

APM81803 Evaluation Board User Guide

DESCRIPTION

The A81803 evaluation board is designed to aid system designers in evaluating the operation and performance of the APM81803 synchronous buck regulator module. The board will arrive with a mark on one of the silkscreen boxes in the top right of the board to identify how the evaluation board is configured.

FEATURES

- APM81803 buck converter power module
- User selectable soft-start timing control
- User selectable PWM vs Low Power mode
- Input to optionally synchronize power converter switching

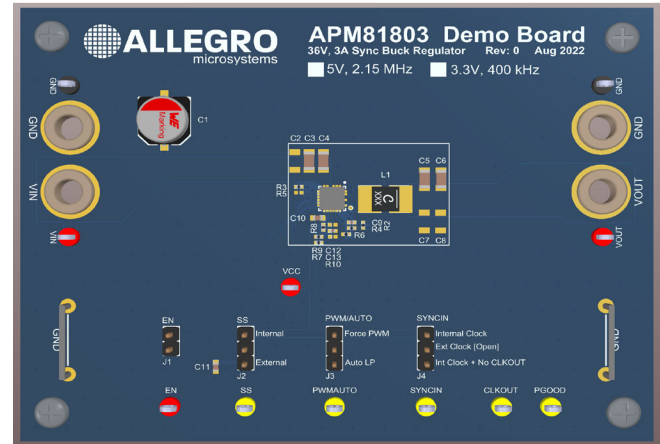


Figure 1: APM81803 Evaluation Board

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Table 1: APM81803 Evaluation Board Configurations

Configuration Name	Part Number	Description
EN	J1	Install to tie EN to VIN and enable the APM81803 when VIN exceeds UVLO. Uninstall to control EN with an external signal through the EN test point.
SS	J2	Soft-start select. Install at "Internal" to use internal soft-start or EXTERNAL to use an external 22 nF soft-start capacitor.
PWM/AUTO	J3	Low-power mode select. Install at AUTO LP to allow the part to enter low-power mode under light loads. Install at FORCE PWM to always stay in PWM switching mode.
SYNCIN	J4	Clock synchronization input. Install from center pin to top INTERNAL CLOCK pin to use the internal clock and enable the CLKOUT pin. Install from center pin to the bottom INT CLOCK + NO CLKOUT to use the internal clock and disable the CLKOUT signal. Leave the jumper open to apply a synchronization clock at the SYNCIN test point.

USING THE EVALUATION BOARD

This section provides an overview of the connections and configuration options of the evaluation board. Each group of connections shown below has a detailed section that follows. The default jumper positions are highlighted in green. The APM81803 datasheet contains detailed information about the use and functionality of each pin and should be consulted for more detailed information not contained in this user guide.

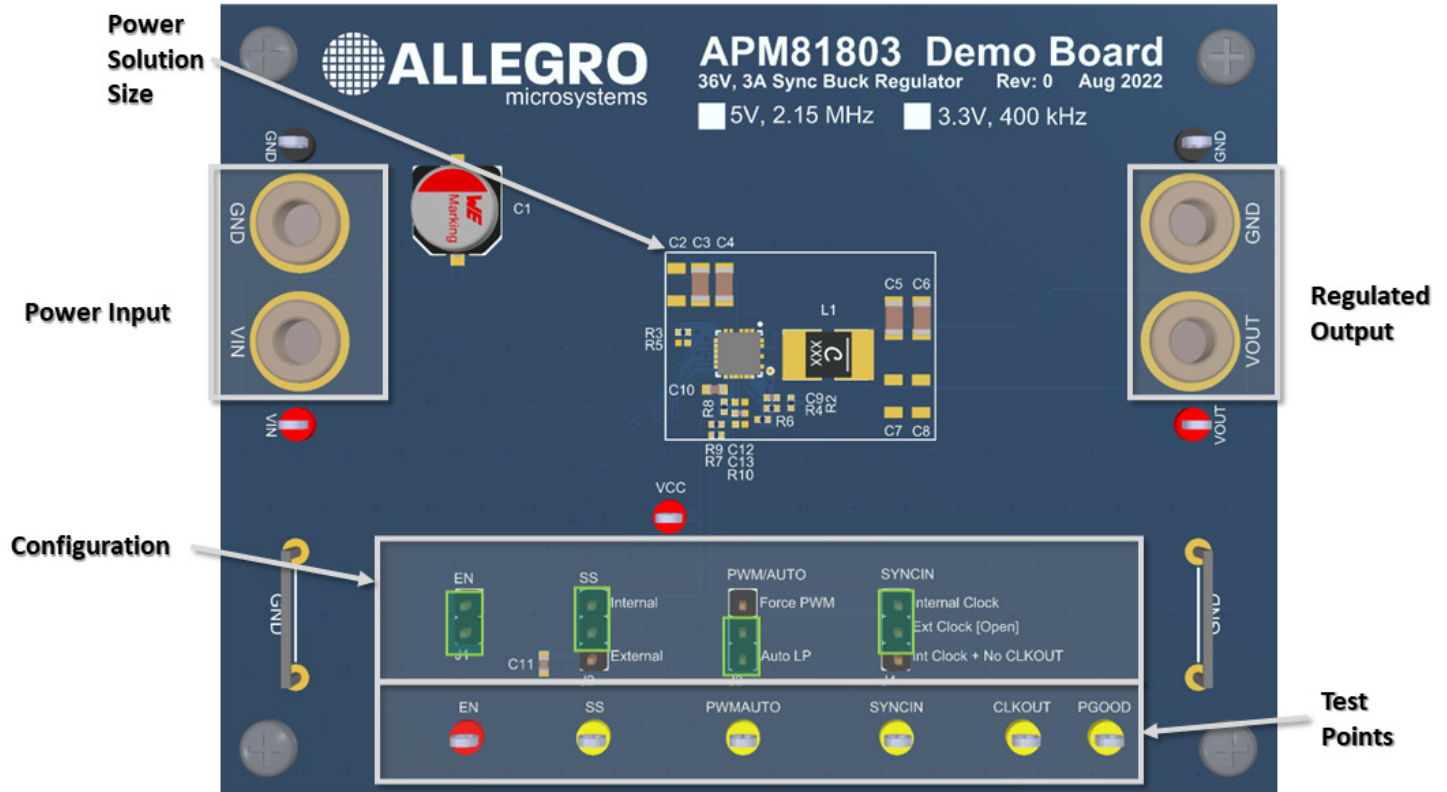


Figure 2: APM81803 Evaluation Board

Power Input

Connect a power supply using banana cables to the VIN and GND through-hole banana jacks or with test leads to the VIN and GND test points.

Device Configuration

There are four configuration jumpers on the evaluation board to exercise different operating modes of the APM81803. All configuration jumpers must be installed prior to power-on unless using an external EN signal or SYNCIN signal, where J1 or J4 is uninstalled.

EVALUATION BOARD PERFORMANCE DATA

Startup and Shutdown

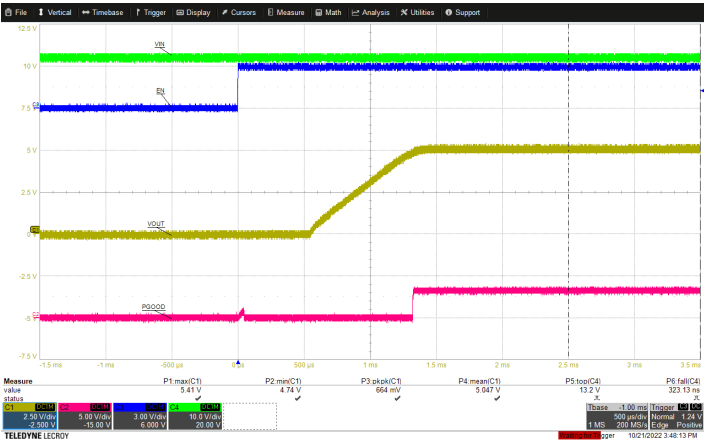


Figure 3: Startup with EN Signal and Internal Soft-Start

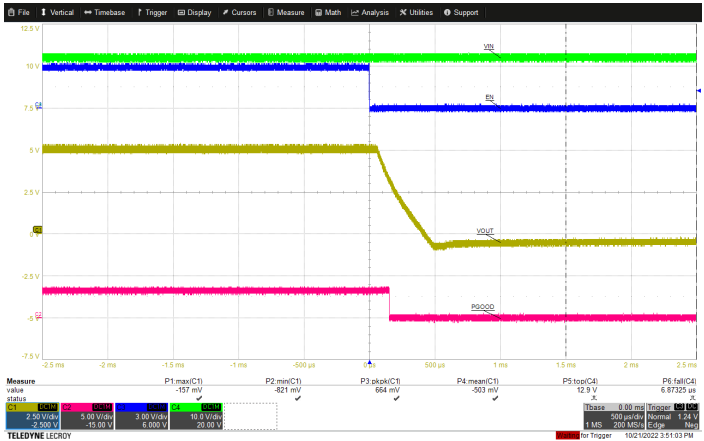


Figure 4: Shutdown with EN Signal

Load Transient

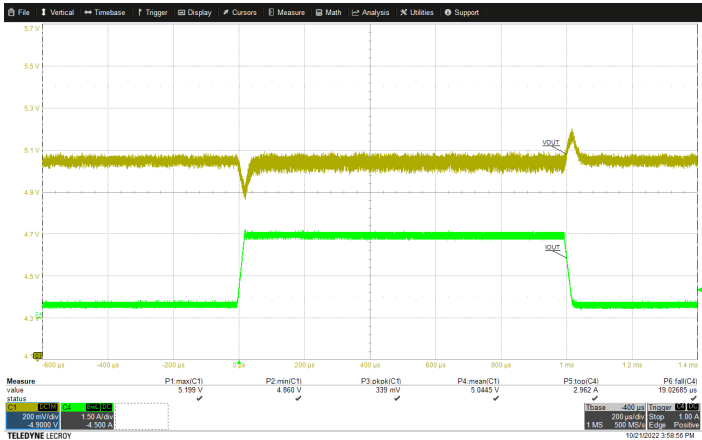


Figure 5: Load Transient 500 ma to 3 A

Efficiency

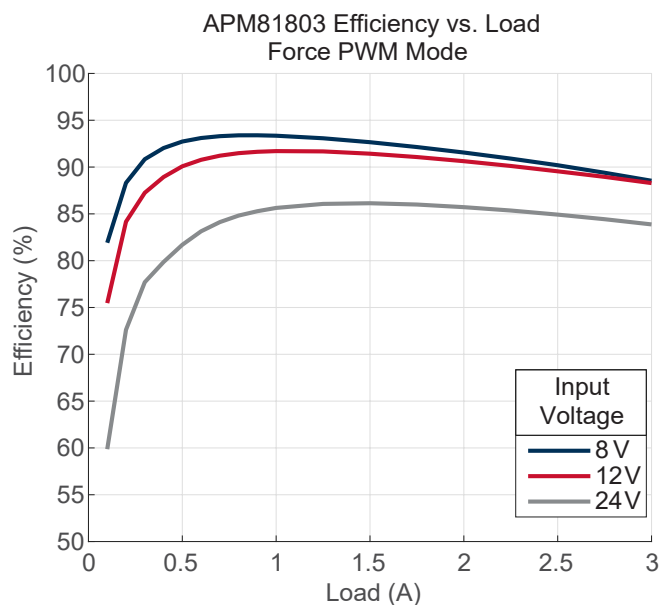


Figure 6: Efficiency at $V_{OUT} = 5\text{ V}$, $f_{SW} = 2.15\text{ MHz}$, PWM Mode

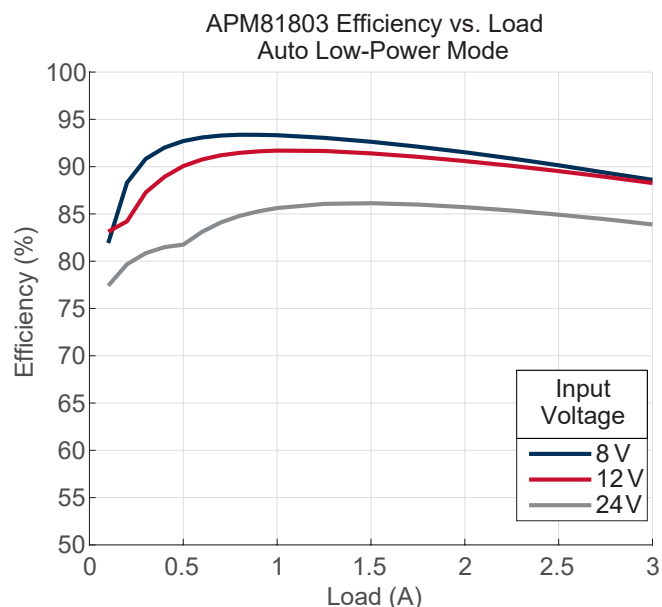


Figure 7: Efficiency at $V_{OUT} = 5\text{ V}$, $f_{SW} = 2.15\text{ MHz}$, Auto Low-Power Mode

Thermal Performance

The thermal performance of the A81803 evaluation board is shown in Figure 8 at input voltage of 14 V, load current of 3 A, switching frequency of 2.15 MHz, and ambient temperature near 25°C. The A81803 evaluation board uses 2 oz copper on the outer layers and 1 oz copper on the inner layers.

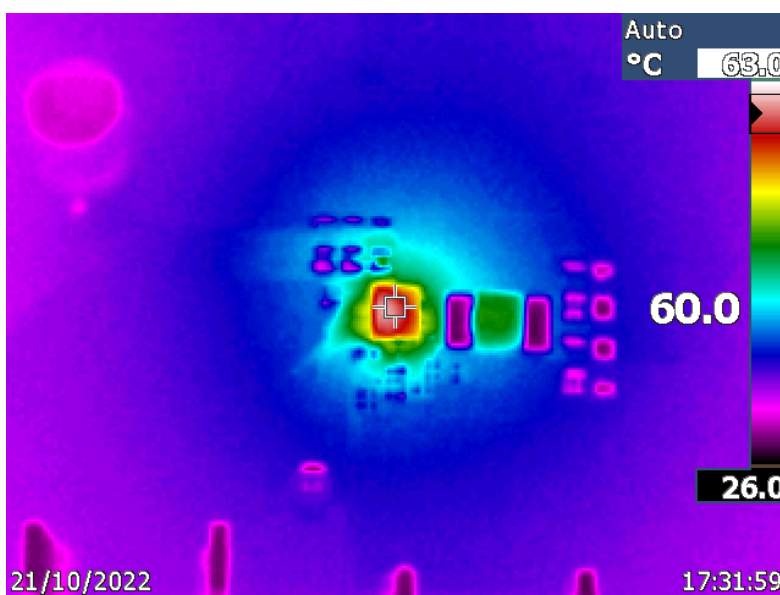


Figure 8: A81803 Evaluation Board Thermal Image at $V_{IN} = 14\text{ V}$, $V_{OUT} = 5\text{ V}$, $I_{OUT} = 3\text{ A}$, $f_{SW} = 2.15\text{ MHz}$

SCHEMATIC

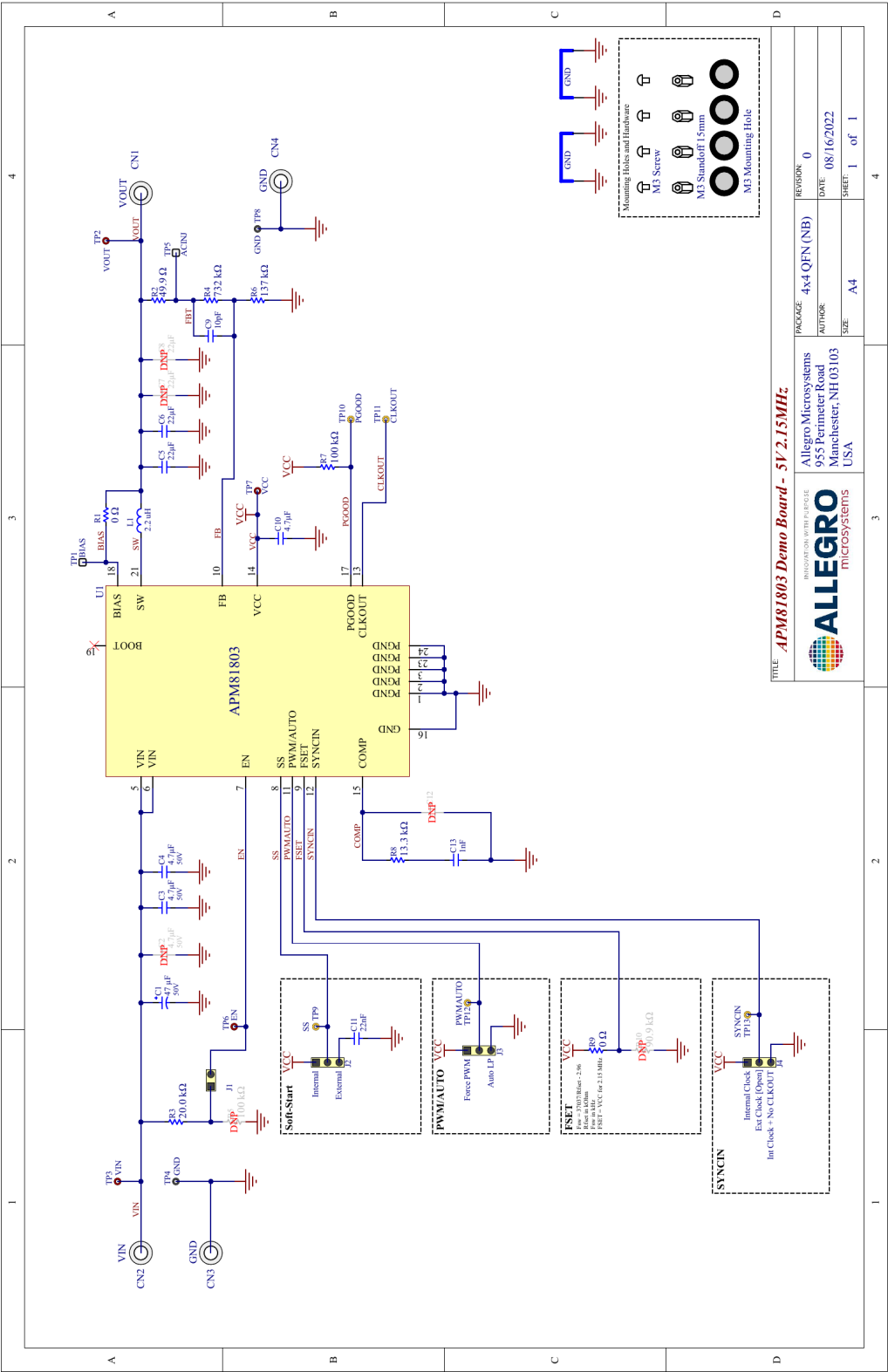


Figure 9: APEK81803KNB-5 Schematic

LAYOUT

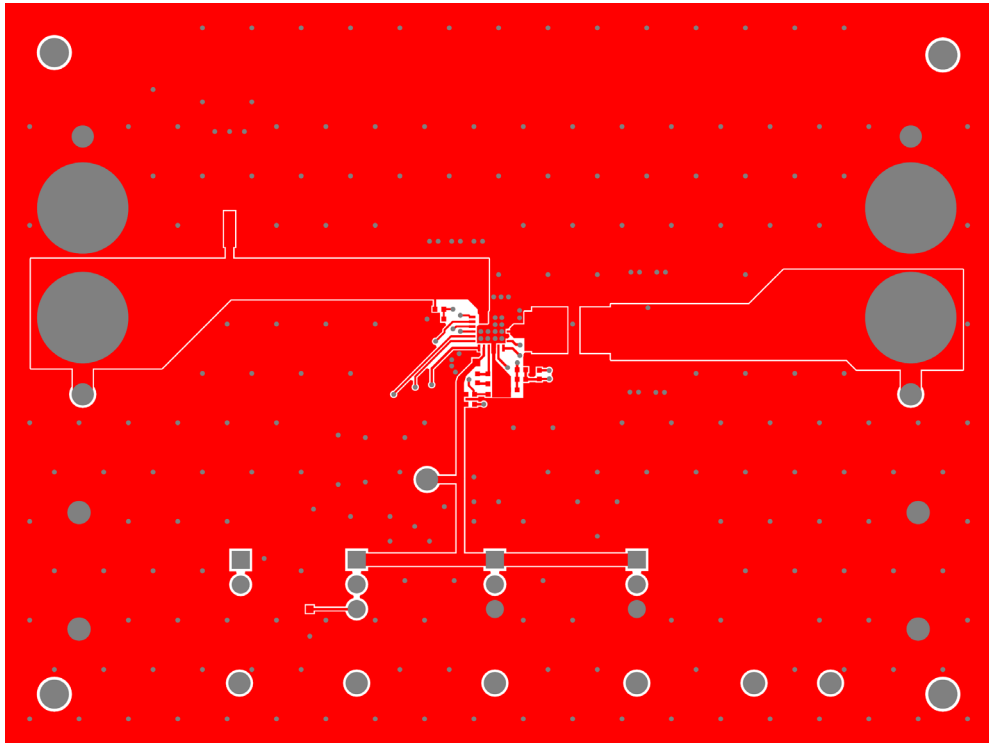


Figure 10: Top Layer

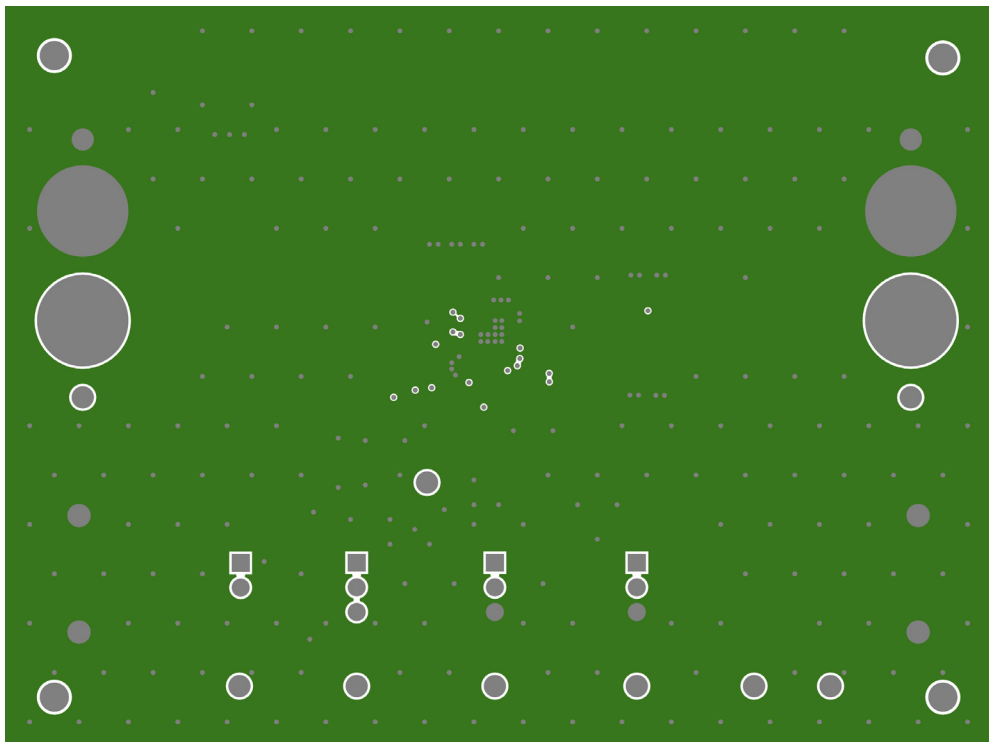


Figure 11: Inner Layer 1 (GND Plane)

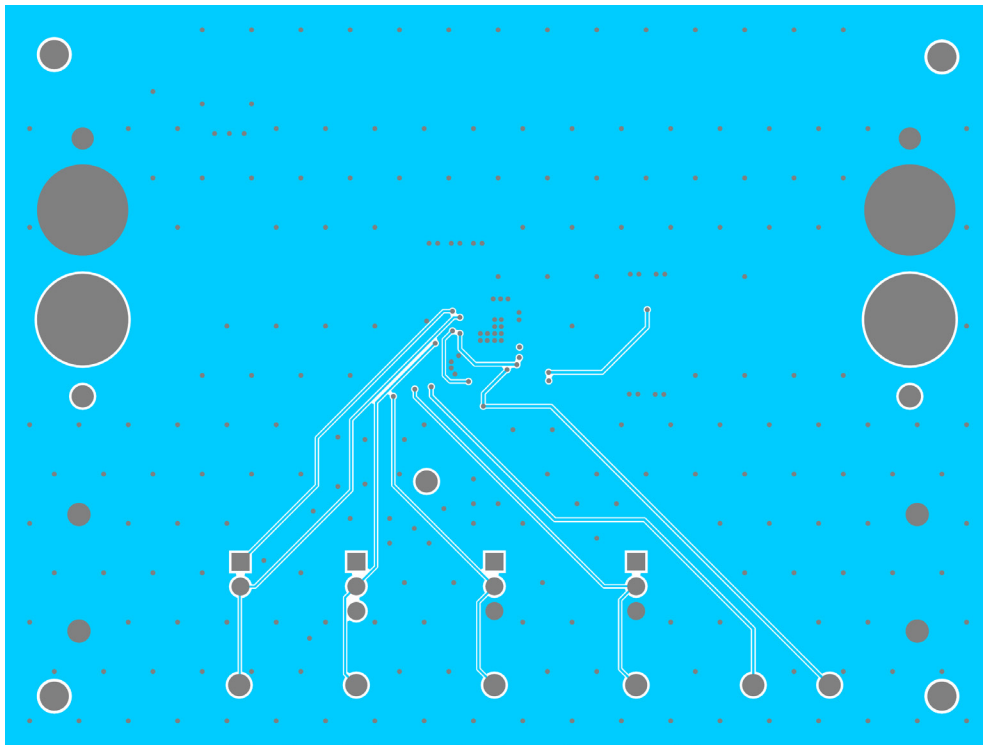


Figure 12: Inner Layer 2

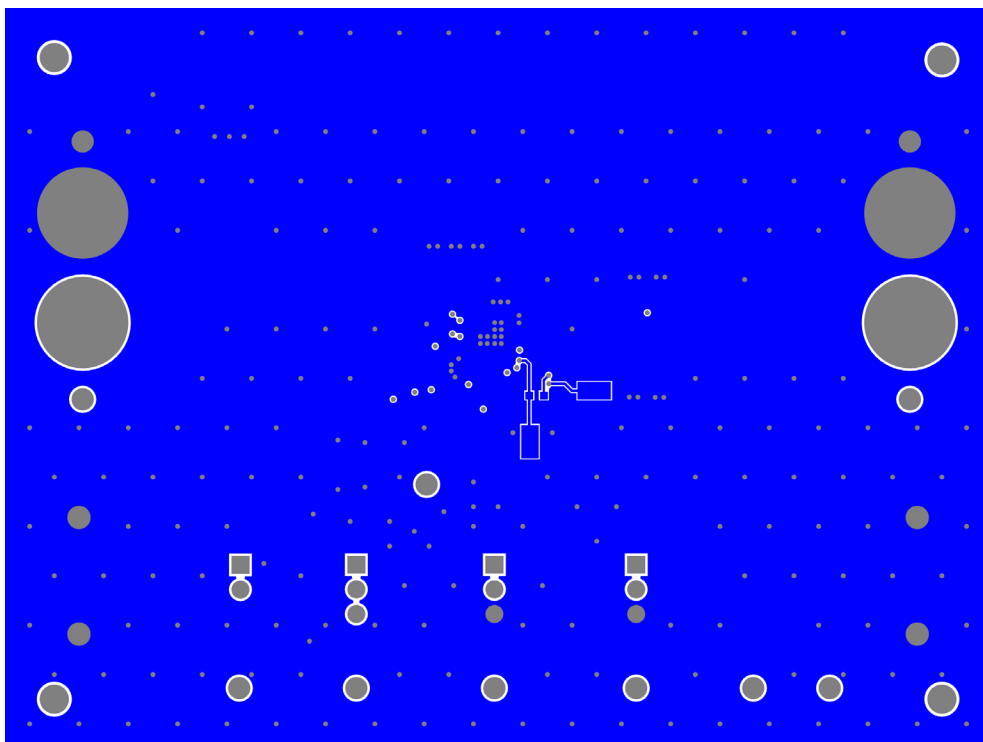


Figure 13: Bottom Layer

BILL OF MATERIALS

Table 2: APM81803 Evaluation Board Bill of Materials, $V_{OUT} = 5\text{ V}$ Version

ELECTRICAL COMPONENTS				
Designator	Quantity	Description	Manufacturer	Manufacturer Part Number
C1	1	Capacitor, Electrolytic, 47 μF , 50 V, 8 mm	Nichicon	UUX1H470MNL6GS
C3, C4	2	CAP CER 4.7 μF 50 V X7S 1206	Murata	GRJ31CC71H475KE11L
C5, C6	2	CAP CER 22 μF 10 V X5R 1206	KEMET	C1206C226M8PACTU
C9	1	CAP CER 10 μF 50 V NP0 0402	TDK	C1005NP01H100D050BA
C10	1	CAP CER 4.7 μF 10 V X5R 0603	KEMET	C0603C475M8PACTU
C11	1	CAP CER 0.022 μF 16V X7R 0603	Kyocera AVX	0603YC223K4T2A
C13	1	CAP CER 1 nF 50V NP0 0402	Murata	GRM1555C1H102FA01D
L1	1	Inductor, 2.2 μH , 20%, 6.3 Asat, 17mQ	Coilcraft	XGL4025-222MEC
R1	1	Resistor, 0 Ω , 1/10 W, Jumper, 0603	Yageo	RC0603JR-070RL
R2	1	Resistor, 49.9 Ω , 1/16 W, 1%, 0402	Yageo	RC0402FR-0749R9L
R3	1	Resistor, 20.0 k Ω , 1/16 W, 1%, 0402	Yageo	RC0402FR-0720KL
R4	1	Resistor, 732 k Ω , 1/16 W, 1%, 0402	Yageo	RC0402FR-07732KL
R6	1	Resistor, 137 k Ω , 1/16 W, 1%, 0402	Yageo	RC0402FR-07137KL
R7	1	Resistor, 100 k Ω , 1/16 W, 1%, 0402	Yageo	RC0402FR-07100KL
R8	1	Resistor, 13.3 k Ω , 1/16 W, 1%, 0402	Yageo	RC0402FR-0713K3L
R9	1	Resistor, 0 Ω , 1/16 W, Jumper, 0402	Yageo	RC0402JR-070RL
U1	1	A81803 in 24-pin, 4mm $\times$ 4mm, QFN MIS package	Allegro MicroSystems	APM81803KNBJSR
MECHANICAL COMPONENTS				
Designator	Quantity	Description	Manufacturer	Manufacturer Part Number
CN1, CN2, CN3, CN4	4	Banana Jack, Noninsulated, 0.218" Length	Keystone Electronics	575-4
J1	1	CONN HEADER VERT 2POS 2.54MM	Würth Electronics	61300211121
J2, J3, J4	3	CONN HEADER VERT 3POS 2.54MM	Würth Electronics	61300311121
MS1, MS2, MS3, MS4	4	PAN HEAD SCREW_M3 $\times$ 8MM CROSS SL	Würth Electronics	97790803111
STND1, STND2, STND3, STND4	4	Standoffs and Spacers 5.0 HEX 15.0mm NYLON	Keystone Electronics	25512
BIAS, ACINJ	2	Test Point, SMT, 105mm $\times$ 40mm	Keystone Electronics	5015
VOUT, VIN, EN, VCC	4	Test Point, Red, Through-Hole Mount, 1.6 mm	Keystone Electronics	5010
GND	2	Test Point, Black, Through-Hole Mount, 1.6 mm	Keystone Electronics	5011
SS, PGOOD, CLKOUT, PWMAUTO, SYNCIN	5	Test Point, Yellow, Through-Hole Mount, 1.6 mm	Keystone Electronics	5014
NOT FITTED				
C2	0	CAP CER 4.7 μF 50V X7S 1206	Murata	GRJ31CC71H475KE11L
C7, C8	0	CAP CER 22 μF 10V X5R 1206	KEMET	C1206C226M8PACTU
C12	0	CAP CER 0.1 μF 25V NP0 0402	Murata	GRM1555C1ER10WA01D
R5	0	Resistor, 100 k Ω , 1/16 W, 1%, 0402	Yageo	RC0402FR-07100KL
R10	0	Resistor, 90.9 k Ω , 1/16 W, 1%, 0402	Yageo	- RC0402FR-0790K9L

RELATED LINKS

<https://www.allegromicro.com/-/media/files/datasheets/apm81803-datasheet.pdf>

Revision History

Number	Date	Description
–	November 29, 2022	Initial release
1	March 2, 2023	Updated to new template
2	April 12, 2023	Editorial update (page 2)

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