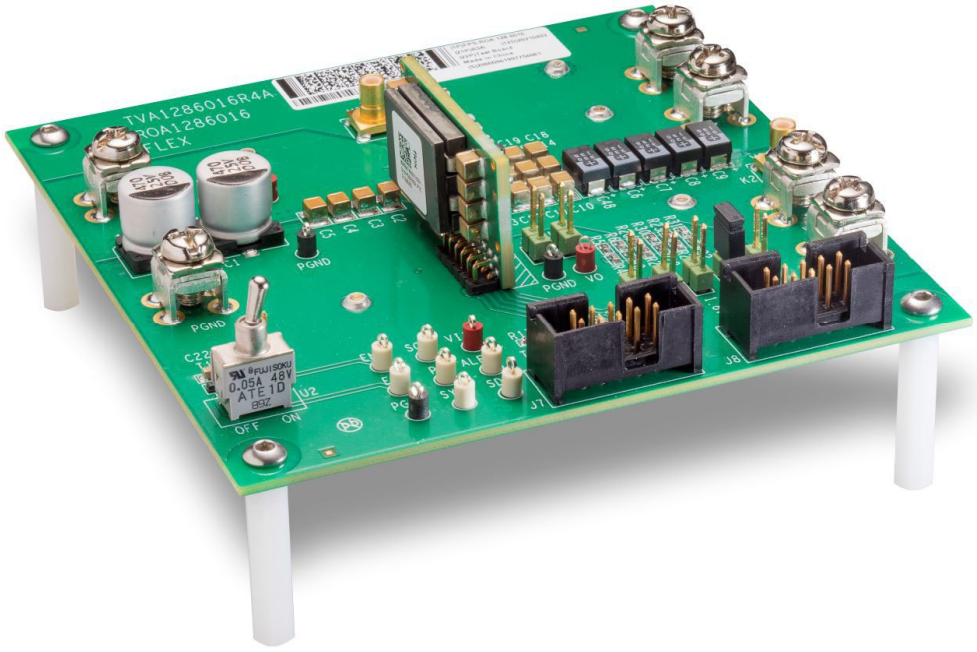
Evaluation Board User Guide BMR474

ROA 128 6016

USER GUIDE



Contents

1 Introduction

This User Guide provides a brief introduction and instruction on how to use the Reference Board ROA128 6016 together with one BMR4742001 module mounted.

1.1 How to contact Flex

For general questions or interest in our products, please contact your local sales representative. Contact details are available from our website:

flexpowermodules.com

1.2 Prerequisites

In order to operate the ROA 128 6016 board, the following is needed:

- Power supply 6 – 15 V.
- USB-PMBus adapter Flex KEP 910 17. It is only needed when the PMBus shall be used.
- The “Flex Power Designer” software package and a compatible Windows PC.

2 Reference Board ROA 128 6016

In Figure 1a and 1b, the top and bottom sides of the ROA 128 6016 are shown.

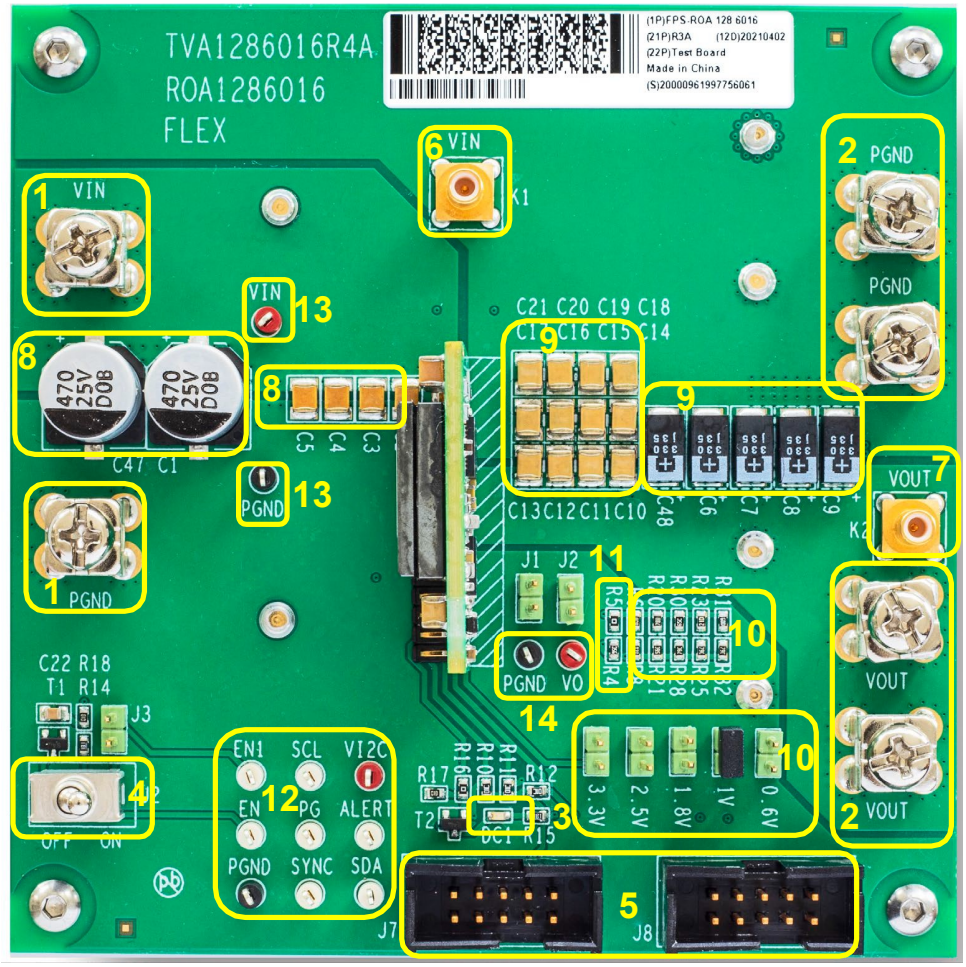


Figure 1a. ROA 128 6016 (top side)

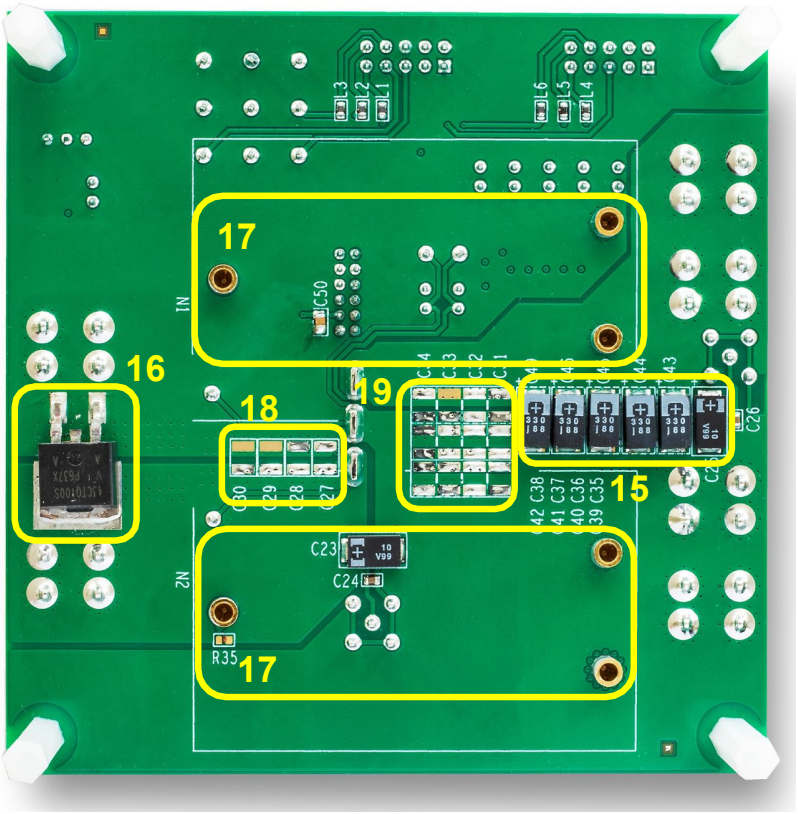


Figure 1b. ROA 128 6016 (bottom side)

Position Description (Top Side)

1	Input voltage connectors.
2	Output voltage connectors.
3	Power Good LED.
4	ENABLE switch.
5	Connector for the USB-PMBus adaptor (KEP 910 17).
6	SMB Oscilloscope connectors for Vin ripple measurement
7	SMB Oscilloscope connectors for Vo ripple measurement
8	Input electrolytic and ceramic capacitors.
9	Output Polymer and ceramic capacitors.
10	Pin-strap resistors and jumper for Vout setting
11	Pin-strap resistors for PMBus address
12	PMBus, SYNC and EN signal probing points
13	Input voltage probing points
14	Output voltage probing points

Position Description (Bottom Side)

15	Output Polymer capacitors

16	Diode for input anti-reverse protection
17	Positions for populating Flex electronic load, ROA128 5552.
18	Positions for additional input ceramic capacitors
19	Positions for additional output ceramic capacitors

3 USB-PMBus adapter

The USB-PMBus adapter used with this board is the Flex KEP 910 17.

3.1 Connection of Flex KEP 910 17 USB-PMBus adapter

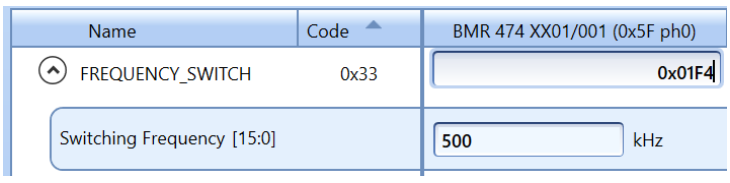
Connect the Flex KEP 910 17 USB-PMBus adapter to the PMBus header, see position 5 in Figure 1a.

4 Power-up and Power-down Instructions

4.1 Power-up instruction

Before power up, read the following table to make sure the module works in the best condition.

Note: The default switching frequency (f_{sw}) is 500kHz, if the module work with output voltage higher than 1.8V, frequency shall be changed, f_{sw} change should be done by using “Flex Power Designer” software tool.



Model	Iout max	Switching frequency	Vin/Vout range
BMR 474 2001	0.6V≤ Vo ≤1.8V Iomax=80A 1.8V < Vo ≤3.3V Iomax=60A	0.6V≤ Vo ≤1.8V f_{sw} =500kHz 1.8V < Vo ≤3.3V f_{sw} =800kHz	Vin =6-15 V 0.6V≤ Vo ≤2.5V Vin=7.5-15V 2.5V < Vo ≤3.3V

- Make sure Enable switch is set to OFF position
- By default, the module is configured to set Vout with pin-strap resistors. Make sure jumper in the position 10 is populated with desired Vout.
- Connect power supply to connectors on position 1.
- Connect load to connectors on position 2.
- Connect the PMBus adapter/cable to the board.
- Apply Vin = 6-15V through connectors on position 1.
- Set Enable switch to ON position. The power good LED will give green light.

  Note: PG LED is powered by USB-PMBus adapter, so only connect demo board with computer through adapter, LED will be lit when module Vout is ready.
- Then increase the load, and through K2 (position 7) to measure the Vout and ripple.

4.2 Power-down instruction

- Set Enable switch to OFF position
- Turn off Vin

5 Address and VSET Resistor

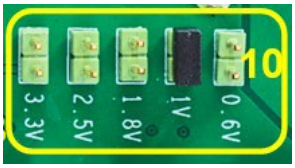
5.1 Adjustment of address resistor

- To change the address, change the resistor shown in Figure 2. Change R4 and R5 (position 11) to achieve the desired PMBus address for the module.
- Refer to chapter ‘PMBus addressing’ in the technical specification to select the proper values.

Figure 2 Address resistor position, R4 and R5, is shown in the picture.

5.2 Adjustment of VSET resistors

Populate a jumper in each “Vset” position to get the desired output voltage. The silk screen marking shows the voltage settings that can be achieved by populating jumpers.



6 Test points

Input voltage should be measured at test points VIN/GND, which are connected directly to the VIN / GND pin of the module.

Output voltage should be measured at test points VO/GND, which are connected directly to the VO/GND pin of the module.

7 Additional Input/output Capacitance

At the bottom side, there are places for additional input/output capacitors.

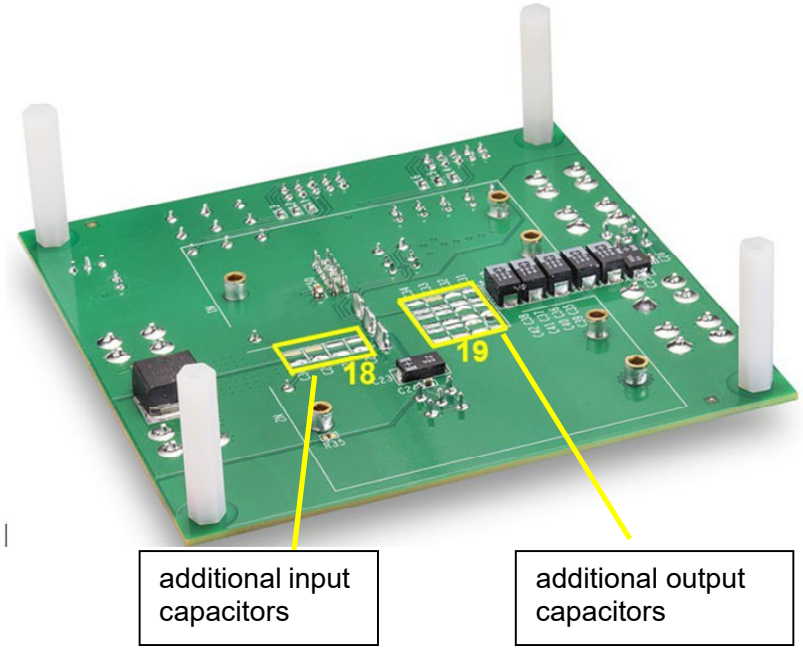


Figure 3 Places for additional input/output capacitors.

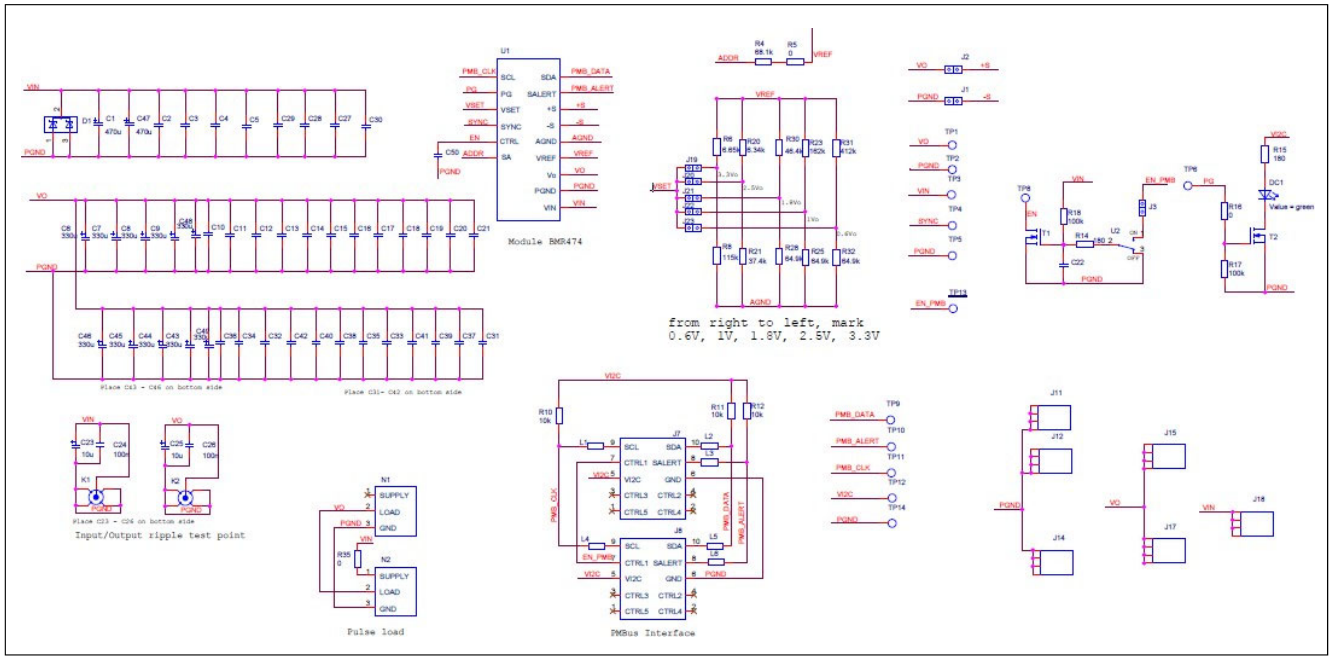
8 Electronic loads

In order to perform load transient tests on the modules, up to 2 pcs of PuLS loads can be connected to the output of the board.

The PuLS loads (ROA 128 5552) can be programmed for different transient loads and waveforms, see the technical specification for further information. The PuLS loads can be easily connected through the sockets. (see position 17 in Fig 1b)

9 Schematic

See schematic of Board ROA 128 6016 for more information.



10 Bill of Materials

Designator	Qty	Description
C1, C47	2	CAP ALUM 470uF 20% 25V SMD
C6,C7,C8,C9, C43,C44,C45,C46,C48,C49	10	330uF 10% 6.3V polymer,CAPACITOR
C23,C25	2	CAP TANT POLY 10uF 35V 2917
C2,C3,C4,C5	4	22uF 10% 1210 25V X7R,CAPACITOR

C10,C11,C12,C13,C14,C15, C16,C17,C18,C19,C20,C21	12	100uF 10% 1210 6.3V X7S,CAPACITOR
C22,C50	2	100nF 10% 0805 25V X7R,CAPACITOR
C24,C26	2	100nF 10% 0603 25V X7R,CAPACITOR
DC1	1	LED, green
J7,J8	2	PMBus connector
L1,L2,L3,L4,L5,L6	6	Ferrite Bead
R5, R16	2	0ohm 0603 ,RESISTOR, -55C~155C
R4	1	68.1kohm 1% 0603 0.1W,RESISTOR, -55C~155C
R6	1	6.65kohm 1% 0603 0.1W,RESISTOR, -55C~155C
R8	1	115kohm 1% 0603 0.1W,RESISTOR, -55C~155C
R20	1	6.34kohm 1% 0603 0.1W,RESISTOR, -55C~155C
R21	1	37.4kohm 1% 0603 0.1W,RESISTOR, -55C~155C
R30	1	46.4kohm 1% 0603 0.1W,RESISTOR, -55C~155C
R28,R25,R32	3	64.9kohm 1% 0603 0.1W,RESISTOR, -55C~155C
R23	1	162kohm 1% 0603 0.1W,RESISTOR, -55C~155C
R31	1	412kohm 1% 0603 0.1W,RESISTOR, -55C~155C
R10,R11,R12	3	10kohm 1% 0603 0.1W,RESISTOR, -55C~155C
R14,R15	2	180ohm 1% 0603 0.1W,RESISTOR, -55C~155C
R17,R18	2	100kohm 1% 0603 0.1W,RESISTOR, -55C~155C
T1,T2	2	nfet_d3-g1-s2, BSS123, sot23
D1	1	VS-43CTQ100SPBF,100V,2x20A, D2PAK(TO-263AB)

11 Layout description

The following sections describe how the layout guidelines provided in the ROA 128 6016. Technical Specification have been applied to the reference board layout. The purpose is to give the reader a better understanding of the guidelines by examples. Please note that every system is different and that there may well be considerations to make which are not provided here, depending on the system requirements and limitations set in the end application

11.1 PCB stack-up summary

Layer	Description	Thickness
Top layer	VIN, VOUT, PGND planes Component footprints, signal traces	2 oz

Layer 2	VOUT, PGND plane, signal traces	2 oz
Layer 3	VIN, VOUT, PGND planes	2 oz
Bottom layer	VIN, VOUT, PGND planes Component footprints, signal traces	2 oz

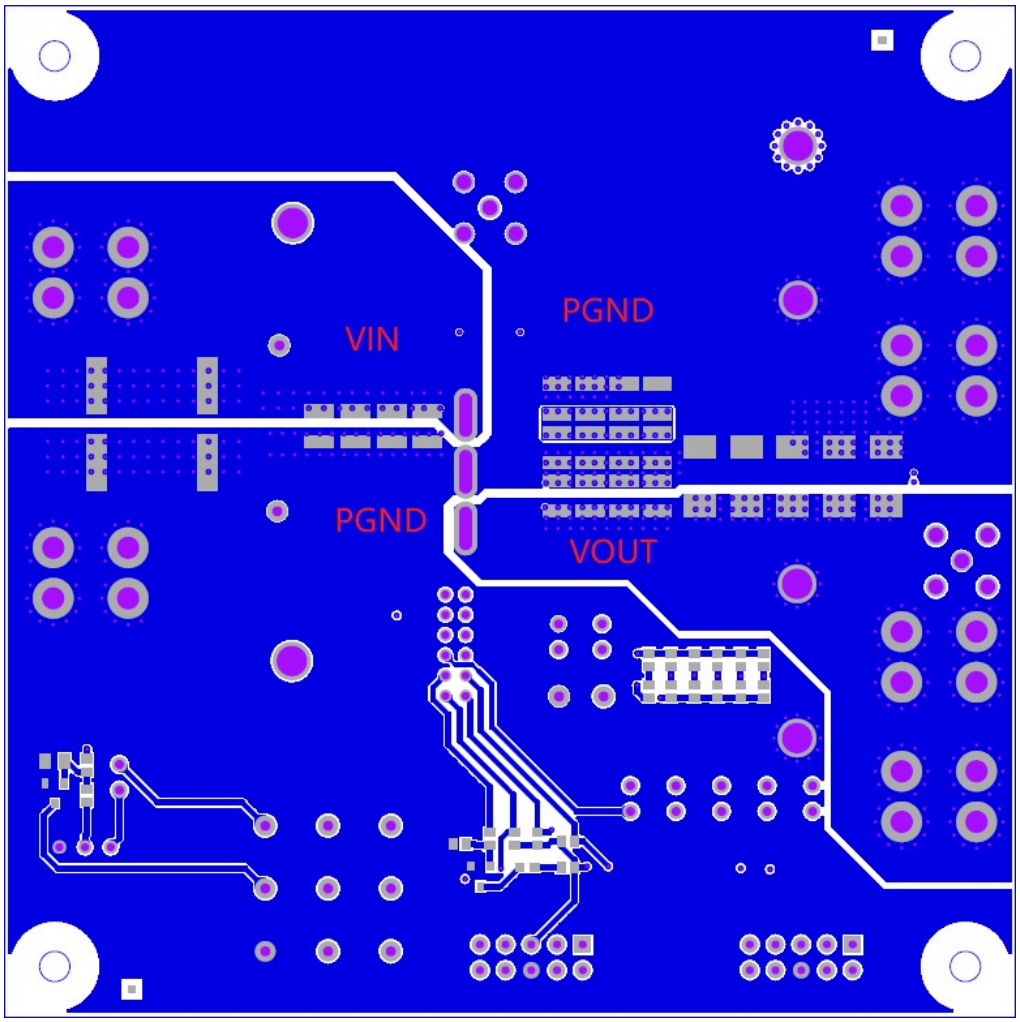


Figure 4 Connection of power pins on top layer

11.2 Input capacitance

The ceramic input capacitors should be placed as close as possible to the VIN/PGND pins to minimize the connection impedance. For the same reason, multiple vias are placed close to the capacitors' terminals, utilizing inner layers to connect to input pins of the module.

Note there are places for additional input capacitors on the bottom side of the board, see section 7.

Placement and connections of the larger bulk input capacitor (used mainly to hold up the input voltage during large load transients or changes in input voltage) follows the rules of the ceramic capacitors described above.

11.3 Output capacitance

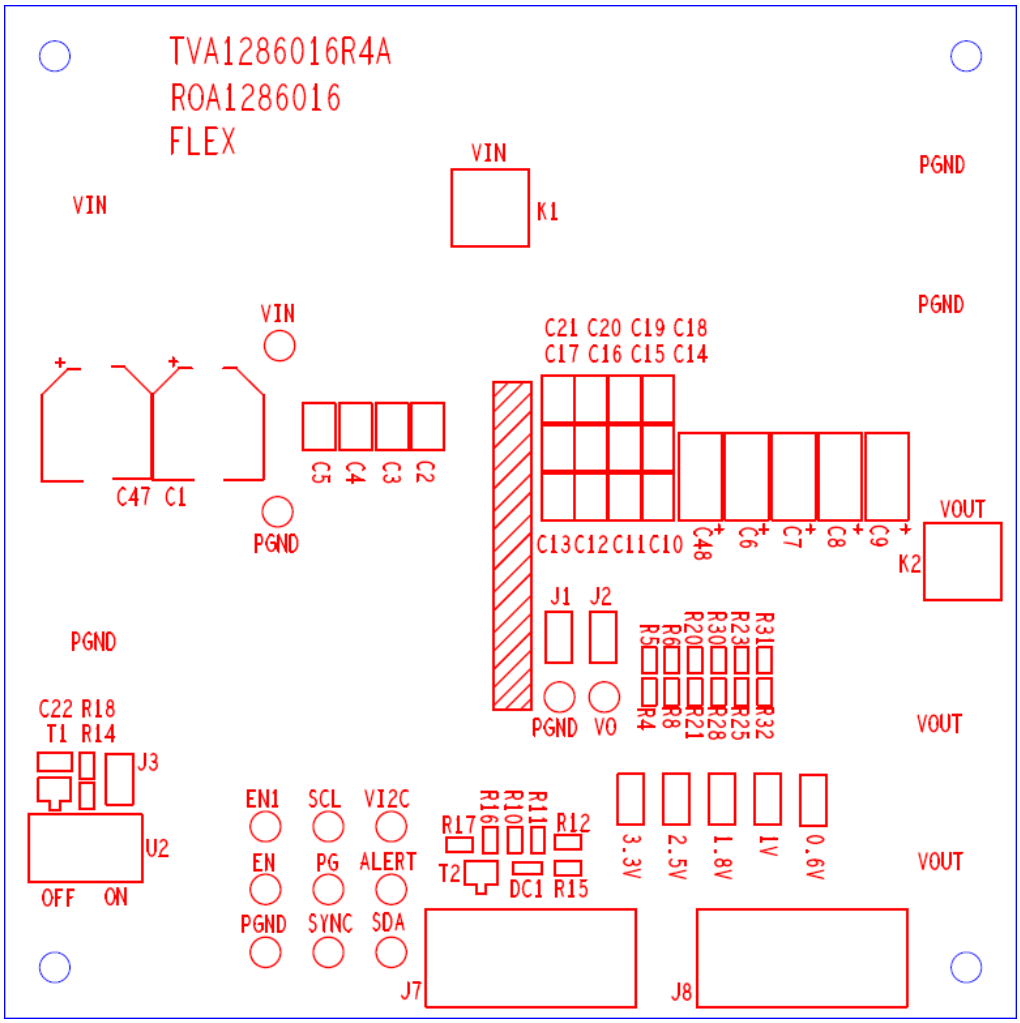
Ceramic output capacitors are placed close to VOUT pins of the module to handle the module's output ripple. Polymer capacitor are added to take care of load transient, see Technical Specification for load transient performance. It is important to secure low impedance connections

Note there are places for additional output capacitors on the bottom side of the board, see section 7.

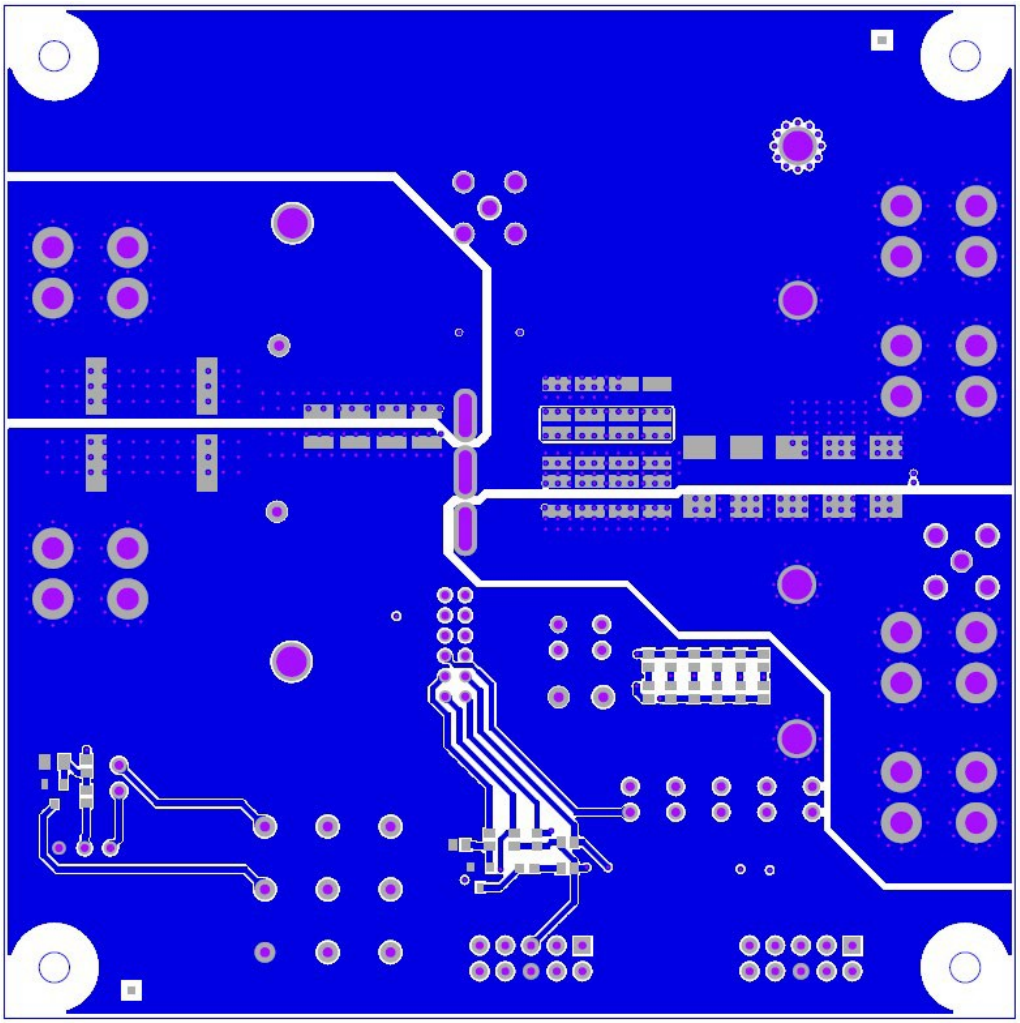
Furthermore, it is important to use planes to distribute the output current to the load in order to minimize losses and the effective output impedance, providing good conditions for the module's control loop to compensating for load transient.

See layout top view of ROA 128 6016 for more information.

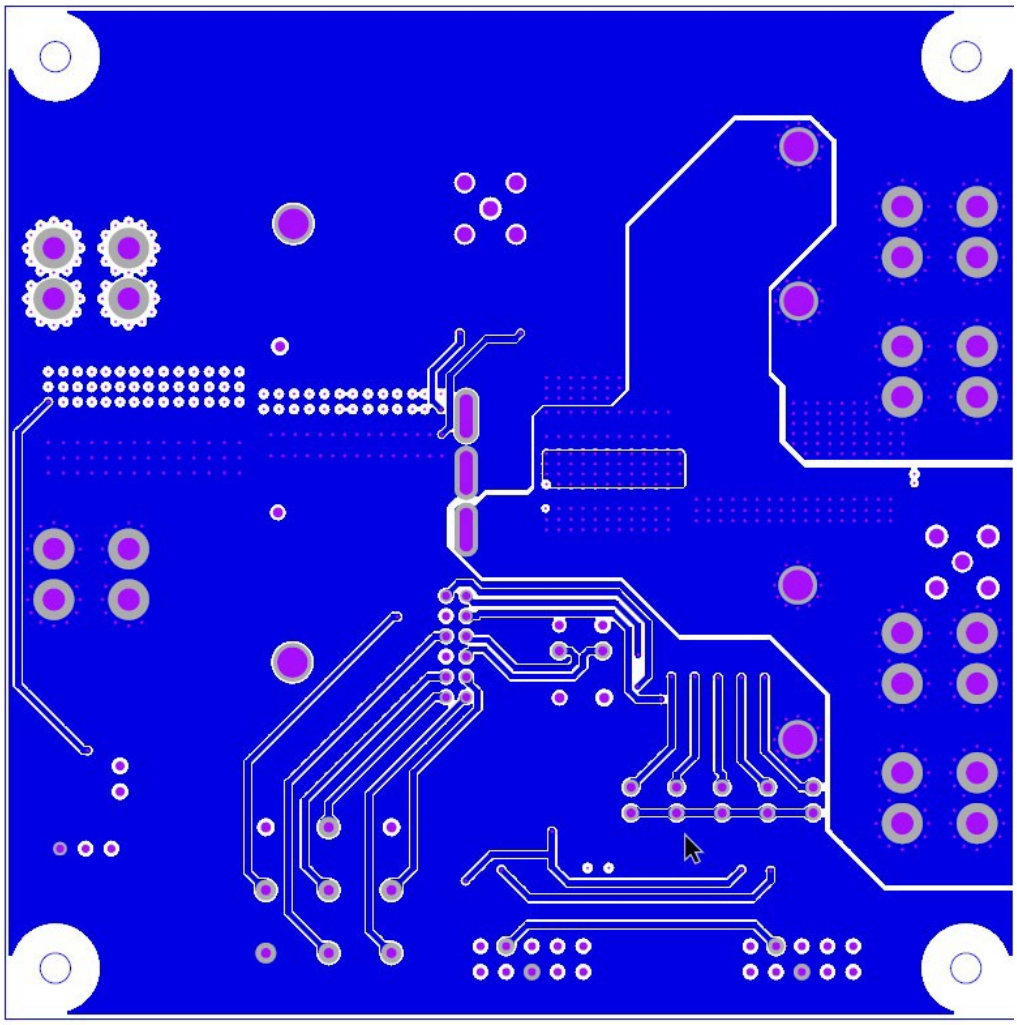
12 Layout top view



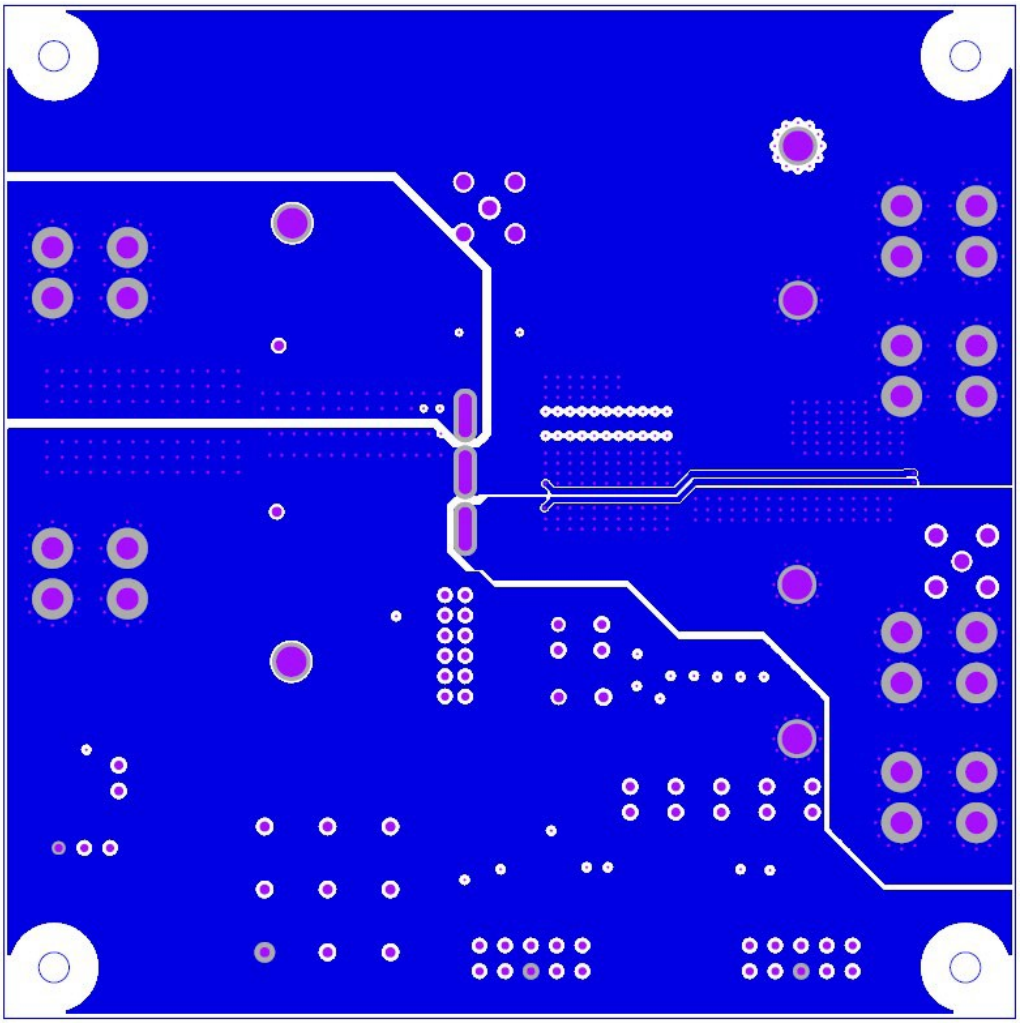
Top side component layout



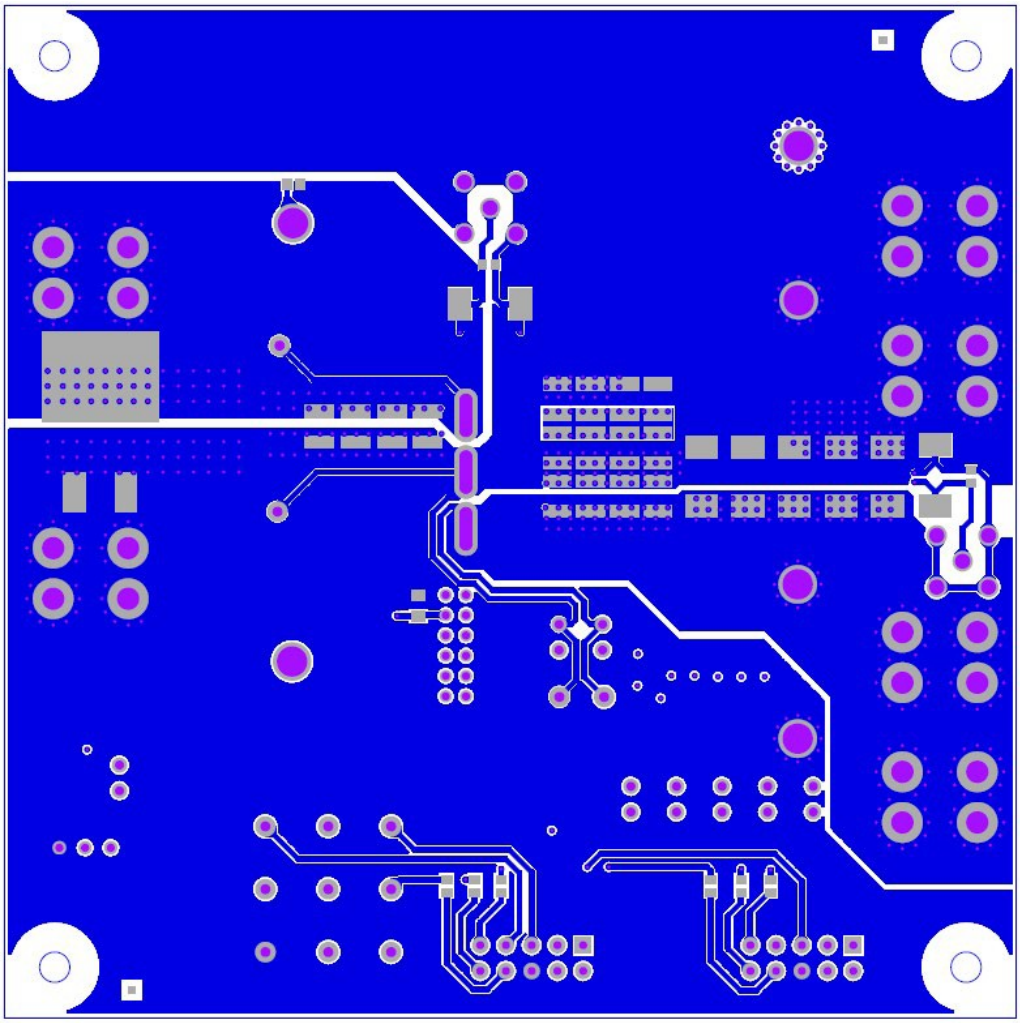
Top layer



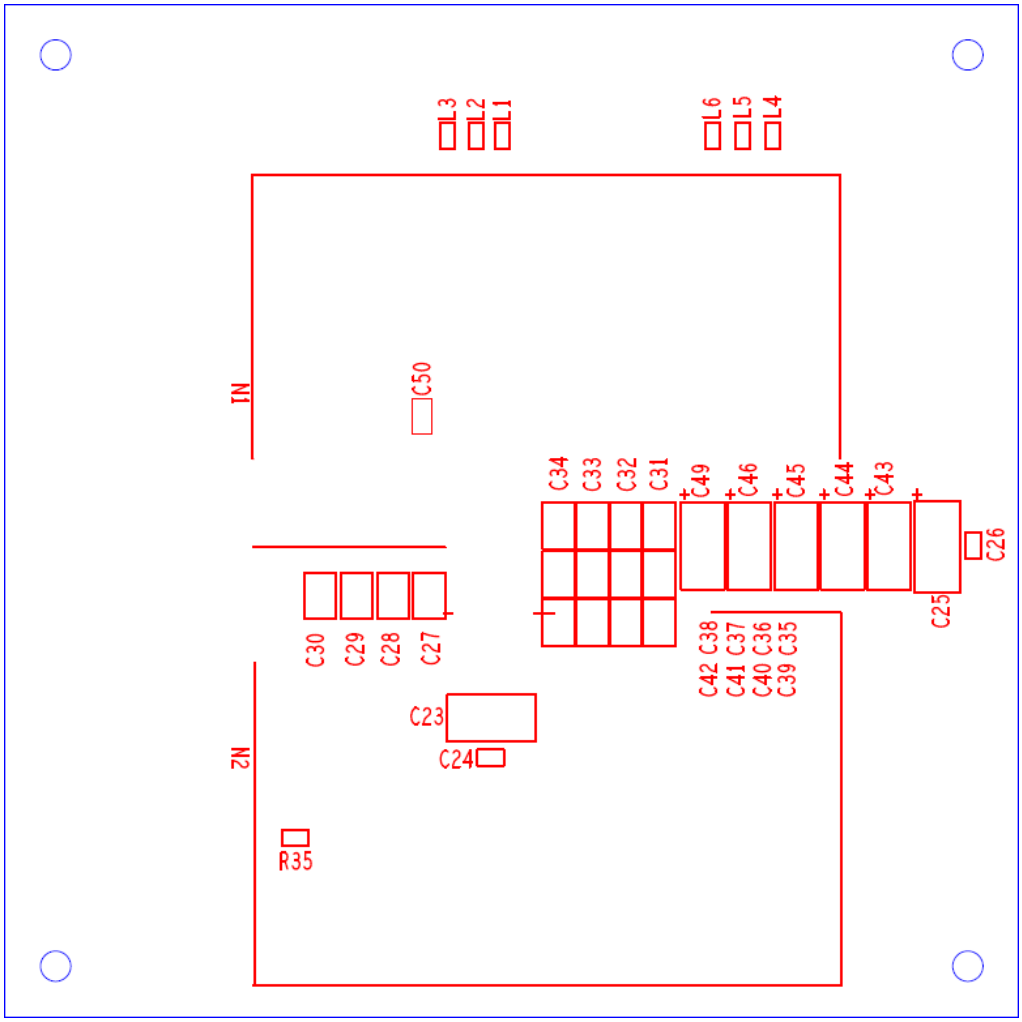
Layer 2



Layer 3



Bottom Layer



Bottom side component layout