



EC4SAW8 Series

Application Note V10 August 2025

ISOLATED DC-DC CONVERTER EC4SAW8 SERIES APPLICATION NOTE



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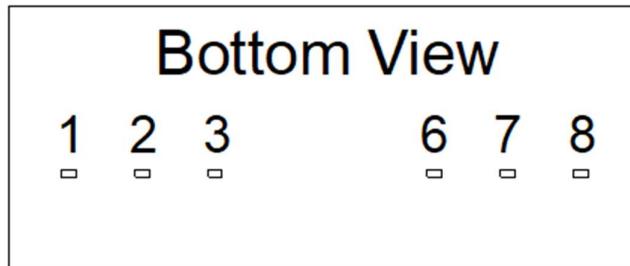
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1. Introduction

The EC4SAW8 series offer 5-6 watts of output power in a 0.86x0.36x0.44 inches SIP-8 plastic packages. The EC4SAW8 series has a 8:1 wide input voltage range of 9-75VDC and provides a precisely regulated output. This series has features such as high efficiency, 3000VDC of isolation and allows an ambient operating temperature range of -40°C to 105°C with de-rating. The features include short circuit protection and Negative remote **on/off** control. All models are very suitable for distributed power architectures, telecommunications, battery operated equipment and industrial applications.

2. Pin Function Description



Single Output

No	Label	Function	Description	Reference
1	-Vin	-V Input	Negative Supply Input	Section 7.1
2	+Vin	+V Input	Positive Supply Input	Section 7.1
3	R.C	Remote On/Off	External Remote On/Off Control	Section 6.3
6	+Vout	+V Output	Positive Power Output	Section 7.2/7.3
7	-Vout	-V Output	Negative Power Output	Section 7.2/7.3
8	N.C	NC	No Connection with Pin	--

Dual Output

No	Label	Function	Description	Reference
1	-Vin	-V Input	Negative Supply Input	Section 7.1
2	+Vin	+V Input	Positive Supply Input	Section 7.1
3	R.C	Remote On/Off	External Remote On/Off Control	Section 6.3
6	+Vout	+V Output	Positive Power Output	Section 7.2/7.3
7	Com	Common	Common Power Output	Section 7.2/7.3
8	-Vout	-V Output	Negative Power Output	Section 7.2/7.3

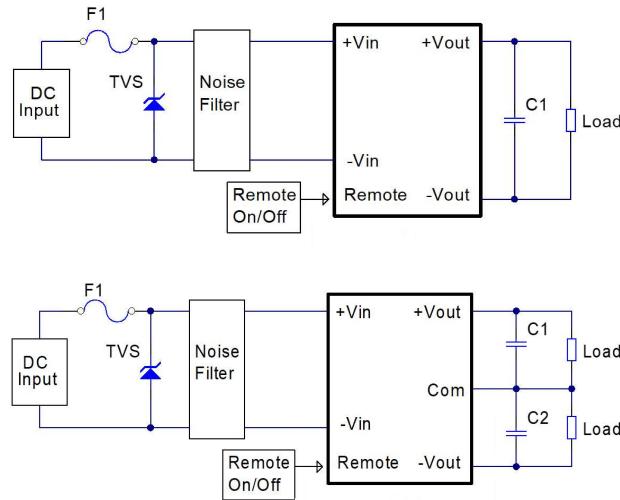


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3. Connection for Standard Use

The connection for standard use is shown below. External output capacitors (C1, C2) are recommended to reduce output ripple and noise, 1uF ceramic capacitor for all models.



Symbol	Component	Reference
F1, TVS	Input fuse, TVS	Section 9.1
C1, C2	External capacitor to reduce output ripple and noise	Section 7.2
Noise Filter	External input noise filter	Section 9.2
Remote On/Off	External remote on/off control	Section 6.3

4. Test Set-Up

The basic test set-up to measure parameters such as efficiency and load regulation is shown below. When testing the modules under any transient conditions please ensure that the transient response of the source is sufficient to power the equipment under test. We can calculate:

- Efficiency
- Load regulation and line regulation

The value of efficiency is defined as:

$$\eta = \frac{V_o \times I_o}{V_{in} \times I_{in}} \times 100\%$$

Where:

V_o is output voltage

I_o is output current

V_{in} is input voltage

I_{in} is input current

The value of load regulation is defined as:

$$\text{Load reg.} = \frac{V_{FL} - V_{NL}}{V_{NL}} \times 100\%$$

Where:

V_{FL} is the output voltage at full load

V_{NL} is the output voltage at no load

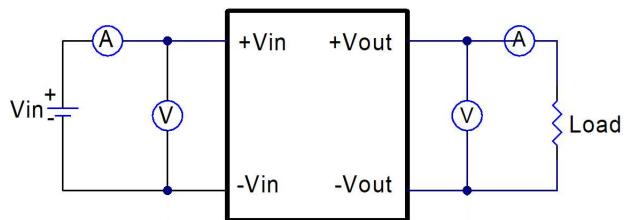
The value of line regulation is defined as:

$$\text{Line reg.} = \frac{V_{HL} - V_{LL}}{V_{LL}} \times 100\%$$

Where:

V_{HL} is the output voltage of maximum input voltage at full load

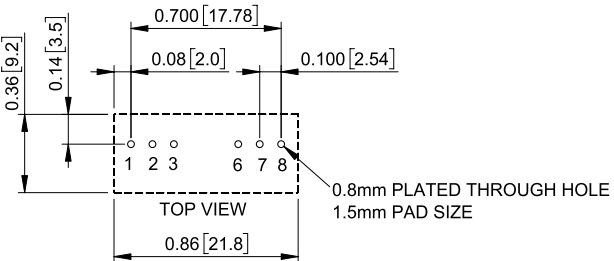
V_{LL} is the output voltage of minimum input voltage at full load



EC4SAW8 Series Test Setup

5. Recommend Layout, PCB Footprint and Soldering Information

The system designer or end user must ensure that metal and other components in the vicinity of the converter meet the spacing requirements for which the system is approved. Low resistance and inductance PCB layout traces are the norm and should be used where possible. Due consideration must also be given to proper low impedance tracks between power module, input and output grounds. The recommended footprints and soldering profiles are shown below.



Note: Dimensions are in inches [millimeters]

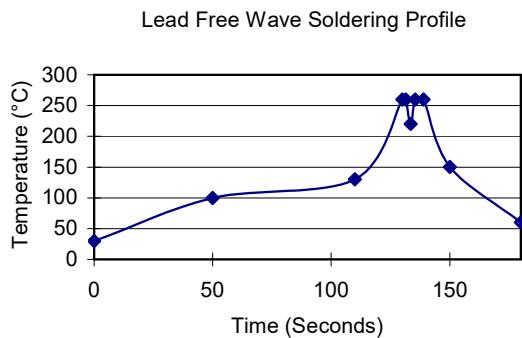


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Clean the soldered side of the module with a brush, prevent liquid from getting into the module. Do not clean by soaking the module into liquid. Do not allow solvent to come in contact with product labels or resin case as this may change the color of the resin case or cause deletion of the letters printed on the product label. After cleaning, dry the modules well.

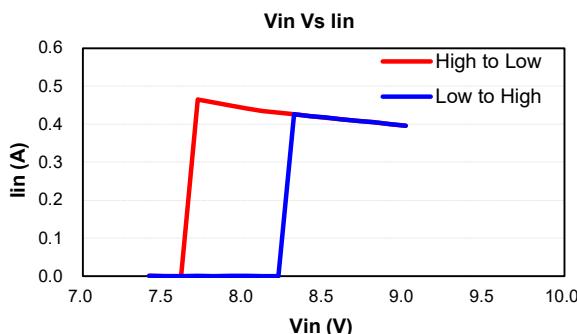
The suggested soldering iron is $420 \pm 10^\circ\text{C}$ for up to 4-10 seconds (less than 90W) used in double PCB and multilayer PCB, the other one is $385 \pm 10^\circ\text{C}$ for up to 2-6 seconds (less than 90W) used in the single PCB. Furthermore the recommended soldering profile is shown below.



6. Features and Functions

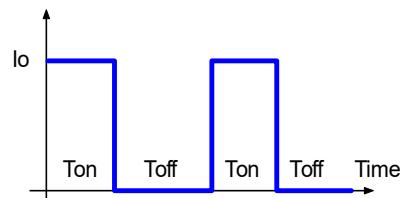
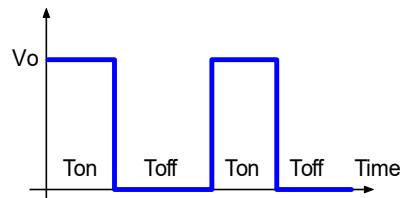
6.1 UVLO (Under Voltage Lock Out)

Input under voltage lockout is standard on the EC4SAW8 series unit. The unit will shut down when the input voltage drops below a threshold, and the unit will operate when the input voltage goes above the upper threshold.



6.2 Over Current/Short Circuit Protection

All models have internal over current and continuous short circuit protection. The unit operates normally once the fault condition is removed. At the point of current limit inception, the converter will go into hiccup mode protection.



6.3 Remote On/Off

The EC4SAW8 series allows the user to switch the module on and off with the remote **on/off** pin. The converter turns off if the remote **on/off** pin is logic high (>5.5Vdc to 15Vdc). Setting the pin logic low (0 to <1.2Vdc or open circuit) will turn on the converter. The signal level of the remote **on/off** input is defined with respect to ground. If not using the **on/off** pin, leave the pin open (module will be on).

Logic State (Pin 3)	Negative Logic
Logic Low	Module on
Logic High	Module off



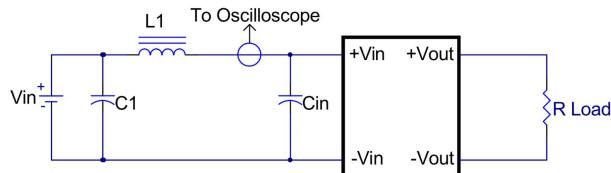
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7. Input/Output Considerations

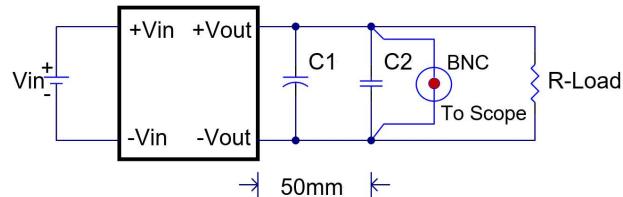
7.1 Input Capacitance at the Power Module

The converters must be connected to low AC source impedance. To avoid problems with loop stability source inductance should be low. Also, the input capacitors (C_{in}) should be placed close to the converter input pins to de-couple distribution inductance. However, the external input capacitors are chosen for suitable ripple handling capability. Low ESR capacitors are good choice. Circuit as shown as below represents typical measurement methods for reflected ripple current. C_1 and L_1 simulate a typical DC source impedance. The input reflected-ripple current is measured by current probe to oscilloscope with a simulated source inductance (L_1).



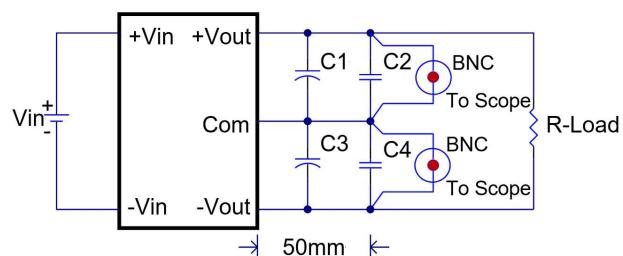
L1: 12uH
C1: None
Cin: None

7.2 Output Ripple and Noise



Note:
C1: None
C2: 1uF ceramic capacitor

EC4SAW8 Single Output Module



Note:
C1 & C3: None
C2 & C4: 1uF ceramic capacitor

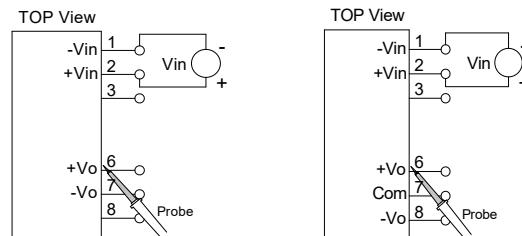
EC4SAW8 Dual Output Module

Output ripple and noise measured with 1uF ceramic capacitor across output, A 20 MHz bandwidth oscilloscope is normally used for the measurement.

The conventional ground clip on an oscilloscope probe should never be used in this kind of measurement. This clip, when placed in a field of radiated high frequency energy, acts as an antenna or inductive pickup loop, creating an extraneous voltage that is not part of the output noise of the converter.



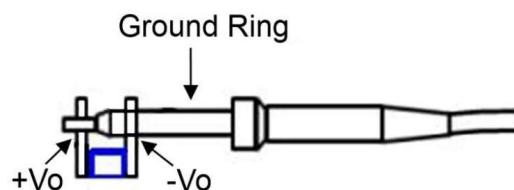
Another method is shown in below, in case of coaxial-cable/BNC is not available. The noise pickup is eliminated by pressing scope probe ground ring directly against the $-V_{out}$ terminal while the tip contacts the $+V_{out}$ terminal. This makes the shortest possible connection across the output terminals.



Single Models

Dual Models

Using Probe to Measure Output Ripple and Noise



7.3 Output Capacitance

The EC4SAW8 series converters provide unconditional stability with or without external capacitors. For good transient response, low ESR output capacitors should be located close to the point of load (<100mm). PCB design emphasizes low resistance and inductance tracks in consideration of high current applications. Output capacitors with their associated ESR values have an impact on loop stability and bandwidth. Cincon's converters are designed to work with load capacitance to see technical specifications.



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8. Thermal Design

8.1 Operating Temperature Range

The EC4SAW8 series converters can be operated within a wide case temperature range of -40°C to 105°C. Consideration must be given to the derating curves when ascertaining maximum power that can be drawn from the converter. The maximum power drawn from models is influenced by usual factors, such as:

- Input voltage range
- Output load current
- Forced air or natural convection

8.2 Convection Requirements for Cooling

To predict the approximate cooling needed for the 0.86"×0.36" module, refer to the power derating curves in **datasheet**. These derating curves are approximations of the ambient temperatures and airflows required to keep the power module temperature below its maximum rating. Once the module is assembled in the actual system, the module's temperature should be monitored to ensure it does not exceed 120°C as measured at the center of the top of the case (thus verifying proper cooling).

8.3 Thermal Considerations

The power module operates in a variety of thermal environments; however, sufficient cooling should be provided to help ensure reliable operation of the unit. Heat is removed by conduction, convection, and radiation to the surrounding environment. The example is presented in **datasheet**. The power output of the module should not be allowed to exceed rated power ($V_{o_set} \times I_{o_max}$).

8.4 Power Derating

The operating case temperature range of EC4SAW8 series is -40°C to +105°C. When operating the EC4SAW8 series, proper derating or cooling is needed. The maximum case temperature under any operating condition should not exceed 120°C (refer to **datasheet**).



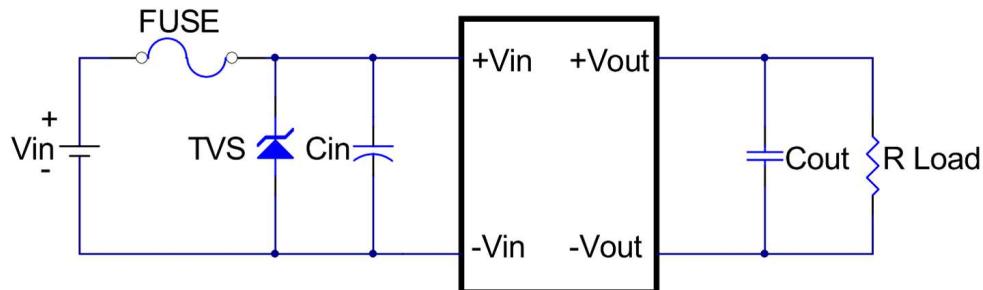
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9. Safety & EMC

9.1 Input Fusing and Safety Considerations

The EC4SAW8 series converters have no internal fuse. In order to achieve maximum safety and system protection, always use an input line fuse. We recommended a fast acting fuse 2A for all modules. It is recommended that the circuit have a transient voltage suppressor diode (TVS) across the input terminal to protect the unit against surge or spike voltage and input reverse voltage (as shown).



The external TVS & input capacitor (Cin) is required if EC4SAW8 series has to meet EN 61000-4-4 & EN 61000-4-5

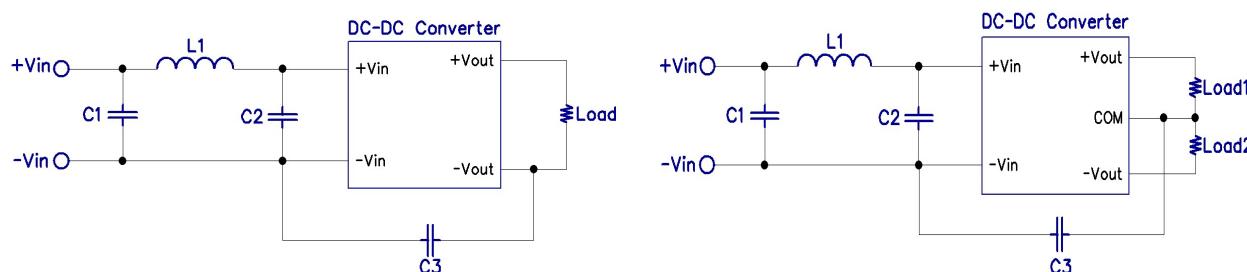
Cin: None

TVS: a SMCJ78A transient voltage suppressor is recommended

9.2 EMC Considerations

EMI Test standard: EN 55032 Conducted & Radiated Emission

Test Condition: Input Voltage: Nominal, Output Load: Full Load



EC4SAW8 Single Output Module

EC4SAW8 Dual Output Module

Model No.	EN 55032 Class A				EN 55032 Class B			
	C1	C2	C3	L1	C1	C2	C3	L1
EC4SAW8 Series	2.2uF/100V TDK	NC	NC	10uH	2.2uF/100V TDK	2.2uF/100V TDK	1000pF 4KV	47uH

Note:

C1, C2: 1210 X7R ceramic capacitor

C3: 1808 X7R ceramic capacitor

L1 P/N: HPIF0402-100M for Class A or HPIF0402-470M for Class B



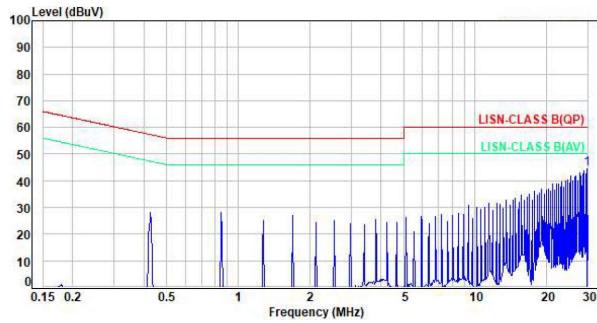
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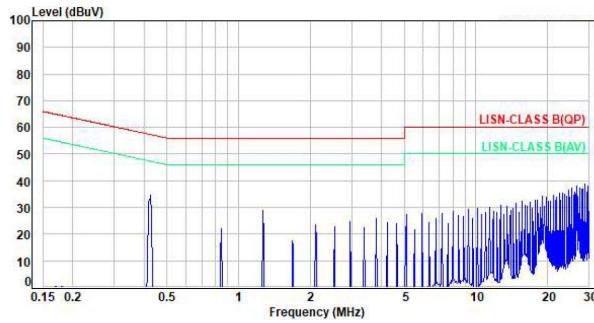
Conducted Emission Class B ($V_{in}=24V_{dc}$):

EC4SAW8-48S33N

Line

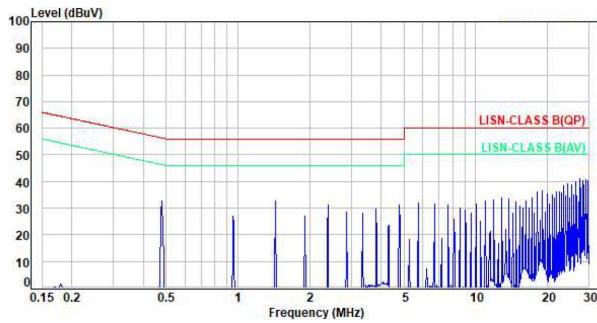


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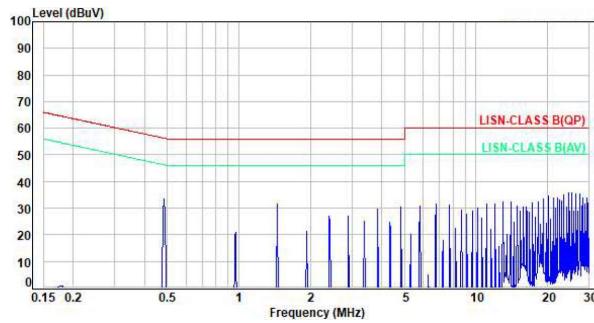


EC4SAW8-48S05N

Line

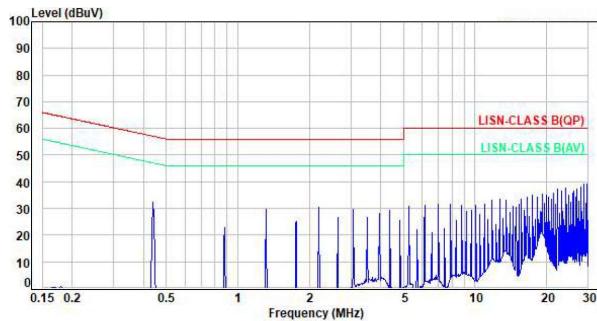


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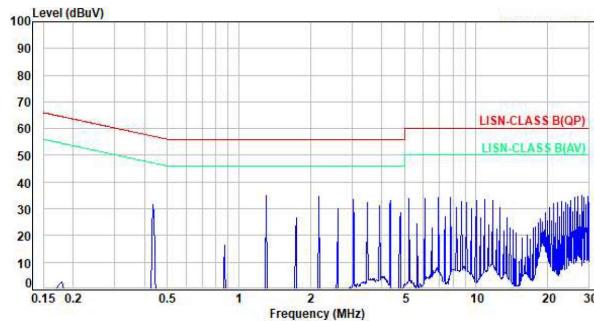


EC4SAW8-48S12N

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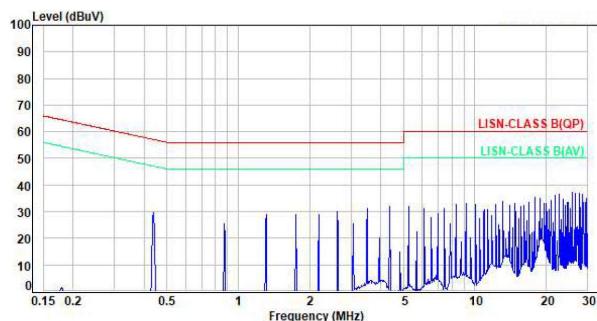


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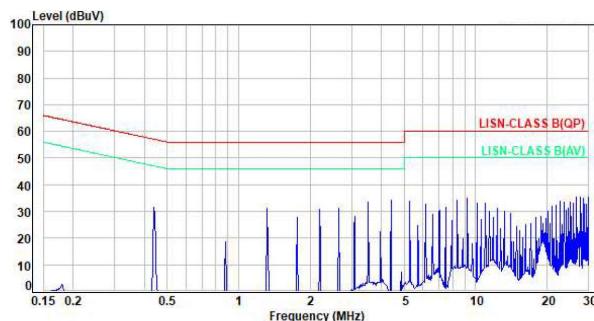


EC4SAW8-48S15N

Line



Neutral



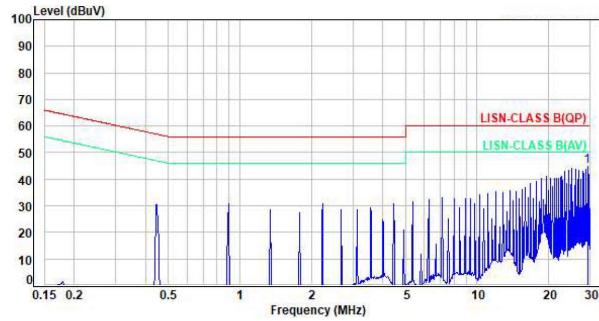


EC4SAW8 Series

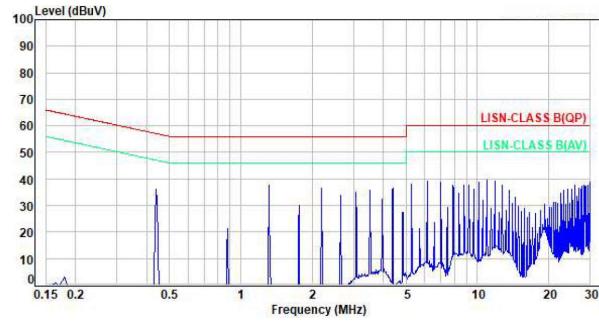
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EC4SAW8-48D05N

Line

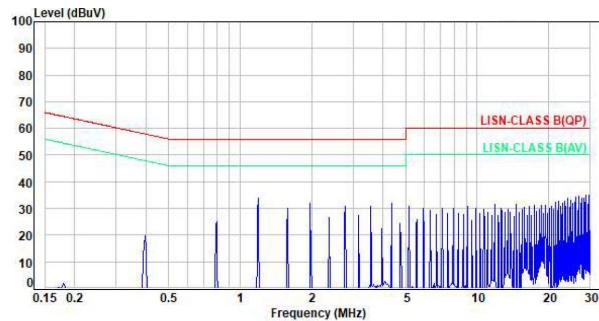


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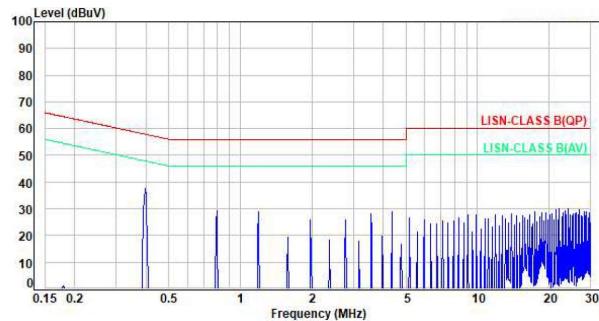


EC4SAW8-48D12N

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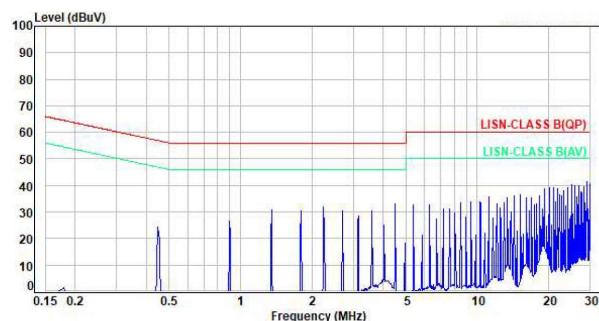


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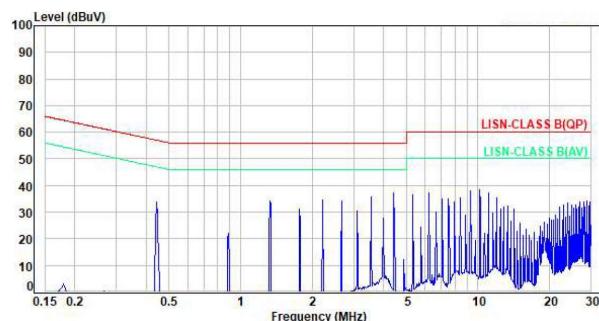


EC4SAW8-48D15N

Line



Neutral





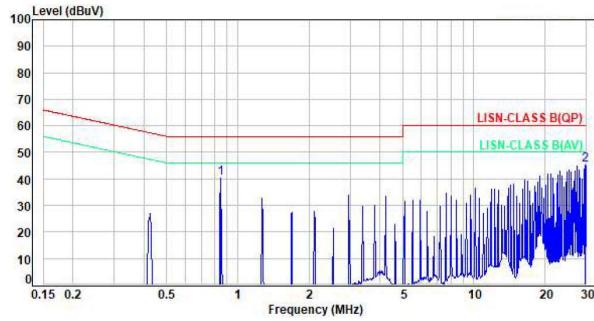
EC4SAW8 Series

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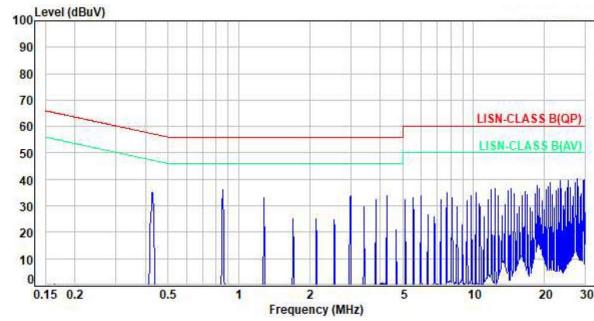
Conducted Emission Class B ($V_{in}=48V_{dc}$):

EC4SAW8-48S33N

Line

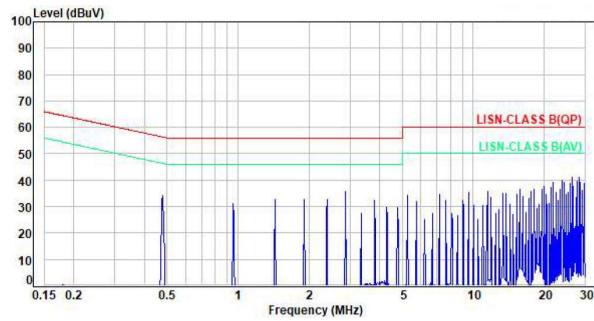


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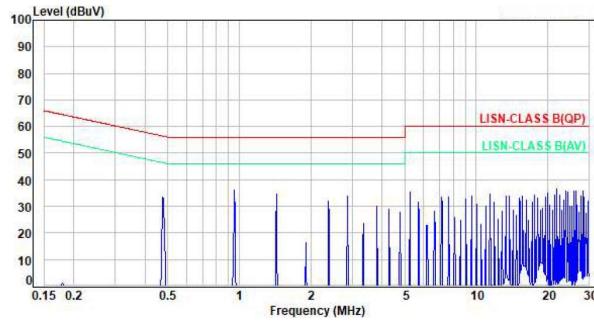


EC4SAW8-48S05N

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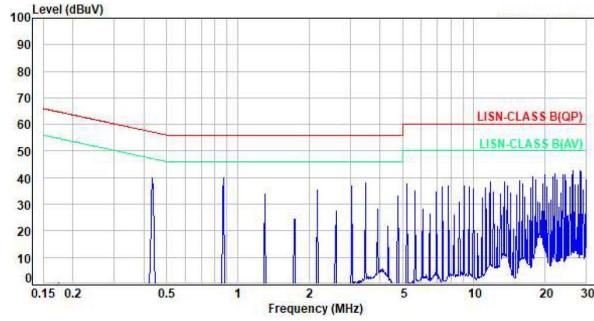


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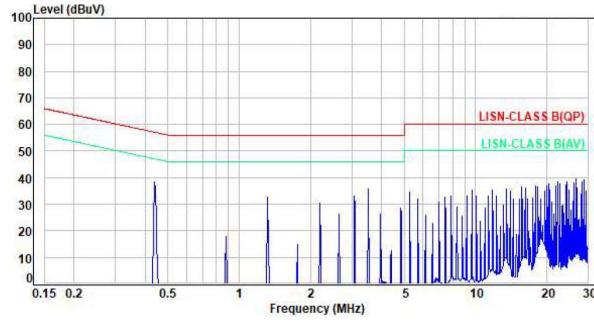


EC4SAW8-48S12N

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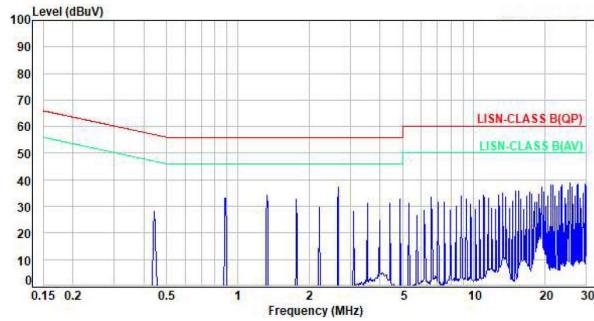


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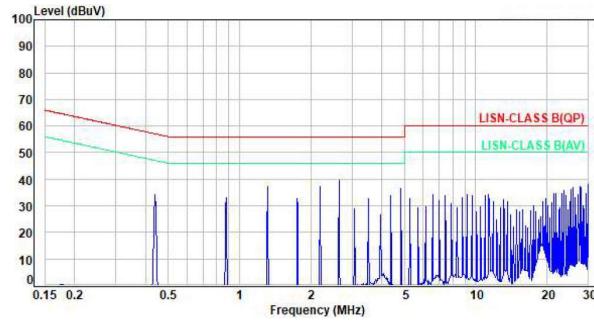


EC4SAW8-48S15N

Line



Neutral



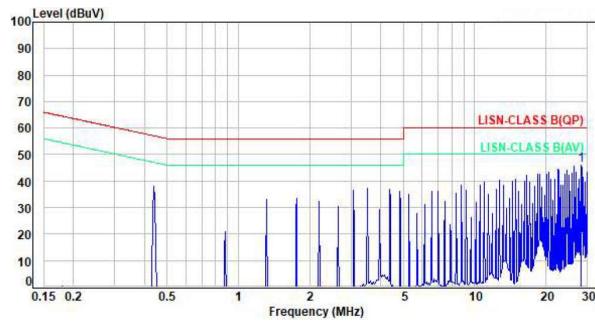


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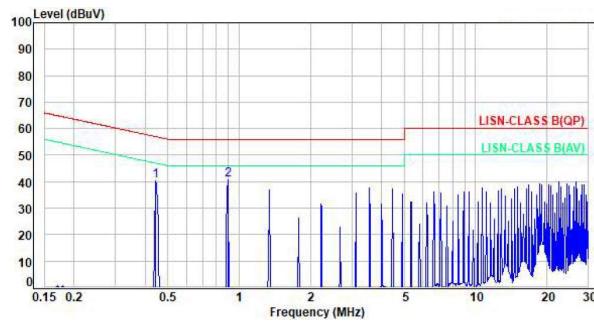
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EC4SAW8-48D05N

Line

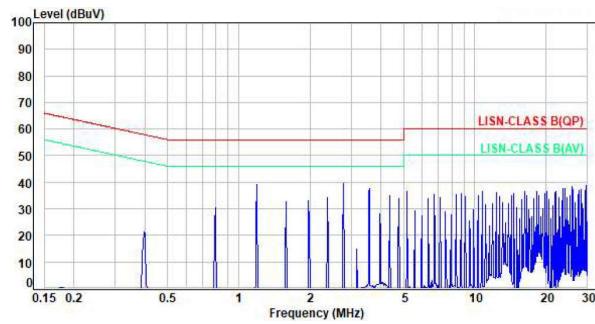


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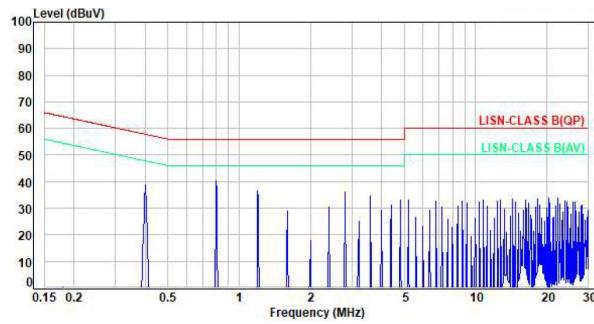


EC4SAW8-48D12N

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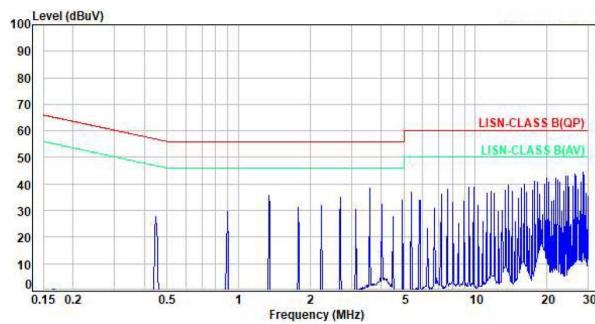


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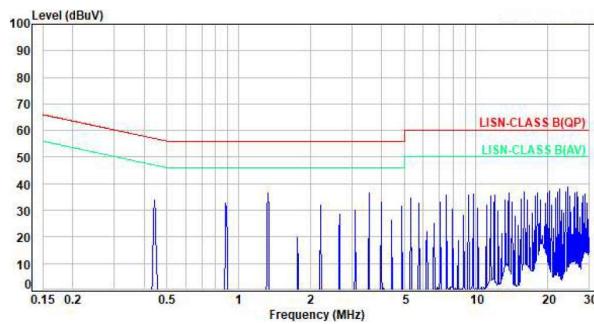


EC4SAW8-48D15N

Line



Neutral





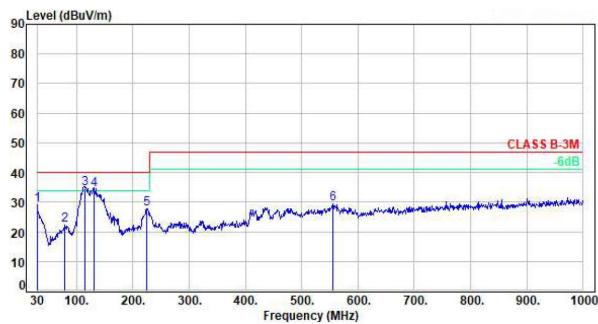
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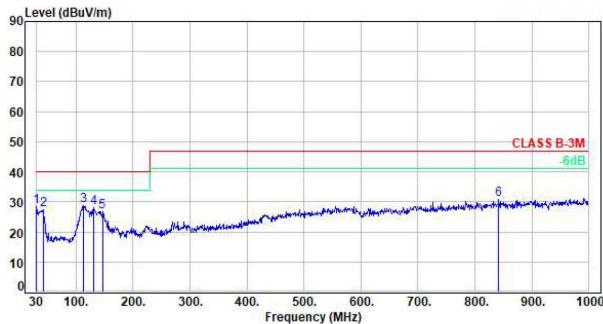
Radiation Emission Class B ($V_{in}=24V_{dc}$):

EC4SAW8-48S33N

Horizontal

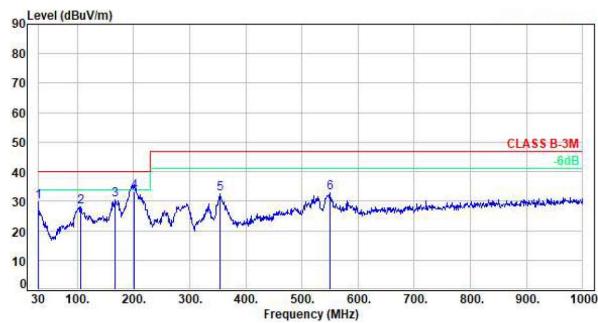


Vertical

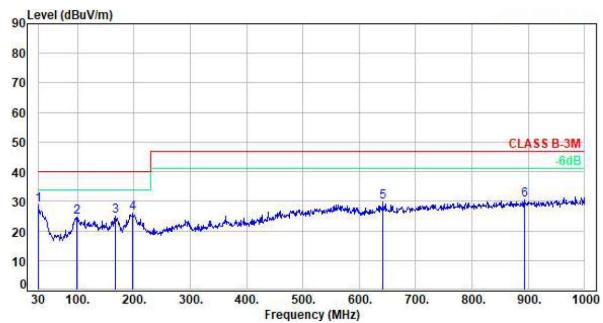


EC4SAW8-48S05N

Horizontal

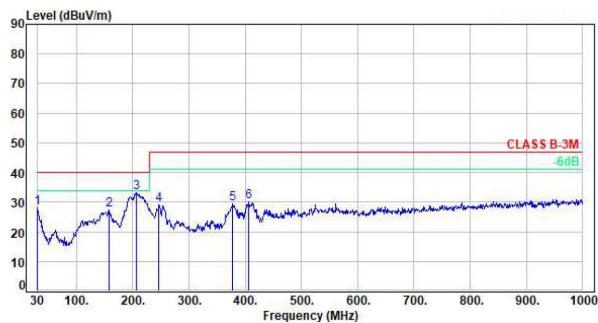


Vertical

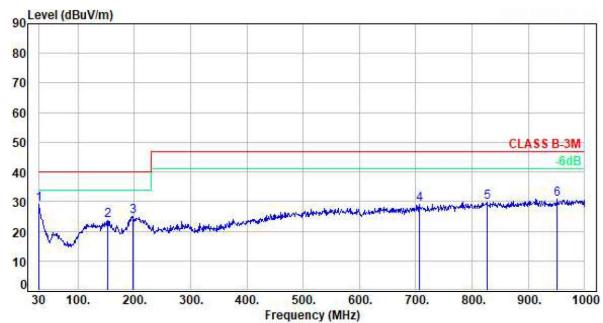


EC4SAW8-48S12N

Horizontal

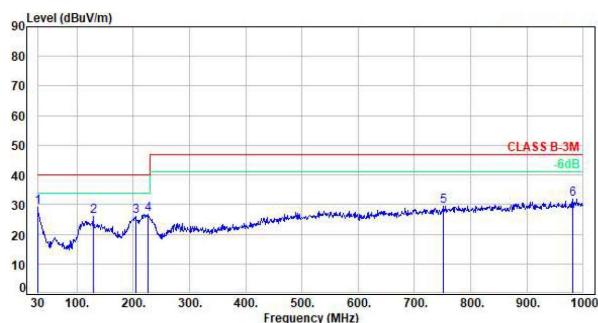


Vertical

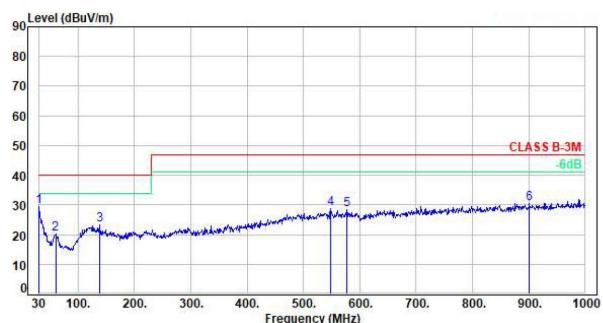


EC4SAW8-48S15N

Horizontal



Vertical



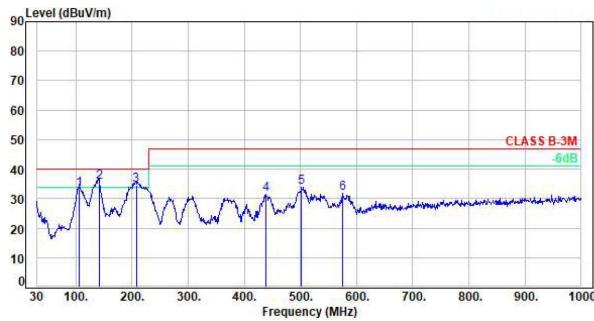


EC4SAW8 Series

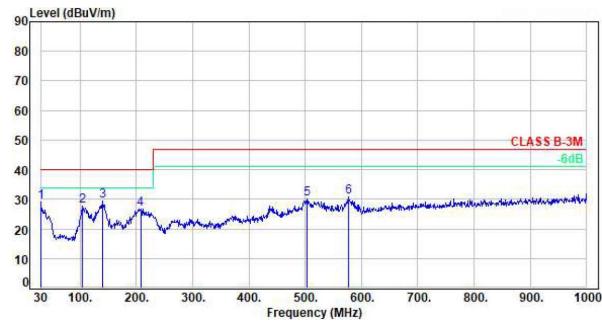
Application Note V10 August 2025

EC4SAW8-48D05N

Horizontal

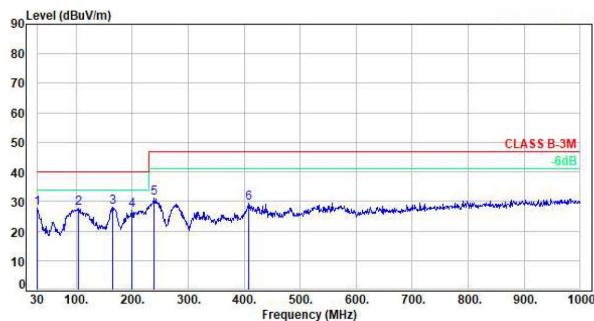


Vertical

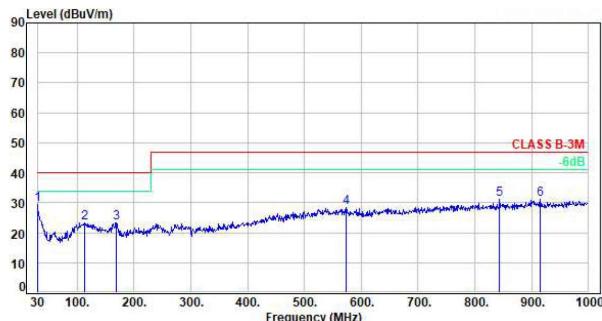


EC4SAW8-48D12N

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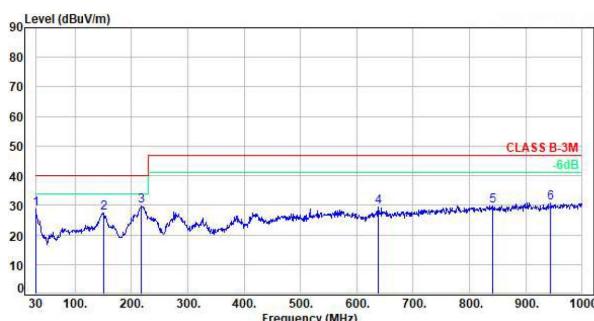


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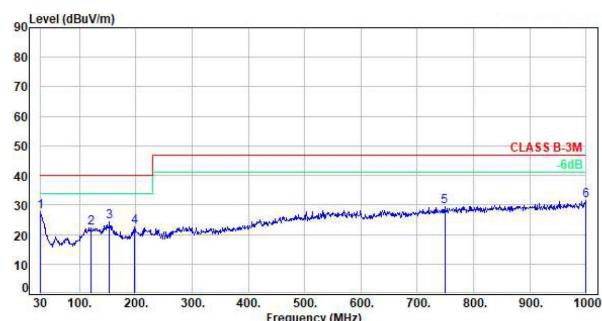


EC4SAW8-48D15N

Horizontal



Vertical





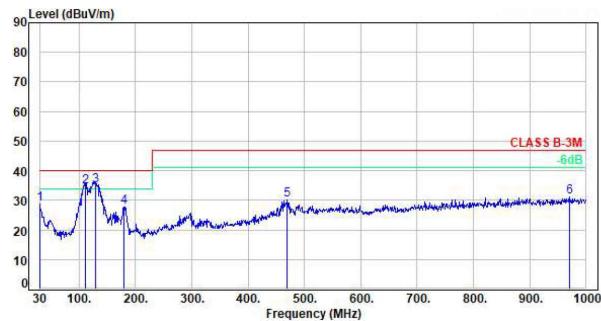
EC4SAW8 Series

Application Note V10 August 2025

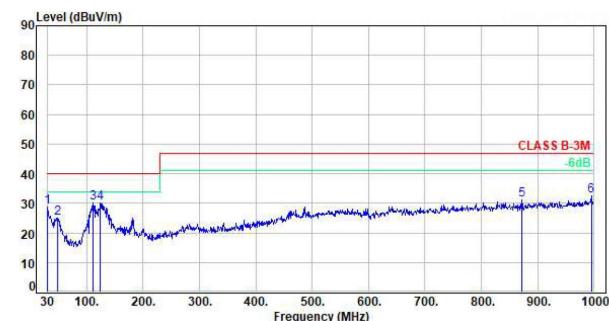
Radiation Emission Class B ($V_{in}=48V_{dc}$):

EC4SAW8-48S33N

Horizontal

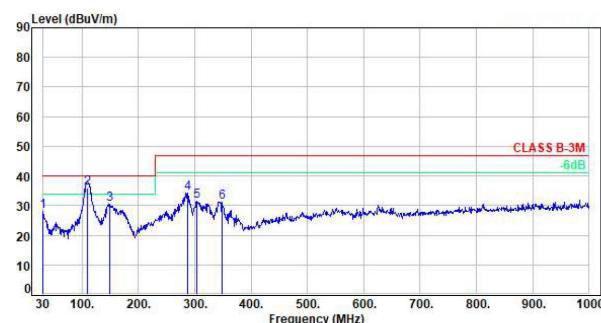


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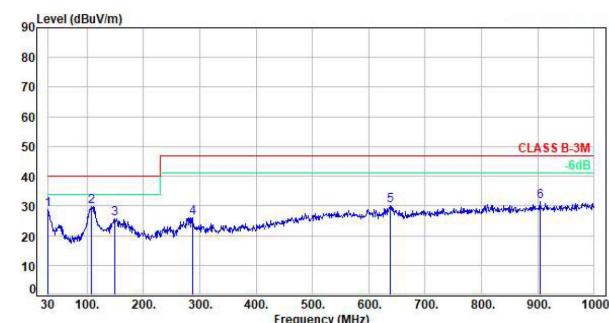


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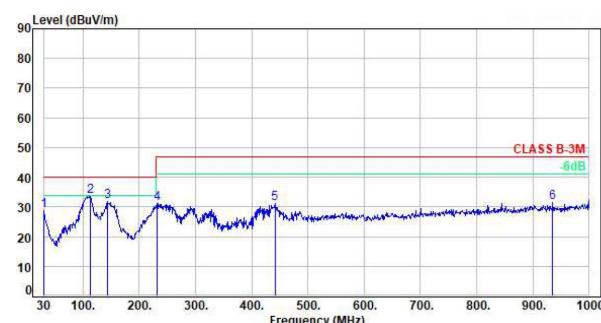


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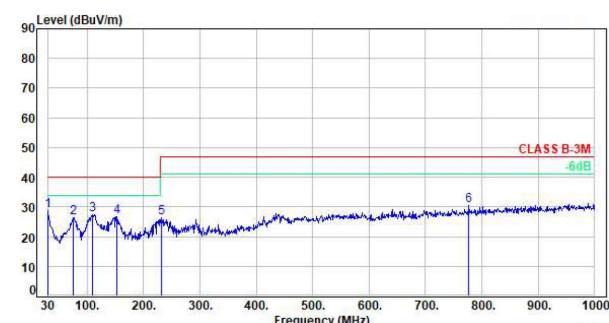


EC4SAW8-48S12N

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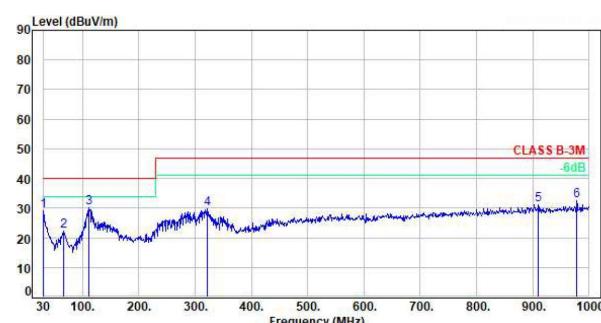


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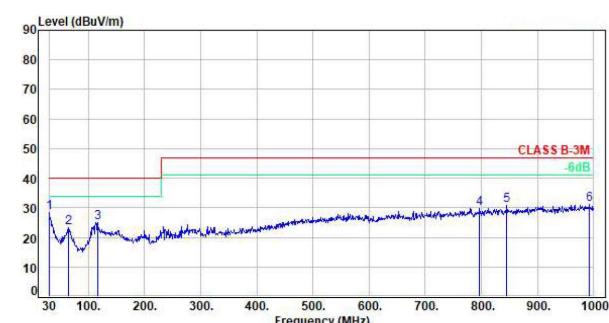


EC4SAW8-48S15N

Horizontal



Vertical



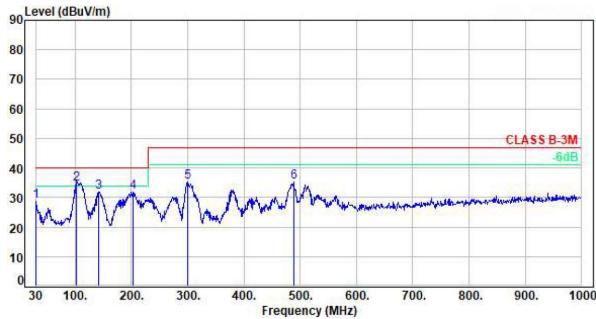


EC4SAW8 Series

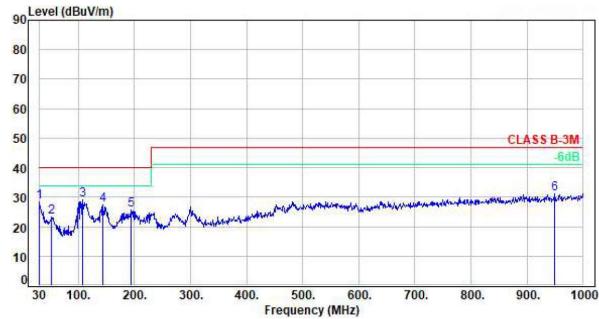
Application Note V10 August 2025

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Horizontal

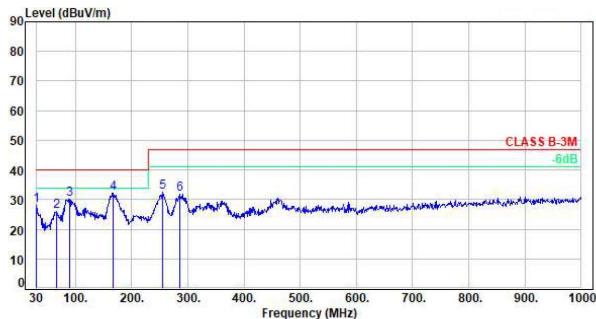


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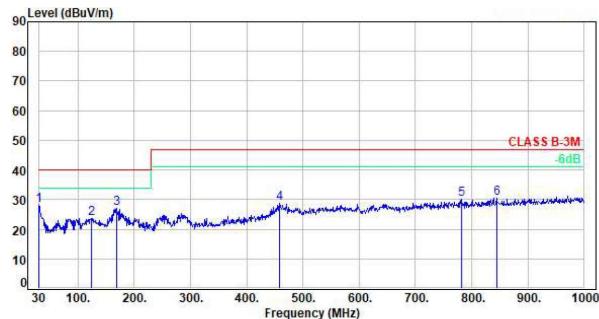


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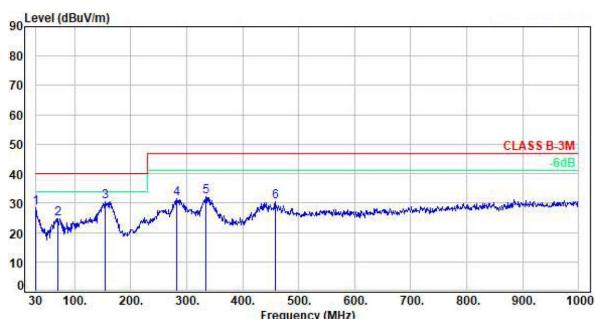


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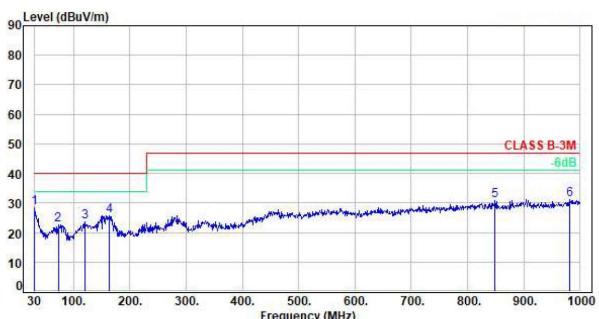


EC4SAW8-48D15N

Horizontal



Vertical



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