# EVM3695-25-RF-02A

**16V, 20A, Scalable DC/DC Power Module with PMBus**

## DESCRIPTION

MPM3695-25 は測定可能で、PMBus インタフェースのある統合された電源モジュールです。MPM3695-25 は、広い入力電圧範囲にわたって、優れた負荷とラインレギュレーションで出力電流最大 25A まで達成する、完全な電源ソリューションをご提供します。MPM3695-25 は広い負荷範囲で高い効率で動作し、最大電流 150A まで並列接続で送ることができます。

MPM3695-25 は MPS 特有の多重フェーズ　コンスタント・オン・タイム (MCOT) コントロール構造を採用しており、超高速過度応答、そして、シンプルなループ補正をご提供できます。

PMBus インターフェースはモジュールの構成とキーとなるパラメータのモニタリングをご提供します。

MPM3695-25 は過電流保護(OCP)、過電圧保護(OVP)、電圧低下保護(UVP)、および過大温度保護(OTP)の機能があります。

MPM3695-25 は最小数の外付け部品が必要です。そしてそれは QFN-59 (10mmx12mmx4mm) パッケージで提供します。

## FEATURES

- Wide Input Voltage Range from 3V
  - 3V-16V Input Voltage with External $V_{CC}$
  - 4V-16V Input Voltage with Internal $V_{CC}$
- 0.5V to 6V Output Voltage Range
- 20A Continuous Output Current, Peak 25A, Parallel Up to 150A Peak
- Auto-Interleaving for Multi-Phase Operation
- Auto-Compensation with Adaptive MCOT for Ultra-Fast Transient Response
- 0.5% Reference Voltage Over 0°C to +70°C Junction Temperature Range
- True Remote Sense of Output Voltage
- PMBus 1.3 Compliant
- Programmable via PMBus
  - Current Limit
  - Selection of Pulse-Skip Mode or Continuous Conduction Mode (CCM)
  - Soft-Start Time
  - Switching Frequency
  - Fault Limits
- Available in a QFN-59 (10mmx12mmx4mm) Package

## APPLICATIONS

- Telecom and Networking Systems
- Industrial Equipment
- Servers and Computing

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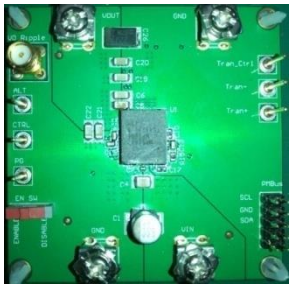
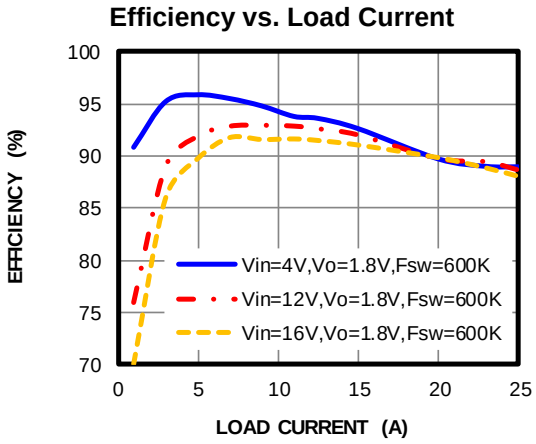
## EVM3695-25-RF-02A DEMO BOARD



**(L × W) 8.9cm × 8.9cm**

| Board Number | MPS IC Number |
|---|---|
| EVM3695-25-RF-02A | MPM3695-25 |





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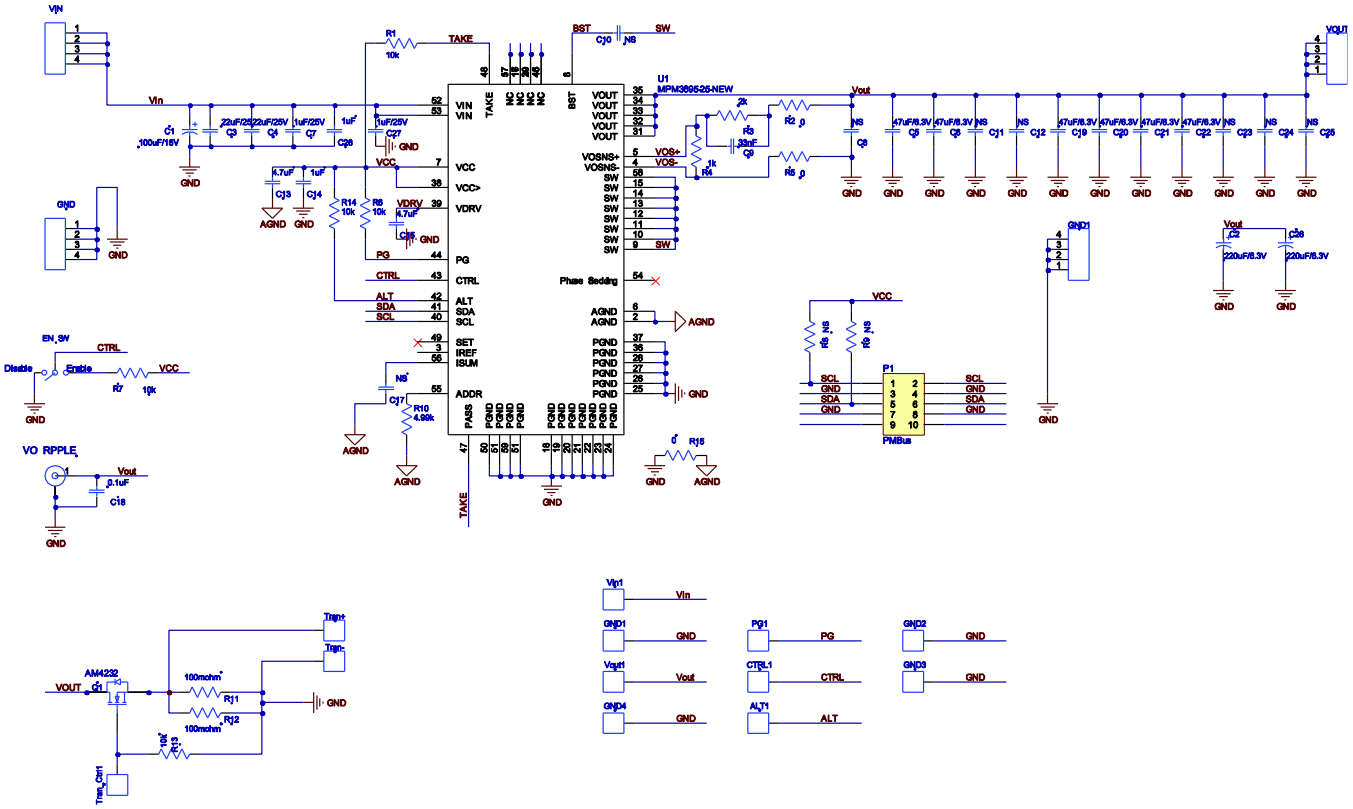
# EVM3695-25-RF-02A SCHEMATIC




**Vin=12V, Vout=1.8V@20A**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# EVM3695-25-RF-02A BOM

| Qty | RefDes | Value | Description | Package | Manufacturer | Manufactuer_P/N |
|---|---|---|---|---|---|---|
| 2 | C3,C4 | 22μF | Ceramic Cap., 25V,X7R | 1210 | Murata | GRM32ER71E226KE15L |
| 2 | C7,C27 | 1μF | Ceramic Cap., 25V,X5R | 0402 | Murata | GRM155R61E105KA12D |
| 2 | C28,C14 | 1μF | Ceramic Cap., 25V,X7R | 0603 | Murata | GRM188R71E105KA12D |
| 2 | C13,C15 | 4.7μF | Ceramic Cap., 25V,X5R | 0603 | Murata | GRM188R61E475KE11D |
| 1 | C18 | 100nF | Ceramic Cap., 25V,X7R | 0603 | Murata | GRM188R71E104KA01D |
| 1 | C9 | 33nF | Ceramic Cap., 25V,X7R | 0603 | Murata | GRM188R71E333KA01D |
| 6 | C5.C6. C19.C20. C21.C22 | 47μF | Ceramic Cap., 6.3V,X5R | 1206 | Murata | GRM31CR60J476ME19L |
| 2 | C2.C26 | 220μF | Tantalum cap., 6.3V | D2 | Panasonic | EEFCX0J221R |
| 1 | C1 | 100μF | 100μF/35V | SMD | NIPPON CHEMI-CON | EMZJ350ADA101MF80G |
| 5 | R1.R6 R14.R7. R13 | 10k | Film Res,1%, 0603,10K | 0603 | YAGEO | RC0603FR-0710KL |
| 1 | R10 | 4K99 | Film Res,1%, 0603,4K99 | 0603 | YAGEO | RC0603FR-074K99L |
| 3 | R2.R5. R15 | 0R | Film Res,1%, 0603,0R | 0603 | YAGEO | RC0603FR-070RL |
| 1 | R3 | 2k | Film Res,1%, 0603,2K | 0603 | YAGEO | RC0603FR-072KL |
| 1 | R4 | 1k | Film Res,1%, 0603,1K | 0603 | YAGEO | RC0603FR-071KL |
| 4 | VIN,GND | N/A | N/A | N/A | Keystone | KEYSTONE7697-75 |
| 6 | ALT | φ1.0 | φ1.0 copper pin | DIP | N/A | φ1.0 copper pin |
| 1 | Vo Ripple | N/A | 4pin | DIP | N/A | SMA 射频座 |
| 1 | CN6 | SWITCH | Tact Switch, push type,white actuator | SMD | WE | 450301014042 |
| 1 | P1 | | 10pin 双排直插针 | | | |
| 1 | U1 | MPM3695-25 | 20A power module | QFN | MPS | MPM3695GRF-25-0022 |
| 2 | R11. R12 | 0R1 | Film Res,1%, 2512,OR1 | 2512 | YAGEO | RC2512FR-070R1L |
| 1 | Q1 | N-MOS | 20A MOSFET | D-PARK2 | Analog | AM4342N |


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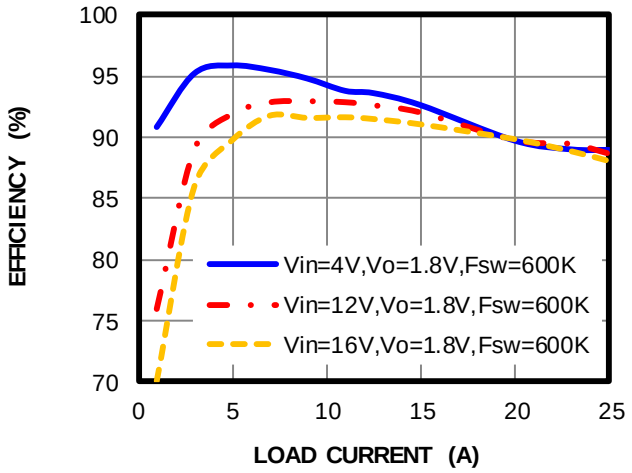
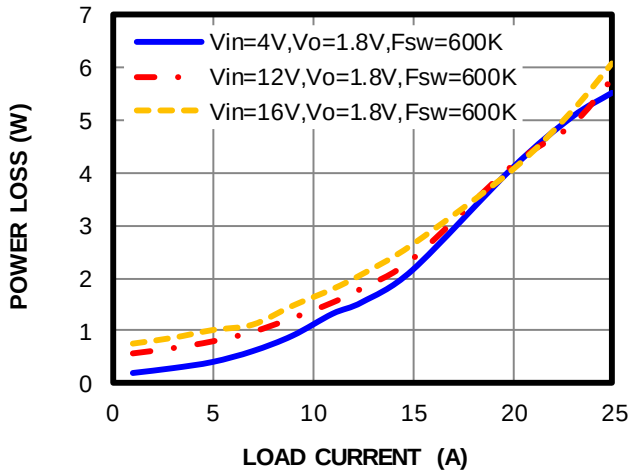
## TYPICAL PERFORMANCE CHARACTERISTICS

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

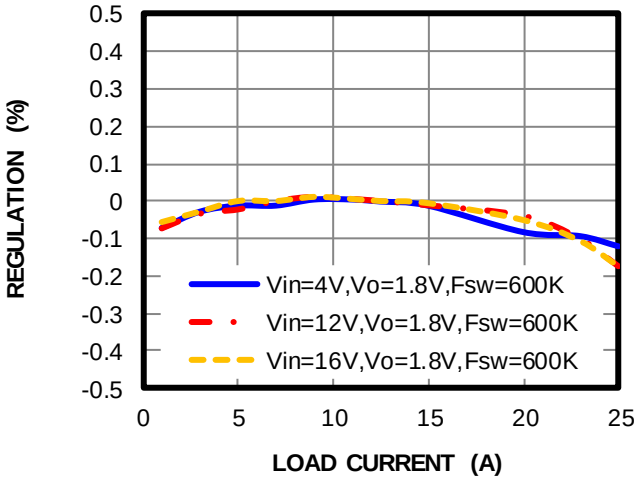
**Efficiency vs. Current Load**



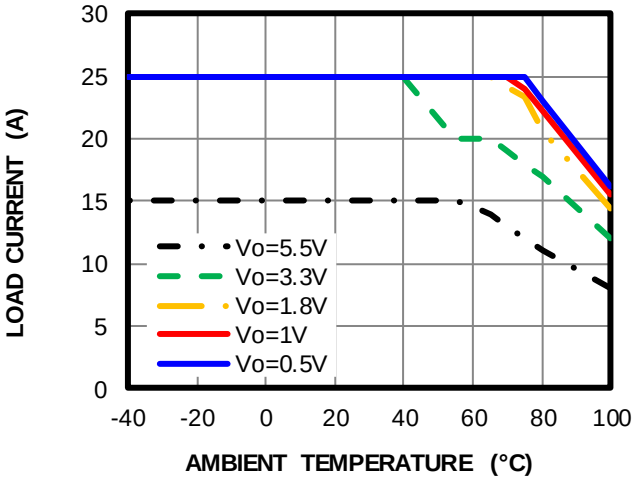

**Power Loss vs. Load Current**




**Regulation vs. Load Current**




**Thermal De-rating vs. Ambient Temp@200LFM Air Flow**





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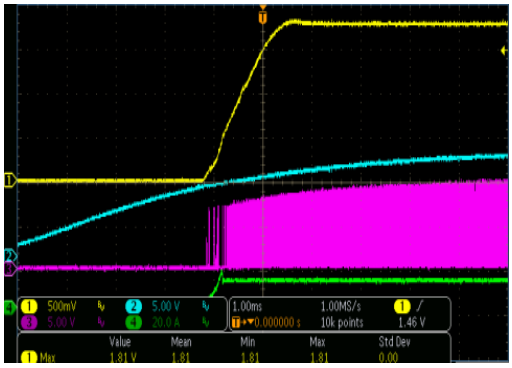
## TYPICAL PERFORMANCE CHARACTERISTICS *(Continued)*

**$V_{IN}$ = 12V, $V_{OUT}$ = 1.8V, Io=20A, $T_A$ = 25°C, unless otherwise noted.**

### VIN Start-Up

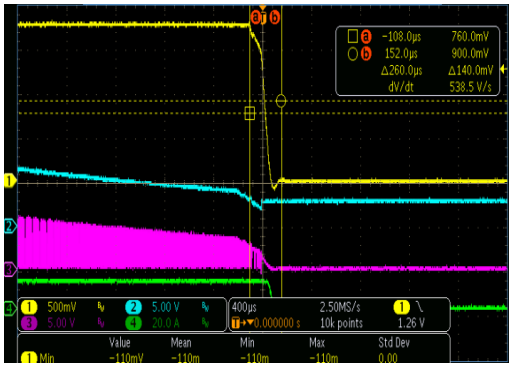
CH1: $V_{OUT}$ 500mV/div.
CH2: $V_{IN}$ 5V/div.
CH3: $V_{SW}$ 5V/div.
CH4: $I_{OUT}$ 20A/div.



1ms/div.

### VIN Shutdown

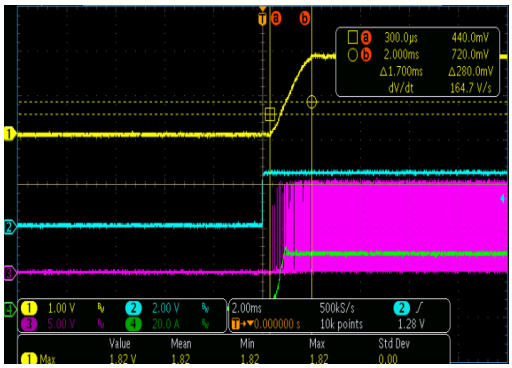
CH1: $V_{OUT}$ 500mV/div.
CH2: $V_{IN}$ 5V/div.
CH3: $V_{SW}$ 5V/div.
CH4: $I_{OUT}$ 20A/div.



400µs/div.

### EN Start-Up

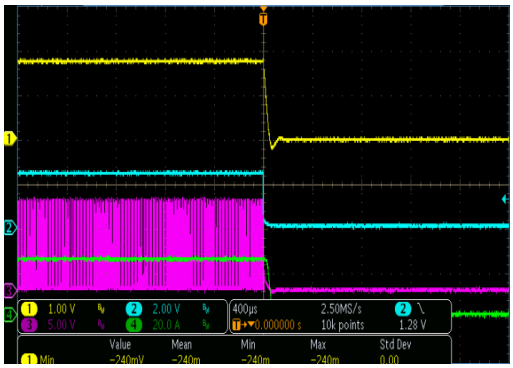
CH1: $V_{OUT}$ 1V/div.
CH2: $V_{EN}$ 2V/div.
CH3: $V_{SW}$ 5V/div.
CH4: $I_{OUT}$ 20A/div.



2ms/div.

### EN Shutdown

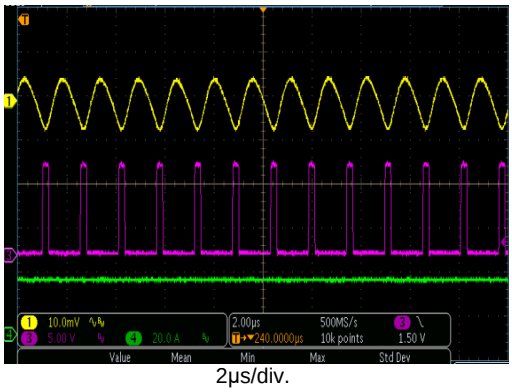
CH1: $V_{OUT}$ 1V/div.
CH2: $V_{EN}$ 2V/div.
CH3: $V_{SW}$ 5V/div.
CH4: $I_{OUT}$ 20A/div.



400µs/div.

### VOUT Ripple@VIN=12V, IO=20A

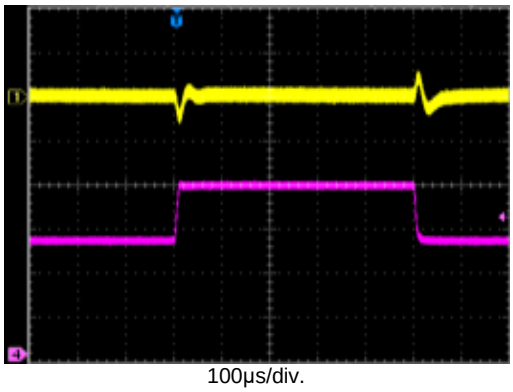
CH1: $V_{OUT}$ 10mV/div.
CH3: $V_{SW}$ 5V/div.
CH4: $I_{OUT}$ 20A/div.



2µs/div.

### Load Transient@25% to 50% Load,2.5A/us

CH1: $V_{OUT}$ 50mV/div.
CH3: $I_{OUT}$ 5V/div.



100µs/div.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## EVM3695-25-RF-02A PCB LAYOUT

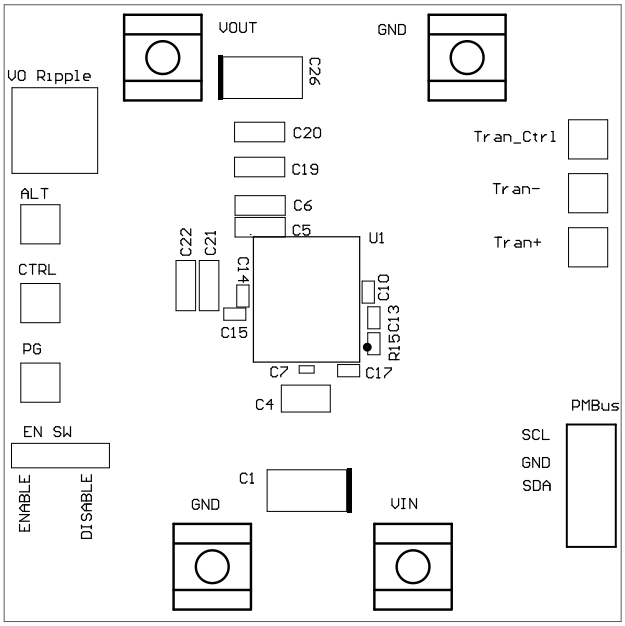


**Figure 1-Top Silk Layer**

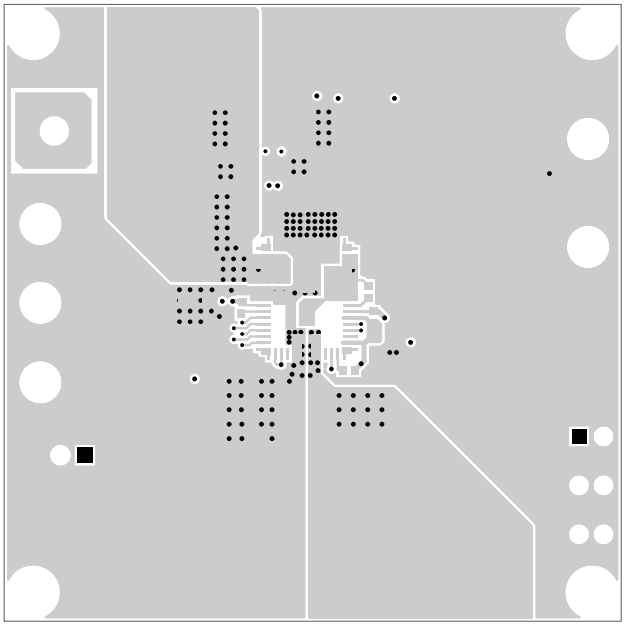

**Figure 2-Top Layer**


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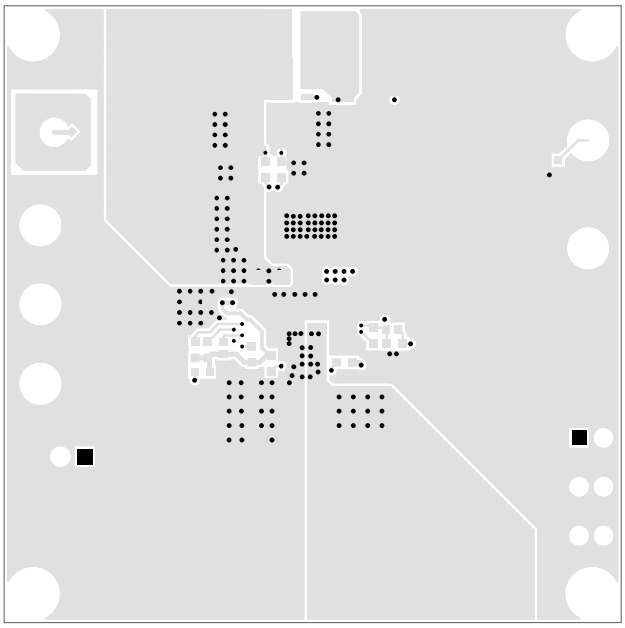

**Figure 3-Bottom Layer**

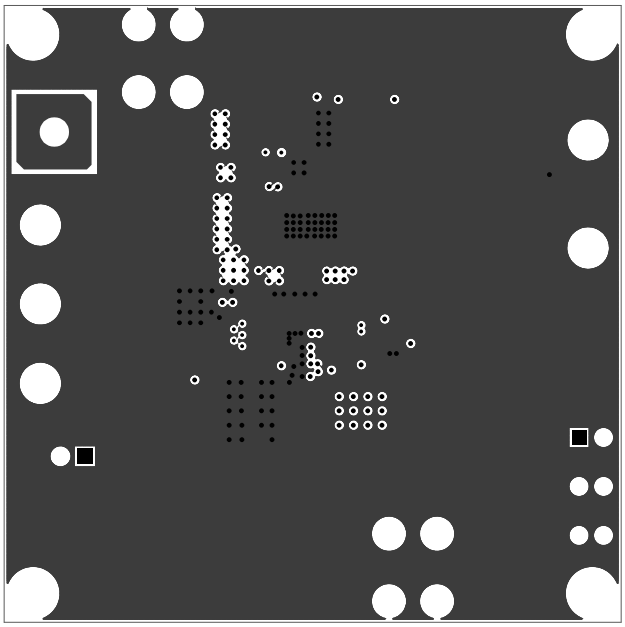

**Figure 4-Inner1 Layer**


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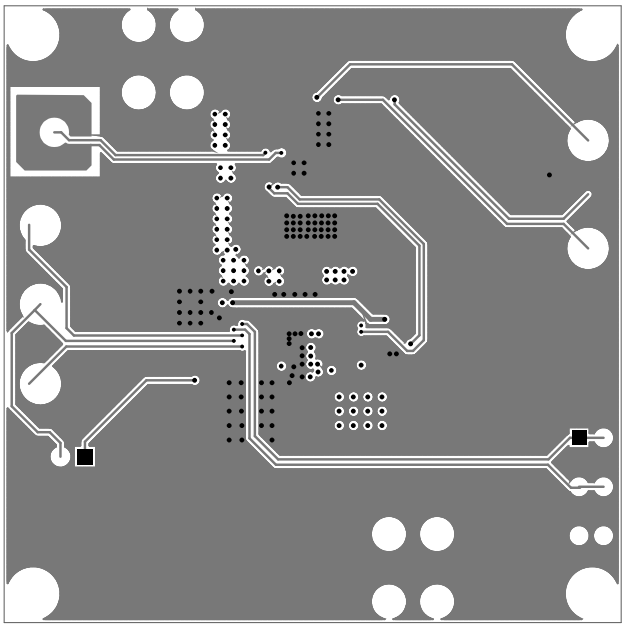

**Figure 5-Inner2 Layer**

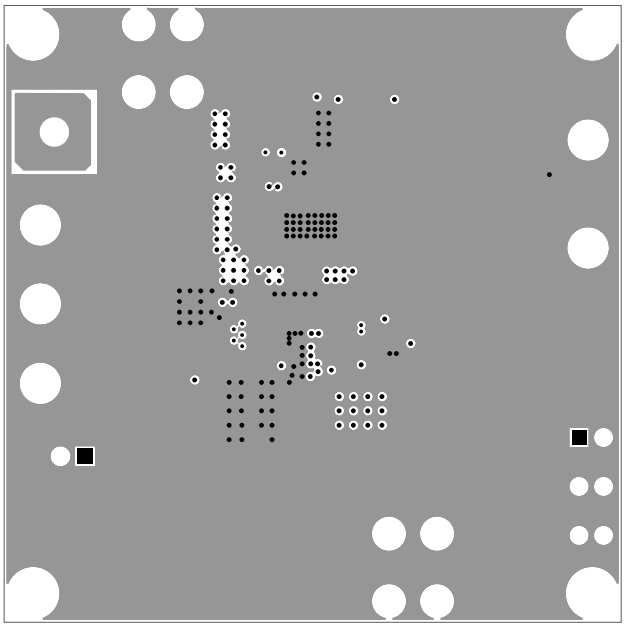

**Figure 6-Inner3 Layer**


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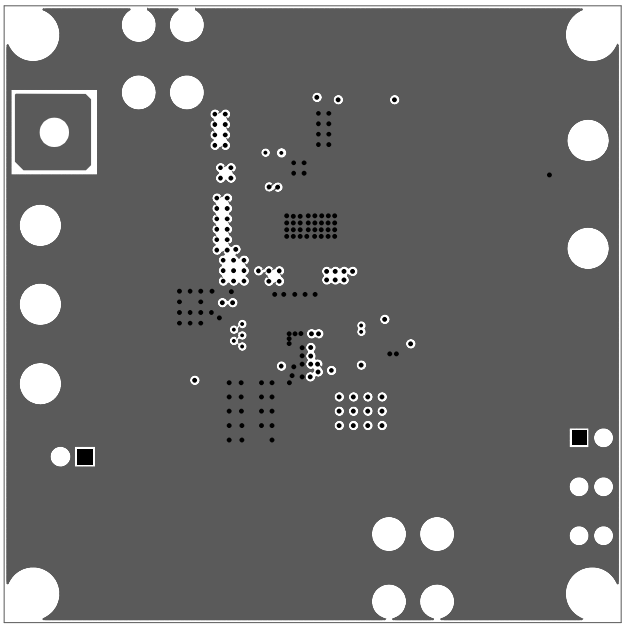

**Figure 7-Inner4 Layer**


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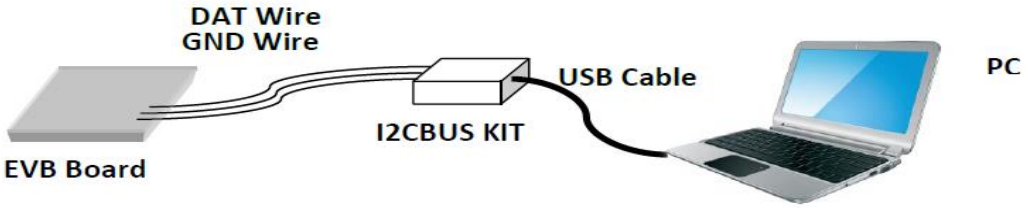
## クイックスタート:

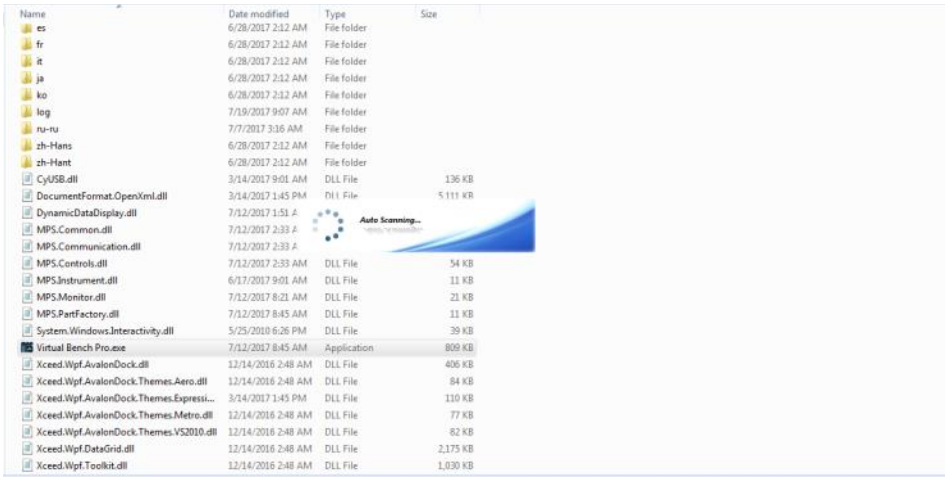
1. 負荷の正と負の端子を VOUT と GND ピンにそれぞれ接続してください。
2. 入力電源をあらかじめ 4V から 16V の間で設定し、それから電源を消してください。
3. 電源の正と負端子を VIN and GND ピンにそれぞれ接続してください。
4. 電源をつけてください。ボードは自動的に起動します。(図 1 - Figure 1) Top Silk Layer
5. MPM3695-25 GUI シンプルガイド:

   a. PMBus ツールについて完全であることを確認してください。

| ITEM | PN | QUANTITY |
|---|---|---|
| EVB | EVM3695-25-RF-02A | 1 |
| PMBus Kit | EVKT-USBI2C-02 | 1 |
| USB Cable | \ | 1 |
| PMBUs Wire | \ | 1 |

b. PMBus ワイヤを EVB に接続し、'Virtual Bench Pro.exe'をクリックしてください。GUI は自動スキャンを始めます。





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c. そのパートが見つかった時、PN が表示されます。GUI は内部のパラメータを修正します。 IC データシートのレジスタ詳細を参照してください。


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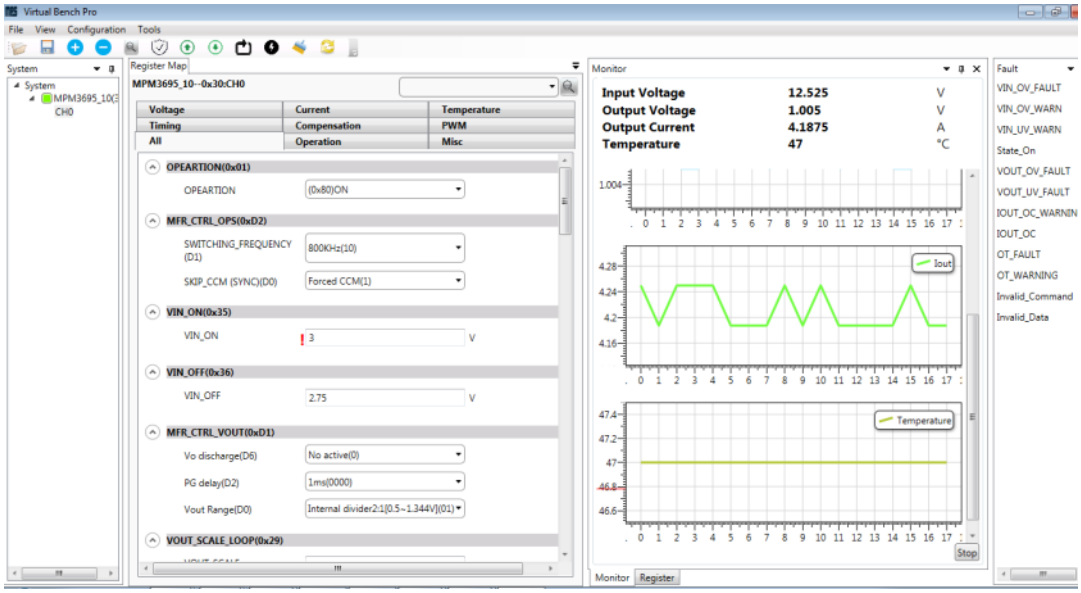
画面右側では、ユーザーは VOUT, IOUT、温度そして他のパラメータを見ることができます。




6. 違う出力電圧については、下記の FB ディバイダと PMBus パラメータが推奨されます。

| Recommended Vo Range(V) | R3 | R4 | Vout_scale | Ramp | Cff | Fsw |
|---|---|---|---|---|---|---|
| 0.5~1 | 500ohm | 500ohm | 0.5 | 44.7mV | 33nF | 600k |
| 1~1.8 | 2k | 1k | 0.335 | 44.7mV | 33nF | 600k |
| 1.8~2.4 | 3k | 1k | 0.25 | 44.7mV | 33nF | 600k |
| 2.4~4 | 6.98k | 1k | 0.125 | 44.7mV | 33nF | 600k |
| 4~6 | 9.09k | 1k | 0.1 | 44.7mV | 33nF | 600k |

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