ISOLATED DC-DC CONVERTER
CHB300-300S SERIES
APPLICATION NOTE

Approved By:

Department	Approved By	Checked By	Written By
Research and Development Department	Jacky	Astray	Joe
Quality Assurance Department	Benny	JoJo	

Contents

1. Introduction

The CHB300-300S series of DC-DC converters offers 300 watts of output power @ single output voltages of 5, 12, 24, 28, 48VDC with industry standard quarter-brick. It has a wide (2:1) input voltage range of 180 to 425VDC (300VDC nominal) and 3000VAC reinforced isolation.

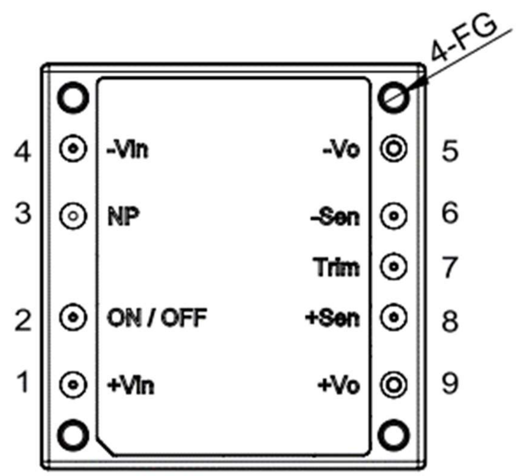
Compliant with EN55032, EN45545. High efficiency up to 90%, allowing case operating temperature range of -40°C to 100°C (except M2 Series –55°Cto 100°C). An optional heat sink is available to extend the full power range of the unit. Very low no load power consumption (10mA), an ideal solution for energy critical systems.

The standard control functions include remote on/off (positive or negative) and -20%, +10% adjustable output voltage.

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

CHB300-300S series is highly suitable for distributed power architectures, telecommunications, servers, base station, battery operated equipment, and industrial applications.

2. Pin Function Description

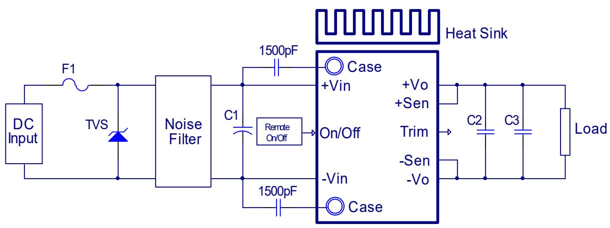


No	Label	Function	Description	Reference
1	+Vin	+V Input	Positive Supply Input	**Section 7.1**
2	ON/OFF	On/Off	External Remote On/Off Control	**Section 6.5**
3	NP			
4	-Vin	-V Input	Negative Supply Input	**Section 7.1**
5	-Vo	-V Output	Negative Power Output	**Section 7.2/7.3**
6	-Sen	-Sense	Negative Output 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 threated mounting insert. Recommended torque 3Kgf-cm.

3. Connection for Standard Use

The connection for standard use is shown below. An external input capacitor (C1) 150uF for all models is recommended to reduce input ripple voltage. External output capacitors (C2, C3) and a Y capacitor (C4) are recommended to reduce output ripple and noise, 10uF aluminum solid, 1uF ceramic capacitor for all models.



Symbol	Component	Reference
F1, TVS	Input fuse, TVS	**Section 10.1**
C1	External capacitor on input side	**Note 1 Section 7.2**
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:
An external input capacitor 150uF (Nippon Chemi-Con KXG or KXJ series) for all models are recommended to reduce input ripple voltage. If the impedance of input line is high, C1 capacitance must be more than above. Use more than two recommended capacitor above in parallel when ambient temperature becomes lower than -20℃.

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:

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

Where:

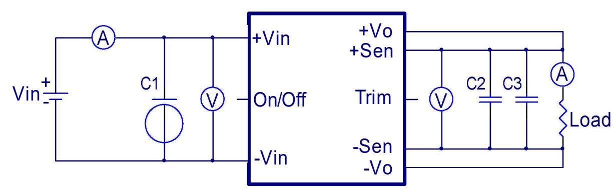
V_{FL} is the output voltage at full load
V_{NL} is the output voltage at no load

The value of line regulation is defined as:

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

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

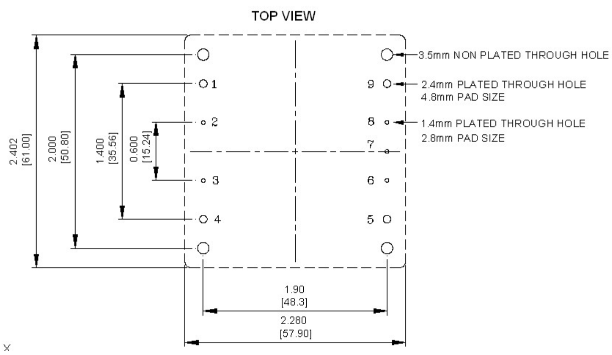


CHB300-300S Series Test Setup

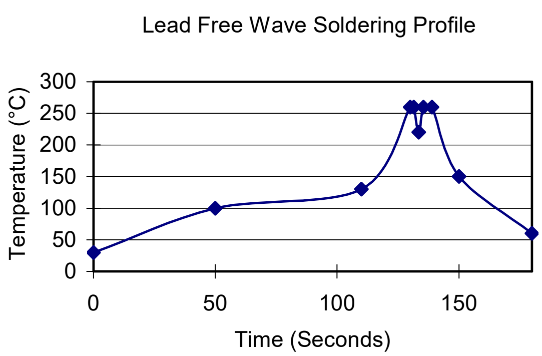
C1: 150uF/450V ESR<0.7Ω
C2: 10uF aluminum capacitor for 48Vout
47uF T521 KO CAP. <55mR for 5Vout
10uF tantalum capacitor for others.
C3: 1uF/ 1210 ceramic capacitor

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.



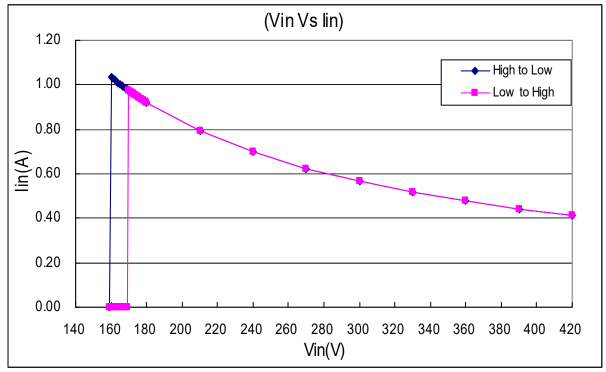
Clean the soldered side of the module with a brush, prevent liquid from getting into the module. Do not clean by soaking the module into liquid. Do not allow solvent to come in contact with product labels or resin case as this may changed the color of the resin case or cause deletion of the letters printed on the product label. After cleaning, dry the modules well.
The suggested soldering iron is 450℃ for up to 5seconds (less than 50W). Furthermore, the recommended soldering profile is shown below, and PCB layout is referring to **Section 10.2**.



6. Features and Functions

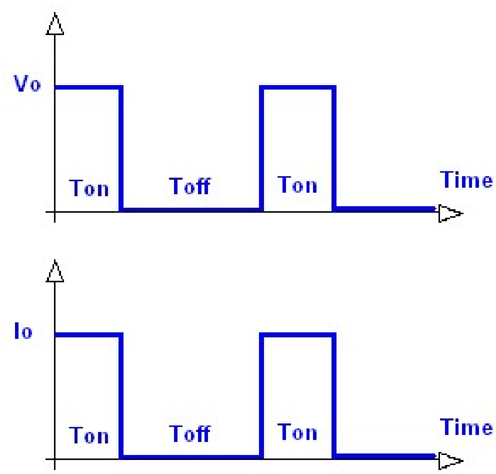
6.1 UVLO (Under Voltage Lock Out)

Input under voltage lockout is standard on the CHB300-300S 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.



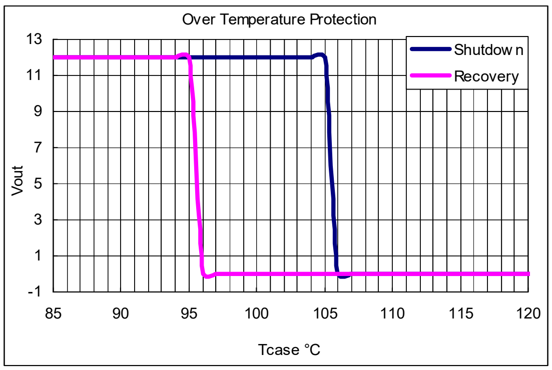
6.3 Output Over Voltage Protection

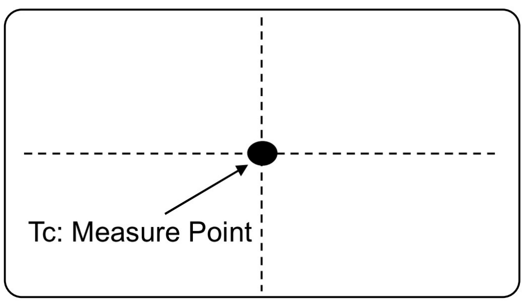
The output over voltage protection consists of circuitry that internally limits the output voltage. If more accurate output over voltage protection is required, then an external circuit can be used via the remote on/off pin.

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.

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

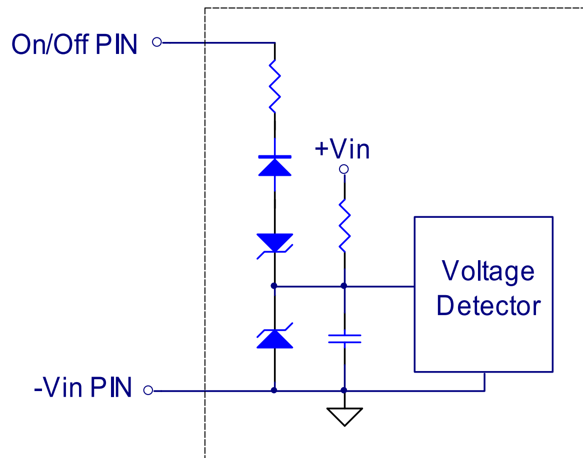
The CHB300-300S series allows the user to switch the module on and off electronically with the remote On/Off feature. All models are available in “positive logic” and “negative logic” (optional) versions. The converter turns on if the remote On/Off pin is high (>3.5Vdc to 75Vdc or open circuit). Setting the pin low (0 to<1.2Vdc, except M2 Series is 0 to<1.0Vdc) will turn the converter off. The signal level of the remote On/Off input is defined with respect to ground.

If not using the remote On/Off pin, leave the pin open (converter will be on).

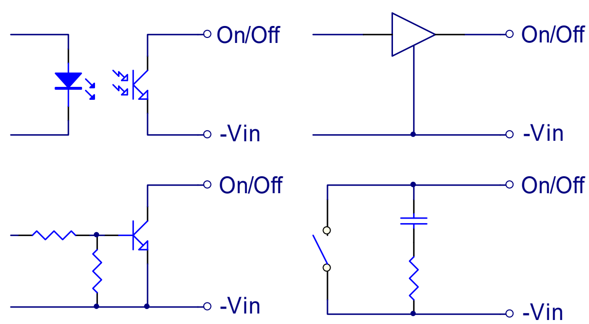
Models with part number suffix “N” are the “negative logic” remote On/Off version. The unit turns off if the remote On/Off pin is high (>3.5Vdc to 75Vdc or open circuit). The converter turns on if the On/Off pin input is low (0 to<1.2Vdc, except M2 Series is 0 to<1.0Vdc). Note that the converter is off by default.

Logic State (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 -Vin pin. Inside connection sees below.



Connection examples see below.



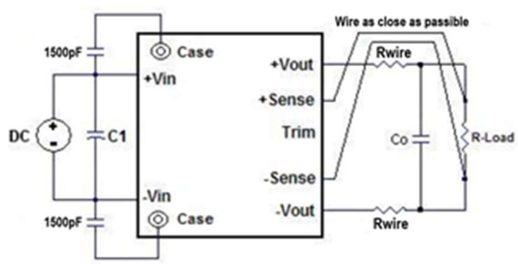
Remote On/Off Connection Example

6.6 Output Remote Sensing

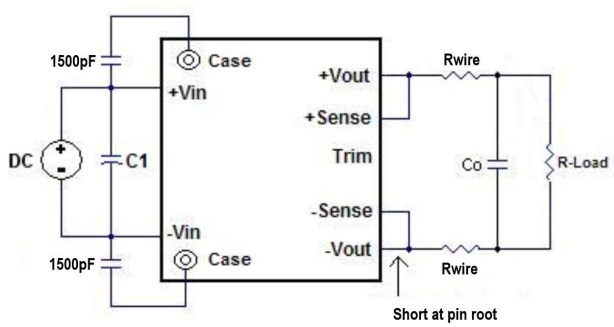
The CHB300-300S series converter has the capability to remotely sense both lines of its output. This feature moves the effective output voltage regulation point from the output of the unit to the point of connection of the remote sense pins. This feature automatically adjusts the real output voltage of the CHB300-300S 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:

$[(+V_{out}) - (-V_{out})] - [(+Sense) - (-Sense)] \leqq 10\%$ 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, heave 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 +Vout pin at the module and the -Sense pin should be connected to the -Vout pin at the module. Wire between +Sense and +Vout and between -Sense and -Vout 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.

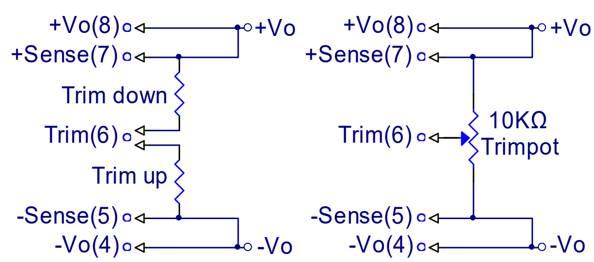


Note:

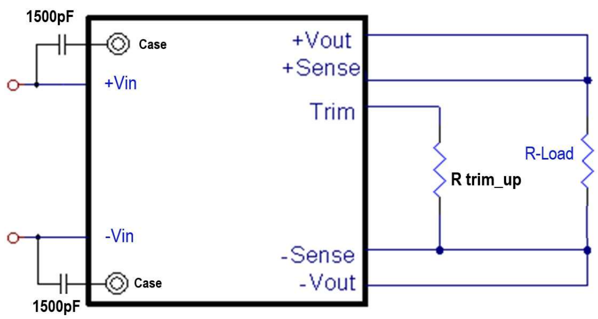
Although the output voltage can be varied (increased or decreased) by both remote sense and trim, the maximum variation for the output voltage is the larger of the two values not the sum of the values. The output power delivered by the module is defined as the voltage at the output terminals multiplied 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

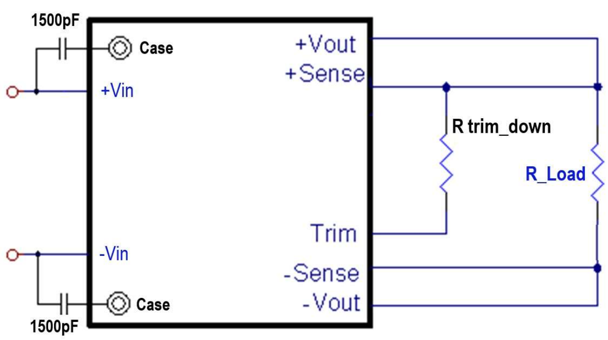
Output may be externally trimmed (-20% to +10%) with a fixed resistor or an external trim pot as shown (optional). Model specific formulas for calculating trim resistors are available upon request as a separate document.



In order to trim the voltage up or down, one needs to connect the trim resistor either between the trim pin and -Sense for trim-up or between trim pin and +Sense for trim-down. The output voltage trim range is -20% to +10%. This is shown:



Trim-up Voltage Setup



Trim-down Voltage Setup

The value of R_{trim_up} defined as:

For Vo=5V Rtrim_up decision:

$$R_{trim\_up} = \frac{R_1 V_r}{V_o - V_{o\_nom}} - R_2 \ (K\Omega)$$

For others Rtrim_up decision:

$$R_{trim\_up} = \left(\frac{R_1\left(V_r - V_f\left(\frac{R_2}{R_2+R_3}\right)\right)}{V_o - V_{o\_nom}}\right) - \frac{R_2 R_3}{R_2+R_3} \ (K\Omega)$$

Where:

R_{trim_up} is the external resistor in KΩ.

$V_{o,\ nom}$ is the nominal output voltage.

V_o is the desired output voltage.

R1, R2, R3, Vf and Vr are internal to the unit and are defined in Table 1.

Table 1 – Trim up and Trim down Resistor Values

V_{out} (V)	R1 (KΩ)	R2 (KΩ)	R3 (KΩ)	V_r (V)	V_f (V)
5V	2.32	1.8	0	2.5	0
12V	9.1	24	5.1	2.5	0.5
24V	20	68	7.5	2.5	0.5
28V	23.7	82	6.2	2.5	0.5
48V	36	82	5.1	2.5	0.5

For example, to trim-up the output voltage of 12V module (CHB300-300S05) by 5% to 5.25V, R_{trim_up} is calculated as follows:

$V_o - V_{o\_nom} = 5.25 - 5 = 0.25V$
R1 = 2.32KΩ, R2 = 1.8 KΩ, R3 = 0KΩ,
V_r= 2.5 V, V_f=0.5 V

$$R_{trim\_up} = \frac{2.32 \times 2.5}{5.25 - 5} - 1.8 = 21.40\,(K\Omega)$$

The typical value of R_{trim_up}

Trim up %	5V	12V	24V	28V	48V
	R_{trim_up} (KΩ)				
1%	114.2	154.1	164.1	167.1	147.4
2%	56.20	74.95	78.65	80.73	71.30
3%	36.87	48.56	50.18	51.93	45.93
4%	27.20	35.37	35.95	37.52	33.25
5%	21.40	27.46	27.41	28.88	25.64
6%	17.53	22.18	21.71	23.12	20.56
7%	14.77	18.41	17.65	19.01	16.94
8%	12.70	15.58	14.60	15.92	14.22
9%	11.09	13.38	12.22	13.52	12.11
10%	9.800	11.63	10.33	11.60	10.42

The value of R_{trim_down} defined as:

$$R_{trim\_down} = \frac{R_1 \times (V_o - V_r)}{V_{o\_nom} - V_o} - R_2 \ (K\Omega)$$

Where:

R_{trim_down} is the external resistor in KΩ.

$V_{o,\ nom}$ is the nominal output voltage.

V_o is the desired output voltage.

R1, R2, R3 and Vr are internal to the unit and are defined in Table 1.

For example: to trim-down the output voltage of 12V module (CHB300-300S12) by 5% to 11.4V, R_{trim_down} is calculated as follows:

$V_{o\_nom} - V_o = 12 - 11.4 = 0.6$ V
R1 = 9.1 KΩ, R2 = 24 KΩ, V_r = 2.5 V

$$R_{trim\_down} = \frac{9.1 \times (11.4 - 2.5)}{0.6} - 24 = 111.0 \ (K\Omega)$$

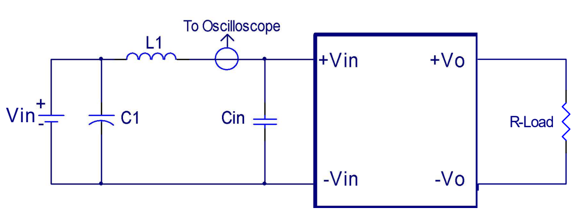
The typical value of R_{trim_down}

Trim down %	5V	12V	24V	28V	48V
	R_{trim_down} (KΩ)				
1%	111.9	687.3	1704	2067	3295
2%	53.88	327.1	807.8	987.5	1588
3%	34.55	207.0	509.2	627.8	1020
4%	24.88	147.0	359.9	447.9	735.1
5%	19.08	111.0	270.3	340.0	564.5
6%	15.21	86.97	210.6	268.0	450.8
7%	12.45	69.82	168.0	216.6	369.5
8%	10.38	56.95	136.0	178.1	308.6
9%	8.77	46.95	111.1	148.1	261.2
10%	7.480	38.94	91.17	124.1	223.3
11%	6.425	32.39	74.88	104.5	192.2
12%	5.547	26.93	61.31	88.17	166.4
13%	4.803	22.32	49.82	74.33	144.5
14%	4.166	18.36	39.98	62.47	125.8
15%	3.613	14.93	31.44	52.19	109.5
16%	3.130	11.93	23.98	43.20	95.28
17%	2.704	9.277	17.39	35.26	82.74
18%	2.324	6.923	11.54	28.21	71.58
19%	1.985	4.817	6.298	21.90	61.61
20%	1.680	2.921	1.583	16.22	52.63

7. Input / Output Considerations

7.1 Input Capacitance at the Power Module

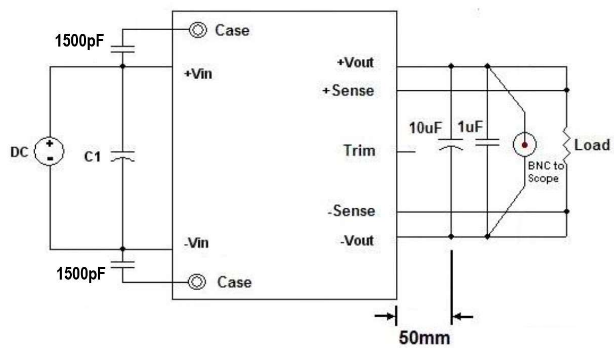
The converters must be connected to low AC source impedance. To avoid problems with loop stability source inductance should be low. Also, the input capacitors (Cin) should be placed close to the converter input pins to de-couple distribution inductance. However, the external input capacitors are chosen for suitable ripple handling capability. Low ESR capacitors are good choice. Circuit as shown as below represents typical measurement methods for reflected ripple current. C1 and L1 simulate a typical DC source impedance. The input reflected-ripple current is measured by current probe to oscilloscope with a simulated source Inductance (L1).



L1: 12uH

C1& Cin: 330uF ESR<0.7ohm @100KHz

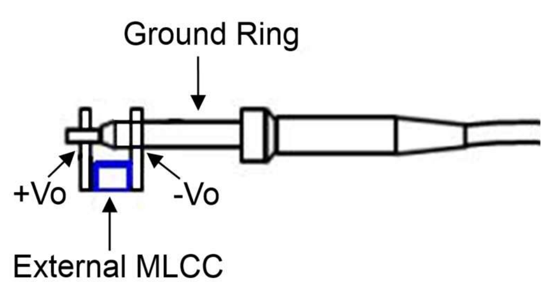
7.2 Output Ripple and Noise



Output ripple and noise measured with 47uF T521 KO CAP. <55mR and 1uF ceramic capacitor across output for 5Vout, 10uF aluminum capacitor and 1uF ceramic capacitor across output for 48Vout and with 10uF tantalum capacitor and 1uF ceramic capacitor for other models. 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.



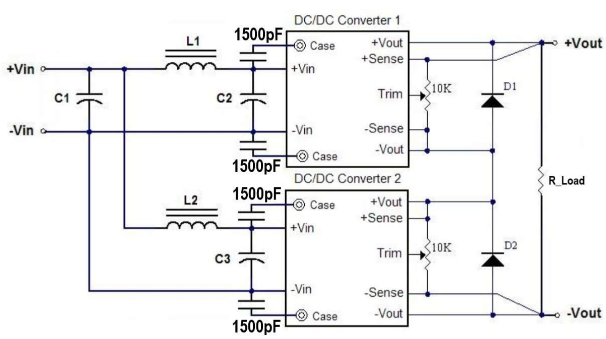
7.3 Output Capacitance

The CHB300-300S 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 specifications.

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

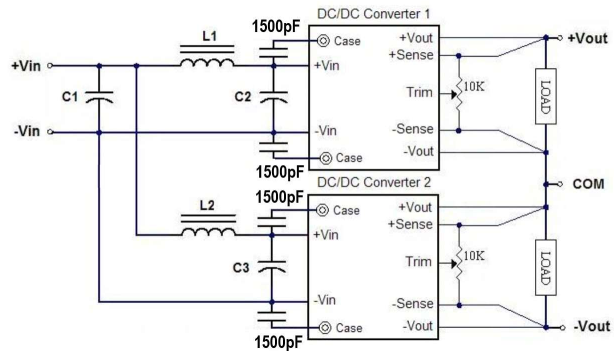
L1, L2: 1.0uH

C1, C2, C3: 150uF/450V ESR<0.7Ω

Note:

1. If the impedance of input line is high, C1, C2, C3 capacitance must be more than above. Use more than two recommended capacitor above in parallel when ambient temperature becomes lower than -20℃.
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 ±output operation is possible by connecting the outputs two units, as shown in the schematic below.



Simple ±Output Operation Connect Circuit

L1, L2: 1.0uH

C1, C2, C3: 150uF/450V ESR<0.7Ω

Note:

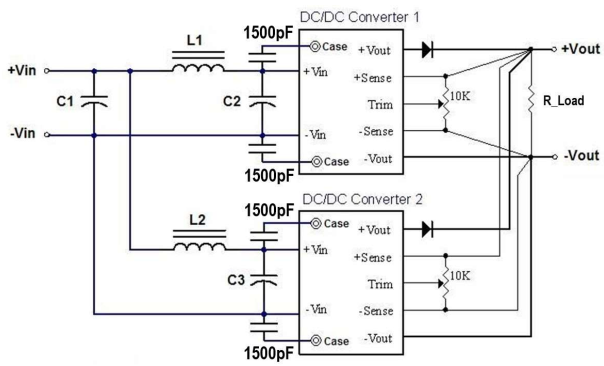
If the impedance of input line is high, C1, C2, C3 capacitance must be more than above. Use more than two recommended capacitor above in parallel when ambient temperature becomes lower than -20℃.

8.2 Parallel Operation

The CHB300-300S series parallel operation is **not** possible.

8.3 Redundant Operation

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: 150uF/450V ESR<0.7Ω

Note:

If the impedance of input line is high10., C1, C2, C3 capacitance must be more than above. Use more than two recommended capacitor above in parallel when ambient temperature becomes lower than -20℃.

9. Thermal Design

9.1 Operating Temperature Range

The CHB300-300S series converters can be operated within a wide case temperature range of -40℃ to 100℃. 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 quarter 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 quarter 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℃ as measured at the center of the top of the case (thus verifying proper cooling).

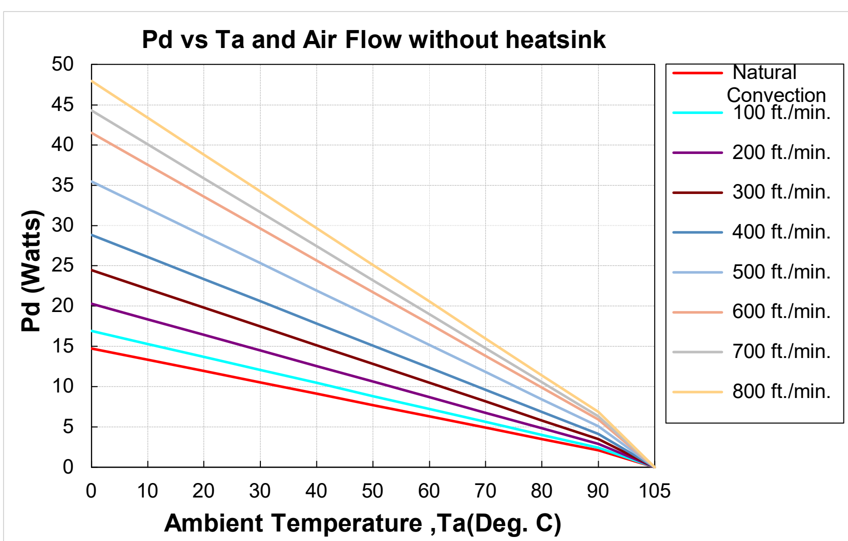
9.3 Thermal Considerations

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} x I_{o_max}).

9.4 Power Derating

The operating case temperature range of CHB300-300S series is -40℃ to +100℃. When operating the CHB300-300S series, proper derating or cooling is needed. The maximum case temperature under any operating condition should not exceed 100℃.

The following curve is the de-rating curve of CHB300-300S series without heat sink.



AIR FLOW RATE	TYPICAL R_{ca}
Natural Convection 20ft./min. (0.1m/s)	7.12 ℃/W
100 ft./min. (0.5m/s)	6.21 ℃/W
200 ft./min. (1.0m/s)	5.17 ℃/W
300 ft./min. (1.5m/s)	4.29 ℃/W
400 ft./min. (2.0m/s)	3.64 ℃/W
500 ft./min. (2.5m/s)	2.96 ℃/W
600 ft./min. (3.0m/s)	2.53 ℃/W
700 ft./min. (3.5m/s)	2.37 ℃/W
800 ft./min. (4.0m/s)	2.19 ℃/W

Example:

What is the minimum airflow necessary for a CHB300-300S48 operating at nominal line voltage, an output current of 6.25A, and a maximum ambient temperature of 25℃?

Solution:

Given: V_{in}= 300V_{dc}, Vo= 48V_{dc}, I_o= 6.25A

Determine Power dissipation (P_d): P_d= P_i-P_o= P_o(1-η)/η, P_d= 48×6.25×(1-0.9)/0.9= 33.33Watts

Determine airflow: Given: P_d= 33.33W and T_a= 25℃

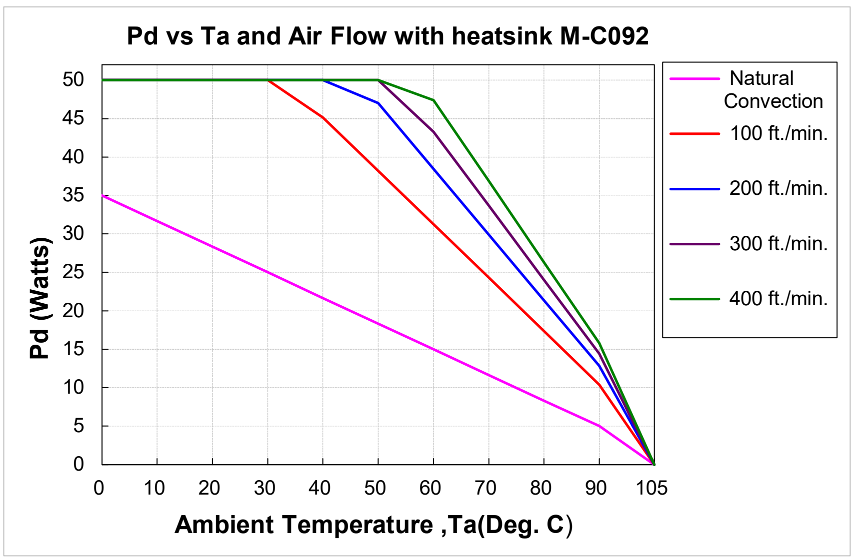
Check *Power Derating* curve: Minimum airflow= 800 ft./min.

Verify:

Maximum temperature rise is ΔT= P_d × R_{ca} = 33.33×2.19=72.99℃
Maximum case temperature is T_c = T_a +ΔT= 97.99℃<100℃

Where:

The R_{ca} is thermal resistance from case to ambient environment.
T_a is ambient temperature and T_c is case temperature.



AIR FLOW RATE	TYPICAL R_{ca}
Natural convection 20ft./min. (0.1m/s)	3.00 ℃/W
100 ft./min. (0.5m/s)	1.44 ℃/W
200 ft./min. (1.0m/s)	1.17 ℃/W
300 ft./min. (1.5m/s)	1.04 ℃/W
400 ft./min. (2.0m/s)	0.95 ℃/W

Example with heat sink HBT254 (M-C092):

What is the minimum airflow necessary for a CHB300-300S05 operating at nominal line voltage, an output current of 12.5A, and a maximum ambient temperature of 45℃?

Solution:

Given: Vin= 300Vdc, Vo= 5Vdc, Io= 60A

Determine Power dissipation (P_d): P_d= P_i-P_o= P_o(1-η)/η, P_d= 5×60×(1-0.89)/0.89= 37.08Watts

Determine airflow: Given: P_d= 37.08W and T_a = 45℃

Check above Power de-rating curve: Minimum airflow= 100 ft./min

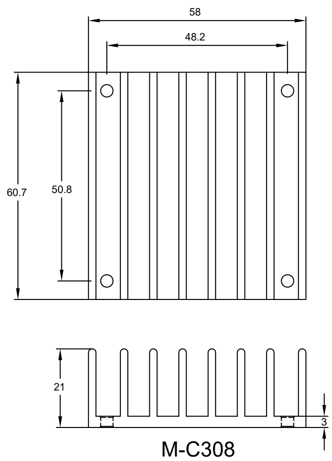
Verify:

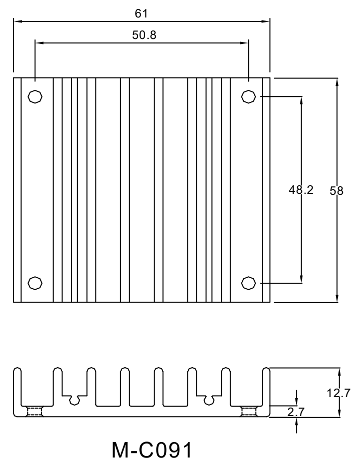
Maximum temperature rise is ΔT= P_d × R_{ca}= 37.08×1.44= 53.40℃
Maximum case temperature is T_c= T_a +ΔT= 98.40℃<100℃

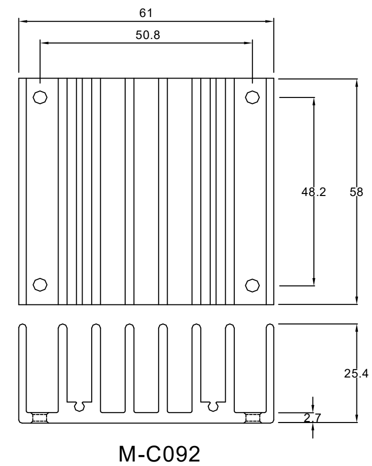
Where:

The R_{ca} is thermal resistance from case to ambient environment.
T_a is ambient temperature and T_c is case temperature.

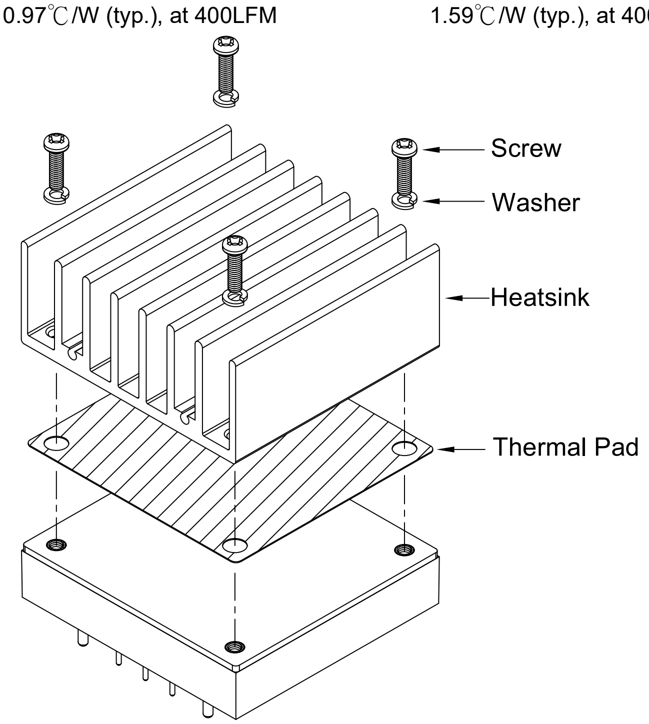
9.5 Half Brick Heat Sinks:







HBL210 (M-C308) G6620400201 Longitudinal Heat Sink	HBT127 (M-C091) G6610120402 Transverse Heat Sink	HBT254 (M-C092) G6610130402 Transverse Heat Sink
Rca:	**Rca:**	**Rca:**
3.90℃/W (typ.), natural convection	4.70℃/W (typ.), natural convection	3.00℃/W (typ.), natural convection
1.74℃/W (typ.), at 100LFM	2.89℃/W (typ.), at 100LFM	1.44℃/W (typ.), at 100LFM
1.33℃/W (typ.), at 200LFM	2.30℃/W (typ.), at 200LFM	1.17℃/W (typ.), at 200LFM
1.12℃/W (typ.), at 300LFM	1.88℃/W (typ.), at 300LFM	1.04℃/W (typ.), at 300LFM
0.97℃/W (typ.), at 400LFM	1.59℃/W (typ.), at 400LFM	0.95℃/W (typ.), at 400LFM

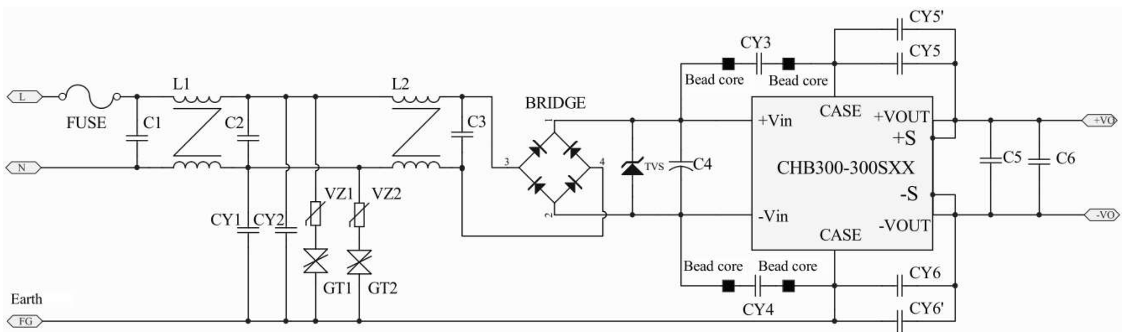


Heatsink: HBL210 (M-C308)
HBT127 (M-C091)
HBT254 (M-C092)
THERMAL PAD PH01: SZ 56.9*60*0.25 mm (G6135041091)
Screw & Washer K308W: M3*8L & WS3.2N (G75A1300322)
Recommended torque 3Kgf-cm

10. Safety & EMC

10.1 Input Fusing and Safety Considerations

The CHB300-300S series converters have no internal fuse. In order to achieve maximum safety and system protection, always use an input line fuse. We recommended a 5A time delay fuse for all 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 circuit is required if CHB300-300SXX series has to meet EN61000-4-4, EN61000-4-5.

The CHB300-300SXX recommended components are shown below.

C4: 150uF/450V aluminum capacitor (Nippon Chemi-Con KXG or KXJ series).

TVS: SMCJ440A Littelfuse

VZ1, VZ2: TVR10471KSV TKS

GT1, GT2: 2RL600L-5 BRIGHTKING

10.2 AC Input EMC Considerations

EMI Test standard: EN55022 / EN55032 Class A Conducted Emission
Test Condition: Input Voltage: Nominal, Output Load: Full Load

(1) EMI and conducted noise meet EN55032 Class A:

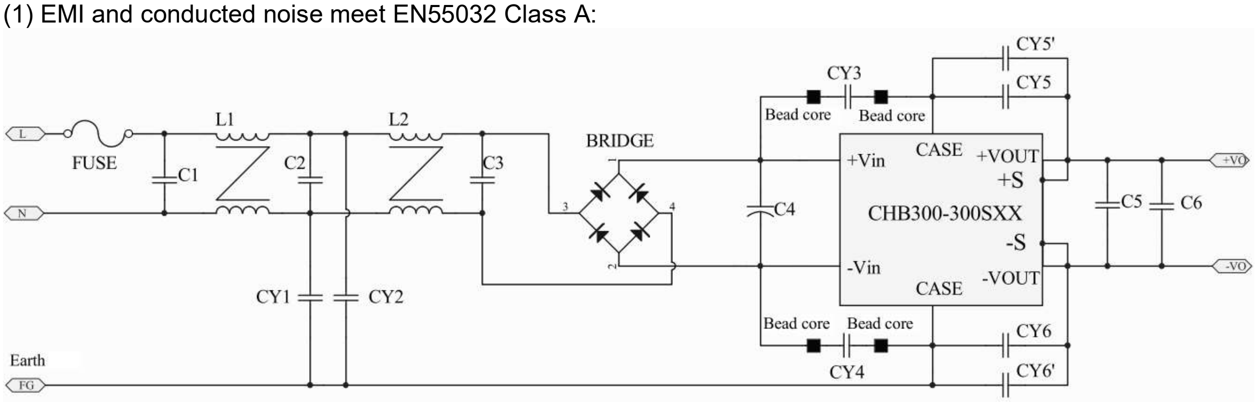
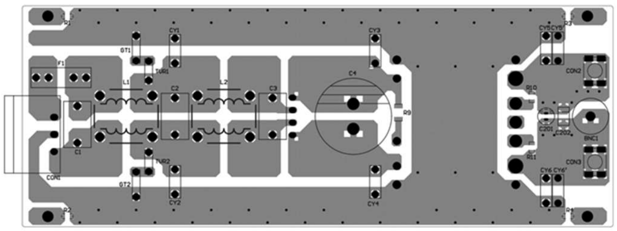


Figure1 Connection circuit



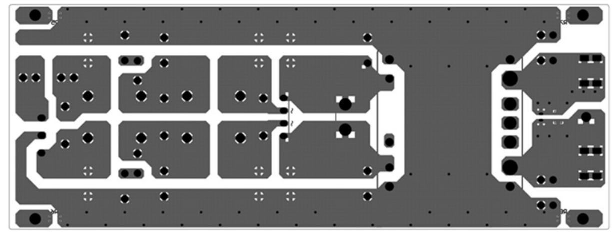


Figure2 PCB layout top view

Figure2 PCB layout bottom view

Components value:

	Model Number				
	CHB300-300S05	**CHB300-300S12**	**CHB300-300S24**	**CHB300-300S28**	**CHB300-300S48**
C1	0.68uF/305V				
C2					
C3					
C4	150uF/450V				
C5	NC				
C6	1uF/100V				
CY1	1000pF				
CY2					
CY3	2200pF				
CY4					
CY5	4700pF				
CY5’					
CY6					
CY6’					
L1	5.5mH /5A BULL WILL URT24-050055H (G91C7221622)				
L2					
BEAD CORE	CY3, CY4				

NOTE:

C1, C2, C3 metallized polypropylene film capacitors, C4 aluminum capacitors,
C6, CY1, CY2, CY3, CY4, CY5, CY5’, CY6, CY6’ ceramic capacitors.
C1, C2, C3: 0.68uF/305V (FARATRONIC MKP62 Series C42Q2684M6HC000) or equivalent.
C4: 150uF/450V (NIPPON CHEMI-CON EKXG-451E□□151MM45S) or equivalent.
CY1, CY2, CY3, CY4, CY5, CY5’, CY6, CY6’:
1000pF (TDK CD Series) or equivalent.
2200pF (TDK CD Series) or equivalent.
4700pF (TDK CD Series) or equivalent.
L1, L2: 5.5mH /5A (BULL WILL URT24-050055H) or equivalent.
BEAD CORE: A6B T 4*1.5*2 KING CORE (or BRI 4.0*1.5*2.0mm CHILISIN) or equivalent.

CHB300-300S Series
Application Note V16

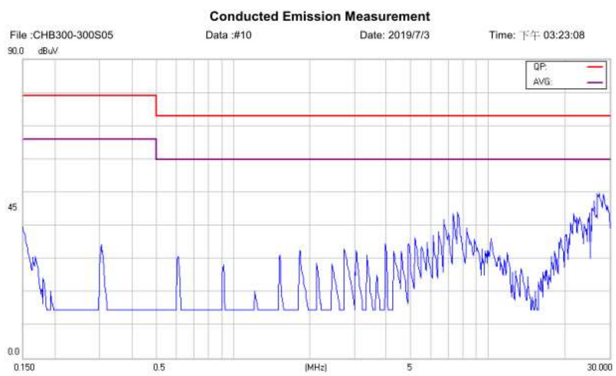
EN55032 Class A Conducted Emission CONDUCTION

※Test with Metal Plate Connect to Case and Earth.

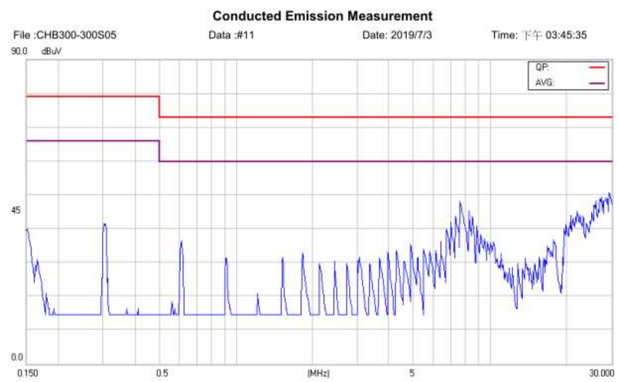
Test Standard: **EN55032/55022** Class A Conducted Emission Conduction

CHB300-300S05

Line

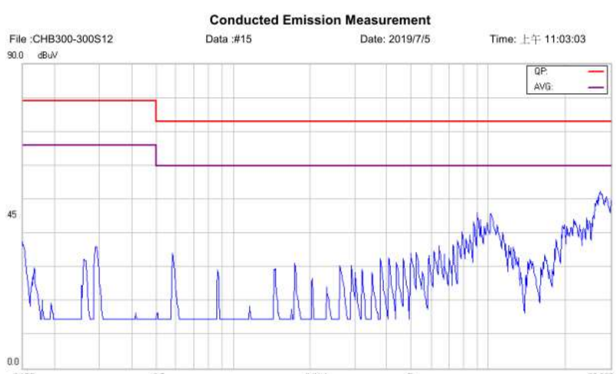


Neutral

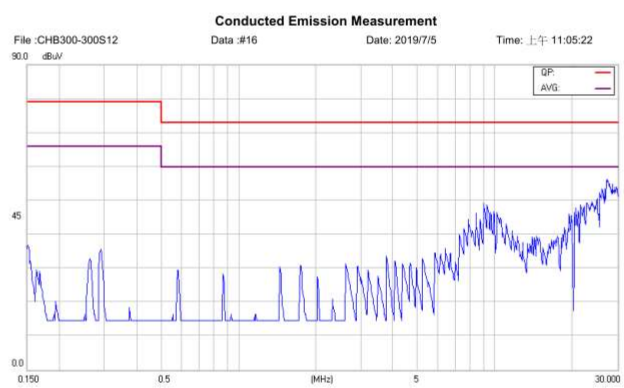


CHB300-300S12

Line

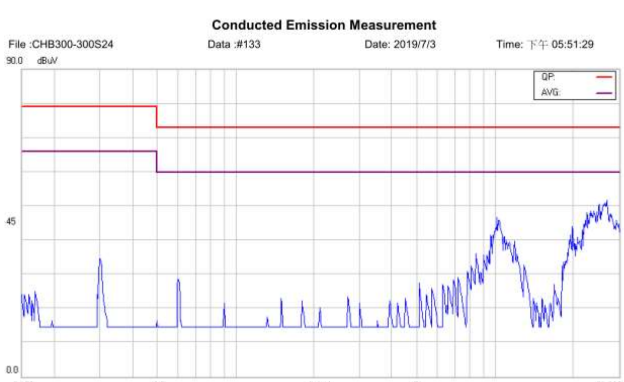


Neutral

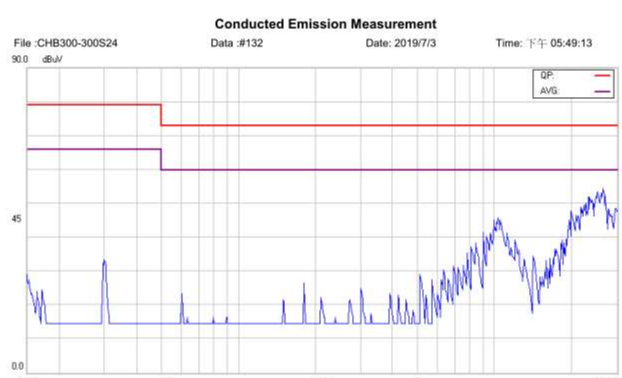


CHB300-300S24

Line

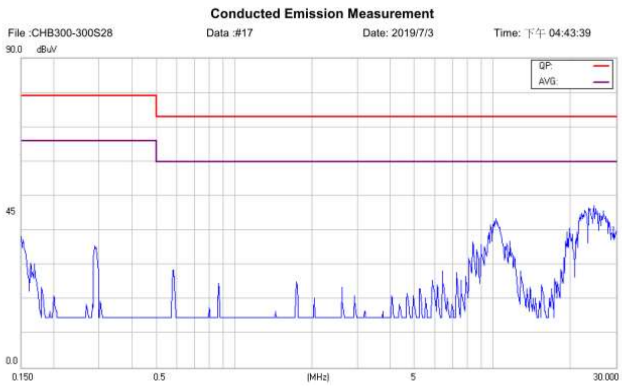


Neutral

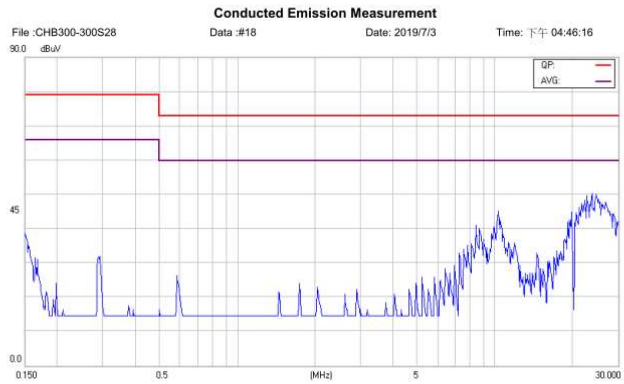


CHB300-300S28

Line

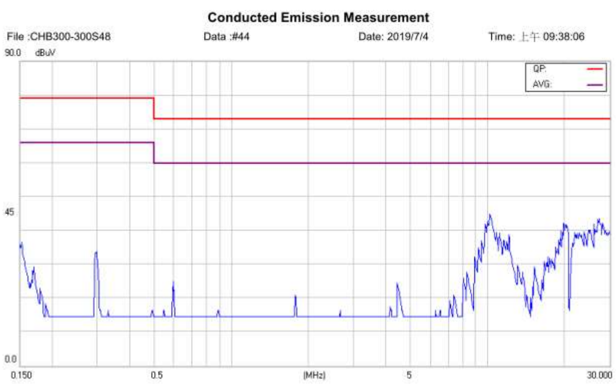


Neutral

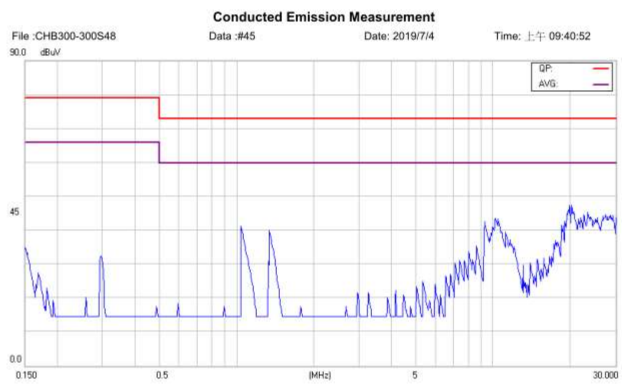


CHB300-300S48

Line



Neutral



10.3 DC Input EMC Considerations

EMI Test standard: EN55022 / EN55032 Class A Conducted Emission
Test Condition: Input Voltage: Nominal, Output Load: Full Load

(1) EMI and conducted noise meet EN55032 Class A:

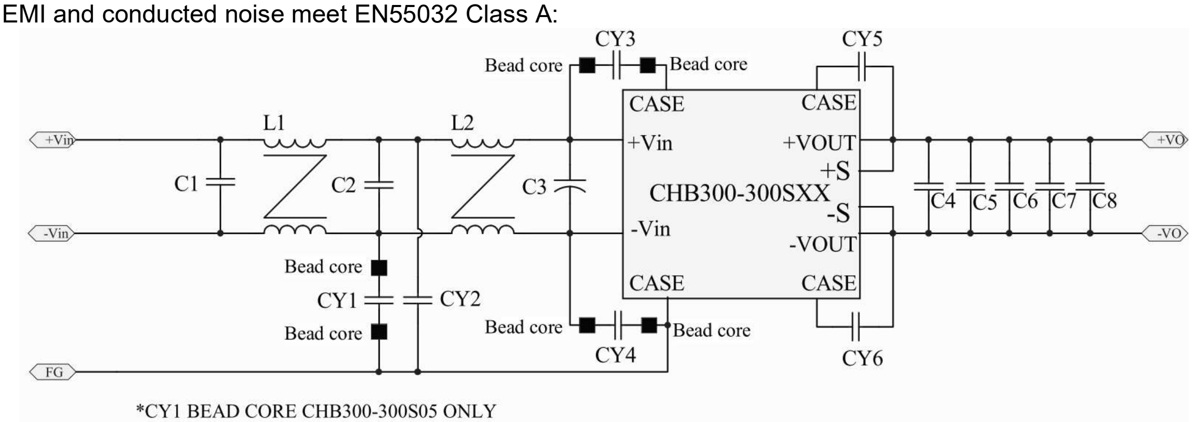


Figure3 Connection circuit for conducted EMI Class A testing

(2) EMI and conducted noise meet EN55022 Class A specifications:

	Model Number				
	CHB300-300S05	**CHB300-300S12**	**CHB300-300S24**	**CHB300-300S28**	**CHB300-300S48**
C1	0.22uF/630V				
C2					
C3	68uF/450V				
C4	4.7uF/50V				4.7uF100V
C5					
C6	0.47uF/250V				
C7					
C8					
CY1	100pF				
CY2	1500pF				
CY3					
CY4					
CY5	4700pF				
CY6					
L1	5.5mH /5A BULL WILL URT24-050055H (G91C7221622)				
L2					
BEAD CORE	CY1, CY3, CY4	CY3, CY4			

Note:

C1, C2, C4, C5, C6, C7, C8, CY1~CY6 ceramic capacitors, C3 aluminum capacitors

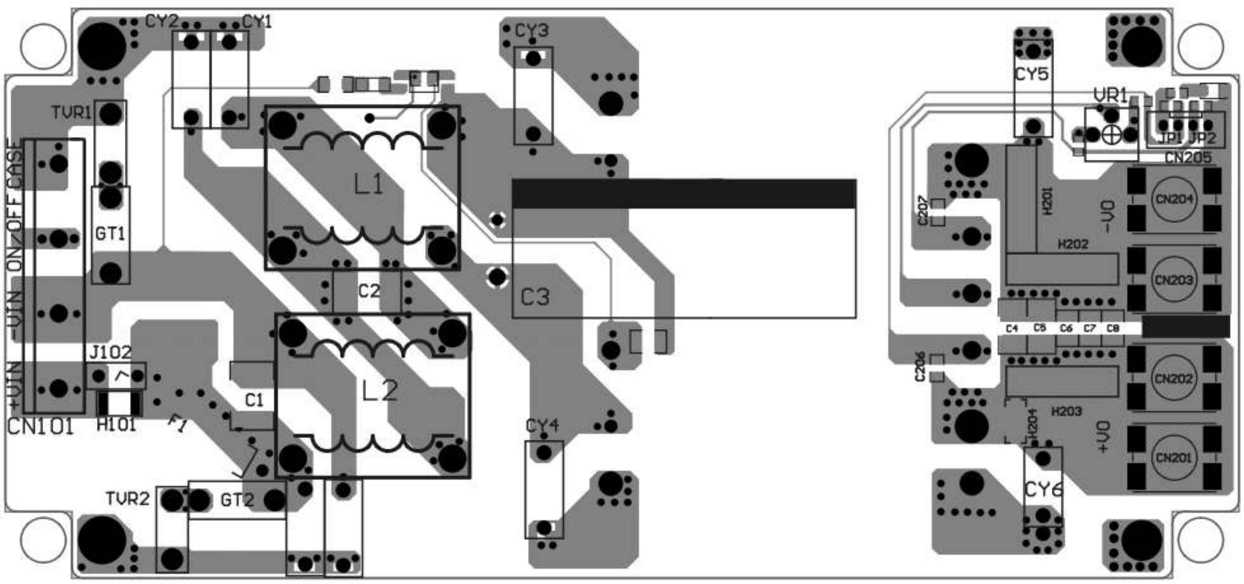
C3: 68uF/450V BXW RUBYCON or equivalent.

CY1~CY6:

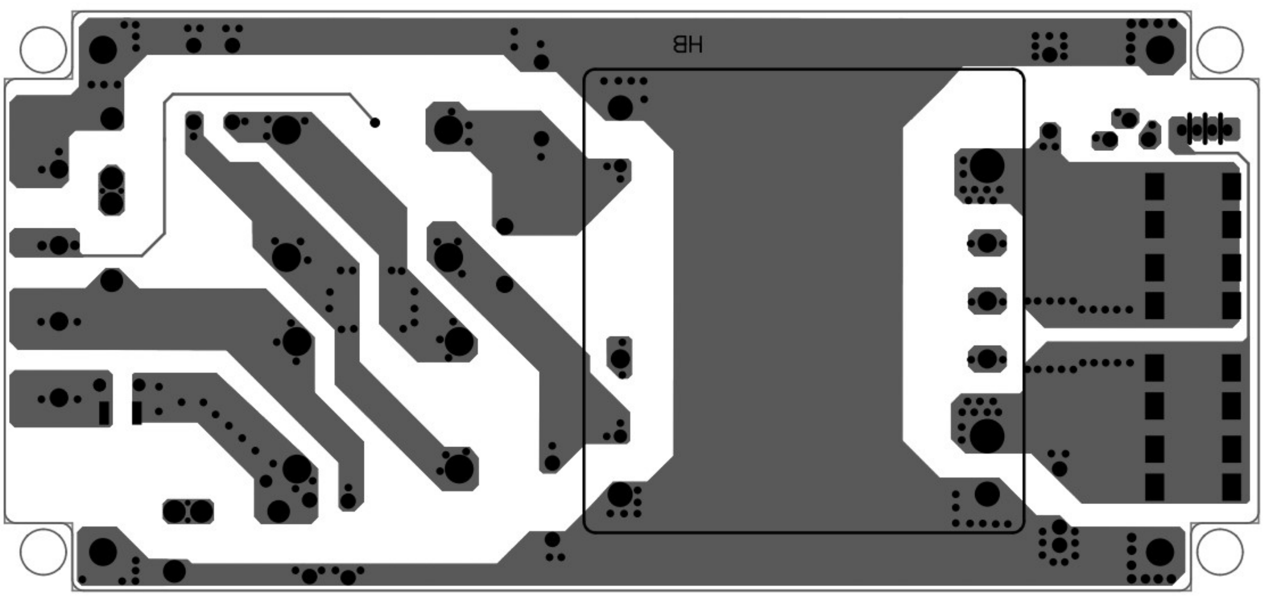
100pF (CD Series TDK) or equivalent
1500pF (CD Series TDK) or equivalent
4700pF (CD Series TDK) or equivalent

L1, L2: 5.5mH /5A (BULL WILL URT24-050055H) or equivalent.

BEAD CORE: A6B T 4*1.5*2 KING CORE (or BRI 4.0*1.5*2.0mm CHILISIN) or equivalent.



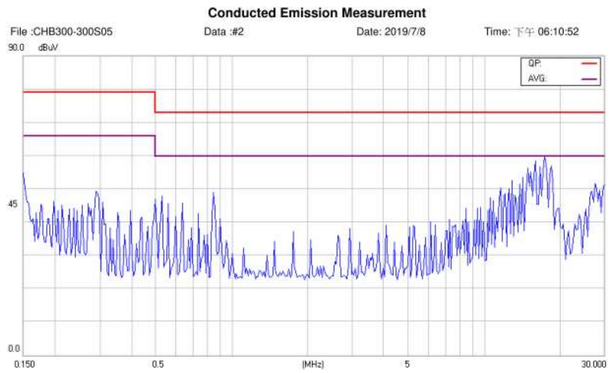
EMI test board top side



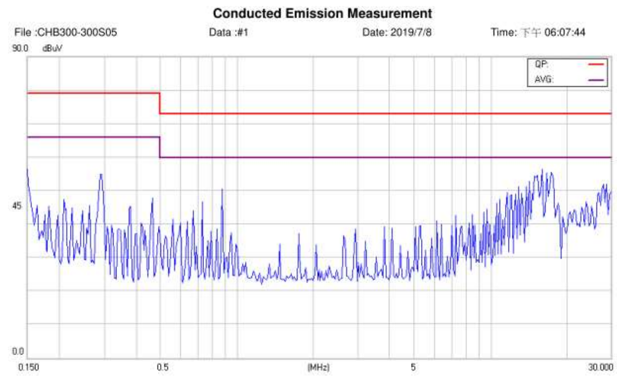
EMI test board bottom side

CHB300-300S05

Line

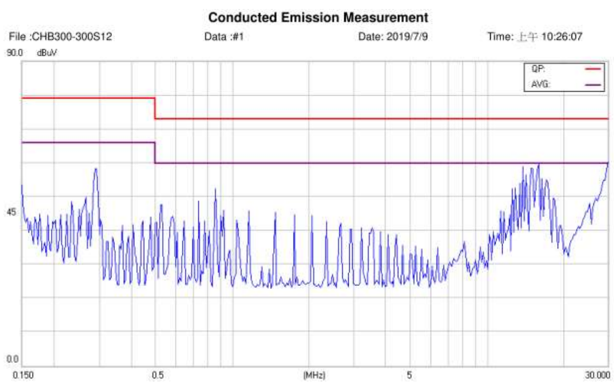


Neutral



CHB300-300S12

Line



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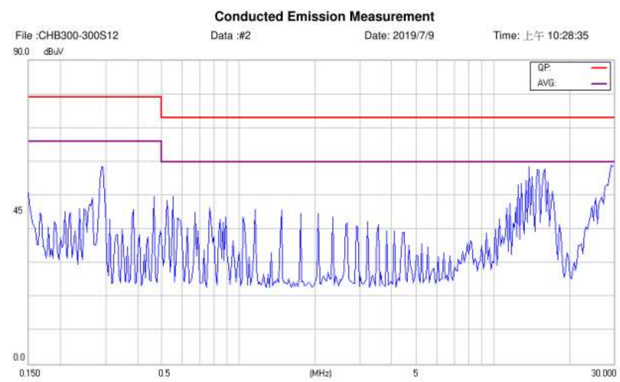
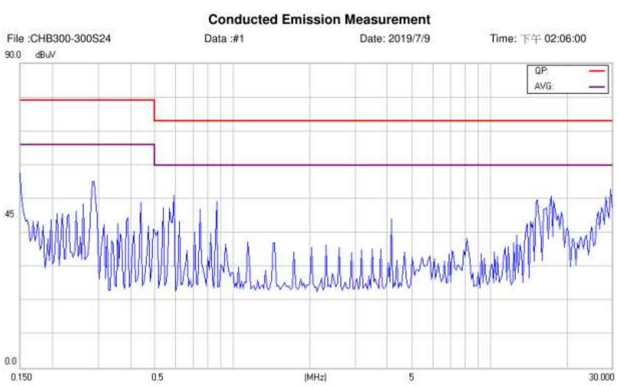


CHB300-300S24

Line



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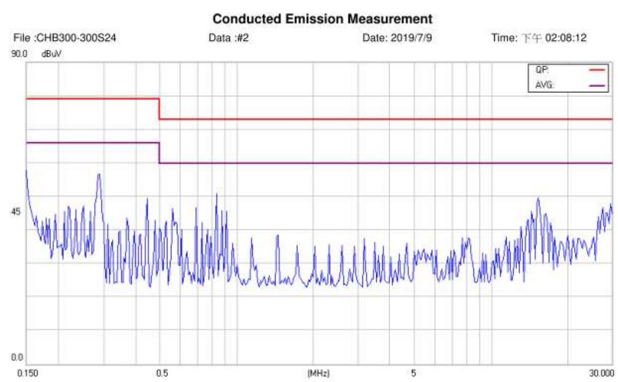
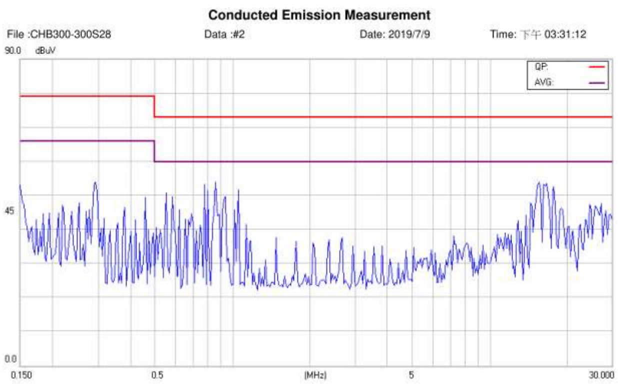


CHB300-300S28

Line



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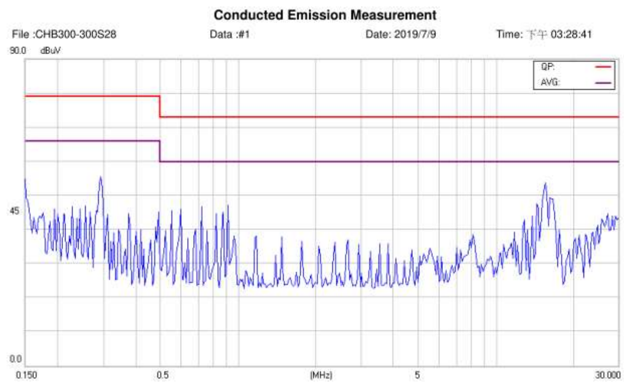
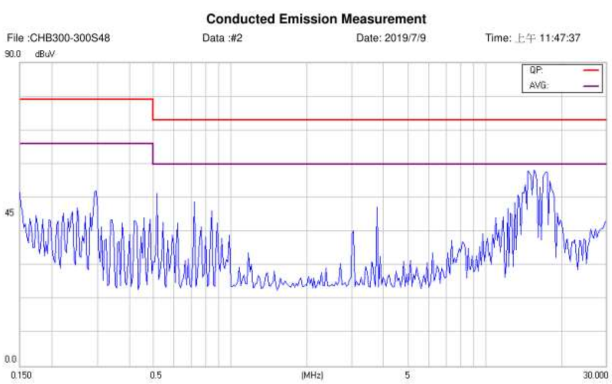


CHB300-300S48

Line



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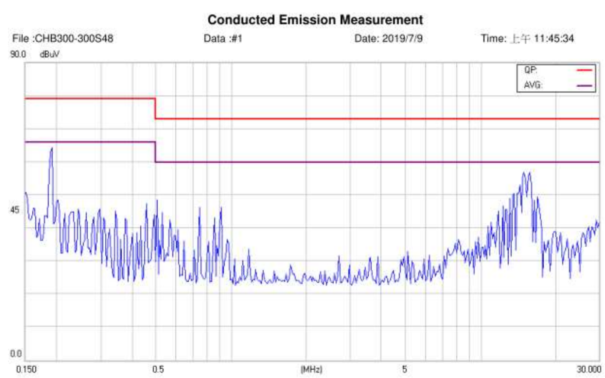

CINCON ELECTRONICS CO., LTD.

Headquarters:

14F, No.306, Sec.4, Hsin Yi Rd.
Taipei, Taiwan
Tel: 886-2-27086210
Fax: 886-2-27029852
E-mail: sales@cincon.com.tw
Web Site: https://www.cincon.com

Factory:

No. 8-1, Fu Kung Rd.
Fu Hsing Industrial Park
Fu Hsing Hsiang,
ChangHua Hsien, Taiwan
Tel: 886-4-7690261
Fax: 886-4-7698031

Cincon North America:

1655Mesa Verde Ave. Ste 180
Ventura, CA93003
Tel: 805-639-3350
Fax: 805-639-4101
E-mail: info@cincon.com