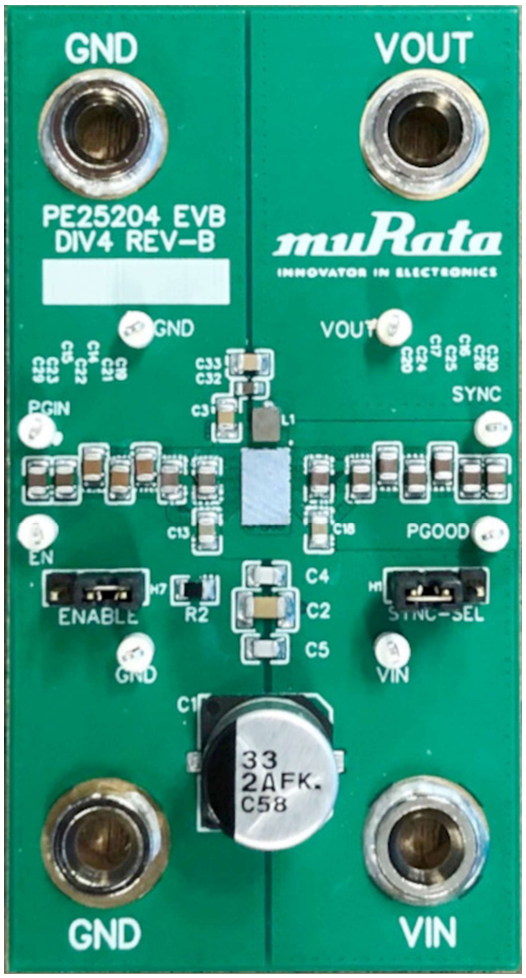
PE25204 Evaluation Kit (EVK)
User's Manual

6A High Efficiency 48-12V Front-End DC-DC Converter



Introduction

The PE25204 is an ultra-high efficiency front-end DC-DC converter solution that divides down an input voltage by either a factor of 3 or 4 and delivers up to 72W output at up to 96.7% peak efficiency. The PE25204 can also be used in parallel to increase output power. The PE25204 supports an input voltage range of 20V to 60V and is available in a WLCSP package.

Evaluation Kit Overview

The PE25204 evaluation kit (EVK) is a hardware platform that allows customers to easily test the step-down DC-DC converter. The PE25204 EVK can be operated with a 20V* to 60V input voltage, and the input is divided by 4 and delivers up to 6A.

Note: A lower range of at least 20V is required to change the R2 resistor, described in Changing the UVLO Value on page 6.

Evaluation Kit User's manual Overview

The PE25204 evaluation kit (EVK) user's manual includes information about the hardware required to control and evaluate the functionality of the DC-DC converter.

Evaluation Kit Contents and Requirements

Kit Contents

The PE25204 EVK includes the following hardware required to evaluate the DC-DC converter.

QUANTITY	DESCRIPTION
1	PE25204 DC-DC converter evaluation board assembly (EK25204-01)

Hardware Requirements

In order to evaluate the performance of the evaluation board, the following equipment is required:

- Bench supply capable of providing 20V–60V at 3A with sense lines
- Three digital multi-meters
- Four-channel oscilloscope with probes (optional to view waveforms)

Caution: The PE25204 DC-DC converter EVK contains components that might be damaged by exposure to voltages in excess of the specified voltage, including voltages produced by electrostatic discharges. Handle the board in accordance with procedures for handling static-sensitive components. Avoid applying excessive voltages to the power supply terminals or signal inputs or outputs.

When connecting the EVK to the source power supply, ensure the power supply is off. Connecting the EVK to a live power supply unit may cause failures.

Quick Start Guide

Quick Start Overview

The evaluation board is designed to ease customer evaluation of the PE25204 DC-DC converter. This section guides you through configuring the hardware and the startup procedures.

Evaluation Board Overview

The evaluation board is designed to ease customer evaluation of Murata's products. The board contains:

- Input/output terminals
- Enable jumper
- Sense points

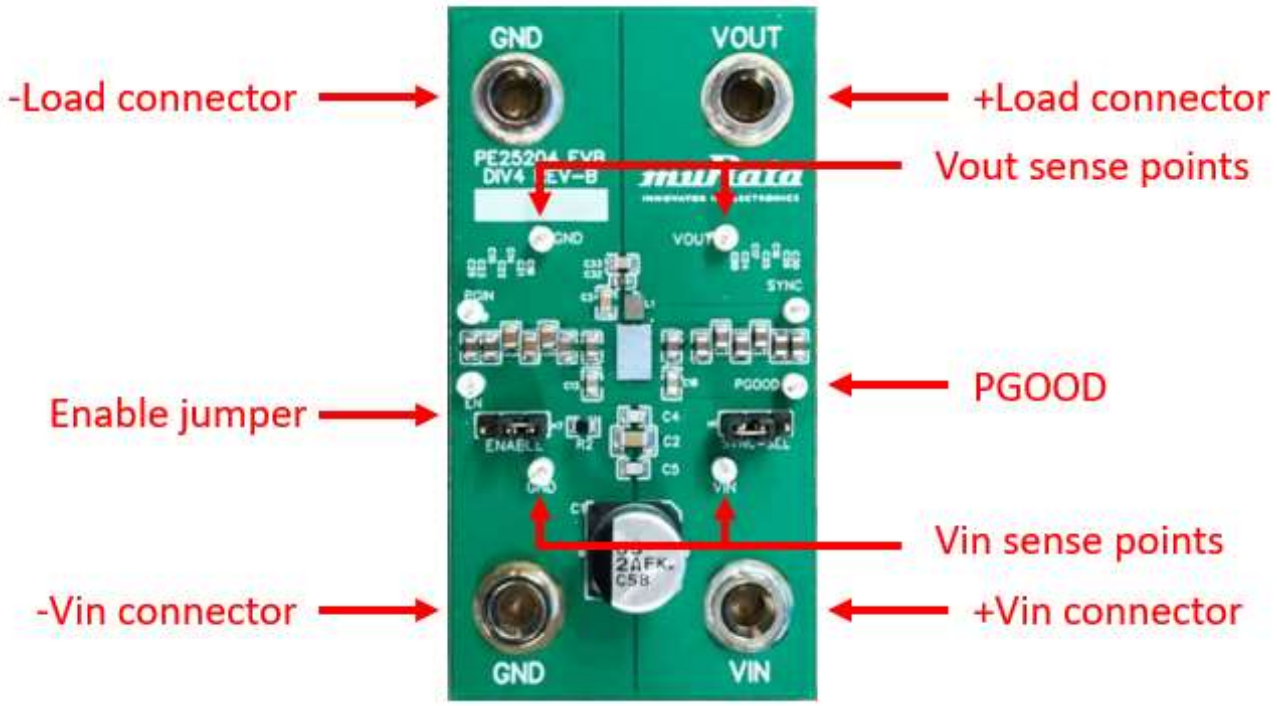


Figure 1. PE25204 Evaluation Board Assembly

EVK Connection

Connect the EVK and the measuring equipment as shown in the example below.

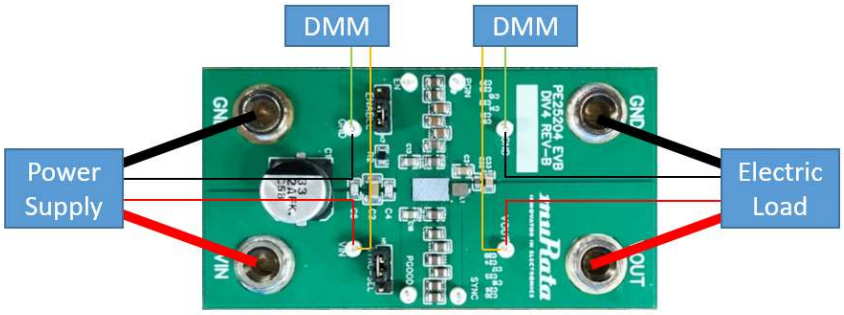


Figure 2. EVK Connectors

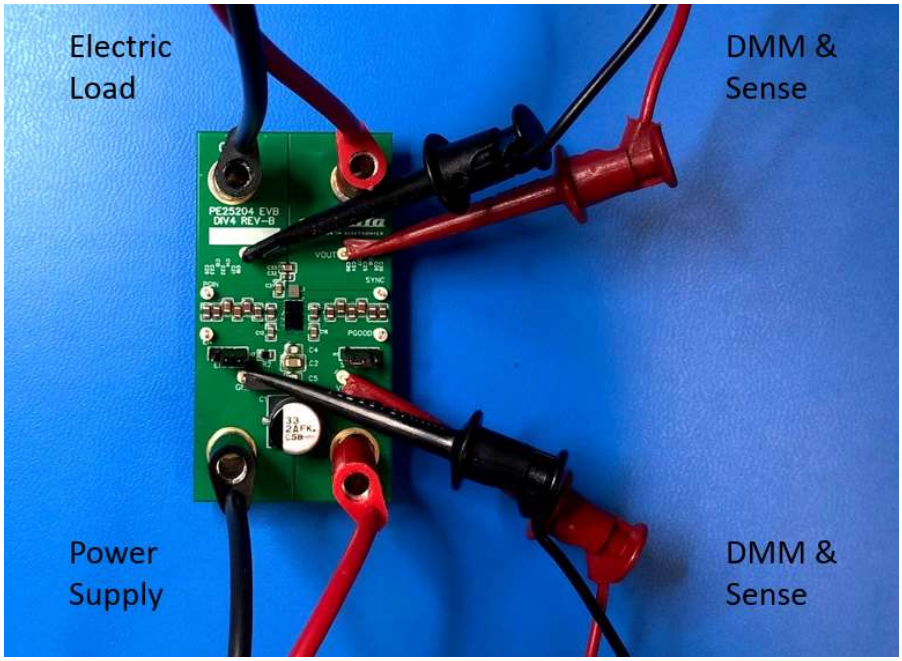


Figure 3. EVK Connection Example

Hardware Operation

The general guidelines for operating the hardware evaluation board are listed in this section. Follow the steps below to configure the hardware properly for the performance.

1. Provide input voltage to the enable pin. (Make sure the enable jumper position is the same as shown in Figure 4.)
2. Apply input voltage.
3. Apply load current after output startup.

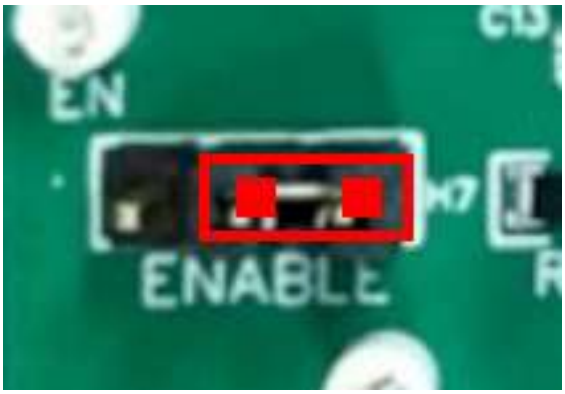


Figure 4. Enable Jumper Position

EVK Startup

When starting the EVK, be sure to start it with no load.

If the EVK is started with a load, it may not start due to the soft start current limit.

Changing the UVLO Value

The under-voltage lockout of the device is set by the R2 resistor. The reference number is written in white text. See Figure 5.

$$UVLO\ (V) = R_{UV}\ (k\Omega) * 1.5$$

Recommended resistors should be 1% or better of the resistance value of the E96 series. It is recommended to use the closest resistor the value needed between 13.7 KΩ and 39.2 KΩ. The initial value is 13.7 KΩ.

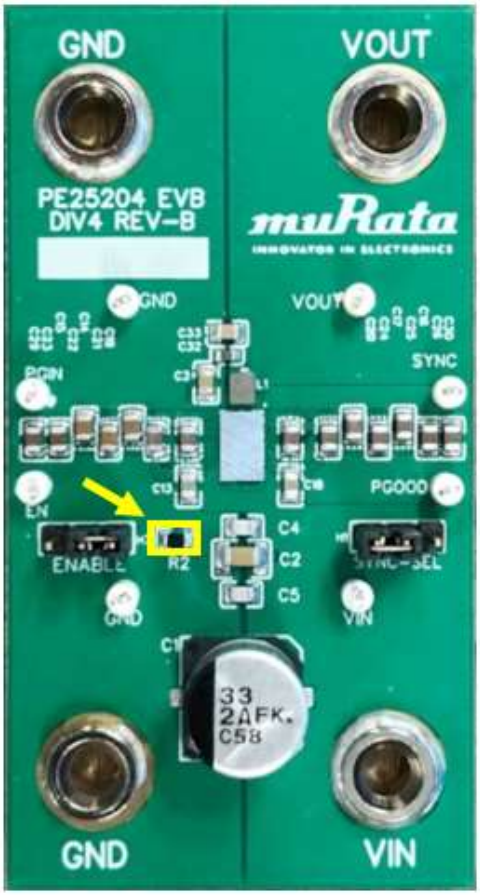


Figure 5. R2 Location

Test Result

The following test results show the typical performance of the PE25204 evaluation board.

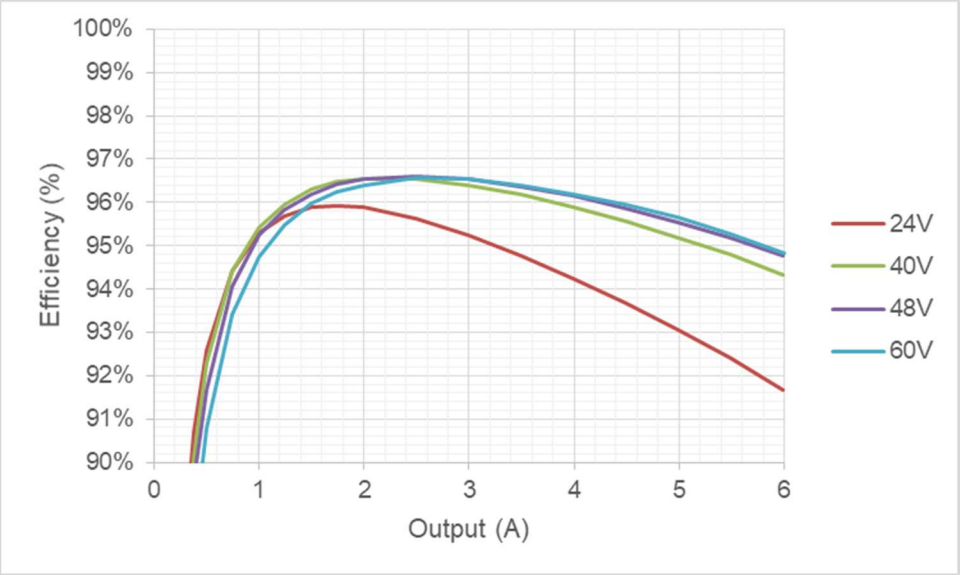


Figure 6. Efficiency vs. Output Current

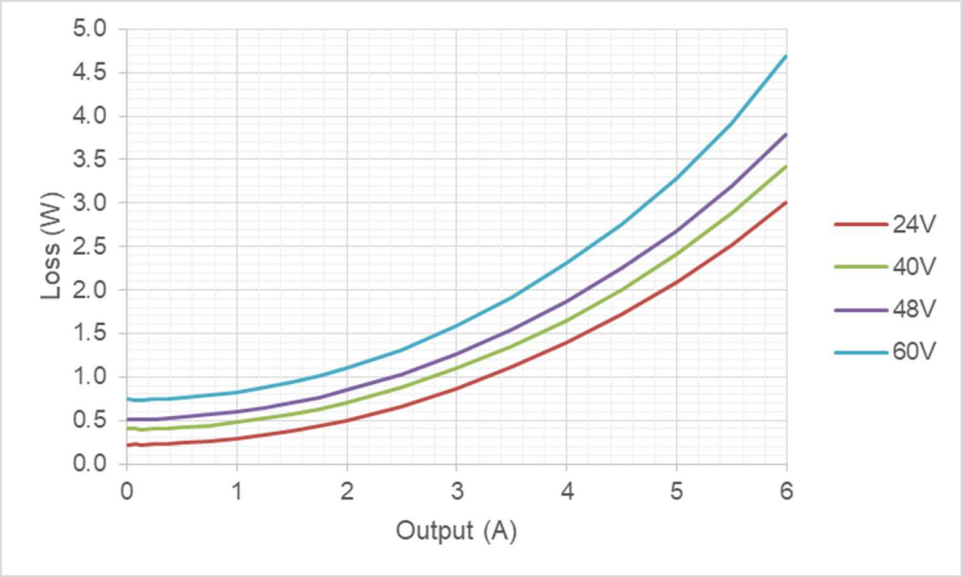


Figure 7. Loss (W) vs. Output Current

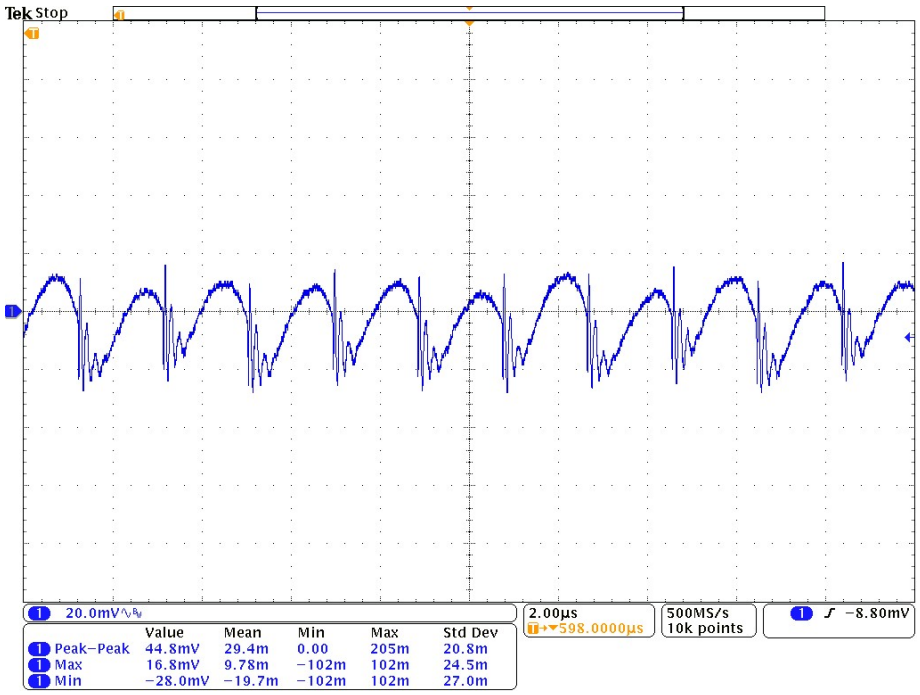


Figure 8. Output Ripple (Vin=48V, Iout=6A) with Added 22 µF Capacitor x2

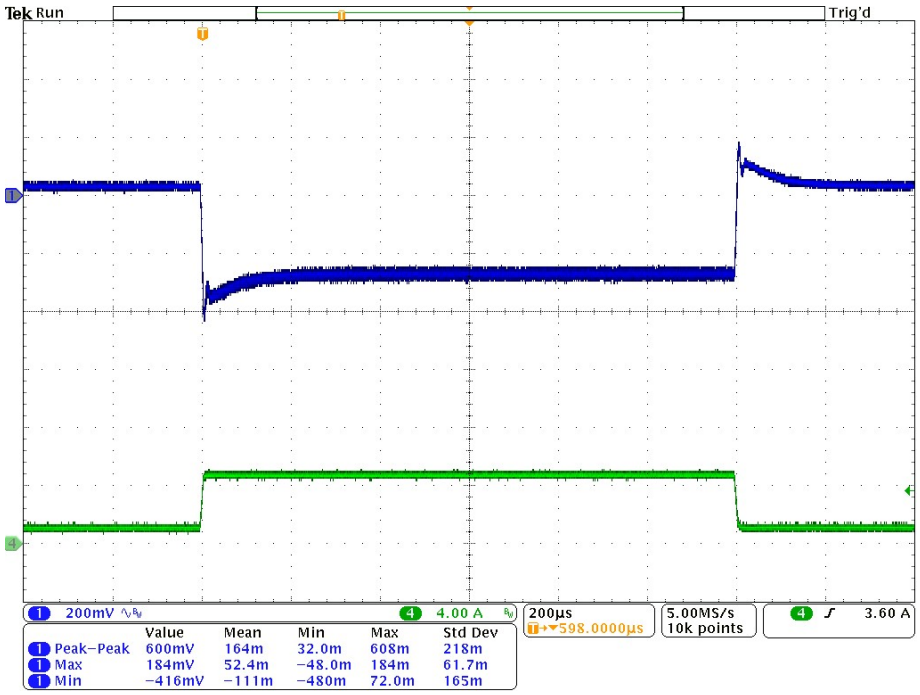


Figure 9. Load Transient Response (Vin=48V, 1.2–4.8A Load Step, 0.5A/µs) with Added 22 µF Capacitor x2

Information

PE25204 EVK PCB Layout

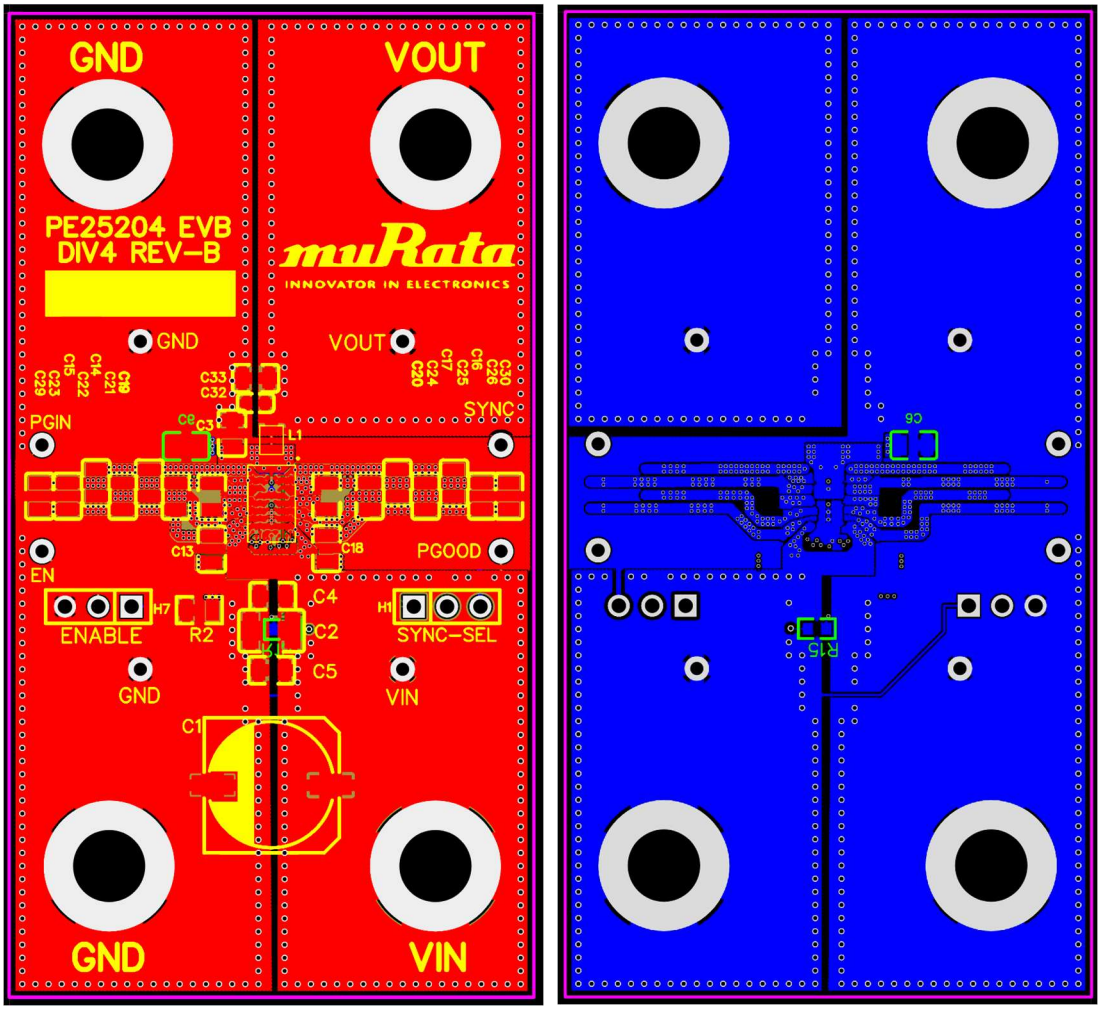


Figure 10. Evaluation Board Layout (Top and Bottom)

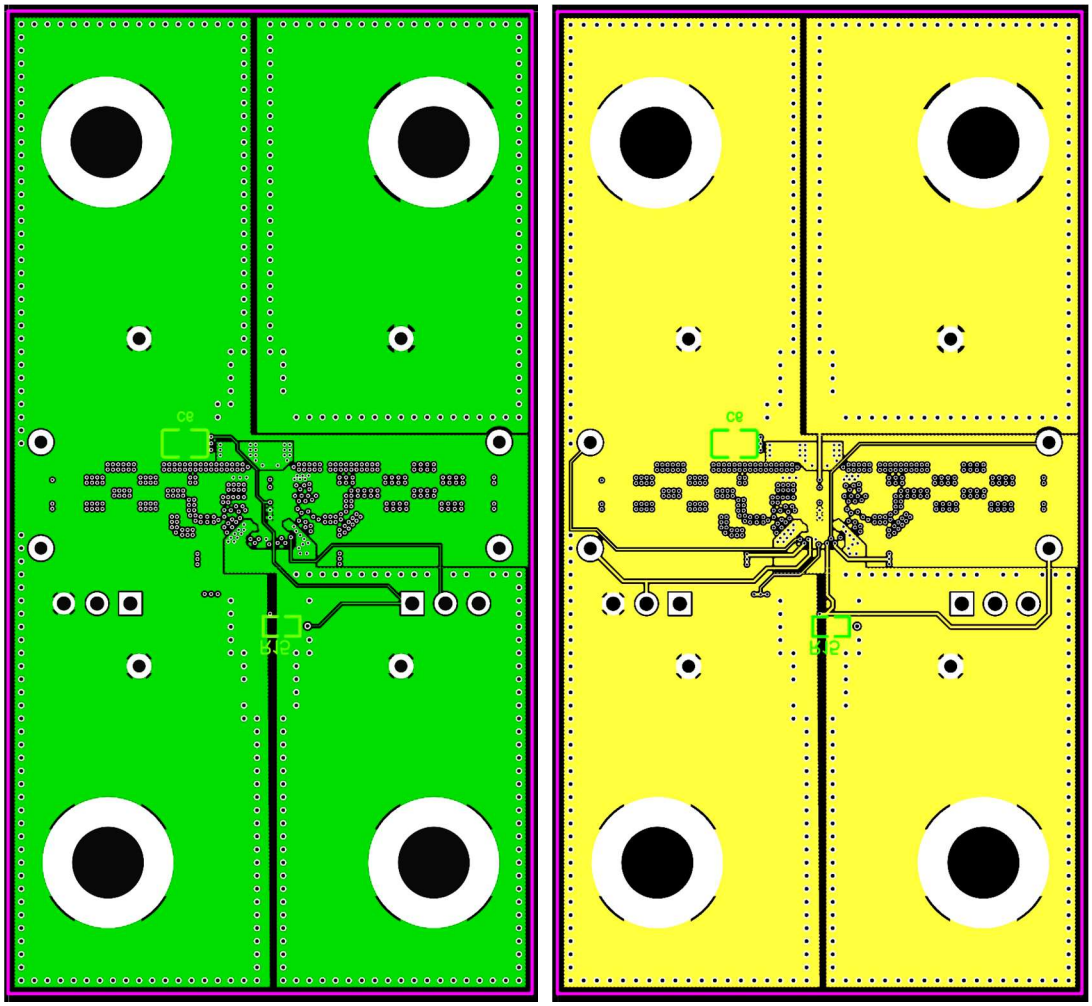


Figure 11. Evaluation Board Layout (Layers 2 and 3)

PE25204 Functional Block Diagram

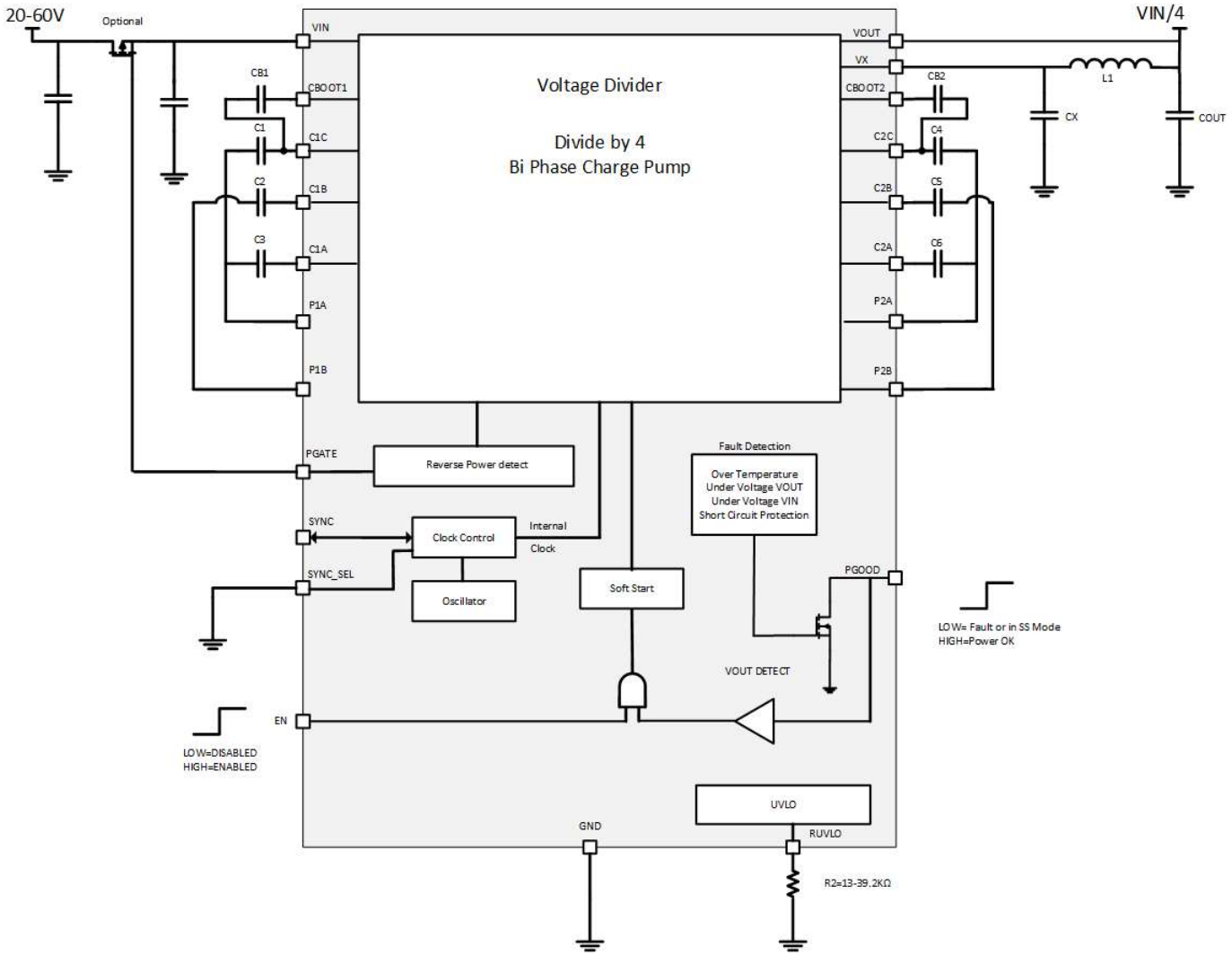


Figure 12. PE25204 Functional Block Diagram

PE25204 EVK PCB Schematic

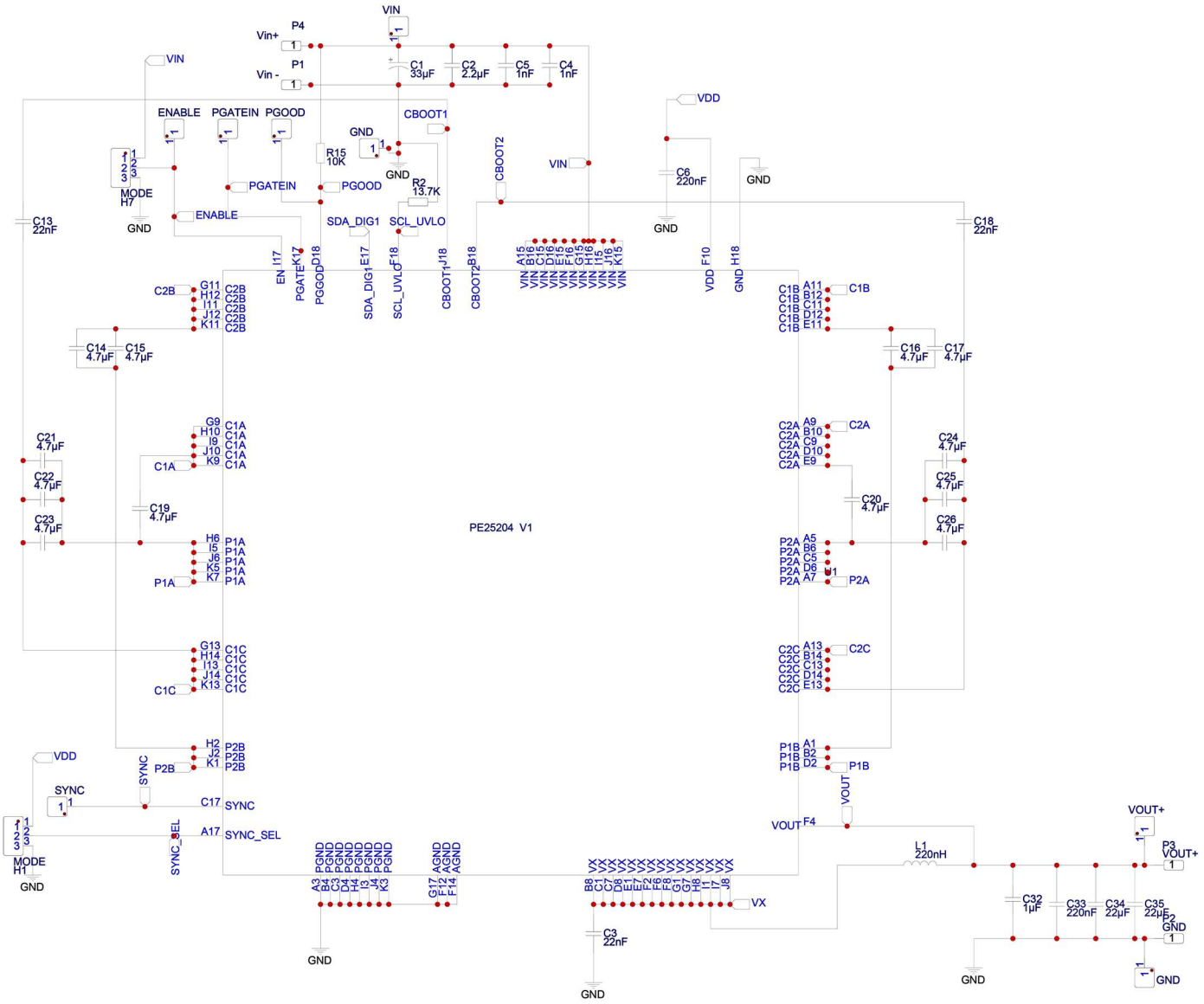


Figure 13. Evaluation Board Schematic

PE25204 EVK BOM List

REFERENCE	VALUE	DESCRIPTION	PART NUMBER
C13,C18	22 nF	CAP, SMD, CER, 22 nF, 25V, +/- 10%, X7S,0805 (2012 metric)	GRM21BC71E475KE11
C1	33 µF	CAP,TH,ELEC-RADIAL,33 µF, 100V, +/- 20%	EMVY101ARA101MKE0S
C2	2.2 µF	CAP,SMD,CER,2.2uf,100v,+/- 10% XS7 0805 (2012 metric)	GCM2165C2A222JA16D
C16,C17,C24,C25,C26, C20,C14,C15,C19,C21, C22,C23	4.7 µF	CAP, SMD, CER, 4.7 µF, 50V, +/- 10%, X7R,0805 (2012 metric)	GRM21BZ71H475KE15
L1	220 nH	IND, SMD, fixed inductors 220 nH, 6000 mA, 10 mΩ, 1008 (2520 Metric)	HMLQ25201B-R22MSR-01
C4,C5	1 nF	CAP, SMD, CER, 1nF, 100V, +/- 10%, X7S,0805 (2012 metric)	GRM2162C2A102JA01D
R15	10K	RES, SMD, thick film, 10K, +/-5%, 1/10W, 0603	0603WAJ0103T5E
C32	1 µF	CAP, SMD, CER, 1 µF, 35V, +/- 10%, X7S,0805 (2012 metric)	GRM219R7YA105KA12#
C33	220 nF	CAP, SMD, CER, 220 nF, 35V, +/- 10%, X7S,0805 (2012 metric)	GRM21AR72A224MAC5
C6	220 nF	CAP, SMD, CER, 220 nF, 10V, +/- 10%, X7S, 0402 (1005M)	GRM155R71A224ME01#
U1	PE25204	IC, PE25204, WLCSP-BGA, pSemi IC	PE25204
R2	13.7 KΩ	RES, SMD, thick film, 13.7K, +/-1%, 1/8W, 0805	0805W8F1372T5E

Table 1. EVK BOM List

Technical Resources

Additional technical resources are available by contacting Sales at https://www.murata.com/contactform. These include the product specification datasheet, zip file, evaluation kit schematic and bill of materials, material declaration form and PC-compatible software file. Trademarks are subject to trademark claims.

Notices

⚠ CAUTION

Limitation of Applications

Please contact us before using our products for the applications listed below which require especially high reliability for the prevention of defects which might lead to damage to life, body or property.

- Aircraft equipment
- Aerospace equipment
- Undersea equipment
- Power plant control equipment
- Surgical implants
- Transportation equipment (vehicles, trains, ships, etc.)
- Traffic signal equipment
- Disaster prevention / crime prevention equipment
- Application of similar complexity and/or reliability requirements to the applications listed in the above

⚠ Note

1. Please make sure that your product has been evaluated and confirmed to your specifications when our product is used in your product.
2. All the items and parameters in this approval sheet for product specification are based on the premise that our product is used for the purpose, under the condition and in the environment agreed upon between you and us. You are requested not to use our product in a manner deviating from such agreement.
3. If you have any concerns about materials other than those listed in the RoHS directive, please contact us.
4. Be sure to provide an appropriate fail-safe functionality in your product to prevent secondary damage that could be caused by the abnormal function or failure of our product.
5. Do not allow our product to be exposed to excess moisture under any circumstances.

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