



# CHB300W Series Application Note V16 February 2025

## ISOLATED DC-DC CONVERTER CHB300W SERIES APPLICATION NOTE



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# CHB300W Series

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### 1. Introduction

The CHB300W series of DC-DC converters offers 300 watts of output power at single output voltages of 5, 12, 15, 24, 28, 48VDC with industry standard half brick. It has a wide (4:1) input voltage range of 9 to 36VDC (24VDC nominal), 18 to 75VDC (48VDC nominal) and 1500VDC isolation.

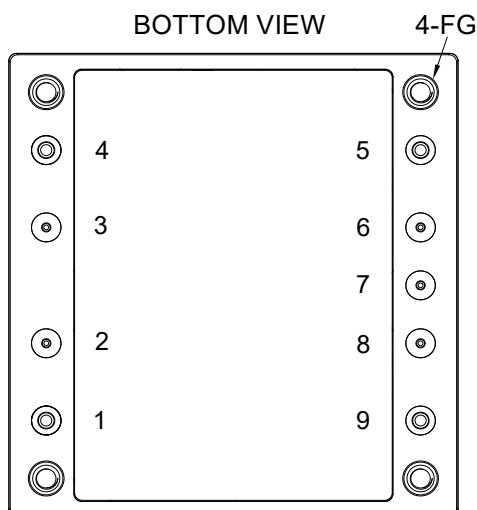
High efficiency up to 92%, allowing case operating temperature range of -40°C to 100°C. An optional heat sink is available to extend the full power range of the unit.

The standard control functions include remote **on/off** (positive or negative) and +10%, -10% adjustable output voltage.

Fully protected against input UVLO (under voltage lock out), output over-current, output over-voltage, over-temperature and continuous short circuit conditions.

CHB300W series can be used in the field of telecommunications, data communications, wireless communications, servers etc.

### 2. Pin Function Description



| No | Label  | Function        | Description                        | Reference        |
|----|--------|-----------------|------------------------------------|------------------|
| 1  | +Vin   | +V Input        | Positive Supply Input              | Section 7.1      |
| 2  | Remote | On/Off          | External Remote On/Off Control     | Section 6.5      |
| 3  | Case   | Case            | Connected to Base Plate            |                  |
| 4  | -Vin   | -V Input        | Negative Supply Input              | Section 7.1      |
| 5  | -Vo    | -V Output       | Negative Power Output              | Section 7.2/7.3  |
| 6  | -Sen   | -Sense          | Negative Output Remote Sense       | Section 6.6      |
| 7  | Trim   | Trim            | External Output Voltage Adjustment | Section 6.7      |
| 8  | +Sen   | +Sense          | Positive Output Remote Sense       | Section 6.6      |
| 9  | +Vo    | +V Output       | Positive Power Output              | Section 7.2/7.3  |
| -- | --     | Mounting Insert | Mounting Insert (FG)               | Section 9.5/10.2 |

Note: Base plate can be connected to FG through M3 threaded mounting insert. Recommended torque 3Kgf-cm.



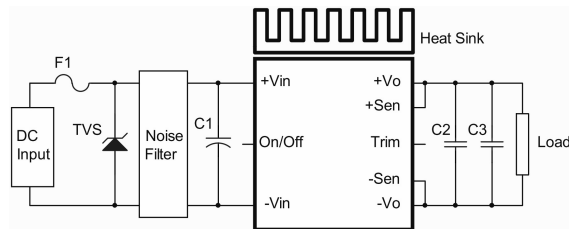
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### 3. Connection for Standard Use

The connection for standard use is shown below. An external input capacitor (C1) 1000uF for 24Vin, 470uF for 48S15 model and 220uF for other 48Vin models ESR<0.7Ω recommended to reduce input ripple voltage. External output capacitors (C2, C3) are recommended to reduce output ripple and noise, 10uF solid tantalum (for 24S05 with 330uF tantalum, 24S12 with 100uF tantalum and 48Vout with 10uF aluminum) and 1uF ceramic capacitors across the output.

The output terminal of models required a minimum capacitor to maintain specified regulation.



| Symbol        | Component                             | Reference               |
|---------------|---------------------------------------|-------------------------|
| F1, TVS       | Input fuse, TVS                       | Section 10.1            |
| C1            | External capacitor on input side      | Note Section 7.1        |
| C2, C3        | External capacitor on the output side | Section 7.2/7.3         |
| Noise Filter  | External input noise filter           | Section 10.2            |
| Remote On/Off | External remote on/off control        | Section 6.5             |
| Trim          | External output voltage adjustment    | Section 6.7             |
| Heat Sink     | External heat sink                    | Section 9.2/9.3/9.4/9.5 |
| +Sense/-Sense | --                                    | Section 6.6             |

#### Note:

If the impedance of input line is high, C1 capacitance must be more than above. Use more than three recommended capacitor above in parallel when ambient temperature becomes lower than -20°C.

### 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:

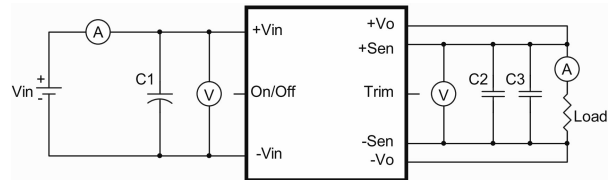
$V_{FL}$  is the output voltage at full load  
 $V_{NL}$  is the output voltage at no load

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



**CHB300W Series Test Setup**

C1: 1000uF for 24Vin, 470uF for 48S15 model and 220uF for other 48Vin models, ESR<0.7Ω

C2: 1uF/1210 ceramic capacitor

C3: 10uF solid tantalum (for 24S05 with 330uF tantalum, 24S12 with 100uF tantalum and 48Vout with 10uF Aluminum solid capacitor)

Note:

The output terminal of models required a minimum capacitor to maintain specified regulation.

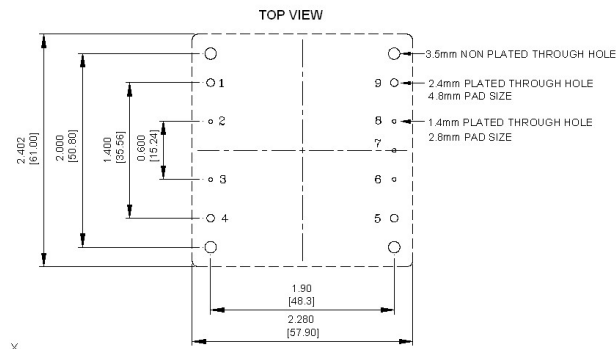


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### 5. Recommend Layout, PCB Footprint and Soldering Information

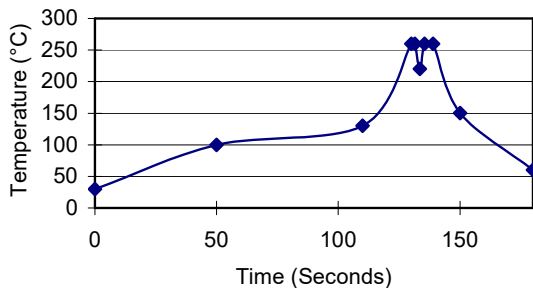
The system designer or end user must ensure that metal and other components in the vicinity of the converter meet the spacing requirements for which the system is approved. Low resistance and inductance PCB layout traces are the norm and should be used where possible. Due consideration must also be given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



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 450°C for up to 5seconds (less than 90W). Furthermore, the recommended soldering profile is shown below, and PCB layout is referring to Section 10.2.

Lead Free Wave Soldering Profile



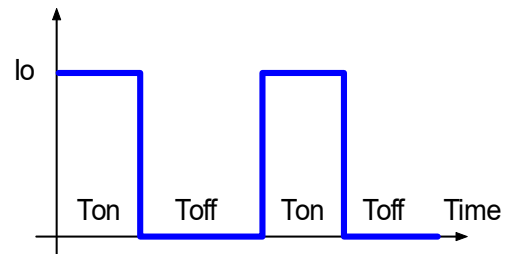
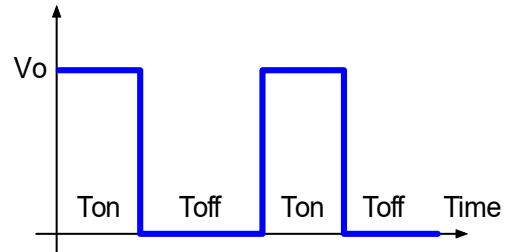
### 6. Features and Functions

#### 6.1 UVLO (Under Voltage Lock Out)

Input under voltage lockout is standard with this converter. At input voltages below the input under voltage lockout limit, the module operation is disabled.

#### 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 Output Over Voltage Protection

The converter is protected against output over voltage conditions. When the output voltage is higher than the specified range, the module enters a hiccup mode of operation. The operation is identical with over current protection.

##### Note:

Please note that device inside the power supply might fail when voltage more than rate output voltage is applied to output pin. This could happen when the customer tests the over voltage protection of unit. OVP can be tested by using the TRIM UP function. Consult us for more information.

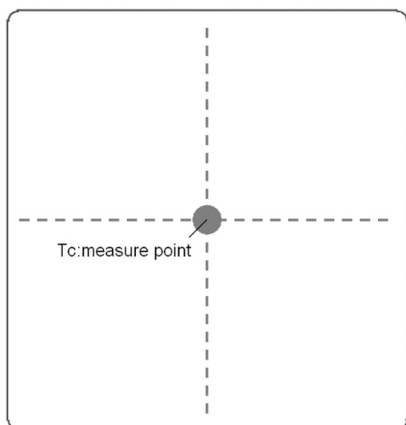


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### 6.4 Over Temperature Protection

These modules have an over temperature protection circuit to safeguard against thermal damage. Shutdown occurs with the maximum case reference temperature is exceeded. The module will restart when the case temperature falls below over temperature recovery threshold. Please measure case temperature of the center part of aluminum base plate.

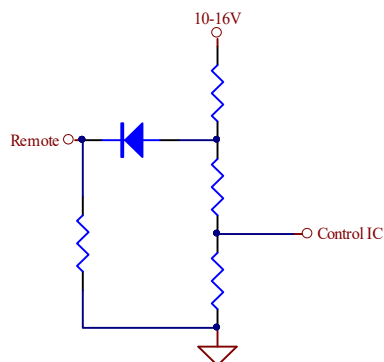


### 6.5 Remote On/Off

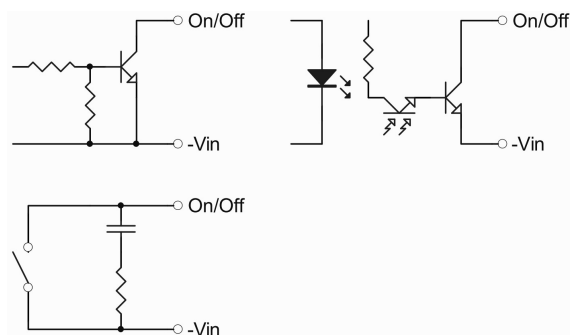
The **on/off** input pin permits the user to turn the power module on or off via a system signal. Two remote **on/off** options are available. Positive logic turns the module on during a logic high voltage on the **on/off** pin, and off during a logic low. Negative logic remote **on/off** turns the module off during a logic high and on during a logic low. The **on/off** pin is internally pulled up through a resistor. A properly de-bounced mechanical switch, open collector transistor, or FET can be used to drive the input of the **on/off** pin. If not using the remote **on/off** feature: For positive logic, leave the **on/off** pin open. For negative logic, short the **on/off** pin to  $-V_{in}$ .

| Logic State<br>(Pin 2) | Negative Logic | Positive Logic |
|------------------------|----------------|----------------|
| Logic Low              | Module on      | Module off     |
| Logic High             | Module off     | Module on      |

The converter remote **on/off** circuit built-in on input side. The ground pin of input side remote **on/off** circuit is  $-V_{in}$  pin. Inside connection sees below.



Connection examples see below



Remote On/Off Connection Example



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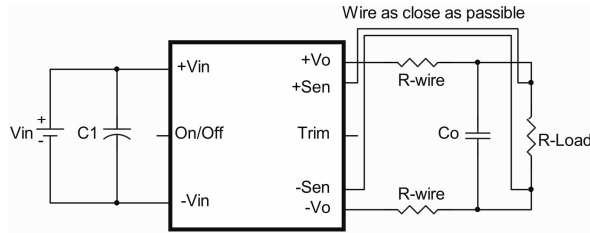
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### 6.6 Output Remote Sensing

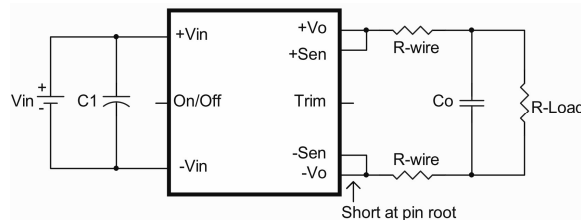
The CHB300W series converter has the capability to remotely sense both lines of its output. This feature moves the effective output voltage regulation point from the output of the unit to the point of connection of the remote sense pins. This feature automatically adjusts the real output voltage of the CHB300W series in order to compensate for voltage drops in distribution and maintain a regulated voltage at the point of load. The remote-sense voltage range is:

$$[(+V_{out}) - (-V_{out})] - [(+Sense) - (-Sense)] \leq 10\% \text{ of } V_{o\_nominal}$$

When remote sense is in use, the sense should be connected by twisted-pair wire or shield wire. If the sensing patterns short, heavy current flows and the pattern may be damaged. Output voltage might become unstable because of impedance of wiring and load condition when length of wire is exceeding 400mm. This is shown in the schematic below.



If the remote sense feature is not to be used, the sense pins should be connected locally. The **+sense** pin should be connected to the **+V<sub>out</sub>** pin at the module and the **-sense** pin should be connected to the **-V<sub>out</sub>** pin at the module. Wire between +Sense and +V<sub>out</sub> and between -Sense and -V<sub>out</sub> as short as possible. Loop wiring should be avoided. The converter might become unstable by noise coming from poor wiring. This is shown in the schematic below.



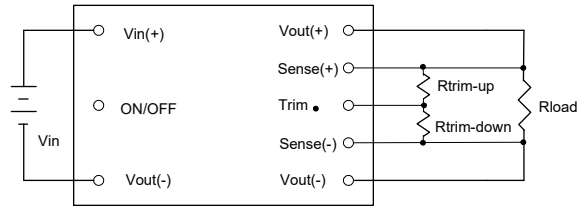
#### Note:

Although the output voltage can be varied (increased or decreased) by both remote sense and trim, the maximum variation for the output voltage is the larger of the two values not the sum of the values. The output power delivered by the module is defined as the voltage at the output terminals multiplied by the output current. Using remote sense and trim can cause the output voltage to increase and consequently increase the power output of the module if output current remains unchanged. Always ensure that the output power of the module remains at or below the maximum rated power. Also be aware that if  $V_{o\_set}$  is below nominal value,  $P_{out\_max}$  will also decrease accordingly because  $I_{o\_max}$  is an absolute limit. Thus,  $P_{out\_max} = V_{o\_set} \times I_{o\_max}$  is also an absolute limit.

### 6.7 Output Voltage Adjustment

Output may be externally trimmed (-10% to +10%) with a fixed resistor or an external trim pot as shown (optional). Model specific formulas for calculating trim resistors are available upon request as a separate document.

#### Method 1



#### Output Voltage Trim Circuit Configuration

The Trim pin should be left open if trimming is not being used. Connecting an external resistor ( $R_{trim-down}$ ) between the Trim pin and the  $V_{out}(-)$  (or Sense (-)) pin decreases the output voltage. The following equation determines the required external resistor value to obtain a down percentage output voltage change of  $\Delta\%$

$$R_{trim-down} = \left[ \frac{511}{\Delta\%} - 10.22 \right] k\Omega$$

Where

$$\Delta\% = \left( \frac{V_{o,set} - V_{desired}}{V_{o,set}} \right) \times 100$$

For example, to trim-down the output voltage of 12V module (CHB300W-48S12) by 5% to 11.4V,  $R_{trim-down}$  is calculated as follow:

$$\Delta\% = 5$$

$$R_{trim-down} = \left( \frac{511}{5} - 10.22 \right) k\Omega$$

$$R_{trim-down} = 91.98 k\Omega$$



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Connecting an external resistor ( $R_{trim-up}$ ) between the Trim pin and the  $V_{out}$  (+) (or Sense (+)) pin increases the output voltage. The following equations determine the required external resistor value to obtain a up percentage output voltage change of  $\Delta\%$ .

$$R_{trim-up} = \left[ \frac{5.11V_{out}(100 + \Delta\%)}{1.24 \times \Delta\%} - \frac{511}{\Delta\%} - 10.22 \right] k\Omega$$

Where

$$\Delta\% = \left( \frac{V_{o,set} - V_{desired}}{V_{o,set}} \right) \times 100$$

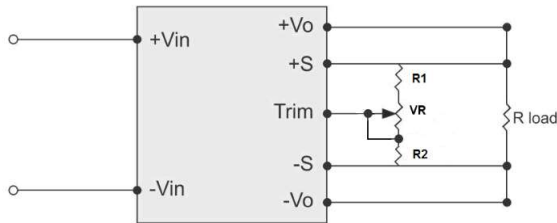
For example, to trim-up the output voltage of 12V module (CHB300W-48S12) by 5% to 12.6V,  $R_{trim-up}$  is calculated as follow:

$\Delta\% = 5$

$$R_{trim-up} = \left( \frac{5.11 \times 12 \times (100 + 5)}{1.24 \times 5} - \frac{511}{5} - 10.22 \right) k\Omega$$

$$R_{trim-up} = 926k\Omega$$

### Method 2



### Output Voltage Trim Circuit Configuration with VR

Recommend Resistor Values:

| $V_{out}$ (V) | $R1$ (K $\Omega$ ) | $R2$ (K $\Omega$ ) | $VR$ (K $\Omega$ ) |
|---------------|--------------------|--------------------|--------------------|
| 5             | 13                 | 5.6                | 10                 |
| 12            | 33                 | 4.7                | 20                 |
| 15            | 36                 | 3.9                | 20                 |
| 24            | 47.5               | 3                  | 20                 |
| 28            | 51                 | 2.7                | 20                 |
| 48            | 56                 | 1.65               | 20                 |

$$R1 + VR \geq \frac{37.089 \times R2 \times V_o - 40.88 \times R2}{40.88 - R2} (K\Omega) \dots \dots \dots (1)$$

$$R1 \leq \frac{45.331 \times R2 \times V_o - 61.32 \times R2}{61.32 + R2} (K\Omega) \dots \dots \dots (2)$$

Ex: CHB300W-48S24

IF  $R2 = 3K\Omega$

$$R1 + VR \geq \frac{37.089 \times 3 \times 24 - 40.88 \times 3}{40.88 - 3} = 67.259K\Omega$$

$$R1 \leq \frac{45.331 \times 3 \times 24 - 61.32 \times 3}{61.32 + 3} = 47.884K\Omega$$

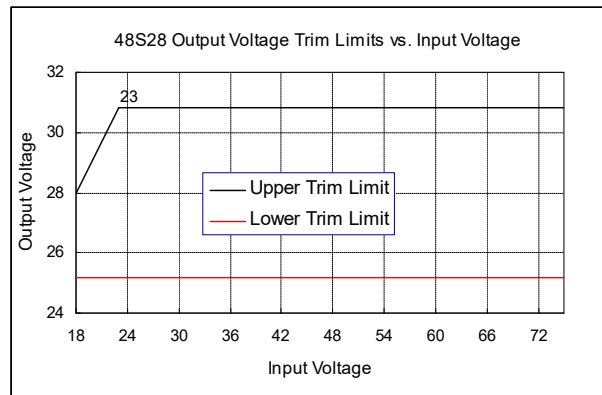
$$VR \geq 67.259 - 47.884 = 19.375K\Omega$$

$R1$  use 47.5K,  $VR$  use 20K

Note:

Although the output voltage can be increased by both the remote sense and by the trim, the maximum increase for the output voltage is not the sum of both. The maximum increase is the larger of either the remote sense or the trim. The amount of power delivered by the module is defined as the voltage at the output terminals multiplied by the output current. When using remote sense and trim, the output voltage of the module can be increased and consequently increase the power output of the module if output current remains unchanged. Care should be taken to ensure that the maximum output power of the module remains at or below the maximum rated power (Maximum rated power =  $V_{o,set} \times I_{o,max}$ ).

The output voltage on 5V&12V&15V& 24V&28V&48V model is adjustable within the range of +10% to -10%. For 48S28 model see input & output trim curves for trim up and trim down is -10%.







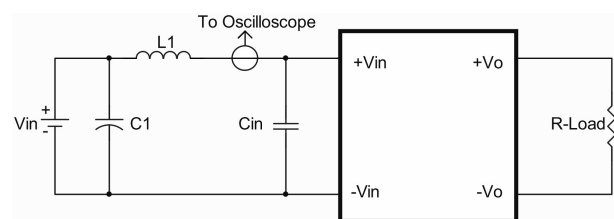
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### 7. Input/Output Considerations

#### 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 ( $L_1$ ).



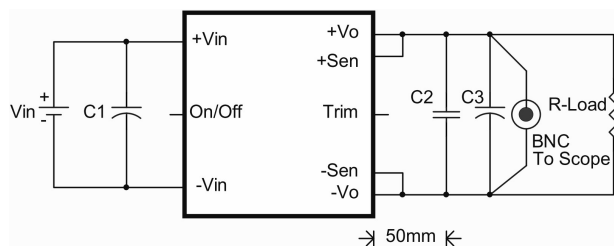
**Input Reflected-Ripple Test Setup**

$L_1$ : 12uH

$C_1$ : NC

$C_{in}$ : 1000uF for 24Vin, 470uF for 48S15 model and 220uF for other 48Vin models,  $ESR < 0.7\Omega$  @100KHz

#### 7.2 Output Ripple and Noise



$C_1$ : None

$C_2$ : 1uF/1210 ceramic capacitor

$C_3$ : 10uF solid tantalum (for 24S05 with 330uF tantalum, 24S12 with 100uF tantalum and 48Vout with 10uF Aluminum solid capacitor)

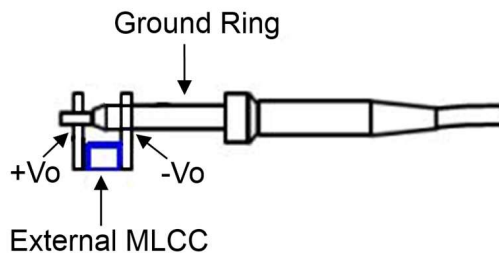
$C_{out}$ : The output terminal of models required a minimum capacitor to maintain specified regulation.

Output ripple and noise measured with 10uF solid tantalum (for 24S05 with 330uF tantalum, 24S12 with 100uF tantalum and 48Vout with 10uF Aluminum) and 1uF ceramic capacitors 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 -Vout terminal while the tip contacts the +Vout terminal. This makes the shortest possible connection across the output terminals.



#### 7.3 Output Capacitance

For good transient response, low ESR output capacitors should be located close to the point of load. 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. Must increased three or four times the minimum output capacitance when operating below  $-20^\circ\text{C}$  and the absolute maximum value of CHB300W series' output capacitance.



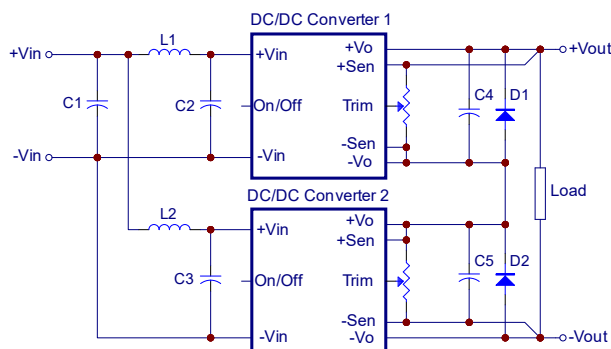
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### 8. Series and Parallel Operation

#### 8.1 Series Operation

Series operation is possible by connecting the outputs two or more units. Connection is shown in below. The output current in series connection should be lower than the lowest rate current in each power module.



**Simple Series Operation Connect Circuit**

L1, L2: 1.0uH

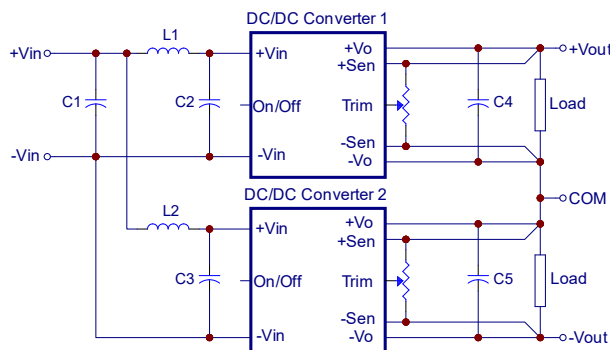
C1, C2, C3: 1000uF for 24Vin, 470uF for 48S15 model and 220uF for other 48Vin models, ESR<0.7Ω@100KHz

C4, C5: The output terminal of models required a minimum capacitor to maintain specified regulation

#### Note:

1. If the impedance of input line is high, C1, C2, C3 capacitance must be more than above. Use more than three recommended capacitor above in parallel when ambient temperature becomes lower than -20°C.
2. Recommend Schottky diode (D1, D2) be connected across the output of each series connected converter, so that if one converter shuts down for any reason, then the output stage won't be thermally overstressed. Without this external diode, the output stage of the shut-down converter could carry the load current provided by the other series converters, with its MOSFETs conducting through the body diodes. The MOSFETs could then be overstressed and fail. The external diode should be capable of handling the full load current for as long as the application is expected to run with any unit shut down.

Series for  $\pm$ output operation is possible by connecting the outputs two units, as shown in the schematic below.



**Simple  $\pm$ Output Operation Connect Circuit**

L1, L2: 1.0uH

C1, C2, C3: 1000uF for 24Vin, 470uF for 48S15 model and 220uF for other 48Vin models, ESR<0.7Ω@100KHz

C4, C5: The output terminal of models required a minimum capacitor to maintain specified regulation

#### Note:

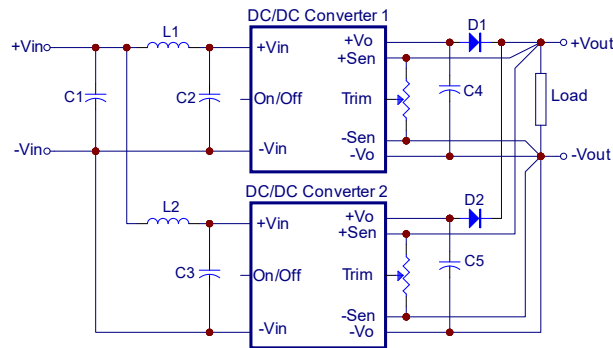
If the impedance of input line is high, C1, C2, C3 capacitance must be more than above. Use more than three recommended capacitor above in parallel when ambient temperature becomes lower than -20°C.

#### 8.2 Parallel Operation

The CHB300W series parallel operation is not possible.



Parallel for redundancy operation is possible by connecting the units as shown in the schematic below. The current of each converter become unbalance by a slight difference of the output voltage. Make sure that the output voltage of units of equal value and the output current from each power supply does not exceed the rate current. Suggest use an external potentiometer to adjust output voltage from each power supply.



### Simple Redundant Operation Connect Circuit

L1, L2: 1.0uH

C1, C2, C3: 1000uF for 24Vin, 470uF for 48S15 model and 220uF for other 48Vin models, ESR<0.7Ω@100KHz

C4, C5: The output terminal of models required a minimum capacitor to maintain specified regulation

**Note:**

If the impedance of input line is high, C1, C2, C3 capacitance must be more than above. Use more than three recommended capacitor above in parallel when ambient temperature becomes lower than -20°C.



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### 9. Thermal Design

#### 9.1 Operating Temperature Range

The CHB300W series converters can be operated within a wide case temperature range of  $-40^{\circ}\text{C}$  to  $100^{\circ}\text{C}$ . Consideration must be given to the derating curves when ascertaining maximum power that can be drawn from the converter. The maximum power drawn from open half brick models is influenced by usual factors, such as:

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

#### 9.2 Convection Requirements for Cooling

To predict the approximate cooling needed for the half brick module, refer to the power derating curves in **section 9.4**. 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  $100^{\circ}\text{C}$  as measured at the center of the top of the case (thus verifying proper cooling).

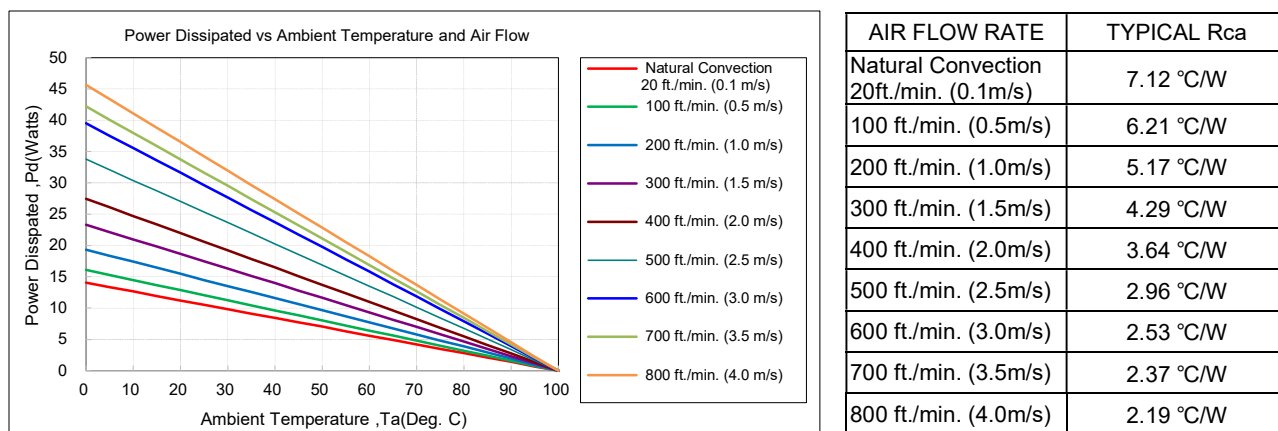
#### 9.3 Thermal Considerations

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 **section 9.4**. The power output of the module should not be allowed to exceed rated power ( $V_{o\_set} \times I_{o\_max.}$ ).

#### 9.4 Power Derating

The operating case temperature range of CHB300W series is  $-40^{\circ}\text{C}$  to  $+100^{\circ}\text{C}$ . When operating the CHB300W series, proper de-rating or cooling is needed. The maximum case temperature under any operating condition should not exceed  $100^{\circ}\text{C}$ .

The following curve is the de-rating curve of CHB300W series without heat sink.





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Example (without heatsink):

What is the minimum airflow necessary for a CHB300W-48S05 operating at nominal line voltage, an output current of 60A, and a maximum ambient temperature of 20°C?

Solution:

Given:

$$V_{in}=48Vdc, V_o=5Vdc, I_o=60A$$

Determine power dissipation (Pd):

$$P_d = P_i - P_o = P_o(1-\eta)/\eta$$

$$P_d = 5V \times 60A \times (1-0.90)/0.90 = 33.4Watts$$

Determine airflow:

$$\text{Given: } P_d=33.4W \text{ and } T_a=20^\circ C$$

Check power de-rating curve:

Minimum airflow=800 ft./min.

Verify:

Maximum temperature rise is

$$\Delta T = P_d \times R_{ca} = 33.4W \times 2.19 = 73.1^\circ C$$

Maximum case temperature is

$$T_c = T_a + \Delta T = 93.1^\circ C < 100^\circ C$$

Where:

The  $R_{ca}$  is thermal resistance from case to ambient environment

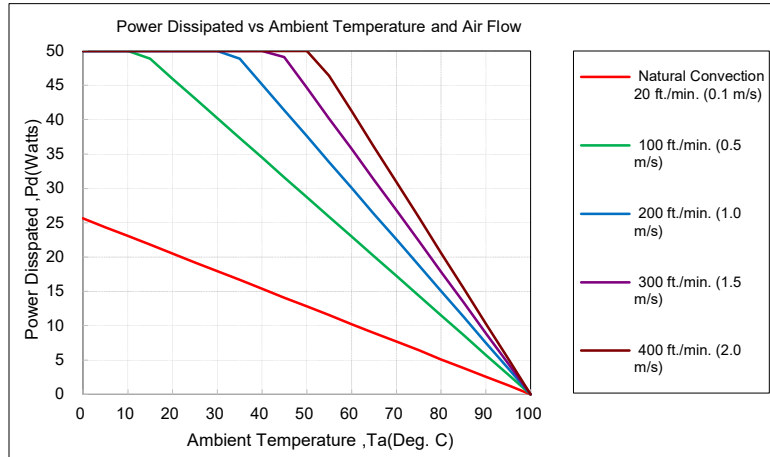
$T_a$  is ambient temperature and  $T_c$  is case temperature



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Example with heatsink HBL210 (M-C308):



| AIR FLOW RATE                             | TYPICAL $R_{ca}$ |
|---|------------------|
| Natural Convection<br>20ft./min. (0.1m/s) | 3.9 °C/W         |
| 100 ft./min. (0.5m/s)                     | 1.74 °C/W        |
| 200 ft./min. (1.0m/s)                     | 1.33 °C/W        |
| 300 ft./min. (1.5m/s)                     | 1.12 °C/W        |
| 400 ft./min. (2.0m/s)                     | 0.97 °C/W        |

What is the minimum airflow necessary for a CHB300W-48S05 operating at nominal line voltage, an output current of 60A, and a maximum ambient temperature of 40°C?

Solution:

Given:

$$V_{in}=48Vdc, V_o=5Vdc, I_o=60A$$

Determine power dissipation ( $P_d$ ):

$$P_d=P_i-P_o=P_o(1-\eta)/\eta$$

$$P_d=5V \times 60A \times (1-0.90)/0.90=33.4Watts$$

Determine airflow:

$$\text{Given: } P_d=33.4W \text{ and } T_a=40^\circ C$$

Check power de-rating curve:

Minimum airflow=100ft./min.

Verify:

Maximum temperature rise is

$$\Delta T=P_d \times R_{ca}=33.4W \times 1.74=58.1^\circ C$$

Maximum case temperature is

$$T_c=T_a+\Delta T=98.1^\circ C < 100^\circ C$$

Where:

The  $R_{ca}$  is thermal resistance from case to ambient environment

$T_a$  is ambient temperature and  $T_c$  is case temperature



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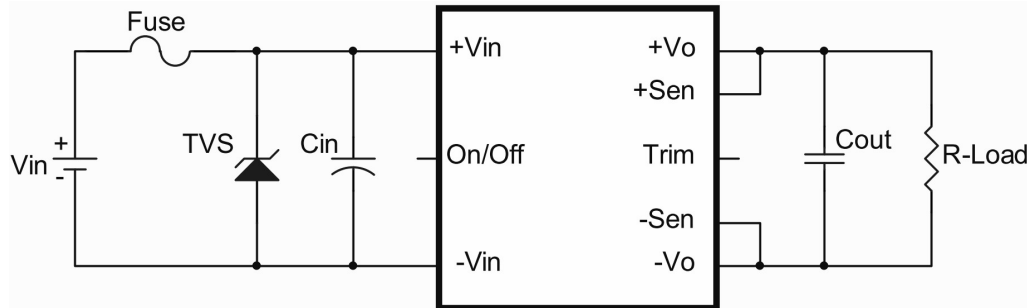
## 9.5 Half Brick Heat Sinks

Heat sinks assembly [refer to Datasheet-Thermal](#)

## 10. Safety & EMC

### 10.1 Input Fusing and Safety Considerations

The CHB300W series converters have no internal fuse. In order to achieve maximum safety and system protection, always use an input line fuse. We recommended a 50A time delay fuse for 24Vin models, and 25A for 48Vin models. 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 input capacitor (Cin) and transient voltage suppressor diode (TVS) are required if CHB300Wseries has to meet EN 61000-4-4, EN 61000-4-5.

The Cin recommended 1000uF for 24Vin, 470uF for 48S15 model and 220uF for other 48Vin models ESR<0.7Ω aluminum capacitor. And the TVS recommended SMDJ40A for 24Vin models, and SMDJ78A for 48Vin models.

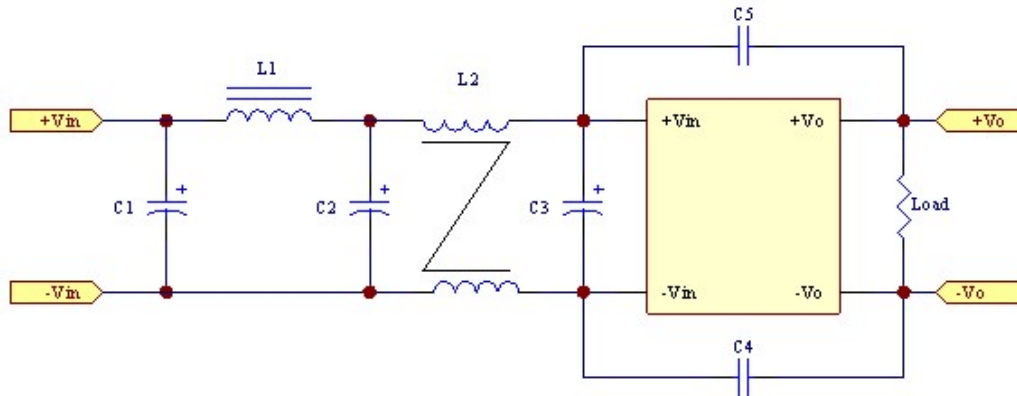
The output terminal of models required a minimum capacitor to maintain specified regulation.

### 10.2 EMC Considerations

EMI Test standard: EN 55032 Class A Conducted Emission

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

(1) EMI and conducted noise meet EN 55032 Class A:



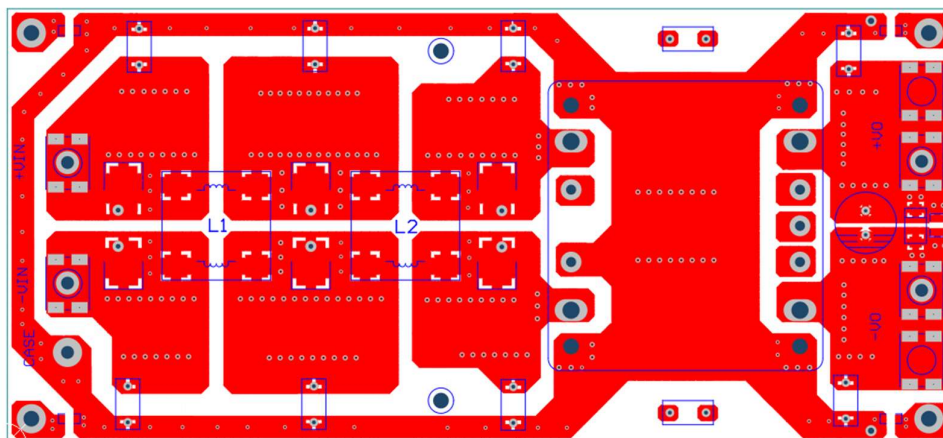
Connection Circuit For Conducted EMI Class A Testing



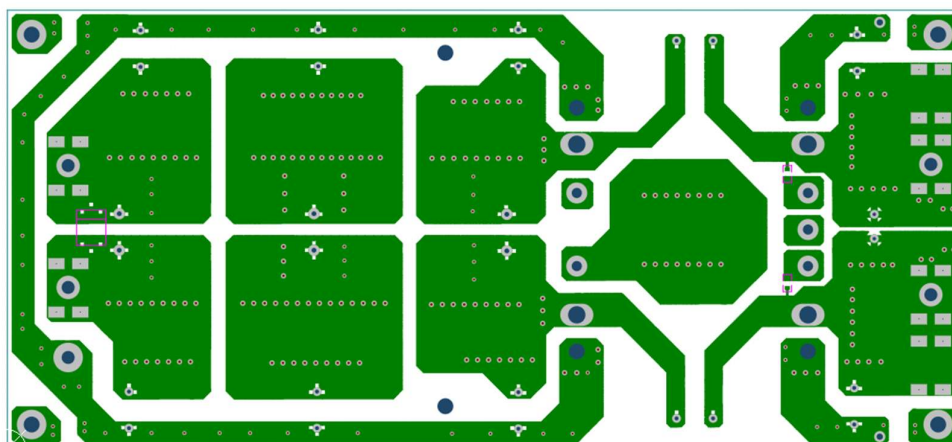


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EMI Test Board Top Side



EMI Test Board Bottom Side

| Model No.     | Class A       |               |               |            |            |       |       |
|---------------|---------------|---------------|---------------|------------|------------|-------|-------|
|               | C1            | C2            | C3            | C4         | C5         | L1    | L2    |
| CHB300W-24S12 | 100uF/50V KY  | 220uF/100V PW | 220uF/100V PW | 1000pF/3KV | NC         | 1.0uH | 0.2mH |
| CHB300W-24S24 | 220uF/100V KY | 220uF/100V KY | 220uF/100V KY | 4700pF/2KV | NC         | 1.0uH | 0.2mH |
| CHB300W-48S05 | NC            | 220uF/100V KY | 220uF/100V KY | NC         | NC         | 1.0uH | 0.2mH |
| CHB300W-48S28 | NC            | 220uF/100V KY | 220uF/100V KY | NC         | NC         | Short | 0.2mH |
| CHB300W-48S48 | NC            | 220uF/100V KY | 220uF/100V KY | 1000pF/2KV | 1000pF/2KV | 1.0uH | 0.2mH |

Note:

C1, C2, C3 is NIPPON-CHEMICON KY series or NICHICON PW series aluminum capacitor

C4, C5 is ceramic capacitors

L1: UPIA1207-1R0M 3L

L2: Core: SM CM20\*12\*10, 5turns double wire



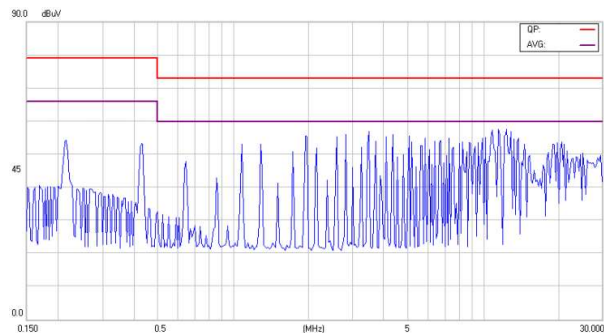


# CHB300W Series

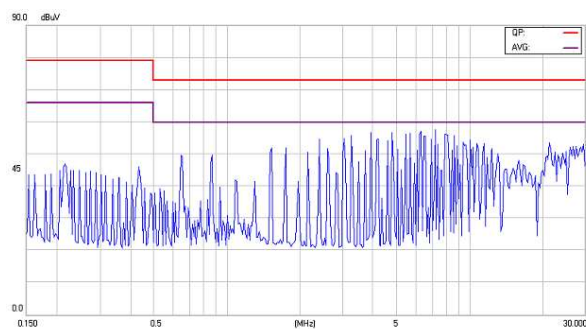
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### Conducted Emission

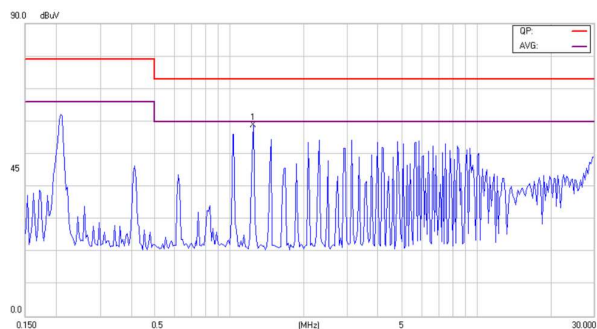
Conducted Class A of CHB300W-24S12



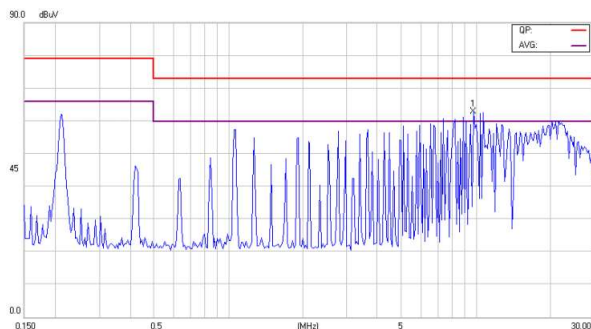
Conducted Class A of CHB300W-24S24



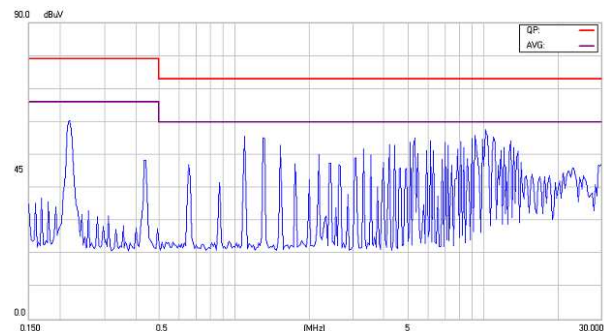
Conducted Class A of CHB300W-48S05



Conducted Class A of CHB300W-48S28



Conducted Class A of CHB300W-48S48



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