



**Isolation Fly-back Converter PWM method**  
**Output Power 5W**  
**BM2P094F-EVK-001**

**User's Guide**

## <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 to not 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.

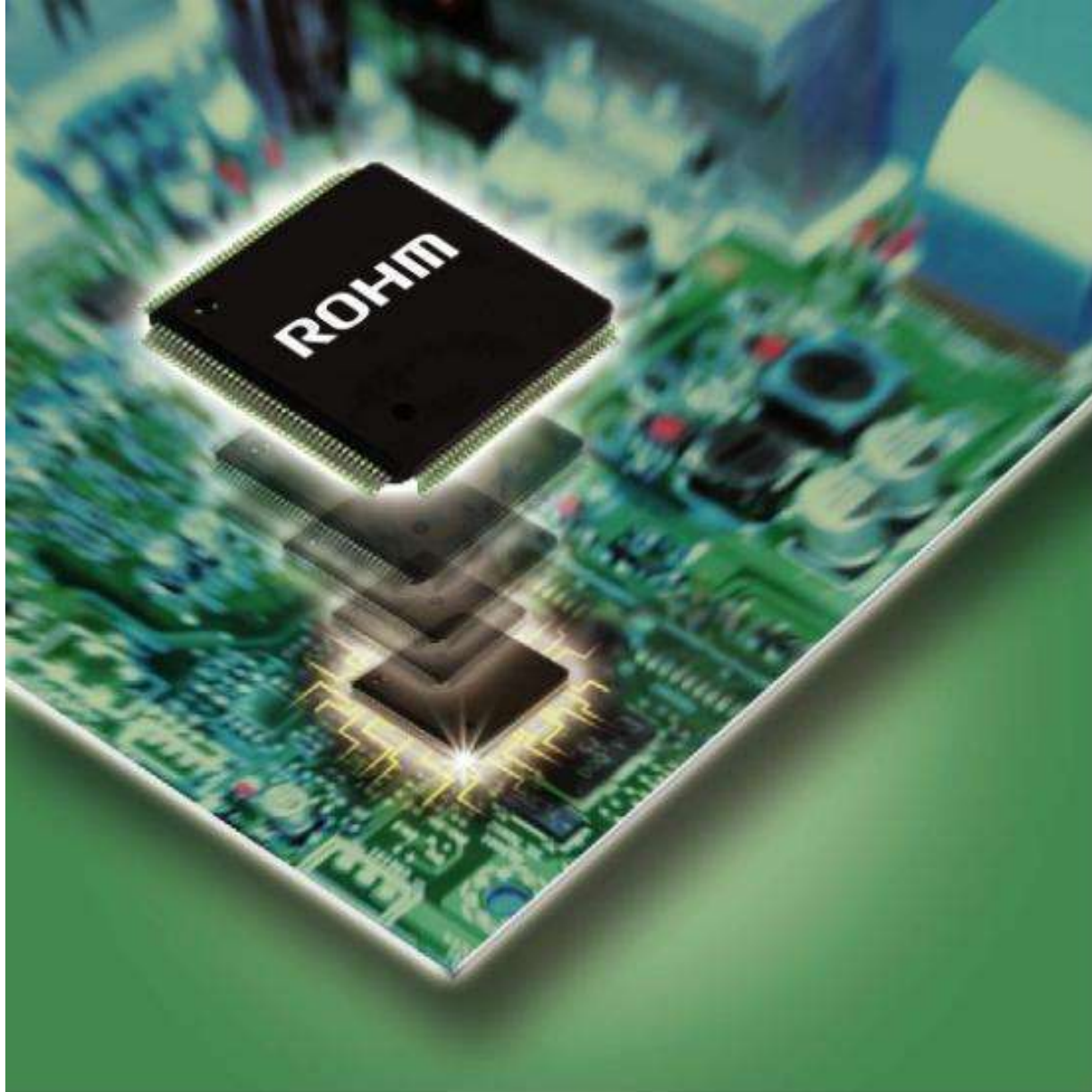
- [7] If used under conditions beyond its rated voltage, it may cause defects such as short-circuit or, depending on the circumstances, explosion or other permanent damages.
- [8] Be sure to wear insulated gloves when handling is required during operation.

### 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 be 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.

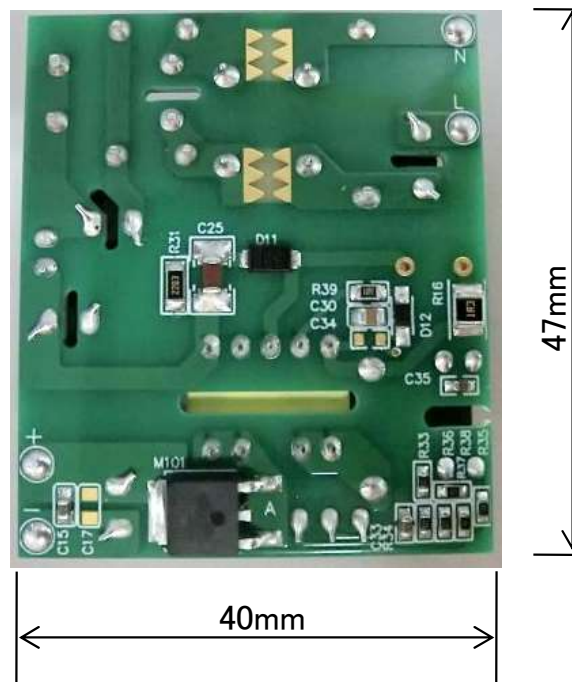
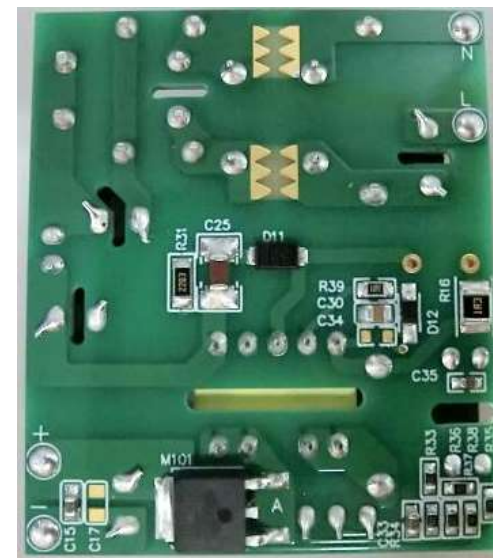


# Innovations Embedded

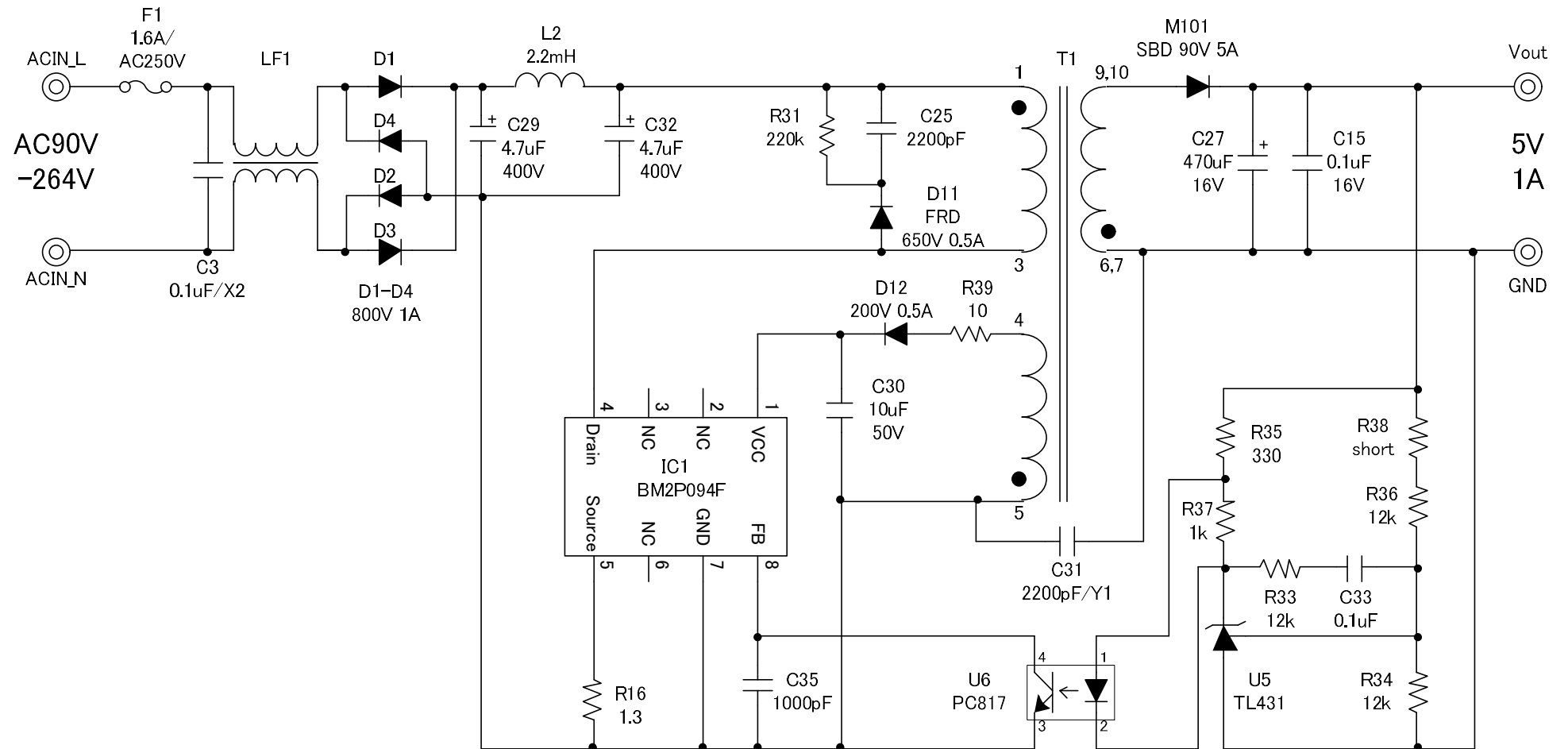
**Board No:BM2P094F-EVK-001**

# 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



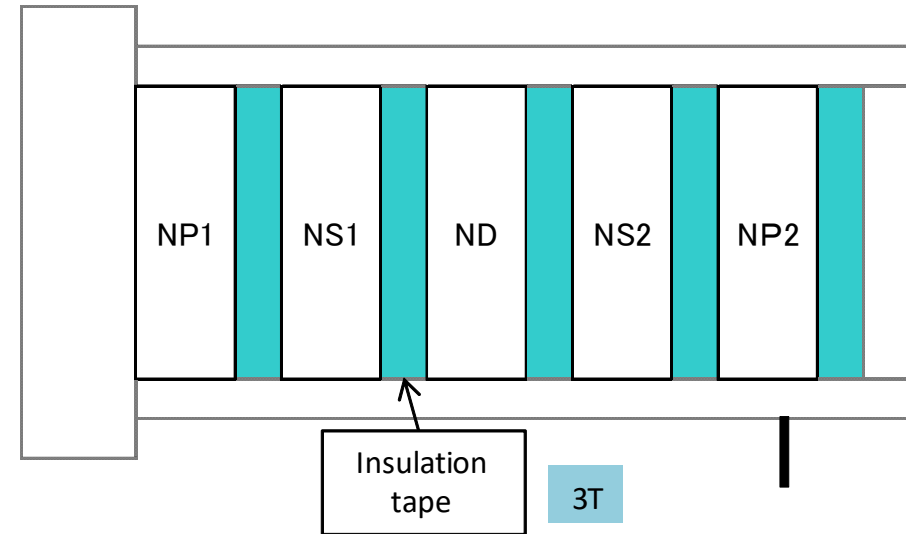
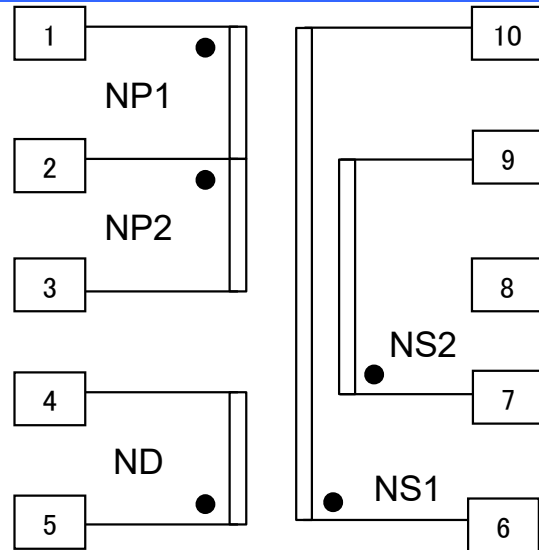
# Application Schematic



# Component List

Item	Specifications	Parts name	Manufacture
C3	0.1 $\mu$ F, 310 V	890334025017CS	WURTH ELECTRONIK
C15,C33	0.1 $\mu$ F, 100 V	HMK107B7104MA-T	TAIYO YUDEN
C25	2,200 pF, 630 V	GRM31B5C2J222JWA1	MURATA
C27	470 $\mu$ F, 35 V	860080575017	WURTH ELECTRONIK
C29,C32	4.7 $\mu$ F, 400 V	860021374008	WURTH ELECTRONIK
C30	2.2 $\mu$ F, 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 $\mu$ H	5300-41-RC	BOURNS
LF1	10 mH	UU9.8V-02100	ALPHA TRANS
M101	SBD, 6 A, 90 V	RB095BGE-90	ROHM
R16	1.3 $\Omega$	KTR25JZPF1R30	ROHM
R31	220 k $\Omega$	ESR18EZPJ224	ROHM
R33,R34,R36	12 k $\Omega$	MCR03EZPFX1202	ROHM
R35	330 $\Omega$	MCR03EZPJ331	ROHM
R37	1 k $\Omega$	MCR03EZPJ102	ROHM
R38	0 $\Omega$	MCR03EZPJ000	ROHM
R39	10 $\Omega$	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/N<sup>2</sup>

Inductance(1-3pin): 1.336 mH±15%

Coil	Terminal	Turns	Wire	Winding Method
NP1	'1-2	65	2UEW 0.2	FIT(密)
NS1	'6-10	11	TEX-E 0.4	1 Layer FIT(密)
ND	'5-4	31	2UEW 0.2	1 Layer FIT(密)
NS2	'7-9	11	TEX-E 0.4	1 Layer FIT(密)
NP2	'2-3	65	2UEW 0.2	FIT(密)

Isolation Voltage :P-S :AC3.0kVrms 1MIN 2mA or AC3.6kVrms 1S 2mA

Winding beginning: Fix by 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

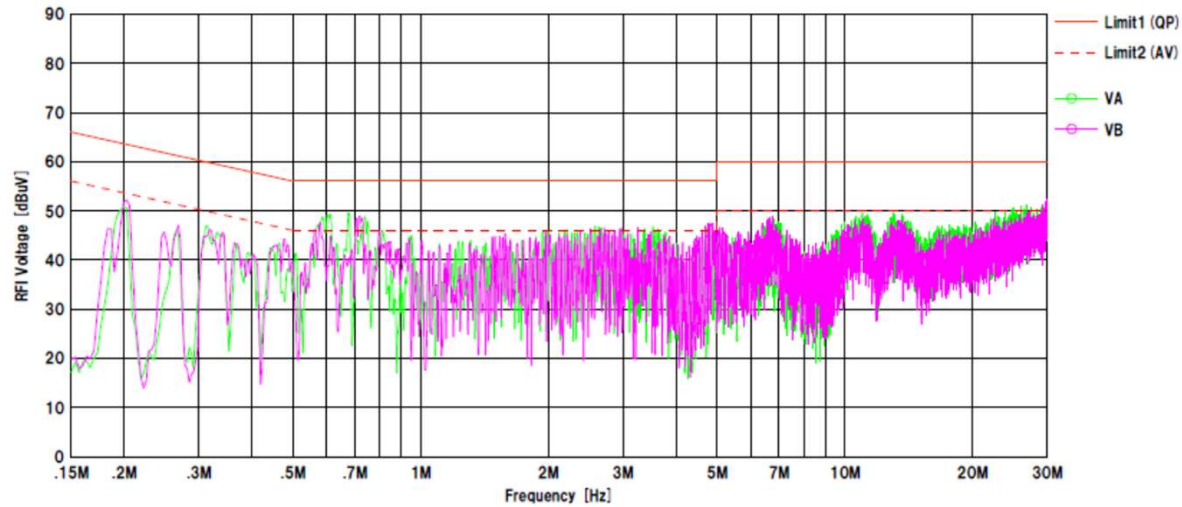


Vin(V)	Pin(W)	Vout(V)	Iout(A)	Pout(W)	$\eta$ (%)
90	0.034	5.007	0	0	-
	0.105	5.007	0.01	0.050	47.5
	1.611	5.003	0.25	1.251	77.6
	3.222	5.000	0.5	2.500	77.6
	4.956	4.998	0.75	3.748	75.6
	6.751	4.996	1	4.996	74.0
100	0.034	5.007	0	0	-
	0.105	5.007	0.01	0.050	47.7
	1.609	5.002	0.25	1.251	77.7
	3.204	4.999	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



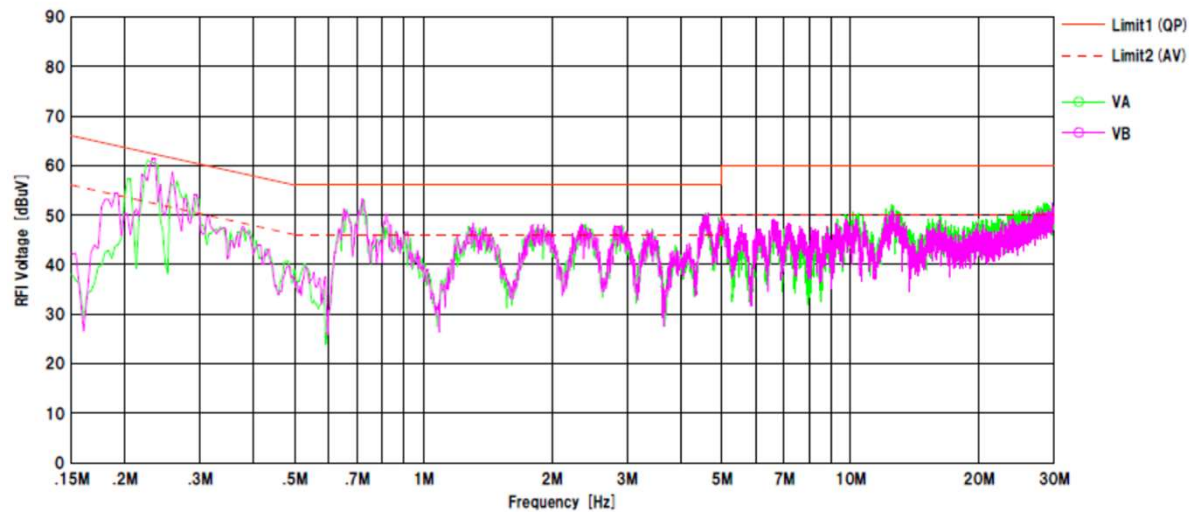
Vin : AC100V/50Hz  
Vout : 5V 1A

Limit1 : CISPR Pub 22 Class B  
Limit2 : CISPR Pub 22 Class B (AV)



Vin : AC230V/50Hz  
Vout : 5V 1A

Limit1 : CISPR Pub 22 Class B  
Limit2 : CISPR Pub 22 Class B (AV)



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