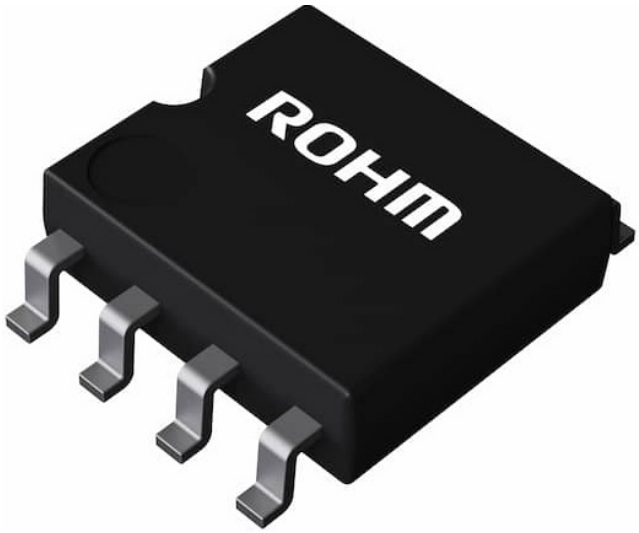
Contents [ hide ]



ROHM

# ROHM BM2P094F-EVK-001 Output Power 5W Isolation Fly Back Conveter




## Specifications

| Description | Symbol | Min | Typ | Max | Unit | Condition |
|---|---|---|---|---|---|---|
| Voltage | Vin | 90 | 264 | – | Vac | VinAC100V/230V |
| Input Frequency | fac | 47 | 50/60 | 63 | Hz | – |
| No Load Input Power | – | – | 50 | – | mW | – |
| Voltage Output | Vout | 4.75 | 5 | 5.25 | V | – |
| Current Output | Iout | – | 1 | – | A | – |
| Ripple Voltage Output | Vripple | – | 100 | – | mV | 20MHz Bandwidth |
| Efficiency | – | – | 70 | 2 | % | – |
| **Board No: BM2P094F-EVK-001** | | | | | | |

## High Voltage Safety Precautions

- Read all safety precautions before use
- Please note that this document covers only the BM2P094F evaluation board (BM2P094F-EVK-001) and its functions. For additional information, please refer to the datasheet.

To ensure safe operation, please carefully read all precautions before handling the

evaluation board

Depending on the configuration of the board and voltages used, Potentially lethal voltages may be generated. Therefore, please make sure to read and observe all safety precautions described in the red box below.

## Before Use

1. Verify that the parts/components are not damaged or missing (i.e., due to the drops).
2. Check that there are no conductive foreign objects on the board.
3. Be careful when performing soldering on the module and/or evaluation board to ensure that solder splash does not occur.
4. Check that there is no condensation or water droplets on the circuit board.

**During Use**

5. Be careful not to allow conductive objects to come into contact with the board.
6. Brief accidental contact or even bringing your hand close to the board may result in discharge and lead to severe injury or death. Therefore, DO NOT touch the board with your bare hands or bring them too close to the board. In addition, as mentioned above please exercise extreme caution when using conductive tools such as tweezers and screwdrivers.
7. If used under conditions beyond its rated voltage, it may cause defects such as short-circuit or, depending on the circumstances, explosion or other permanent damage.
8. Be sure to wear insulated gloves when handling is required during operation.

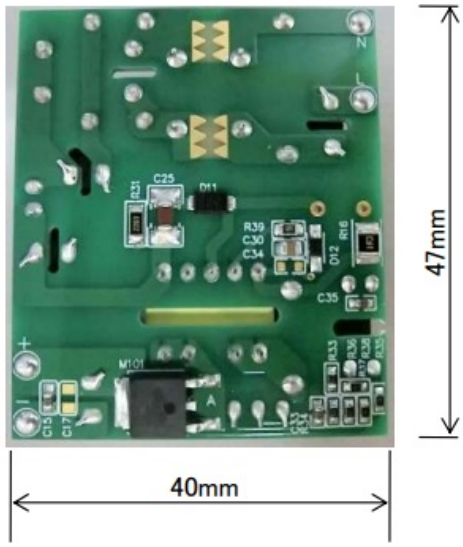
**After Use**

9. The ROHM Evaluation Board contains the circuits which store the high voltage. Since it stores the charges even after the connected power circuits are cut, please discharge the electricity after using it, and please deal with it after confirming such electric discharge.
10. Protect against electric shocks by wearing insulated gloves when handling.

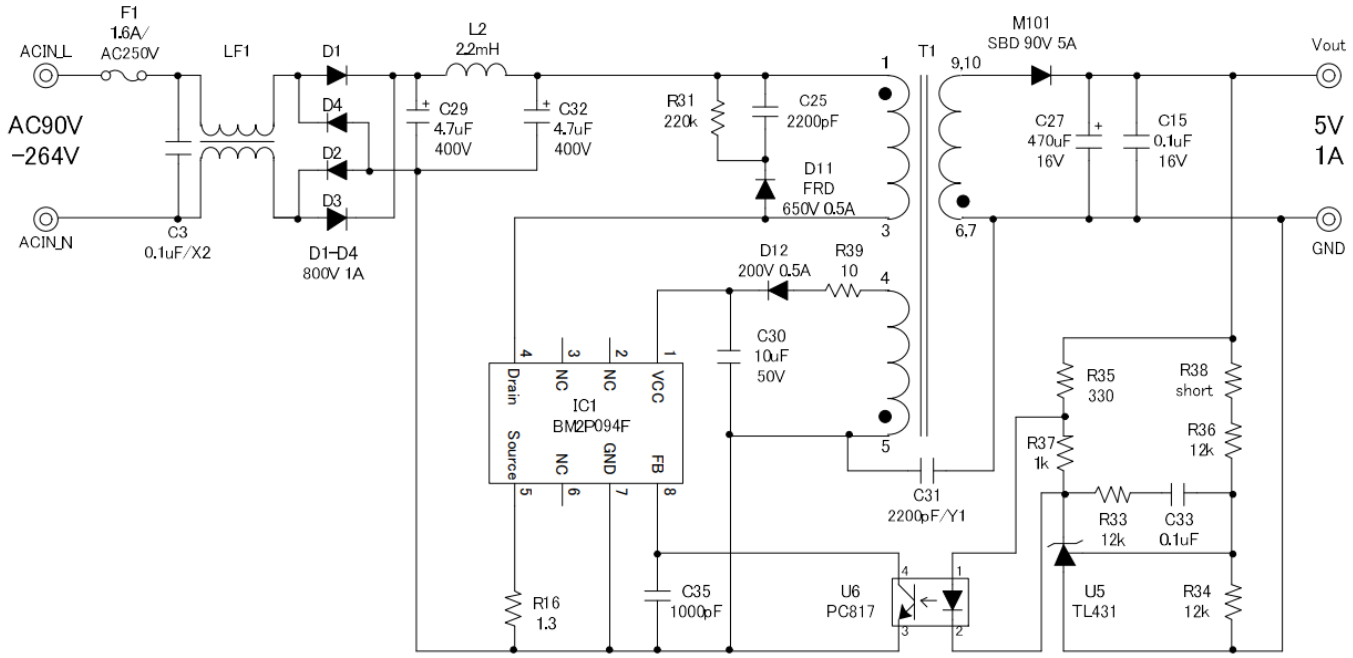
This evaluation board is intended for use only in research and development facilities and should by handled only by qualified personnel familiar with all safety and operating procedures. We recommend carrying out operation in a safe environment that includes the use of high voltage signage at all entrances, safety interlocks, and protective glasses.

## Reference Board Specification

| Description | | Symbol | Min | Typ | Max | Unit | Condition |
|---|---|---|---|---|---|---|---|
| Input | Voltage | Vin | 90 | | 264 | Vac | |
| | Frequency | fac | 47 | 50/60 | 63 | Hz | |
| | No Load Input Power | | | | 50 | mW | Vin AC100V/230V |
| Output | Voltage | Vout | 4.75 | 5 | 5.25 | V | |
| | Current | Iout | 1 | | | A | |
| | Ripple Voltage | Vripple | | | 100 | mV | 20MHz Bandwidth |
| | Efficiency | | 70 | | | % | Output 5V 1A |


## Application Schematic



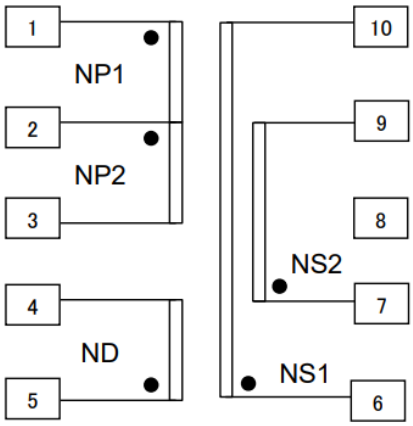

## Component List

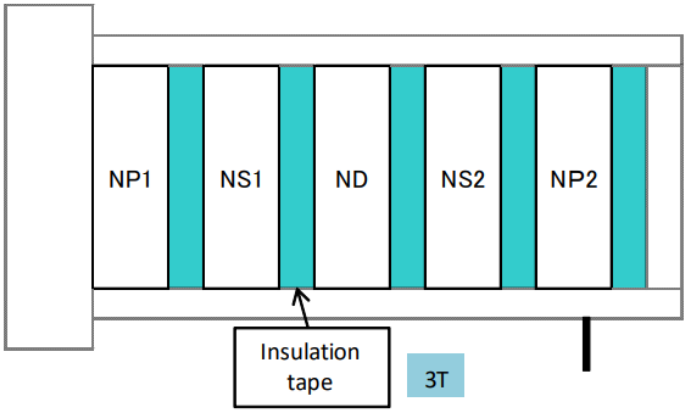
| Item | Specifications | Parts name | Manufacture |
|---|---|---|---|
| C3 | 0.1 µF, 310 V | 890334025017CS | WURTH ELECTRONIK |
| C15,C33 | 0.1 µF, 100 V | HMK107B7104MA-T | TAIYO YUDEN |
| C25 | 2,200 pF, 630 V | GRM31B5C2J222JWA1 | MURATA |
| C27 | 470 µF, 35 V | 860080575017 | WURTH ELECTRONIK |
| C29,C32 | 4.7 µF, 400 V | 860021374008 | WURTH ELECTRONIK |
| C30 | 2.2 µF, 50 V | UMK212BB7225MG-T | TAIYO YUDEN |
| C31 | 2200 pF, 300 V | DE1E3RA222MJ4BP01F | MURATA |
| C35 | 1000 pF, 100 V | HMK107B7102KA-T | TAIYO YUDEN |

| | | | |
|---|---|---|---|
| D1,D2,D3, D4 | 1 A, 1000 V | 1N4007-GP | VISHAY |
| D11 | FRD, 0.8 A, 700 V | RFN1LAM7S | ROHM |
| D12 | FRD, 0.5 A, 200 V | RF05VAM2S | ROHM |
| F1 | 1 A, 300 V | 36911000000 | LITTELFUSE |
| IC1 | | BM2P094F | ROHM |
| L2 | 2200 µH | 5300-41-RC | BOURNS |
| LF1 | 10 mH | UU9.8V-02100 | ALPHA TRANS |
| M101 | SBD, 6 A, 90 V | RB095BGE-90 | ROHM |
| R16 | 1.3 Ω | KTR25JZPF1R30 | ROHM |
| R31 | 220 kΩ | ESR18EZPJ224 | ROHM |
| R33,R34, R36 | 12 kΩ | MCR03EZPFX1202 | ROHM |
| R35 | 330 Ω | MCR03EZPJ331 | ROHM |
| R37 | 1 kΩ | MCR03EZPJ102 | ROHM |
| R38 | 0 Ω | MCR03EZPJ000 | ROHM |
| R39 | 10 Ω | MCR10EZPJ100 | ROHM |
| T1 | EE13 | XE2494Y | ALPHATRANS |
| U5 | | TL431BCLP | TI |
| U6 | | LTV-817-B | LITEON |
| N | BLUE | LC-2-G-SKY | MAC8 |
| L | BLUE | LC-2-G-SKY | MAC8 |

| | | | |
|---|---|---|---|
| 5V/1A | RED | LC-22-G-RED | MAC8 |
| GND | BLACK | LC-2-G-BLACK | MAC8 |

**Transformer:YPP1181 (EE13)**




- **Core** Tomita 2G8-EE13x12x6.3 or compatible
- **Bobbin** Tomita TBB347 Vertical/Terminal Pins 5-5(10pins) or compatible
- **AL-Value** 79.1 nH/N2
- **Inductance(1-3pin)** 1.336 H±15%

| Coil | Terminal | Turns | Wire | Winding Method |
|---|---|---|---|---|
| NP1 | ‘1-2 | 65 | 2UEW 0.2 | FIT |
| NS1 | ‘6-10 | 11 | TEX-E 0.4 | 1 Layer FIT |
| ND | ‘5-4 | 31 | 2UEW 0.2 | 1 Layer FIT |
| NS2 | ‘7-9 | 11 | TEX-E 0.4 | 1 Layer FIT |
| N 2 | ‘2-3 | 65 | 2UEW 0.2 | FIT |

- **Isolation Voltage** :P-S :AC3.0kVrms 1MIN 2mA or AC3.6kVrms 1S 2mA
- **Winding beginning** Fix with barrier tape
- **PS-CORE** :AC1.5kVrms 1MIN 2mA or AC1.8kVrms 1S 2mA
- **Winding end** Interpose the line drawn, Isolation Resistance P-S,

- **PS-CORE**:100MΩ at DC500V

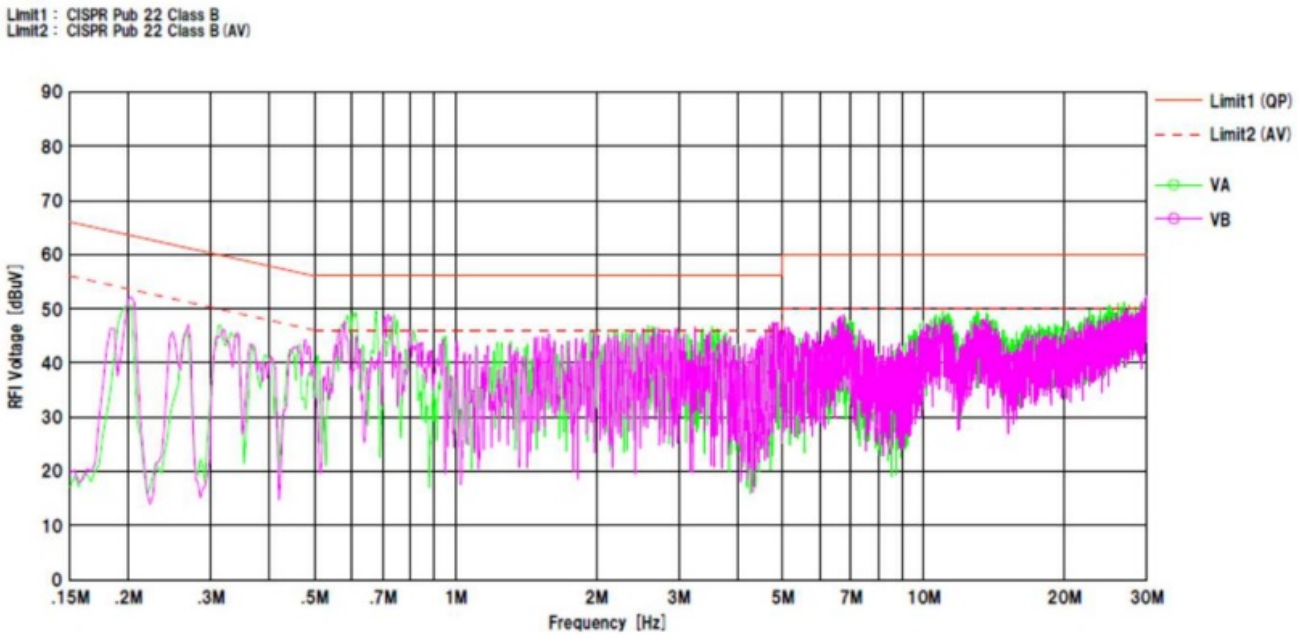
## Measurement Data

| Vin(V) | Pin(W) | Vout(V) | Iout(A) | Pout(W) | η(%) |
|---|---|---|---|---|---|
| 90 | 0.034 | 5.007 | 0 | 0 | – |
| | 0.105 | 5.007 | 0.01 | 0.050 | 47.5 |
| | 1.611 | 5.003 | 0.25 | 1.251 | 77.6 |
| | 3.222 | 5.000 | 0.5 | 2.500 | 77.6 |
| | 4.956 | 4.998 | 0.75 | 3.748 | 75.6 |
| | 6.751 | 4.996 | 1 | 4.996 | 74.0 |
| 100 | 0.034 | 5.007 | 0 | 0 | – |
| | 0.105 | 5.007 | 0.01 | 0.050 | 47.7 |
| | 1.609 | 5.002 | 0.25 | 1.251 | 77.7 |
| | 3.204 | 4.999 | 0.5 | 2.500 | 78.0 |
| | 4.894 | 4.997 | 0.75 | 3.747 | 76.6 |
| | 6.617 | 4.995 | 1 | 4.995 | 75.5 |
| 230 | 0.033 | 5.007 | 0 | 0 | – |
| | 0.105 | 5.007 | 0.01 | 0.050 | 47.6 |
| | 1.655 | 5.002 | 0.25 | 1.250 | 75.6 |
| | 3.229 | 4.996 | 0.5 | 2.498 | 77.4 |
| | 4.821 | 4.990 | 0.75 | 3.742 | 77.6 |
| | 6.460 | 4.985 | 1 | 4.985 | 77.2 |

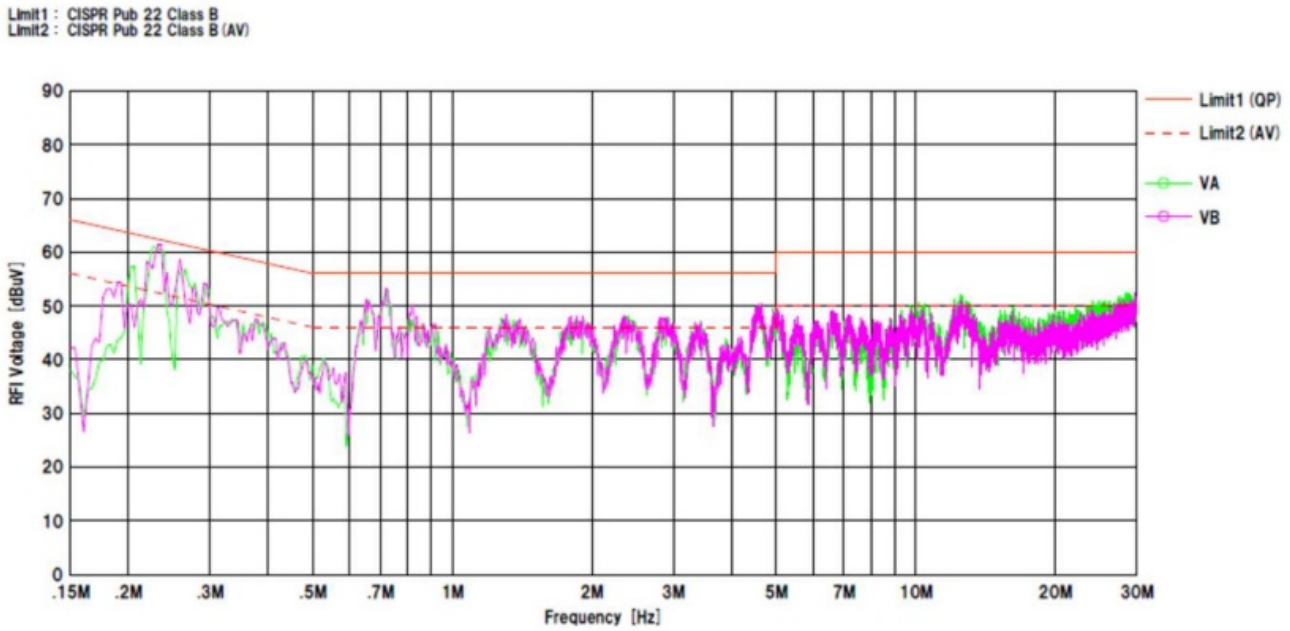
| | | | | | |
|---|---|---|---|---|---|
| 264 | 0.032 | 5.007 | 0 | 0 | – |
| | 0.102 | 5.007 | 0.01 | 0.050 | 49.0 |
| | 1.668 | 5.002 | 0.25 | 1.250 | 75.0 |
| | 3.288 | 4.995 | 0.5 | 2.498 | 76.0 |
| | 4.894 | 4.989 | 0.75 | 3.742 | 76.5 |
| | 6.516 | 4.983 | 1 | 4.983 | 76.5 |

## Conduction EMI

- **Vin** AC100V/50Hz
- **Vout** 5V 1A




- **Vin** AC230V/50Hz
- **Vout** 5V 1A

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## Frequently Asked Questions

What should I do if I accidentally touch the board with bare hands?

Immediately stop handling the board, wear insulated gloves, and discharge any stored electricity before continuing.

Can I operate the evaluation board without wearing insulated gloves?

It is strongly recommended to wear insulated gloves during operation to prevent electric shocks and ensure safety.

What happens if the board is operated beyond its rated voltage?

Operating beyond the rated voltage may cause defects, short-circuits, explosions, or permanent damages. Always operate within the specified limits for safety.

How should I handle soldering on the module?

Exercise caution to prevent solder splash and ensure a safe soldering environment to avoid accidents and damage to the board.

Are there specific guidelines for storing the evaluation board?

Store the board in a dry, dust-free environment, away from conductive objects, and follow proper handling procedures to maintain its integrity.

How can I discharge electricity stored in the circuits after use?

Follow the recommended procedures provided in the safety precautions section of

the manual to safely discharge any stored electricity before handling the board.

Can I use conductive tools such as tweezers and screwdrivers with the evaluation board?

Exercise extreme caution when using conductive tools near the board to avoid accidents, discharge, or damage. It is recommended to wear insulated gloves and follow safety guidelines.

Is there a risk of electric shock when operating the evaluation board?

Yes, there is a risk of electric shock due to potentially lethal voltages generated during operation. Always wear insulated gloves, follow safety precautions, and handle the board with care to prevent accidents.

What are the recommended safety measures for handling the evaluation board?

Ensure you read and follow all safety precautions outlined in the manual, wear insulated gloves, avoid contact with conductive objects, discharge stored electricity after use, and operate within specified voltage limits to maintain safety.

Can the evaluation board be used in any environment?

The evaluation board should only be used in research and development facilities by qualified personnel familiar with safety procedures. Operate in a safe environment with necessary safety measures in place for protection against high voltages.

How should I dispose of the evaluation board after use?

Follow proper disposal guidelines for electronic components and ensure all safety precautions are taken before handling and disposing of the evaluation board to

prevent accidents and environmental hazards.

What are the key considerations for ensuring safe operation of the evaluation board?

Key considerations include verifying components before use, avoiding conductive objects near the board, wearing insulated gloves during handling, discharging stored electricity after use, and operating within specified voltage limits to prevent accidents and ensure safe operation.

Is there a risk of permanent damage if safety precautions are not followed?

Yes, failure to follow safety precautions may result in permanent damages, short-circuits, explosions, or injuries. Always prioritize safety measures and handle the evaluation board with caution to prevent such incidents.

Can I modify or repair the evaluation board on my own?

It is not recommended to modify or repair the evaluation board on your own unless you are a qualified professional with knowledge of high-voltage components. Seek assistance from authorized personnel for any modifications or repairs to ensure safety and proper functionality.

What should I do if I encounter an issue during operation of the evaluation board?

If you encounter any issues during operation, immediately stop using the board, disconnect power sources, wear insulated gloves, and refer to the troubleshooting section of the manual or contact technical support for assistance.

## Documents / Resources

| | |
|---|---|
|  | ROHM BM2P094F-EVK-001 Output Power 5W Isolation Fly Back Convet er [pdf] User Guide<br>BM2P094F-EVK-001, BM2P094F-EVK-001 Output Power 5W Isolation Fl y Back Conveter, Output Power 5W Isolation Fly Back Conveter, Power 5 W Isolation Fly Back Conveter, Isolation Fly Back Conveter, Conveter |

## References

- User Manual

ROHM

BM2P094F-EVK-001, BM2P094F-EVK-001 Output Power 5W Isolation Fly Back Conveter, Conveter, Isolation Fly Back Conveter, Output Power 5W Isolation Fly Back Conveter, Power 5W Isolation Fly Back Conveter, ROHM

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