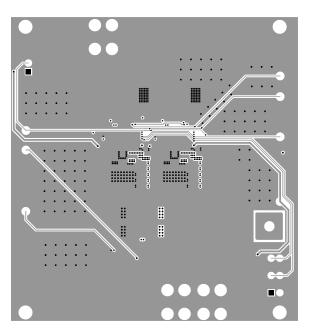


Figure 7: Inner 4 Layer

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