# EVMPC22164-2891-Split-02A

**130A, Two-Phase Intelli-Module with Quiet Switcher™ Technology Evaluation Board**

## DESCRIPTION

The EVMPC22164-2891-Split-02A is an evaluation board designed for the MPC22164-130, a 130A, 2-phase Intelli-Module with Quiet Switcher™ Technology.

The evaluation board can deliver 130A of load current across a wide operating input voltage ($V_{IN}$) range, and it can achieve high efficiency across a wide output current ($I_{OUT}$) load range.

The evaluation board employs one MP2891 device and two MPC22164-130 devices. The MP2018-33, a low-power linear regulator, is also integrated because it provides a stable 3.3V power supply for the MP2981 and MPC22164-130. There are two power supply rails that can run independently.

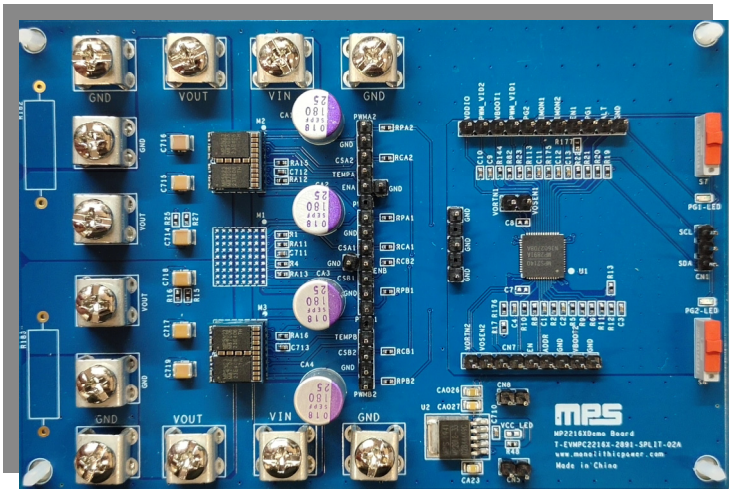
The EVMPC22164-2891-Split-02A can monitor the MPC22164-130's $V_{IN}$, output voltage ($V_{OUT}$), $I_{OUT}$, and temperature. The EVMPC22164-2891-Split-02A provides configurable $V_{IN}$ under-voltage lockout (UVLO) protection, $V_{OUT}$ over-voltage protection (OVP), under-voltage protection (UVP), over-current limiting (OCL), and over-current protection (OCP).

## PERFORMANCE SUMMARY

Specifications are at $T_A$ = 25°C, unless otherwise noted.

| Parameters | Conditions | Value |
|---|---|---|
| Input voltage ($V_{IN}$) range | | 10V to 16V |
| Output voltage ($V_{OUT}$) | $V_{IN}$ = 10V to 16V, $I_{OUT}$ = 0A to 130A | $V_{OUT}$ = 0.8V |
| Maximum output current ($I_{OUT}$) | $V_{IN}$ = 10V to 16V | 130A |
| Switching frequency ($f_{SW}$) | | 500kHz |

## EVMPC22164-2891-SPLIT-02A EVALUATION BOARD




**LxWxH (12cmx8cmx2cm)**

| Board Number | MPS IC Number |
|---|---|
| EVMPC22164-2891-Split-02A | MPC22164-130 |
| | MP2891 |
| | MP2018-33 |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# QUICK START GUIDE

The EVMPC22164-2891-Split-02A has a 10V to 16V input voltage ($V_{IN}$) range. For proper measurement equipment set-up, refer to Figure 1. The EVMPC22164-2891-Split-02A has a start-up and shutdown sequence, described below.

### Start-Up Sequence

1. Set the input voltage ($V_{IN}$) between 10 and 16V.
2. Turn on the mechanical EN switches S7 and S6 (for rail A and rail B, respectively).
3. Turn on the EN commands in the GUI, and VOUT1 and VOUT2 (for rail A and rail B, respectively).

### Shutdown Sequence (1)

1. Set $V_{IN}$ to be below 10V or above 16V.
2. Turn off the EN switches (S7 and S6), or turn off the EN commands in the GUI.

**Note:**

1) The evaluation board can also be shut down due to $V_{IN}$ over-voltage protection (OVP) and under-voltage protection (UVP), $V_{OUT}$ OVP and UVP, over-current protection (OCP), or over-temperature protection (OTP). If a protection is triggered, the output can be recovered by cycling the power on the VIN or EN switches.

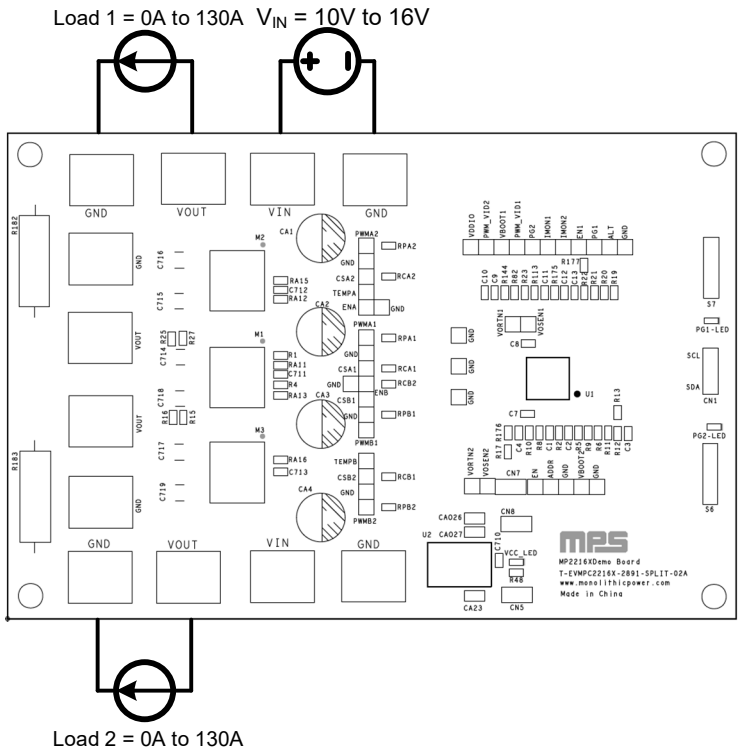


**Figure 1: Measurement Equipment Set-Up**


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# EVALUATION BOARD SCHEMATICS

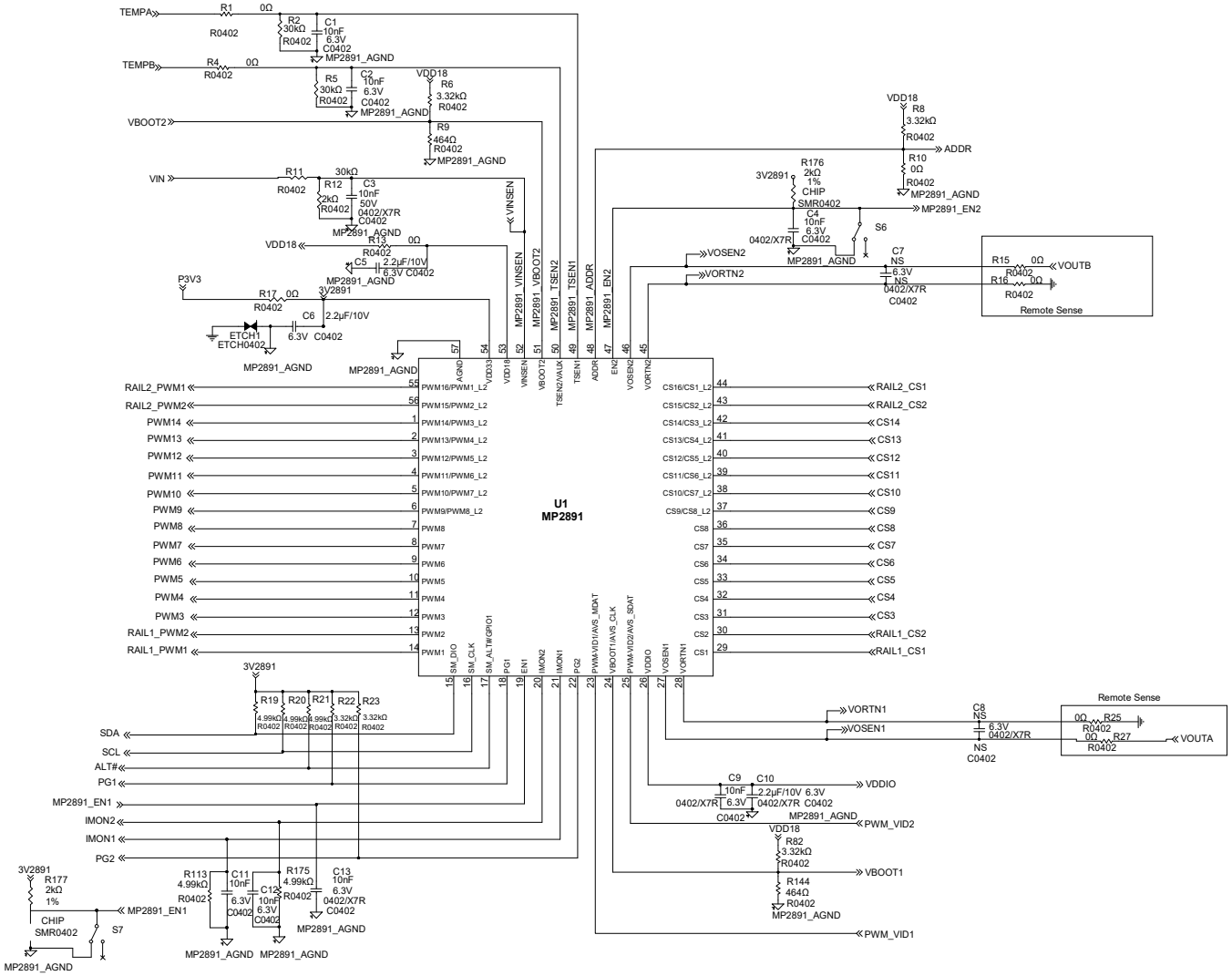


**Figure 2: Evaluation Board Schematic (MP2891)**


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# EVALUATION BOARD SCHEMATICS *(continued)*

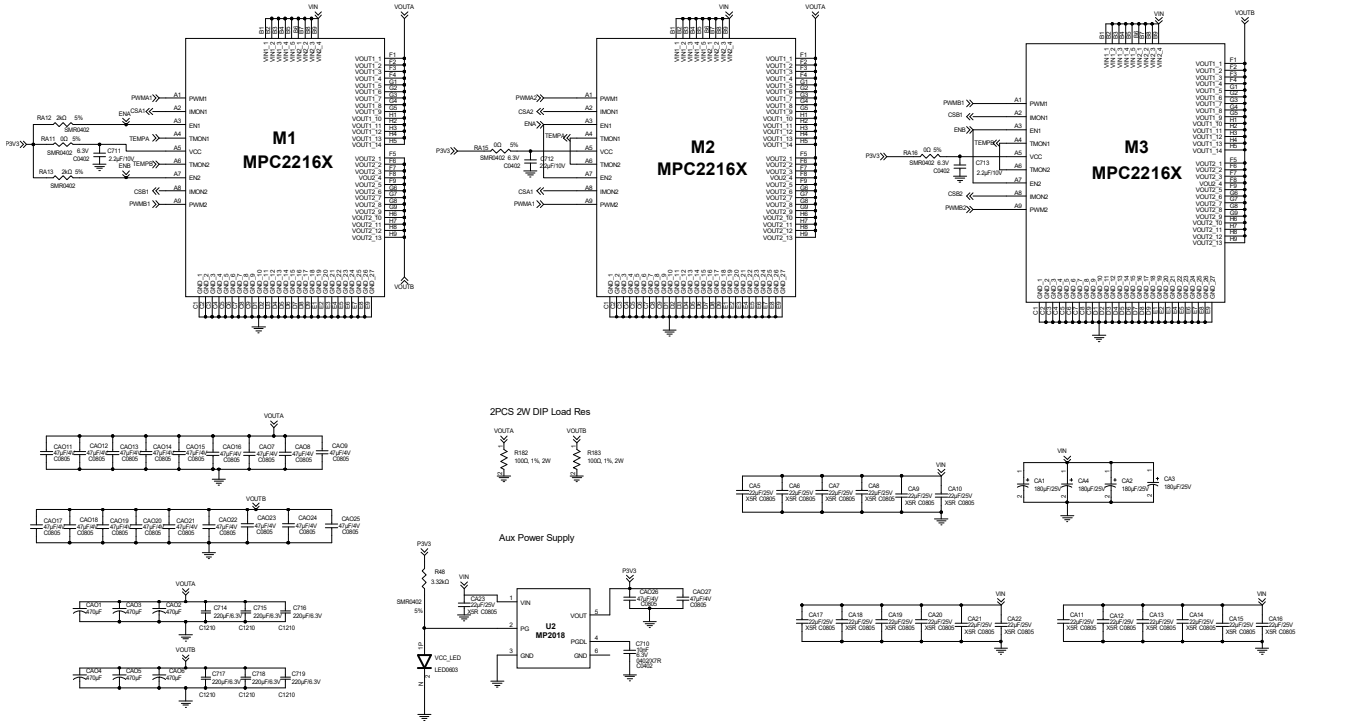


**Figure 3: Evaluation Board Schematic (MPC2216x and Aux Power Supply)**

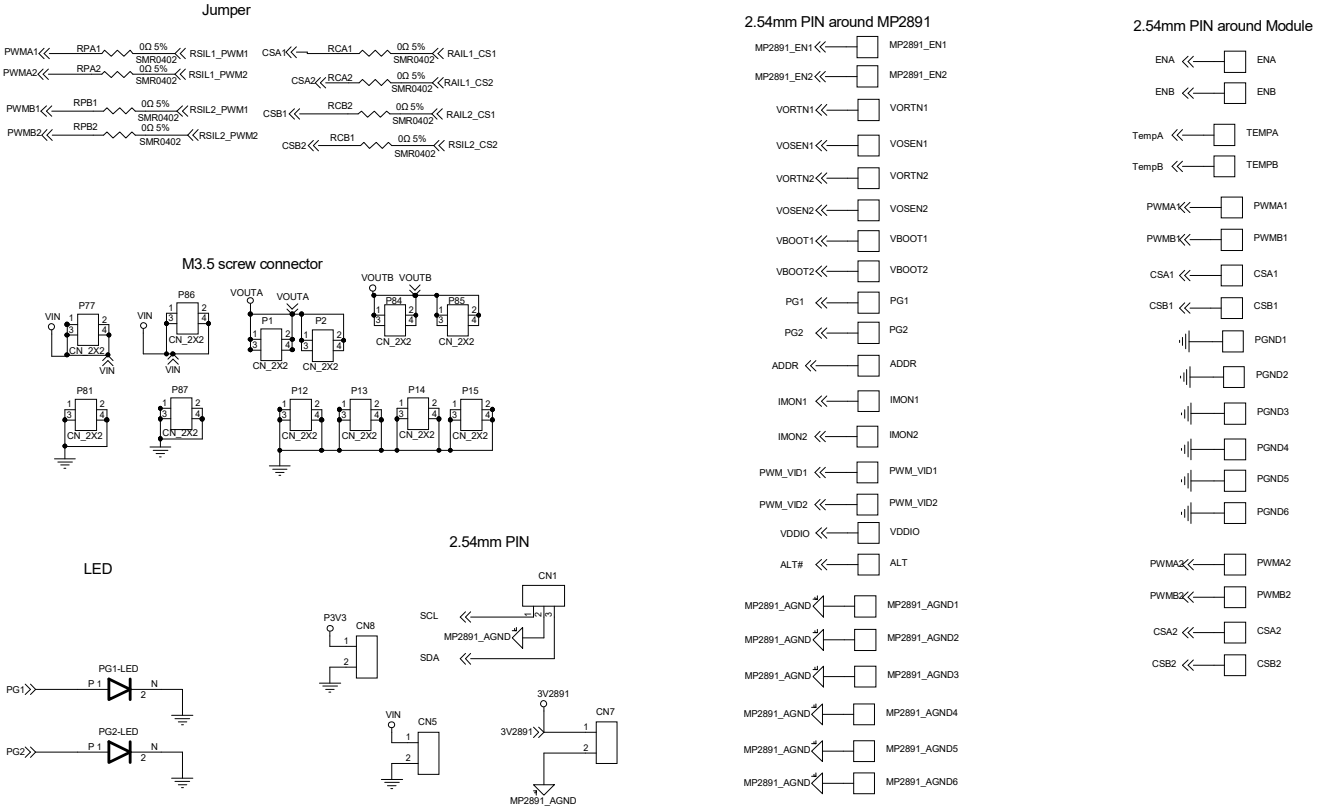


**Figure 4: Evaluation Board Schematic (Connectors)**


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## EVMPC22164-2891-02A BILL OF MATERIALS

| Qty | Ref | Value | Description | Package | Manufacturer | Manufacturer PN |
|---|---|---|---|---|---|---|
| 4 | CA1, CA2, CA3, CA4 | 180µF | Electrolytic capacitor, 180µF/25V, DIP8X11.3 | DIP | Panasonic | 25SEPF180M |
| 6 | CAO1, CAO2, CAO3, CAO4, CAO5, CAO6 | 470µF | POS capacitor, 470µF/2.5V | 7343 | Panasonic | EEFGX0E471R |
| 19 | CA5, CA6, CA7, CA8, CA9, CA10, CA11, CA12, CA13, CA14, CA15, CA16, CA17, CA18, CA19, CA20, CA21, CA22, CA23 | 22µF | MLCC capacitor, 22µF/25V, X5R, 0805 | 0805 | Murata | GRM21BR61E226ME44 |
| 20 | CAO7, CAO8, CAO9, CAO11, CAO12, CAO13, CAO14, CAO15, CAO16, CAO17, CAO18, CAO19, CAO20, CAO21, CAO22, CAO23, CAO24, CAO25, CAO26, CAO27 | 47µF | MLCC capacitor, 47µF/4V, X6S, 0805 | 0805 | Murata | GRM21BC80G476ME15 |
| 9 | C1, C2, C3, C4, C9, C11, C12, C13, C710 | 10nF | MLCC capacitor, 10nF/50V, X7R, 0402 | 0402 | Murata | GRM155R71H103KA88 |
| 6 | C5, C6, C10, C711, C712, C713 | 2.2µF | MLCC capacitor, 2.2µF/10V, X6S, 0402 | 0402 | Murata | GRM155C81A225ME44 |
| 2 | C7, C8 | NS | Ceramic capacitor, 220pF,6.3V, 10%, X7R, CAP0402 | 0402 | | |
| 6 | C714, C715, C716, C717, C718, C719 | 220µF | MLCC capacitor, 220µF/6.3V, X5R, 1210 | 1210 | Murata | GRM32ER60J227ME05 |
| 20 | RPB1, RPA1, RCB1, RCA1, R1, RPB2, RPA2, RCB2, RCA2, R4, R10, RA11, R13, RA15, R15, RA16, R16, R17, R25, R27 | 0Ω | Resistor, 1/16W ±5% (0402) | 0402 | Yageo | RC0402FR-070RL |
| 5 | RA12, R12, RA13, R176, R177 | 2kΩ | Resistor, 1/16W, ±1% (0402) | 0402 | Yageo | RC0402FR-072KL |
| 3 | R2, R5, R11 | 30kΩ | Resistor, 1/16W, ±1% (0402) | 0402 | Yageo | RC0402FR-0730KL |
| 6 | R6, R8, R22, R23, R48, R82 | 3.32kΩ | Resistor, 1/16W, ±1% (0402) | 0402 | Yageo | RC0402FR-073K32L |


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## EVMPC22164-2891-02A BILL OF MATERIALS *(continued)*

| Qty | Ref | Value | Description | Package | Manufacturer | Manufacturer PN |
|---|---|---|---|---|---|---|
| 2 | R9, R144 | 464Ω | Resistor, 1/16W, ±1% (0402) | 0402 | Yageo | RC0402FR-07464RL |
| 5 | R19, R20, R21, R113, R175 | 4.99kΩ | Resistor, 1/16W, ±1% (0402) | 0402 | Yageo | RC0402FR-074K99L |
| 2 | R182, R183 | NS | Resistor, 1/16W, ±1% (0402) | DIP | | |
| 2 | S6, S7 | 10mmx 2mm | Switch | DIP | Any | |
| 3 | PG1-LED, PG2-LED, 12V_LED | 0.2W | Green LED | 0603 | BaiHong | BL-HGE36A-AV-TRB |
| 12 | P1, P2, P12, P13, P14, P15, P77, P81, P84, P85, P86, P87 | 6-32 screw size | Screw connector, 4-pin | DIP | Keystone Electronics | 8191K-ND |
| 45 | VOSEN1, VORTN1, VBOOT1, PWM_VID1, PWMB1, PWMA1, PGND1, PG1, IMON1, CSB1, CSA1, VOSEN2, VORTN2, VBOOT2, PWM_VID2, PWMB2, PWMA2, PGND2, PG2, IMON2, CSB2, CSA2, PGND3, PGND4, PGND5, PGND6, EN1, EN2, AGND1, AGND2, AGND3, AGND4, AGND5, AGND6, VDDIO, TEMPB, TEMPA, ENB, ENA, ALT, ADDR, CN1, CN5, CN7. CN8 | 2.54mm | Pin header, single row | DIP | Any | |
| 2 | M2, M3 | MPC22164 -130 | Power block | LGA-72 (9mmx 10mmx 9.65mm) | MPS | MPC22164-130 |
| 1 | M1 | NS | Power block | | | |
| 1 | U1 | MP2891 | 16-phase digital controller | QFN-56 (7mmx 7mm) | MPS | MP2891GQN |
| 1 | U2 | MP2018-33 | 16V input, 3.3V output, 500mA, linear regulator | TO252-5 | MPS | MP2018GZD-33 |


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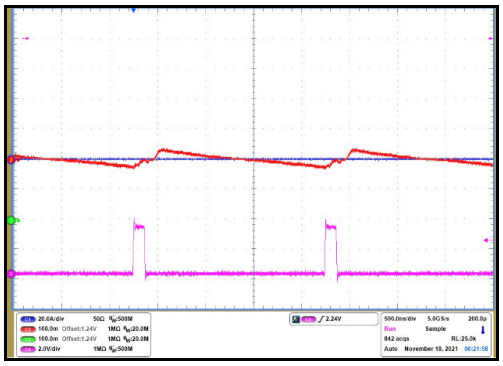
# EVB TEST RESULTS

**Performance curves and waveforms are tested on the evaluation board. $V_{IN}$ = 12V, $V_{OUT}$ = 0.8V, $T_A$ = 25°C, unless otherwise noted.**

### Steady State (IMON Reporting)

1-phase, $I_{OUT}$ = 0A

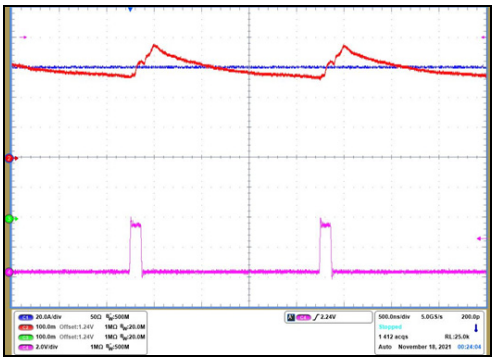
CH1: $I_{OUT}$
CH2: $I_{MON}$
CH3: PWM



### Steady State (IMON Reporting)

1-phase, $I_{OUT}$ = 60A

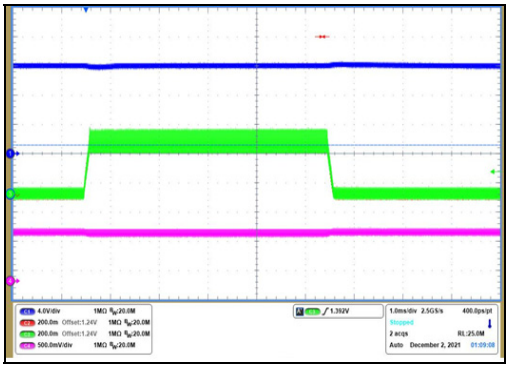
CH1: $I_{OUT}$
CH2: $I_{MON}$
CH3: PWM



### Load Transient Response

2 phases (interleaved), $V_{IN}$ = 12V,
$I_{OUT}$ = 0A to 130A to 0A

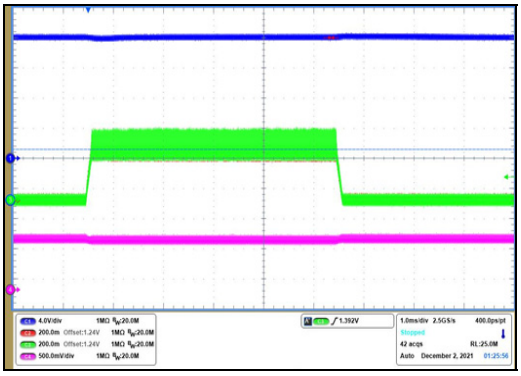
CH1: $V_{IN}$
CH2: $I_{MON1}$
CH3: $I_{MON2}$
CH4: $V_{OUT}$



### Load Transient Response

2 phases (interleaved), $V_{IN}$ = 16V,
$I_{OUT}$ = 0A to 130A to 0A

CH1: $V_{IN}$
CH2: $I_{MON1}$
CH3: $I_{MON2}$
CH4: $V_{OUT}$

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## PCB LAYOUT

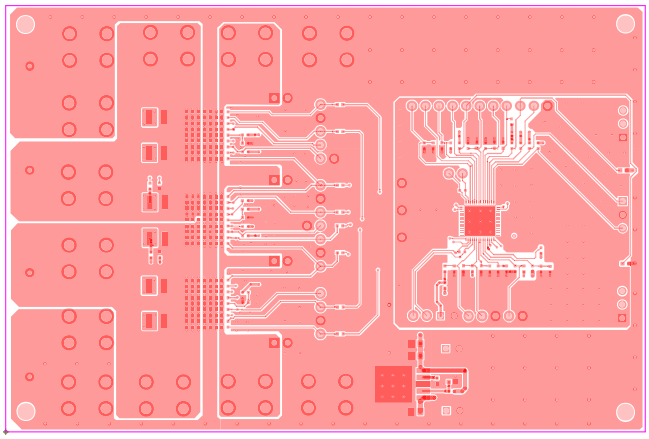

Figure 5: Top Layer

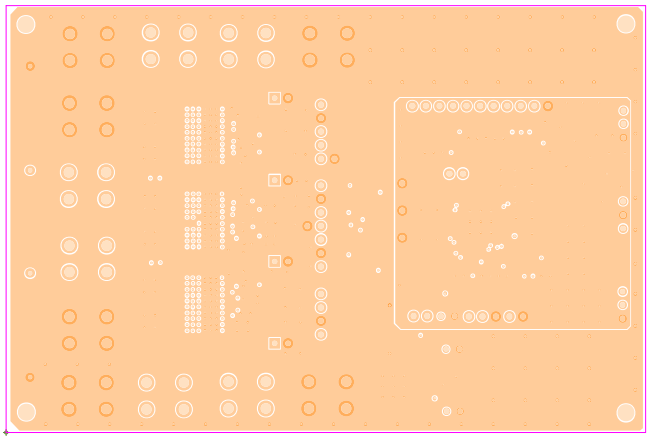

Figure 6: Mid-Layer 1

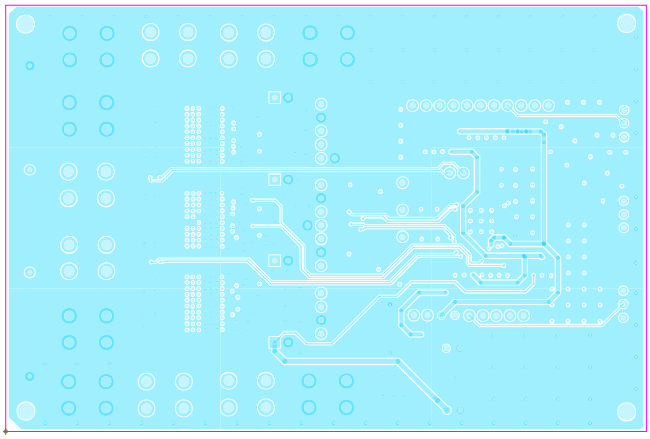

Figure 7: Mid-Layer 2

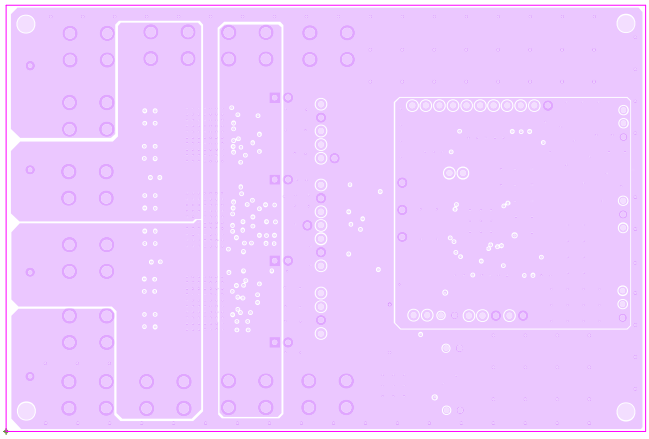

Figure 8: Mid-Layer 3

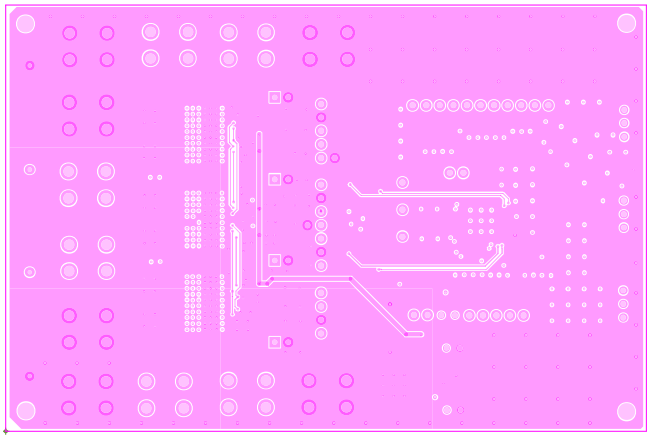

Figure 9: Mid-Layer 4

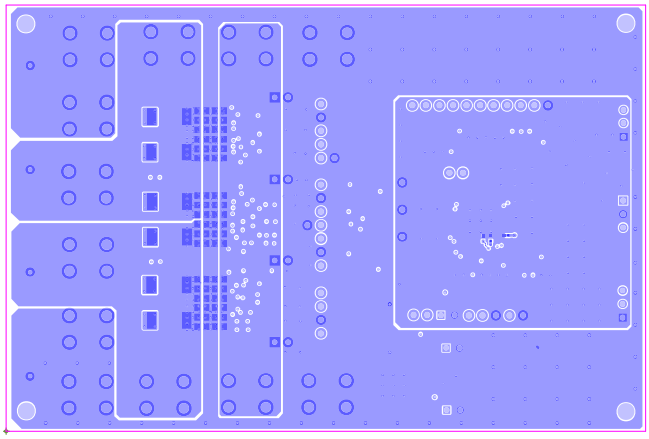

Figure 10: Bottom Layer


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## REVISION HISTORY

| Revision # | Revision Date | Description | Pages Updated |
|---|---|---|---|
| 1.0 | 2/8/2023 | Initial Release | - |

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